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ADDENDUM #2

Oscoda Area Schools 2024 Bond Projects
Bid Package No. 2 – New Community Center

February 14, 2025

Contents:

1. The Collaborative Addendum 2 Writeup 136 pages
2. Bid Division Descriptions:
 - General Trades – The general trades bid division is responsible for providing and installing the wall padding in the field house – Alt. A2
 - General Trades – The general trades bid division is responsible for supplying and installing all door hardware, including access control door hardware as indicated in the hardware sets as it relates to hollow metal doors. Card readers by Electrical bid division.
 - Glass & Glazing – The glass & glazing bid division is responsible for supplying and installing all door hardware, including access control door hardware as indicated in the hardware sets as it relates to aluminum doors and frames. Card readers by Electrical bid division.
 - Electrical – the electrical bid division is responsible for supplying and installing the card readers.
 - Earthwork – The re-pave alternates shall include complete removal and replacement of existing asphalt.
 - Asphalt – The re-pave alternates shall include complete removal and replacement of existing asphalt.
3. Bid RFI Responses – Most of this information is also included in the AE writeup.
 - Bid RFI #1 – Door Schedule
 - Bid RFI #2 – Asphalt Path
 - Bid RFI #3 – Electrical Clarifications
 - Bid RFI #4 – Resilient Athletic Flooring Substitution Request
 - Bid RFI #5 – Shoemaker Mfr. Company
 - Bid RFI #6 – Existing Controls
 - Bid RFI #7 – Panel Schedules & One-Line
 - Bid RFI #8 – Sound Absorbing Wall & Ceiling Units
 - Bid RFI #9 – Material SS3
 - Bid RFI #10 – Wall Panels
 - Bid RFI #11 – Light Poles
 - Bid RFI #12 – Locker Substitution Request
 - Bid RFI #13 – Isimet Panic Button
 - Bid RFI #14 – A4.20 – Detail C2
 - Bid RFI #15 – Mesh & Rebar
 - Bid RFI #16 – Gas Pipe Size
 - Bid RFI #17 – Sport Equipment



- Bid RFI #18 – Dynamic Sport Substitution Request
- Bid RFI #19 - RTUs & Ducts in Gym Substitution Request
- Bid RFI #20 – Support Steel

4. If you would like to attend the bid opening virtually and have any issues opening the link in the bid documents email Christie @ chuver@wolgast.com. Link is on word document included in the bid documents files as well.

5. The Bid due date **HAS CHANGED** bids are now due **February 19, 2025 @ 3:30 pm.**

6. Be sure to note receipt of this Addendum on your bid form.

THE
COLLAB
ORATIVE

02/13/2025

ADDENDUM NO. 02

To the Drawings and Specifications for:

Oscoda Area Schools Community Center

107253

Owner Name: Oscoda Area Schools

Prepared By:

The Collaborative

Telephone: (419) 242-7405

Fax: (419) 242-7400

TO ALL BIDDERS:

This addendum supplements and amends the original drawings and specifications, and shall be taken into account in preparing proposals, and shall become a part of the contract documents. Receipt of this Addendum must be acknowledged in the Bid Form.

Architecture, Planning & Design
TC.design

Ann Arbor
Columbus
Toledo

GENERAL

Question 01: We are looking at the Oscoda Schools project and have a couple questions. Doors 001, 002, 003, 004, 005 and 006-1 appear to have sidelites as shown on the floor plan on sheet A1.10 and sheet A6.00 detail F2. The Door Schedule has them listed as frame type F-1. Please confirm they should be frame type F-4?

Answer 01: Doors 001, 002, 003, 004, 005 and 006-1 should be marked as frame type F-4. Drawing revised and resubmitted

Question 02: I am inquiring on the asphalt path for this project, on sheet C-501 it states "see standard duty HMA pavement section". Does this mean that it will be a copy of the 2 lifts of 4EL or is that only referring to the sub-base and aggregate base portion of that section? And if it is not a copy of the entire standard duty section, will the HMA portion for this path be 1 lift at 1.5", or something different entirely?

Answer 02: The intent of the path is to be the same pavement section as the standard duty HMA section - both lifts of HMA (3" total) and the associated subbase and aggregate base.

Question 03: Please confirm receptacle mounting requirements on PEMB columns in 018 FIELD HOUSE. 7/E5.01 requires rigid galvanized steel conduit for column-mounted receptacles in unfinished areas. Does this apply here? Is EMT conduit acceptable?

Answer 03: 018 FIELDHOUSE is not considered an unfinished area.

Question 04: Columns are wrapped w/ plywood & padding. Will the padding be cut to accommodate receptacles? If so, who is responsible?

Answer 04: Wolgast to confirm means and methods. GC will be installing and cutting the padding as required as well as providing the cutout inserts. Outlets just need to be furred out flush with finished surface as noted in specs and on detail 7/E5.01

Question 05: Detail 3/E5.01 requires stainless steel conduit in areas deeded by Ambient Declaration Table. Will stainless steel conduit be required on this project? The detail also calls for waterproof around the panelboard. Please confirm if this is required. Please confirm if details 1 & 5 require hazardous location fittings. Both call for conduit tee Crouse-Hinds GAUT24. This is an explosion-proof fitting, listed for Class 1, Division 1 and other hazardous locations.

Answer 05: Waterproofing will not be required. Details 1 & 5 will not require hazardous location fittings.

Question 06: Please review the attached information on Tarkett Sports PolyTurf for consideration as an approved equal.

Answer 06: Submittal rejected. Please see specs for acceptable manufacturers.

Question 07: I am writing to request approval for Shoemaker Manufacturing as an equal to the specified make and model grilles and diffusers specified and scheduled in the bid documents.

Answer 07: Rejected, Provide products by one of the specified manufacturers.

Question 08: Is there an existing district control system that this building will need to be interfaced with? I see no control contractors or control systems are currently specified.

Answer 08: The HVAC control system being installed on the High School heating project is being provided by Control Solutions Inc. The system is Distech Controls with Niagara 4. The Community Center is to interface with that new system to provide an integrated interface for the campus. See attached a revised Control System for HVAC specification.

Question 09: E6.01 & E7.01 - Please confirm amperage for panelboard RP1A and its feeder. - panel schedule indicates 100A - Online indicates 225A

Answer 09: Provide 100A panelboard for RP1A as indicated on sheet E6.01, revise feeder for RP1A to 100A, 4W (4#2, #8GND, 1 1/4" C) and circuit breaker to 100A-3P on sheet E7.01. Sheet E7.01 revised and resubmitted.

Question 10: Please clarify design intent for (4) existing wood poles in E-W line across parking lot. For simplicity, will refer to western pole as 'A', and continuing B, C, D to East. A & D noted as pole + fixture existing to remain. No conflict noted. B & C noted as pole + fixture to remain. Also keynoted for new dimming, motion sensing, and photocell control. 'FLP10' by each pole appears to be a new fixture. Maybe FB10 from fixture schedule? Do existing fixtures remain? How many new fixtures per pole? Does 1" C refer to a new underground 1" conduit between poles?

Answer 10: 'FLP10' by each pole is a typographical error and should be 'FB10'. These are new light fixtures. The existing fixtures point to the north and are to remain. Existing fixtures are most likely on a utility supplied circuit. There is one (1) new fixture per pole and each are directed south into the new parking lot. 1" C does refer to a new underground 1" conduit between poles.

Question 11: Please clarify is structural steel will be supplying support steel between PEMB main frames to support basketball backtops?

Answer 11: Structural steel or cold-formed steel purlins are both acceptable to support basketball equipment; this determination will be made by the delegated PEMB engineer / designer / manufacturer. Loads are provided in S0.01.

Question 12: Please clarify that structural steel will be provided for perimeter divider curtains.

Answer 12: Structural steel or cold-formed steel purlins are both acceptable to support basketball equipment; this determination will be made by the delegated PEMB engineer / designer / manufacturer. Loads are provided in S0.01.

Question 13: Please clarify if attachment to purlins is acceptable for batting cages and curtains (that divide the basketball courts and batting cages) .

Answer 13: Structural steel or cold-formed steel purlins are both acceptable to support basketball equipment; this determination will be made by the delegated PEMB engineer / designer / manufacturer.

Question 14: Please note that drawing E1.02 does not accurately represent the number of gym curtain motor/power locations necessary. Layout for curtain motors is TBD; however, there will be a minimum of 6 locations.

Answer 14: Provide additional (3) 20A-1P circuits RP1B-23, RP1B-25, RP1B-27 for curtain motors, revise power locations as necessary.

Question 15: Please note that drawing E1.02 does not show motor/power requirements for batting cages. There will be two (2) batting cage motors.

Answer 15: Provide (2) 20A-1P circuits RP1B-29, RP1B-31 for batting cage locations.

Question 16: I am writing with regards to the Oscoda BP 2 New Community Center project in Oscoda, MI. I am submitting fräsch! for consideration as a comparable product to the specified products below: Section 098430 P2.1B9 Kirei Simple Baffle

Answer 16: Substitution rejected. Please see specs for list of acceptable manufacturers

Question 17: I am sending this email in reference to the print A3.0 callout of MP-1 and MP-3 (Omega light clip and caulk) siding in the office area. The rest of the building is MP-2 MBCI 36" wide metal panel. We are a well-established metal building erector and very familiar with most of the materials used in PEMB's. This Omega material is very uncommon, at least in our experience. I looked it up online to see what it is and how to install it. It looks like it would be a bit labor intense and slow to install properly. Needless to say, we are not skilled in this material. I think we could install it, but it would not be an efficient process and therefore add additional cost. We would be very interested in doing this project and have worked with Wolgast on many occasions. I would recommend several possible alternatives; the easiest alternative would be to use a standard metal wall panel with a different profile to obtain a contrast to the primary sheeting material on the rest of the building. This would be a much cheaper option and there are some attractive surfaces that could provide the esthetic contrast. Another option would be insulated wall panels which would provide an appearance similar to what your rendering shows and would not require additional insulation as the panels are already insulated. A 3- or 4-inch panel provides excellent R value and is simpler to install. The third option is to find an installer familiar with this system, to do the office siding. I am certainly willing to search one out and try to get a quote for that portion of the building. If you are interested in my personal recommendation, I would go with the Insulated wall panel, It is the best of all world's, esthetics and function.

Answer 18: Substitution for wall panels rejected. See specs for a list of acceptable manufacturers. Also please submit proper substitution documentation for any further requests.

Question 19: Drawing E1.01 shows the Isimet Alarm System, is there any additional information that can be provided for this system?

Answer 19: See included documentation

Question 20: Please see detail section C2 on Page A4.20. It is calling for rigid insulation board and looks to be hat channel over the block wall. My question is it necessary for seven hat channels and are we to cut the rigid foam board to fit?

Answer 20: Detail A7/4.10 notes them as Z furring and the amount provided should be designed to work with the PEMB metal panel system and rigid insulation

Question 21: Please see the attached conversions for the Oscoda Public schools project. I hope you and the team can see some value in removing some of the wire mesh and rebar in this project. Let me know if you have any questions or if the architect has any questions.

Answer 21: Substitution requests for steel fibers and/or poly fibers (macro fibers or micro fibers) will be accepted during construction submittals. Dosage will be provided by the fiber manufacturer. Fibers may be substituted for conventional welded wire reinforcing on the administration area floor slab, field house floor slab, housekeeping pads, and light-duty exterior equipment pads. Fiber substitution will be rejected for wall foundations and spread foundations.

Question 22: Can you tell me what the diameter of the gas pipe that goes to the exterior units. I do not see it listed anywhere on sheet M1.01?

Answer 22: Gas piping at meter to be 3"Ø manifold with branches for:

1. RTU-1&2 --> 3"Ø to RTU-2
2"Ø from tee at RTU-2 to RTU-1
2. RTU-3 --> 1-1/4"Ø
3. Gas grill --> 3/4"Ø

Question 23: Would Dynamic Sports Construction be considered for the Oscoda Community Center?

Answer 23: Submittal Rejected, Please see specs for suitable alternatives.

Question 24: Could, Captive Air, Paragon & Modine be a substitute for the Aeon systems. Cannot find a manufacturer for the bathroom stalls. Could Prihoda be a substitute for the fabric duct in the gym.

Answer 24: Rejected, please submit proper forms and documentation for substitution requests. See spec sections for acceptable manufactures. See SECTION 102113.19 - SOLID PLASTIC TOILET COMPARTMENTS 2.1 for Bathroom stall partitions.

Question 25: Please clarify support steel requirements for scoreboards as shown on A4.00. Please clarify support steel requirements for overhead volleyball equipment.

Answer 25: Scoreboard: Assume a dead load of 200 lbs per unit. Provide miscellaneous framing between wall girts for anchorage. Sub-framing between girts shall be by the PEMB supplier (similar to a framed opening).

Volleyball: Locations per A7.22, provide PEMB secondary framing at the primary attachment point of 1250 lbs and brace attachment point of 500 lbs, final dimensions and layout shall be coordinated with the supplier.

Question 26: In the screenshot attached it is calling for SS3 and there is no SS3 in the material schedule. Should this be SS1 or SS2? This is on page A7.20.

Answer 26: The Horizontal surface of the sink in TLT/SHOWER 011 should be SS2 not SS3.

Question 27: The plans (A4.00) only provide simple details of the hanging letters and the vinyl wall graphic has no dimensions on plans A6.00.

Answer 27: The vinyl wall graphic on E4/A6.00 is roughly 7' x 6'. The hanging letters on E2/A4.00 have overall dimensions. For details of both please refer to Spec Section 101400 - Signage 2.4 and 2.5 for specifics on the ceiling hung vinyl letters and Vinyl wall graphics.

Clarifications

1. See Isimet Panic Button documentation for question 19
2. Sports Floor thickness on drawing A7.21 to take precedent over specs
3. The following section are to be deleted from the specifications:
 - a. Section 233424: Circulation Fans
 - b. Section 237200: Air-to-Air Energy Recovery Equipment

Specifications

Division 22:

Section 220719: Plumbing Piping Insulation

Division 23:

Section 230923: Direct-digital control system for hvac

Section 230593: Testing, Adjusting, and Balancing for HVAC

Section 230713: Duct Insulation

Section 230913: Instrumentation and Control Devices for HVAC

Section 230993: Sequence of Operations for HVAC Controls

Section 231123: Facility Natural Gas Piping

Section 233100: HVAC Ducts and Casings

Section 233439: High-Volume, Low-Speed Propeller Fans

Section 233600: Air Terminal Units

Section 233700: Air Outlets and Inlets

Section 237416: Packaged Rooftop Air-Conditioning Units

Drawings

Civil Drawings

Drawing C-103

Item #1: Updated Alt A2: Expanded Concrete Pad to Alt **C4**: Expanded Concrete Pad to match sheet C-102

Architectural Drawings

Drawing A2.00

Item #1: Updated door frames in door schedule

Drawing A7.21

Item#1: SF5 Royal Blue to be changed to Marine

Drawing A7.21

Item #1: Updated layout name to FINISH PLAN - ALTERNATE **A2** - WALL PADS to match list of alternates given.

Item #2: Updated any reference to Alt A3 to be Alt A2 to match list of alternates given

Electrical Drawings

Drawing E7.01

Item #1: Revise RP1A feeder circuit breaker to 100A-3P in lieu of 225A-3P.

Item #2: Revise RP1A feeder conductor to 100A,4W in lieu of 225A, 4W.

Item #2: Revise RP1A panel size to 100A in lieu of 225A.

END OF ADDENDUM #01 (07 Written Pages, 03 Re-Issued Drawings, 01 Specification Section)

**SECTION 220719
PLUMBING PIPING INSULATION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flexible elastomeric cellular insulation.
- B. Glass fiber insulation.
- C. Jacketing and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 221005 - Plumbing Piping: Placement of hangers and hanger inserts.

1.03 REFERENCE STANDARDS

- A. 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).
- B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2019).
- C. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.
- D. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.
- E. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- H. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 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

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER INSULATION

- A. Manufacturers:
 - 1. CertainTeed Corporation; _____: www.certainteed.com/#sle.
 - 2. Johns Manville Corporation; _____: www.jm.com/#sle.
 - 3. Knauf Insulation: www.knaufinsulation.com/#sle.
 - 4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: www.ocbuildingspec.com/#sle.
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
 - 1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
 - 2. Maximum Service Temperature: 850 degrees F (454 degrees C).
 - 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 (0.029 ng/(Pa s m)).
- D. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.
- E. Vapor Barrier Lap Adhesive: Compatible with insulation.
- F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Manufacturers:
 - 1. Aeroflex USA; AEROFLEX Self-Seal: www.aeroflexusa.com/#sle.
 - 2. Armacell LLC; AP Armaflex: www.armacell.us/#sle.
 - 3. K-Flex USA LLC; Insul-Tube: www.kflexusa.com/#sle.
- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
 - 1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
 - 2. Maximum Service Temperature: 220 degrees F (104 degrees C).
 - 3. Connection: Waterproof vapor barrier adhesive.
- C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.
- D. Weather Barrier: Air dried, contact adhesive, compatible with insulation and ASTM E84 compliant.

2.04 JACKETING AND ACCESSORIES

- A. PVC Plastic Jacket:
 - 1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F (Minus 18 degrees C).
 - b. Maximum Service Temperature: 150 degrees F (66 degrees C).
 - c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/(Pa s m)), maximum, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 10 mil, 0.010 inch (0.25 mm).
 - e. Connections: Brush on welding adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

- B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E. Glass fiber insulated pipes conveying fluids below ambient temperature:
 - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- G. Glass fiber insulated pipes conveying fluids above ambient temperature:
 - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- H. Inserts and Shields:
- I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 078400.
- J. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with PVC jacket and fitting covers.

3.03 SCHEDULES

- A. Plumbing Systems:
 - 1. Domestic Hot Water Supply:
 - a. Glass Fiber Insulation:
 - 1) Thickness: 1 inch (25.4 mm).
 - 2. Domestic Hot Water Recirculation:
 - a. Glass Fiber Insulation:
 - 1) Thickness: 1 inch (25 mm).
 - 3. Domestic Cold Water:
 - a. Glass Fiber Insulation:
 - 1) Thickness: 1 inch (25 mm).

END OF SECTION 220719

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SECTION 230593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Testing, adjustment, and balancing of hydronic systems.
- C. Measurement of final operating condition of HVAC systems.

1.02 RELATED REQUIREMENTS

- A. Section 014000 - Quality Requirements: Employment of testing agency and payment for services.

1.03 REFERENCE STANDARDS

- A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.
- B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008, with Errata (2019).
- C. NEBB (TAB) - Procedural Standard for Testing, Adjusting and Balancing of Environmental Systems; 2019, with Errata (2022).
- D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2023.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract. The following are approved test and balance contractors. No others may be used or their work will be dismissed and test and balance will need to be done again.
 - 1. HiTech Test and Balance, Freeland
 - 2. Great Lakes Balancing, Grand Rapids.
 - 3. Integrity Test and Balance, Traverse City
 - 4. Ener-Tech Testing, Holly
 - 5. Control Solutions, Alpena
- C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
 - 1. Include at least the following in the plan:
 - a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
 - b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
 - c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
 - d. Final test report forms to be used.
 - e. Procedures for formal deficiency reports, including scope, frequency and distribution.
- D. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
 - 1. Submit to the the Commissioning Authority within two weeks after completion of testing, adjusting, and balancing.
 - 2. Revise TAB plan to reflect actual procedures and submit as part of final report.
 - 3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.

4. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations. Provide additional PDF of same.
5. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
6. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
7. Units of Measure: Report data in I-P (inch-pound) units only.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 1. AABC (NSTSB), AABC National Standards for Total System Balance.
 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
 3. SMACNA (TAB).
 4. Maintain at least one copy of the standard to be used at project site at all times.
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D. TAB Agency Qualifications:
 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section. See approved T and B contractors above.
 2. Certified by one of the following:
 - a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
 - b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
 - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.
- E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 1. Systems are started and operating in a safe and normal condition.
 2. Temperature control systems are installed complete and operable.
 3. Proper thermal overload protection is in place for electrical equipment.
 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 5. Duct systems are clean of debris.
 6. Fans are rotating correctly.
 7. Fire and volume dampers are in place and open.
 8. Air coil fins are cleaned and combed.
 9. Access doors are closed and duct end caps are in place.
 10. Air outlets are installed and connected.
 11. Duct system leakage is minimized.
 12. Hydronic systems are flushed, filled, and vented.
 13. Pumps are rotating correctly.

14. Proper strainer baskets are clean and in place.
 15. Service and balance valves are open.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C. Beginning of work means acceptance of existing conditions.

3.03 PREPARATION

- A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
1. Require attendance by all installers whose work will be tested, adjusted, or balanced.
- B. Provide additional balancing devices as required.

3.04 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
- C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.05 RECORDING AND ADJUSTING

- A. Field Logs: Maintain written logs including:
1. Running log of events and issues.
 2. Discrepancies, deficient or uncompleted work by others.
 3. Contract interpretation requests.
 4. Lists of completed tests.
- B. Ensure recorded data represents actual measured or observed conditions.
- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.06 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.
- L. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.
- M. On fan powered VAV boxes, adjust air flow switches for proper operation.

3.07 WATER SYSTEM PROCEDURE

- A. Adjust water systems to provide required or design quantities.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
- C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- D. Effect system balance with automatic control valves fully open to heat transfer elements.
- E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.
- F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.08 SCOPE

- A. Test, adjust, and balance the following:
 - 1. Plumbing Pumps.
 - 2. Air Cooled Refrigerant Condensers.
 - 3. Packaged Roof Top Heating/Cooling Units.
 - 4. Packaged Terminal Air Conditioning Units.
 - 5. Unit Air Conditioners.
 - 6. Air Coils.
 - 7. Air Handling Units.
 - 8. Fans.
 - 9. Air Filters.
 - 10. Air Terminal Units.
 - 11. Air Inlets and Outlets.

3.09 MINIMUM DATA TO BE REPORTED

- A. Electric Motors:
 - 1. Manufacturer.
 - 2. Model/Frame.
 - 3. HP/BHP.
 - 4. Phase, voltage, amperage; nameplate, actual, no load.
 - 5. RPM.
 - 6. Service factor.
 - 7. Starter size, rating, heater elements.
 - 8. Sheave Make/Size/Bore.
- B. V-Belt Drives:

1. Identification/location.
 2. Required driven RPM.
 3. Driven sheave, diameter and RPM.
 4. Belt, size and quantity.
 5. Motor sheave diameter and RPM.
 6. Center to center distance, maximum, minimum, and actual.
- C. Pumps:
1. Identification/number.
 2. Manufacturer.
 3. Size/model.
 4. Impeller.
 5. Service.
 6. Design flow rate, pressure drop, BHP.
 7. Actual flow rate, pressure drop, BHP.
 8. Discharge pressure.
 9. Suction pressure.
 10. Total operating head pressure.
 11. Shut off, discharge and suction pressures.
 12. Shut off, total head pressure.
- D. Air Cooled Condensers:
1. Identification/number.
 2. Location.
 3. Manufacturer.
 4. Model number.
 5. Serial number.
 6. Entering DB air temperature, design and actual.
 7. Leaving DB air temperature, design and actual.
 8. Number of compressors.
- E. Electric Duct Heaters:
1. Manufacturer.
 2. Identification/number.
 3. Location.
 4. Model number.
 5. Design kW.
 6. Number of stages.
 7. Phase, voltage, amperage.
 8. Test voltage (each phase).
 9. Test amperage (each phase).
 10. Air flow, specified and actual.
 11. Temperature rise, specified and actual.
- F. Air Moving Equipment:
1. Location.
 2. Manufacturer.
 3. Model number.
 4. Serial number.
 5. Arrangement/Class/Discharge.
 6. Air flow, specified and actual.
 7. Return air flow, specified and actual.
 8. Outside air flow, specified and actual.
 9. Total static pressure (total external), specified and actual.
 10. Inlet pressure.

11. Discharge pressure.
 12. Sheave Make/Size/Bore.
 13. Number of Belts/Make/Size.
 14. Fan RPM.
- G. Return Air/Outside Air:
1. Identification/location.
 2. Design air flow.
 3. Actual air flow.
 4. Design return air flow.
 5. Actual return air flow.
 6. Design outside air flow.
 7. Actual outside air flow.
 8. Return air temperature.
 9. Outside air temperature.
 10. Required mixed air temperature.
 11. Actual mixed air temperature.
 12. Design outside/return air ratio.
 13. Actual outside/return air ratio.
- H. Exhaust Fans:
1. Location.
 2. Manufacturer.
 3. Model number.
 4. Serial number.
 5. Air flow, specified and actual.
 6. Total static pressure (total external), specified and actual.
 7. Inlet pressure.
 8. Discharge pressure.
 9. Sheave Make/Size/Bore.
 10. Number of Belts/Make/Size.
 11. Fan RPM.
- I. Terminal Unit Data:
1. Manufacturer.
 2. Type, constant, variable, single, dual duct.
 3. Identification/number.
 4. Location.
 5. Model number.
 6. Size.
 7. Minimum static pressure.
 8. Minimum design air flow.
 9. Maximum design air flow.
 10. Maximum actual air flow.
 11. Inlet static pressure.
- J. Air Distribution Tests:
1. Air terminal number.
 2. Room number/location.
 3. Terminal type.
 4. Terminal size.
 5. Design air flow.
 6. Test (final) air flow.
 7. Percent of design air flow.

END OF SECTION 230593

**SECTION 230713
DUCT INSULATION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Duct insulation.
- B. Duct liner.
- C. Weather barrier coatings.
- D. Jacketing and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 230553 - Identification for HVAC Piping and Equipment.

1.03 REFERENCE STANDARDS

- A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.
- C. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.
- D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).
- E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).
- F. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2020.
- G. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2019.
- H. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation; 2023.
- I. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts; 2016 (Reapproved 2021).
- J. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2019 (Reapproved 2022).
- K. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers; 2015 (Reapproved 2022).
- L. ASTM C1423 - Standard Guide for Selecting Jacketing Materials for Thermal Insulation; 2021.
- M. ASTM C1775 - Standard Specification for Laminate Protective Jacket and Tape for Use Over Thermal Insulation for Outdoor Applications; 2022.
- N. ASTM D5590 - Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay; 2017 (Reapproved 2021).
- O. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- P. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- Q. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

- R. SAE AMS3779 - Tape, Adhesive, Pressure-Sensitive Thermal Radiation Resistant, Aluminum Coated Glass Cloth; 2016b.
- S. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- T. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements 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 necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than 6 years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.07 FIELD CONDITIONS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

- A. Manufacturer:
 - 1. CertainTeed Corporation: www.certainteed.com/#sle.
 - 2. Johns Manville: www.jm.com/#sle.
 - 3. Knauf Insulation: www.knaufinsulation.com/#sle.
 - 4. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
 - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
 - 1. K (Ksi) value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C518.
 - 2. Maximum Service Temperature: 1,200 degrees F (649 degrees C).
 - 3. Maximum Water Vapor Absorption: 5.0 percent by weight.
- C. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
 - 3. Secure with pressure-sensitive tape.

- D. Vapor Barrier Tape:
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.
- E. Indoor Vapor Barrier Mastic:
 - 1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- F. Outdoor Vapor Barrier Mastic:
 - 1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

2.03 GLASS FIBER, RIGID

- A. Manufacturer:
 - 1. CertainTeed Corporation; _____: www.certainteed.com/#sle.
 - 2. Johns Manville; _____: www.jm.com/#sle.
 - 3. Knauf Insulation; _____: www.knaufinsulation.com/#sle.
 - 4. Owens Corning Corporation; 700 Series FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.
 - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Insulation: ASTM C612; rigid, noncombustible blanket.

2.04 WEATHER BARRIER COATINGS

- A. Weather-Resistive Barrier Coating: Fire-resistive, UV resistant, water-based mastic for use over closed cell polyethylene and polyurethane foam insulation; applied with glass fiber or synthetic reinforcing mesh.
 - 1. Manufacturers:
 - a. H.B. Fuller Construction Products, Inc; Childers - CP Series Weather Barrier Coating: www.fosterproducts.com/#sle.
 - 2. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, Class A, when tested in accordance with ASTM E84.
 - 3. Water Vapor Permeance: Greater than 1.0 perm (57 ng/(Pa s m)) in accordance with ASTM E96/E96M.
 - 4. Resistance to Fungal Growth: No growth when tested in accordance with ASTM D5590.
 - 5. Color: As selected by Architect.

2.05 JACKETING AND ACCESSORIES

- A. Aluminum Jacket:
 - 1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch (0.41 mm) with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
 - 2. Thickness: 0.016 inch (0.40 mm) sheet.
 - 3. Finish: Smooth.
 - 4. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
 - 5. Fittings: 0.016 inch (0.40 mm) thick die-shaped fitting covers with factory-attached protective liner.
 - 6. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.
- B. Aluminum-Foil Laminate Jacket:
 - 1. Manufacturers:
 - a. Ideal Tape Co., Inc: www.idealtape.com/#sle.
 - 2. Factory-applied, pressure sensitive adhesive jacketing on paper release liner.
 - 3. Comply with ASTM C1775.
- C. Aluminum-Foil Laminate Jacket:
 - 1. Manufacturers:
 - a. H.B. Fuller Construction Products, Inc; Foster - Vapor-Fas: www.fosterproducts.com/#sle.
 - 2. Factory-applied, pressure sensitive adhesive jacketing to comply with ASTM C1775.

- D. Flexible Weather-Proofing Outdoor Jacket: Self-healing, field-applied outdoor cladding.
 - 1. Material: Aluminum foil/polymer laminate with rubberized asphalt layer and acrylic adhesive.
 - 2. Thickness: 34 mil, 0.034 inch (0.86 mm).
 - 3. Finish: Embossed.
 - 4. Color: Silver.
 - 5. Water Vapor Transmission: 0.002 perm inch (0.0029 ng/(Pa s m)), maximum, when tested in accordance with ASTM E96/E96M.
 - 6. Mold Resistance: Pass when tested in accordance with ASTM C1338.
 - 7. Emissivity: 0.30 when tested in accordance with ASTM C1371.
 - 8. Manufacturers:
 - a. Polyguard Products; Alumaguard: www.polyguardproducts.com/#sle.
- E. Reinforced Tape:
 - 1. Manufacturers:
 - a. Ideal Tape Co., Inc: www.idealtape.com/#sle.
 - 2. FSK tape suitable for sealing seams between insulation, insulated elbows, and fittings resulting in a tight, smooth surface without wrinkles.
 - 3. Comply with UL 723 or ASTM E84.
 - 4. Moisture Vapor Permeability: 0.00 perm inch (0.00 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
 - 5. Finish: Match insulation.

2.06 DUCT LINER

- A. Manufacturers:
 - 1. Aeroflex USA; AEROFLEX Breathe-EZ: www.aeroflexusa.com/#sle.
 - 2. Armacell LLC; ArmaFlex Ultra with FlameDefense: www.armacell.us/#sle.
 - 3. CertainTeed Corporation: www.certainteed.com/#sle.
 - 4. Ductmate Industries, Inc, a DMI Company: www.ductmate.com/#sle.
 - 5. Johns Manville: www.jm.com/#sle.
 - 6. Owens Corning Corporation; QuietR Rotary Duct Insulation: www.ocbuildingspec.com/#sle.
- B. Note: Choose the liner type - Elastomeric Foam, Glass Fiber, or Phenolic Foam.
- C. Elastomeric Foam Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.
 - 1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
 - 2. Maximum Service Temperature: 180 degrees F (82 degrees C).
 - 3. Fungal Resistance: No growth when tested according to ASTM G21.
 - 4. Apparent Thermal Conductivity: Maximum of 0.28 at 75 degrees F (0.045 at 24 degrees C).
 - 5. Minimum Noise Reduction Coefficients:
 - a. 1 inch (25 mm) Thickness: 0.40.
 - 6. Connection: Waterproof vapor barrier adhesive.
- D. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation. Comply with ASTM C916.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Test ductwork for design pressure prior to applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

- B. Insulated Ducts Conveying Air Below Ambient Temperature:
 - 1. Provide insulation with vapor barrier jackets.
 - 2. Finish with tape and vapor barrier jacket.
 - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 - 4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- C. Insulated Ducts Conveying Air Above Ambient Temperature:
 - 1. Provide with or without standard vapor barrier jacket.
 - 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- D. Exterior Applications: Provide insulation with vapor barrier jacket.
- E. Slope exterior ductwork to shed water. See detail on drawings.
- F. External Duct Insulation Application:
 - 1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
 - 2. Secure insulation without vapor barrier with staples, tape, or wires.
 - 3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
 - 4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
 - 5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
- G. Duct and Plenum Liner Application:
 - 1. Adhere insulation with adhesive for 90 percent coverage.
 - 2. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
 - 3. Seal and smooth joints. Seal and coat transverse joints.
 - 4. Seal liner surface penetrations with adhesive.
 - 5. Duct dimensions indicated are net inside dimensions required for airflow. Increase duct size to allow for insulation thickness.

3.03 SCHEDULES

- A. Exhaust Ducts Within 10 ft (3 m) of Exterior Openings:
 - 1. Flexible Glass Fiber Duct Insulation: 1-1/2" thick, 0.75 lbs/ft³, R-5.1 (R-4.2 installed)
- B. Supply Ducts:
 - 1. Above ceilings: Flexible Glass Fiber Duct Insulation: 1-1/2" thick, 0.75 lbs/ft³, R-5.1 (R-4.2)
 - 2. Exterior: Rigid Glass Fiber Duct Insulation: 2", 3 lbs/ft³ or 6 lbs/ft³, R-8.7.

END OF SECTION 230713

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**SECTION 230913
INSTRUMENTATION AND CONTROL DEVICES FOR HVAC**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Control panels.
- B. Damper Operators:
- C. Wall-, Surface-, and Duct-Mounted Sensors:
 - 1. Temperature sensors.
 - 2. Humidity sensors.
 - 3. Static air pressure sensors.
 - 4. Carbon dioxide sensors.
- D. Thermostats:
 - 1. Electric thermostats.
- E. Fan and pump motor run-status monitoring.
- F. Pipe-Mounted Sensors and Transmitters:
 - 1. Temperature sensors.

1.02 RELATED REQUIREMENTS

- A. Section 233300 - Air Duct Accessories.
- B. Section 253513 - Integrated Automation Actuators and Operators.
- C. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.
- D. Section 262726 - Wiring Devices: Elevation of exposed components.

1.03 REFERENCE STANDARDS

- A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- B. NEMA DC 3 - Residential Controls - Electrical Wall-Mounted Room Thermostats; 2013.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 EQUIPMENT - GENERAL

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.02 CONTROL PANELS

- A. Unitized cabinet type for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gauges, pilot lights, push buttons and switches flush on cabinet panel face.

- B. NEMA 250, general purpose utility enclosures with enameled finished face panel.
- C. Provide common keying for all panels.

2.03 DAMPER OPERATORS

- A. General:
 - 1. Provide actuators with torque capacity sized for minimum of 20 percent greater than maximum design stream velocity and hold tight seal against maximum system pressures.
 - 2. Provide spring return for two position control and for fail safe operation.
 - 3. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.
 - 4. Provide one operator for maximum 36 sq ft (3.34 sq m) damper section.
 - 5. See Section 253513 for field-mount damper actuators and operators.

2.04 WALL-, SURFACE-, AND DUCT-MOUNT SENSORS

- A. Temperature Sensors:
 - 1. Use thermistor or RTD type temperature sensing elements with characteristics resistant to moisture, vibration, and other conditions consistent with the application without affecting accuracy and life expectancy.
 - 2. Construct RTD of nickel or platinum with base resistance of 1000 ohms at 70 degrees F (26 degrees C).
 - 3. 100 ohm platinum RTD is acceptable if used with project DDC controllers.
 - 4. Temperature Sensing Device: Compatible with project DDC controllers.
 - 5. Performance Characteristics:
 - a. Outside Air Sensors: Watertight inlet fitting shielded from direct rays of the sun.
 - b. Immersion Temperature Sensors: A sensor encased in a corrosion-resistant probe with an indoor junction box service entry body.
 - c. Room Temperature Sensors with Integral Digital Display:
 - 1) Construct for surface or wall box.
 - 2) Provide a four button keypad with the following capabilities:
 - (a) Indication of space and outdoor temperatures.
 - (b) Setpoint adjustment to accommodate room setpoint, DDC Input/Output Points List, and Sequence of Operation.
 - (c) Display and control fan operation status.
 - (d) Manual occupancy override and indication of occupancy status.
 - (e) Controller mode status.
 - (f) Password enabled setpoint and override modes.
- B. Humidity Sensors, Duct-Mounted:
 - 1. Digitally profiled thin-film capacitive sensor probe extended from die-cast metal, weather-proof plastic or metal housing designed for duct mounting.
 - 2. Measuring Scale: 0 to 100 percent RH, noncondensing, temperature compensated.
 - 3. Hardwired Output: Two-wire, 4 to 20 mA, loop powered.
 - 4. Accuracy: Plus/minus 1 percent between 20 to 40 percent RH linear range, NIST traceable with multi-point calibration.
- C. Static-Air Pressure Sensors:
 - 1. Unidirectional with ranges not exceeding 150 percent of maximum expected input.
 - 2. Temperature compensate with typical thermal error or 0.06 percent of full scale in temperature range of 40 to 100 degrees F (5 to 40 degrees C).
 - 3. Accuracy: One percent of full scale with repeatability 0.3 percent.
 - 4. Output: 0 to 5 vdc with power at 12 to 28 vdc.
- D. Carbon Dioxide Sensors, Duct and Wall:
 - 1. General: Provide nondispersive infrared (NDIR), diffusion sampling CO2 sensors with integral transducers and linear output.

2. Air Temperature: Range of 32 to 122 degrees F (0 to 50 degrees C).
3. Relative Humidity: Range of 0 to 95 percent (noncondensing).
4. Calibration Characteristics:
 - a. Automatically compensating algorithm for sensor drift due to sensor degradation.
 - b. Maximum Drift: 2 percent.
 - c. User calibratable with a minimum calibration interval of 5 years.
5. Construction:
 - a. Sensor Chamber: Noncorrosive material for neutral effect on carbon dioxide sample.
 - b. Provide duct mounted sensors with duct probe designed to protect sensing element from dust accumulation and mechanical damage.
 - c. Housing: High impact plastic.

2.05 THERMOSTATS

- A. Electric Thermostats:
 1. Type: NEMA DC 3, 24 volts, with setback/setup temperature control.
 2. Service: Cooling and heating.
 3. Covers: Locking with set point adjustment, with thermometer.

2.06 FAN AND PUMP MOTOR RUN-STATUS MONITORING

- A. Current Switches:
 1. Mini Solid-Core: 2-State, On/Off digital output of motor status with adjustable trip point to detect belt loss or mechanical failure.
 2. Mini Split-Core: 2-state, On/Off digital output of inverter-duty motor status with adjustable trip point to detect belt loss or mechanical failure.
 3. Maximum AC Current Monitoring Value: As indicated on drawings.

2.07 PIPE-MOUNTED SENSORS AND TRANSMITTERS

- A. Temperature Sensors:
 1. Pipe-mounted temperature probe tied to weather-resistant enclosure for direct insertion into compatible liquids or gases or inserted into intermediary thermal grease-filled pipe-well compatible with interfaced fluid.
 2. Sensor Type: 1,000 ohm Platinum RTD.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that systems are ready to receive work.
- B. Beginning of installation means installer accepts existing conditions.
- C. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.
- D. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.
- E. Ensure installation of components is complementary to installation of similar components.
- F. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check and verify location of thermostats with plans and room details before installation. Locate 60 inches (1500 mm) above floor. Align with lighting switches; see Section 262726.
- C. Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.
- D. Provide isolation (two-position) dampers of parallel blade construction.

- E. Mount control panels adjacent to associated equipment on vibration free walls or free-standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.
- F. Provide conduit and electrical wiring in accordance with Section 260583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

3.03 MAINTENANCE

- A. Provide service and maintenance of control system for one year from Date of Substantial Completion.
- B. Provide complete service of controls systems, including call backs, and submit written report of each service call.

END OF SECTION 230913

SECTION 230923
DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temperature control System (TCS), utilizing direct digital controls.
 - 1. The Temperature Control Contractor shall be herein referred to the TCC.

1.02 REFERENCE STANDARDS

- A. IEEE 142 - IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems; 2007, with Errata (2014).
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- C. NEMA ICS 1 - Industrial Control and Systems General Requirements; 2022.
- D. UL 506 - Standard for Specialty Transformers; Current Edition, Including All Revisions.
- E. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.
- F. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.03 RELATED WORK

- A. Products Supplied but Not Installed Under This Section:
 - 1. Control Actuators.
 - 2. HVAC Equipment
- B. Products Installed but Not Supplied Under This Section:
 - 1. See System Description below.
 - 2. The existing front-end controllers, equipment controllers, their present state of programming, current API & SKDs status, graphics, etc., must be field verified.
- C. Products existing or new with the Work of This Section:
 - 1. NOTE: All new equipment as noted on plans must be fully integrated per this specification and Sequence of Operations.
 - 2. Roof top units.
 - 3. Variable air volume boxes.
 - 4. Mini-split cooling only units.
 - 5. Other HVAC systems as noted on plans.
- D. Work Required Under Other Divisions Related to This Section:
 - 1. Power wiring to line side of equipment.
 - 2. Provision and wiring devices relating to fire alarm system.

1.04 RELATED SECTIONS

- A. Section 23 00 00 – HVAC, 230553 Identification for HVAC Piping and Equipment.

1.05 SYSTEM DESCRIPTION

- A. Scope: Furnish all labor, materials and equipment necessary for a complete and operating Tridium 4 with HTML/5 Temperature Control System (TCS), utilizing Direct Digital Bacnet Protocol Controls as noted on the drawings and as described herein. Drawings are diagrammatic only. All controllers furnished in this section shall communicate on a peer-to-peer bus over an open protocol bus (Examples: BACnet, Modbus).
 - 1. The intent of this specification is to provide a fully, non-proprietary, TCS comprised of non-proprietary equipment controller and front-end controller.
 - 2. System architecture shall fully support a multi-vendor environment and be able to integrate third party systems via existing vendor protocols including, as a minimum, BACnet and MODBUS and LonTalk. All new controllers shall be Bacnet protocol.

3. System architecture shall provide secure Web access using any of the current versions of Microsoft Edge, Mozilla Firefox, or Google Chrome browsers from any computer on the owner's LAN.
 4. All control devices furnished with this Section shall be programmable directly from the Niagara 4 Workbench embedded toolset upon completion of this project. The use of configurable or programmable controllers that require additional software tools for post-installation maintenance shall not be acceptable.
 5. The TCS server shall host all graphic files for the control system. All graphics and navigation schemes for this project shall Niagara 4 Framework server.
 6. The TCC shall coordinate the installation of the new Tridium 4 software onto a virtual server provided by Owner.
 - a. The TCC shall provide written request through the Construction Manager all necessary server requests, server requirements, IP addresses, etc., as part of the approved shop drawing process.
 7. Owner shall receive all Administrator level login and passwords for engineering toolset at first training session. The Owner shall have full licensing and full access rights for all network management, operating system server, engineering and programming software required for the ongoing maintenance and operation of the TCS.
 8. All hardware licenses and certificates shall be stored on a local external hard drive employing encrypted "safe boot" technology. TCC shall provide external drive device.
- B. NiCS REQUIREMENTS: All Niagara software licenses for this project shall have a 100% open, Tridium Niagara Compatibility Statement (NICS).
1. Brand ID = Open
 2. Station Compatibility In = All "*"
 3. Tool Compatibility In = Open or Open "All"
 4. Tool Compatibility Out = "All"
 - a. All Passwords shall be given to the Owner and shall be verified by the Engineer. THE OWNER AND CONTRACTOR MUST CREATE PASSWORD TOGETHER. NO RESETTING OR MANUFACTURER RESETTING OF PASSWORD IS AVAILABLE.
 5. Note: It is the requirement of this specification that the Tridium hardware and software system installed by the Contractor shall be 100% accessible by any other Contractor the Owner wishes to employ for the lifespan of the Tridium system (no less than 20 years). The NICS shall be set-up so that there is no limitation to the access, copying, and modification of programming, sequencing, coding, graphics, passwords, etc.
- C. All products of the TCS shall be provided with the following agency approvals. Verification that the approvals exist for all submitted products shall be provided on request, with the submittal package. Systems or products not currently offering the following approvals are not acceptable.
1. Federal Communications Commission (FCC), Rules and Regulations, Volume II -July 1986 Part 15 Class A Radio Frequency Devices.
 2. FCC, Part 15, Subpart B, Class B
 3. FCC, Part 15, Subpart C
 4. FCC, Part 15, Subpart J, Class A Computing Devices.
 5. UL 504 - Industrial Control Equipment.
 6. UL 506 - Specialty Transformers.
 7. UL 910 - Test Method for Fire and Smoke Characteristics of Electrical and Optical-Fiber Cables Used in Air-Handling Spaces.
 8. UL 916 - Energy Management Systems All.
 9. UL 1449 - Transient Voltage Suppression.
 10. Standard Test for Flame Propagation Height of Electrical and Optical - Fiber Cables Installed Vertically in Shafts.
 11. EIA/ANSI 232-E - Interface Between Data Technical Equipment and Data Circuit Terminal Equipment Employing Serial Binary Data Interchange.

12. EIA 455 - Standard Test Procedures for Fiber Optic Fibers, Cables, Transducers, Connecting and Terminating Devices.
13. IEEE C62.41- Surge Voltages in Low-Voltage AC Power Circuits.
14. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
 - a. NEMA 250 - Enclosures for Electrical Equipment.
 - b. NEMA ICS 1 - Industrial Controls and Systems.
 - c. NEMA ST 1 - Specialty Transformers.
 - d. NCSBC Compliance, Energy: Performance of control system shall meet or surpass the requirements of ASHRAE/IESNA 90.1-1999.
 - e. CE 61326.
 - f. C-Tick.
 - g. cUL.

1.06 SPECIFICATION NOMENCLATURE

- A. The term Control Contractor, Temperature Control Contractor (TCC) shall all serve as Contractor in this specification and project.
- B. Acronyms used in this specification are as follows:
 1. Actuator: Control device that opens or closes valve or damper in response to control signal.
 2. AI: Analog Input.
 3. AO: Analog Output.
 4. Analog: Continuously variable state over stated range of values.
 5. TCS: Temperature control System.
 6. DDC: Direct Digital Control.
 7. Discrete: Binary or digital state.
 8. DI: Discrete Input.
 9. DO: Discrete Output.
 10. FC: Fail Closed position of control device or actuator. Device moves to closed position on loss of control signal or energy source.
 11. FO: Fail open (position of control device or actuator). Device moves to open position on loss of control signal or energy source.
 12. GUI: Graphical User Interface.
 13. HVAC: Heating, Ventilating and Air Conditioning.
 14. IDC: Interoperable Digital Controller.
 15. ILC: Interoperable Lon Controller.
 16. LAN: Local Area Network.
 17. Modulating: Movement of a control device through an entire range of values, proportional to an infinitely variable input value.
 18. Motorized: Control device with actuator.
 19. NAC: Network Area Controller.
 20. NC: Normally closed position of switch after control signal is removed or normally closed position of manually operated valves or dampers.
 21. NO: Normally open position of switch after control signal is removed; or the open position of a controlled valve or damper after the control signal is removed; or the usual position of a manually operated valve.
 22. OSS: Operating System Server, host for system graphics, alarms, trends, etc.
 23. Operator: Same as actuator.
 24. PC: Personal Computer.
 25. Peer-to-Peer: Mode of communication between controllers in which each device connected to network has equal status and each shares its dataTCS values with all other devices connected to network.

26. P: Proportional control; control mode with continuous linear relationship between observed input signal and final controlled output element.
27. PI: Proportional-Integral control, control mode with continuous proportional output plus additional change in output TCSed on both amount and duration of change in controller variable (reset control).
28. PICS: BACnet Product Interoperability Compliance Statement.
29. PID: Proportional-Integral-Derivative control, control mode with continuous correction of final controller output element versus input signal TCSed on proportional error, its time history (reset) and rate at which it's changing (derivative).
30. Point: Analog or discrete instrument with addressable dataTCS value.
31. WAN: Wide Area Network.

1.07 SUBMITTALS

1. Shop Drawings:
 - a. See General Requirements and HVAC General Requirements.
 - b. Submit electronic, Portable Document Format (PDF), submittals to Construction Manager and Engineer for review.
 - c. Submit complete manufacturers shop drawings of all equipment, accessories and controls, including capacities, weights, dimensions, construction details, installation, controls, wiring diagrams, and motor data.
 - d. Approval of shop drawings is for general application only and is a service only and not considered as a guarantee of total compliance with or as relieving Contractor of basic responsibilities under all Contract Documents, and does not approve changes in time or cost.
 - e. After approval, each Contractor and Subcontractor is responsible to provide information to all other trades involved in or affected by installation of his equipment.
2. Operating and Maintenance Instruction and Manuals:
 - a. Each Contractor shall provide for all equipment (3) bound and indexed sets of operating and maintenance instructions to Engineer for approval. Manual shall include a complete set of shop drawings.
 - b. Submit manuals prior to Substantial Completion. Final payment and release of Retainage shall follow submission of manuals.

1.08 QUALITY ASSURANCE

- A. The Contractor shall have a full service DDC office within 100 miles (____) of the job site. This office shall be staffed with applications engineers, software engineers and field technicians. This office shall maintain parts inventory and shall have all testing and diagnostic equipment necessary to support this work, as well as staff trained in the use of this equipment.
- B. The project manager or lead installer and programmer of the project employed by the Contractor shall be available on-site, the same day within 4 hours of a requested service call.
- C. Single Source Responsibility of Supplier: The Control System Contractor shall be responsible for the complete installation and proper operation of the control system. The Control System Contractor shall exclusively be in the regular and customary business of design, installation and service of computerized temperature control systems similar in size and complexity to the system specified. The Control System Contractor shall be the manufacturer of the primary DDC system components or shall have been the authorized representative for the primary DDC components manufacturer for at least 5 years. All control panels shall be assembled by the Control System Contractor in a UL-Certified 508A panel shop.
- D. Equipment and Materials: Equipment and materials shall be cataloged products of manufacturers regularly engaged in the production and installation of HVAC control systems. Products shall be manufacturer's latest standard design and have been tested and proven in actual use.

1.09 PRE-INSTALLATION MEETINGS

- A. Coordinate with Construction Manager and/or Engineer.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Maintain integrity of shipping cartons for each piece of equipment and control device through shipping, storage and handling as required to prevent equipment damage. Store equipment and materials inside and protected from weather.

1.11 JOB CONDITIONS

- A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to insure that the Work will be carried out in an orderly fashion. It shall be this Contractor's responsibility to check the Contract Documents for possible conflicts between his Work and that of other crafts in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, air diffusers and structural and architectural features.

1.12 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Approved equipment controller manufacturers and front-end controller with supervisor:
 - 1. Distech Controls with Niagara 4 Installed by Control Solutions Inc. Alpena Mi 989-379-2404
- B. All approved TCS equipment shall be purchased direct from manufacturer and not through distribution.
- C. Substitutions: Not permitted.
- D. Temperature control system manufacturers must provide a single price to the Mechanical Contractor for temperature control system equipment complete for installation, that shall not include packaging of other HVAC equipment (air handlers, roof top units, boilers, pumps, etc.).
- E. Requests for substitutions must receive written pre-approved during the bidding period by the Engineer. The equipment supplier

2.02 GENERAL

- A. The Temperature Control System (TCS) shall be comprised of a network of interoperable, stand-alone digital controllers, a network area controller, graphics and programming and other control devices for a complete system as specified herein.
- B. The installed system shall provide secure password access to all features, functions and data contained in the overall TCS.
- C. Temperature Control System Project Summary:
 - 1. A new stand-alone server (or virtual server if provided by Owner) shall be provided and configured by the Temperature Control Contractor must install a new Tridium Niagara 4 platform. All new equipment, integration, and programming required for a fully operational platform must be provided by the Temperature Control Contractor.

2.03 OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURE

- A. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system utilizing Open protocols in one open, interoperable system.
- B. The supplied computer software shall employ object-oriented technology (OOT) for representation of all data and control devices within the system. Physical connection of any BACnet control equipment, such as rooftop units or boilers, shall be via Ethernet or IP.
- C. All components and controllers supplied under this contract shall be true "peer-to-peer" communicating devices. Components or controllers requiring "polling" by a host to pass data shall not be acceptable.

- D. The supplied system shall incorporate the ability to access all data using HTML5 enabled browsers without requiring proprietary operator interface and configuration programs or browser plug-ins. An Open DataTCSe Connectivity (ODBC) or Structured Query Language (SQL) compliant server dataTCSe is required for all system dataTCSe parameter storage. This data shall reside on the Operating System Server located in the Facilities Office on the LAN. Systems requiring proprietary dataTCSe and user interface programs shall not be acceptable.
- E. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network. Systems employing a "flat" single tiered architecture shall not be acceptable.
 - 1. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 5 seconds for network connected user interfaces.
 - 2. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 60 seconds for remote or dial-up connected user interfaces.

2.04 TCS SERVER HARDWARE

- A. The Temperature Control Contractor shall include all necessary memory, hard drive, display and network cards, as requested by Owner based on the following:
 - 1. Refer to Tridium Niagara 4 (latest version) Minimum Requirements.
 - 2. Memory: 16 GB or more recommended for the Windows 64-bit version.
 - 3. Hard Drive: 256 GB minimum, more recommended depending on archiving requirements.
 - 4. Display: Video card and monitor capable of displaying 1024 x 768 pixel resolution or greater.
 - 5. Network Support: Ethernet adapter (10/100 Mb with RJ-45 connector).
 - 6. The TCC shall verify the hardware requirements and ensure enhanced TCS hardware performance capabilities are included for robust operation.
- B. The Temperature Control Contractor must include all necessary materials and labor to provide a complete installation of the TCS software onto the Owner Virtual Server.

2.05 SYSTEM NETWORK CONTROLLER (SNC)

- A. These controllers are designed to manage communications between the programmable equipment controllers (PEC), application specific controllers (ASC) and advanced unitary controllers (AUC) which are connected to its communications trunks, manage communications between itself and other system network controllers (SNC) and with any operator workstations (OWS) that are part of the TCS, and perform control and operating strategies for the system TCSed on information from any controller connected to the TCS.
- B. The controllers shall be fully programmable to meet the unique requirements of the facility it shall control.
- C. The controllers shall be capable of peer-to-peer communications with other SNC's and with any OWS connected to the TCS, whether the OWS is directly connected, connected via cellular modem or connected via the Internet.
- D. The communication protocols utilized for peer-to-peer communications between SNC's will be Niagara 4 BACnet TCP/IP and SNMP. Use of a proprietary communication protocol for peer-to-peer communications between SNC's is not allowed.
- E. The SNC shall employ a device count capacity license model that supports expansion capabilities.
- F. The SNC shall be enabled to support and shall be licensed with the following Open protocol drivers (client and server) by default:
 - 1. BACnet
 - 2. Lon
 - 3. MODBUS

4. SNMP
 5. KNX
- G. The SNC shall be capable of executing application control programs to provide:
1. Calendar functions.
 2. Scheduling.
 3. Trending.
 4. Alarm monitoring and routing.
 5. Time synchronization.
 6. Integration of LonWorks, BACnet, and MODBUS controller data.
 7. Network management functions for all SNC, PEC and ASC TCSed devices.
- H. The SNC shall provide the following hardware features as a minimum:
1. Two 10/100 Mbps Ethernet ports.
 2. Two Isolated RS-485 ports with biasing switches.
 3. 1 GB RAM
 4. 4 GB Flash Total Storage / 2 GB User Storage
 5. Wi-Fi (Client or WAP)
 6. USB Flash Drive
 7. High Speed Field Bus Expansion
 8. -20-60°C Ambient Operating Temperature
 9. Integrated 24 VAC/DC Global Power Supply
 10. MicroSD Memory Card Employing Encrypted Safe Boot Technology
- I. The SNC shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 16 simultaneous users.
- J. The SNC shall provide alarm recognition, storage, routing, management and analysis to supplement distributed capabilities of equipment or application specific controllers.
- K. The SNC shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via cellular modem, or wide-area network.
1. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including but not limited to:
 - a. Alarm.
 - b. Return to normal.
 - c. To default.
 - 1) Alarms shall be annunciated in any of the following manners as defined by the user:
 - d. Screen message text.
 - e. Email of complete alarm message to multiple recipients.
 - f. Graphics with flashing alarm object(s).
 - 1) The following shall be recorded by the SNC for each alarm (at a minimum):
 - g. Time and date.
 - h. Equipment (air handler #, access way, etc.).
 - i. Acknowledge time, date, and user who issued acknowledgement.
- L. Programming software and all controller "Setup Wizards" shall be embedded into the SNC.
- M. The SNC shall support the following security functions.
1. Module code signing to verify the author of programming tool and confirm that the code has not been altered or corrupted.
 2. Role-TCSed Access Control (RBAC) for managing user roles and permissions.
 3. Require users to use strong credentials.
 4. Data in Motion and Sensitive Data at Rest be encrypted.
 5. LDAP and Kerberos integration of access management.

- N. The SNC shall support the following data modeling structures to utilize Search; Hierarchy; Template; and Permission functionality:
 - 1. Metadata: Descriptive tags to define the structure of properties.
 - 2. Tagging: Process to apply metadata to components
 - 3. Tag Dictionary
- O. The SNC shall employ template functionality. Templates are a containerized set of configured data tags, graphics, histories, alarms... that are set to be deployed as a unit TCSed upon manufacturer's controller and relationships. All lower level communicating controllers (PEC, AUC, AVAV, VFD...) shall have an associated template file for reuse on future project additions.
- P. The SNC shall be provided with a 5 Year Software Maintenance license. Labor to implement not included.

2.06 PROGRAMMABLE EQUIPMENT CONTROLLER (PEC)

- A. All new HVAC control equipment controllers shall be accomplished using Native BACnet TCSed devices. Where the existing application has a LonMark profile or BTL Listed PICS defined, LonMark may be used. Where LonMark devices are not available for a particular application, devices TCSed on LonWorks shall be acceptable. For each LonWorks device that does not have LonMark certification, the device supplier shall provide an XIF file for the device. The controller platform shall provide options and advanced system functions, programmable and configurable using Niagara 4 Framework, that allow standard and customizable control solutions required in executing the "Sequence of Operation".
- B. All PECs shall be application programmable and shall at all times maintain their certification. All control sequences within or programmed into the PEC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery to be retained.
- C. The PEC shall provide LED indication of communication and controller performance to the technician, without cover removal.
- D. The PEC shall not require any external configuration tool or programming tool. All configuration and programming tasks shall be accomplished and accessible from within the Niagara 4 environment.
- E. The following integral and remote Inputs/Outputs shall be supported per each PEC:
 - 1. Eight integral dry contact digital inputs.
 - 2. Any two digital inputs may be configured as pulse counters with a maximum pulse read rate of 15 Hz.
 - 3. Eight integral analog inputs (configurable as 0-10V, 0-10,000 ohm or, 20K NTC).
 - 4. Six integral 4-20 ma analog outputs.
 - 5. Eight integral 24 Vac Triac digital outputs, configurable as maintained or floating motor control outputs.
 - 6. One integral 20 Vdc, 65-mA power supply for auxiliary devices.
 - 7. If a 20 Vdc 65-mA power supply terminal is not integral to the PEC, provide at each PEC a separate, fully isolated, enclosed, current limited and regulated UL listed auxiliary power supply for power to auxiliary devices.
- F. Each PEC shall have expansion ability to support additional I/O requirements through the use of remote input/output modules.
- G. PEC Controllers shall support at minimum the following control techniques:
 - 1. General-purpose control loops that can incorporate Demand Limit Control strategies, Set point reset, adaptive intelligent recovery, and time of day bypass.
 - a. General-purpose, non-linear control loops.
 - b. Start/stop Loops.
 - c. If/Then/Else logic loops.
 - d. Math Function loops (MIN, MAX, AVG, SUM, SUB, SQRT, MUL, DIV, ENTHALPY).

2.07 ADVANCED UNITARY CONTROLLER (AUC)

- A. The advanced unitary controller (AUC) platform shall be designed specifically to control HVAC - ventilation, filtration, heating, cooling, humidification, and distribution. Equipment includes: constant volume air handlers, VAV air handlers, packaged RTU, boilers, PTACs, pumps, fin-tube radiation. The control shall use LonMark or BACnet TCSed devices where the application has a LonMark profile or BTL Listed PICS defined. Where LonMark devices are not available for a particular application, devices TCSed on LonWorks shall be acceptable. For each LonWorks device that does not have LonMark certification, the device supplier shall provide an XIF file for the device. The controller platform shall provide options and advanced system functions, programmable and configurable using Niagara 4 Framework, that allow standard and customizable control solutions required in executing the "Sequence of Operation".
- B. Minimum Requirements:
1. The controller shall be fully programmable with full functionality on any Niagara 4 brand platform.
 - a. Support downloads to the controller from any brand of Niagara 4 platform.
 - b. Support uploads from the controller to any brand of Niagara 4 platform.
 - c. Support simulation/debug mode of the controller.
 - d. Maintain native GUI.
 - e. Native function-block programming software and all controller "Setup Wizards" shall be embedded within the Niagara 4 environment.
 2. The controller shall be capable of either integrating with other devices or stand-alone operation.
 3. The controller shall have two microprocessors. The Host processor contains on-chip FLASH program memory, FLASH information memory, and RAM to run the main HVAC application. The second processor for network communications. Controller memory minimum requirements include:
 - a. FLASH Memory Capacity: 60 Kilobytes with 8 Kilobytes for application program.
 - b. FLASH Memory settings retained for ten years.
 - c. RAM: 2 Kilobytes.
 4. The controller shall have an internal time clock with the ability to automatically revert from a master time clock on failure.
 - a. Operating Range: 24 hour, 365 day, multi-year calendar including day of week and configuration for automatic day-light savings time adjustment to occur on configured start and stop dates.
 - b. Accuracy: ± 1 minute per month at 77 degrees Fahrenheit (25 degrees Celsius).
 - c. Power Failure Backup: 24 hours at 32 degrees to 122 degrees Fahrenheit (0 degrees Celsius).
 5. The controller shall have Significant Event Notification, Periodic Update capability, and Failure Detect when network inputs fail to be detected within their configurable time frame.
 6. The controller shall have an internal DC power supply to power external sensors.
 - a. Power Output: 20 VDC $\pm 10\%$ at 75 mA.
 7. The controller shall have a visual indication (LED) of the status of the device:
 - a. Controller operating normally.
 - b. Controller in process of download.
 - c. Controller in manual mode under control of software tool.
 - d. Controller lost its configuration.
 - e. No power to controller, low voltage, or controller damage.
 - f. Processor and/or controller are not operating.
 8. The minimum controller Environmental ratings.
 - a. Operating Temperature Ambient Rating: -40 degrees to 150 degrees Fahrenheit (40 degrees Celsius).
 - b. Storage Temperature Ambient Rating: -40 degrees to 150 degrees Fahrenheit (40 degrees Celsius).

- c. Relative Humidity: 5% to 95% non-condensing.
 - 1) The controller shall have the additional approval requirements, listings, and approvals:
 - d. UL/cUL (E87741) listed under UL916 (Standard for Open Energy Management Equipment) with plenum rating.
 - e. CSA (LR95329-3) Listed.
 - f. Meets FCC Part 15, Subpart B, Class B (radiated emissions) requirements.
 - g. Meets Canadian standard C108.8 (radiated emissions).
 - h. Conforms requirements European Consortium standard EN 61000-6-1; 2001 (EU Immunity).
 - i. Conforms requirements European Consortium standard EN 61000-6-3; 2001 (EU Emission).
9. The controller housing shall be UL plenum rated mounting to either a panel or DIN rail (standard EN50022; 7.5mm x 35mm).
10. The controller shall have a mix of digital inputs (DI), digital Triac outputs (DO), analog outputs (AO), and universal inputs (UI).
- a. Analog outputs (AO) shall be capable of being configured as digital outputs (DO).
 - b. Input and Output wiring terminal strips shall be removable from the controller without disconnecting wiring.
 - c. Input and Output wiring terminals shall be designated with color coded labels.
 - d. Universal inputs shall be capable of being configured as binary inputs, resistive inputs, voltage inputs (0-10 VDC), or current inputs (4-20 mA).
 - e. The controller shall provide "continuous" automated loop tuning with an Adaptive Integral Algorithm Control Loop.
 - f. The controller platform shall have standard HVAC application programs that are modifiable to support both the traditional and specialized "sequence of operations" as outlined in Section 4.
 - g. Discharge air control and low limit.
 - h. Pressure-dependent dual duct without flow mixing.
 - i. Variable air volume with return flow tracking.
 - j. Economizer with differential enthalpy.
 - k. Minimum airflow coordinated with CO₂.
 - l. Unit ventilator cycle (1, 2, 3) 2-pipe.
 - m. Unit ventilator cycle (1, 2, 3) 2-pipe with face/bypass.
 - n. Unit ventilator cycle (1, 2, 3) 4-pipe.
 - o. Unit ventilator cycle (1, 2, 3) 4-pipe with EOC valve.

2.08 OTHER CONTROL SYSTEM HARDWARE

- A. Motorized control dampers that will not be integral to the equipment shall be furnished by the Control System Contractor. Control damper frames shall be constructed of galvanized steel, formed into changes and welded or riveted. Dampers shall be galvanized, with nylon bearings. Blade edge seals shall be vinyl or neoprene. Blade edge and tip seals shall be included for all dampers. Blades shall be 16-gauge minimum and 6 inches (152.4 mm) wide maximum and frame shall be of welded channel iron. Damper leakage shall not exceed 10 CFM per square foot, at 1.5 inches (38.1 mm) water gauge static pressure.
- B. Control damper actuators shall be furnished by the Control System Contractor. Two-position or proportional electric actuators shall be direct-mount type sized to provide a minimum of 5 inch (127 mm)-lb torque per square foot of damper area. Damper actuators shall be spring return type. Operators shall be heavy-duty electronic type for positioning automatic dampers in response to a control signal. Motor shall be of sufficient size to operate damper positively and smoothly to obtain correct sequence as indicated. All applications requiring proportional operation shall utilize truly proportional electric actuators. Honeywell is TCSis of design.

- C. Wall Mount Room Temperature sensors: Each room temperature sensor shall provide temperature indication to the digital controller, provide the capability for a software-limited occupant set point adjustment (warmer-cooler slider bar or switch) and limited operation override capability. Room Temperature Sensors shall be 20,000-ohm thermistor type with a temperature range of -40 to 140 degrees Fahrenheit (38 degrees Celsius). The sensor shall be complete with a decorative cover and suitable for mounting over a standard electrical utility box. These devices shall have an accuracy of 0.5 degrees Fahrenheit (0.24 degrees Celsius) over the entire range. Honeywell is TCSis of design.
- D. Duct-mounted and Outside Air Temperature Sensors: 20,000-ohm thermistor temperature sensors with an accuracy of ± 0.2 degrees Celsius. Outside air sensors shall include an integral sun shield. Duct-mounted sensors shall have an insertion measuring probe of a length appropriate for the duct size, with a temperature range of -40 to 160 degrees F (-38 to 71 degrees C). The sensor shall include a utility box and a gasket to prevent air leakage and vibration noise. For all mixed air and preheat air applications, install bendable averaging duct sensors with a minimum 8 feet (2438 mm) long sensor element. These devices shall have accuracy of 0.5 degrees Fahrenheit (0.24 degrees Celsius) over the entire range. Honeywell is TCSis of design.
- E. Humidity sensors shall be thin-film capacitive type sensor with on-board nonvolatile memory, accuracy to plus or minus two percent (2%) at 0 to 90% RH, 12 - 30 VDC input voltage, analog output (0 - 10 VDC or 4 - 20mA output). Operating range shall be 0 to 100% RH and 32 to 140 degrees Fahrenheit (____). Sensors shall be selected for wall, duct or outdoor type installation as appropriate. Honeywell is TCSis of design.
- F. Carbon Dioxide Sensors (CO₂): Sensors shall utilize Non-dispersive infrared technology (N.D.I.R.), repeatable to plus or minus 20 PPM. Sensor range shall be 0 - 2000 PPM. Accuracy shall be plus or minus five percent (5%) or 75 PPM, whichever is greater. Response shall be less than one minute. Input voltage shall be 20 to 30 VAC or DC. Output shall be 0 - 10 VDC. Sensor shall be wall or duct mounted type, as appropriate for the application, housed in a high impact plastic enclosure. Honeywell is TCSis of design.
- G. Current Sensitive Switches: Solid state, split core current switch that operates when the current level (sensed by the internal current transformer) exceeds the adjustable trip point. Current switch to include an integral LED for indication of trip condition and a current level below trip set point. Honeywell is TCSis of design.
- H. Differential Analog (duct) Static Pressure Transmitters Provide a pressure transmitter with integral capacitance type sensing and solid-state circuitry. Accuracy shall be plus or minus 1% of full range; range shall be selected for the specific application. Provide zero and span adjustment capability. Device shall have integral static pickup tube. Honeywell is TCSis of design.
- I. Differential Air Pressure Switches: Provide SPDT type, UL-approved, and selected for the appropriate operating range where applied. Switches shall have adjustable set points and barbed pressure tips. Honeywell is TCSis of design.
- J. Temperature Control Panels: Furnish temperature control panels of code gauge steel with locking doors for mounting all devices as shown. All electrical devices within a control panel shall be factory wired. Control panel shall be assembled by the TCS in a UL-Certified 508A panel shop. A complete set of 'as-built' control drawings (relating to the controls within that panel) shall be furnished within each control panel.
- K. Pipe and Duct Temperature sensing elements: 20,000-ohm thermistor temperature sensors with and accuracy of $\pm 1\%$ accuracy. Their range shall be -5 to 250 degrees Fahrenheit (____). Limited range sensors shall be acceptable provided they are capable of sensing the range expected for the point at the specified accuracy. Thermal wells with heat conductive gel shall be included. Honeywell is TCSis of design.

- L. Low Air Temperature Sensors: Provide SPST type switch, with 15 to 55 degrees Fahrenheit (____), range, vapor-charged temperature sensor. Honeywell model L482A, or approved equivalent.
- M. Variable Frequency Drives: The variable frequency drive (VFD) shall be designed specifically for use in Heating, Ventilation, and Air Conditioning (HVAC) applications in which speed control of the motor can be applied. The VFD, including all factory installed options, shall have UL & CSA approval. VFD's shall include communications capability with DDC TCS via built-in interface card (MODBUS or BACnet). Honeywell SmartVFD is TCSis of design.
- N. Relays: Start/stop relay model shall provide either momentary or maintained switching action as appropriate for the motor being started. All relays shall be plugged in, interchangeable, mounted on a sub TCSe and wired to numbered terminals strips. Relays installed in panels shall all be DPDT with indicating lamp. Relays installed outside of controlled devices shall be enclosed in a NEMA enclosure suitable for the location. Relays shall be labeled with UR symbol. RIB-style relays are acceptable for remote enable/disable.
- O. Transducers: Differential pressure transducers shall be electronic with a 4-20 mA output signal compatible to the Direct Digital Controller. Wetted parts shall be stainless steel. Unit shall be designed to operate in the pressure ranges involved.
- P. Control Power Transformers: Provide step-down transformers for all DDC controllers and devices as required. Transformers shall be sized for the load, but shall be sized for 50 watts, minimum. Transformers shall be UL listed Class 2 type, for 120 VAC/24 VAC operation. Honeywell is TCSis of design.
- Q. Line voltage protection: All DDC system control panels that are powered by 120 VAC circuits shall be provided with surge protection. This protection is in addition to any internal protection provided by the manufacturer. The protection shall meet UL, ULC 1449, IEEE C62.41B. A grounding conductor, (minimum 12 AWG), shall be brought to each control panel.

2.09 TCS SERVER & WEB BROWSER GUI - SYSTEM OVERVIEW

- A. The TCC Contractor shall provide system software TCS based on server/thin-client architecture, designed around the open standards of web technology. The TCS server shall communicate using Ethernet and TCP. Server shall be accessed using a web browser over Owner intranet and remotely over the Internet.
- B. The intent of the thin-client architecture is to provide the operator(s) complete access to the TCS system via a web browser. The thin-client web browser Graphical User Interface (GUI) shall be browser and operating system agnostic, meaning it will support HTML5 enabled browsers without requiring proprietary operator interface and configuration programs or browser plug-ins. Microsoft, Firefox, and Chrome browsers (current released versions), and Windows as well as non-Window operating systems.
- C. The TCS server software shall support at least the following server platforms (Windows 7, Windows 10). The TCS server software shall be developed and tested by the manufacturer of the system stand-alone controllers and network controllers/routers.
- D. The web browser GUI shall provide a completely interactive user interface and shall provide a HTML5 experience that supports the following features as a minimum:
 - 1. Trending.
 - 2. Scheduling.
 - 3. Electrical demand limiting.
 - 4. Duty Cycling.
 - 5. Downloading Memory to field devices.
 - 6. Real time 'live' Graphic Programs.
 - 7. Tree Navigation.
 - 8. Parameter change of properties.
 - 9. Set point adjustments.
 - 10. Alarm / event information.

11. Configuration of operators.
 12. Execution of global commands.
 13. Add, delete, and modify graphics and displayed data.
- E. Software Components: All software shall be the most current version. All software components of the TCS system software shall be provided and installed as part of this project. TCS software components shall include:
1. Server Software, DataTCSe and Web Browser Graphical User Interface.
 2. 5 Year Software Maintenance license. Labor to implement not included.
 3. Embedded System Configuration Utilities for future modifications to the system and controllers.
 4. Embedded Graphical Programming Tools.
 5. Embedded Direct Digital Control software.
 6. Embedded Application Software.
- F. TCS Server DataTCSe: The TCS server software shall utilize a Java DataTCSe Connectivity (JDBC) compatible dataTCSe such as: MS SQL 8.0, Oracle 8i or IBM DB2. TCS systems written to Non -Standard and/or Proprietary dataTCSeS are NOT acceptable.
- G. Thin Client - Web Browser TCSeD: The GUI shall be thin client or browser TCSeD and shall meet the following criteria:
1. Web Browser's for PC's: Only the current released browser (Edge/Firefox/Chrome) will be required as the GUI and a valid connection to the server network. No installation of any custom software shall be required on the operator's GUI workstation/client. Connection shall be over an intranet or the Internet.
 2. Secure Socket Layers: Communication between the Web Browser GUI and TCS server shall offer encryption using 128-bit encryption technology within Secure Socket Layers (SSL). Communication protocol shall be Hyper-Text Transfer Protocol (HTTP).

2.10 WEB BROWSER GRAPHICAL USER INTERFACE

- A. Web Browser Navigation: The Thin Client web browser GUI shall provide a comprehensive user interface. Using a collection of web pages, it shall be constructed to "feel" like a single application, and provide a complete and intuitive mouse/menu driven operator interface. It shall be possible to navigate through the system using a web browser to accomplish requirements of this specification. The Web Browser GUI shall (as a minimum) provide for navigation, and for display of animated graphics, schedules, alarms/events, live graphic programs, active graphic set point controls, configuration menus for operator access, reports and reporting actions for events.
- B. Login: On launching the web browser and selecting the appropriate domain name or IP address, the operator shall be presented with a login page that will require a login name and strong password. Navigation in the system shall be dependent on the operator's role-TCSeD application control privileges.
- C. Navigation: Navigation through the GUI shall be accomplished by clicking on the appropriate level of a navigation tree (consisting of an expandable and collapsible tree control like Microsoft's Explorer program) and/or by selecting dynamic links to other system graphics. Both the navigation tree and action pane shall be displayed simultaneously, enabling the operator to select a specific system or equipment and view the corresponding graphic. The navigation tree shall as a minimum provide the following views: Geographic, Network, Groups and Configuration.
1. Geographic View shall display a logical geographic hierarchy of the system including: cities, sites, buildings, building systems, floors, equipment and objects.
 2. Groups View shall display Scheduled Groups and custom reports.
 3. Configuration View shall display all the configuration categories (Operators, Schedule, Event, Reporting and Roles).
- D. Action Pane: The Action Pane shall provide several functional views for each subsystem specified. A functional view shall be accessed by clicking on the corresponding button:

1. Graphics: Using graphical format suitable for display in a web browser, graphics shall include aerial building/campus views, color building floor-plans, equipment drawings, active graphic set point controls, web content and other valid HTML elements. The data on each graphic page shall automatically refresh.
2. Dashboards: User customizable data using drag and drop HTML5 elements. Shall include Web Charts, Gauges, and other custom developed widgets for web browser. User shall have ability to save custom dashboards.
3. Search: User shall have multiple options for searching data TCSed upon Tags. Associated equipment, real time data, Properties, and Trends shall be available in result.
4. Properties: Shall include graphic controls and text for the following: Locking or overriding objects, demand strategies, and any other valid data required for setup. Changes made to the properties pages shall require the operator to depress an 'accept/cancel' button.
5. Schedules: Shall be used to create, modify/edit and view schedules TCSed on the systems hierarchy (using the navigation tree).
6. Alarms: Shall be used to view alarm information geographically (using the navigation tree), acknowledge alarms, sort alarms by category, actions and verify reporting actions.
7. Charting: Shall be used to display associated trend and historical data, modify colors, date range, axis and scaling. User shall have ability to create HTML charts through web browser without utilizing chart builder. User shall be able to drag and drop single or multiple data points, including schedules, and apply status colors for analysis.
8. Logic - Live Graphic Programs: Shall be used to display 'live' graphic programs of the control algorithm, (micro block programming) for the mechanical/electrical system selected in the navigation tree.
9. Other actions such as Print, Help, Command, and Logout shall be available via a drop-down window.
10. Color Graphics: The Web Browser GUI shall make extensive use of color in the graphic pane to communicate information related to set points and comfort. Animated .gifs or .jpg, vector scalable, active set point graphic controls shall be used to enhance usability. Graphics tools used to create Web Browser graphics shall be non-proprietary and conform to the following TCSic criteria:
11. Display Size: The GUI workstation software shall graphically display in a minimum of 1024 by 768 pixels 24 bit True Color.
12. General Graphic: General area maps shall show locations of controlled buildings in relation to local landmarks.
13. Color Floor Plans: Floor plan graphics shall show heating and cooling zones throughout the buildings in a range of colors, as selected by Owner. Provide a visual display of temperature relative to their respective set points. The colors shall be updated dynamically as a zone's actual comfort condition changes.
14. Mechanical Components: Mechanical system graphics shall show the type of mechanical system components serving any zone through the use of a pictorial representation of components. Selected I/O points being controlled or monitored for each piece of equipment shall be displayed with the appropriate engineering units. Animation shall be used for rotation or moving mechanical components to enhance usability. .
15. Minimum System Color Graphics: Color graphics shall be selected and displayed via a web browser for the following:
 16. Each piece of equipment monitored or controlled including each terminal unit.
 17. Each building.
 18. Each floor and zone controlled.

- E. Hierarchical Schedules: Utilizing the Navigation Tree displayed in the web browser GUI, an operator (with proper access credentials) shall be able to define a Normal, Holiday or Override schedule for an individual piece of equipment or room, or choose to apply a hierarchical schedule to the entire system, site or floor area. For example, Independence Day ' Holiday' for every level in the system would be created by clicking at the top of the geographic hierarchy defined in the Navigation Tree. No further operator intervention would be required and every control module in the system with would be automatically downloaded with the ' Independence Day' Holiday. All schedules that affect the system/area/equipment highlighted in the Navigation Tree shall be shown in a summary schedule table and graph.
1. Schedules: Schedules shall comply with the LonWorks and BACnet standards, (Schedule Object, Calendar Object, Weekly Schedule property and Exception Schedule property) and shall allow events to be scheduled TCSed on:
 - a. Types of schedule shall be Normal, Holiday or Override.
 - b. A specific date.
 - c. A range of dates.
 - d. Any combination of Month of Year (1-12, any), Week of Month (1-5, last, any), Day of Week (M-Sun, Any).
 - e. Wildcard (example, allow combinations like second Tuesday of every month).
 2. Schedule Categories: The system shall allow operators to define and edit scheduling categories (different types of "things" to be scheduled; for example, lighting, HVAC occupancy, etc.). The categories shall include: name, description, icon (to display in the hierarchy tree when icon option is selected) and type of value to be scheduled.
 3. Schedule Groups: In addition to hierarchical scheduling, operators shall be able to define functional Schedule Groups, comprised of an arbitrary group of areas/rooms/equipment scattered throughout the facility and site. For example, the operator shall be able to define an ' individual tenant' group - who may occupy different areas within a building or buildings. Schedules applied to the ' tenant group' shall automatically be downloaded to control modules affecting spaces occupied by the ' tenant group'.
 4. Intelligent Scheduling: The control system shall be intelligent enough to automatically turn on any supporting equipment needed to control the environment in an occupied space. If the operator schedules an individual room in a VAV system for occupancy, for example, the control logic shall automatically turn on the VAV air handling unit, chiller, boiler and/or any other equipment required to maintain the specified comfort and environmental conditions within the room.
 5. Partial Day Exceptions: Schedule events shall be able to accommodate a time range specified by the operator (ex: board meeting from 6 pm to 9 pm overrides Normal schedule for conference room).
 6. Schedule Summary Graph: The schedule summary graph shall clearly show Normal versus Holiday versus Override Schedules and the net operating schedule that results from all contributing schedules. Note: In case of priority conflict between schedules at the different geographic hierarchy, the schedule for the more detailed geographic level shall apply.
- F. Alarms: Alarms associated with a specific system, area, or equipment selected in the Navigation Tree, shall be displayed in the Action Pane by selecting an ' Alarms' view. Alarms, and reporting actions shall have the following capabilities:
1. Alarms View: Each Alarm shall display an Alarms Category (using a different icon for each alarm category), date/time of occurrence, current status, alarm report and a bold URL link to the associated graphic for the selected system, area or equipment. The URL link shall indicate the system location, address and other pertinent information. An operator shall easily be able to sort events, edit event templates and categories, acknowledge or force a return to normal in the Events View as specified in this section.
 2. Alarm Categories: The operator shall be able to create, edit or delete alarm categories such as HVAC, Maintenance, Fire, or Generator. An icon shall be associated with each alarm category, enabling the operator to easily sort through multiple events displayed.

3. Alarm Templates: Alarm template shall define different types of alarms and their associated properties. As a minimum, properties shall include a reference name, verbose description, severity of alarm, acknowledgement requirements, and high/low limit and out of range information.
4. Alarm Areas: Alarm Areas enable an operator to assign specific Alarm Categories to specific Alarm Reporting Actions. For example, it shall be possible for an operator to assign all HVAC Maintenance Alarm on the 1st floor of a building to email the technician responsible for maintenance. The Navigation Tree shall be used to setup Alarm Areas in the Graphic Pane.
5. Alarm Time/Date Stamp: All events shall be generated at the DDC control module level and comprise the Time/Date Stamp using the standalone control module time and date.
6. Alarm Configuration: Operators shall be able to define the type of Alarm generated per object. A 'network' view of the Navigation Tree shall expose all objects and their respective Alarm Configuration. Configuration shall include assignment of Alarm, type of Acknowledgement and notification for return to normal or fault status.
7. Alarm Summary Counter: The view of Alarm in the Graphic Pane shall provide a numeric counter, indicating how many Alarms are active (in alarm), require acknowledgement and total number of Alarms in the TCS Server dataTCSe.
8. Alarm Auto-Deletion: Alarms that are acknowledged and closed shall be auto-deleted from the dataTCSe and archived to a text file after an operator defined period.
9. Alarm Reporting Actions: Alarm Reporting Actions specified shall be automatically launched (under certain conditions) after an Alarm is received by the TCS server software. Operators shall be able to easily define these Reporting Actions using the Navigation Tree and Graphic Pane through the web browser GUI. Reporting Actions shall be as follows:
 10. Print: Alarm information shall be printed to the TCS server's PC or a networked printer.
 11. Email: Email shall be sent via any POP3-compatible e-mail server (most Internet Service Providers use POP3). Email messages may be copied to several email accounts. Note: Email reporting action shall also be used to support alphanumeric paging services, where email servers support pagers.
 12. File Write: The ASCII File write reporting action shall enable the operator to append operator defined alarm information to any alarm through a text file. The alarm information that is written to the file shall be completely definable by the operator. The operator may enter text or attach other data point information (such as AHU discharge temperature and fan condition upon a high room temperature alarm).
 13. Write Property: The write property reporting action updates a property value in a hardware module.
 14. SNMP: The Simple Network Management Protocol (SNMP) reporting action sends an SNMP trap to a network in response to receiving an alarm.
 15. Run External Program: The Run External Program reporting action launches specified program in response to an event.
- G. Trends: As system is engineered, all points shall be enabled to trend. Trends shall both be displayed and user configurable through the Web Browser GUI. Trends shall comprise analog, digital or calculated points simultaneously. A trend log's properties shall be editable using the Navigation Tree and Graphic Pane.
 1. Viewing Trends: The operator shall have the ability to view trends by using the Navigation Tree and selecting a Trends button in the Graphic Pane. The system shall allow y- and x-axis maximum ranges to be specified and shall be able to simultaneously graphically display multiple trends per graph.
 2. Local Trends: Trend data shall be collected locally by Multi-Equipment/Single Equipment general-purpose controllers, and periodically uploaded to the TCS server if historical trending is enabled for the object. Trend data, including run time hours and start time date shall be retained in non-volatile module memory. Systems that rely on a gateway/router to run trends are NOT acceptable.

3. Resolution. Sample intervals shall be as small as one second. Each trended point will have the ability to be trended at a different trend interval. When multiple points are selected for displays that have different trend intervals, the system will automatically scale the axis.
 4. Dynamic Update. Trends shall be able to dynamically update at operator-defined intervals.
 5. Zoom/Pan. It shall be possible to zoom-in on a particular section of a trend for more detailed examination and 'pan through' historical data by simply scrolling the mouse.
 6. Numeric Value Display. It shall be possible to pick any sample on a trend and have the numerical value displayed.
 7. Copy/Paste. The operator shall have the ability to pan through a historical trend and copy the data viewed to the clipboard using standard keystrokes (i.e. CTRL+C, CTRL+V).
- H. Security Access: Systems that are accessed from the web browser GUI to TCS server shall require a Login Name and Strong Password. Access to different areas of the TCS system shall be defined in terms of Role-TCSed Access Control privileges as specified:
1. Roles: Roles shall reflect the actual roles of different types of operators. Each role shall comprise a set of 'easily understood English language' privileges. Roles shall be defined in terms of View, Edit and Function Privileges.
 - a. View Privileges shall comprise: Navigation, Network, and Configuration Trees, Operators, Roles and Privileges, Alarm/Event Template and Reporting Action.
 - b. Edit Privileges shall comprise: Set point, Tuning and Logic, Manual Override, and Point Assignment Parameters.
 - c. Function Privileges shall comprise: Alarm/Event Acknowledgement, Control Module Memory Download, Upload, Schedules, Schedule Groups, Manual Commands, Print and Alarm/Event Maintenance.
 2. Geographic Assignment of Roles: Roles shall be geographically assigned using a similar expandable/collapsible navigation tree. For example, it shall be possible to assign two HVAC Technicians with similar competencies (and the same operator defined HVAC Role) to different areas of the system.

2.11 GRAPHICAL PROGRAMMING

- A. The system software shall include a Graphic Programming Language (GPL) for all DDC control algorithms resident in all control modules. Any system that does not use a drag and drop method of graphical icon programming shall not be accepted. All systems shall use a GPL method used to create a sequence of operations by assembling graphic microblocks that represent each of the commands or functions necessary to complete a control sequence. Microblocks represent common logical control devices used in conventional control systems, such as relays, switches, high signal selectors etc., in addition to the more complex DDC and energy management strategies such as PID loops and optimum start. Each microblock shall be interactive and contain the programming necessary to execute the function of the device it represents.
- B. Graphic programming shall be performed while on screen and using a mouse; each microblock shall be selected from a microblock library and assembled with other microblocks necessary to complete the specified sequence. Microblocks are then interconnected on screen using graphic "wires," each forming a logical connection. Once assembled, each logical grouping of microblocks and their interconnecting wires then forms a graphic function block which may be used to control any piece of equipment with a similar point configuration and sequence of operation.
- C. Graphic Sequence: The clarity of the graphic sequence shall be such that the operator has the ability to verify that system programming meets the specifications, without having to learn or interpret a manufacturer's unique programming language. The graphic programming shall be self-documenting and provide the operator with an understandable and exact representation of each sequence of operation.
- D. GPL Capabilities: The following is a minimum definition of the capabilities of the Graphic Programming software:

1. Function Block (FB): Shall be a collection of points, microblocks and wires which have been connected together for the specific purpose of controlling a piece of HVAC equipment or a single mechanical system.
2. Logical I/O: Input/Output points shall interface with the control modules in order to read various signals and/or values or to transmit signal or values to controlled devices.
3. Microblocks: Shall be software devices that are represented graphically and may be connected together to perform a specified sequence. A library of microblocks shall be submitted with the control contractors bid.
4. Wires: Shall be Graphical elements used to form logical connections between microblocks and between logical I/O.
5. Reference Labels: Labels shall be similar to wires in that they are used to form logical connections between two points. Labels shall form a connection by reference instead of a visual connection, i.e. two points labeled 'A' on a drawing are logically connected even though there is no wire between them.
6. Parameter: A parameter shall be a value that may be tied to the input of a microblock.
7. Properties: Dialog boxes shall appear after a microblock has been inserted which has editable parameters associated with it. Default parameter dialog boxes shall contain various editable and non-editable fields, and shall contain 'push buttons' for the purpose of selecting default parameter settings.
8. Icon: An icon shall be graphic representation of a software program. Each graphic microblock has an icon associated with it that graphically describes its function.
9. Menu-bar Icon: Shall be an icon that is displayed on the menu bar on the GPL screen, which represents its associated graphic microblock.
10. Live Graphical Programs: The Graphic Programming software shall support a 'live' mode, where all input/output data, calculated data and set points shall be displayed in a 'live' real-time mode.

2.12 LONWORKS NETWORK MANAGEMENT

- A. BACnet shall be the primary protocol used. Systems requiring the use of third-party LonWorks network management tools shall not be accepted.
- B. Network management shall include the following services: device identification, device installation, device configuration, device diagnostics, device maintenance and network variable binding.
- C. The Network configuration tool shall also provide diagnostics to identify devices on the network, to reset devices and to view health and status counters within devices.
- D. These tools shall provide the ability to "learn" an existing LonWorks network, regardless of what network management tool(s) were used to install the existing network, so that existing LonWorks devices and newly added devices are part of a single network management dataTCSe.
- E. The network management dataTCSe shall be resident in the Network Area Controller (NAC), ensuring that anyone with proper authorization has access to the network management dataTCSe at all times. Systems employing network management dataTCSe that are not resident, at all times and within the control system shall not be accepted.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.

- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. The temperature control contractor shall coordinate all work with Owner,
- D. Technical Services (IT) Department. Coordinate requirement for virtual network, IP addresses, and VPN. TCC shall provide all requested hardware, firmware, software, and programming requested by the Owner.

3.03 GENERAL

- A. Install system and materials in accordance with manufacturer's instructions, and as detailed on the project drawing set.
- B. Line and low voltage electrical connections to control equipment shown specified or shown on the control diagrams shall be furnished and installed by the Control System Contractor in accordance with these specifications.
- C. Equipment furnished by the Mechanical Contractor that is normally wired before installation shall be furnished completely wired. Control wiring normally performed in the field will be furnished and installed by the Control System Contractor.
- D. All control devices mounted on the face of control panels shall be clearly identified as to function and system served with permanently engraved phenolic labels.

3.04 WIRING

- A. All electrical control wiring to the control panels shall be the responsibility of the Control System Contractor.
- B. All wiring shall be in accordance with the Project Electrical Specifications (Division 26), the National Electrical Code and any applicable local codes. All control wiring shall be installed in raceways.
- C. Excess wire shall not be looped or coiled in the controller cabinet.
- D. Incorporate electrical noise suppression techniques in relay control circuits.
- E. There shall be no drilling on the controller cabinet after the controls are mounted inside.
- F. Careful stripping of wire while inside the cabinet is required to ensure that no wire strand fragments land on circuit boards.
- G. Use manufacturer-specified wire for all network connections.
- H. Use approved optical isolation and lightning protection when penetrating building envelope.
- I. Read installation instructions carefully. Any unavoidable deviations shall be approved by owner's rep prior to installation.

3.05 ACCEPTANCE TESTING

- A. Upon completion of the installation, the Control System Contractor shall load all system software and start-up the system. The Control System Contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to insure that the system is functioning in full accordance with these specifications.
- B. The Control System Contractor shall perform tests to verify proper performance of components, routines and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the DDC system operation.
- C. System Acceptance: Satisfactory completion is when the Control System Contractor has performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner's Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.
- D. The Third-party temperature control system commissioning agent will provide a written commissioning report.

- E. The TCC shall provide all necessary labor and materials required to meet the recommendations of the commissioning agent prior to system acceptance, project close-out, and release of retainage.
- F. Final written acceptance of the TCS shall be provided by the Owner.

3.06 OPERATOR TRAINING

- A. During system commissioning and at such time acceptable performance of the Control System hardware and software has been established, the Control System Contractor shall provide on-site operator instruction to the owner's operating personnel. Operator instruction shall be done during normal working hours and shall be performed by a competent representative familiar with the system hardware, software and accessories.
- B. The Control System Contractor shall provide minimum 32 total hours of comprehensive training in multiple sessions for system orientation, product maintenance and troubleshooting, programming and engineering. These classes are to be spread out during the 1st year warranty period. The first class starting after final commissioning and the last class is to be in the last month of 1-year warranty period.

3.07 WARRANTY PERIOD SERVICES

- A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of system acceptance.
- B. Within this period, upon notice by the Owner, any defects in the TCS due to faulty materials, methods of installation or workmanship shall be promptly repaired or replaced by the Control System Contractor at no expense to the Owner.
- C. Maintenance of Computer Software Programs: The Control System Contractor shall maintain all software during the standard first year warranty period. In addition, all factory or sub-vendor upgrades to software during the first year warranty period shall be added to the systems, when they become available, at no additional cost. In addition to first year standard warranty, software provided by Control System Contractor shall come with a 5 Year Software Maintenance license. All SNC and TCS Servers are included in this coverage. Labor to implement upgrades in years two through five are not included in standard warranty.
- D. Maintenance of Control Hardware: The Control System Contractor shall inspect, repair, replace, adjust, and calibrate, as required, the controllers, control devices and associated peripheral units during the warranty period. The Control System Contractor shall then furnish a report describing the status of the equipment, problem areas (if any) noticed during service work, and description of the corrective actions taken. The report shall clearly certify that all hardware is functioning correctly.
- E. Service Period: Calls for service by the Owner shall be honored within 24 hours and are not to be considered as part of routine maintenance.
- F. Service Documentation: A copy of the service report associated with each owner-initiated service call shall be provided to the owner.

3.08 WARRANTY ACCESS

- A. The Owner shall grant to the Temperature Control System Contractor reasonable access to the TCS during the warranty period. Remote access to the TCS (for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period) may be allowed.

3.09 OPERATION & MAINTENANCE MANUALS

- A. See General Requirements. O&M manuals shall include the following elements, as a minimum:
 1. As-built control drawings for all equipment.
 2. As-built Network Communications Diagram.
 3. General description and specifications for all components.
 4. Completed Performance Verification sheets.
 5. Completed Controller Checkout/Calibration Sheets.

3.10 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 230923

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SECTION 230993
SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.
- B. Sequence of operation for:
 - 1. Air terminal units.

1.02 RELATED REQUIREMENTS

- A. Section 230913 - Instrumentation and Control Devices for HVAC.
- B. Section 230923 - Direct-Digital Control System for HVAC.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.
 - 1. Preface: 1 or 2 paragraph overview narrative of the system describing its purpose, components and function.
 - 2. State each sequence in small segments and give each segment a unique number for referencing in Functional Test procedures; provide a complete description regardless of the completeness and clarity of the sequences specified in Contract Documents.
 - 3. Include at least the following sequences:
 - a. Start-up.
 - b. Warm-up mode.
 - c. Normal operating mode.
 - d. Unoccupied mode.
 - e. Shutdown.
 - f. Capacity control sequences and equipment staging.
 - g. Temperature and pressure control, such as setbacks, setups, resets, etc.
 - h. Detailed sequences for all control strategies, such as economizer control, optimum start/stop, staging, optimization, demand limiting, etc.
 - i. Sequences for all alarms and emergency shut downs.
 - j. Interactions and interlocks with other systems.
 - 4. Include initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
 - 5. For packaged controlled equipment, include manufacturer's furnished sequence of operation amplified as required to describe the relationship between the packaged controls and the control system, indicating which points are adjustable control points and which points are only monitored.
 - 6. Include schedules, if known.
- C. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.
 - 1. Label with settings, adjustable range of control and limits.
 - 2. Include flow diagrams for each control system, graphically depicting control logic.
 - 3. Include the system and component layout of all equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
 - 4. Include all monitoring, control and virtual points specified in elsewhere.

5. Include a key to all abbreviations.
- D. Points List: Submit list of all control points indicating at least the following for each point.
 1. Name of controlled system.
 2. Point abbreviation.
 3. Point description; such as dry bulb temperature, airflow, etc.
 4. Display unit.
 5. Control point or setpoint (Yes / No); i.e. a point that controls equipment and can have its setpoint changed.
 6. Monitoring point (Yes / No); i.e. a point that does not control or contribute to the control of equipment but is used for operation, maintenance, or performance verification.
 7. Calculated point (Yes / No); i.e. a "virtual" point generated from calculations of other point values.
- E. Project Record Documents: Record actual locations of components and setpoints of controls, including changes to sequences made after submission of shop drawings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 AIR TERMINAL UNITS

- A. Single-duct Variable Volume:
 1. Run Conditions - Scheduled: The unit shall run according to a user definable time schedule in the following modes:
 - a. Occupied Mode: The unit shall maintain
 - 1) A 74°F (adj.) cooling setpoint
 - 2) A 70°F (adj.) heating setpoint.
 - b. Unoccupied Mode (night setback): The unit shall maintain
 - 1) A 85°F (adj.) cooling setpoint.
 - 2) A 55°F (adj.) heating setpoint.
 2. Alarms shall be provided as follows:
 - a. High Zone Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.).
 - b. Low Zone Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).
 3. Zone Setpoint Adjust: The occupant shall be able to adjust the zone temperature heating and cooling setpoints at the zone sensor.
 4. Zone Optimal Start: The unit shall use an optimal start algorithm for morning start-up. This algorithm shall minimize the unoccupied warm-up or cool-down period while still achieving comfort conditions by the start of scheduled occupied period.
 5. Zone Unoccupied Override: A timed local override control shall allow an occupant to override the schedule and place the unit into an occupied mode for an adjustable period of time. At the expiration of this time, control of the unit shall automatically return to the schedule.
 6. Reversing Variable Volume Terminal Unit - Flow Control: The unit shall maintain zone setpoints by controlling the airflow through one of the following:
 - a. Occupied:
 - 1) When zone temperature is greater than its cooling setpoint, the zone damper shall modulate between the minimum occupied airflow (adj.) and the maximum cooling airflow (adj.) until the zone is satisfied.
 - 2) When the zone temperature is between the cooling setpoint and the heating setpoint, the zone damper shall maintain the minimum required zone ventilation (adj.).

- 3) When zone temperature is less than its heating setpoint, the controller shall enable heating to maintain the zone temperature at its heating setpoint. Additionally, if warm air is available from the AHU, the zone damper shall modulate between the minimum occupied airflow (adj.) and the maximum heating airflow (adj.) until the zone is satisfied.
- b. Unoccupied:
 - 1) When the zone is unoccupied the zone damper shall control to its minimum unoccupied airflow (adj.).
 - 2) When the zone temperature is greater than its cooling setpoint, the zone damper shall modulate between the minimum unoccupied airflow (adj.) and the maximum cooling airflow (adj.) until the zone is satisfied.
 - 3) When zone temperature is less than its unoccupied heating setpoint, the controller shall enable heating to maintain the zone temperature at the setpoint. Additionally, if warm air is available from the AHU, the zone damper shall modulate between the minimum unoccupied airflow (adj.) and the auxiliary heating airflow (adj.) until the zone is satisfied.
- 7. Electric Reheating Stage: The controller shall measure the zone temperature and stage the reheating to maintain its setpoint. To prevent short cycling, the stage shall have a user definable (adj.) minimum runtime.
 - a. The reheating shall be enabled whenever:
 - 1) Outside air temperature is less than 65°F (adj.).
 - 2) AND the zone temperature is below setpoint.
 - 3) AND sufficient airflow is provided.

8. Points List

Point Name	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic
Airflow	x								x		x
Zone Setpoint Adjust	x										x
Zone Temp	x								x		x
Zone Damper		x							x		x
Zone Override			x						x		x
Reheating Stage 1				x					x		x
Airflow Setpoint					x				x		x
Cooling Setpoint					x				x		x
Heating Setpoint					x				x		x
Heating Mode						x			x		
Schedule								x			
High Zone										x	

Point Name	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic
Temp											
Low Zone Temp										x	

3.02 EXHAUST FANS

- A. Run Conditions - Interlocked: The fan(s) shall be interlocked as noted on the Exhaust Fan Schedule to run whenever its respective Rooftop Unit runs unless shutdown on safeties.
- B. Exhaust Air Damper: The exhaust air damper shall open anytime the unit runs and shall close anytime the unit stops. The exhaust air damper shall close 30 sec (adj.) after the fan stops.
- C. Alarms shall be provided as follows:
 - 1. Damper Failure: Commanded open, but the status is closed.
- D. Damper Status: The fan shall be enabled after the damper status has proven.
- E. Fan Status: The controller shall monitor the fan status.
- F. Alarms shall be provided as follows:
 - 1. Fan Failure: Commanded on, but the status is off.
 - 2. Fan in Hand: Commanded off, but the status is on.
 - 3. Fan Runtime Exceeded: Fan status runtime exceeds a user definable limit (adj.).
- G. Points List:

Point Name	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic
Exhaust Air Damper Status			x						x		x
Fan Status			x						x		x
Exhaust Air Damper				x					x		x
Fan Start/Stop				x					x		x
Exhaust Air Damper Failure										x	
Exhaust Air Damper in Hand										x	
Fan Failure										x	
Fan in Hand										x	
Fan Runtime Exceeded										x	

3.03 ROOFTOP UNITS

- A. Mode Enable Sensor
 - 1. Single Zone VAV units will use the space sensor as the mode enable sensor
 - 2. VAV units will use the supply air temp sensor as the mode enable sensor
- B. Occupied Mode Initiation
 - 1. BACnet command will force units into Occupied Mode
 - 2. BACnet command(s) will control Optimal Start Sequences
- C. Unoccupied Operation
 - 1. SZ VAV unit will the space temperature sensor and Night Setback Offsets for Heating and Cooling calls and the normal dehumidification setpoint for dehumidification calls.
 - 2. VAV units will cycle based on BACnet command

3. Outdoor Air Damper will be closed except if the unit is in Unoccupied Economizer Free Cooling mode.
 4. If there is no call for Heating or Cooling the unit will be off.
 5. HVAC Modes of Operation
 6. Cooling Mode
 7. Heating Mode
 8. Dehumidification Mode (RTU-1&2)
 9. Vent Mode
 10. Off Mode
- D. Cooling Mode
1. In the Cooling Mode, as the Supply Air Temperature (SAT) rises above the Active Supply Air Cooling Setpoint (adj) cooling will begin to stage on. Each stage must meet its Minimum Off Time (adj.) before it is allowed to energize and successive stages are subject to a Cooling Stage Up Delay (adj).
 2. Cooling stages will continue to run until the SAT falls below the Active SAT Cooling Setpoint minus the Cooling Stage Control Window at which point the cooling will begin to stage off. Each stage must meet its Minimum Run Time (adj.) before it is allowed to stage off and successive stages are subject to a Cooling Stage Down Delay (adj.).
 3. Mechanical cooling is disabled if the Outdoor Air Temperature (OAT) falls 1° below the Cooling Lockout Setpoint and will remain disabled until the OAT rises 1° above the Cooling Lockout Setpoint. If the OAT disables mechanical cooling while it is currently operating, mechanical cooling will stage off as minimum run times and stage down delays are satisfied.
 4. If the Economizer is enabled it will function as the first stage of cooling.
- E. Heating Mode
1. In the Heating Mode, as the Supply Air Temperature falls below the Active Supply Air Heating Setpoint (adj), the heating will begin to modulate.
 2. Heating stages will continue to run until the supply air temperature rises above the Active Supply Air Temperature Setpoint plus the Heating Stage Control Window at which point the heating will begin to stage off. Heating must meet its Minimum Run Time (adj.) before it is allowed to stage off.
 3. Mechanical heating is disabled if the Outdoor Air Temperature (OAT) rises 1° above the Heating Lockout Setpoint and will remain disabled until the OAT falls 1° below the Heating Lockout Setpoint. If the OAT disables mechanical heating while it is currently operating, mechanical heating will stage off as minimum run times and stage down delays are satisfied.
- F. Dehumidification Mode (RTU-1&2)
1. Dehumidification is enabled when the Indoor Humidity rises above the Indoor Humidity Enable/Hi Reset Setpoint and is disabled when the Indoor Humidity falls below the Disable/Lo Reset Setpoint and requires the use of the E-BUS Combination Space (or Return Air) Temperature/Humidity Sensor.
 2. Once in DX Dehumidification, compressors are staged to maintain the Evaporator Coil Suction (Saturation) Temperature at the Coil Suction (Saturation) Temperature Setpoint.
 3. Dehumidification Reheat is always controlled to the appropriate Active Supply Air Temperature Setpoint which will be dependent on whether you are in Cooling Dehumidification, Heating Dehumidification, or Vent Dehumidification. During Vent Mode Dehumidification the Supply Air Temperature Setpoint is calculated to be halfway between the HVAC Mode Setpoints.
- G. Ventilation Mode
1. This mode is only available in the Occupied Mode of operation anytime there is no demand for heating or cooling.
- H. Off Mode

1. Off Mode occurs in the Unoccupied Mode when there is no heating or cooling demand.
 2. The Supply fan is off and the Outside Air Damper is closed.
- I. Comparative Enthalpy Economizer Operation
1. Enabled when OA enthalpy falls below the Comparative Enthalpy Enable Setpoint by the Comparative Enthalpy Enable Deadband and the OA Enthalpy is less than RA Enthalpy by the Comparative Enthalpy Enable Deadband
 2. Disabled when OA enthalpy rises above the Comparative Enthalpy Enable Setpoint by the Comparative Enthalpy Enable Deadband or the OA Enthalpy exceeds than RA Enthalpy by the Comparative Enthalpy Enable Deadband
 3. Economizer acts as 1st stage of cooling and controls to the Supply Air Cooling Setpoint. If the economizer reaches 100% for 2 minutes and the supply air temperature is still above setpoint, mechanical cooling is allowed to stage up while the economizer is held at the full open position.
 4. An Economizer Minimum Position can be configured in the controller.
 5. A CO2 sensor shall be used to reset the Economizer Minimum Position for IAQ control.
 6. Economizer Damper is closed during Unoccupied Mode, except when Unoccupied free cooling is used during night setback operation
- J. IAQ (CO2) Control Operation
1. A Minimum CO2 Level Setpoint and a Maximum CO2 Level Setpoint can be configured.
 2. If the return air CO2 level remains below the Minimum CO2 Level Setpoint, the Economizer Minimum Position (or Minimum Outside Airflow Position) will remain at its configured value.
 3. As the level of CO2 increases above the Minimum CO2 Level Setpoint, the Economizer Minimum Position will begin to be reset higher. The Economizer Minimum Position will be proportionally higher as the CO2 rises within the range set by the Minimum CO2 Level Setpoint and the Maximum CO2 Level Setpoint.
 4. If the CO2 level reaches the Maximum CO2 Level Setpoint, the Economizer Minimum Position will be reset to the Maximum Economizer Position During High CO2.
 5. The Maximum Economizer Position During High CO2 is the highest the Economizer Minimum Position can be reset to during CO2 Control Operation. This Setpoint is user-adjustable and does not keep the Economizer from opening further during Economizer operation.
- K. Supply Fan Operation
1. Occupied Mode – supply fan shall run continuously.
 2. Unoccupied Mode
 - a. Upon going Unoccupied, Cooling and Heating will be immediately de-energized and the supply fan will then de-energize within 30-60 seconds
 - b. Typically, the supply fan will cycle on a call for heating, cooling or BACnet command
 3. The supply fan can also be configured for continuous operation during Unoccupied Mode
 4. Anytime the Supply Fan is requested to start, a 1 minute minimum off timer must be satisfied. If the timer is satisfied the Supply Fan relay is activated while all other outputs are held off for a period of 1-2 minutes to purge stagnate air from the ductwork before heating or cooling occurs.
 5. When going into Occupied Mode, an optional “Purge Mode” can be initiated. The fan runs with the Economizer closed, and all Cooling and Heating is de-energized. The length of the Purge Mode is user-adjustable.
 6. In fan cycle mode or when going unoccupied the supply fan is held on for 2 minutes after the last stage of heating or cooling stages off.
- L. VAV Units With Duct Static Pressure Control (RTU-3)
1. The VCCX2 Controller shall modulate the Supply Fan VFD to maintain the active Duct Static Pressure Setpoint.
 2. The Duct Static Pressure Setpoint, the Setpoint Deadband, the Static Pressure Control Signal, and the Static Control Rate are all user-adjustable

- M. Single Zone VAV Units (RTU-1&2)
 - 1. The VCCX2 Controller shall modulate the Supply Fan VFD to maintain the space temperature setpoint while the heating and cooling are staged or modulated to maintain the active Supply Air Setpoint.
 - 2. The Supply Fan VFD will begin operation as the Minimum VFD Heating Speed (adj for both heating and cooling modes) and modulate between this setpoint and the Maximum VFD Heating Speed (adj for both heating and cooling modes) as needed to maintain the space temperature.
- N. Supply Fan Proof of Flow Interlock
 - 1. A Proof of Flow switch provides a 24 VAC wet contact closure when the supply fan is operating.
 - 2. If this contact opens while the fan is being called to run, all heating and cooling is disabled and a Fan Proving Alarm is generated.
- O. Heat Wheel Operation (RTU-1&2)
 - 1. The Heat Wheel will be active anytime the supply fan is operating, the unit is not in economizer mode, and OA is above or below the High and Low Outdoor Air Enthalpy Setpoints (adj).
- P. Exhaust Fan Operation
 - 1. The exhaust fan shall be used to maintain the Building Pressure Setpoint (adj). On an increase in building pressure, the exhaust fan shall start the exhaust fan VFD will be ramped to maintain the setpoint.
- Q. Emergency Shutdown
 - 1. A 24 VAC wet contact input is available to be used a freezestat, smoke detector, or high static shutdown device. If this contact opens, it will initiate immediate shutdown of the unit and will generate an alarm condition.
- R. Temperature Protection
 - 1. Activated when the Supply Air Temperature (SAT) rises above the High Cutoff Temperature (immediate) or drops below the Low Cutoff Temperature (for 10 minutes) both of which are user adjustable. This mode shuts off the unit (with a 3 minute fan off delay) until the mode is cancelled.
 - 2. This mode is cancelled when the SAT drops 10 degrees below the High Cutoff Temperature Setpoint or rises 10 degrees above the Low Temp Cutoff Temperature Setpoint, or when the unit changes back into Occupied Operation.
 - 3. Outdoor Air Lockouts
 - 4. Mechanical cooling is disabled when the Outdoor Air Temperature is below the Cooling Lockout Setpoint.
 - 5. Mechanical heating is disabled when the Outdoor Air Temperature is above the Heating Lockout Setpoint.
- S. A2L Refrigerant Leak Detection Sequences
 - 1. The units shall be provided with A2L Refrigerant Leak Detection controls.
 - 2. If a refrigerant leak is detected in the airstream:
 - a. A2L Leak Detect Alarm will be activated
 - b. All compressor operations will cease immediately
 - c. During occupied times the unit will operate normally with the compressors locked out.
 - d. During unoccupied times the supply fan will be forced on
 - e. Heating can operate based on unoccupied temps
 - 3. If a refrigerant leak is detected in the cabinet only:
 - a. A2L Leak Detect Alarm will be activated
 - b. The unit is commanded off
 - 4. If a refrigerant leak is detected in both the airstream and the cabinet:
 - a. A2L Leak Detect Alarm will be activated

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- b. All compressor and heating operations will cease immediately
- c. During occupied times the unit will operate normally with the compressors and heat locked out
- d. During unoccupied times the supply fan will be forced on

T. Points list

Point Name	AI	BI	AV	Loop	Sched	Trend	Alarm	Show On Graphic
Occupied/Unoccupied			X		X			X
HVAC Mode Status	X							X
Occupied Cooling Space Setpoint (RTU-1&2)			X					X
Occupied Heating Space Setpoint (RTU-1&2)			X					X
Unoccupied Cooling Space Offset (RTU-1&2)			X					
Unoccupied Heating Space Offset (RTU-1&2)			X					
Cooling Enabled/Disabled		X						X
Heating Enabled/Disabled		X						X
Economizer Enabled/Disabled		X						X
Energy Recovery Wheel On/Off (RTU-1&2)		X						X
Space Temp (RTU-1&2)	X					X		X
Space RH (RTU-1&2)	X					X		X
Mod Hot Gas Reheat Valve Position (RTU-1&2)	X							
Min Space RH Setpoint			X					
Max Space RH Setpoint			X					
Return Air Temp	X							X
Return Air RH	X							X
Return Enthalpy	X							
Outdoor Air Temp	X					X		X
Outdoor Air RH	X							X
Outdoor Air Enthalpy	X							
Supply Air Temp	X					X		X
Supply Air Cooling Setpoint			X					
Supply Air Heating Setpoint			X					
Outdoor Air Damper Signal	X							
Outdoor Air Damper Feedback	X							
Min Outdoor Air Damper Position			X					
Max Outdoor Air Damper CO2 Position			X					
Return Air CO2	X					X		X
Min CO2 Setpoint			X					
Max CO2 Setpoint			X					
Supply Fan On/Off		X						X

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Point Name	AI	BI	AV	Loop	Sched	Trend	Alarm	Show On Graphic
Supply Fan Proof of Flow		X						
Supply Duct Static (RTU-1)	X							
Supply Duct Static Setpoint (RTU-1)			X					
Supply Fan Control Signal	X							
Exhaust Fan On/Off		X						X
Exhaust Fan Proof of Flow		X						
Building Pressure	X							
Building Pressure Setpoint			X					
Exhaust Fan Control Signal	X							
Mod Heat Valve Signal	X							
Cooling Stage 1		X						X
Cooling Stage 2		X						X
Cooling Stage 3		X						X
Cooling Stage 4		X						X
Cooling Stage 5		X						X
Evap Coil Temp	X							
Evap Coil Temp Setpoint	X							
Emergency Shutdown		X					X	X
Alarms (Over 50 available)		X						

1. Notes:
 - a. AI Points are read-only
 - b. AV Points are read/write
 - c. BI Points are read-only

END OF SECTION 230993

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**SECTION 231123
FACILITY NATURAL-GAS PIPING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, valves, and connections for natural gas piping systems.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 099113 - Exterior Painting.
- C. Section 099123 - Interior Painting.
- D. Section 230516 - Expansion Fittings and Loops for HVAC Piping.
- E. Section 230548 - Vibration and Seismic Controls for HVAC.
- F. Section 230553 - Identification for HVAC Piping and Equipment.
- G. Section 335216 - Gas Hydrocarbon Piping.

1.03 REFERENCE STANDARDS

- A. ANSI LC 1/CSA 6.26 - Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing; 2019.
- B. ANSI Z21.18/CSA 6.3 - Gas Appliance Pressure Regulators; 2019.
- C. ANSI Z21.80/CSA 6.22 - Line Pressure Regulators; 2019.
- D. ANSI Z223.1 - National Fuel Gas Code; 2024.
- E. 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.
- F. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
- G. ASME B31.1 - Power Piping; 2022.
- H. ASME B31.9 - Building Services Piping; 2020.
- I. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- J. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- K. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023a.
- L. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.
- M. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).
- N. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).
- O. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).
- P. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2023.
- Q. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).
- R. MSS SP-78 - Gray Iron Plug Valves, Flanged and Threaded Ends; 2011.

- S. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, 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. Welders' Certificates: Submit certification of welders' compliance with ASME BPVC-IX.
- D. Project Record Documents: Record actual locations of valves.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.
- 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.
- D. Welder Qualifications: Certified in accordance with ASME BPVC-IX.
- E. Identify pipe with marking including size, ASTM material classification, and ASTM specification.

1.06 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

2.01 NATURAL GAS PIPING, BURIED BEYOND 5 FEET (1500 MM) OF BUILDING

- A. Steel Pipe: ASTM A53/A53M, Grade B, Type F, Schedule 40 black.
 - 1. Fittings: ASTM A234/A234M, wrought steel welding type, with AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil (0.25 mm) polyethylene tape.
 - 2. Joints: ASME B31.1, welded.
- B. PE Pipe: ASTM D 2513, SDR 11
 - 1. PE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.
 - 2. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
 - 3. Transition Service-Line Risers: Factory fabricated and leak tested.
 - a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet connected to steel pipe complying with ASTM A 53/A 53M, Schedule 40, Type E or S, Grade B, with corrosion-protective coating for aboveground outlet.
 - b. Outlet shall be threaded or suitable for welded connection.
 - c. Bridging sleeve over mechanical coupling.
 - d. Factory-connected anode.
 - e. Tracer wire connection.
 - f. Ultraviolet shield.
 - g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

2.02 NATURAL GAS PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. Steel Pipe: ASTM A53/A53M, Grade B, Type F, Schedule 40 black.

1. Fittings: ASTM A234/A234M, wrought steel welding type.
 2. Joints: ANSI Z223.1, welded.
 3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil (0.25 mm) polyethylene tape.
- B. PE Pipe: ASTM D 2513, SDR 11
1. PE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.
 2. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
 3. Transition Service-Line Risers: Factory fabricated and leak tested.
 - a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet connected to steel pipe complying with ASTM A 53/A 53M, Schedule 40, Type E or S, Grade B, with corrosion-protective coating for aboveground outlet.
 - b. Outlet shall be threaded or suitable for welded connection.
 - c. Bridging sleeve over mechanical coupling.
 - d. Factory-connected anode.
 - e. Tracer wire connection.
 - f. Ultraviolet shield.
 - g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

2.03 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M, Grade B, Type F, Schedule 40 black.
1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
 2. Joints: Threaded or welded to ASME B31.1.

2.04 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches (80 mm) and Under:
1. Ferrous Pipe: Class 150 malleable iron threaded unions.
- B. Flanges for Pipe Size Over 1 Inch (25 mm):
1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.

2.05 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
 3. Trapeze Hangers: Welded steel channel frames attached to structure.
 4. Vertical Pipe Support: Steel riser clamp.
 5. Rooftop Supports for Low-Slope Roofs: See specifications elsewhere for roof supports.
 - a. Bases: High dens
 - b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 - c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
 - d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
 - e. Height: Provide minimum clearance of 6 inches (150 mm) under pipe to top of roofing.
- B. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
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. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
6. Other Types: As required.

2.06 BALL VALVES

- A. Manufacturers:
 1. Apollo Valves: www.apollovalves.com/#sle.
 2. Effebi; Gladiator: www.efebe.com/#sle.
 3. Grinnell Products: www.grinnell.com/#sle.
 4. Milwaukee Valve Company: www.milwaukeevalve.com/#sle.
 5. Nibco, Inc: www.nibco.com/#sle.
- B. Construction, 4 Inches (100 mm) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, brass, bronze, or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, Teflon seats and stuffing box ring, blowout proof stem, lever handle with balancing stops, solder, threaded, or grooved ends with union.

2.07 PLUG VALVES

- A. Construction 2-1/2 Inches (65 mm) and Larger: MSS SP-78, 175 psi (1200 kPa) CWP, cast iron body and plug, pressure lubricated, Teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw.

2.08 LINE PRESSURE REGULATORS AND APPLIANCE REGULATORS INDICATORS

- A. Manufacturers:
 1. Maxitrol Company; _____: www.maxitrol.com/#sle.
- B. Compliance Requirements:
 1. Appliance Regulator: ANSI Z21.18/CSA 6.3.
 2. Line Pressure Regulator: ANSI Z21.80/CSA 6.22.
- C. Maximum Inlet Operating Pressure: 10 psi (68.9 kPa).
- D. Maximum Body Pressure: 10 psi (1000 mbar).
- E. Output Pressure Range: 1 inch wc (2.5 mbar) to 80 inch wc (200 mbar).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 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.

3.03 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. Refer to Section 230516.

- 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 support for utility meters in accordance with requirements of utility companies.
- J. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
 - 1. Painting of interior piping systems and components is specified in Section 099123.
 - 2. Painting of exterior piping systems and components is specified in Section 099113.
- K. Install valves with stems upright or horizontal, not inverted.
- L. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood or provide ventless approved gas pressure reducing valves.
- M. Sleeve pipes passing through partitions, walls and floors.
- N. 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 (15 mm) space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
 - 5. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 7. Provide hangers adjacent to motor driven equipment with vibration isolation; refer to Section 230548.

3.04 APPLICATION

- A. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- C. Install ball valves for throttling, bypass, or manual flow control services.
- D. Provide plug valves in natural gas systems for shut-off service.

3.05 SERVICE CONNECTIONS

- A. Provide new gas service complete with gas meter and regulators in accordance with Section 335216. Gas service distribution piping to have initial minimum pressure of 2 psi (14 kPa). Provide regulators on each line serving gravity type appliances, sized in accordance with equipment.

3.06 SCHEDULES

- A. Pipe Hanger Spacing:
 - 1. Metal Piping:
 - a. Pipe Size: 1/2 inches (15 mm) to 1-1/4 inches (32 mm):
 - 1) Maximum Hanger Spacing: 6.5 ft (2 m).
 - 2) Hanger Rod Diameter: 3/8 inches (9 mm).
 - b. Pipe Size: 1-1/2 inches (40 mm) to 2 inches (50 mm):
 - 1) Maximum Hanger Spacing: 10 ft (3 m).
 - 2) Hanger Rod Diameter: 3/8 inch (9 mm).
 - c. Pipe Size: 2-1/2 inches (65 mm) to 3 inches (75 mm):
 - 1) Maximum Hanger Spacing: 10 ft (3 m).
 - 2) Hanger Rod Diameter: 1/2 inch (13 mm).
 - d. Pipe Size: 4 inches (100 mm) to 6 inches (150 mm):
 - 1) Maximum Hanger Spacing: 10 ft (3 m).

- 2) Hanger Rod Diameter: 5/8 inch (15 mm).
- e. Pipe Size: 8 inches (200 mm) to 12 inches (300 mm):
 - 1) Maximum Hanger Spacing: 14 ft (4.25 m).
 - 2) Hanger Rod Diameter: 7/8 inch (22 mm).

END OF SECTION 231123

**SECTION 233100
HVAC DUCTS AND CASINGS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal ducts.
- B. Flexible ducts.
- C. Air plenums and casings.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 230130.51 - HVAC Air-Distribution System Cleaning: Post install duct cleaning.
- C. Section 230548 - Vibration and Seismic Controls for HVAC.
- D. Section 230713 - Duct Insulation: External insulation and duct liner.
- E. Section 233300 - Air Duct Accessories.
- F. Section 233319 - Duct Silencers.
- G. Section 233600 - Air Terminal Units.
- H. Section 233700 - Air Outlets and Inlets: Fabric air distribution devices.

1.03 REFERENCE STANDARDS

- A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASHRAE Std 90.1 I-P-2019 - Energy Standard for Buildings Except Low-Rise Residential Buildings; 2019, with Errata and Addenda (2021).
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- E. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.
- F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- G. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.
- H. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- I. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; 2012.
- J. SMACNA (RIDC) - Rectangular Industrial Duct Construction Standards; 2007.
- K. SMACNA (ROUND) - Round Industrial Duct Construction Standards; 2013.
- L. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for duct materials.
- C. Shop Drawings: Indicate duct fitting types, gauges, sizes, welds, and configuration.
- D. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate per appropriate seal class, following SMACNA (LEAK).

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum 6 years of documented experience, and approved by manufacturer.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 6 years of documented experience.

1.06 FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.
- B. Provide metal duct unless otherwise indicated.
- C. Acoustical Treatment: Provide sound-absorbing liners for metal-based ducts in compliance with Section 233319.
- D. Duct Shape and Material in accordance with Allowed Static Pressure Range:
 - 1. Round: Plus or minus 2 in-wc (500 Pa) of galvanized steel.
 - 2. Rectangular: Plus or minus 2 in-wc (500 Pa) of galvanized steel.
 - 3. Flat Oval: Plus 2 in-wc (500 Pa) of galvanized steel.
 - 4. Flexible Duct (Fabric and wire): Plus or minus 2 in-wc (500 Pa); see Section 233700.
- E. Duct Sealing and Leakage in accordance with Static Pressure Class:
 - 1. Low Pressure Service: Up to 2 in-wc (500 Pa):
 - a. Seal: Class C, apply to seal off transverse joints.
 - b. Leakage:
 - 1) Rectangular: Class 24 or 24 cfm/100 sq ft (680 Lpm/9.3 sq m).
 - 2) Round: Class 12 or 12 cfm/100 sq ft (340 Lpm/9.3 sq m).
- F. Duct Fabrication Requirements:
 - 1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
 - 2. No variation of duct configuration or size permitted except by written permission. Size round duct installed in place of rectangular ducts in accordance with ASHRAE (FUND) Handbook - Fundamentals.
 - 3. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
 - 4. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide airfoil turning vanes of perforated metal .
 - 5. Provide turning vanes of perforated metal when acoustical lining is indicated.
 - 6. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
 - 7. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide transition fitting, blank-out panels sealing louver area around duct are not allowed. Slope bottom portion of transition to louver to allow drainage of any moisture to the exterior.

2.02 METAL DUCTS

- A. Material Requirements:
 - 1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
- B. Rectangular Metal Duct:
 - 1. Rectangular Double Wall Insulated: Rectangular spiral lock seam duct with galvanized steel outer wall, perforated galvanized steel inner wall; fitting with the solid inner wall.
 - a. Insulation:
 - 1) Thickness: 1 inch (25 mm).
 - 2) Material: Air.
- C. Flat-Oval Metal Ducts:
 - 1. Flat-Oval Single Wall Duct: Machine made from a round spiral lock seam duct.
 - a. Fittings: Manufacture at least two gauges heavier metal than the duct.
 - b. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.
- D. Round Spiral Duct:
 - 1. Round spiral lock seam duct with galvanized steel outer wall.
- E. Connectors, Fittings, Sealants, and Miscellaneous:
 - 1. Fittings: Manufacture with solid inner wall of perforated galvanized steel.
 - 2. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
 - a. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 - b. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.

2.03 FLEXIBLE DUCTS

- A. Flexible Ducts: UL 181, Class 1, polyethylene film, mechanically fastened and rolled using galvanized steel to form spiral helix.
 - 1. Pressure Rating: 10 in-wc (2.50 kPa) positive and 5 in-wc (1.25 kPa) negative.
 - 2. Maximum Velocity: 5500 fpm (27.9 m/sec).
 - 3. Temperature Range: Minus 20 degrees F to 250 degrees F (Minus 28 degrees C to 121 degrees C).

2.04 AIR PLENUMS AND CASINGS

- A. Fabricate in accordance with SMACNA (DCS) for indicated operating pressures indicated.
- B. Minimum Fabrication Requirements:
 - 1. Fabricate acoustic plenum or casing with reinforcing turned inward.
 - 2. Provide 16-gauge, 0.059-inch (1.52 mm) sheet steel back facing and 22-gauge, 0.029-inch (0.76 mm) perforated sheet steel front facing with 3/32 inch (2.4 mm) diameter holes on 5/32 inch (4 mm) centers.
 - 3. Construct panels 3 inches (75 mm) thick, packed with 4.5 pcf (72 kg/cu m) minimum glass fiber insulation media, on inverted channel of 16-gauge, 0.059-inch (1.52 mm) sheet steel.
 - 4. Mount floor-mounted plenum or casings on 4-inch (100 mm) high concrete curbs. At floor, rivet panels on 8-inch (200 mm) centers to angles.
- C. Access Doors:
 - 1. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.
 - 2. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles.
 - 3. Provide clear wire glass observation ports, minimum 6 by 6 inch (150 by 150 mm) size.
- D. Fire-Rated Metal Panels:

1. Fire Rating: 60 minutes when tested in accordance with ASTM E119.
2. Material: Steel-faced composite panel with noncombustible structural high density mineral fiber core, UL or ETL labeled, nonload bearing fire separations.
 - a. Facing: Galvanized steel (G90), 24 gauge (0.0275 inch) (0.701 mm).
 - b. Finish: Unpainted.
 - c. Core: Mineral wool board.
 - d. Structural: Nonload bearing.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. Install products following the manufacturer's instructions.
- C. Comply with safety standards NFPA 90A and NFPA 90B.
- D. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.
- E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- F. Flexible Ducts: Connect to metal ducts with adhesive.
- G. Duct sizes indicated are precise inside dimensions. For lined ducts, maintain sizes inside lining.
- H. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- I. Connect terminal units to supply ducts directly or with one foot (300 mm) maximum length of flexible duct. Do not use flexible duct to change direction.
- J. Connect diffusers or light troffer boots to low-pressure ducts directly or with 5 feet (1.5 m) maximum length of flexible duct held in place with strap or clamp.
- K. Set plenum doors at 6 to 12 inches (150 to 300 mm) above floor. Arrange door swings so that fan static pressure holds door in closed position.
- L. Fire Partitions: Provide firestopping sealing. See Section 078400.
- M. Duct Accessories, Terminal Units, Inlets, and Outlets: Interconnect as indicated in Sections 233300, 233600, and 233700.
- N. Duct Insulation: Provide duct insulation. See Section 230713.

3.02 CLEANING

- A. See Section 017419 - Construction Waste Management and Disposal for additional requirements.
- B. Clean thoroughly each duct system. See Section 230130.51.

END OF SECTION 233100

SECTION 233439
HIGH-VOLUME, LOW-SPEED PROPELLER FANS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes
 - 1. High Volume, Low Speed Overhead Fans
- B. Related Sections:
 - 1. 01 00 00 General Requirements
 - 2. 07 00 00 Thermal and Moisture Protection
 - 3. 09 00 00 Finishes
 - 4. 23 00 00 Heating, Ventilating, and Air-Conditioning (HVAC)
 - 5. 26 00 00 Electrical

1.02 REFERENCES

- A. Air Movement and Control Association Inc. (AMCA):
 - 1. 99 - Standards Handbook
 - 2. 200 - Publication, Air Systems
 - 3. 201-90 - Publication, Fans and Systems
 - 4. 202-88 - Publication, Troubleshooting
 - 5. 203-90 - Publication, Field Performance Measurement of Fan Systems
 - 6. 211-05 - Publication, Certified Ratings Program – Product Rating Manual for Fan Air Performance
 - 7. 300-96 - Standard Reverberant Room Method for Sound Testing of Fans
 - 8. 311-05 - Publication, Certified Ratings Program – Product Rating Manual for Fan Sound Performance
 - 9. 99-0401-86 - Classification for Spark Resistant Construction
 - 10. 99-2408-69 - Operating Limits for Centrifugal Fans
- B. Air Movement and Control Association Inc. (AMCA), American National Standards Institute (ANSI):
 - 1. 204-05 - Standard Balance Quality and Vibration Levels for Fans
 - 2. 210-99 - Standard Laboratory Methods of Testing Fans for Aerodynamic Performance Rating
 - 3. 230-15 - Standard Laboratory Methods of Testing Air Circulating Fans for Rating and Certification
- C. American National Standards Institute (ANSI):
 - 1. 11-r1999 - Method of Evaluating Load Ratings of Bearings
- D. American Society of Civil Engineers (ASCE):
 - 1. 7-02 - Minimum Design Loads for Building and Other Structures
- E. American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE):
 - 1. Chapter 45 - 2003 Handbook, HVAC Applications
 - 2. Chapter 7 - 2001 Fundamentals handbook, Sound-Vibration
 - 3. Chapter 32 - 2001 Fundamentals handbook, Duct Design
 - 4. Chapter 18 - 1992 HVAC System and Equipment handbook, Fans
- F. American Society for Testing and Materials (ASTM):
 - 1. E330-02 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylight and Curtain Walls by Uniform Static Air Pressure Difference
- G. National Fire Protection Association (NFPA)
 - 1. 13 - Standard for the Installation of Sprinkler Systems
 - 2. 70 - National Electrical Code
 - 3. 72 - National Fire Alarm and Signaling Code

4. 90A-02 - Standard for the Installation of Air-Conditioning and Ventilating Systems
 5. 92A-06 - Recommend Practice for Smoke-Control System
 6. 92B-05 - Standard for Smoke Management System in Malls, Atria, and Large Areas
 7. 96-04 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations
- H. Occupational Safety and Health Administration (OSHA):
1. 1910.212 - General requirements for Machine Guarding
 2. 1910.219 - General requirements for guarding safe use of mechanical power transmission apparatus
 3. 1926.300 - General requirements for safe operation and maintenance of hand and power tools
- I. Underwriters Laboratories (UL):
1. 507 - Electric Fans
 2. 555 - Fire Dampers
 3. 555S - Smoke Dampers
 4. 705 - Standard Power Ventilators
 5. 762 - Standard Power Roof Ventilators for Restaurant Exhaust Appliances
 6. 793 - Snow Load

1.03 SUBMITTALS

- A. General: Submit in accordance with Section 013300 Submittal Procedures.
- B. Provide dimensional drawings and product data on each fan.
- C. Provide fan curves for each fan at the specified operation point, with the flow and fan RPM clearly plotted.
- D. Provide A-weighted total sound pressure levels in decibels for each fan.
- E. Strictly adhere to QUALITY ASSURANCE requirements as stated in this specification.
- F. Provide manufacturer's certification that High Volume, Low Speed (HVLS) overhead fans are licensed to bear the Air Movement and Control Association (AMCA) Certified Rating Seal for Circulating Fan Performance.
- G. Installation, Operation, and Maintenance Manual (IOM): Provide manufacturer's installation, operation, and maintenance manual, including instructions on installation, operation, maintenance, receiving, handling, storage, and cleaning. A troubleshooting guide, parts list, safety information and electrical wiring diagrams shall also be included.

1.04 QUALITY ASSURANCE

- A. Performance ratings shall conform to AMCA standard 211. Fans must be tested in accordance with ANSI/AMCA Standard 230-15 inch (381 mm) at an AMCA accredited laboratory. Fans shall be certified to bear the AMCA Seal for Circulating Fan Performance.
- B. Entire fan assembly (with or without the optional LED light kit) shall be UL/cUL-Listed to Underwriters Laboratory (UL) Standard 507 and CSA Standard 22.2 No. 113 to ensure compliance with the most current international testing standards. Intertek/ETL certification to UL Standard 507 and CSA Standard 22.2 No. 113 shall not be accepted.
- C. Fans shall be compliant with NFPA 13 – Standard for the Installation of Sprinkler Systems, NFPA 72 – National Fire Alarm and Signaling Code, and NFPA 70 – National Electrical Code (NEC).
- D. Fan controls shall comply with the National Electrical Code (NEC).
- E. Good workmanship shall be evident in all aspects of the fan's construction. Field balancing of the fan's airfoils and hub shall not be required.
- F. All fan motors and variable frequency drives (VFDs) shall be factory-tested prior to shipment.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer, material, products included, and location of installation.
- B. Storage: Store materials in a dry area indoor, protected from damage, and in accordance with manufacturer's instructions. For long term storage follow manufacturer's Installation, Operation, and Maintenance Manual.
- C. Handling: Handle and lift fans in accordance with the manufacturer's instructions. Protect materials and finishes during handling and installation to prevent damage. Follow all safety warnings posted by the manufacturer.

1.06 WARRANTY

- A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.
 - 1. The warranty of this equipment is to be free from defects in material and workmanship for a period of ten years from the purchase date. Any units or parts which prove defective during the warranty period will be replaced at the Manufacturer's option when returned to Manufacturer, transportation prepaid.
 - 2. Motor and variable frequency drive (VFD) are warranted by the motor & VFD manufacturer for a period of one year.

1.07 MAINTENANCE

- A. Refer to Manufacturer's Installation, Operation and Maintenance Manual (IOM), to find maintenance procedures.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Greenheck, www.greenheck.com
- B. Big Ass Fans

2.02 DIRECT DRIVE HIGH VOLUME, LOW SPEED (HVLS) OVERHEAD FANS

- A. General Description:
 - 1. High Volume, Low Speed (HVLS) overhead fans shall be licensed to bear the AMCA Certified Rating Seal for Circulating Fan Performance to ensure performance as cataloged in the field. Unlicensed overhead fans shall not be accepted.
 - 2. Entire fan assembly (with or without the optional LED light kit) shall be UL/cUL-Listed to Underwriters Laboratory (UL) Standard 507 and CSA Standard 22.2 No. 113 to ensure compliance with the most current international testing standards. Intertek/ETL certification to UL Standard 507 and CSA Standard 22.2 No. 113 shall not be accepted.
 - 3. Performance capabilities up to 55,800 cubic feet per minute (cfm).
 - 4. Maximum continuous operating temperature of 104° Fahrenheit (40° Celsius).
 - 5. Designed for forward (counter-clockwise when viewed from floor) and reverse (clockwise when viewed from floor) operation capabilities, for comfort cooling and destratification applications.
 - 6. Each fan shall bear a permanently affixed manufacturer's mylar nameplate containing the model number, individual serial number, and electrical requirements of the fan.
- B. Impeller:
 - 1. Impeller shall be constructed of aerodynamic 6005A-T6 extruded aluminum airfoil blades connected to a single-piece, laser-cut 5/16 inch (7.94 mm) steel hub for structural strength. Multi-piece hubs shall not be permitted. All connections shall be made using a minimum of SAE Grade 5 hardware.

2. Airfoil blades shall be interlocked with one another and the impeller hub via a heavy-duty steel airfoil retaining ring for safety. Airfoil retaining ring shall be constructed of heavy gauge steel and installed at the factory to ensure proper function. Field-installed airfoil retainers shall not be accepted.
 3. Airfoil blades shall be provided with a mill aluminum finish as standard. Optional finishes shall include industrial powder coatings, anodize finishes, wood grain finishes, or custom color matched coatings.
 4. Airfoil blades shall be optimized for maximum airflow, fan efficiency, and coverage area.
 5. Airfoil blades shall be internally reinforced to minimize blade deflection while the fan is in standby or in operation. Blade deflection shall not exceed ± 2.4 inches (60.96 mm) in either situation.
 6. Airfoil blades shall be designed for minimal weight in order to maximize fan efficiency. Individual blade weight shall not exceed 10 pounds.
 7. Impeller hub shall be secured to the face of the motor by a minimum of 6 bolts. Impeller hub shall also be connected to the building structure via a safety restraint cable and hub retaining ring. Hub retaining ring shall be constructed of heavy gauge steel and installed at the factory to ensure proper function.
- C. Motor:
1. Motor enclosure: IP54
 2. Motors shall be of the high torque, low speed direct drive type, carefully matched to the fan load and furnished at the specified voltage and phase. High speed motors provided with a gearbox to reduce the operating speed of the fan shall not be permitted.
 3. Motors shall be an external rotor design. Internal rotor motors shall not be permitted.
 4. Motors shall be of the brushless DC type for maximum efficiency and speed controllability. No other motor type shall be accepted.
 5. Motors shall include plug-and-play connectors for all wiring to the variable frequency drive. Motors that require these wiring connections to be stripped and terminated in the field shall not be permitted.
 6. Motors shall include an internally-mounted thermistor for continuous monitoring of the motor's internal temperature.
 7. Motors shall include Class B insulation.
- D. Variable Frequency Drive (VFD):
1. VFD enclosure: IP50
 2. VFD shall be factory programmed and designed for Modbus RS-485 communication with control devices via the Modbus RTU communication protocol.
 3. VFD shall be UL Listed for single phase input at the specified voltage.
 4. VFD shall be provided with factory-installed, plug-and-play wiring for ease of installation. Plug-and-play wiring shall include power, communication, and fire alarm wiring pigtails that are designed for quick and easy termination in the field.
 5. VFD shall be factory-wired for power and control of LED light when fan is supplied with optional LED light kit.
 6. VFD shall include two thermistors for continuous monitoring of VFD's internal and external temperature.
 7. VFD shall include sensors for continuous monitoring of voltage and current.
 8. VFD shall include intelligent protection systems to prevent failures caused by over/under-voltage, over-current, over-temperature, over-speed, and fan impact. VFDs without these protection features shall not be permitted.
 9. VFD shall include the most current firmware version as of the product's manufacturing date to ensure optimal performance. As a result of continuous development, the manufacturer reserves the right to update VFD firmware without notice.
- E. Universal Ceiling Mount & Downtube:

1. Fans shall be provided with a universal ceiling mount that is designed for fast and secure installation on a variety of building structures. Universal ceiling mount shall be constructed of heavy gauge, bolted steel and shall include a pivoting knuckle joint with one axis of rotation to accommodate any ceiling pitch.
 2. Downtube shall be constructed of heavy gauge steel to provide a structural connection between the universal ceiling mount and fan motor. Downtube shall also include a welded guy wire connection ring for fast and secure installation of guy wires when required based on downtube length.
 3. Universal ceiling mount and downtube shall be powder-coated for corrosion resistance and aesthetic appearance.
 4. Standard drop length between top of universal ceiling mount and top of airfoil blades shall be 2 feet (60.96 cm). Optional drop lengths are also available in one foot increments between 3 and 10 feet (304.8 cm).
 5. All hardware shall be a minimum of SAE Grade 5.
- F. Safety Retention Cables:
1. Fans shall include a braided galvanized steel safety retention cable that is rated for a load of 495 pounds or greater. Safety retention cable shall be installed on the fan motor at the factory to ensure proper function. Field construction or installation of safety retention cables shall not be permitted.
 2. Safety retention cable shall be secured around the building structure via a minimum of two u-bolt steel cable clamps as standard. Optionally, safety retention cable may be secured via one No. 4 Gripple® connector for ease of installation.
- G. Guy Wires:
1. Guy wires shall be included for fans with drop lengths equal to or greater than 4 feet (121.92 cm) in length. Guy wires shall be constructed of braided galvanized steel and designed to prevent lateral movement of the fan when installed.
 2. If included, guy wires shall be secured to the building structure via the supplied beam clamps and quick links for ease of installation.
 3. If included, guy wires shall be secured to the fan and tensioned via high-strength steel turnbuckles with quick links. Turnbuckles shall be connected to each guy wire via a minimum of two u-bolt steel cable clamps per guy wire as standard. Optionally, guy wires may be secured to the fan and tensioned via one UG2 Gripple® turnbuckle per guy wire for ease of installation.
- H. Fire Control Panel Integration:
1. Fans shall include a normally closed electromechanical relay for integration with a building's fire control panel. Normally closed electromechanical relay shall be compatible with 24 VDC/VAC and 115 VAC control signals.
- I. Options/Accessories:
1. Finishes:
 2. Type: Hi-Pro Polyester
 - a. Fan Components:
 - 1) Universal Ceiling Mount
 - 2) Downtube
 - 3) Impeller Hub
 - 4) Airfoil Blades
 - 5) Winglets
 - b. Colors: Provide selection chart
 3. Type: Anodize
 - a. Fan Components: Airfoil Blades
 - b. Colors: 204-R1 Clear Anodize
 4. Mounting Hardware:
 5. Type: I-Beam Kit

6. Disconnect Switches:
 - a. NEMA Rated: 1
 - b. Protection: None
 - c. Positive electrical shut-off.
 - d. Shipped loose for field mounting.
7. Overhead Fan Controls:
 - a. Type: Advanced Touchscreen Control with BACnet
 - b. Controls shall be capable of operating one or multiple overhead fans as specified. Controls shall provide start/stop, speed, and rotation direction control capabilities as well as diagnostic and fault history information for each connected fan. Controls shall also be capable of dimming the optional fan-mounted LED light.
 - c. Controls shall include RJ45 ports for plug-and-play connection to overhead fans via shielded CAT-5e communication cable in the field.
8. CAT-5e Cable Length:
 - a. Field-Assembled Cable Type: 1,000 foot (30480 cm) spool
 - 1) Field-assembled CAT-5e cable must be shielded 26 gauge cable with a drain wire and must be compliant with ISO 11801 to prevent network communication issues. Cable must be cut to appropriate length and terminated with shielded RJ45 connectors with a soldered drain in the field by an experienced contractor or electrician. Wiring configuration must follow EIA/TIA T568B wiring pinout and individual cable lengths must not exceed 200 feet (6096 cm).

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's product data, including technical bulletins, product catalog, and installation instructions.

3.02 EXAMINATION

- A. Examine areas to receive fans. Notify the Engineer of conditions that would adversely affect installation or subsequent utilization and maintenance of fans. Do not proceed with installation until unsatisfactory conditions are corrected.

3.03 PREPARATION

- A. Verify that the fan is to be installed in a location where the airfoils will be a minimum of 10 feet (304.8 cm) above the finished floor with a minimum of 3 feet (91.44 cm) of clearance to any obstructions.
- B. If the building has a mezzanine or other elevated spaces that may be occupied by people, verify that no component of the fan can be reached from the highest level or deck. The fan must be positioned so that the tips of the airfoils are a minimum of 3 feet (91.44 cm) away from the furthest point that a person could extend an appendage outward.
- C. If the fan is to be mounted in an area where materials or equipment may be elevated into its path, ensure that the floor is marked or painted to alert personnel of the overhead location of the fans.
- D. If the building is equipped with a fire sprinkler system, verify that the placement of the fan will not interfere with correct sprinkler operation and that the fan installation complies with all national, state and local codes. For NFPA 13 compliance, fans must be installed in the center of four adjacent sprinklers with at least 3 feet (91.44 cm) of vertical clearance between the fan and sprinkler deflectors. Fans must also be interlocked to shut down upon receiving a waterflow signal from the building's alarm system.
- E. Check to see if the intended placement of the fan is directly below any building lights or skylights. Avoid installing fans directly below a light source to prevent a strobing effect that can be caused by fan rotation.

- F. For best performance, fans must be installed with a two fan diameter minimum clearance between the center of the fan and radiant heaters or HVAC system discharges or intakes.
- G. Verify that the mounting surface will bear the operating weight and maximum torque (twisting force) of the unit. The Structural Engineer of Record (SEOR) must perform a thorough evaluation of the mounting structure and determine all final mounting requirements before the fan is installed.

3.04 INSTALLATION

- A. Install fan system as indicated in the Installation, Operation and Maintenance Manual (IOM) and contract drawings.
- B. Install fans in accordance with manufacturer's instructions.

3.05 SYSTEM STARTUP

- A. Refer to Installation, Operation, and Maintenance Manual (IOM).

3.06 CLEANING

- A. Clean as recommended by manufacturer. Do not use material or methods which may damage finish surface or surrounding construction.

3.07 PROTECTION

- A. Protect installed product and finished surfaces from damage during construction.
- B. Protect installed fans to ensure that, except for normal weathering, fans will be without damage or deterioration at time of substantial completion.

END OF SECTION 233439

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**SECTION 233600
AIR TERMINAL UNITS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single-duct terminal units.
 - 1. Variable-volume units.

1.02 RELATED REQUIREMENTS

- A. Section 230548 - Vibration and Seismic Controls for HVAC.
- B. Section 230923 - Direct-Digital Control System for HVAC.
- C. Section 230993 - Sequence of Operations for HVAC Controls.
- D. Section 232113 - Hydronic Piping: Connections to heating coils.
- E. Section 232114 - Hydronic Specialties: Connections to heating coils.
- F. Section 233100 - HVAC Ducts and Casings.
- G. Section 233300 - Air Duct Accessories.
- H. Section 233700 - Air Outlets and Inlets.
- I. Section 251400 - Integrated Automation Local Control Units: HVAC controllers.

1.03 REFERENCE STANDARDS

- A. AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils; 2001, with Addenda (2011).
- B. AHRI 880 (I-P) - Performance Rating of Air Terminals; 2017 (Reaffirmed 2023).
- C. ASTM A492 - Standard Specification for Stainless Steel Rope Wire; 1995 (Reapproved 2019).
- D. ASTM A603 - Standard Specification for Metallic-Coated Steel Structural Wire Rope; 2019.
- E. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2019.
- F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- I. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate airflow, static pressure, and NC designation. Include electrical characteristics and connection requirements.
- C. Shop Drawings: Indicate configuration, general assembly, and materials used in fabrication, and electrical characteristics and connection requirements.
- D. Certificates: Certify that coils are tested and rated in accordance with AHRI 410.
- E. Project Record Documents: Record actual locations of units and locations of access doors required for access of valving.
- F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant-volume regulators.
- G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements for additional provisions.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer warranty for air terminal units.

PART 2 PRODUCTS

2.01 SINGLE-DUCT, VARIABLE-VOLUME UNITS

- A. Manufacturers:
 1. Carrier, a part of UTC Building and Industrial Systems, a unit of United Technologies Corp.; _____: www.commercial.carrier.com/#sle.
 2. Price Industries; _____: www.priceindustries.com/#sle.
 3. Titus: www.titus-hvac.com.
- B. General:
 1. Factory-assembled, AHRI 880 (I-P) rated and bearing the AHRI seal, air volume control terminal with damper assembly, flow sensor, externally mounted volume controller, duct collars, and all required features.
 2. Control box bearing identification, including but not necessarily limited to nominal cfm, maximum and minimum factory-set airflow limits, coil type and coil (right or left hand) connection, where applicable.
- C. Unit Casing:
 1. Minimum 22 gauge, 0.0299 inch (0.76 mm) galvanized steel.
 2. Air Inlet Collar: Provide round, suitable for standard flexible duct sizes.
 3. Unit Discharge: Rectangular, with slip-and-drive connections.
 4. Acceptable Liners:
 - a. 1/2 inch (13 mm) thick, coated, fibrous-glass complying with ASTM C1071.
 - 1) Secure with adhesive.
 - 2) Coat edges exposed to airstream with NFPA 90A approved sealant.
 - 3) Cover liner with non-porous foil.
 - b. Liner not to contain pentabrominated diphenyl ether (CAS #32534-81-9) or octabrominated diphenyl ether.
- D. Damper Assembly:
 1. Heavy-gauge, galvanized steel, or extruded aluminum construction with solid steel, nickel-plated shaft pivoting on HDPE, self-lubricating bearings.
 2. Provide integral position indicator or alternative method for indicating damper position over full range of 90 degrees.
 3. Incorporate low leak damper blades for tight airflow shutoff.
- E. Electric Heating Coil:
 1. Listed and provided by the terminal unit manufacturer.
 2. Coil Casing: 20 gauge, 0.0359 inch (0.92 mm) galvanized steel.
 3. Heating Elements: Nickel chrome, supported by ceramic insulators.
 4. Integral Control Panel: NEMA 250, Type 2 enclosure with hinged access door for access to all controls and safety devices.
 5. Furnish a primary automatic reset thermal cutout and differential pressure airflow switch for proof of airflow.

6. Provide the following additional components, mounted and/or wired within the control enclosure:
 - a. Fused or non-fused door interlocking disconnect switch.
 - b. Mercury contactors.
 - c. Fuse block.
 7. Factory wired, including all limit switches and steps of control as indicated on the equipment schedule, with the SSR (solid-state relay) proportional heat control.
- F. Electrical Requirements:
1. Single-point power connection.
 2. Equipment wiring to comply with requirements of NFPA 70.
- G. Control Transformers: Factory supplied and mounted for electric and electronic control applications.
- H. Controls:
1. Terminal Unit Controls:
 - a. Provide accessories for field interfaced controller including thermostat.
 - b. Factory ship DDC controller including airflow sensor, integral airflow transmitter, integral damper actuator, and duct-mounted temperature sensor.
 - c. Sequence of Operation: Zone temperature control with airflow and coil discharge monitoring.
 2. DDC (Direct-Digital Controls):
 - a. Include a factory-installed, unit-mounted, direct-digital controller.
 - b. Bi-directional Damper Actuator: 24 volt, powered closed, spring return open.
 - c. Microprocessor-Based Controller: Air volume controller, pressure-independent with electronic airflow transducers, factory-calibrated maximum and minimum CFMs.
 - 1) Occupied and unoccupied operating mode.
 - 2) Remote reset of temperature or CFM set points.
 - 3) Proportional, plus integral control of room temperature.
 - 4) Monitoring and adjusting with portable terminal.
 - d. Room Sensor:
 - 1) Compatible with temperature controls specified.
 - 2) Wall-mounted, system powered, with temperature set-point adjustment including connection access for portable operator terminal.
 - e. See Section 25 1400.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that conditions are suitable for installation.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install the inlets of air terminal units and air flow sensors a minimum of four duct diameters from elbows, transitions, and duct takeoffs.
- C. See drawings for the size(s) and duct location(s) of the air terminal units.
- D. Provide ceiling access doors or locate units above easily removable ceiling components.
- E. Support units individually from structure with wire rope complying with ASTM A492 and ASTM A603 in accordance with SMACNA (SRM). See Section 23 0548.
- F. Do not support from ductwork.
- G. Connect to ductwork in accordance with Section 233100.
- H. Verify that electric power is available and of the correct characteristics.

3.03 ADJUSTING

- A. Reset volume with damper operator attached to assembly allowing flow range modulation from 100 percent of design flow to zero percent full flow. Set units with heating coils for minimum 50 percent full flow.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Provide manufacturer's field representative to test, inspect, instruct, and observe field-assembled components and equipment installation, including connections and to assist in field testing. Report results in writing.
 - 1. Operational Test:
 - a. After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - b. Test and adjust controls and safeties.
 - c. Replace damaged and malfunctioning controls and other equipment.
 - d. Remove and replace malfunctioning units and retest as specified above.

3.05 CLEANING

- A. See Section 017419 - Construction Waste Management and Disposal for additional requirements.
- B. Vacuum clean coils and inside of units.

END OF SECTION 233600

**SECTION 233700
AIR OUTLETS AND INLETS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Diffusers:
- B. Rectangular ceiling diffusers.
- C. Round ceiling diffusers.
- D. Slot ceiling diffusers.
- E. Registers/grilles:
 - 1. Ceiling-mounted, exhaust and return register/grilles.
 - 2. Ceiling-mounted, supply register/grilles.
 - 3. Wall-mounted, supply register/grilles.
 - 4. Wall-mounted, exhaust and return register/grilles.
- F. Duct-mounted supply and return registers/louvers.
- G. Fabric air distribution devices.

1.02 REFERENCE STANDARDS

- A. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Air Inlets; 2023.
- B. ASHRAE Std 130 - Laboratory Methods of Testing Air Terminal Units; 2016.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- E. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.
- F. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.
- G. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- H. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.
- I. UL 2518 - Standard for Safety Air Dispersion Systems; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.
- C. Fabric Duct:
 - 1. Provide detailed drawings confirming configuration of Textile Dispersion System (diameter, lengths, airflow, pressure, and textile permeability).
 - 2. Provide detailed installation instructions for components to be installed.
 - 3. Provide warranty and maintenance documentation.

1.04 QUALITY ASSURANCE

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum 6 years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Krueger-HVAC: www.krueger-hvac.com/#sle.
- B. Metalaire, a brand of Metal Industries Inc: www.metalaire.com/#sle.
- C. Price Industries: www.priceindustries.com/#sle.
- D. Ruskin Company: www.ruskin.com/#sle.
- E. Titus, a brand of Air Distribution Technologies; _____: www.titus-hvac.com/#sle.
- F. Tuttle and Bailey: www.tuttleandbailey.com/#sle.
- G. Substitutions: See Section 016000 - Product Requirements.

2.02 RECTANGULAR CEILING DIFFUSERS

- A. Type: Provide square formed backpan stamped and core removable ceiling diffusers constructed to maintain 360 degree discharge air pattern.
- B. Connections: Round.
- C. Frame: Provide surface mount and inverted T-bar type. In plaster ceilings, provide plaster frame and ceiling frame.
- D. Fabrication: Steel with baked enamel finish.
- E. Color: As indicated.

2.03 CEILING SLOT DIFFUSERS

- A. Type: Continuous 1 inch (25 mm) wide slot, two slots wide, with adjustable vanes for left, right, or vertical discharge.
- B. Fabrication: Aluminum extrusions with factory clear lacquer finish.
- C. Color: As indicated.

2.04 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

- A. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting.
- B. Fabrication: Steel with 20 gauge, 0.0359 inch (0.91 mm) minimum frames and 22 gauge, 0.0299 inch (0.76 mm) minimum blades, steel and aluminum with 20 gauge, 0.0359 inch (0.91 mm) minimum frame, or aluminum extrusions, with factory baked enamel finish.
- C. Color: As indicated.

2.05 FABRIC AIR DISTRIBUTION DEVICES

- A. Manufacturers:
 - 1. DuctSox Corporation; _____: www.ductsox.com/#sle.
- B. SkeleCore Pull-Tight System: Air diffusers shall be constructed with both internal retention and external tensioning.
 - 1. System shall consist of internal tensioning baskets with cable or track stops that externally tension the system off of the suspension system selected below along with 360 degree internal retention hoops that are spaced 5' on center between tensioning baskets.
 - 2. Tensioning baskets are designed to self-lock when tension is applied to the system.
 - 3. All straight sections utilize both internal retention hoops and external tensioning with the use of the tension baskets, all fittings(crosses, elbows, reducers, and tees) utilize internal retention hoops.
 - 4. Distance between consecutive tensioning baskets should not be more than 40'.
 - 5. System shall be installed with a one row suspension system located 1.5" above top-dead-center of the textile system.
 - 6. System attachment to cable or U-Track shall be made using Gliders spaced no further than 12 inches apart.
 - 7. Available for diameters from 8" – 60".

8. Not available for natatorium applications.
 9. One row suspension options(must specify if multiple on same project)
 - a. Cable suspension hardware to include cable, eye bolts, thimbles, cable clamps, and turnbuckle(s) as required.
 - 1) Cable suspension options
 - (a) Galvanized steel cable
 - 2) Support lengths available in 5'(standard), 10', 15', & 30'.
- C. Textile
1. Sedona-Xm
 - a. Textile Construction: Filament/filament twill polyester treated with a machine washable anti-microbial agent by the fabric manufacturer, fire retardant in accordance with UL 2518.
 - b. Air Permeability: 2 (+2/-1) CFM/ft² per ASTM D737, Frazier
 - 1) The air permeability of the fabric must NOT be created by perforating the fabric.
 - 2) The air permeability must be confirmed by third party testing to eliminate the formation of condensate on the fabric.
 - c. Weight: 6.8 oz. /yd² per ASTM D3776
 - d. Warranty: 15 years
 2. Textile Color
 - a. Submit standard color selection samples for selection by Architect.
- D. Textile System Fabrication Requirements
1. Textile system to be constructed in modular lengths (zippered) with proper radial securing clips (inlets, endcaps and mid-sections) and top access zippers for tension lock attachments.
 2. Integrated air dispersion shall be specified and approved by manufacturer. (select only those that apply)
 - a. Linear Vents
 - 1) Air dispersion accomplished by linear vent and permeable fabric. Linear vents must be sized in 1 CFM per linear foot increments (based on .5" SP), starting a 1 CFM through 90 CFM per linear foot. Linear vent is to consist of an array of open orifices rather than a mesh style vent to reduce maintenance requirements of mesh style vents. Linear vents should also be designed to minimize dusting on fabric surface.
 - 2) Size of vent openings and location of linear vents to be specified and approved by manufacturer.
 - b. Orifices
 - 1) Air dispersion and extended throws are accomplished by reinforced orifices and permeable fabric. Reinforced laser-cut orifices retain the integrity of the opening and withstand laundry processes.
 - 2) Diameter, quantity, and location of reinforced orifices to be specified and approved by manufacturer.
 3. Inlet connection to metal duct via fabric draw band with anchor patches as supplied by manufacturer. Anchor patches to be secured to metal duct via. zip screw fastener – supplied by contractor.
 4. Inlet connection includes zipper for easy removal / maintenance.
 5. Lengths to include required intermediate zippers as specified by manufacturer.
 6. System to include Adjustable Flow Devices to balance turbulence, airflow and distribution as needed. Flow restriction device shall include ability to adjust the airflow resistance from 0.06 – 0.60 in w.g. static pressure.
 7. End cap includes zipper for easy maintenance.
 8. Each section of the textile shall include identification labels documenting order number, section diameter, section length, piece number, code certifications and other pertinent information.

- E. Design Parameters
 - 1. Textile air diffusers shall be designed from 0.25" water gage minimum to 3.1" maximum, with 0.5" as the standard.
 - 2. Textile air diffusers shall be limited to design temperatures between 0 degrees F and 180 degrees F (-17.8 degrees C and 82 degrees C).
 - 3. System overall design; diameter, length, airflow, operating static pressure and dispersion shall be designed or approved by the manufacturer.
 - 4. Do not use textile diffusers in concealed locations.
 - 5. Use textile air dispersion systems only for positive pressure air distribution components of the mechanical ventilation system.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.
- C. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.
- D. Install diffusers to ductwork with air tight connection.
- E. Provide balancing dampers on duct take-off to diffusers and grilles and registers, despite whether dampers are specified as part of diffuser, or grille and register assembly.
- F. Paint ductwork visible behind air outlets and inlets matte black, see Section 099123.

3.02 INSTALLATION OF TEXTILE AIR DISPERSION SYSTEM:

- A. Install chosen suspension system in accordance with the requirements of the manufacturer. Instructions for installation shall be provided by the manufacturer with product.
- B. CLEANING AND PROTECTION:
 - 1. Clean air handling unit and ductwork prior to the DuctSox system unit-by-unit as it is installed. Clean external surfaces of foreign substance which may cause corrosive deterioration of facing.
 - 2. Temporary Closure: At ends of ducts which are not connected to equipment or distribution devices at time of ductwork installation, cover with polyethylene film or other covering which will keep the system clean until installation is completed.
 - 3. If DuctSox systems become soiled during installation, they should be removed and cleaned following the manufacturers standard terms of laundry.

3.03 CLOSEOUT ACTIVITIES

- A. Demonstrate operational system to Owner's representative.
- B. Instruct Owner's representative to maintain system and use occupant controls or interfaces, as required.

3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Replace, repair, or touch-up damaged products before Substantial Completion.

END OF SECTION 233700

SECTION 237416
PACKAGED ROOFTOP AIR-CONDITIONING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02 RELATED REQUIREMENTS

- A. Section 230913 - Instrumentation and Control Devices for HVAC: Control components, time clocks.
- B. Section 230913 - Instrumentation and Control Devices for HVAC: Installation of thermostats and other control components.

1.03 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
- C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- D. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements for additional provisions.
 - 2. Extra Filters: One set for each unit.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from physical damage by storing off site until roof mounting curbs are in place and ready for immediate installation of units.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Provide a five year warranty to include coverage for refrigeration compressors.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Aaon: www.aaon.com.
- B. Carrier Corporation; _____: www.commercial.carrier.com/#sle.
- C. Daikin: www.daikinapplied.com
- D. Greenheck: www.greenheck.com
- E. Lennox: www.lennox.com

2.02 GENERAL

- A. Packaged rooftop unit shall include compressors, evaporator coils, filters, supply fans, dampers, reheat coil, gas heaters, exhaust fans, energy recovery wheels, and unit controls.
- B. Unit shall be factory assembled and tested including leak testing of the DX coils, and run testing of the completed unit. Run test report shall be supplied with the unit in the service compartment's literature pocket.
- C. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.

- D. Unit components shall be labeled, including electrical and controls components.
- E. Estimated sound power levels (dB) shall be shown on the unit ratings sheet.
- F. Installation, Operation, and Maintenance manual shall be supplied within the unit.
- G. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment's hinged access door.
- H. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's hinged access door.

2.03 CONSTRUCTION

- A. All cabinet walls, access doors, and roof shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.
- B. Unit insulation shall have a minimum thermal resistance R-value of 13. Foam insulation shall have a minimum density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D1929-11 for a minimum flash ignition temperature of 610°F.
- C. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break. Double wall construction with a thermal break prevents moisture accumulation on the insulation, provides a cleanable interior, reduces heat transfer through the panel, and prevents exterior condensation on the panel.
- D. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Cabinet leakage shall not exceed 1% of total airflow when tested at 3 times the minimum external static pressure provided in AHRI Standard 340/360. Panel deflection shall not exceed L/240 ratio at 125% of design static pressure, at a maximum 8 inches of positive or negative static pressure, to reduce air leakage. Deflection shall be measured at the midpoint of the panel height and width. Continuous sealing shall be included between panels and between access doors and openings to reduce air leakage. Piping and electrical conduit through cabinet panels shall include sealing to reduce air leakage.
- E. Roof of the air tunnel shall be sloped to provide complete drainage. Cabinet shall have rain break overhangs above access doors.
- F. Access to filters, dampers, cooling coils, reheat coil, heaters, energy recovery wheels, and electrical and controls components shall be through hinged access doors with quarter turn, zinc cast, lockable handles. Full length stainless steel piano hinges shall be included on the doors.
- G. Exterior paint finish shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.
- H. Units with cooling coils shall include double sloped 304 stainless steel drain pans.
- I. Unit shall be provided with base discharge and return air openings. All openings through the base pan of the unit shall have upturned flanges of at least 1/2 inch in height around the opening.
- J. Unit shall include lifting lugs on the top of the unit.
- K. Unit shall include factory installed, painted galvanized steel condenser coil guards on the face of the condenser coil.

2.04 ELECTRICAL

- A. Unit shall have a 5kAIC SCCR.
- B. Unit shall be provided with single point power connection with factory installed and factory wired, non-fused disconnect switch.
- C. Unit shall be provided with factory installed and factory wired 115V, 12 amp GFI outlet with disconnect switch in the unit control panel.

2.05 SUPPLY FANS

- A. Unit shall include direct drive, unhooded, backward curved, plenum supply fans.
- B. Blowers and motors shall be dynamically balance and mounted on rubber isolators.
- C. Variable frequency drives shall be factory mounted and wired in the cabinet.
- D. Fan motors shall be premium efficiency

2.06 EXHAUST FANS

- A. Exhaust fans shall be sized for 100% relief.
- B. Fans and motors shall be dynamically balanced.
- C. Unit shall include barometric relief dampers.
- D. Access to exhaust fans shall be through double wall, hinged access doors with quarter turn lockable handles.
- E. Variable frequency drives shall be factory mounted and wired in the cabinet.
- F. Fan motors shall be premium efficiency

2.07 REFRIGERATION SYSTEM

- A. Evaporator Coils
 - 1. Coils shall be designed for use with R-454B refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and galvanized steel end casings. Fin design shall be sine wave rippled.
 - 2. Coils shall be hydrogen or helium leak tested.
 - 3. Coils shall be furnished with factory installed expansion valves.
- B. Unit shall be factory charged with R-454B refrigerant.
- C. Unit shall include (2) two-stage scroll compressors capable of 5 stages of total cooling capacity
- D. Compressors shall be mounted in an isolated service compartment which can be accessed without affecting unit operation. Lockable hinged compressor access doors shall be fabricated of double wall, rigid polyurethane foam insulated panels to prevent the transmission of noise outside the cabinet.
- E. Each refrigeration circuit shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant safety controls, Schrader type service fittings on both the high pressure and low pressure sides, and factory installed liquid line filter driers.
- F. Condenser fans shall be high efficiency variable speed with factory installed head pressure control module. Condenser airflow shall continuously modulate based on head pressure and cooling operation shall be allowed down to 35°F.
- G. All refrigeration circuit(s) shall be provided with factory installed hot gas bypass to protect against evaporator frosting and to prevent excessive compressor cycling.
- H. Hot gas reheat - units RTU-1 and 2 only
 - 1. Units shall be provided with hot gas reheat coil, modulating valves, electronic controller, supply air temperature sensor and a control signal terminal which allow the unit to have a dehumidification mode of operation, which includes supply air temperature control to prevent supply air temperature swings and overcooling of the space.
- I. Condenser coils shall be designed for use with R-454B refrigerant. Coils shall be multi-pass and fabricated from aluminum microchannel tubes.

2.08 GAS HEATING

- A. Stainless steel heat exchanger furnace shall carry a 25 year non-prorated warranty, from the date of original equipment shipment from the factory.

- B. Gas furnace shall consist of stainless steel heat exchangers with multiple concavities, an induced draft blower and an electronic pressure switch to lockout the gas valve until the combustion chamber is purged and combustion airflow is established.
- C. Furnace shall include a gas ignition system consisting of an electronic igniter to a pilot system, which will be continuous when the heater is operating, but will shut off the pilot when heating is not required.
- D. Unit shall include a single gas connection and have gas supply piping entrances in the unit base for through-the-curb gas piping and in the outside cabinet wall for across the roof gas piping.
- E. 10:1 High Turndown Modulating Natural Gas Furnace shall be equipped with modulating gas valves, adjustable speed combustion blowers, stainless steel tubular heat exchangers, and electronic controller. Combustion blowers and gas valves shall be capable of modulation. Electronic controller includes a factory wired, field installed supply air temperature sensor. Sensor shall be field installed in the supply air ductwork. Supply air temperature setpoint shall be adjustable on the electronic controller within the controls compartment. Gas heater shall be capable of capacity turndown ratio as shown on the unit rating sheet. Heat trace shall be included on the condensate drain
- F. Filters
- G. Unit shall include 4 inch thick, pleated panel filters with an ASHRAEMERV rating of 13, upstream of the cooling coil. Unit shall also include 2 inch thick, pleated panel pre filters with an ASHRAE MERV rating of 8, upstream of the 4 inch standard filters.
- H. Outside Air/Economizer
- I. Unit shall include 0-100% economizer consisting of a motor operated outside air damper and return air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 20 cfm of leakage per sq ft. at 4 in. w.g. air pressure differential across the damper. Low leakage dampers shall be Class 2 AMCA certified, in accordance with AMCA Standard 511. Damper assembly shall be controlled by spring return actuator. Unit shall include outside air opening bird screen and outside air hood.
- J. Economizer shall be controlled based on comparative enthalpy between the outside air and the return air.
- K. Economizer shall be furnished with a California Energy Commission Certified Title 24 Fault Detection and Diagnostic package. Economizer assembly shall carry a 5 year parts warranty from the date of original equipment shipment from the factory.
- L. Economizer shall be furnished with return air CO2 override for demand-controlled ventilation.

2.09 ENERGY RECOVERY - UNITS RTU-1 AND 2 ONLY

- A. Unit shall contain a factory mounted and tested energy recovery wheel. The energy recovery wheel shall be mounted in a rigid frame containing the wheel drive motor, drive belt, wheel seals and bearings. Frame shall slide out for service and removal from the cabinet.
- B. The energy recovery component shall incorporate a rotary wheel in an insulated cassette frame complete with seals, drive motor and drive belt.
- C. The energy recovery cassette shall be an Underwriters Laboratories Recognized Component for electrical and fire safety. The wheel drive motor shall be an Underwriters Laboratory Recognized Component and shall be mounted in the cassette frame and supplied with a service connector or junction box. Thermal performance shall be certified by the manufacturer in accordance with ASHRAE Standard 84, Method of Testing Air-to-Air Heat Exchangers and AHRI Standard 1060, Rating Air-to-Air Energy Recovery Ventilation Equipment. Cassettes shall be listed in the AHRI Certified Products.

- D. Energy recovery wheel cassette shall carry a 5 year non-prorated warranty, from the date of original equipment shipment from the factory. The first 12 months from the date of equipment startup, or 18 months from the date of original equipment shipment from the factory, whichever is less, shall be covered under the standard AAON limited parts warranty. The remaining period of the warranty shall be covered by Airxchange. The 5 year warranty applies to all parts and components of the cassette, with the exception of the motor, which shall carry an 18 month warranty. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided the Airxchange written instructions for Installation, Operation, and Maintenance have been followed. Warranty excludes parts associated with routine maintenance, such as belts. Refer to the Airxchange Energy Recovery Cassette Limited Warranty Certificate.
- E. Unit shall include 2 inch thick, pleated panel outside air filters with an ASHRAE MERV rating of 8, upstream of the wheels.
- F. Unit shall include 1 inch thick aluminum mesh filters upstream of the outside air opening
- G. Hinged service access doors shall allow access to the wheel.
 - 1. Aluminum Energy Recovery Wheels
 - a. Unit shall contain a factory mounted and tested monolithic aluminum energy recovery wheel with an inverter duty motor and a durable segmented link drive belt composite. Wheel frame shall be constructed with prime G90 hot-dip galvanized steel tested for corrosion resistance of 400 hours of salt spray.
 - b. Aluminum Energy recovery wheel shall be covered under the standard AAON limited parts warranty; the first 12 months from the date of equipment startup, or 18 months from the date of original equipment shipment from the factory, whichever is less. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided the written instructions for installation, operation and maintenance have been followed. Warranty excludes parts associated with routine maintenance, such as belts.
 - 2. Total energy recovery wheels shall be made of corrugated aluminum with a 3A molecular sieve desiccant coating. Coated segments shall be cleanable with hot water or compressed air without degrading the latent recovery.

2.10 CONTROLS

- A. Factory Installed and Factory Provided Controller
- B. Unit controller shall be capable of controlling all features and options of the unit. Controller shall be factory installed in the unit controls compartment and factory tested. Controller shall be capable of stand alone operation with unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling available without dependence on a building management system.
- C. Controller shall have an onboard clock and calendar functions that allow for occupancy scheduling.
- D. Controller shall include non-volatile memory to retain all programmed values without the use of a battery, in the event of a power failure.
- E. Controller shall be capable of communicating and integrating with BACnet MSTP or IP network.
- F. Variable Air Volume Controller
 - 1. RTU-3
- G. Single Zone VAV Controller
 - 1. RTU-1
 - 2. RTU-2

2.11 ACCESSORIES

- A. Unit shall be provided with a safety shutdown terminal block for field installation of a smoke detector which shuts off the unit's control circuit.

2.12 CURBS

- A. Curbs shall be fully welded, insulated, with horizontal supply and return with duct connections as shown on drawings.
- B. Curbs shall be fully gasketed between the curb top and unit bottom with the curb providing full perimeter support, cross structure support and air seal for the unit. Curb gasket shall be furnished within the control compartment of the rooftop unit to be mounted on the curb immediately before mounting of the rooftop unit.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NFPA 90A.
- C. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level on grade.

3.02 SYSTEM STARTUP

- A. Installation, Operation, and Maintenance manual shall be supplied with the unit.
- B. Installing contractor shall install unit, including field installed components, in accordance with Installation, Operation, and Maintenance manual instructions.
- C. Start up and maintenance requirements shall be complied with to ensure safe and correct operation of the unit.
- D. Prepare and start equipment. Adjust for proper operation.

END OF SECTION 237416

SECTION 230923
DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temperature control System (TCS), utilizing direct digital controls.
 - 1. The Temperature Control Contractor shall be herein referred to the TCC.

1.02 REFERENCE STANDARDS

- A. IEEE 142 - IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems; 2007, with Errata (2014).
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- C. NEMA ICS 1 - Industrial Control and Systems General Requirements; 2022.
- D. UL 506 - Standard for Specialty Transformers; Current Edition, Including All Revisions.
- E. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.
- F. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.03 RELATED WORK

- A. Products Supplied but Not Installed Under This Section:
 - 1. Control Actuators.
 - 2. HVAC Equipment
- B. Products Installed but Not Supplied Under This Section:
 - 1. See System Description below.
 - 2. The existing front-end controllers, equipment controllers, their present state of programming, current API & SKDs status, graphics, etc., must be field verified.
- C. Products existing or new with the Work of This Section:
 - 1. NOTE: All new equipment as noted on plans must be fully integrated per this specification and Sequence of Operations.
 - 2. Roof top units.
 - 3. Variable air volume boxes.
 - 4. Mini-split cooling only units.
 - 5. Other HVAC systems as noted on plans.
- D. Work Required Under Other Divisions Related to This Section:
 - 1. Power wiring to line side of equipment.
 - 2. Provision and wiring devices relating to fire alarm system.

1.04 RELATED SECTIONS

- A. Section 23 00 00 – HVAC, 230553 Identification for HVAC Piping and Equipment.

1.05 SYSTEM DESCRIPTION

- A. Scope: Furnish all labor, materials and equipment necessary for a complete and operating Tridium 4 with HTML/5 Temperature Control System (TCS), utilizing Direct Digital Bacnet Protocol Controls as noted on the drawings and as described herein. Drawings are diagrammatic only. All controllers furnished in this section shall communicate on a peer-to-peer bus over an open protocol bus (Examples: BACnet, Modbus).
 - 1. The intent of this specification is to provide a fully, non-proprietary, TCS comprised of non-proprietary equipment controller and front-end controller.
 - 2. System architecture shall fully support a multi-vendor environment and be able to integrate third party systems via existing vendor protocols including, as a minimum, BACnet and MODBUS and LonTalk. All new controllers shall be Bacnet protocol.

3. System architecture shall provide secure Web access using any of the current versions of Microsoft Edge, Mozilla Firefox, or Google Chrome browsers from any computer on the owner's LAN.
 4. All control devices furnished with this Section shall be programmable directly from the Niagara 4 Workbench embedded toolset upon completion of this project. The use of configurable or programmable controllers that require additional software tools for post-installation maintenance shall not be acceptable.
 5. The TCS server shall host all graphic files for the control system. All graphics and navigation schemes for this project shall Niagara 4 Framework server.
 6. The TCC shall coordinate the installation of the new Tridium 4 software onto a virtual server provided by Owner.
 - a. The TCC shall provide written request through the Construction Manager all necessary server requests, server requirements, IP addresses, etc., as part of the approved shop drawing process.
 7. Owner shall receive all Administrator level login and passwords for engineering toolset at first training session. The Owner shall have full licensing and full access rights for all network management, operating system server, engineering and programming software required for the ongoing maintenance and operation of the TCS.
 8. All hardware licenses and certificates shall be stored on a local external hard drive employing encrypted "safe boot" technology. TCC shall provide external drive device.
- B. NiCS REQUIREMENTS: All Niagara software licenses for this project shall have a 100% open, Tridium Niagara Compatibility Statement (NICS).
1. Brand ID = Open
 2. Station Compatibility In = All "*"
 3. Tool Compatibility In = Open or Open "All"
 4. Tool Compatibility Out = "All"
 - a. All Passwords shall be given to the Owner and shall be verified by the Engineer. THE OWNER AND CONTRACTOR MUST CREATE PASSWORD TOGETHER. NO RESETTING OR MANUFACTURER RESETTING OF PASSWORD IS AVAILABLE.
 5. Note: It is the requirement of this specification that the Tridium hardware and software system installed by the Contractor shall be 100% accessible by any other Contractor the Owner wishes to employ for the lifespan of the Tridium system (no less than 20 years). The NICS shall be set-up so that there is no limitation to the access, copying, and modification of programming, sequencing, coding, graphics, passwords, etc.
- C. All products of the TCS shall be provided with the following agency approvals. Verification that the approvals exist for all submitted products shall be provided on request, with the submittal package. Systems or products not currently offering the following approvals are not acceptable.
1. Federal Communications Commission (FCC), Rules and Regulations, Volume II -July 1986 Part 15 Class A Radio Frequency Devices.
 2. FCC, Part 15, Subpart B, Class B
 3. FCC, Part 15, Subpart C
 4. FCC, Part 15, Subpart J, Class A Computing Devices.
 5. UL 504 - Industrial Control Equipment.
 6. UL 506 - Specialty Transformers.
 7. UL 910 - Test Method for Fire and Smoke Characteristics of Electrical and Optical-Fiber Cables Used in Air-Handling Spaces.
 8. UL 916 - Energy Management Systems All.
 9. UL 1449 - Transient Voltage Suppression.
 10. Standard Test for Flame Propagation Height of Electrical and Optical - Fiber Cables Installed Vertically in Shafts.
 11. EIA/ANSI 232-E - Interface Between Data Technical Equipment and Data Circuit Terminal Equipment Employing Serial Binary Data Interchange.

12. EIA 455 - Standard Test Procedures for Fiber Optic Fibers, Cables, Transducers, Connecting and Terminating Devices.
13. IEEE C62.41- Surge Voltages in Low-Voltage AC Power Circuits.
14. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
 - a. NEMA 250 - Enclosures for Electrical Equipment.
 - b. NEMA ICS 1 - Industrial Controls and Systems.
 - c. NEMA ST 1 - Specialty Transformers.
 - d. NCSBC Compliance, Energy: Performance of control system shall meet or surpass the requirements of ASHRAE/IESNA 90.1-1999.
 - e. CE 61326.
 - f. C-Tick.
 - g. cUL.

1.06 SPECIFICATION NOMENCLATURE

- A. The term Control Contractor, Temperature Control Contractor (TCC) shall all serve as Contractor in this specification and project.
- B. Acronyms used in this specification are as follows:
 1. Actuator: Control device that opens or closes valve or damper in response to control signal.
 2. AI: Analog Input.
 3. AO: Analog Output.
 4. Analog: Continuously variable state over stated range of values.
 5. TCS: Temperature control System.
 6. DDC: Direct Digital Control.
 7. Discrete: Binary or digital state.
 8. DI: Discrete Input.
 9. DO: Discrete Output.
 10. FC: Fail Closed position of control device or actuator. Device moves to closed position on loss of control signal or energy source.
 11. FO: Fail open (position of control device or actuator). Device moves to open position on loss of control signal or energy source.
 12. GUI: Graphical User Interface.
 13. HVAC: Heating, Ventilating and Air Conditioning.
 14. IDC: Interoperable Digital Controller.
 15. ILC: Interoperable Lon Controller.
 16. LAN: Local Area Network.
 17. Modulating: Movement of a control device through an entire range of values, proportional to an infinitely variable input value.
 18. Motorized: Control device with actuator.
 19. NAC: Network Area Controller.
 20. NC: Normally closed position of switch after control signal is removed or normally closed position of manually operated valves or dampers.
 21. NO: Normally open position of switch after control signal is removed; or the open position of a controlled valve or damper after the control signal is removed; or the usual position of a manually operated valve.
 22. OSS: Operating System Server, host for system graphics, alarms, trends, etc.
 23. Operator: Same as actuator.
 24. PC: Personal Computer.
 25. Peer-to-Peer: Mode of communication between controllers in which each device connected to network has equal status and each shares its dataTCS values with all other devices connected to network.

26. P: Proportional control; control mode with continuous linear relationship between observed input signal and final controlled output element.
27. PI: Proportional-Integral control, control mode with continuous proportional output plus additional change in output TCSed on both amount and duration of change in controller variable (reset control).
28. PICS: BACnet Product Interoperability Compliance Statement.
29. PID: Proportional-Integral-Derivative control, control mode with continuous correction of final controller output element versus input signal TCSed on proportional error, its time history (reset) and rate at which it's changing (derivative).
30. Point: Analog or discrete instrument with addressable dataTCS value.
31. WAN: Wide Area Network.

1.07 SUBMITTALS

1. Shop Drawings:
 - a. See General Requirements and HVAC General Requirements.
 - b. Submit electronic, Portable Document Format (PDF), submittals to Construction Manager and Engineer for review.
 - c. Submit complete manufacturers shop drawings of all equipment, accessories and controls, including capacities, weights, dimensions, construction details, installation, controls, wiring diagrams, and motor data.
 - d. Approval of shop drawings is for general application only and is a service only and not considered as a guarantee of total compliance with or as relieving Contractor of basic responsibilities under all Contract Documents, and does not approve changes in time or cost.
 - e. After approval, each Contractor and Subcontractor is responsible to provide information to all other trades involved in or affected by installation of his equipment.
2. Operating and Maintenance Instruction and Manuals:
 - a. Each Contractor shall provide for all equipment (3) bound and indexed sets of operating and maintenance instructions to Engineer for approval. Manual shall include a complete set of shop drawings.
 - b. Submit manuals prior to Substantial Completion. Final payment and release of Retainage shall follow submission of manuals.

1.08 QUALITY ASSURANCE

- A. The Contractor shall have a full service DDC office within 100 miles (____) of the job site. This office shall be staffed with applications engineers, software engineers and field technicians. This office shall maintain parts inventory and shall have all testing and diagnostic equipment necessary to support this work, as well as staff trained in the use of this equipment.
- B. The project manager or lead installer and programmer of the project employed by the Contractor shall be available on-site, the same day within 4 hours of a requested service call.
- C. Single Source Responsibility of Supplier: The Control System Contractor shall be responsible for the complete installation and proper operation of the control system. The Control System Contractor shall exclusively be in the regular and customary business of design, installation and service of computerized temperature control systems similar in size and complexity to the system specified. The Control System Contractor shall be the manufacturer of the primary DDC system components or shall have been the authorized representative for the primary DDC components manufacturer for at least 5 years. All control panels shall be assembled by the Control System Contractor in a UL-Certified 508A panel shop.
- D. Equipment and Materials: Equipment and materials shall be cataloged products of manufacturers regularly engaged in the production and installation of HVAC control systems. Products shall be manufacturer's latest standard design and have been tested and proven in actual use.

1.09 PRE-INSTALLATION MEETINGS

- A. Coordinate with Construction Manager and/or Engineer.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Maintain integrity of shipping cartons for each piece of equipment and control device through shipping, storage and handling as required to prevent equipment damage. Store equipment and materials inside and protected from weather.

1.11 JOB CONDITIONS

- A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to insure that the Work will be carried out in an orderly fashion. It shall be this Contractor's responsibility to check the Contract Documents for possible conflicts between his Work and that of other crafts in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, air diffusers and structural and architectural features.

1.12 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Approved equipment controller manufacturers and front-end controller with supervisor:
 - 1. Distech Controls with Niagara 4 Installed by Control Solutions Inc. Alpena Mi 989-379-2404
- B. All approved TCS equipment shall be purchased direct from manufacturer and not through distribution.
- C. Substitutions: Not permitted.
- D. Temperature control system manufacturers must provide a single price to the Mechanical Contractor for temperature control system equipment complete for installation, that shall not include packaging of other HVAC equipment (air handlers, roof top units, boilers, pumps, etc.).
- E. Requests for substitutions must receive written pre-approved during the bidding period by the Engineer. The equipment supplier

2.02 GENERAL

- A. The Temperature Control System (TCS) shall be comprised of a network of interoperable, stand-alone digital controllers, a network area controller, graphics and programming and other control devices for a complete system as specified herein.
- B. The installed system shall provide secure password access to all features, functions and data contained in the overall TCS.
- C. Temperature Control System Project Summary:
 - 1. A new stand-alone server (or virtual server if provided by Owner) shall be provided and configured by the Temperature Control Contractor must install a new Tridium Niagara 4 platform. All new equipment, integration, and programming required for a fully operational platform must be provided by the Temperature Control Contractor.

2.03 OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURE

- A. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system utilizing Open protocols in one open, interoperable system.
- B. The supplied computer software shall employ object-oriented technology (OOT) for representation of all data and control devices within the system. Physical connection of any BACnet control equipment, such as rooftop units or boilers, shall be via Ethernet or IP.
- C. All components and controllers supplied under this contract shall be true "peer-to-peer" communicating devices. Components or controllers requiring "polling" by a host to pass data shall not be acceptable.

- D. The supplied system shall incorporate the ability to access all data using HTML5 enabled browsers without requiring proprietary operator interface and configuration programs or browser plug-ins. An Open DataTCSe Connectivity (ODBC) or Structured Query Language (SQL) compliant server dataTCSe is required for all system dataTCSe parameter storage. This data shall reside on the Operating System Server located in the Facilities Office on the LAN. Systems requiring proprietary dataTCSe and user interface programs shall not be acceptable.
- E. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network. Systems employing a "flat" single tiered architecture shall not be acceptable.
 - 1. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 5 seconds for network connected user interfaces.
 - 2. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 60 seconds for remote or dial-up connected user interfaces.

2.04 TCS SERVER HARDWARE

- A. The Temperature Control Contractor shall include all necessary memory, hard drive, display and network cards, as requested by Owner based on the following:
 - 1. Refer to Tridium Niagara 4 (latest version) Minimum Requirements.
 - 2. Memory: 16 GB or more recommended for the Windows 64-bit version.
 - 3. Hard Drive: 256 GB minimum, more recommended depending on archiving requirements.
 - 4. Display: Video card and monitor capable of displaying 1024 x 768 pixel resolution or greater.
 - 5. Network Support: Ethernet adapter (10/100 Mb with RJ-45 connector).
 - 6. The TCC shall verify the hardware requirements and ensure enhanced TCS hardware performance capabilities are included for robust operation.
- B. The Temperature Control Contractor must include all necessary materials and labor to provide a complete installation of the TCS software onto the Owner Virtual Server.

2.05 SYSTEM NETWORK CONTROLLER (SNC)

- A. These controllers are designed to manage communications between the programmable equipment controllers (PEC), application specific controllers (ASC) and advanced unitary controllers (AUC) which are connected to its communications trunks, manage communications between itself and other system network controllers (SNC) and with any operator workstations (OWS) that are part of the TCS, and perform control and operating strategies for the system TCSed on information from any controller connected to the TCS.
- B. The controllers shall be fully programmable to meet the unique requirements of the facility it shall control.
- C. The controllers shall be capable of peer-to-peer communications with other SNC's and with any OWS connected to the TCS, whether the OWS is directly connected, connected via cellular modem or connected via the Internet.
- D. The communication protocols utilized for peer-to-peer communications between SNC's will be Niagara 4 BACnet TCP/IP and SNMP. Use of a proprietary communication protocol for peer-to-peer communications between SNC's is not allowed.
- E. The SNC shall employ a device count capacity license model that supports expansion capabilities.
- F. The SNC shall be enabled to support and shall be licensed with the following Open protocol drivers (client and server) by default:
 - 1. BACnet
 - 2. Lon
 - 3. MODBUS

4. SNMP
 5. KNX
- G. The SNC shall be capable of executing application control programs to provide:
1. Calendar functions.
 2. Scheduling.
 3. Trending.
 4. Alarm monitoring and routing.
 5. Time synchronization.
 6. Integration of LonWorks, BACnet, and MODBUS controller data.
 7. Network management functions for all SNC, PEC and ASC TCSed devices.
- H. The SNC shall provide the following hardware features as a minimum:
1. Two 10/100 Mbps Ethernet ports.
 2. Two Isolated RS-485 ports with biasing switches.
 3. 1 GB RAM
 4. 4 GB Flash Total Storage / 2 GB User Storage
 5. Wi-Fi (Client or WAP)
 6. USB Flash Drive
 7. High Speed Field Bus Expansion
 8. -20-60°C Ambient Operating Temperature
 9. Integrated 24 VAC/DC Global Power Supply
 10. MicroSD Memory Card Employing Encrypted Safe Boot Technology
- I. The SNC shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 16 simultaneous users.
- J. The SNC shall provide alarm recognition, storage, routing, management and analysis to supplement distributed capabilities of equipment or application specific controllers.
- K. The SNC shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via cellular modem, or wide-area network.
1. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including but not limited to:
 - a. Alarm.
 - b. Return to normal.
 - c. To default.
 - 1) Alarms shall be annunciated in any of the following manners as defined by the user:
 - d. Screen message text.
 - e. Email of complete alarm message to multiple recipients.
 - f. Graphics with flashing alarm object(s).
 - 1) The following shall be recorded by the SNC for each alarm (at a minimum):
 - g. Time and date.
 - h. Equipment (air handler #, access way, etc.).
 - i. Acknowledge time, date, and user who issued acknowledgement.
- L. Programming software and all controller "Setup Wizards" shall be embedded into the SNC.
- M. The SNC shall support the following security functions.
1. Module code signing to verify the author of programming tool and confirm that the code has not been altered or corrupted.
 2. Role-TCSed Access Control (RBAC) for managing user roles and permissions.
 3. Require users to use strong credentials.
 4. Data in Motion and Sensitive Data at Rest be encrypted.
 5. LDAP and Kerberos integration of access management.

- N. The SNC shall support the following data modeling structures to utilize Search; Hierarchy; Template; and Permission functionality:
 - 1. Metadata: Descriptive tags to define the structure of properties.
 - 2. Tagging: Process to apply metadata to components
 - 3. Tag Dictionary
- O. The SNC shall employ template functionality. Templates are a containerized set of configured data tags, graphics, histories, alarms... that are set to be deployed as a unit TCSed upon manufacturer's controller and relationships. All lower level communicating controllers (PEC, AUC, AVAV, VFD...) shall have an associated template file for reuse on future project additions.
- P. The SNC shall be provided with a 5 Year Software Maintenance license. Labor to implement not included.

2.06 PROGRAMMABLE EQUIPMENT CONTROLLER (PEC)

- A. All new HVAC control equipment controllers shall be accomplished using Native BACnet TCSed devices. Where the existing application has a LonMark profile or BTL Listed PICS defined, LonMark may be used. Where LonMark devices are not available for a particular application, devices TCSed on LonWorks shall be acceptable. For each LonWorks device that does not have LonMark certification, the device supplier shall provide an XIF file for the device. The controller platform shall provide options and advanced system functions, programmable and configurable using Niagara 4 Framework, that allow standard and customizable control solutions required in executing the "Sequence of Operation".
- B. All PECs shall be application programmable and shall at all times maintain their certification. All control sequences within or programmed into the PEC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery to be retained.
- C. The PEC shall provide LED indication of communication and controller performance to the technician, without cover removal.
- D. The PEC shall not require any external configuration tool or programming tool. All configuration and programming tasks shall be accomplished and accessible from within the Niagara 4 environment.
- E. The following integral and remote Inputs/Outputs shall be supported per each PEC:
 - 1. Eight integral dry contact digital inputs.
 - 2. Any two digital inputs may be configured as pulse counters with a maximum pulse read rate of 15 Hz.
 - 3. Eight integral analog inputs (configurable as 0-10V, 0-10,000 ohm or, 20K NTC).
 - 4. Six integral 4-20 ma analog outputs.
 - 5. Eight integral 24 Vac Triac digital outputs, configurable as maintained or floating motor control outputs.
 - 6. One integral 20 Vdc, 65-mA power supply for auxiliary devices.
 - 7. If a 20 Vdc 65-mA power supply terminal is not integral to the PEC, provide at each PEC a separate, fully isolated, enclosed, current limited and regulated UL listed auxiliary power supply for power to auxiliary devices.
- F. Each PEC shall have expansion ability to support additional I/O requirements through the use of remote input/output modules.
- G. PEC Controllers shall support at minimum the following control techniques:
 - 1. General-purpose control loops that can incorporate Demand Limit Control strategies, Set point reset, adaptive intelligent recovery, and time of day bypass.
 - a. General-purpose, non-linear control loops.
 - b. Start/stop Loops.
 - c. If/Then/Else logic loops.
 - d. Math Function loops (MIN, MAX, AVG, SUM, SUB, SQRT, MUL, DIV, ENTHALPY).

2.07 ADVANCED UNITARY CONTROLLER (AUC)

- A. The advanced unitary controller (AUC) platform shall be designed specifically to control HVAC - ventilation, filtration, heating, cooling, humidification, and distribution. Equipment includes: constant volume air handlers, VAV air handlers, packaged RTU, boilers, PTACs, pumps, fin-tube radiation. The control shall use LonMark or BACnet TCSed devices where the application has a LonMark profile or BTL Listed PICS defined. Where LonMark devices are not available for a particular application, devices TCSed on LonWorks shall be acceptable. For each LonWorks device that does not have LonMark certification, the device supplier shall provide an XIF file for the device. The controller platform shall provide options and advanced system functions, programmable and configurable using Niagara 4 Framework, that allow standard and customizable control solutions required in executing the "Sequence of Operation".
- B. Minimum Requirements:
1. The controller shall be fully programmable with full functionality on any Niagara 4 brand platform.
 - a. Support downloads to the controller from any brand of Niagara 4 platform.
 - b. Support uploads from the controller to any brand of Niagara 4 platform.
 - c. Support simulation/debug mode of the controller.
 - d. Maintain native GUI.
 - e. Native function-block programming software and all controller "Setup Wizards" shall be embedded within the Niagara 4 environment.
 2. The controller shall be capable of either integrating with other devices or stand-alone operation.
 3. The controller shall have two microprocessors. The Host processor contains on-chip FLASH program memory, FLASH information memory, and RAM to run the main HVAC application. The second processor for network communications. Controller memory minimum requirements include:
 - a. FLASH Memory Capacity: 60 Kilobytes with 8 Kilobytes for application program.
 - b. FLASH Memory settings retained for ten years.
 - c. RAM: 2 Kilobytes.
 4. The controller shall have an internal time clock with the ability to automatically revert from a master time clock on failure.
 - a. Operating Range: 24 hour, 365 day, multi-year calendar including day of week and configuration for automatic day-light savings time adjustment to occur on configured start and stop dates.
 - b. Accuracy: ± 1 minute per month at 77 degrees Fahrenheit (25 degrees Celsius).
 - c. Power Failure Backup: 24 hours at 32 degrees to 122 degrees Fahrenheit (0 degrees Celsius).
 5. The controller shall have Significant Event Notification, Periodic Update capability, and Failure Detect when network inputs fail to be detected within their configurable time frame.
 6. The controller shall have an internal DC power supply to power external sensors.
 - a. Power Output: 20 VDC $\pm 10\%$ at 75 mA.
 7. The controller shall have a visual indication (LED) of the status of the device:
 - a. Controller operating normally.
 - b. Controller in process of download.
 - c. Controller in manual mode under control of software tool.
 - d. Controller lost its configuration.
 - e. No power to controller, low voltage, or controller damage.
 - f. Processor and/or controller are not operating.
 8. The minimum controller Environmental ratings.
 - a. Operating Temperature Ambient Rating: -40 degrees to 150 degrees Fahrenheit (40 degrees Celsius).
 - b. Storage Temperature Ambient Rating: -40 degrees to 150 degrees Fahrenheit (40 degrees Celsius).

- c. Relative Humidity: 5% to 95% non-condensing.
 - 1) The controller shall have the additional approval requirements, listings, and approvals:
 - d. UL/cUL (E87741) listed under UL916 (Standard for Open Energy Management Equipment) with plenum rating.
 - e. CSA (LR95329-3) Listed.
 - f. Meets FCC Part 15, Subpart B, Class B (radiated emissions) requirements.
 - g. Meets Canadian standard C108.8 (radiated emissions).
 - h. Conforms requirements European Consortium standard EN 61000-6-1; 2001 (EU Immunity).
 - i. Conforms requirements European Consortium standard EN 61000-6-3; 2001 (EU Emission).
9. The controller housing shall be UL plenum rated mounting to either a panel or DIN rail (standard EN50022; 7.5mm x 35mm).
10. The controller shall have a mix of digital inputs (DI), digital Triac outputs (DO), analog outputs (AO), and universal inputs (UI).
- a. Analog outputs (AO) shall be capable of being configured as digital outputs (DO).
 - b. Input and Output wiring terminal strips shall be removable from the controller without disconnecting wiring.
 - c. Input and Output wiring terminals shall be designated with color coded labels.
 - d. Universal inputs shall be capable of being configured as binary inputs, resistive inputs, voltage inputs (0-10 VDC), or current inputs (4-20 mA).
 - e. The controller shall provide "continuous" automated loop tuning with an Adaptive Integral Algorithm Control Loop.
 - f. The controller platform shall have standard HVAC application programs that are modifiable to support both the traditional and specialized "sequence of operations" as outlined in Section 4.
 - g. Discharge air control and low limit.
 - h. Pressure-dependent dual duct without flow mixing.
 - i. Variable air volume with return flow tracking.
 - j. Economizer with differential enthalpy.
 - k. Minimum airflow coordinated with CO₂.
 - l. Unit ventilator cycle (1, 2, 3) 2-pipe.
 - m. Unit ventilator cycle (1, 2, 3) 2-pipe with face/bypass.
 - n. Unit ventilator cycle (1, 2, 3) 4-pipe.
 - o. Unit ventilator cycle (1, 2, 3) 4-pipe with EOC valve.

2.08 OTHER CONTROL SYSTEM HARDWARE

- A. Motorized control dampers that will not be integral to the equipment shall be furnished by the Control System Contractor. Control damper frames shall be constructed of galvanized steel, formed into changes and welded or riveted. Dampers shall be galvanized, with nylon bearings. Blade edge seals shall be vinyl or neoprene. Blade edge and tip seals shall be included for all dampers. Blades shall be 16-gauge minimum and 6 inches (152.4 mm) wide maximum and frame shall be of welded channel iron. Damper leakage shall not exceed 10 CFM per square foot, at 1.5 inches (38.1 mm) water gauge static pressure.
- B. Control damper actuators shall be furnished by the Control System Contractor. Two-position or proportional electric actuators shall be direct-mount type sized to provide a minimum of 5 inch (127 mm)-lb torque per square foot of damper area. Damper actuators shall be spring return type. Operators shall be heavy-duty electronic type for positioning automatic dampers in response to a control signal. Motor shall be of sufficient size to operate damper positively and smoothly to obtain correct sequence as indicated. All applications requiring proportional operation shall utilize truly proportional electric actuators. Honeywell is TCSis of design.

- C. Wall Mount Room Temperature sensors: Each room temperature sensor shall provide temperature indication to the digital controller, provide the capability for a software-limited occupant set point adjustment (warmer-cooler slider bar or switch) and limited operation override capability. Room Temperature Sensors shall be 20,000-ohm thermistor type with a temperature range of -40 to 140 degrees Fahrenheit (38 degrees Celsius). The sensor shall be complete with a decorative cover and suitable for mounting over a standard electrical utility box. These devices shall have an accuracy of 0.5 degrees Fahrenheit (0.24 degrees Celsius) over the entire range. Honeywell is TCSis of design.
- D. Duct-mounted and Outside Air Temperature Sensors: 20,000-ohm thermistor temperature sensors with an accuracy of ± 0.2 degrees Celsius. Outside air sensors shall include an integral sun shield. Duct-mounted sensors shall have an insertion measuring probe of a length appropriate for the duct size, with a temperature range of -40 to 160 degrees F (-38 to 71 degrees C). The sensor shall include a utility box and a gasket to prevent air leakage and vibration noise. For all mixed air and preheat air applications, install bendable averaging duct sensors with a minimum 8 feet (2438 mm) long sensor element. These devices shall have accuracy of 0.5 degrees Fahrenheit (0.24 degrees Celsius) over the entire range. Honeywell is TCSis of design.
- E. Humidity sensors shall be thin-film capacitive type sensor with on-board nonvolatile memory, accuracy to plus or minus two percent (2%) at 0 to 90% RH, 12 - 30 VDC input voltage, analog output (0 - 10 VDC or 4 - 20mA output). Operating range shall be 0 to 100% RH and 32 to 140 degrees Fahrenheit (____). Sensors shall be selected for wall, duct or outdoor type installation as appropriate. Honeywell is TCSis of design.
- F. Carbon Dioxide Sensors (CO₂): Sensors shall utilize Non-dispersive infrared technology (N.D.I.R.), repeatable to plus or minus 20 PPM. Sensor range shall be 0 - 2000 PPM. Accuracy shall be plus or minus five percent (5%) or 75 PPM, whichever is greater. Response shall be less than one minute. Input voltage shall be 20 to 30 VAC or DC. Output shall be 0 - 10 VDC. Sensor shall be wall or duct mounted type, as appropriate for the application, housed in a high impact plastic enclosure. Honeywell is TCSis of design.
- G. Current Sensitive Switches: Solid state, split core current switch that operates when the current level (sensed by the internal current transformer) exceeds the adjustable trip point. Current switch to include an integral LED for indication of trip condition and a current level below trip set point. Honeywell is TCSis of design.
- H. Differential Analog (duct) Static Pressure Transmitters Provide a pressure transmitter with integral capacitance type sensing and solid-state circuitry. Accuracy shall be plus or minus 1% of full range; range shall be selected for the specific application. Provide zero and span adjustment capability. Device shall have integral static pickup tube. Honeywell is TCSis of design.
- I. Differential Air Pressure Switches: Provide SPDT type, UL-approved, and selected for the appropriate operating range where applied. Switches shall have adjustable set points and barbed pressure tips. Honeywell is TCSis of design.
- J. Temperature Control Panels: Furnish temperature control panels of code gauge steel with locking doors for mounting all devices as shown. All electrical devices within a control panel shall be factory wired. Control panel shall be assembled by the TCS in a UL-Certified 508A panel shop. A complete set of 'as-built' control drawings (relating to the controls within that panel) shall be furnished within each control panel.
- K. Pipe and Duct Temperature sensing elements: 20,000-ohm thermistor temperature sensors with and accuracy of $\pm 1\%$ accuracy. Their range shall be -5 to 250 degrees Fahrenheit (____). Limited range sensors shall be acceptable provided they are capable of sensing the range expected for the point at the specified accuracy. Thermal wells with heat conductive gel shall be included. Honeywell is TCSis of design.

- L. Low Air Temperature Sensors: Provide SPST type switch, with 15 to 55 degrees Fahrenheit (____), range, vapor-charged temperature sensor. Honeywell model L482A, or approved equivalent.
- M. Variable Frequency Drives: The variable frequency drive (VFD) shall be designed specifically for use in Heating, Ventilation, and Air Conditioning (HVAC) applications in which speed control of the motor can be applied. The VFD, including all factory installed options, shall have UL & CSA approval. VFD's shall include communications capability with DDC TCS via built-in interface card (MODBUS or BACnet). Honeywell SmartVFD is TCSis of design.
- N. Relays: Start/stop relay model shall provide either momentary or maintained switching action as appropriate for the motor being started. All relays shall be plugged in, interchangeable, mounted on a sub TCSe and wired to numbered terminals strips. Relays installed in panels shall all be DPDT with indicating lamp. Relays installed outside of controlled devices shall be enclosed in a NEMA enclosure suitable for the location. Relays shall be labeled with UR symbol. RIB-style relays are acceptable for remote enable/disable.
- O. Transducers: Differential pressure transducers shall be electronic with a 4-20 mA output signal compatible to the Direct Digital Controller. Wetted parts shall be stainless steel. Unit shall be designed to operate in the pressure ranges involved.
- P. Control Power Transformers: Provide step-down transformers for all DDC controllers and devices as required. Transformers shall be sized for the load, but shall be sized for 50 watts, minimum. Transformers shall be UL listed Class 2 type, for 120 VAC/24 VAC operation. Honeywell is TCSis of design.
- Q. Line voltage protection: All DDC system control panels that are powered by 120 VAC circuits shall be provided with surge protection. This protection is in addition to any internal protection provided by the manufacturer. The protection shall meet UL, ULC 1449, IEEE C62.41B. A grounding conductor, (minimum 12 AWG), shall be brought to each control panel.

2.09 TCS SERVER & WEB BROWSER GUI - SYSTEM OVERVIEW

- A. The TCC Contractor shall provide system software TCS based on server/thin-client architecture, designed around the open standards of web technology. The TCS server shall communicate using Ethernet and TCP. Server shall be accessed using a web browser over Owner intranet and remotely over the Internet.
- B. The intent of the thin-client architecture is to provide the operator(s) complete access to the TCS system via a web browser. The thin-client web browser Graphical User Interface (GUI) shall be browser and operating system agnostic, meaning it will support HTML5 enabled browsers without requiring proprietary operator interface and configuration programs or browser plug-ins. Microsoft, Firefox, and Chrome browsers (current released versions), and Windows as well as non-Window operating systems.
- C. The TCS server software shall support at least the following server platforms (Windows 7, Windows 10). The TCS server software shall be developed and tested by the manufacturer of the system stand-alone controllers and network controllers/routers.
- D. The web browser GUI shall provide a completely interactive user interface and shall provide a HTML5 experience that supports the following features as a minimum:
 - 1. Trending.
 - 2. Scheduling.
 - 3. Electrical demand limiting.
 - 4. Duty Cycling.
 - 5. Downloading Memory to field devices.
 - 6. Real time 'live' Graphic Programs.
 - 7. Tree Navigation.
 - 8. Parameter change of properties.
 - 9. Set point adjustments.
 - 10. Alarm / event information.

11. Configuration of operators.
 12. Execution of global commands.
 13. Add, delete, and modify graphics and displayed data.
- E. Software Components: All software shall be the most current version. All software components of the TCS system software shall be provided and installed as part of this project. TCS software components shall include:
1. Server Software, DataTCSe and Web Browser Graphical User Interface.
 2. 5 Year Software Maintenance license. Labor to implement not included.
 3. Embedded System Configuration Utilities for future modifications to the system and controllers.
 4. Embedded Graphical Programming Tools.
 5. Embedded Direct Digital Control software.
 6. Embedded Application Software.
- F. TCS Server DataTCSe: The TCS server software shall utilize a Java DataTCSe Connectivity (JDBC) compatible dataTCSe such as: MS SQL 8.0, Oracle 8i or IBM DB2. TCS systems written to Non -Standard and/or Proprietary dataTCSeS are NOT acceptable.
- G. Thin Client - Web Browser TCSeD: The GUI shall be thin client or browser TCSeD and shall meet the following criteria:
1. Web Browser's for PC's: Only the current released browser (Edge/Firefox/Chrome) will be required as the GUI and a valid connection to the server network. No installation of any custom software shall be required on the operator's GUI workstation/client. Connection shall be over an intranet or the Internet.
 2. Secure Socket Layers: Communication between the Web Browser GUI and TCS server shall offer encryption using 128-bit encryption technology within Secure Socket Layers (SSL). Communication protocol shall be Hyper-Text Transfer Protocol (HTTP).

2.10 WEB BROWSER GRAPHICAL USER INTERFACE

- A. Web Browser Navigation: The Thin Client web browser GUI shall provide a comprehensive user interface. Using a collection of web pages, it shall be constructed to "feel" like a single application, and provide a complete and intuitive mouse/menu driven operator interface. It shall be possible to navigate through the system using a web browser to accomplish requirements of this specification. The Web Browser GUI shall (as a minimum) provide for navigation, and for display of animated graphics, schedules, alarms/events, live graphic programs, active graphic set point controls, configuration menus for operator access, reports and reporting actions for events.
- B. Login: On launching the web browser and selecting the appropriate domain name or IP address, the operator shall be presented with a login page that will require a login name and strong password. Navigation in the system shall be dependent on the operator's role-TCSeD application control privileges.
- C. Navigation: Navigation through the GUI shall be accomplished by clicking on the appropriate level of a navigation tree (consisting of an expandable and collapsible tree control like Microsoft's Explorer program) and/or by selecting dynamic links to other system graphics. Both the navigation tree and action pane shall be displayed simultaneously, enabling the operator to select a specific system or equipment and view the corresponding graphic. The navigation tree shall as a minimum provide the following views: Geographic, Network, Groups and Configuration.
1. Geographic View shall display a logical geographic hierarchy of the system including: cities, sites, buildings, building systems, floors, equipment and objects.
 2. Groups View shall display Scheduled Groups and custom reports.
 3. Configuration View shall display all the configuration categories (Operators, Schedule, Event, Reporting and Roles).
- D. Action Pane: The Action Pane shall provide several functional views for each subsystem specified. A functional view shall be accessed by clicking on the corresponding button:

1. Graphics: Using graphical format suitable for display in a web browser, graphics shall include aerial building/campus views, color building floor-plans, equipment drawings, active graphic set point controls, web content and other valid HTML elements. The data on each graphic page shall automatically refresh.
2. Dashboards: User customizable data using drag and drop HTML5 elements. Shall include Web Charts, Gauges, and other custom developed widgets for web browser. User shall have ability to save custom dashboards.
3. Search: User shall have multiple options for searching data TCSed upon Tags. Associated equipment, real time data, Properties, and Trends shall be available in result.
4. Properties: Shall include graphic controls and text for the following: Locking or overriding objects, demand strategies, and any other valid data required for setup. Changes made to the properties pages shall require the operator to depress an 'accept/cancel' button.
5. Schedules: Shall be used to create, modify/edit and view schedules TCSed on the systems hierarchy (using the navigation tree).
6. Alarms: Shall be used to view alarm information geographically (using the navigation tree), acknowledge alarms, sort alarms by category, actions and verify reporting actions.
7. Charting: Shall be used to display associated trend and historical data, modify colors, date range, axis and scaling. User shall have ability to create HTML charts through web browser without utilizing chart builder. User shall be able to drag and drop single or multiple data points, including schedules, and apply status colors for analysis.
8. Logic - Live Graphic Programs: Shall be used to display 'live' graphic programs of the control algorithm, (micro block programming) for the mechanical/electrical system selected in the navigation tree.
9. Other actions such as Print, Help, Command, and Logout shall be available via a drop-down window.
10. Color Graphics: The Web Browser GUI shall make extensive use of color in the graphic pane to communicate information related to set points and comfort. Animated .gifs or .jpg, vector scalable, active set point graphic controls shall be used to enhance usability. Graphics tools used to create Web Browser graphics shall be non-proprietary and conform to the following TCSic criteria:
11. Display Size: The GUI workstation software shall graphically display in a minimum of 1024 by 768 pixels 24 bit True Color.
12. General Graphic: General area maps shall show locations of controlled buildings in relation to local landmarks.
13. Color Floor Plans: Floor plan graphics shall show heating and cooling zones throughout the buildings in a range of colors, as selected by Owner. Provide a visual display of temperature relative to their respective set points. The colors shall be updated dynamically as a zone's actual comfort condition changes.
14. Mechanical Components: Mechanical system graphics shall show the type of mechanical system components serving any zone through the use of a pictorial representation of components. Selected I/O points being controlled or monitored for each piece of equipment shall be displayed with the appropriate engineering units. Animation shall be used for rotation or moving mechanical components to enhance usability. .
15. Minimum System Color Graphics: Color graphics shall be selected and displayed via a web browser for the following:
 16. Each piece of equipment monitored or controlled including each terminal unit.
 17. Each building.
 18. Each floor and zone controlled.

- E. Hierarchical Schedules: Utilizing the Navigation Tree displayed in the web browser GUI, an operator (with proper access credentials) shall be able to define a Normal, Holiday or Override schedule for an individual piece of equipment or room, or choose to apply a hierarchical schedule to the entire system, site or floor area. For example, Independence Day ' Holiday' for every level in the system would be created by clicking at the top of the geographic hierarchy defined in the Navigation Tree. No further operator intervention would be required and every control module in the system with would be automatically downloaded with the ' Independence Day' Holiday. All schedules that affect the system/area/equipment highlighted in the Navigation Tree shall be shown in a summary schedule table and graph.
1. Schedules: Schedules shall comply with the LonWorks and BACnet standards, (Schedule Object, Calendar Object, Weekly Schedule property and Exception Schedule property) and shall allow events to be scheduled TCSed on:
 - a. Types of schedule shall be Normal, Holiday or Override.
 - b. A specific date.
 - c. A range of dates.
 - d. Any combination of Month of Year (1-12, any), Week of Month (1-5, last, any), Day of Week (M-Sun, Any).
 - e. Wildcard (example, allow combinations like second Tuesday of every month).
 2. Schedule Categories: The system shall allow operators to define and edit scheduling categories (different types of "things" to be scheduled; for example, lighting, HVAC occupancy, etc.). The categories shall include: name, description, icon (to display in the hierarchy tree when icon option is selected) and type of value to be scheduled.
 3. Schedule Groups: In addition to hierarchical scheduling, operators shall be able to define functional Schedule Groups, comprised of an arbitrary group of areas/rooms/equipment scattered throughout the facility and site. For example, the operator shall be able to define an ' individual tenant' group - who may occupy different areas within a building or buildings. Schedules applied to the ' tenant group' shall automatically be downloaded to control modules affecting spaces occupied by the ' tenant group'.
 4. Intelligent Scheduling: The control system shall be intelligent enough to automatically turn on any supporting equipment needed to control the environment in an occupied space. If the operator schedules an individual room in a VAV system for occupancy, for example, the control logic shall automatically turn on the VAV air handling unit, chiller, boiler and/or any other equipment required to maintain the specified comfort and environmental conditions within the room.
 5. Partial Day Exceptions: Schedule events shall be able to accommodate a time range specified by the operator (ex: board meeting from 6 pm to 9 pm overrides Normal schedule for conference room).
 6. Schedule Summary Graph: The schedule summary graph shall clearly show Normal versus Holiday versus Override Schedules and the net operating schedule that results from all contributing schedules. Note: In case of priority conflict between schedules at the different geographic hierarchy, the schedule for the more detailed geographic level shall apply.
- F. Alarms: Alarms associated with a specific system, area, or equipment selected in the Navigation Tree, shall be displayed in the Action Pane by selecting an ' Alarms' view. Alarms, and reporting actions shall have the following capabilities:
1. Alarms View: Each Alarm shall display an Alarms Category (using a different icon for each alarm category), date/time of occurrence, current status, alarm report and a bold URL link to the associated graphic for the selected system, area or equipment. The URL link shall indicate the system location, address and other pertinent information. An operator shall easily be able to sort events, edit event templates and categories, acknowledge or force a return to normal in the Events View as specified in this section.
 2. Alarm Categories: The operator shall be able to create, edit or delete alarm categories such as HVAC, Maintenance, Fire, or Generator. An icon shall be associated with each alarm category, enabling the operator to easily sort through multiple events displayed.

3. Alarm Templates: Alarm template shall define different types of alarms and their associated properties. As a minimum, properties shall include a reference name, verbose description, severity of alarm, acknowledgement requirements, and high/low limit and out of range information.
4. Alarm Areas: Alarm Areas enable an operator to assign specific Alarm Categories to specific Alarm Reporting Actions. For example, it shall be possible for an operator to assign all HVAC Maintenance Alarm on the 1st floor of a building to email the technician responsible for maintenance. The Navigation Tree shall be used to setup Alarm Areas in the Graphic Pane.
5. Alarm Time/Date Stamp: All events shall be generated at the DDC control module level and comprise the Time/Date Stamp using the standalone control module time and date.
6. Alarm Configuration: Operators shall be able to define the type of Alarm generated per object. A 'network' view of the Navigation Tree shall expose all objects and their respective Alarm Configuration. Configuration shall include assignment of Alarm, type of Acknowledgement and notification for return to normal or fault status.
7. Alarm Summary Counter: The view of Alarm in the Graphic Pane shall provide a numeric counter, indicating how many Alarms are active (in alarm), require acknowledgement and total number of Alarms in the TCS Server dataTCS.
8. Alarm Auto-Deletion: Alarms that are acknowledged and closed shall be auto-deleted from the dataTCS and archived to a text file after an operator defined period.
9. Alarm Reporting Actions: Alarm Reporting Actions specified shall be automatically launched (under certain conditions) after an Alarm is received by the TCS server software. Operators shall be able to easily define these Reporting Actions using the Navigation Tree and Graphic Pane through the web browser GUI. Reporting Actions shall be as follows:
 10. Print: Alarm information shall be printed to the TCS server's PC or a networked printer.
 11. Email: Email shall be sent via any POP3-compatible e-mail server (most Internet Service Providers use POP3). Email messages may be copied to several email accounts. Note: Email reporting action shall also be used to support alphanumeric paging services, where email servers support pagers.
 12. File Write: The ASCII File write reporting action shall enable the operator to append operator defined alarm information to any alarm through a text file. The alarm information that is written to the file shall be completely definable by the operator. The operator may enter text or attach other data point information (such as AHU discharge temperature and fan condition upon a high room temperature alarm).
 13. Write Property: The write property reporting action updates a property value in a hardware module.
 14. SNMP: The Simple Network Management Protocol (SNMP) reporting action sends an SNMP trap to a network in response to receiving an alarm.
 15. Run External Program: The Run External Program reporting action launches specified program in response to an event.
- G. Trends: As system is engineered, all points shall be enabled to trend. Trends shall both be displayed and user configurable through the Web Browser GUI. Trends shall comprise analog, digital or calculated points simultaneously. A trend log's properties shall be editable using the Navigation Tree and Graphic Pane.
 1. Viewing Trends: The operator shall have the ability to view trends by using the Navigation Tree and selecting a Trends button in the Graphic Pane. The system shall allow y- and x-axis maximum ranges to be specified and shall be able to simultaneously graphically display multiple trends per graph.
 2. Local Trends: Trend data shall be collected locally by Multi-Equipment/Single Equipment general-purpose controllers, and periodically uploaded to the TCS server if historical trending is enabled for the object. Trend data, including run time hours and start time date shall be retained in non-volatile module memory. Systems that rely on a gateway/router to run trends are NOT acceptable.

3. Resolution. Sample intervals shall be as small as one second. Each trended point will have the ability to be trended at a different trend interval. When multiple points are selected for displays that have different trend intervals, the system will automatically scale the axis.
 4. Dynamic Update. Trends shall be able to dynamically update at operator-defined intervals.
 5. Zoom/Pan. It shall be possible to zoom-in on a particular section of a trend for more detailed examination and 'pan through' historical data by simply scrolling the mouse.
 6. Numeric Value Display. It shall be possible to pick any sample on a trend and have the numerical value displayed.
 7. Copy/Paste. The operator shall have the ability to pan through a historical trend and copy the data viewed to the clipboard using standard keystrokes (i.e. CTRL+C, CTRL+V).
- H. Security Access: Systems that are accessed from the web browser GUI to TCS server shall require a Login Name and Strong Password. Access to different areas of the TCS system shall be defined in terms of Role-TCSed Access Control privileges as specified:
1. Roles: Roles shall reflect the actual roles of different types of operators. Each role shall comprise a set of 'easily understood English language' privileges. Roles shall be defined in terms of View, Edit and Function Privileges.
 - a. View Privileges shall comprise: Navigation, Network, and Configuration Trees, Operators, Roles and Privileges, Alarm/Event Template and Reporting Action.
 - b. Edit Privileges shall comprise: Set point, Tuning and Logic, Manual Override, and Point Assignment Parameters.
 - c. Function Privileges shall comprise: Alarm/Event Acknowledgement, Control Module Memory Download, Upload, Schedules, Schedule Groups, Manual Commands, Print and Alarm/Event Maintenance.
 2. Geographic Assignment of Roles: Roles shall be geographically assigned using a similar expandable/collapsible navigation tree. For example, it shall be possible to assign two HVAC Technicians with similar competencies (and the same operator defined HVAC Role) to different areas of the system.

2.11 GRAPHICAL PROGRAMMING

- A. The system software shall include a Graphic Programming Language (GPL) for all DDC control algorithms resident in all control modules. Any system that does not use a drag and drop method of graphical icon programming shall not be accepted. All systems shall use a GPL method used to create a sequence of operations by assembling graphic microblocks that represent each of the commands or functions necessary to complete a control sequence. Microblocks represent common logical control devices used in conventional control systems, such as relays, switches, high signal selectors etc., in addition to the more complex DDC and energy management strategies such as PID loops and optimum start. Each microblock shall be interactive and contain the programming necessary to execute the function of the device it represents.
- B. Graphic programming shall be performed while on screen and using a mouse; each microblock shall be selected from a microblock library and assembled with other microblocks necessary to complete the specified sequence. Microblocks are then interconnected on screen using graphic "wires," each forming a logical connection. Once assembled, each logical grouping of microblocks and their interconnecting wires then forms a graphic function block which may be used to control any piece of equipment with a similar point configuration and sequence of operation.
- C. Graphic Sequence: The clarity of the graphic sequence shall be such that the operator has the ability to verify that system programming meets the specifications, without having to learn or interpret a manufacturer's unique programming language. The graphic programming shall be self-documenting and provide the operator with an understandable and exact representation of each sequence of operation.
- D. GPL Capabilities: The following is a minimum definition of the capabilities of the Graphic Programming software:

1. Function Block (FB): Shall be a collection of points, microblocks and wires which have been connected together for the specific purpose of controlling a piece of HVAC equipment or a single mechanical system.
2. Logical I/O: Input/Output points shall interface with the control modules in order to read various signals and/or values or to transmit signal or values to controlled devices.
3. Microblocks: Shall be software devices that are represented graphically and may be connected together to perform a specified sequence. A library of microblocks shall be submitted with the control contractors bid.
4. Wires: Shall be Graphical elements used to form logical connections between microblocks and between logical I/O.
5. Reference Labels: Labels shall be similar to wires in that they are used to form logical connections between two points. Labels shall form a connection by reference instead of a visual connection, i.e. two points labeled 'A' on a drawing are logically connected even though there is no wire between them.
6. Parameter: A parameter shall be a value that may be tied to the input of a microblock.
7. Properties: Dialog boxes shall appear after a microblock has been inserted which has editable parameters associated with it. Default parameter dialog boxes shall contain various editable and non-editable fields, and shall contain 'push buttons' for the purpose of selecting default parameter settings.
8. Icon: An icon shall be graphic representation of a software program. Each graphic microblock has an icon associated with it that graphically describes its function.
9. Menu-bar Icon: Shall be an icon that is displayed on the menu bar on the GPL screen, which represents its associated graphic microblock.
10. Live Graphical Programs: The Graphic Programming software shall support a 'live' mode, where all input/output data, calculated data and set points shall be displayed in a 'live' real-time mode.

2.12 LONWORKS NETWORK MANAGEMENT

- A. BACnet shall be the primary protocol used. Systems requiring the use of third-party LonWorks network management tools shall not be accepted.
- B. Network management shall include the following services: device identification, device installation, device configuration, device diagnostics, device maintenance and network variable binding.
- C. The Network configuration tool shall also provide diagnostics to identify devices on the network, to reset devices and to view health and status counters within devices.
- D. These tools shall provide the ability to "learn" an existing LonWorks network, regardless of what network management tool(s) were used to install the existing network, so that existing LonWorks devices and newly added devices are part of a single network management dataTCSe.
- E. The network management dataTCSe shall be resident in the Network Area Controller (NAC), ensuring that anyone with proper authorization has access to the network management dataTCSe at all times. Systems employing network management dataTCSe that are not resident, at all times and within the control system shall not be accepted.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.

- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. The temperature control contractor shall coordinate all work with Owner,
- D. Technical Services (IT) Department. Coordinate requirement for virtual network, IP addresses, and VPN. TCC shall provide all requested hardware, firmware, software, and programming requested by the Owner.

3.03 GENERAL

- A. Install system and materials in accordance with manufacturer's instructions, and as detailed on the project drawing set.
- B. Line and low voltage electrical connections to control equipment shown specified or shown on the control diagrams shall be furnished and installed by the Control System Contractor in accordance with these specifications.
- C. Equipment furnished by the Mechanical Contractor that is normally wired before installation shall be furnished completely wired. Control wiring normally performed in the field will be furnished and installed by the Control System Contractor.
- D. All control devices mounted on the face of control panels shall be clearly identified as to function and system served with permanently engraved phenolic labels.

3.04 WIRING

- A. All electrical control wiring to the control panels shall be the responsibility of the Control System Contractor.
- B. All wiring shall be in accordance with the Project Electrical Specifications (Division 26), the National Electrical Code and any applicable local codes. All control wiring shall be installed in raceways.
- C. Excess wire shall not be looped or coiled in the controller cabinet.
- D. Incorporate electrical noise suppression techniques in relay control circuits.
- E. There shall be no drilling on the controller cabinet after the controls are mounted inside.
- F. Careful stripping of wire while inside the cabinet is required to ensure that no wire strand fragments land on circuit boards.
- G. Use manufacturer-specified wire for all network connections.
- H. Use approved optical isolation and lightning protection when penetrating building envelope.
- I. Read installation instructions carefully. Any unavoidable deviations shall be approved by owner's rep prior to installation.

3.05 ACCEPTANCE TESTING

- A. Upon completion of the installation, the Control System Contractor shall load all system software and start-up the system. The Control System Contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to insure that the system is functioning in full accordance with these specifications.
- B. The Control System Contractor shall perform tests to verify proper performance of components, routines and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the DDC system operation.
- C. System Acceptance: Satisfactory completion is when the Control System Contractor has performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner's Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.
- D. The Third-party temperature control system commissioning agent will provide a written commissioning report.

- E. The TCC shall provide all necessary labor and materials required to meet the recommendations of the commissioning agent prior to system acceptance, project close-out, and release of retainage.
- F. Final written acceptance of the TCS shall be provided by the Owner.

3.06 OPERATOR TRAINING

- A. During system commissioning and at such time acceptable performance of the Control System hardware and software has been established, the Control System Contractor shall provide on-site operator instruction to the owner's operating personnel. Operator instruction shall be done during normal working hours and shall be performed by a competent representative familiar with the system hardware, software and accessories.
- B. The Control System Contractor shall provide minimum 32 total hours of comprehensive training in multiple sessions for system orientation, product maintenance and troubleshooting, programming and engineering. These classes are to be spread out during the 1st year warranty period. The first class starting after final commissioning and the last class is to be in the last month of 1-year warranty period.

3.07 WARRANTY PERIOD SERVICES

- A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of system acceptance.
- B. Within this period, upon notice by the Owner, any defects in the TCS due to faulty materials, methods of installation or workmanship shall be promptly repaired or replaced by the Control System Contractor at no expense to the Owner.
- C. Maintenance of Computer Software Programs: The Control System Contractor shall maintain all software during the standard first year warranty period. In addition, all factory or sub-vendor upgrades to software during the first year warranty period shall be added to the systems, when they become available, at no additional cost. In addition to first year standard warranty, software provided by Control System Contractor shall come with a 5 Year Software Maintenance license. All SNC and TCS Servers are included in this coverage. Labor to implement upgrades in years two through five are not included in standard warranty.
- D. Maintenance of Control Hardware: The Control System Contractor shall inspect, repair, replace, adjust, and calibrate, as required, the controllers, control devices and associated peripheral units during the warranty period. The Control System Contractor shall then furnish a report describing the status of the equipment, problem areas (if any) noticed during service work, and description of the corrective actions taken. The report shall clearly certify that all hardware is functioning correctly.
- E. Service Period: Calls for service by the Owner shall be honored within 24 hours and are not to be considered as part of routine maintenance.
- F. Service Documentation: A copy of the service report associated with each owner-initiated service call shall be provided to the owner.

3.08 WARRANTY ACCESS

- A. The Owner shall grant to the Temperature Control System Contractor reasonable access to the TCS during the warranty period. Remote access to the TCS (for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period) may be allowed.

3.09 OPERATION & MAINTENANCE MANUALS

- A. See General Requirements. O&M manuals shall include the following elements, as a minimum:
 1. As-built control drawings for all equipment.
 2. As-built Network Communications Diagram.
 3. General description and specifications for all components.
 4. Completed Performance Verification sheets.
 5. Completed Controller Checkout/Calibration Sheets.

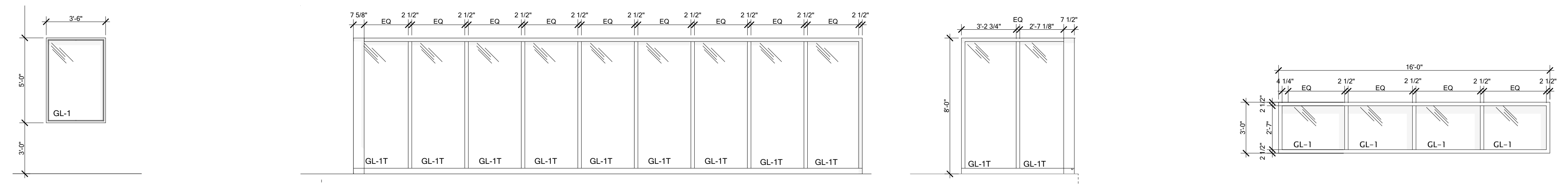
3.10 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

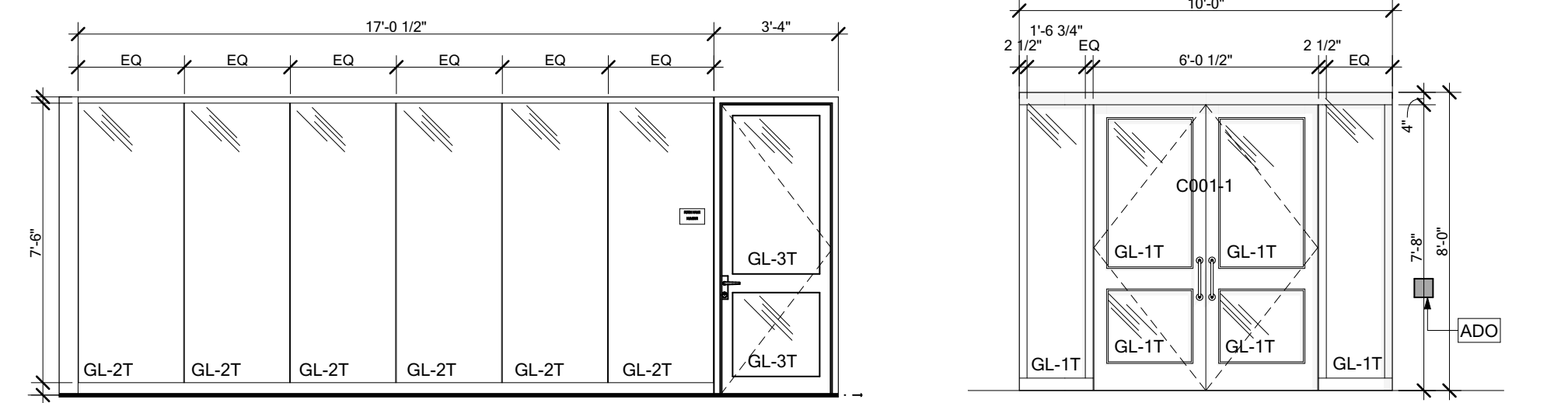
END OF SECTION 230923

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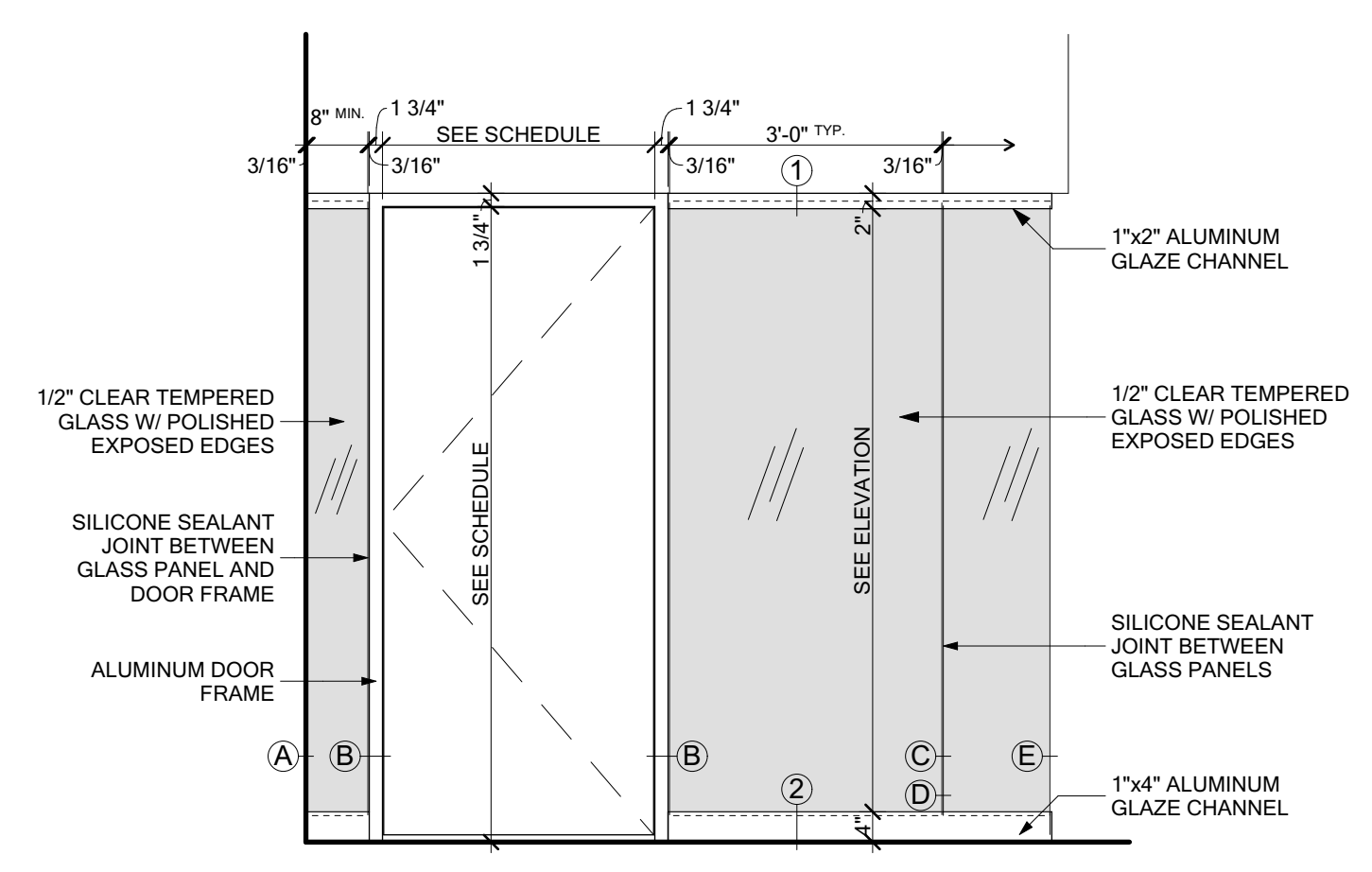
GLAZING GENERAL NOTES:
 1. PROVIDE SAFETY GLAZING AT ALL LOCATIONS REQUIRED BY CODE.
 2. REFER TO SPECIFICATIONS FOR DETAILED INFORMATION OF THE GLASS TYPES LISTED BELOW.
GLASS TYPES:
 GL-1 1" INSULATING GLASS UNIT
 GL-1T 1" INSULATING GLASS UNIT (TEMPERED)
 GL-2T 1/2" GLASS UNIT (TEMPERED)
 GL-3T 1/4" GLASS UNIT (TEMPERED)



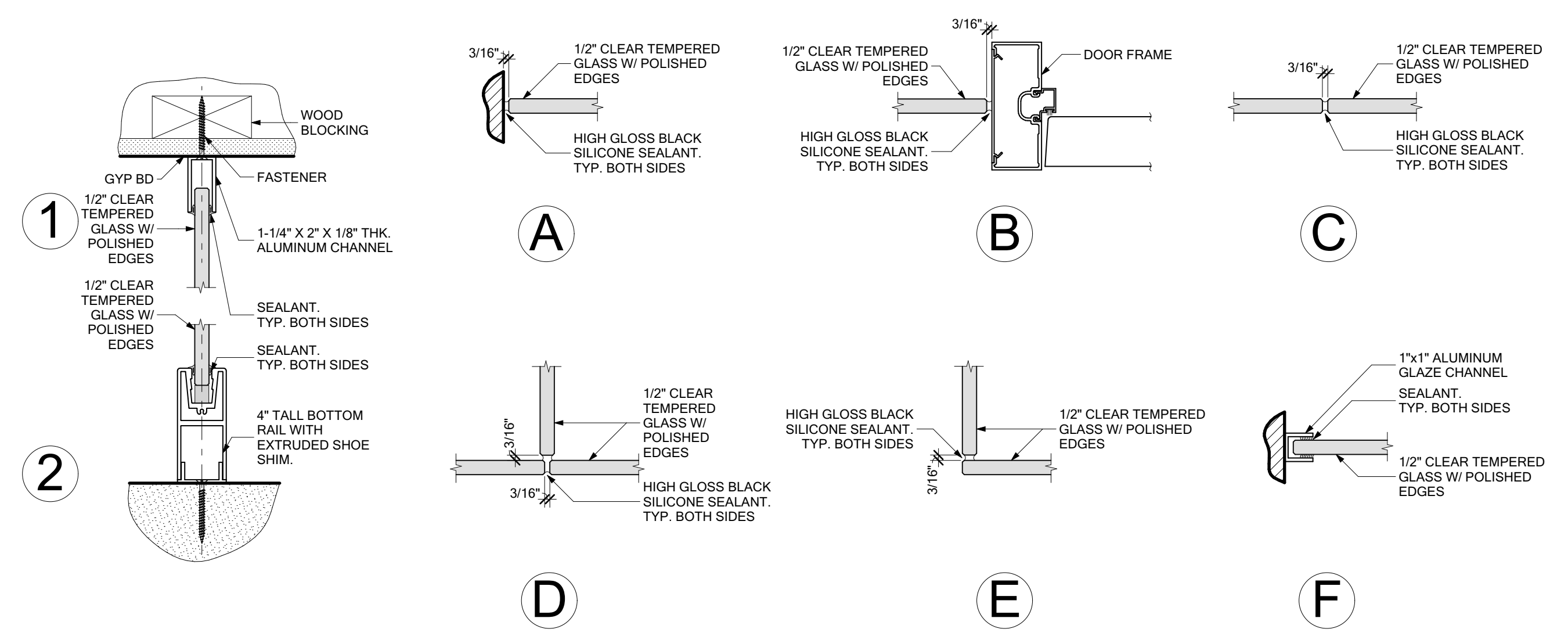
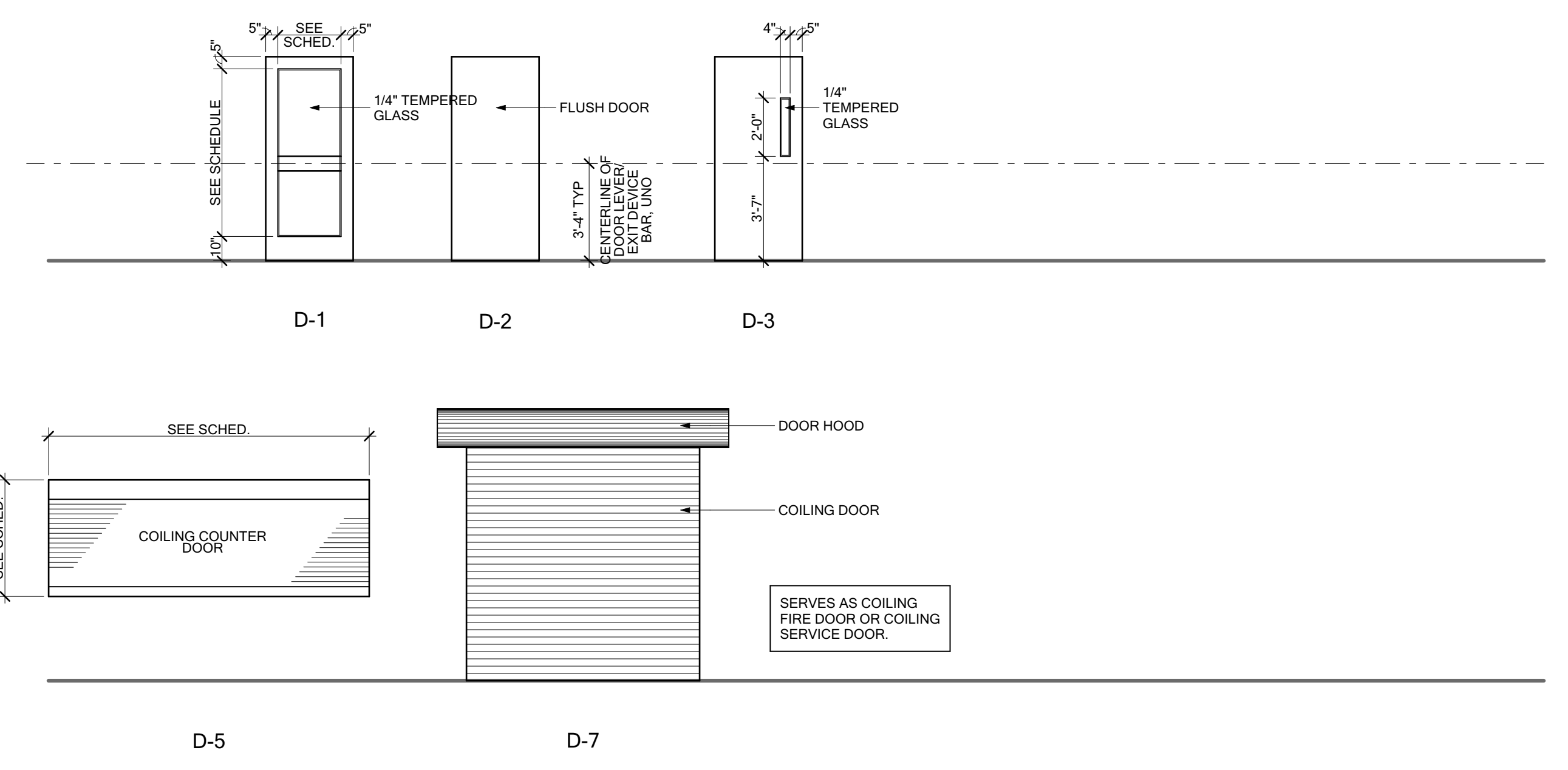
G9 SF-01 ELEVATION SCALE: 1/4" = 1'-0"
G6 SF-03A ELEVATION SCALE: 1/4" = 1'-0"
G5 SF-03B ELEVATION SCALE: 1/4" = 1'-0"
G3 SF-04 ELEVATION SCALE: 1/4" = 1'-0"



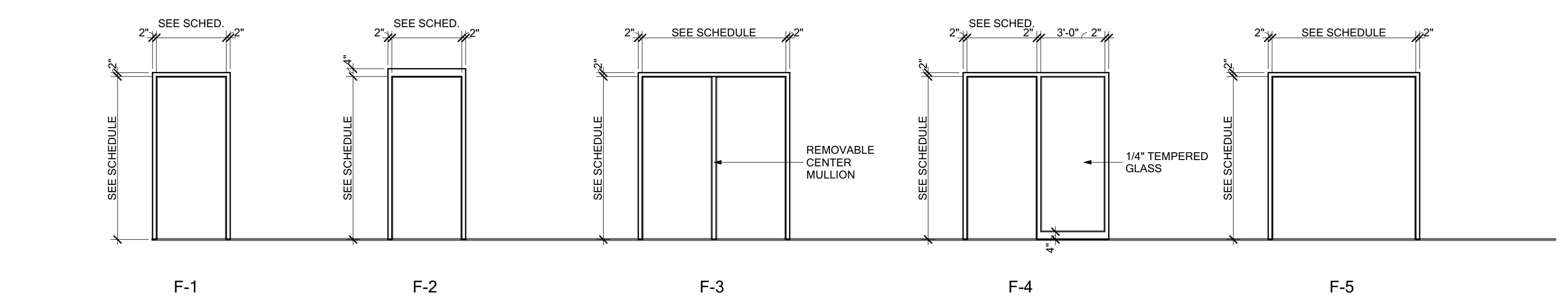
F8 IGW-01 ELEVATION SCALE: 1/4" = 1'-0"
F7 SF-02A ELEVATION SCALE: 1/4" = 1'-0"



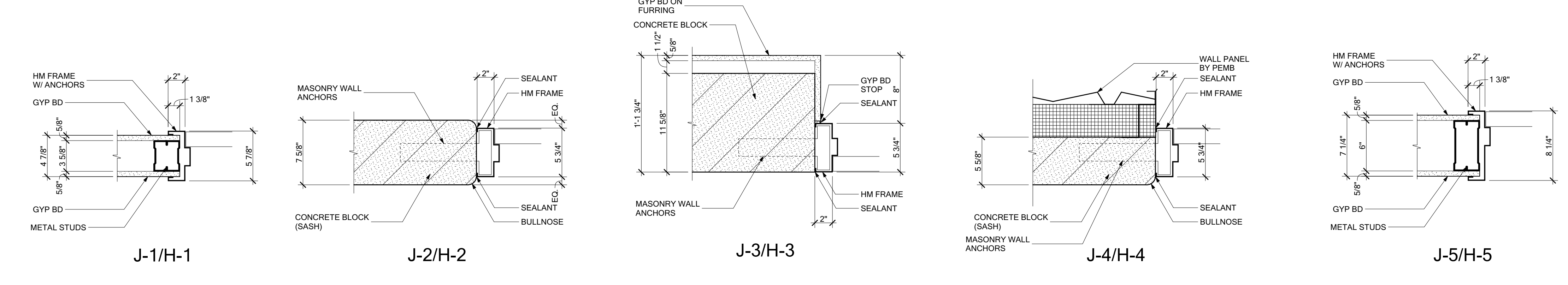
E2 INTERIOR GLAZING DETAILS 1/2" SCALE: 1/2" = 1'-0"



D1 INTERIOR GLAZING DETAILS 3" SCALE: 3" = 1'-0"



B5 DOOR ELEVATIONS SCALE: 1/4" = 1'-0"



A3 DOOR JAMB DETAILS SCALE: 1 1/2" = 1'-0"

No.	SIZE	DOOR				FRAME				H	J	HDW SET	FIRE RATING	REMARKS
		EL	MATL	FIN	STAIN	MATL	FIN	PT	PT					
001	3'-0"x8'-0"	D-1	SCWD	STAIN	F-4	HM	PT	H1	J1	8.0	-	-	-	-
002	3'-0"x8'-0"	D-1	SCWD	STAIN	F-4	HM	PT	H1	J1	8.0	-	-	-	-
003	3'-0"x8'-0"	D-1	SCWD	STAIN	F-4	HM	PT	H1	J1	8.0	-	-	-	-
004	3'-0"x8'-0"	D-1	SCWD	STAIN	F-4	HM	PT	H1	J1	8.0	-	-	-	-
005	3'-0"x8'-0"	D-1	SCWD	STAIN	F-4	HM	PT	H1	J1	8.0	-	-	-	-
006-1	3'-0"x8'-0"	D-1	SCWD	STAIN	F-4	HM	PT	H1	J1	8.0	-	-	-	-
006-2	3'-0"x8'-0"	D-2	HM	PT	F-1	HM	PT	H5	J5	3.0	-	-	-	-
007	3'-0"x8'-0"	D-2	HM	PT	F-1	HM	PT	H1	J1	6.0	-	-	-	-
008-1	3'-0"x8'-0"	D-2	HM	PT	F-1	HM	PT	H1	J1	6.0	-	-	-	-
008-2	6'-0"x8'-0"	D-2	HM	PT	F-3	HM	PT	H5	J5	4.0	-	-	-	-
009	3'-0"x8'-0"	D-1	SCWD	STAIN	F-1	HM	PT	H1	J1	6.0	-	-	-	-
010	3'-0"x8'-0"	D-2	HM	PT	F-1	HM	PT	H3	J3	11.0	-	-	-	-
011	3'-0"x8'-0"	D-2	HM	PT	F-1	HM	PT	H2	J2	12.0	-	-	-	-
012	3'-0"x8'-0"	D-2	HM	PT	F-1	HM	PT	H3	J3	13.0	-	-	-	-
013	3'-0"x8'-0"	D-2	HM	PT	F-1	HM	PT	H3	J3	13.0	-	-	-	-
014-1	3'-0"x7'-10"	D-1	AL	CLEAR	F-1	AL	-	-	-	7.0	-	-	-	SEE INT GLAZING
014-2	3'-0"x8'-0"	D-3	SCWD	PT	F-1	HM	PT	H1	J1	6.0	-	-	-	-
015-1	3'-0"x8'-0"	D-3	SCWD	PT	F-1	HM	PT	H1	J1	6.0	-	-	-	-
015-2	3'-0"x8'-0"	D-2	SCWD	PT	F-1	HM	PT	H1	J1	6.0	-	-	-	-
016-1	3'-0"x8'-0"	D-3	SCWD	PT	F-1	HM	PT	H1	J1	6.0	-	-	-	-
016-2	6'-0"x8'-0"	D-2	HM	PT	F-3	HM	PT	H5	J5	4.0	-	-	-	-
016-3	4'-0"x4'-0"	D-5	-	-	-	-	-	-	-	5.0	-	-	-	Serving window
017-1	8'-0"x8'-0"	D-7	-	-	-	-	-	-	-	5.0	-	-	-	COILING COUNTER
017-2	3'-0"x8'-0"	D-2	HM	PT	F-1	HM	PT	H1	J1	6.0	-	-	-	-
018-1	6'-0"x8'-0"	D-2	HM	PT	F-3	HM	PT	H4	J4	4.0	-	-	-	-
018-2	6'-0"x8'-0"	D-2	HM	PT	F-3	HM	PT	H4	J4	4.0	-	-	-	-
018-3	6'-0"x8'-0"	D-2	HM	PT	F-3	HM	PT	H4	J4	4.0	-	-	-	-
018-4	6'-0"x8'-0"	D-2	HM	PT	F-3	HM	PT	H4	J4	4.0	-	-	-	-
018-5	6'-0"x8'-0"	D-1	-	-	-	-	-	-	-	5.0	-	-	-	OH DOOR
019	6'-0"x8'-0"	D-2	HM	PT	F-3	HM	PT	H1	J1	9.0	-	-	-	-
020	3'-0"x8'-0"	D-2	HM	PT	F-1	HM	PT	H1	J1	6.0	-	-	-	-
C001-1	6'-0"x7'-8"	D-1	AL	CLEAR	-	AL	CLEAR	-	-	1.0	-	-	-	STOREFRONT ENTRANCE
C001-2	6'-0"x8'-0"	D-1	AL	CLEAR	-	AL	CLEAR	-	-	2.0	-	-	-	STOREFRONT ENTRANCE
C002	6'-0"x8'-0"	D-2	HM	PT	F-5	HM	PT	H1	J1	10.0	-	-	-	180 Door swing, Both Sides and frame of door to be PT2
C003-1	3'-0"x8'-0"	D-1	SCWD	PT	F-1	HM	PT	H1	J1	6.0	-	-	-	-
C003-2	3'-0"x8'-0"	D-2	HM	PT	F-1	HM	PT	H5	J5	3.0	-	-	-	-

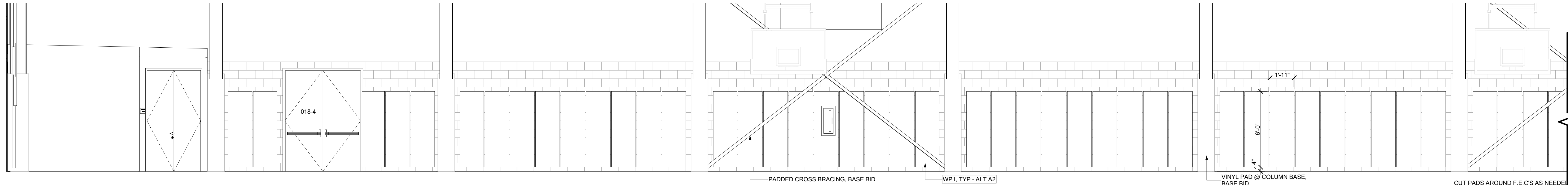
PROJECT TITLE
 OSCODA AREA SCHOOLS

NEW COMMUNITY CENTER
 3550 E River Rd,
 Oscoda, MI, 48750

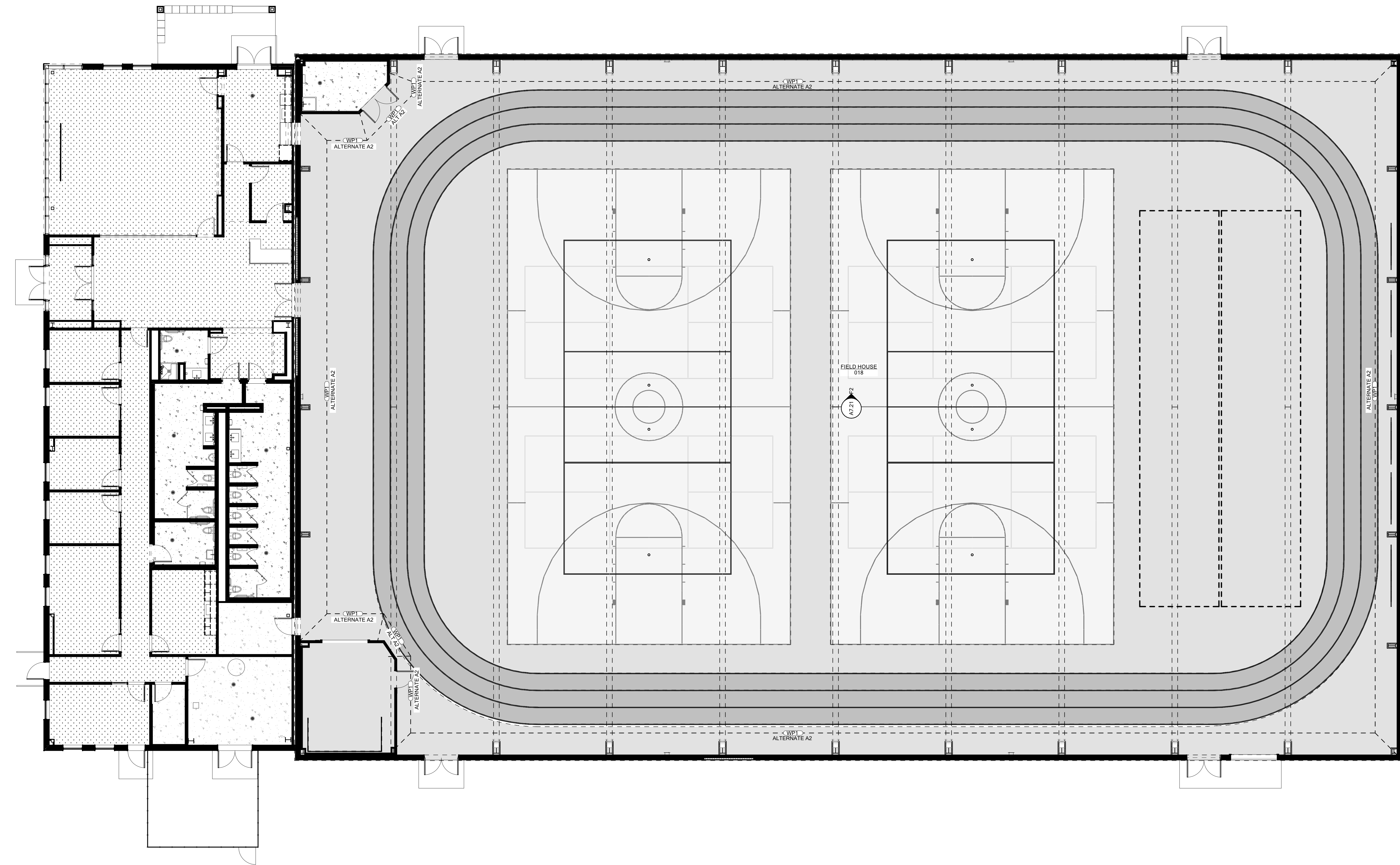
02/13/2025	ADDENDUM #01
12/18/2024	CD/RD
10/11/2024	DESIGN DEVELOPMENT
08/16/2024	SCHEMATIC DESIGN

TC JOB NO. 107253
 OWNER JOB NO. #Client Project No.

SHEET TITLE
 DOOR SCHEDULE/
 WINDOW ELEVATIONS



F2 FIELDHOUSE 018 - PARTIAL EAST ELEVATION - ALT A2
SCALE: 1/4" = 1'-0"



A1 FIRST FLOOR FINISH PLAN - ALTERNATE A3
SCALE: 1/8" = 1'-0"

FINISHES GENERAL NOTES

- REFER TO REFLECTED CEILING PLANS FOR INFORMATION ON CEILING FINISHES.
- REFER TO ARCHITECTURAL PLANS AND SPECIFICATIONS FOR ADDITIONAL INFORMATION ON MATERIALS AND CONSTRUCTION.
- GYPSUM BOARD THAT RECEIVES EPOXY PAINTS (EPTX AND PAINTS) PTX ARE TO RECEIVE A LEVEL 5 GYPSUM BOARD FINISH. SURFACES ARE TO BE SKIM COATED AND SHALL BE SMOOTH AND FREE OF TOOL MARKS AND RIDGES. REFER TO GYPSUM BOARD SPECIFICATIONS FOR ADDITIONAL INFORMATION, INCLUDING DETAILED LEVEL 5 FINISH REQUIREMENTS.
- CONCRETE SLAB SAWCUT LOCATIONS MUST BE TRANSFERRED UP TO CERAMIC FLOOR TILE AS EXPANSION JOINTS. ADDITIONAL JOINTS MAY ALSO BE REQUIRED WHERE COLD JOINTS BETWEEN SLAB POURS OCCUR. IF ADDITIONAL JOINTS ARE REQUIRED, NOTIFY ARCHITECT AS ADDITIONAL EXPANSION JOINTS IN THE TILE PATTERN WILL NEED TO BE ADDED.
- IF A MORTAR BED IS USED IN THE INSTALLATION OF CERAMIC FLOOR TILE, IT IS THE RESPONSIBILITY OF THE TILE CONTRACTOR TO ADJUST ALL FLOOR TRANSITION STRIPS WITH ADJOINING FLOOR MATERIALS DUE TO THE ADDED THICKNESS OF THE MORTAR BED. FLOOR SLABS MUST ALSO BE FEATHERED WHERE CERAMIC TILE JOINTS ARE EXPOSED. CERAMIC TILE CONTRACTOR TO PROVIDE A THRESHOLD OF NO MORE THAN 1/2" IN AREAS WHERE FLOOR TILE SURROUNDS ARE SHOWN AROUND WALK OFF CARPETING. LEVELING COMPOUND MUST BE ADDED TO RAISE THE WALK OFF CARPET TO BE LEVEL WITH THE FLOOR TILE. CONTRACTOR TO FIELD VERIFY ALL DIFFERING CONDITIONS.
- DOOR FRAME PAINT COLOR TO MATCH ADJACENT WALL COLOR UNO.
- CEILING TO BE PAINTED WILL BE PT1 UNO.

FINISHES SYMBOL LEGEND

NOTE: NOT ALL SYMBOLS SHOWN ARE USED ON DRAWINGS.

- CORNER GUARD (CG)
- STAINLESS STEEL CORNER GUARD (SSCG)
- FLOOR DRAIN (FD)
- ① TRANSITION TYPE TAG (SEE TRANSITION TYPE DETAILS)
- PTX ACENT FINISH AT WALLS INDICATED

REFER TO THE FOLLOWING TAG FOR GENERAL FINISH INFORMATION FOR EACH ROOM UNLESS OTHERWISE NOTED.

---	WALL FINISH
---	WALL BASE FINISH
---	FLOORING FINISH

FLOORING MATERIAL LEGEND

- CARPET
- WALK OFF CARPET
- CERAMIC & QUARRY TILE
- VINYL COMPOSITE TILE (VCT)
- LUXURY VINYL TILE (LVT)
- SPORTS FLOOR
- CONCRETE - SEALED
- CONCRETE - GROUND/POLISHED
- CONCRETE - EPOXY PAINT

FINISH SCHEDULE

ACOUSTICAL PANEL CEILING (APC):
SEE REFLECTED CEILING PLANS.

CONCRETE FLOORING (CC):

CC-EPT	CONCRETE - EPOXY PAINTED
CC-P	CONCRETE - GROUND/POLISHED
CC-S	CONCRETE - SEALED

CERAMIC WALL TILE (CTW):

CTW1	ATLAS CONCORDE, REFLEX, BRIGHT, VERTICAL STACK/BOND
CTW2	FLORIDATILE, SONGBIRD, NATURAL DOWN, 3X12 BRICK PATTERN, WHITE GROUT

CERAMIC TILE TRIM (CTT):

CTT1	SCHLUTER DILEX-4HKA
CTT2	SCHLUTER, RONDEC

CERAMIC TILE BASE (CTB):

CTB1	CAESAR CERAMIC, LINK, 6"X12" COVE BASE, CHAIN
------	---

CORNER GUARD (CG):

CG1	CONSTRUCTION SPECIALTIES, VA SERIES, 1 1/2" WING, HEIGHT, 4FT
-----	---

FIBER REINFORCED PLASTIC (FRP):

FRP1	CRANE COMPOSITES, FULL HEIGHT PANEL, GLASSBORO EMBOSSED FINISH, COLOR: WHITE COLOR
------	--

INTERIOR WOOD (IWD):

IWD1	HYDREE, MAPLE, NATURAL, 5/25" TONGUE AND GROOVE, BEVELED EDGE, RANDOM PATTERN
------	---

LUXURY VINYL TILE (LVT):

LVT1	SHAW, EON, 22 MIL 5MM, 20"x20", STRATA 1206, INSTALL: QUARTER TURN
LVT2	SHAW, EON, 22 MIL 5MM, 20"x20", BASIN 1288, INSTALL: QUARTER TURN

PLASTIC LAMINATE (PLAM):

PLAM1	WILSONART, SOLAR OAK
-------	----------------------

PAINTS (PT) & EPOXY PAINTS (EPT):

PT1	SW 7103 WHITETAIL
PT2	SW CUSTOM, DELTA OSCODA BLUE, SEE A7.20/PT
PT3	SW CUSTOM, CLOUD MOUNTA, SEE A7.20/PT
PT4	SW 7019 GAUNTLET GRAY
PT5	SW HONOR ONE 7009
EPT1	SW 7103 WHITETAIL

RESILIENT WALL BASE (RWB):

RWB1	JOHNSONITE, 63 BURNT UMBER, 4" COVE BASE
------	--

SPORTS FLOOR (SF):

SF1	MONDO SUPER X 720 K35, 10.5MM, P18 MEDIUM BLUE (TRACK)
SF2	MONDO ADVANCE PRO 10MM, WHITE (TRACK LINES)
SF3	MONDO ADVANCE PRO 10MM, L70 LIGHT GREY (COURT SURROUND)
SF4	MONDO ADVANCE PRO 10MM, L62 SAND (COURT)
SF5	MONDO ADVANCE PRO 10MM, L73 ROYAL BLUE (COURT LINES)

SOLID SURFACE (SS):

SS1	DURAT, D0100-00 WHITE
SS2	DURAT, D0440-01 DARK GREY

TOILET PARTITION (TP):

TP1	ASI, ACCURATE PARTITIONS, BLUE 9509, SOLID PLASTIC
-----	--

WALL PAD (WP):

WP1	AALCO, STANDARD WALL PADS, ROYAL 09
-----	-------------------------------------

PROJECT TITLE
OSCODA AREA SCHOOLS

NEW COMMUNITY CENTER

3550 E River Rd,
Oscoda, MI, 48750

02/13/2025	ADDENDUM #01
12/18/2024	CD/BID
10/11/2024	DESIGN DEVELOPMENT
08/16/2024	SCHEMATIC DESIGN

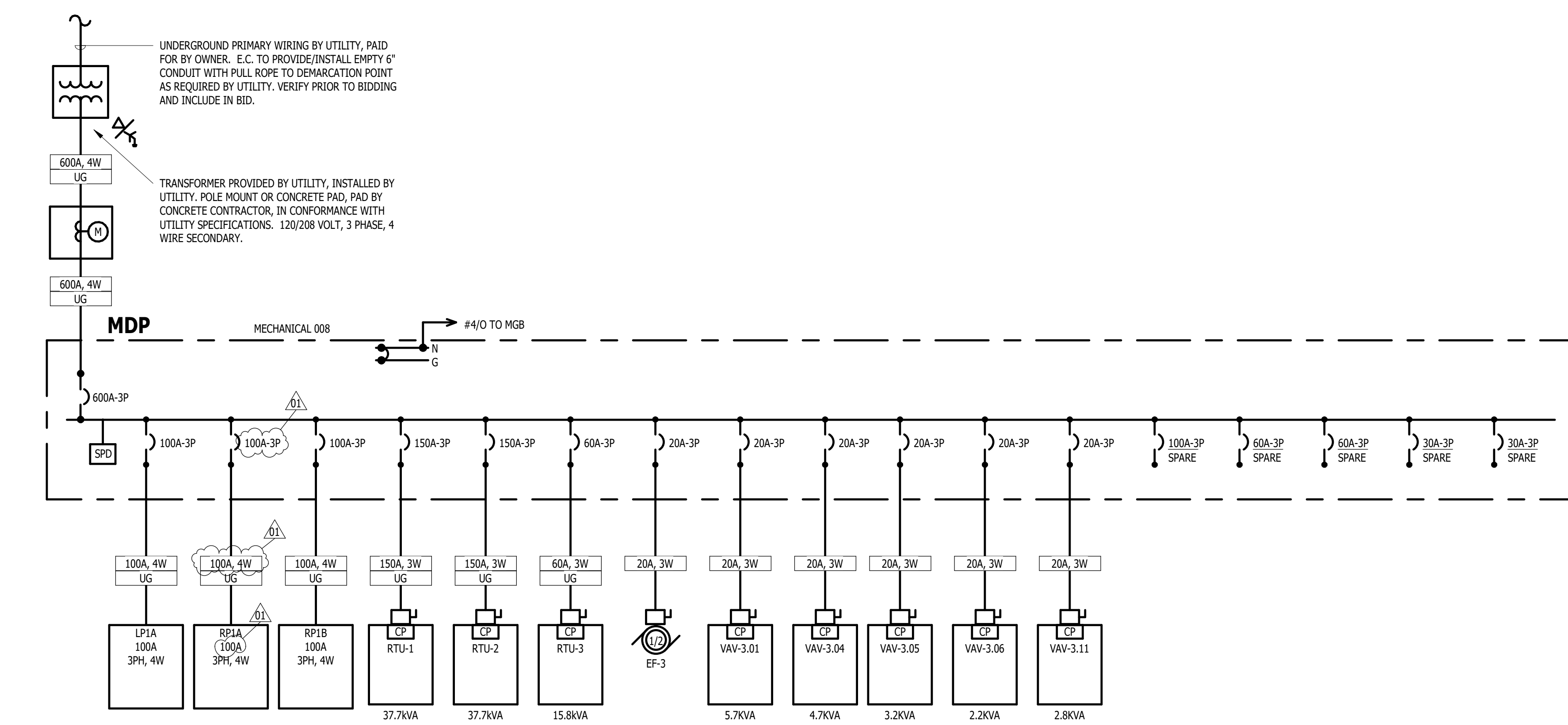
TC JOB NO. 107253

OWNER JOB NO. #Client Project No.

SHEET TITLE
FINISH PLAN - ALTERNATE A2 - WALL PADS

SHEET NO.

A7.21



1 ONE LINE DIAGRAM
E7.01 NOT TO SCALE

FEEDER SCHEDULE ABBREVIATIONS

TAG	REFERENCE
UG	FEEDERS SHALL BE ROUTED UNDERGROUND

FEEDER SCHEDULE (COPPER)

TAG	CONDUCTORS	EQUIPMENT GROUND	CONDUIT
20A, 3W	3#12	#12	1 1/2"
60A, 3W	3#6	#10	1"
100A, 4W	4#2	#8	1 1/2"
150A, 3W	3#1/0	#6	2"
600A, 4W	2 X (4 #350)	2 X #1	(2) 3"

PROJECT TITLE
OSCODA AREA SCHOOLS

NEW COMMUNITY CENTER
3550 E River Rd
Oscoda, MI 48750

02/13/2024 ADDENDUM #01

TC JOB NO. 107167
OWNER JOB NO.

SHEET TITLE
ONE LINE DIAGRAM

SHEET NO.
E7.01

ISIMET

Fire Pit, Gas Grill and Heater Gas Controller

Model: BGC

Safeguards Fire Pits, Gas Grills and Heaters.

IDEAL Applications:

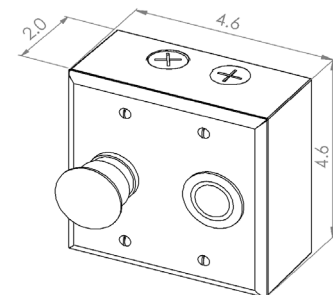
- Hotels, Condos, Apartments, Outdoor spaces, Restaurants.

Operational Features:

- **Eliminates gas from being left on.**
 - Field Configurable Timer: 30 min, 1 hour, 2 hours, 4 hours, 8 hours, or 12 hours
- **Limits Access and Easy to Use.**
 - Day and Time of Day Control. (With Optional 7-Day Timer.)
 - Optional Keyed-Reset Stop Button.
- **LED Notifications:**
 - Green: Gas is ON.
 - Red: Gas is OFF.
 - Green flashing: 5 minutes or less remaining in run time.
 - Red flashing: Emergency State (Gas OFF.)
- **Secondary output (120 VAC) for controlling an igniter or glow plug.**
 - Configurable to 5, 10, 15, 30, 45, or 60 Seconds.
- **Stop Button:** For Easy Shutdown.
- **Emergency Input:** Building Emergency or additional Panic Button Input.



Front View



Isometric View

Physical Features:

- **Surface-Mount Box:** Metal 4.6-inch x 4.6-inch x 2-inch
- **Front Cover:** Brushed Stainless Steel 4.6-inch x 4.6-inch
- **Weatherproof, Outdoor rated Controller.**

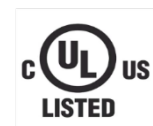
Standard Items:

Gas Activation Method	Push Button (IP65 rated)
Wall Mounting Method	Surface Mount
Box	Metal Double-Gang
Cover Plate	Brushed Stainless Steel

Designed in the USA!

Made in the USA!

Tech Support all in the USA!





OPTIONS

Gas De-activation Button	<ul style="list-style-type: none"> • Mushroom Stop Button: Standard 40mm mushroom style IPO • Flush Mount Stop Button • Keyed Reset Mushroom Stop Button. <i>(Prevents unauthorized access)</i>
Gas Valve	<ul style="list-style-type: none"> • UL Self-Closing Electronic Ball Valves (Sizes: ½ in, ¾ in, or 1 in) <i>ISIMET recommends Self-Closing Electronic Ball Valves. (Reasons: Reliability, Heat, Noise, Energy Savings, open port advantages...)</i> • UL Solenoids (Sizes ½-in, ¾-in, 1-in, 1 ¼- in, 1 1/2- in, or 2-in.)
Valve Assembly <i>(See photo below.)</i>	<ul style="list-style-type: none"> • Y-strainer, Solenoid, 2xUnions, and a ¼-Turn Manual Ball Valve
7-Day Timer (Time of Day or Day-of-Week Control)	<ul style="list-style-type: none"> • 7-Day Programmable Timer * Installs in a standard single-gang box (not included).
Post Mounting <i>(See photo below.)</i>	<ul style="list-style-type: none"> • Pedestal Mount with Flange • Pedestal Mount without Flange.

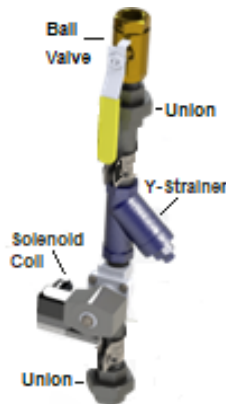
Field Configurable Times:

- **Gas Shutdown Times:** 30 minutes, 1-hour, 2-hours, 4-hours, 8-hours and 12-hours. *(Default is 1 hour)*
- **120 VAC igniter or Glow plug Times:** 5, 10, 15, 30, 45 and 60 Seconds. *(Disabled by default)*

Post/Pedestal Options



Valve Assembly



Solenoid



Self-Closing Electronic Ball Valve



7-Day Timer



Reference Photos

BGC - - - - -

(Enable Gas)
P: Push Button

(Disable Gas)
M: Mushroom Button
B: Stop Button
K: Keyed Reset

(Mounting)
S: Weatherproof Surface Mount¹

(24V Output Timer)²
0: 30 minutes
1: 1 hour
2: 2 hours
3: 4 hours
4: 8 hours
5: 12 hours

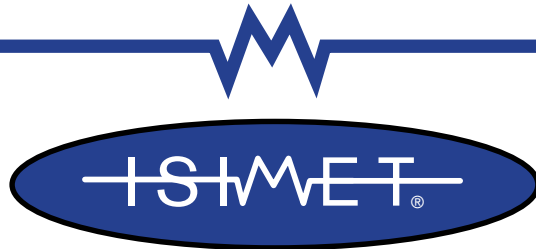
(120V Output Timer)
0: Same as 24V Output
1: 5 seconds
2: 10 seconds
3: 15 seconds
4: 30 seconds
5: 45 seconds
6: 60 seconds

Additional Options
T: 7-Day Timer³

¹Metal Weatherproof Box

²Field Configurable. Default Shutdown Timer is set to one hour.

³Add a 7-day, 24-hour programmable light switch timer with battery backup for day/time-of-day control.



The Leader in Utility Safety Controls since 2000

Fire Pit and Gas Grill Controller (Model BGC)

FOR HOTELS, APARTMENTS, CONDOS & RECREATION AREAS



Controls access to firepits and gas grills

- Controls length of use—automatic gas shutoff after predetermined time
- Ability to control time of day gas is available (with optional 7-Day Programmable Timer Switch)
- Prevents unauthorized and unattended use
- Conserves gas

Easy to operate

- Simply press button to activate gas
- Green indicates “Gas On”
- Red indicates “Gas Off”
- Flashing green indicates gas flow will cease in five minutes

Weatherproof stainless steel cover and powder-coated metal box standard



The ISIMET advantage.
www.isimet.com
(903) 781-6994





Fire Pit and Gas Grill Controller (Model BGC)

FOR COMMUNITY GAS GRILLS AND FIRE PITS

Features

- Size 4.56" x 4.56" x 2.25"
- Mushroom "Stop" button standard
- Surface mount standard

Options

- Keyed reset available
- Flush "Stop" button available
- 7-day programmable timer switch

System choices

- Complete system: controller & electronic ball valve, 1/2", 3/4", 1" valve size (lowest maintenance/power consumption)
- Controller & solenoid
- Controller only
- Master Controller—controls/disables multiple grills and firepits

Flush "Stop" button



Keyed reset



Recommended

To order, please contact:



The ISIMET advantage.
www.isimet.com
(903) 781-6994

Visit isimet.com for details.
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WCM Industries, Inc. © 2024
Patent Pending
Rev 1-12-24



BGC Submittal

Equipment Specifications Model #:

BGC-

Enable Gas Option:

P (Push Button) *(Standard)*

Disable Gas Option:

M (Mushroom Stop Button) *(Preferred)*

B (Flush Stop Button)

K (Keyed Reset Mushroom Stop Button)

Mounting Option:

S (Surface Mount) – Weatherproof Metal Double-Gang Box *(Standard)*

24 VDC Output (Primary Output)

Automatic Shutdown Timer *(Field Configurable, additional timeout options available):*

30 minutes 1 hour 2 hours

4 hours 8 hours 12 hours

120 VAC Output (Secondary Output):

Standard *(120V turns on/off with 24VDC primary circuit)*

Igniter/Glow Plug Timeout *(Select Time)*

5 seconds 10 seconds 15 seconds

30 seconds 45 seconds 60 seconds

Time of Day Functionality:

Add 7-Day Programmable Timer Decora Switch*

* Installs in a standard single-gang box (not included).

Model Number:

BGC -


(Enable Gas) P: Push Button	(Disable Gas) M: Mushroom Button B: Stop Button K: Keyed Reset	(Mounting) S: Weatherproof Surface Mount ¹	(24V Output Timer)² 0: 30 minutes 1: 1 hour 2: 2 hours 3: 4 hours 4: 8 hours 5: 12 hours	(120V Output Timer) 0: Same as 24V Output 1: 5 seconds 2: 10 seconds 3: 15 seconds 4: 30 seconds 5: 45 seconds 6: 60 seconds	Additional Options T: 7-Day Timer ³
---------------------------------------	--	---	--	--	--

¹Metal Weatherproof Box

²Field Configurable. Default Shutdown Timer is set to one hour.

³Add a 7-day, 24-hour programmable light switch timer with battery backup for day/time-of-day control.

ISIMET JOB #: _____



Model: BGC*
(4.56-in H x 4.56-in W x 3.54-in D)

Project Owner: _____

Project Name: _____

Project Address: _____

Notes: _____



BGC Submittal

Additional Items: (These options may require a separate line item and/or submittal to be processed.)

Solenoid/EBV Model #:

S-

Valve Option:

- None
- Electronic Ball Valve (Full Port, Self-Closing) [1/2" - 1" Only]

ISIMET recommends Electronic Ball Valves

- Solenoid [1/2" - 2"]

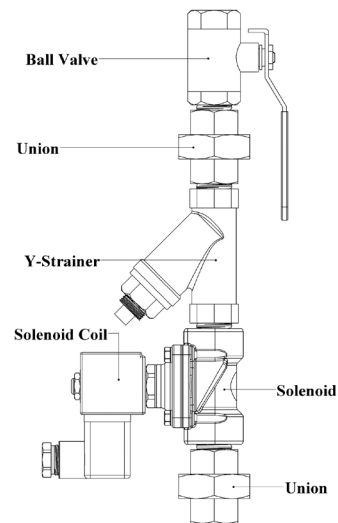
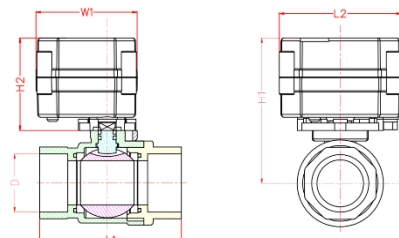
Valve Size (inches):

- 1/2 3/4 1 *EBV Sizes Only*
- 1-1/4 1-1/2 2

Valve Assembly:

- Includes 2x Unions and 1/4-Turn Manual Ball Valve
- Add 80-mesh Y-Strainer

ISIMET also offers S-Series Enclosures, Rack Assemblies, Valve Assemblies, and other options.



Solenoid/EBV Specifications:

ISIMET Model	Port Size	Orifice Size	Seat Material	Min. Pressure	Flow Factor	Operation Pressure		24 VDC	
						Air/Gas	Water	Inrush	Holding
Units	in	in		psi	psi	psi	psi	VA	VA
S-301	1/2	0.71	BUNA	0	4	3	-	19	19
S-302	3/4	0.71	BUNA	0	4.9	3	-	19	19
S-303	1	1.26	BUNA	0	12	0.75	-	19	19
S-304	1 1/4	1.26	BUNA	0	14	0.75	-	19	19
S-305	1 1/2	1.89	BUNA	0.015	41	3	-	19	19
S-306	2	2.00	BUNA	0.015	50	3	-	19	19
S-951	1/2	Full Port	Buna-N	0	Full Port	45	-	-	-
S-952	3/4	Full Port	Buna-N	0	Full Port	45	-	-	-
S-953	1	Full Port	Buna-N	0	Full Port	45	-	-	-

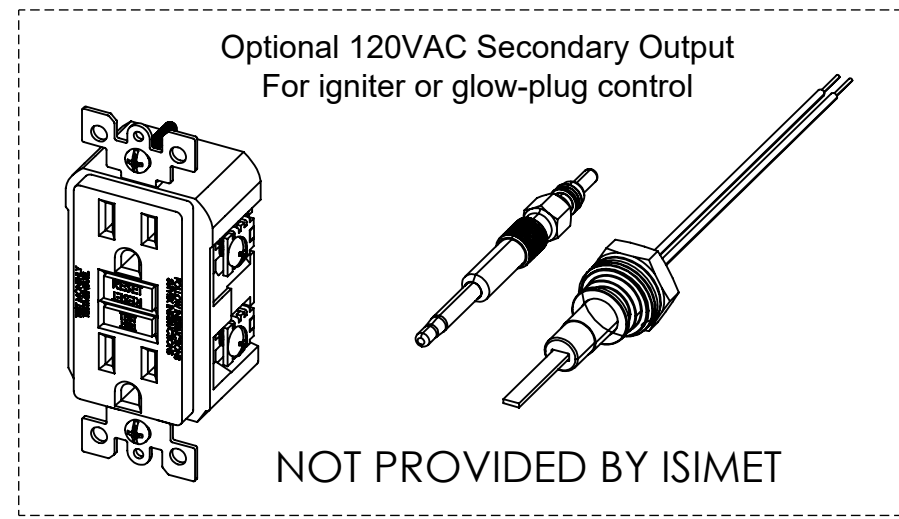
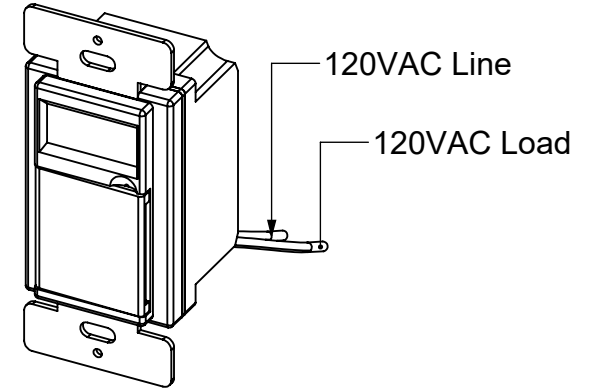
Series 300 are Fuel gas, Aluminum construction Normally Closed Solenoid Valves. (Designed for low pressure fuel gas applications.)
 Series 900 are Stainless-Steel Electronic Ball Valves that automatically close when power is lost.

Additional BGC Options: (Requires Separate Line Item to Order)

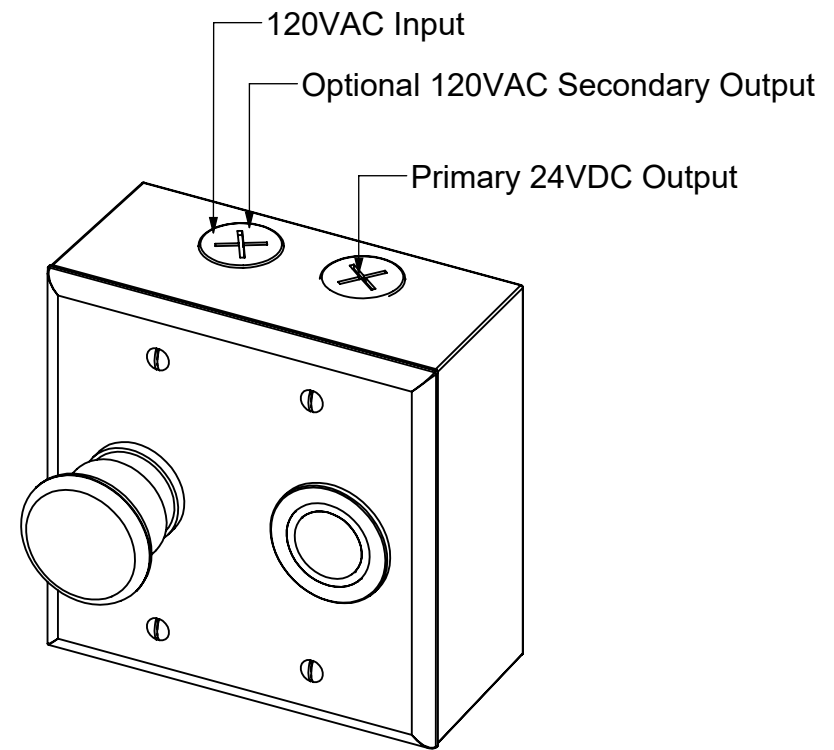
- Add Rooftop Pedestal Mount with Flange
- Add Yard-Style Pedestal Mount without Flange

NAME	BGC Engineering Drawing		PART NO.	SCALE	1:2	REVISION	BY	CH	EC	DATE
	FOR	Firepit and Grill Controllers								
MATERIAL	Varies		TOLERANCE UNLESS SPECIFIED	DECIMALS: ±.01	TWO PLACE	FRACTIONS: ±.005	THREE PLACE	FRACTIONS: ±.1/32	ANGLES: ±0.5°	SURFACE TEXTURE: 32
ISIMET, LLC										

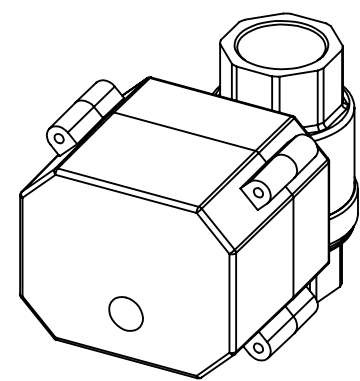
7-Day Programmable Timer (Optional)



ISIMET Firepit and Gas Grill Controller Model BGC

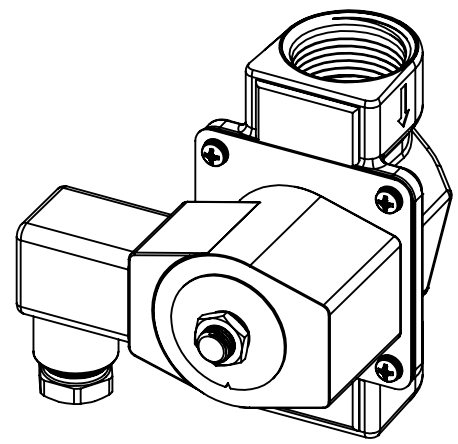


Electronic Ball Valve (EBV) 900 Series (24VDC, 1/2" to 1")



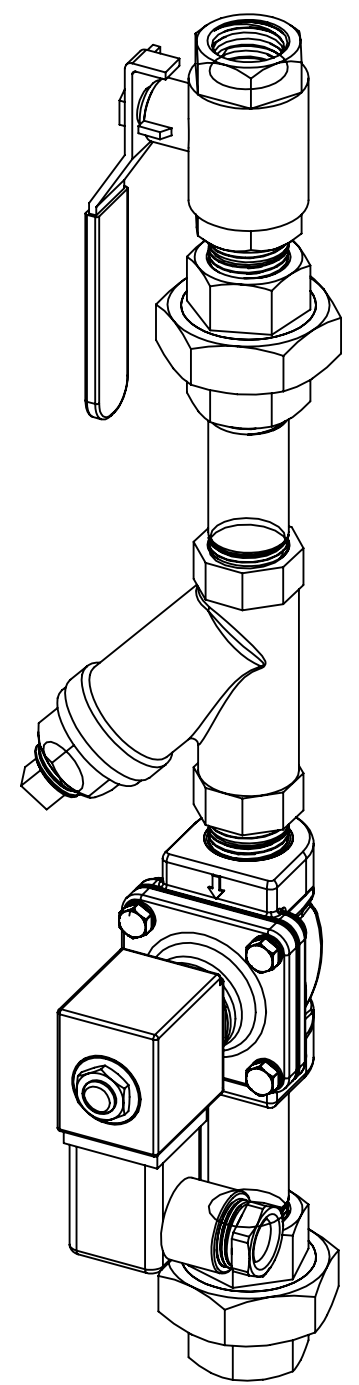
OR

ISIMET Solenoid 300 Series (24VDC, 1/2" to 1-1/2")



OR

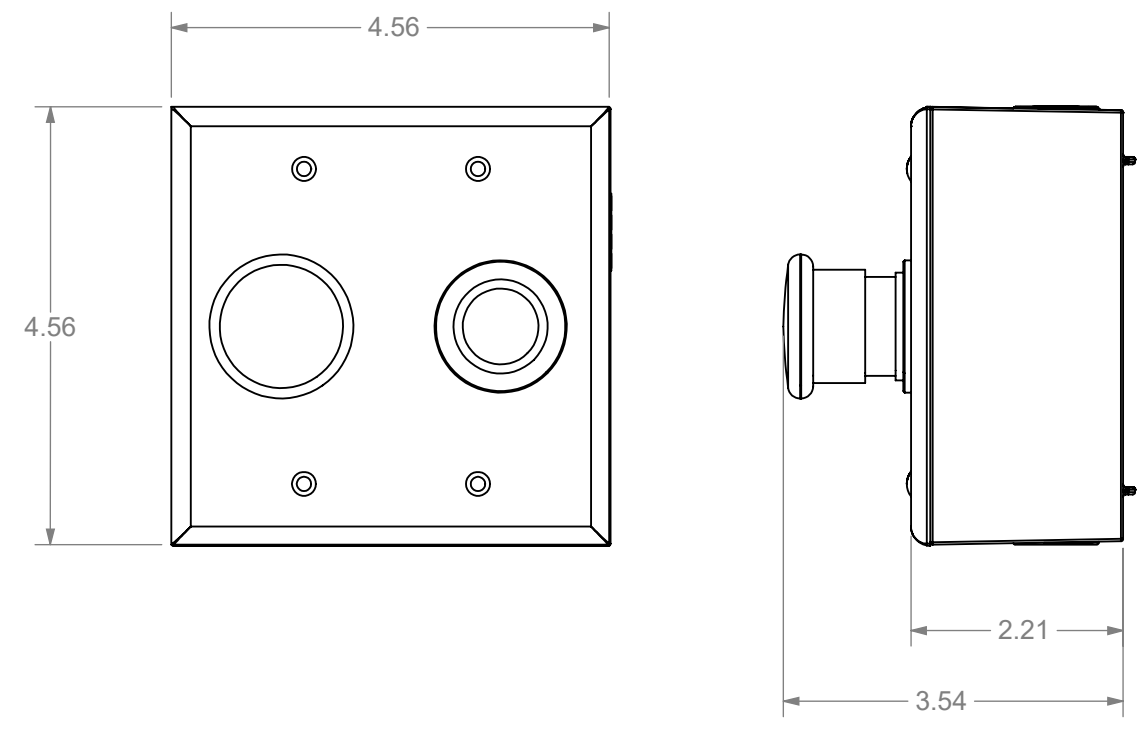
ISIMET Valve Assembly EBV or Solenoid (with or without Y-Strainer)



Notes:

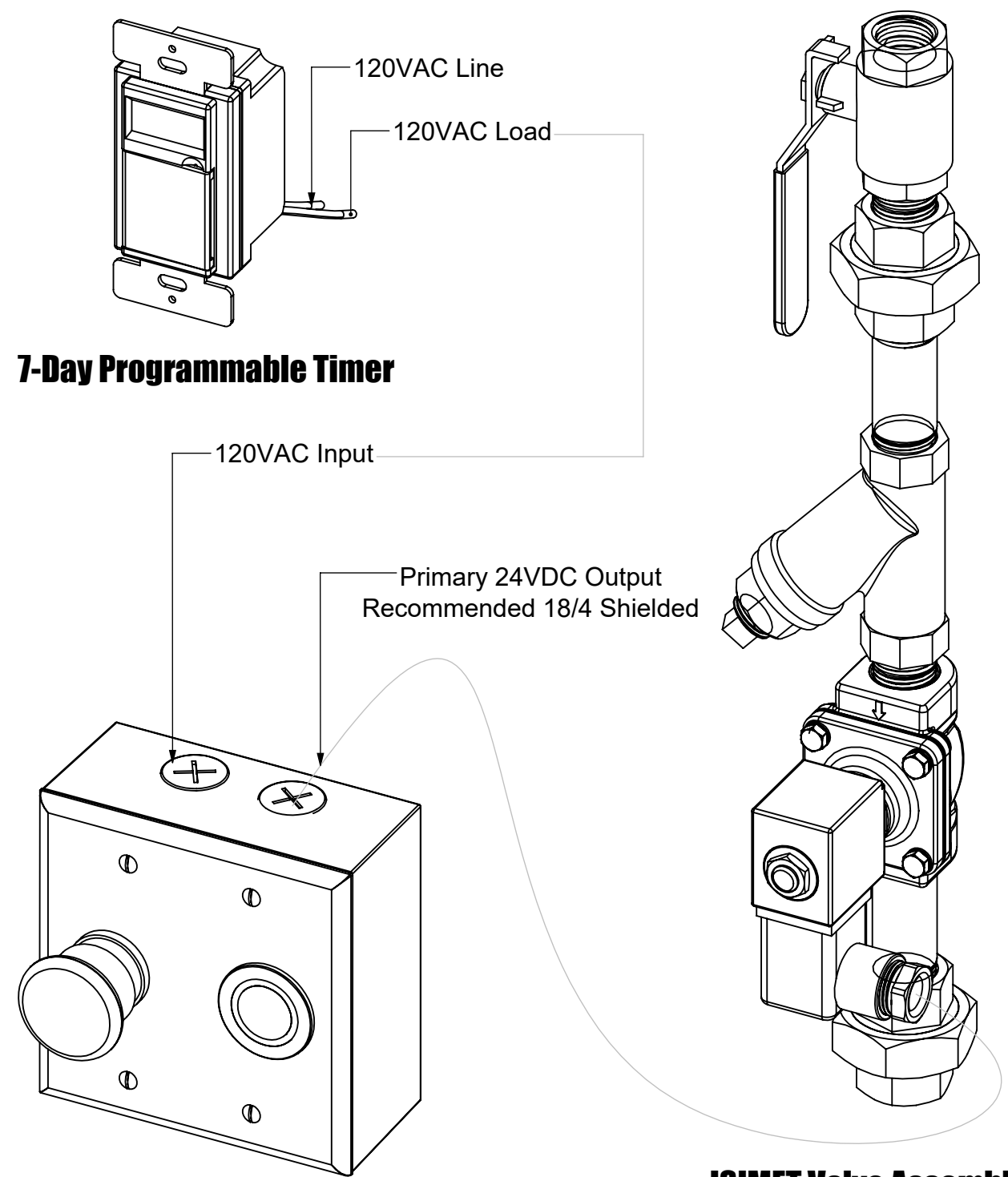
1	ISIMET Firepit and Gas Grill Controller, Model: BGC (120VAC Input, 24VDC Output)
2	7-Day Programmable Timer (Optional) - (120VAC Input, 120VAC Output, Battery Backup)
3	ISIMET Gas Valve Assembly (Includes 2x Unions, Manual Ball Valve, Y-Strainer, and Valve)
4	ISIMET Gas Electronic Ball Valve - 900 Series (Full-Port, 24VDC, Automatic Closing)
5	ISIMET Gas Solenoid - 300 Series (24VDC, Normally-Closed)

NAME	BGC Engineering Drawing		SCALE	1:2	ISIMET	PART NO.	BY	CH	EC	DATE				
	FOR	Firepit and Grill Grill Controllers					GY				12/18/2023			
	MATERIAL	Varies					REVISION							
	ISIMET, LLC													
TOLERANCE UNLESS SPECIFIED		DECIMALS: ±.01		FRACTIONS: ±.005		ANGLES: ±0.5°		SURFACE TEXTURE: 32√						



Dimensional Drawing of BGC

Typical Wiring Layout



ISIMET Firepit and Gas Grill Controller Model BGC

ISIMET Valve Assembly EBV or Solenoid

ISIMET

Fire Pit & Gas Grill Controller

Model: BGC

Installation Manual

ISIMET BGC
Installation Manual

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Patent Pending

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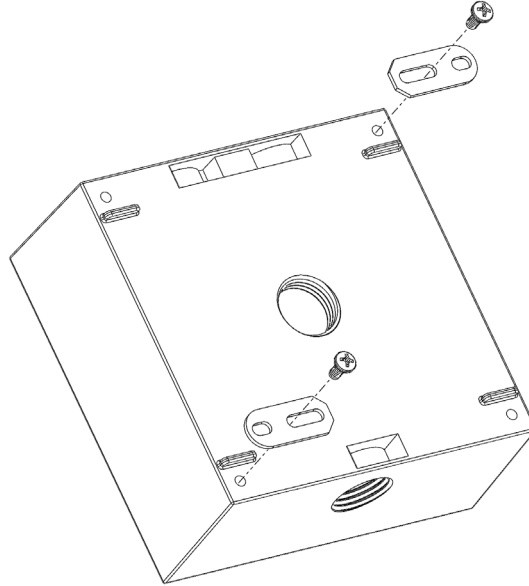


Mounting the BGC

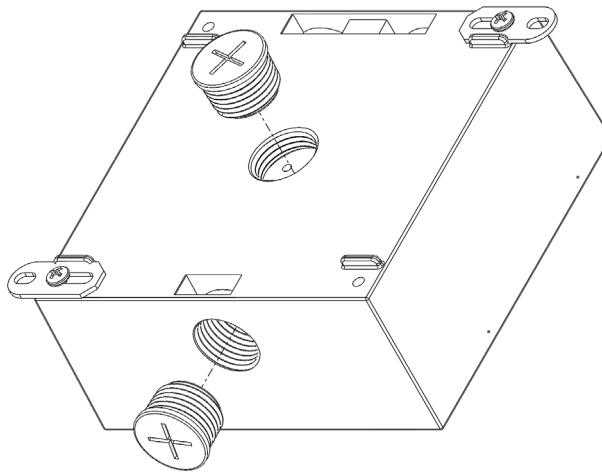
The BGC must be mounted in a location that is easily and readily accessible. The installation height of the BGC must comply with ADA standards. The BGC was designed to be Surface Mounted. While the BGC is outdoor rated, it should be installed under an overhang or location that provides adequate protection from direct sunlight and rain.

Surface Mount Installation

1. Install the surface mount brackets to the double-gang box using the included screws.

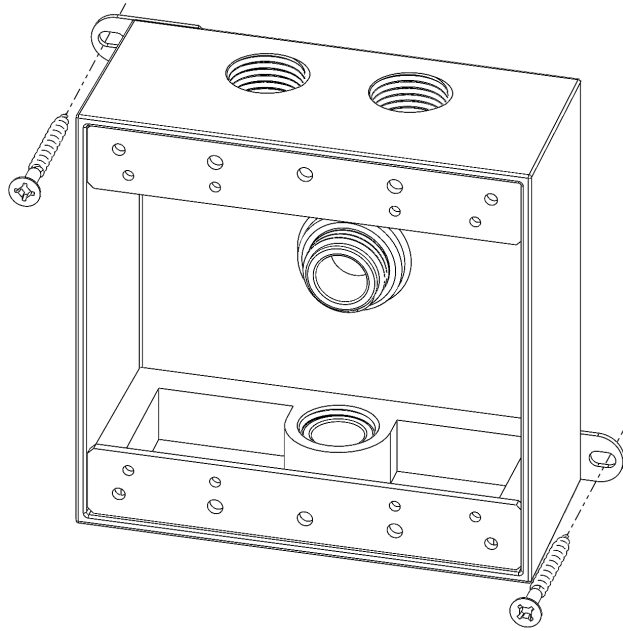


2. Install the two knockout plugs into the unused knockouts of the double-gang box.

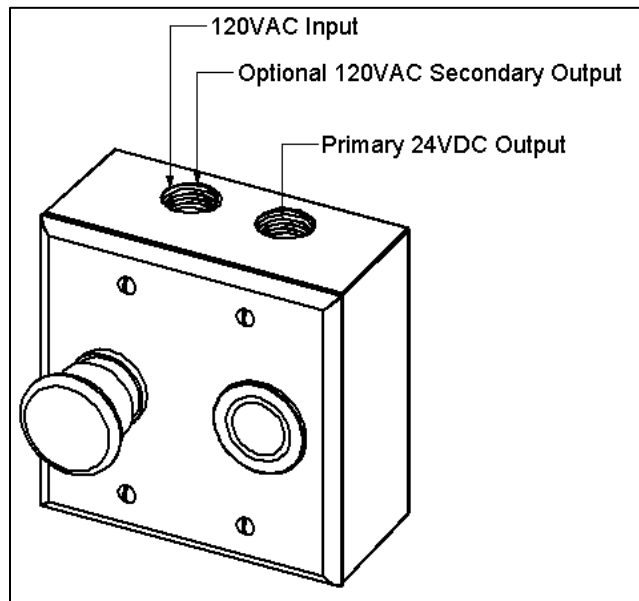


Note: It is recommended to use silicone sealant on the threads for outdoor applications.

3. Attach the double-gang box using appropriate screws (not included).



4. Install appropriate connectors and conduit between the BGC and power source (120V) and the BGC and the gas valve (24VDC).



Recommended wire sizes:

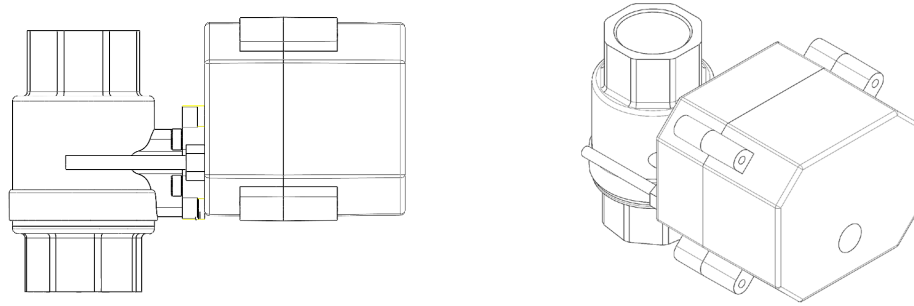
14AWG for the 120VAC and 18AWG for the gas valve

Mounting the Electronic Ball Valve (EBV) or Solenoid

A licensed installer should complete this section following all National and Local Codes.

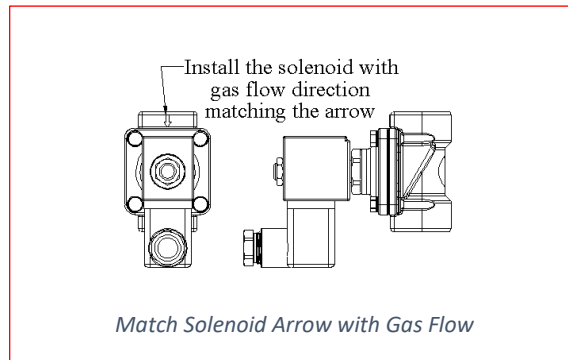
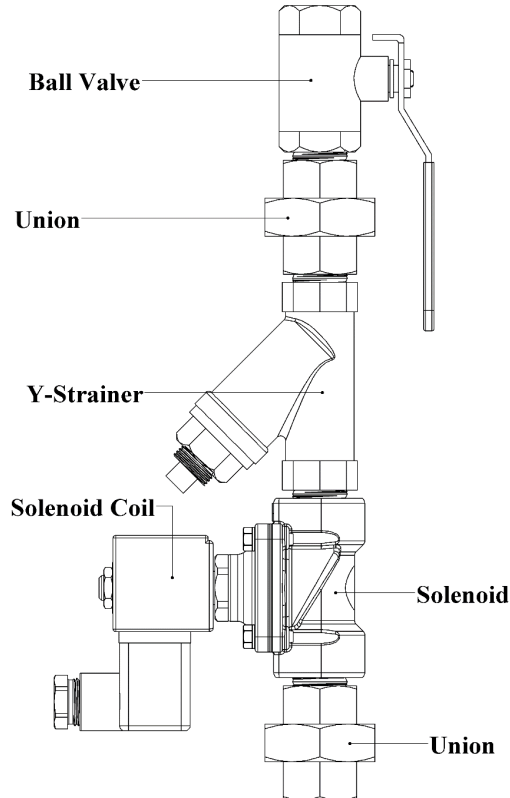
ISIMET's Electronic Ball Valve Installation Recommendations:

- ISIMET's electronic ball valves are the preferred gas valve for the BGC.
- Orientation and gas flow direction do NOT matter for electronic ball valves.
- Electronic ball valves do NOT have to be removed to flush the piping systems prior to initial startup. Simply open the valve, and flush the system prior to initial startup.



Solenoid Installation Recommendations:

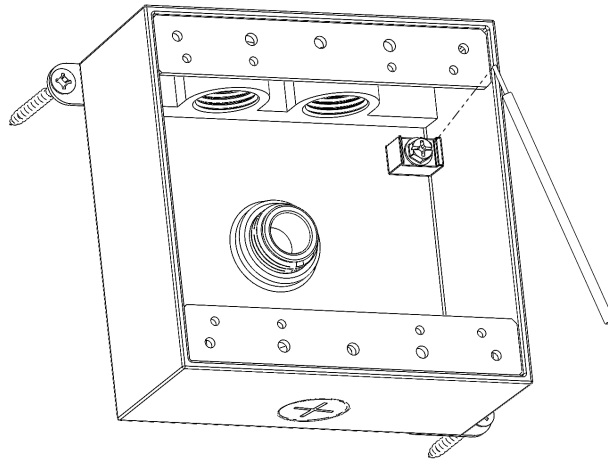
- Solenoid must be rated for 24VDC.
- ISIMET's Valve Assembly typically includes a Solenoid Assembly (see below), which includes a Y-Strainer, manual Ball Valve, and two Unions.
- The solenoids should be installed with an access panel for maintenance and/or service if not installed with an S-Series Enclosure.
- Remove the solenoid assemblies and flush the piping systems prior to initial startup.



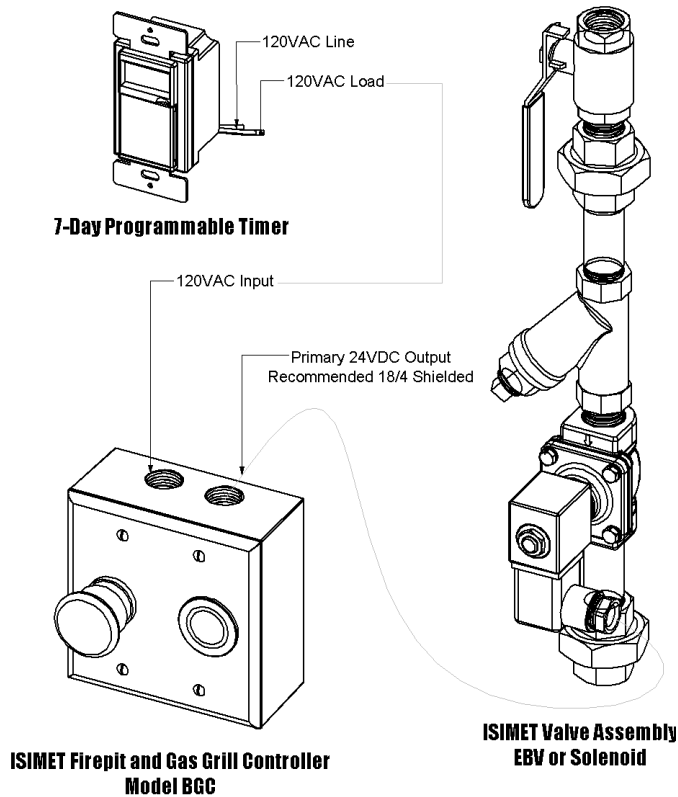
Wiring the BGC

A licensed electrical contractor should perform all 120VAC wiring following all electrical codes and procedures. Low-Voltage and control wiring should be isolated from any line voltages and use 18 AWG minimum. **Warning: All Inputs MUST be Dry-Contact (Voltage-Free)!**

1. Install a ground pigtail wire using the supplied ground screw. The metal box must be grounded per NEC NFPA 70.



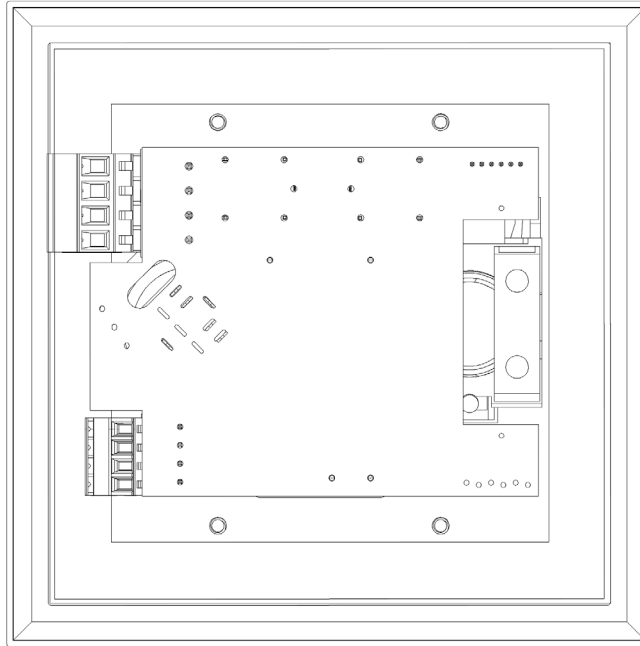
2. Attach the appropriate conduit to the BGC and connect the wires as needed:



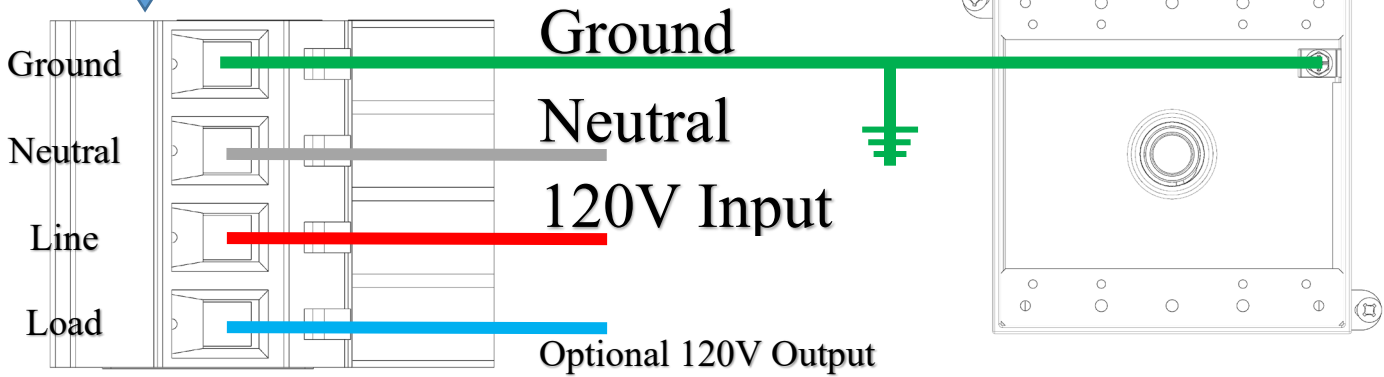
Typical Wiring Layout for the BGC

BGC High-Voltage Wiring Instructions

1. Remove the High-Voltage terminal block and connect the wires as shown below:



BGC (High-Voltage) Wiring Diagram



BGC Label

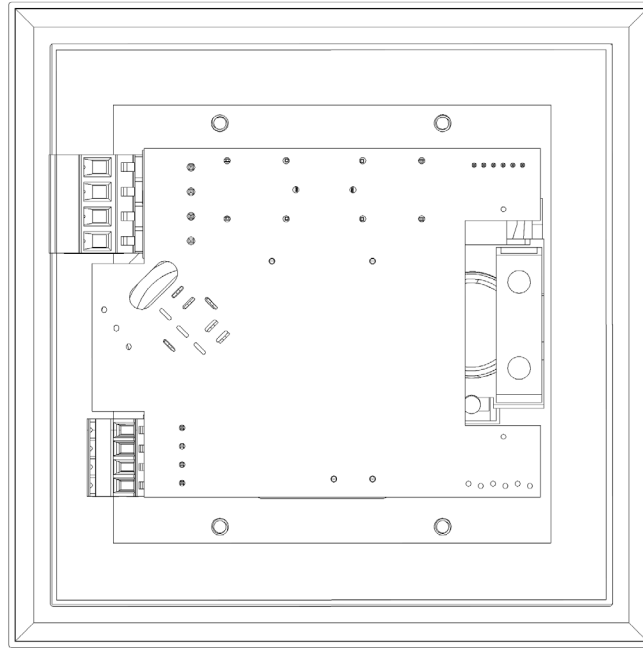
Description

<i>Ground Symbol</i>	<i>120VAC Ground</i>
<i>Neutral</i>	<i>120VAC Neutral</i>
<i>Line</i>	<i>120VAC Line</i>
<i>Load</i>	<i>Optional Igniter or Glow Plug output</i>

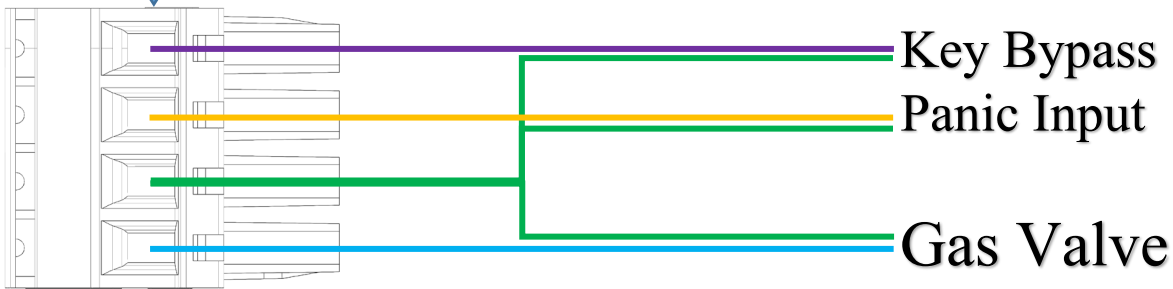
BGC Low-Voltage Wiring Instructions

Recommended: 18/4 Shielded Wire

1. Remove the Low-Voltage terminal block and connect the wires as shown below:



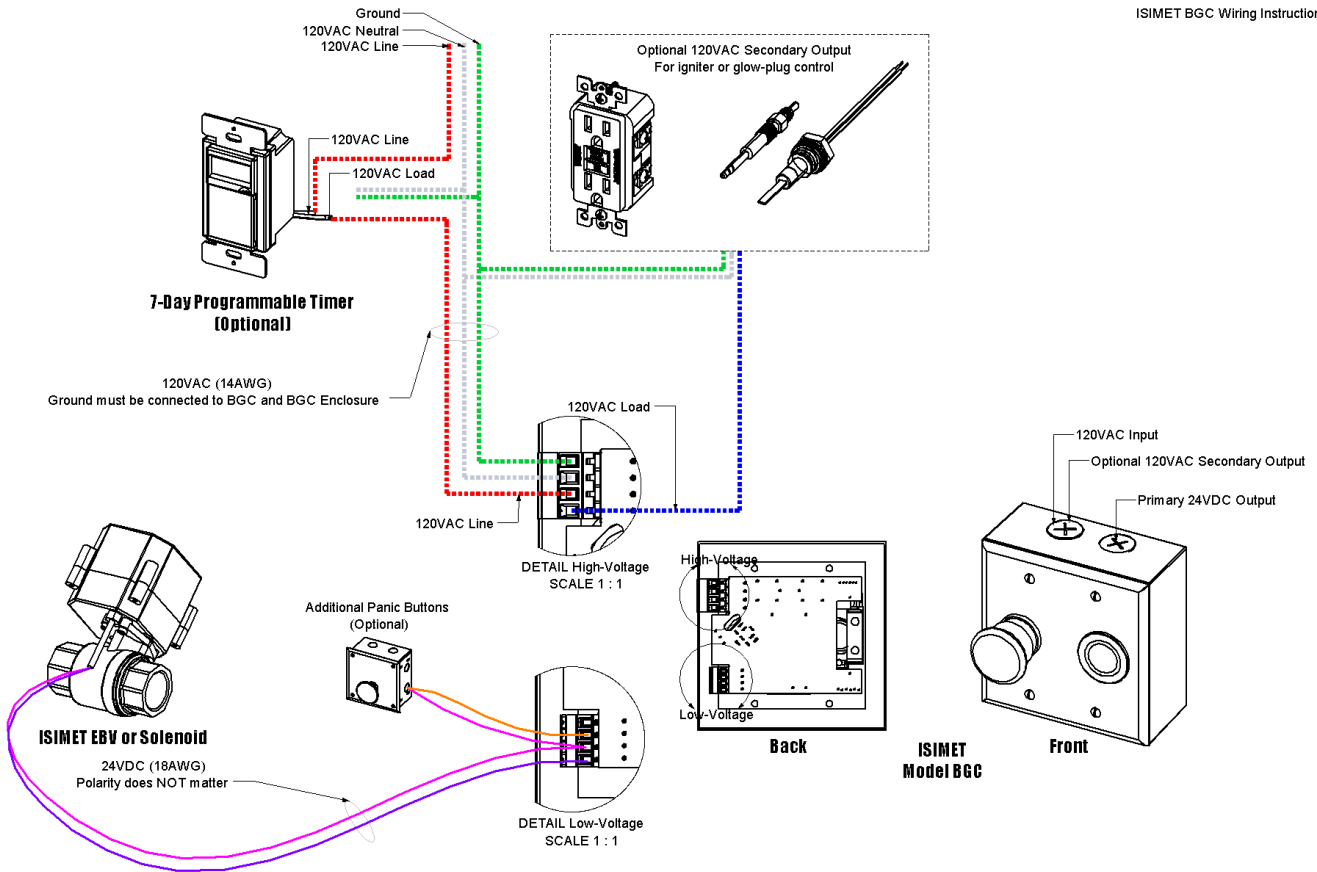
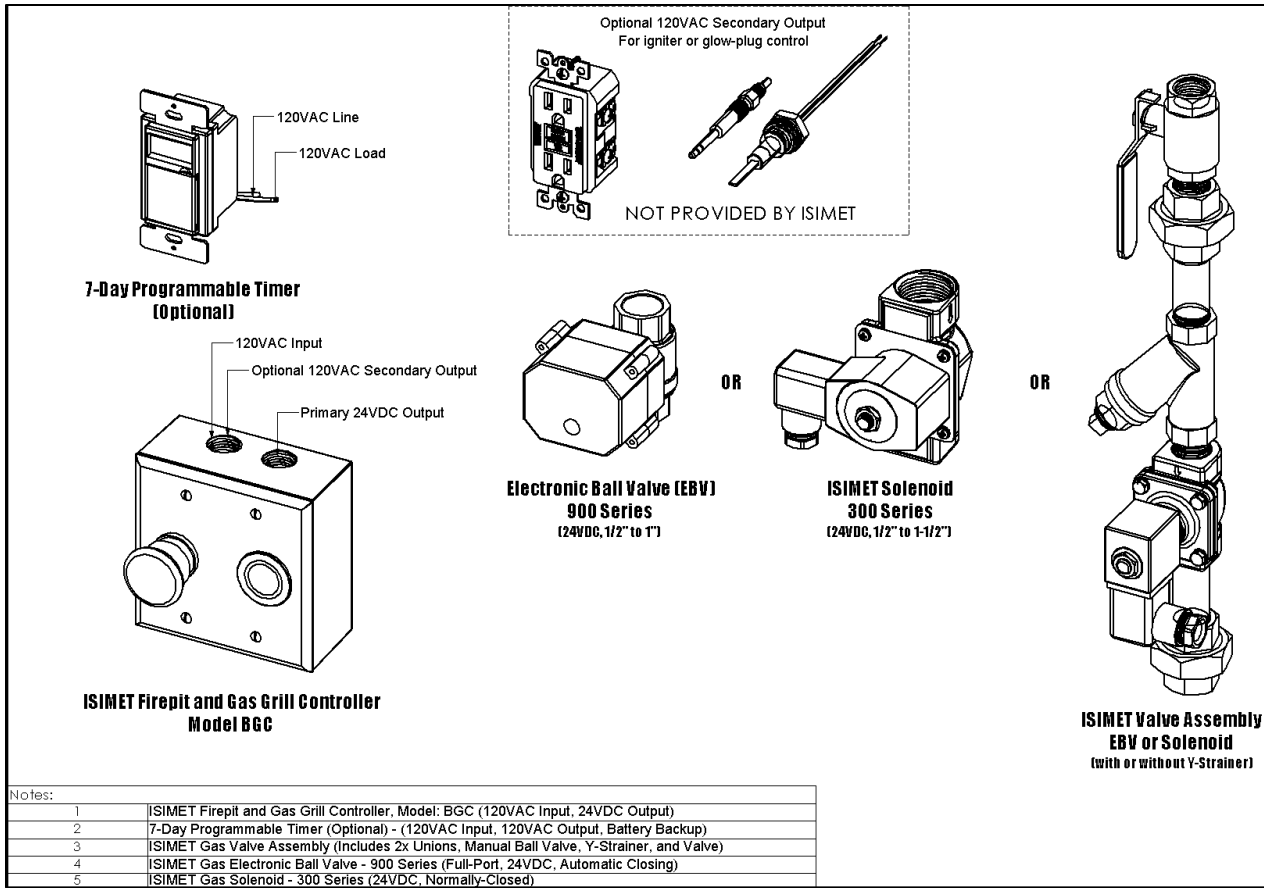
BGC (High-Voltage) Wiring Diagram



BGC Label

Description

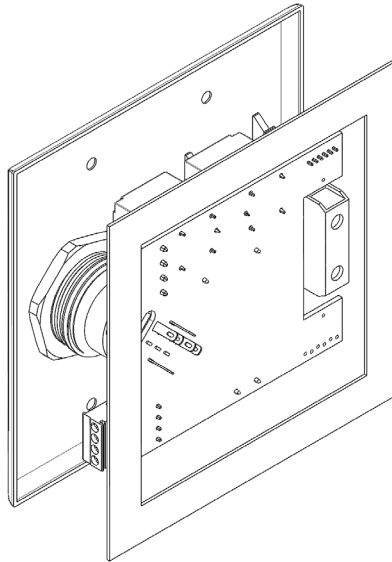
<i>Key</i>	<i>Key Bypass – Enables the Gas (Normally-Open Dry-Contact)</i>
<i>Panic</i>	<i>Emergency Shutoff Input (Normally-Open Dry-Contact)</i>
<i>Ground Symbol</i>	<i>Common</i>
<i>+24V</i>	<i>Gas Control Output (24V Electronic Ball Valve or Solenoid)</i>



Completing the BGC Installation

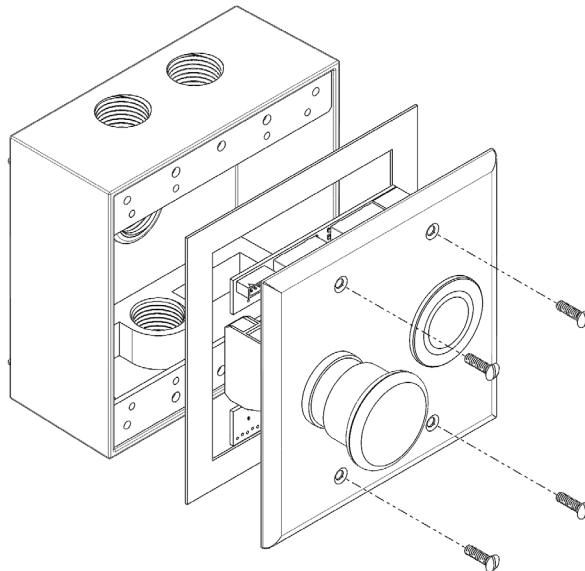
Attach the BGC Front Cover Assembly to the Double-Gang Box

1. The included weather foam gasket should be attached to the BGC Front Cover Assembly.



Weather Foam Gasket

2. Attach the BGC Front Cover Assembly using the included screws and make sure the foam gasket is centered to prevent water from entering the enclosure.



BGC Install Front Cover Assembly

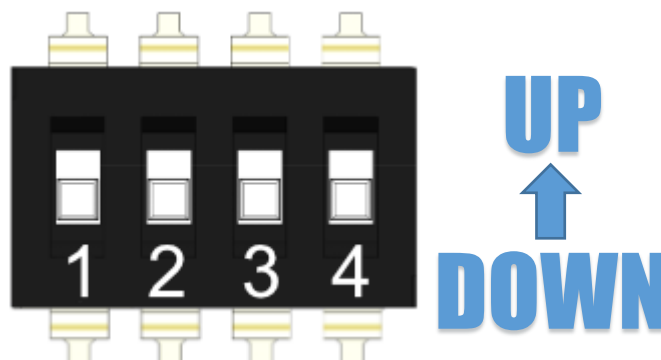
3. Turn on the power to the unit and test the functionality.

Configuring the BGC

The BGC will come preconfigured from the factory to turn the gas off after 1 hour; however, the configuration can easily be changed to an alternate timeout setting. The BGC time settings are adjusted by removing the front cover and adjusting the Timer Config DIP switch.

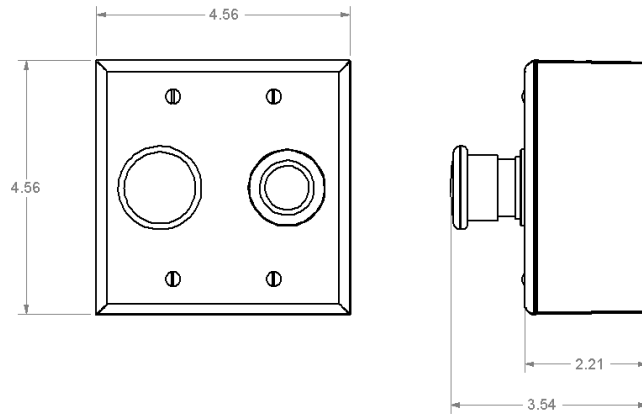
BGC Timing Configuration Settings

Timeout Setting	Timer Config 1	Timer Config 2	Timer Config 3	Timer Config 4
10 minutes	DOWN	DOWN	DOWN	DOWN
15 minutes	DOWN	DOWN	DOWN	UP
20 minutes	DOWN	DOWN	UP	DOWN
30 minutes	DOWN	DOWN	UP	UP
45 minutes	DOWN	UP	DOWN	DOWN
1 hour	DOWN	UP	DOWN	UP
2 hours	DOWN	UP	UP	DOWN
3 hours	DOWN	UP	UP	UP
4 hours	UP	DOWN	DOWN	DOWN
6 hours	UP	DOWN	DOWN	UP
8 hours	UP	DOWN	UP	DOWN
10 hours	UP	DOWN	UP	UP
12 hours	UP	UP	DOWN	DOWN
14 hours	UP	UP	DOWN	UP
16 hours	UP	UP	UP	DOWN
20 hours	UP	UP	UP	UP



Electrical Specifications

The BGC Utility Controller system is designed to be used with 15A/120VAC line voltage and a 24VDC Circuit Output.



Dimensional Drawing of BGC

BGC

100-240VAC (50/60Hz) Line Voltage Input

Line Input Current (1A + igniter/glow-plug)

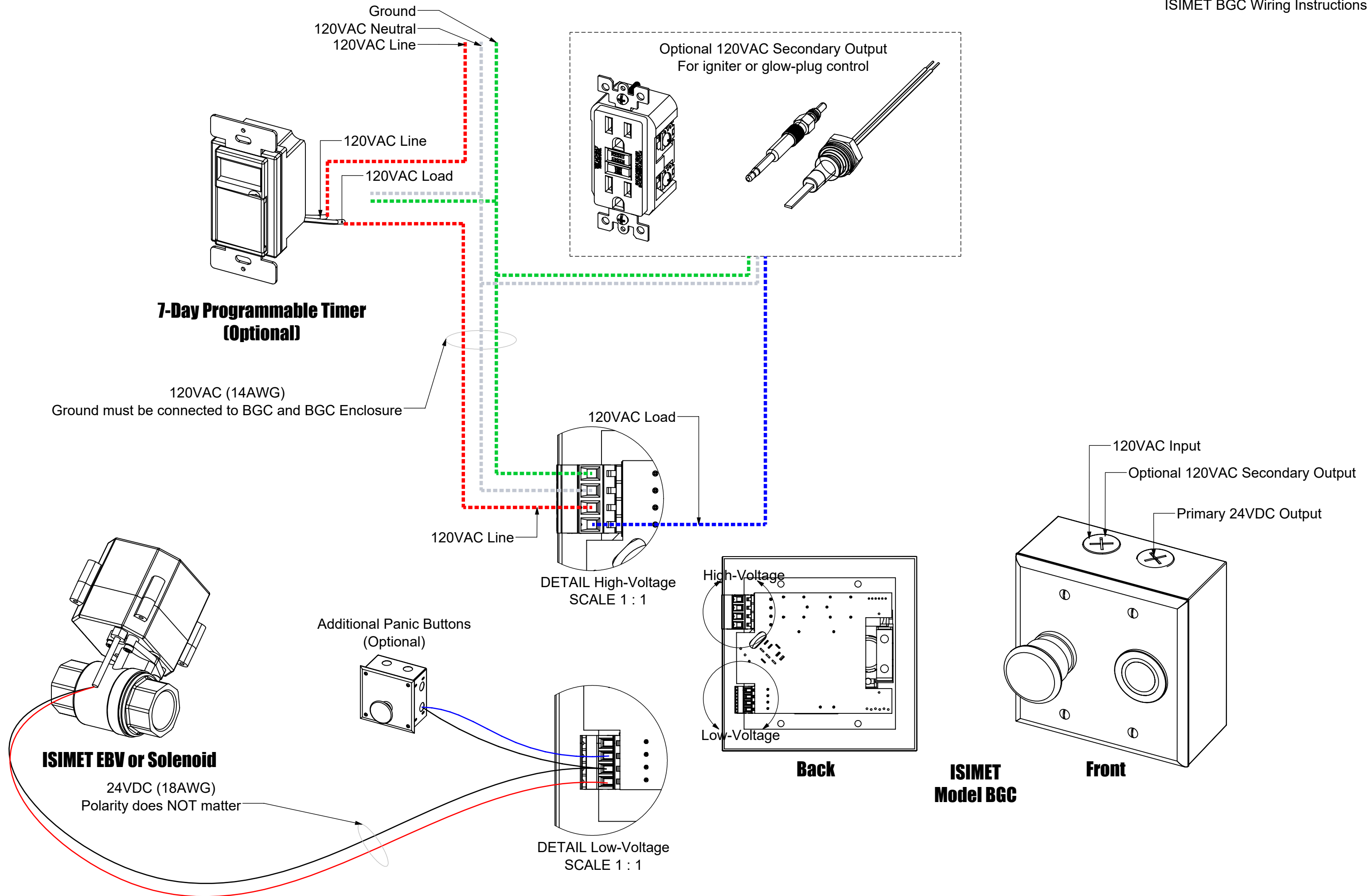
24VDC Circuit Output (Max 0.9A)

24VDC Output (Max 20W)

**Low-Voltage Short-Circuit Protection
(No Fuses)**

Line-Voltage Wire Size: 14 AWG Recommended

Control Wire Size: 18 AWG Recommended



RFI detail

#1 Door Schedule - Northern Michigan Glass



Status	Closed
Created on	Jan 30, 2025 by Matt Moser (WOLGAST CORPORATION)
RFI type	Default RFI workflow
Ball in court	Matt Moser (WOLGAST CORPORATION)
Answered	Feb 4, 2025 by Allison Schrecongost, Dustin DeWitt (The Collaborative)

Question

We are looking at the Oscoda Schools project and have a couple questions.

Doors 001, 002, 003, 004, 005 and 006-1 appear to have sidelites as shown on the floor plan on sheet A1.10 and sheet A6.00 detail F2. The Door Schedule has them listed as frame type F-1. Please confirm they should be frame type F-4?

Official response

Allison Schrecongost: See reply from Dustin.

Dustin DeWitt (The Collaborative): Doors 001, 002, 003, 004, 005 and 006-1 should be marked as frame type F-4. Sheet A2.00 has been included with updated door schedule.

By Allison Schrecongost, Dustin DeWitt (The Collaborative) - Feb 4, 2025, 9:05 AM EST

Official response attachments

[107253_OSCODA CC_A2.00 DOOR SCHEDULE_WINDOW ELEVATIONS_BULLETIN 01.PDF](#), Jan 31, 2025, 11:18 AM EST

Impact

Cost impact -

Schedule impact -

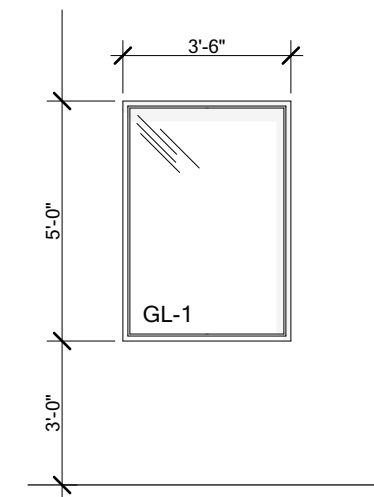
Other attributes

Priority Normal

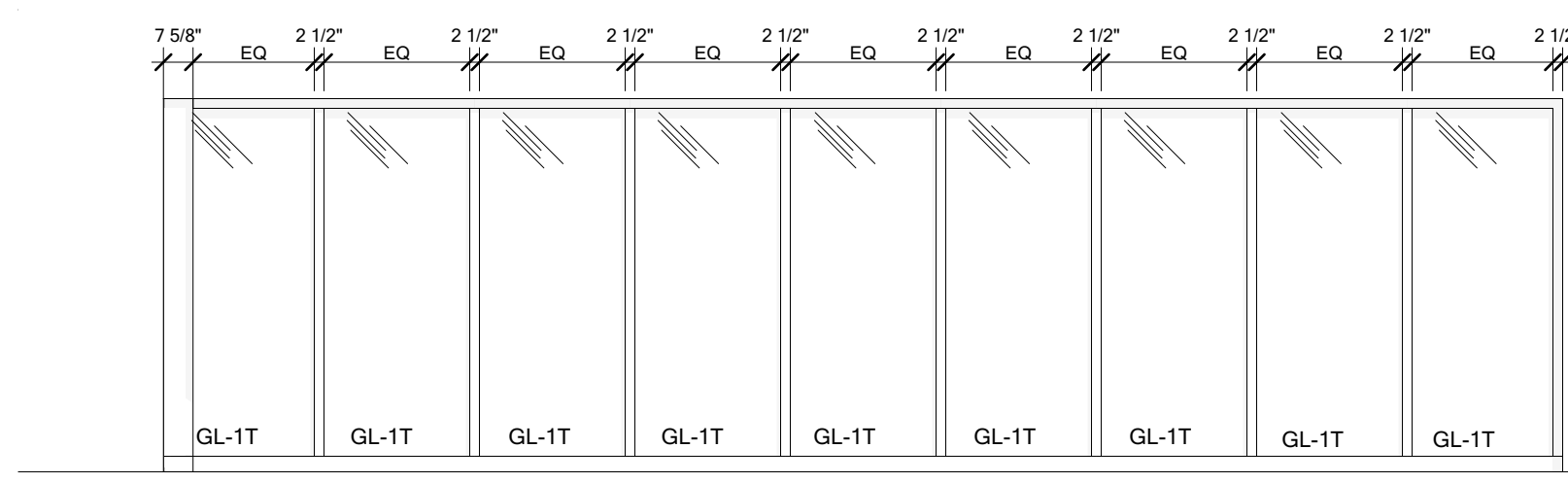
Discipline	-
Category	-
Location	-
Location details	jfogo@northernmichiganglass.com
External id	-
Co-reviewer(s)	
Construction Phase	Pre-Bid
Spec Section	-

Activities	By	At
<p>Christie Huver changed the status from Open Answered to Closed</p> <p>Official response: Allison Schrecongost: See reply from Dustin. Dustin DeWitt (The Collaborative): Doors 001, 002, 003, 004, 005 and 006-1 should be marked as frame type F-4. Sheet A2.00 has been included with updated door schedule. changed the official response attachment to: 107253_OSCODA CC_A2.00 DOOR SCHEDULE_WINDOW ELEVATIONS_BULLETIN 01.PDF</p>	Christie Huver	Feb 4, 2025, 9:09 AM EST
<p>Christie Huver changed the status from Open In Review to Open Answered set Ball in court to Matt Moser (WOLGAST CORPORATION)</p>	Christie Huver	Feb 4, 2025, 9:05 AM EST
<p>Allison Schrecongost response was submitted by Christie Huver: See reply from Dustin.</p>	Christie Huver	Feb 4, 2025, 9:05 AM EST
<p>Dustin DeWitt added a response: Doors 001, 002, 003, 004, 005 and 006-1 should be marked as frame type F-4. Sheet A2.00 has been included with updated door schedule. added the response attachment to: 107253_OSCODA CC_A2.00 DOOR SCHEDULE_WINDOW ELEVATIONS_BULLETIN 01.PDF</p>	Dustin DeWitt	Jan 31, 2025, 11:18 AM EST
<p>Matt Moser (WOLGAST CORPORATION) created this RFI in Open In Review status and set Ball in court to Allison Schrecongost, Dustin DeWitt (The Collaborative).</p>	Matt Moser	Jan 30, 2025, 10:24 AM EST

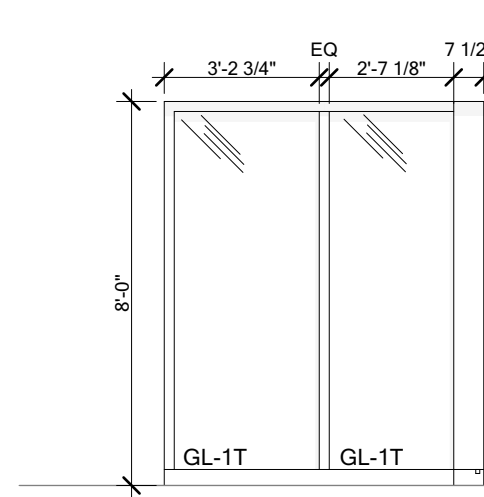
GLAZING GENERAL NOTES:
 1. PROVIDE SAFETY GLAZING AT ALL LOCATIONS REQUIRED BY CODE.
 2. REFER TO SPECIFICATIONS FOR DETAILED INFORMATION OF THE GLASS TYPES LISTED BELOW.
GLASS TYPES:
 GL-1 1" INSULATING GLASS UNIT
 GL-1T 1" INSULATING GLASS UNIT (TEMPERED)
 GL-2T 1/2" GLASS UNIT (TEMPERED)
 GL-3T 1/4" GLASS UNIT (TEMPERED)



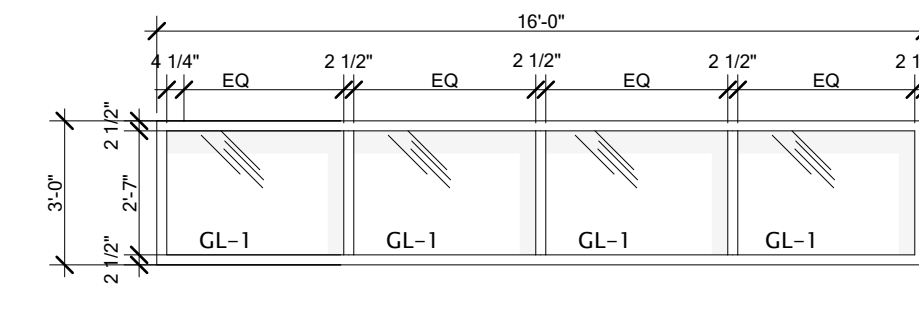
G9 SF-01 ELEVATION
SCALE: 1/4" = 1'-0"



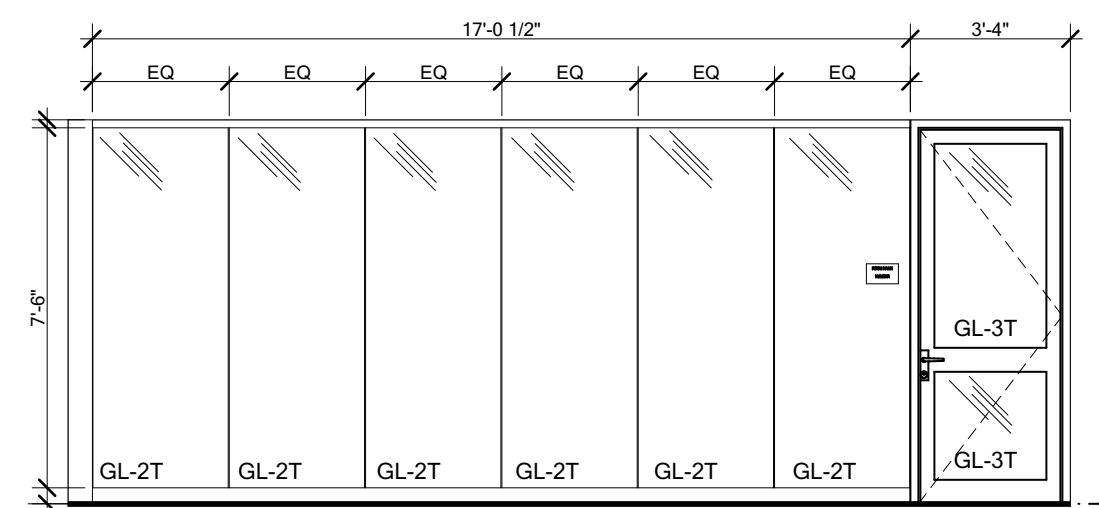
G6 SF-03A ELEVATION
SCALE: 1/4" = 1'-0"



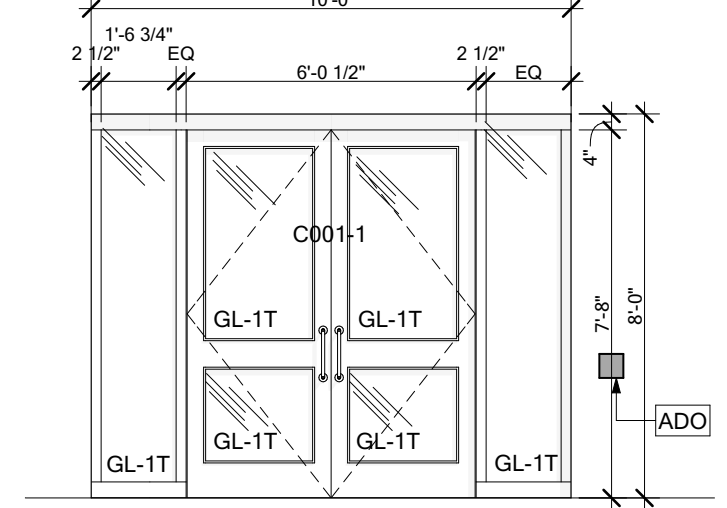
G5 SF-03B ELEVATION
SCALE: 1/4" = 1'-0"



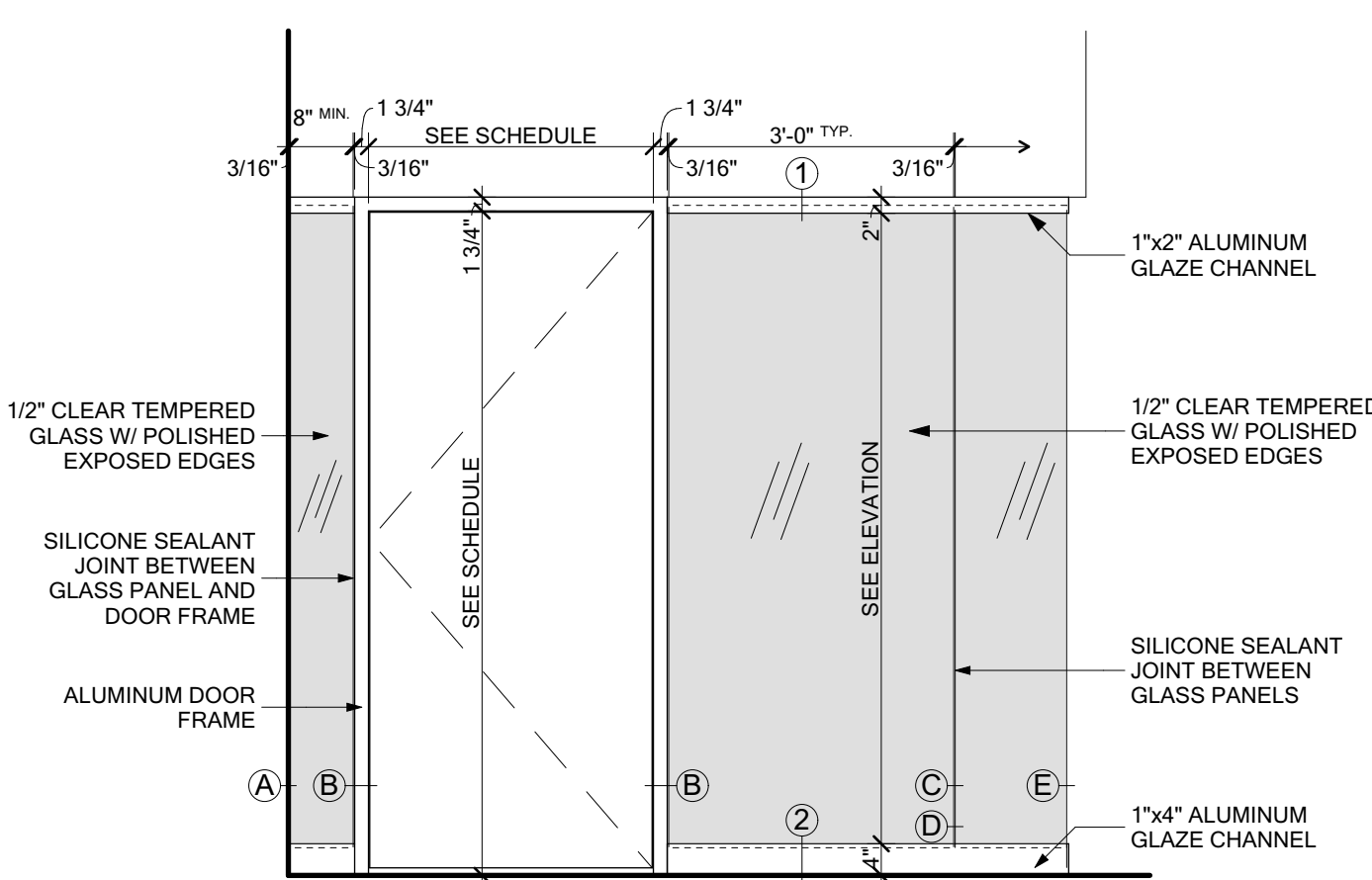
G3 SF-04 ELEVATION
SCALE: 1/4" = 1'-0"



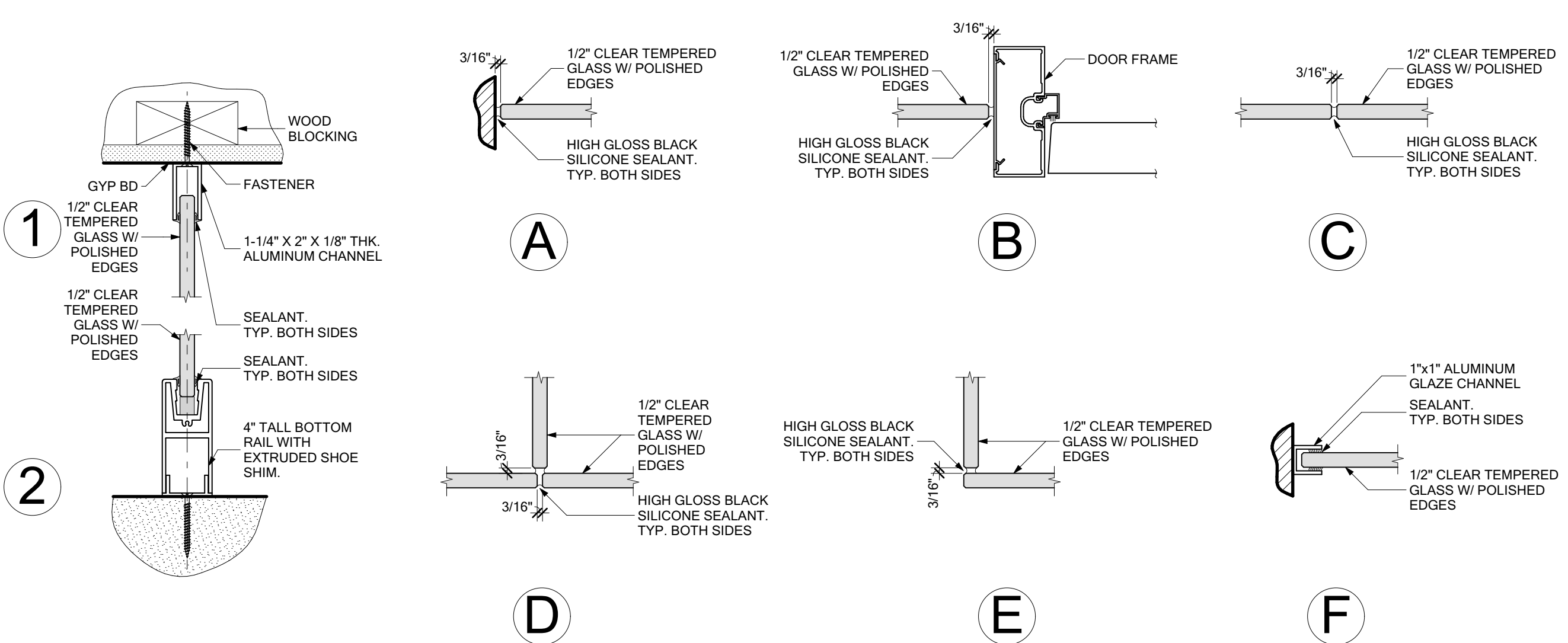
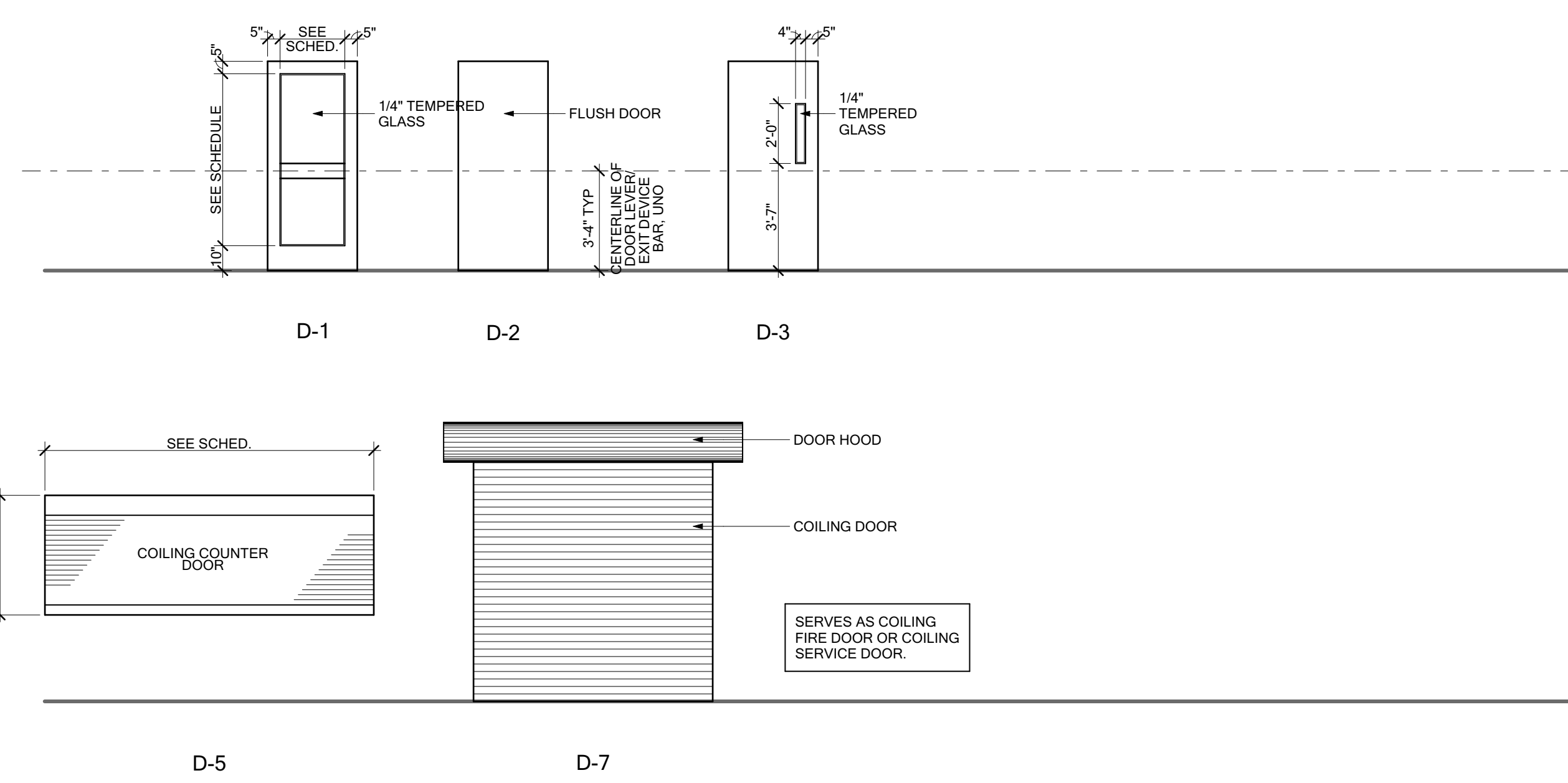
F8 IGW-01 ELEVATION
SCALE: 1/4" = 1'-0"



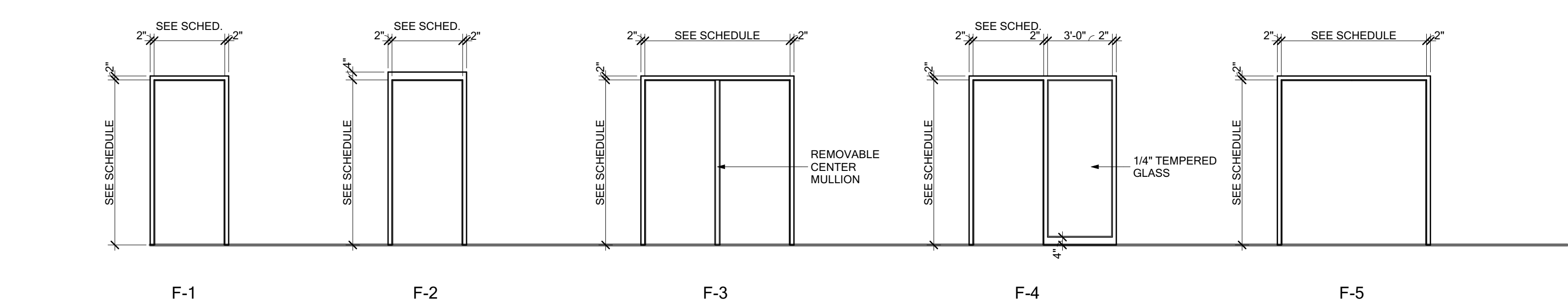
F7 SF-02A ELEVATION
SCALE: 1/4" = 1'-0"



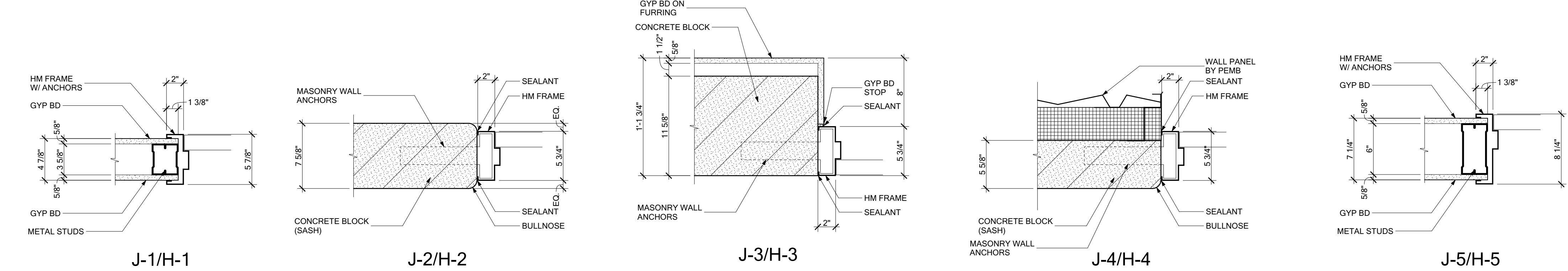
E2 INTERIOR GLAZING DETAILS 1/2"
SCALE: 1/2" = 1'-0"



D1 INTERIOR GLAZING DETAILS 3"
SCALE: 3" = 1'-0"



B5 DOOR ELEVATIONS
SCALE: 1/4" = 1'-0"



A3 DOOR JAMB DETAILS
SCALE: 1 1/2" = 1'-0"

No.	SIZE	DOOR				FRAME				H	J	HDW SET	FIRE RATING	REMARKS
		EL	MATL	FIN	STAIN	MATL	FIN	PT	PT					
001	3'-0"x8'-0"	D-1	SCWD	STAIN	F-4	HM	PT	H1	J1	8.0				
002	3'-0"x8'-0"	D-1	SCWD	STAIN	F-4	HM	PT	H1	J1	8.0				
003	3'-0"x8'-0"	D-1	SCWD	STAIN	F-4	HM	PT	H1	J1	8.0				
004	3'-0"x8'-0"	D-1	SCWD	STAIN	F-4	HM	PT	H1	J1	8.0				
005	3'-0"x8'-0"	D-1	SCWD	STAIN	F-4	HM	PT	H1	J1	8.0				
006-1	3'-0"x8'-0"	D-1	SCWD	STAIN	F-4	HM	PT	H1	J1	8.0				
006-2	3'-0"x8'-0"	D-2	HM	PT	F-1	HM	PT	H5	J5	3.0				
007	3'-0"x8'-0"	D-2	HM	PT	F-1	HM	PT	H1	J1	6.0				
008-1	3'-0"x8'-0"	D-2	HM	PT	F-1	HM	PT	H1	J1	6.0				
008-2	6'-0"x8'-0"	D-2	HM	PT	F-3	HM	PT	H5	J5	4.0				
009	3'-0"x8'-0"	D-1	SCWD	STAIN	F-1	HM	PT	H1	J1	6.0				
010	3'-0"x8'-0"	D-2	HM	PT	F-1	HM	PT	H3	J3	11.0				
011	3'-0"x8'-0"	D-2	HM	PT	F-1	HM	PT	H2	J2	12.0				
012	3'-0"x8'-0"	D-2	HM	PT	F-1	HM	PT	H3	J3	13.0				
013	3'-0"x8'-0"	D-2	HM	PT	F-1	HM	PT	H3	J3	13.0				
014-1	3'-0"x7'-10"	D-1	AL	CLEAR	F-1	AL				7.0				SEE INT GLAZING
014-2	3'-0"x8'-0"	D-3	SCWD	PT	F-1	HM	PT	H1	J1	6.0				
015-1	3'-0"x8'-0"	D-3	SCWD	PT	F-1	HM	PT	H1	J1	6.0				
015-2	3'-0"x8'-0"	D-2	SCWD	PT	F-1	HM	PT	H1	J1	6.0				
016-1	3'-0"x8'-0"	D-3	SCWD	PT	F-1	HM	PT	H1	J1	6.0				
016-2	6'-0"x8'-0"	D-2	HM	PT	F-3	HM	PT	H5	J5	4.0				
016-3	4'-0"x4'-0"	D-5								5.0				Serving window
017-1	8'-0"x8'-0"	D-7								5.0				COILING COUNTER
017-2	3'-0"x8'-0"	D-2	HM	PT	F-1	HM	PT	H1	J1	6.0				
018-1	6'-0"x8'-0"	D-2	HM	PT	F-3	HM	PT	H4	J4	4.0				
018-2	6'-0"x8'-0"	D-2	HM	PT	F-3	HM	PT	H4	J4	4.0				
018-3	6'-0"x8'-0"	D-2	HM	PT	F-3	HM	PT	H4	J4	4.0				
018-4	6'-0"x8'-0"	D-2	HM	PT	F-3	HM	PT	H4	J4	4.0				
018-5	6'-0"x8'-0"	D-1								5.0				OH DOOR
019	6'-0"x8'-0"	D-2	HM	PT	F-3	HM	PT	H1	J1	9.0				
020	3'-0"x8'-0"	D-2	HM	PT	F-1	HM	PT	H1	J1	6.0				
C001-1	6'-0"x7'-8"	D-1	AL	CLEAR		AL	CLEAR			1.0				STOREFRONT ENTRANCE
C001-2	6'-0"x8'-0"	D-1	AL	CLEAR		AL	CLEAR			2.0				STOREFRONT ENTRANCE
C002	6'-0"x8'-0"	D-2	HM	PT	F-5	HM	PT	H1	J1	10.0				180 Door swing, Both Sides and frame of door to be PT2
C003-1	3'-0"x8'-0"	D-1	SCWD	PT	F-1	HM	PT	H1	J1	6.0				
C003-2	3'-0"x8'-0"	D-2	HM	PT	F-1	HM	PT	H5	J5	3.0				

PROJECT TITLE
 OSCODA AREA SCHOOLS

NEW COMMUNITY CENTER

3550 E River Rd,
 Oscoda, MI, 48750

01/31/2025 BULLETIN #01
 12/18/2024 CD/RD
 10/11/2024 DESIGN DEVELOPMENT
 08/16/2024 SCHEMATIC DESIGN

TC JOB NO. 107253
 OWNER JOB NO. #Client Project No.

SHEET TITLE
 DOOR SCHEDULE/
 WINDOW ELEVATIONS

RFI detail

#2 Asphalt Path - Rieth-Riley



Status	Closed
Created on	Jan 30, 2025 by Matt Moser (WOLGAST CORPORATION)
RFI type	Default RFI workflow
Ball in court	Matt Moser (WOLGAST CORPORATION)
Answered	Feb 4, 2025 by Dustin DeWitt (The Collaborative)

Question

I am inquiring on the asphalt path for this project, on sheet C-501 it states "see standard duty HMA pavement section".

Does this mean that it will be a copy of the 2 lifts of 4EL or is that only referring to the sub-base and aggregate base portion of that section?

And if it is not a copy of the entire standard duty section, will the HMA portion for this path be 1 lift at 1.5", or something different entirely?

Official response

Dustin DeWitt (The Collaborative): The intent of the path is to be the same pavement section as the standard duty HMA section - both lifts of HMA (3" total) and the associated subbase and aggregate base. - F&V

By **Dustin DeWitt** (The Collaborative) - Feb 4, 2025, 9:10 AM EST

Impact

Cost impact -

Schedule impact -

Other attributes

Priority Normal

Discipline -

Category	-
Location	-
Location details	mhofweber@rieth-riley.com
External id	-
Co-reviewer(s)	
Construction Phase	Pre-Bid
Spec Section	-

Activities	By	At
<p>Christie Huver changed the status from Open Answered to Closed</p> <p>Official response: Dustin DeWitt (The Collaborative): The intent of the path is to be the same pavement section as the standard duty HMA section – both lifts of HMA (3” total) and the associated subbase and aggregate base. - F&V</p>	Christie Huver	Feb 4, 2025, 9:11 AM EST
<p>Christie Huver changed the status from Open In Review to Open Answered set Ball in court to Matt Moser (WOLGAST CORPORATION)</p>	Christie Huver	Feb 4, 2025, 9:10 AM EST
<p>Allison Schrecongost response was submitted by Christie Huver: Refer to response from Dustin</p>	Christie Huver	Feb 4, 2025, 9:10 AM EST
<p>Dustin DeWitt added a response: The intent of the path is to be the same pavement section as the standard duty HMA section – both lifts of HMA (3” total) and the associated subbase and aggregate base. - F&V</p>	Dustin DeWitt	Jan 31, 2025, 12:14 PM EST
<p>Matt Moser (WOLGAST CORPORATION) created this RFI in Open In Review status and set Ball in court to Allison Schrecongost, Dustin DeWitt (The Collaborative).</p>	Matt Moser	Jan 30, 2025, 12:03 PM EST

RFI detail

#3 Electrical Clarifications - Thunder Bay Electric



Status	Closed
Created on	Jan 30, 2025 by Matt Moser (WOLGAST CORPORATION)
RFI type	Default RFI workflow
Ball in court	Matt Moser (WOLGAST CORPORATION)
Answered	Feb 4, 2025 by Dustin DeWitt (The Collaborative)

Question

1 - Please confirm receptacle mounting requirements on PEMB columns in 018 FIELD HOUSE. 7/E5.01 requires rigid galvanized steel conduit for column-mounted receptacles in unfinished areas. Does this apply here? Is EMT conduit acceptable?

Columns are wrapped w/ plywood & padding. Will the padding be cut to accommodate receptacles? If so, who is responsible?

2 - Detail 3/E5.01 requires stainless steel conduit in areas deed by Ambient Declaration Table. Will stainless steel conduit be required on this project? The detail also calls for waterproof around the panelboard. Please confirm if this is required.

3 - Please confirm if details 1 & 5 require hazardous location fittings. Both call for conduit tee Crouse-Hinds GAUT24.

This is an explosion-proof fitting, listed for Class 1, Division 1 and other hazardous locations.

Official response

Dustin DeWitt (The Collaborative): 1 - Please confirm receptacle mounting requirements on PEMB columns in 018 FIELD HOUSE. 7/E5.01 requires rigid galvanized steel conduit for column-mounted receptacles in unfinished areas. Does this apply here? Is EMT conduit acceptable?

018 FIELDHOUSE is not considered an unfinished area.

Columns are wrapped w/ plywood & padding. Will the padding be cut to accommodate receptacles? If so, who is responsible?

General Trades will be installing and cutting the padding as required as well as providing the cutout inserts. Outlets just need to be furred out flush with finished surface as noted in specs and on detail 7/E5.01

2 - Detail 3/E5.01 requires stainless steel conduit in areas deed by Ambient Declaration Table. Will stainless steel conduit be required on this project? The detail also calls for waterproof around the panelboard. Please confirm if this is required.

Waterproofing will not be required.

3 - Please confirm if details 1 & 5 require hazardous location fittings. Both call for conduit tee Crouse-Hinds GAUT24. This is an explosion-proof fitting, listed for Class 1, Division 1 and other hazardous locations.

Details 1 & 5 will not require hazardous location fittings.

By *Dustin DeWitt* (The Collaborative) - Feb 4, 2025, 9:23 AM EST

References and Attachments

Files (3)

- [Clarification Request_TBE 01_250130.pdf](#)
- [Clarification Request_TBE 02_250130.pdf](#)
- [Clarification Request_TBE 03_250130.pdf](#)

Impact

Cost impact -

Schedule impact -

Other attributes

Priority Normal

Discipline -

Category -

Location -

Location details -

External id -

Co-reviewer(s)

Construction Phase Pre-Bid

Spec Section -

Activities	By	At
<p>Dustin DeWitt added a response: 1 - Please confirm receptacle mounting requirements on PEMB columns in 018 FIELD HOUSE. 7/E5.01 requires rigid galvanized steel conduit for column-mounted receptacles in unfinished areas. Does this apply here? Is EMT conduit acceptable? 018 FIELDHOUSE is not considered an unfinished area. Columns are wrapped w/ plywood & padding. Will the padding be cut to accommodate receptacles? If so, who is responsible? Wolgast to confirm means and methods. GC will be installing and cutting the padding as required as well as providing the cutout inserts. Outlets just need to be furred out flush with finished surface as noted in specs and on detail 7/E5.01 2 - Detail 3/E5.01 requires stainless steel conduit in areas deed by Ambient Declaration Table. Will stainless steel conduit be required on this project? The detail also calls for waterproof around the panelboard. Please confirm if this is required. Waterproofing will not be required. 3 - Please confirm if details 1 & 5 require hazardous location fittings. Both call for conduit tee Crouse-Hinds GAUT24. This is an explosion-proof fitting, listed for Class 1, Division 1 and other hazardous locations. Details 1 & 5 will not require hazardous location fittings.</p>	<p>Dustin DeWitt</p>	<p>Feb 4, 2025, 8:36 AM EST</p>
<p>Matt Moser changed the status from Draft to Open In Review changed the due date to Feb 3, 2025 set Ball in court to Allison Schrecongost, Dustin DeWitt (The Collaborative)</p>	<p>Matt Moser</p>	<p>Jan 30, 2025, 1:37 PM EST</p>
<p>Matt Moser added a reference to a File Clarification Request_TBE 03_250130.pdf</p>	<p>Matt Moser</p>	<p>Jan 30, 2025, 1:36 PM EST</p>
<p>changed the question to 1 - Please confirm receptacle mounting requirements on PEMB columns in 018 FIELD HOUSE. 7/E5.01 requires rigid galvanized steel conduit for column-mounted receptacles in unfinished areas. Does this apply here? Is EMT conduit acceptable? Columns are wrapped w/ plywood & padding. Will the padding be cut to accommodate receptacles? If so, who is responsible? 2 - Detail 3/E5.01 requires stainless steel conduit in areas deed by Ambient Declaration Table. Will stainless steel conduit be required on this project? The detail also calls for waterproof around the panelboard. Please confirm if this is required. 3 - Please confirm if details 1 & 5 require hazardous location fittings. Both call for conduit tee Crouse-Hinds GAUT24. This is an explosion-proof fitting, listed for Class 1, Division 1 and other hazardous locations.</p>	<p>Matt Moser</p>	<p>Jan 30, 2025, 1:35 PM EST</p>

changed the **question** to 1 - Please confirm receptacle mounting requirements on PEMB columns in 018 FIELD HOUSE. 7/E5.01 requires rigid galvanized steel conduit for column-mounted receptacles in unfinished areas. Does this apply here? Is EMT conduit acceptable? Columns are wrapped w/ plywood & padding. Will the padding be cut to accommodate receptacles? If so, who is responsible? 2 - Detail 3/E5.01 requires stainless steel conduit in areas deed by Ambient Declaration Table. Will stainless steel conduit be required on this project? The detail also calls for waterproof around the panelboard. Please confirm if this is required.3 - Please conrm if details 1 & 5 require hazardous location ttings. Both call for conduit tee Crouse-Hinds GAUT24. This is an explosion-proof tting, listed for Class 1, Division 1 and other hazardous locations.

Matt Moser

Jan 30, 2025, 1:33 PM EST

changed the **question** to 1 - Please confirm receptacle mounting requirements on PEMB columns in 018 FIELD HOUSE. 7/E5.01 requires rigid galvanized steel conduit for column-mounted receptacles in unfinished areas. Does this apply here? Is EMT conduit acceptable? Columns are wrapped w/ plywood & padding. Will the padding be cut to accommodate receptacles? If so, who is responsible? 2 - Detail 3/E5.01 requires stainless steel conduit in areas deed by Ambient Declaration Table. Will stainless steel conduit be required on this project? The detail also calls for waterproof around the panelboard. Please confirm if this is required.

Matt Moser

Jan 30, 2025, 1:33 PM EST

changed the **question** to 1 - Please confirm receptacle mounting requirements on PEMB columns in 018 FIELD HOUSE. 7/E5.01 requires rigid galvanized steel conduit for column-mounted receptacles in unfinished areas. Does this apply here? Is EMT conduit acceptable? Columns are wrapped w/ plywood & padding. Will the padding be cut to accommodate receptacles? If so, who is responsible? 2 - Detail 3/E5.01 requires stainless steel conduit in areas deed by Ambient Declaration Table. Will stainless steel conduit be required on this project?

Matt Moser

Jan 30, 2025, 1:31 PM EST

Matt Moser
changed the status from  **Open** Waiting for Submission to  **Draft**

Matt Moser

Jan 30, 2025, 1:30 PM EST

Need to revise

Matt Moser

Jan 30, 2025, 1:30 PM EST

Matt Moser
changed the status from  **Open** In Review to  **Open** Waiting for Submission
set Ball in court to **Matt Moser** (WOLGAST CORPORATION)

Matt Moser

Jan 30, 2025, 1:30 PM EST

Need to revise

Matt Moser

Jan 30, 2025, 1:30 PM EST

Matt Moser added a reference to a File **Clarification Request_TBE 02_250130.pdf**

Matt Moser

Jan 30, 2025, 12:44 PM EST

Matt Moser added a reference to a File **Clarification Request_TBE 01_250130.pdf**

Matt Moser

Jan 30, 2025, 12:44 PM EST

Matt Moser (WOLGAST CORPORATION) created this RFI in

Open In Review status and set Ball in court to **Allison Schrecongost,**
Dustin DeWitt (The Collaborative).

Matt Moser

Jan 30, 2025, 12:44
PM EST

CLARIFICATION REQUEST FORM

Date: 1/30/25

Wolgast Clarification Request #: _____

To: Wolgast Corporation
Matt Moser or **Christie Bigelow-Huver**
4835 Towne Centre Road, Suite 203
Saginaw, MI 48604
Phone (989) 790-9120, Fax (989) 790-9063

From: Thunder Bay Electric, Inc
Contractor Name David Hammerquist
Contact Name david@thunderbayelectric.com
Email Address (989) 354-2840
Phone # _____ Fax # _____

Bid Division # and Name: 260000 - Electrical

CSI Code (If Applicable): _____

Drawing #: E5.01 Detail or Item #: 7/E5.01

Reason for Request: More Detail Needed Engineering Clarification Alternate Proposal Other

Project: Oscoda Area Schools 2024 Bond Program

Site Location: BP 2 Community Center

ITEM(S) FOR CLARIFICATION OF BID: (Please use one form for each item)

Please review and respond to the following item(s) for clarification:

Please confirm receptacle mounting requirements on PEMB columns in 018 FIELD HOUSE. 7/E5.01 requires rigid galvanized steel conduit for column-mounted receptacles in unfinished areas. Does this apply here? Is EMT conduit acceptable?

Columns are wrapped w/ plywood & padding. Will the padding be cut to accommodate receptacles? If so, who is responsible?

RESPONSE: ITEM TO BE INCLUDED IN ADDENDUM

Construction Manager: _____
Signature Date

Architect: _____
Signature Date

END OF SECTION 00310

CLARIFICATION REQUEST FORM

Date: 1/30/25

Wolgast Clarification Request #: _____

To: Wolgast Corporation
Matt Moser or **Christie Bigelow-Huver**
4835 Towne Centre Road, Suite 203
Saginaw, MI 48604
Phone (989) 790-9120, Fax (989) 790-9063

From: Thunder Bay Electric, Inc
Contractor Name David Hammerquist
Contact Name david@thunderbayelectric.com
Email Address (989) 354-2840
Phone # _____ Fax # _____

Bid Division # and Name: 260000 - Electrical

CSI Code (If Applicable): _____

Drawing #: E5.01 Detail or Item #: 3/E5.01

Reason for Request: More Detail Needed Engineering Clarification Alternate Proposal Other

Project: Oscoda Area Schools 2024 Bond Program

Site Location: BP 2 Community Center

ITEM(S) FOR CLARIFICATION OF BID: (Please use one form for each item)

Please review and respond to the following item(s) for clarification:

Detail 3/E5.01 requires stainless steel conduit in areas defined by Ambient Declaration Table.
Is stainless steel conduit required on this project. _____

The detail also calls for waterproof seal around the panelboard. Please confirm if this is required. _____

RESPONSE: **ITEM TO BE INCLUDED IN ADDENDUM**

Construction Manager: _____
Signature Date

Architect: _____
Signature Date

END OF SECTION 00310

CLARIFICATION REQUEST FORM

Date: 1/30/25

Wolgast Clarification Request #: _____

To: Wolgast Corporation
Matt Moser or **Christie Bigelow-Huver**
4835 Towne Centre Road, Suite 203
Saginaw, MI 48604
Phone (989) 790-9120, Fax (989) 790-9063

From: Thunder Bay Electric, Inc
Contractor Name David Hammerquist
Contact Name david@thunderbayelectric.com
Email Address (989) 354-2840
Phone # _____ Fax # _____

Bid Division # and Name: 260000 - Electrical

CSI Code (If Applicable): _____

Drawing #: E5.02 Detail or Item #: 1/E5.02, 5/E5.02

Reason for Request: More Detail Needed Engineering Clarification Alternate Proposal Other

Project: Oscoda Area Schools 2024 Bond Program

Site Location: BP 2 Community Center

ITEM(S) FOR CLARIFICATION OF BID: (Please use one form for each item)

Please review and respond to the following item(s) for clarification:

Please confirm if details 1 & 5 require hazardous location fittings. _____
Both call for conduit tee Crouse-Hinds GAUT24. _____
This is an explosion-proof fitting, listed for Class 1, Division 1 and other hazardous locations. _____

RESPONSE: ITEM TO BE INCLUDED IN ADDENDUM

Construction Manager: _____
Signature Date

Architect: _____
Signature Date

END OF SECTION 00310

RFI detail

#4 Resilient Athletic Flooring Substitution Request



Status	Closed
Created on	Feb 3, 2025 by Christie Huver (WOLGAST CORPORATION)
RFI type	Default RFI workflow
Ball in court	Christie Huver (WOLGAST CORPORATION)
Answered	Feb 13, 2025 by Dustin DeWitt (The Collaborative)

Question

Please review the attached information on Tarkett Sports PolyTurf for consideration as an approved equal.

Official response

Dustin DeWitt (The Collaborative): Submittal rejected. Please see specs for acceptable manufacturers

By *Dustin DeWitt* (The Collaborative) - Feb 13, 2025, 1:45 PM EST

References and Attachments

Files (7)

- [Brochure - Omnisports - TSI - OCT2022_US_reader.pdf](#)
- [Brochure - PolyTurf - TSI - APR2024_reader.pdf](#)
- [CSI Sub Request Form -Oscoda Area Schools BP#2 - Cutting Edge Sports Flooring - Sub Request #2.pdf](#)
- [CSI Sub Request Form -Oscoda Area Schools BP#2 - Cutting Edge Sports Flooring - Sub Request.pdf](#)
- [Data Sheet - Omnisports HPL 7 - TS Indoor - MAR2021.pdf](#)
- [TS - Great Space - TS_Cutting Edge - NOV2023.pdf](#)
- [Technical Data - TS Indoor - POLYTURF PLUS 7+2 PAD AND POUR.pdf](#)

Impact

Cost impact -

Schedule impact -

Other attributes

Priority Normal

Discipline -

Category -

Location -

Location details jennifer@cesportsflooring.com

External id -

Co-reviewer(s)

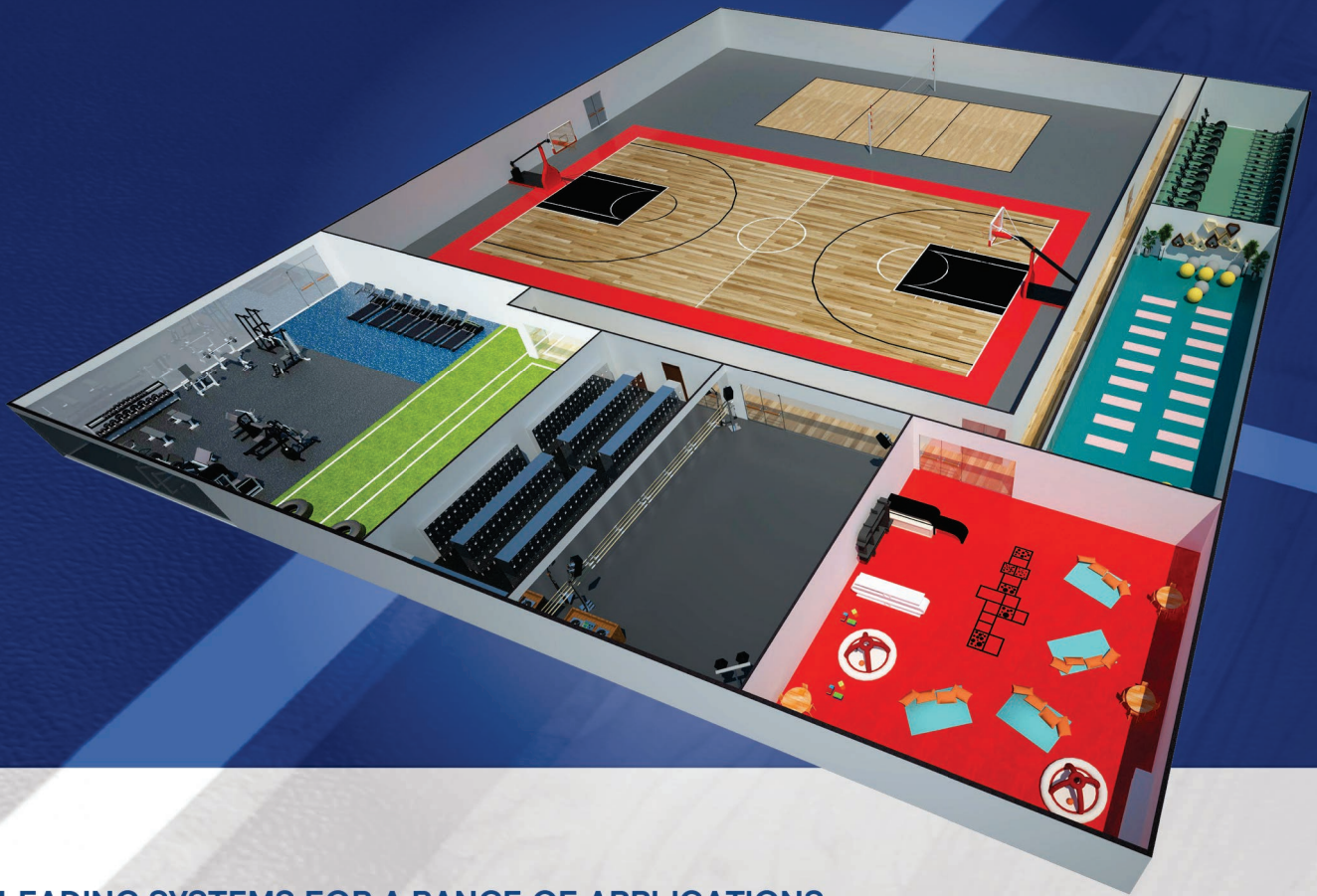
Spec Section -

Construction Phase Pre-Bid

Activities	By	At
Christie Huver changed the status from Open Answered to Closed Official response: Dustin DeWitt (The Collaborative): Submittal rejected. Please see specs for acceptable manufacturers	Christie Huver	Feb 13, 2025, 1:45 PM EST
Christie Huver changed the status from Open In Review to Open Answered set Ball in court to Christie Huver (WOLGAST CORPORATION)	Christie Huver	Feb 13, 2025, 1:45 PM EST
Allison Schrecongost response was submitted by Christie Huver : See response from Dustin	Christie Huver	Feb 13, 2025, 1:45 PM EST
Dustin DeWitt added a response: Submittal rejected. Please see specs for acceptable manufacturers	Dustin DeWitt	Feb 6, 2025, 9:54 AM EST
Christie Huver added a reference to a File Data Sheet - Omnisports HPL 7 - TS Indoor - MAR2021.pdf	Christie Huver	Feb 3, 2025, 12:12 PM EST
Christie Huver added a reference to a File CSI Sub Request Form -Oscoda Area Schools BP#2 - Cutting Edge Sports Flooring - Sub Request.pdf	Christie Huver	Feb 3, 2025, 12:12 PM EST
Christie Huver added a reference to a File CSI Sub Request Form -Oscoda Area Schools BP#2 - Cutting Edge Sports Flooring - Sub Request #2.pdf	Christie Huver	Feb 3, 2025, 12:12 PM EST
Christie Huver added a reference to a File Brochure - PolyTurf - TSI - APR2024_reader.pdf	Christie Huver	Feb 3, 2025, 12:12 PM EST
Christie Huver added a reference to a File Brochure - Omnisports - TSI - OCT2022_US_reader.pdf	Christie Huver	Feb 3, 2025, 12:12 PM EST
Christie Huver added a reference to a File TS - Great Space - TS_Cutting Edge - NOV2023.pdf	Christie Huver	Feb 3, 2025, 12:12 PM EST
Christie Huver added a reference to a File Technical Data - TS Indoor - POLYTURF PLUS 7+2 PAD AND POUR.pdf	Christie Huver	Feb 3, 2025, 12:12 PM EST
Christie Huver (WOLGAST CORPORATION) created this RFI in Open In Review status and set Ball in court to Allison Schrecongost, Dustin DeWitt (The Collaborative).	Christie Huver	Feb 3, 2025, 12:12 PM EST

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ONE SURFACE AT A TIME



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Laura Piebenga
616.808.0292
laura@cesportsflooring.com

WE HAVE THE KNOWLEDGE & EXPERTISE TO MAKE YOUR FACILITY A SUCCESS



OMNISPORTS

BENEFITS

- ▶ Floor Score® indoor air quality
- ▶ Superior Sports Performance
- ▶ Consistent Surface Texture
- ▶ Easy Maintenance
- ▶ Fast Identification Recovery
- ▶ Phthalate-Free Manufacturing



LINOSPORT

BENEFITS

- ▶ Floor Score® indoor air quality
- ▶ Extreme abrasion and soil resistance
- ▶ Reduced maintenance
- ▶ LEED credit qualifications
- ▶ Unique color selection and natural patterns of EcoPure linoleum



LUMAFLEX

BENEFITS

- ▶ Multipurpose floor with unlimited possibilities
- ▶ Reduced Annual Maintenance Costs
- ▶ Lower life cycle costs
- ▶ LEED credit qualifications
- ▶ Very good for Point Load Stress Impact
- ▶ Outstanding Playability



CLUTCHCOURT

BENEFITS

- ▶ A Consistent Competitive Surface
- ▶ MFMA PUR Compliant
- ▶ Quality Manufacturing



POLYTURF PLUS PAD & POUR

BENEFITS

- ▶ GREENGUARD Gold Certification
- ▶ Seamless Surface
- ▶ Fast Installation Time
- ▶ More Color Options



DROPZONE

BENEFITS

- ▶ Floor Score® indoor air quality
- ▶ Versatile Color Selection
- ▶ Reduced Maintenance



DROPTURF

BENEFITS

- ▶ Delivers leading performance, stability, and wear resistance.
- ▶ Leading comfort, reduced abrasion
- ▶ Customizable designs
- ▶ VOC Compliance: Less than 10 µg/m³



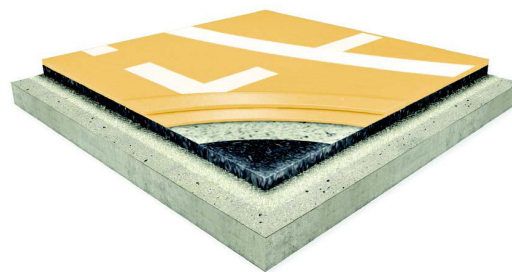
EASY FIELD

BENEFITS

- ▶ Durable turf
- ▶ Lightweight cushioned tile
- ▶ Easy installation
- ▶ A full field in less than a day
- ▶ Easy-to-handle lightweight tiles

Description

PolyTurf Plus Pad and Pour 7+2 is a seamless polyurethane sports surface that is designed for durability. This field-constructed system includes a 7 mm recycled rubber base mat for comfort and shock absorption.



PROPERTY	STANDARD	VALUE
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| Sports Characteristics

Surface Finish Effect	ASTM F2772-11	Passed
Force Reduction	ASTM F2772-11	Class 2
Vertical Deformation	ASTM F2772-11	Passed
Ball Rebound	ASTM F2772-11	Passed

| Technical Characteristics

Reaction to Fire	ASTM E648	Class 1 (Radiant Panel)
Shore Hardness	—	80 (Shore A)
Rolling Load	EN 1569	≤ 0.5 mm (No Degradation)
Tensile Strength	ASTM D412	3200 psi
Elongation	ASTM D412	340%
Tear Strength	ASTM D624	360 PLI
Thickness	—	9.0 mm (0.354")
Roll Width (Base Mat)	—	1.5 m (59")
Roll Length (Base Mat)	—	25 m (82')
Weight (Base Mat)	—	4.5 kg/m ² (0.93 lbs./sq. ft.)
Density (Base Mat)	ASTM D297	0.67 min g/cm ³
Tensile Strength (Base Mat)	ASTM D412	88 psi (die cast C)
Elongation (Base Mat)	ASTM D412	48.5% (die cast C)
Compression (Base Mat)	ASTM F36	87% (50 psi), 91% (100 psi), 91% (200 psi)
Flexibility (Base Mat)	ASTM F147	0-1
Compression Set B (Base Mat)	ASTM D395	37% (25% deflection, 158° F/22 hrs.)
Compression Set B (Base Mat)	ASTM D395	26% (50% deflection 158°F/22hrs)

Compatible substrates include: properly constructed and prepared concrete, wood, asphalt, and cementitious underlayments. Refer to current installation guidelines, ASTM F710, ACI 302.2R, and other industry standard recommendations for more information. Tarkett Sports reserves the right to modify these specifications without affecting their compliance with standards. Some results may vary in relation to certain flexibilities found within specified testing procedures and manufacturing tolerances.

Warranty Protection

30 - year comprehensive product coverage. Refer to sample warranty document for complete coverage details

Environmental Facts

For environmental facts, visit: <https://www.tarkettsportsindoor.com/environmental-responsibility/>

Maintenance Instructions

For maintenance instructions, please refer to the PolyTurf Plus Pad and Pour maintenance guide at the following link: [tarkettsportsindoor.com/en/specs-and-data/care-and-maintenance](https://www.tarkettsportsindoor.com/en/specs-and-data/care-and-maintenance).

Installation Method

- Multi-Poxy Adhesive: installation using Tarkett's solvent-free Multi-Poxy adhesive, which allows moisture tolerance of up to 98% relative humidity per ASTM F2170.
- Beybond 50 Adhesive: installation using Beybond 50 two-part polyurethane adhesive, which allows moisture tolerance of up to 92% relative humidity per ASTM F2170.
- Tarkolay with Multi-Poxy: installation over Tarkolay moisture barrier using Tarkett's solvent-free Multi-Poxy adhesive, which allows moisture tolerance of up to 100% relative humidity per ASTM F2170.

Available Colors



Beige
1200-0133



Black
1200-0091



Blue Blood
1200-0185



Blue Chip
1200-0063



Blue Jay
1200-0125



Blue
1200-0161



Boyden Green
1200-0169



Bright Orange
1200-0065



Bright Red
1200-0044



Butterfield Yellow
1200-0177



Chapel Hill Blue
1200-0073



Classic Tan
1200-0089



Dark Navy Blue
1200-0081



Deep Blue
1200-0111



Desert
1200-0015



Dolphin Grey
1200-0004



Gallant Gold
1200-0123



Garden Cucumber
1200-0155



Garden Green
1200-0062



Gauntlet Grey
1200-0154



Gold
1200-0043



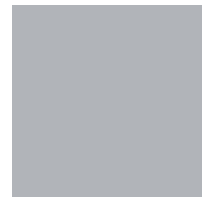
Grass Green
1200-0093



Green
1200-0113



Grey Cloud
1200-0085



Grey Screen
1200-0184

The colors presented here are representations only.
For information on obtaining individual color swatches, contact a local Tarkett Sports representative or call 888-364-6541.

POLYTURF PLUS 7+2 PAD AND POUR Technical Data Sheet

Available Colors



Grey Smoke
1200-0077



Grey
1200-0060



Light Grey
1200-0083



Mid Grey
1200-0180



Midnight Blue
1200-0070



Morning Fog
1200-0066



Ocean Blue
1200-0011



Orange
1200-0094



Pink Panther
1200-0186



Pool Blue
1200-0096



Purdue Gold
1200-0162



Purple
1200-0175



Real Red
1200-0084



Red Theatre
1200-0181



Royal Blue
1200-0037



Sage Green
1200-0006



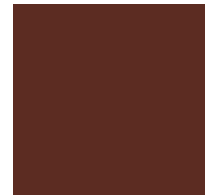
Smoothie
1200-0068



Southern Blue
1200-0168



Storm Grey
1200-0102



Sundried Tomato
1200-0122



Tarkett Blue
1200-0092



Tropical Green
1200-0135



Vibrant Yellow
1200-0149



White
1200-0900



Yellow
1200-0149

The colors presented here are representations only.
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Game Line Colors



Blue



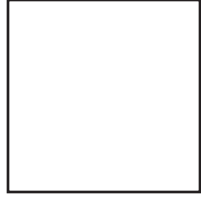
Yellow



Orange



Aviation-Bright Red



White



Green



Black

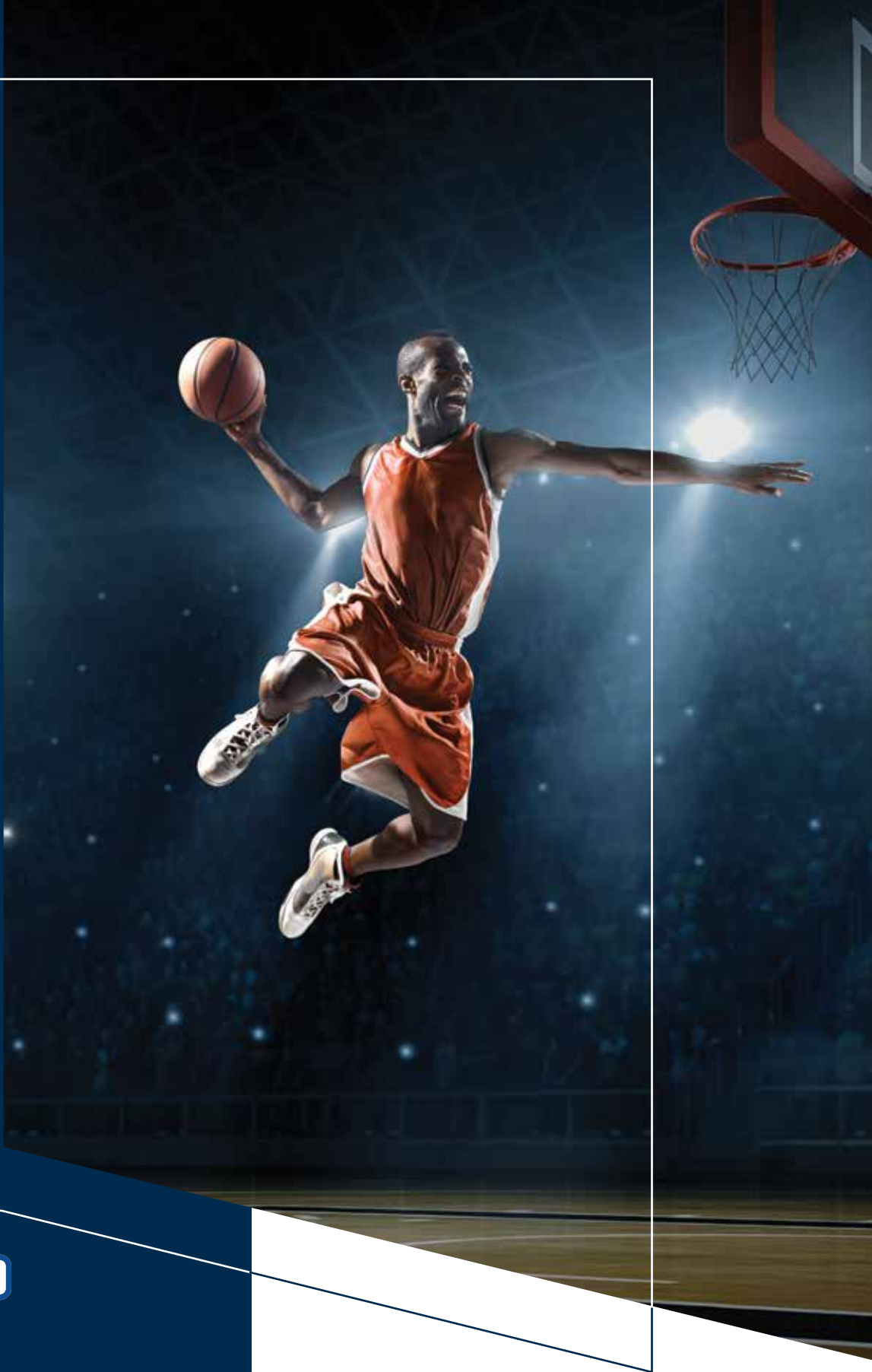


Grey

The colors presented here are representations only.
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Play to win

OMNISPORTS



 **Tarkett**SPORTS
INDOOR

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OMNISPORTS

Everything we do, and the way we do it, is aimed to make the process easier for you. We focus on ensuring your experience is memorable and hassle free.

We understood long ago that a successful sports surface relies on a quality product installed by a quality team. We've built our Omnisports Series by combing the best systems with the best people and the best partners. You can trust the renowned quality of Omnisports and the reputed experience of our team.

**We're ready to partner on your next project.
Lets get started!**

TARKETT SPORTS IS A WORLD LEADER IN ATHLETIC SURFACING, OFFERING A COMPREHENSIVE PORTFOLIO OF INDOOR AND OUTDOOR SPORTS SURFACES. OUR MISSION: TO OFFER SUSTAINABLE SPORTS SURFACES THAT MAKE THE DIFFERENCE FOR ATHLETES.



TARKETT SPORTS BRAND

Tarkett Sports is a world leader in athletic surfacing, offering a comprehensive portfolio of sports flooring solutions through its brands: FieldTurf, Beynon Sports, Renner Sports, EasyTurf, GrassMaster, PlayMaster and Tarkett Sports Indoor.



DESIGN & CONSTRUCTION EXPERTS

Tarkett Sports and our partners are some of the most experienced and knowledgeable teams in the industry. When it comes to the design and construction of your sports surface, we are the experts.



FINANCIALLY STABLE

The Tarkett Group is a worldwide leader of innovative flooring and sports surface solutions. Tarkett Sports Indoor is backed by unprecedented financial support and stability. You can rest easy.



LEADING DURABILITY

Manufactured and installed with the highest attention to detail, Tarkett Sports Indoor's systems showcase proven durability.



EXPERIENCE

With over 10,000 installations in North America in the last 10 years, Tarkett Sports Indoor has the knowledge and expertise to make your sports facility a success.



TRUSTED

Tarkett Sports Indoor offers some of the most trusted sports flooring solutions for a variety of applications and programs.



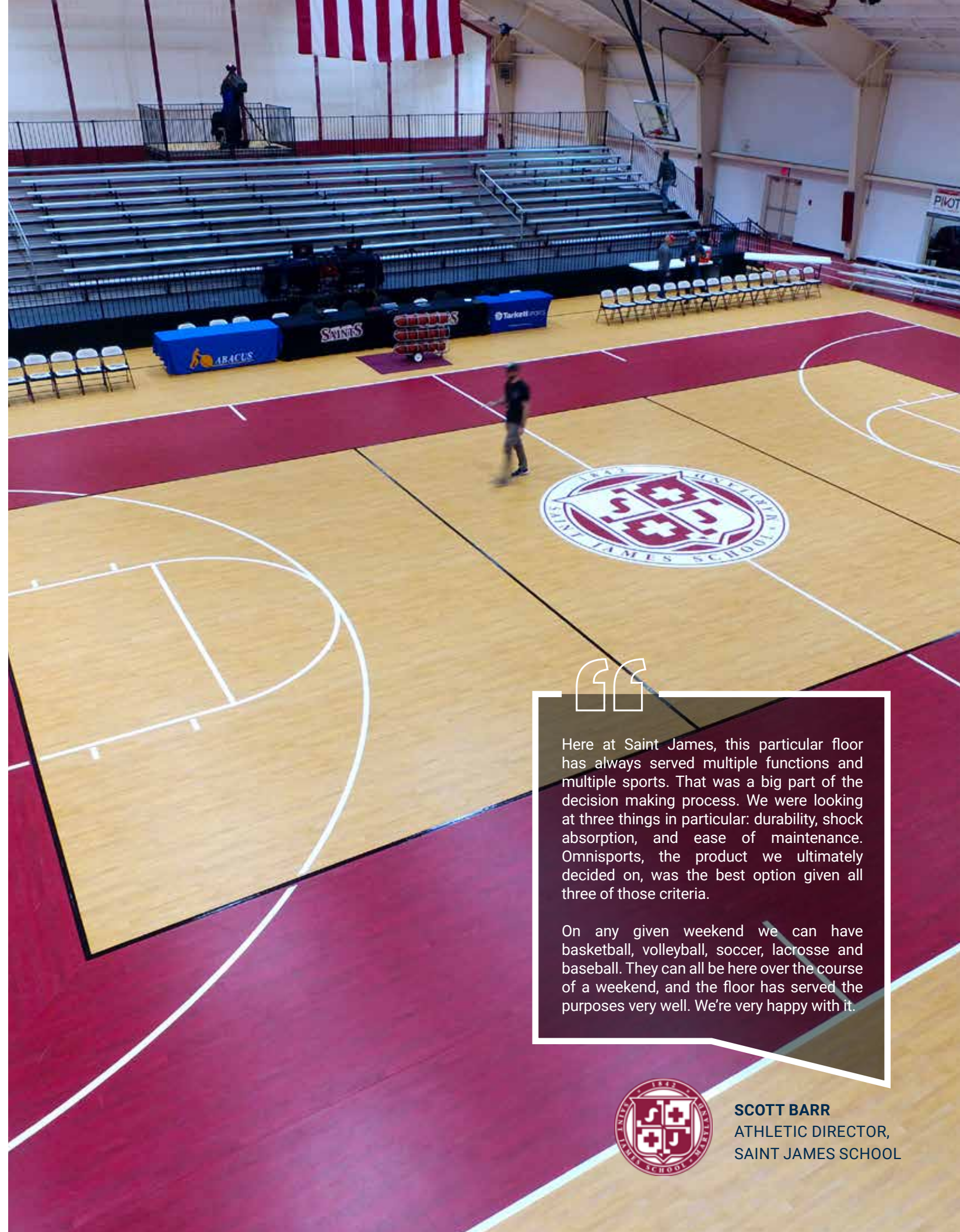
ENDLESS PURSUIT OF INNOVATION

From the Dropzone rubber, PolyTurf Plus Pad & Pour system, Omnisports vinyl sports flooring, ClutchCourt wood, and LinoSport linoleum, our innovation and versatility extend beyond just sports. We're there to support your team.



SERVICE

We are as committed to your program as you are, and we're with you for the long term. When you buy from Tarkett Sports, you're buying from a company that knows how to take care of you.



Here at Saint James, this particular floor has always served multiple functions and multiple sports. That was a big part of the decision making process. We were looking at three things in particular: durability, shock absorption, and ease of maintenance. Omnisports, the product we ultimately decided on, was the best option given all three of those criteria.

On any given weekend we can have basketball, volleyball, soccer, lacrosse and baseball. They can all be here over the course of a weekend, and the floor has served the purposes very well. We're very happy with it.



SCOTT BARR
ATHLETIC DIRECTOR,
SAINT JAMES SCHOOL

ENGINEERED TO DOMINATE

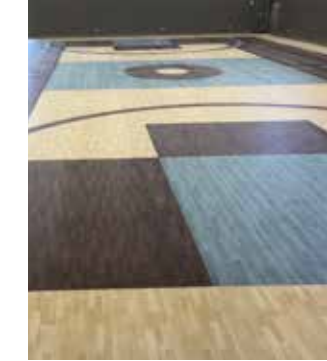
DESIGNED TO IMPRESS



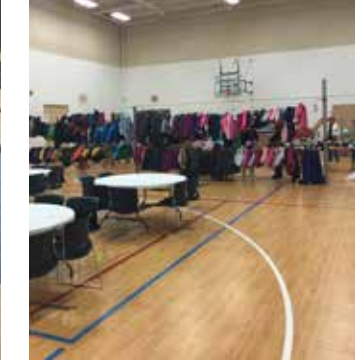
PROVEN HISTORY & REFERENCES



BUILT TO BE THE MUSCLE ON YOUR TEAM



MADE TO STAND OUT WITH A VARIETY OF DESIGN OPTIONS

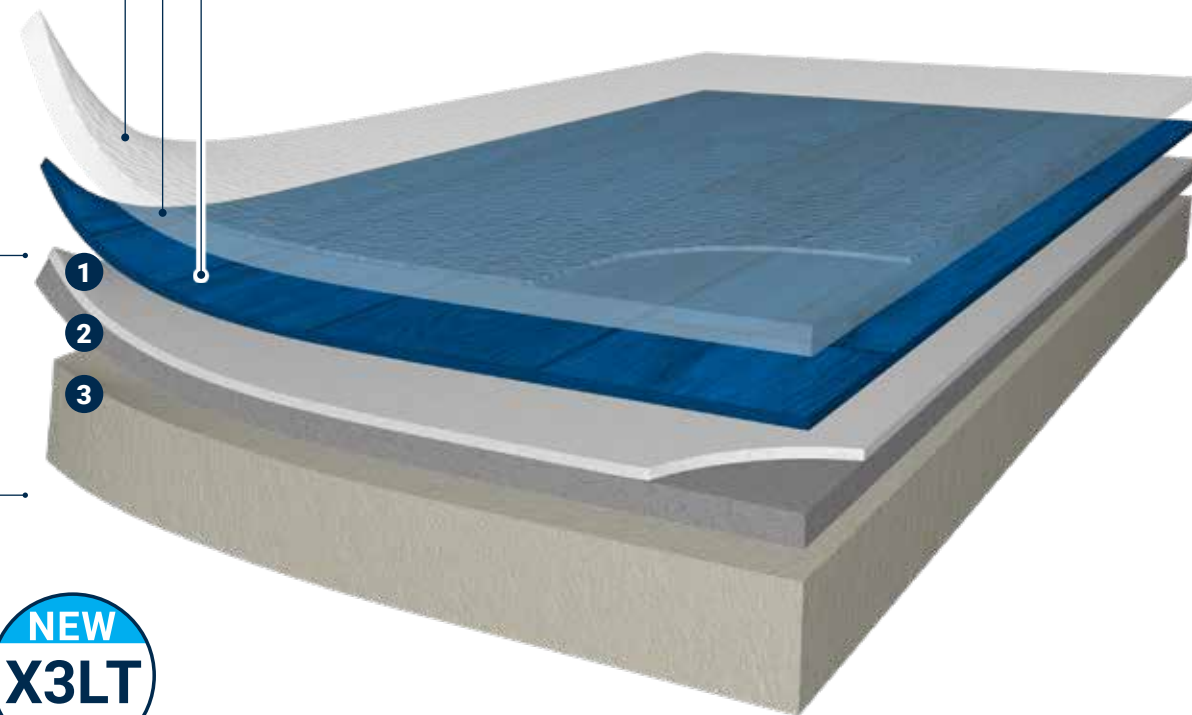


MULTIFUNCTIONAL SPORTS, RECREATION, ACTIVITIES & MORE

PROTECTION LAYER: Leading Surface Feel & Easy Maintenance

WEAR LAYER: Leading Durability & Protection

PRINTED LAYER: Dynamic Colors & Realistic Textures



PERFORMANCE LAYER: Leading Shock Absorption & Stability

YOU CAN FEEL THE DIFFERENCE

OMNISPORTS X3LT - XTREME 3-LAYER TECHNOLOGY

<p>1</p> <p>FIBERGLASS MESH Less is more! Extremely tough single fiberglass mesh reinforcement</p> <p>2X</p> <p>BETTER INDENTATION RECOVERY THAN SIMILAR PRODUCTS</p>	+	<p>2</p> <p>CALENDARED SHEET High performance & durability, made from recycled material</p> <p>Up to</p> <p>60%</p> <p>RECYCLED CONTENT</p>	+	<p>3</p> <p>XCS CUSHION High expansion rate and recovery, less fillers for maximized performances</p> <p>+12%</p> <p>IMPROVED SHOCK ABSORPTION</p>
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UNRIVALED SPORTS EXPERIENCE

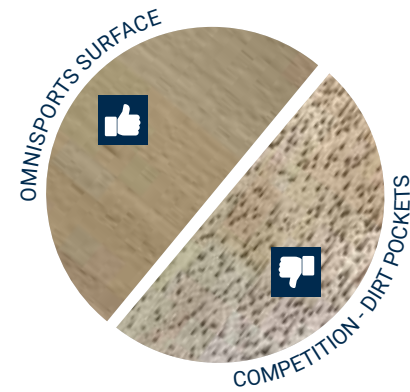
Our XCS aerated, high cell density cushion, offers improved comfort while providing leading indentation recovery. Delivering excellent fatigue reduction, the Performance Layer allows athletes to play longer and recover faster.

A WINNING COMBINATION

The magic happens by combining our best features. Together, the XCS high-quality expanded cellular cushion, combined with our durable resilient calendared layer and extremely tough fiberglass mesh, provides improved sports performance and a higher resistance to rolling and static loads than competitor systems.

WASH, RINSE & PLAY

Maintenance is that easy with Omnisports. Our systems are finished with our factory-applied polyurethane surface treatment, TopClean XP. The application delivers leading resistance to scratches, scuffs, stains and abrasion. As the TopClean XP surface treatment does not promote organism microbial growth, the system reduces the possibility of bacteria and micro-organisms build up on the surface.



FREE OF DIRT POCKETS

The Tarkett Difference – Omnisports’ unique single-surface embossing repels dirt, unlike some systems that trap dirt in surface pockets.



TABLES & CHAIRS, BRING IT ON

Omnisports systems offer exceptional resistance to indentation marks and rolling loads. The surface can safely be used for events and recreational activities that require temporary equipment and furniture to be placed on the surface.



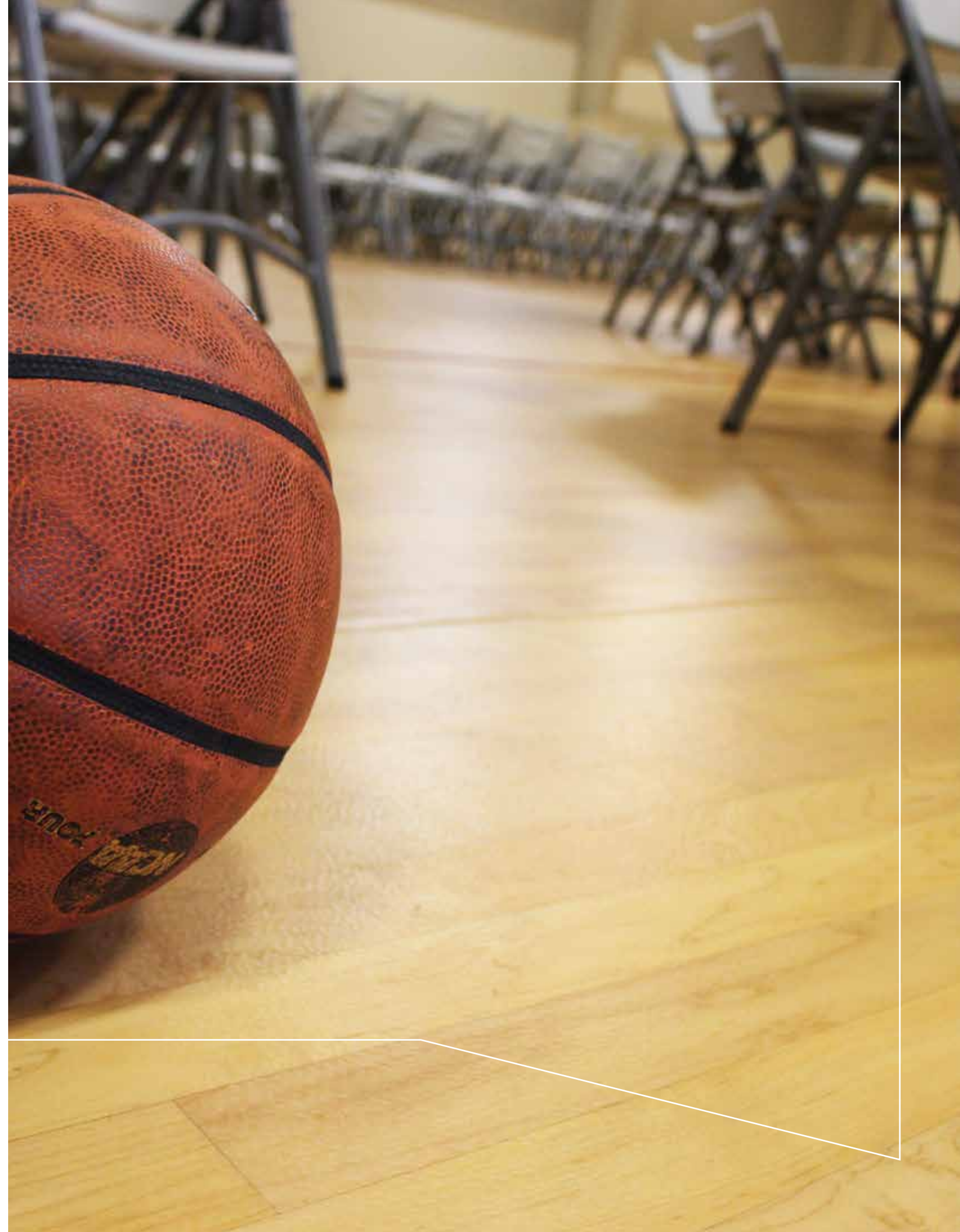
HIGHLY RESISTANT TO STAINS

Omnisports systems are engineered to deliver leading resistance to staining and footwear marks. Spills are easily cleaned and the surface requires less maintenance.



LESS TIME CLEANING

Omnisports systems are easy to maintain as they require mechanical cleaning no more than once a week. You could save up to 25% on your maintenance budget.

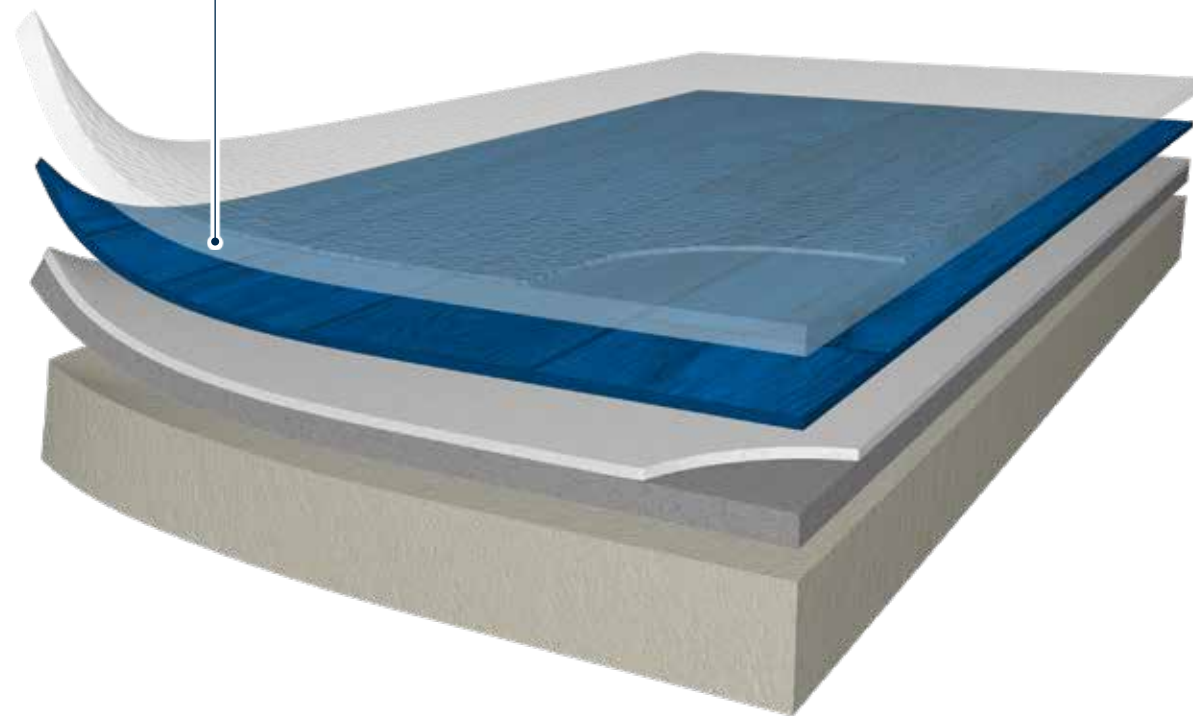


OVER
30%*
 THICKER
 WEAR
 LAYER VS LEADING
 COMPETITOR
 SYSTEMS

*Based on ASTM F1303 standard

Our Omnisports vinyl wear layer delivers long lasting protection for unmatched value.

30% thicker than the leading competitor systems and made of pure polyvinyl chloride (PVC), Omnisports' wear layer provides excellent floor protection and is backed by a leading 25-year warranty.



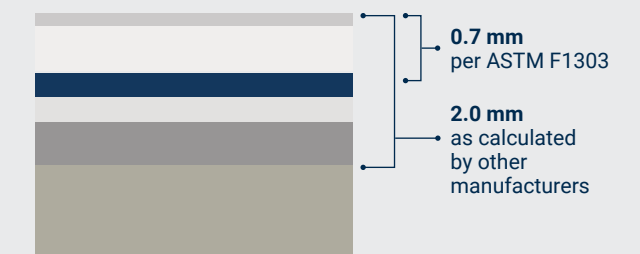
MEASURE YOUR WEAR LAYER CORRECTLY

The wear layer is the portion of a resilient floor covering that contains or protects the pattern effect. With a thin wear layer, your surface could quickly show signs of wear and damage. Tarkett Sports relies on ASTM F1303, a leading industry standard, to define its wear layer thickness. Some manufacturers include additional layers as a part of their wear layer calculation. When comparing systems, be sure to compare using identical methods.

HOW TO MEASURE WEAR LAYER THICKNESS AND WHAT DEPTH IS ENOUGH?

- Rely on independent testing standards – We recommend ASTM F1303 testing
- Select the proper type and grade for your facility
- Be cautious of manufacturers advertising thicknesses based on “internal” testing
- Ask for and read the full details of the warranty of your wear layer
- An inadequate wear layer could lead to premature damage to your surface

WEAR LAYER DEFINITION ASTM F1303 VS OTHER METHODS



MAKE SURE YOU'RE COMPARING THE IDENTICAL METHODS

	OMNISPORTS ACTIVE+	COMPETITOR SYSTEM	DIFFERENCE
Wear layer per ASTM F1303	0.7 mm	0.5 mm	+40%
Wear layer as calculated by other manufacturers	2.0 mm	2.1 mm	-5%

ASK IF YOUR SYSTEM IS DESIGNED FOR COMMERCIAL USE

Rely on the Standard for Sheet Vinyl Flooring - ASTM F1303 testing

TYPE	GRADE	WEAR LAYER THICKNESS (MM)	INTENDED USE	RECOMMENDED FOR SPORT APPLICATIONS
Type 1 (Min. 90% PVC binder content)	Grade 1: >0.51mm	0.51	Residential / Commercial / Light Commercial	✓
Type 1 (Min. 90% PVC binder content)	Grade 2: 0.51mm><0.36mm	0.36	Residential / Light Commercial	✗
Type 1 (Min. 90% PVC binder content)	Grade 3 0.36mm><0.25mm	0.25	Residential	✗

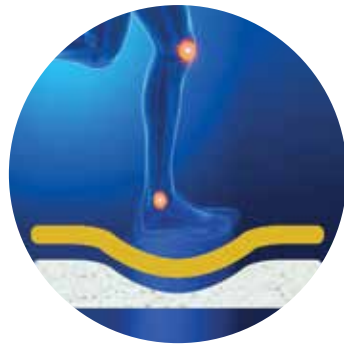
COMFORT & PERFORMANCE



WORLD-CLASS FEELING UNDERFOOT

Leading Shock Absorption

Our XCS aerated, high cell density cushion, delivers leading shock absorption, comfort and indentation recovery. The engineered cushioning technology also assists with excellent fatigue reduction allowing for longer and safer play at both recreational and competitive levels.



LESS IMPACT ON THE BODY

Leading Energy Return

XCS high-quality expanded cellular cushion, combined with our durable resilient calendared layer and extremely tough reinforcing fiberglass mesh, provides superior fatigue reduction, better sports performance, and higher resistance to rolling and static loads compared to competitor systems.



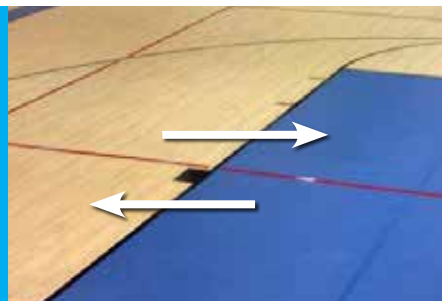
BETTER GRIP CONTROL

Consistent surface friction

Omnisports' homogeneous top embossing and surface treatment provide the proper balance of friction and grip control. It reduces friction burn risks and provides safer protection with anti-slip grip on all patterns and colors.

TARKETT SPORTS DIFFERENCE

No change in grip and feeling underfoot when moving from solid color to pattern




FOR THE ATHLETE & FOR THE PLANET

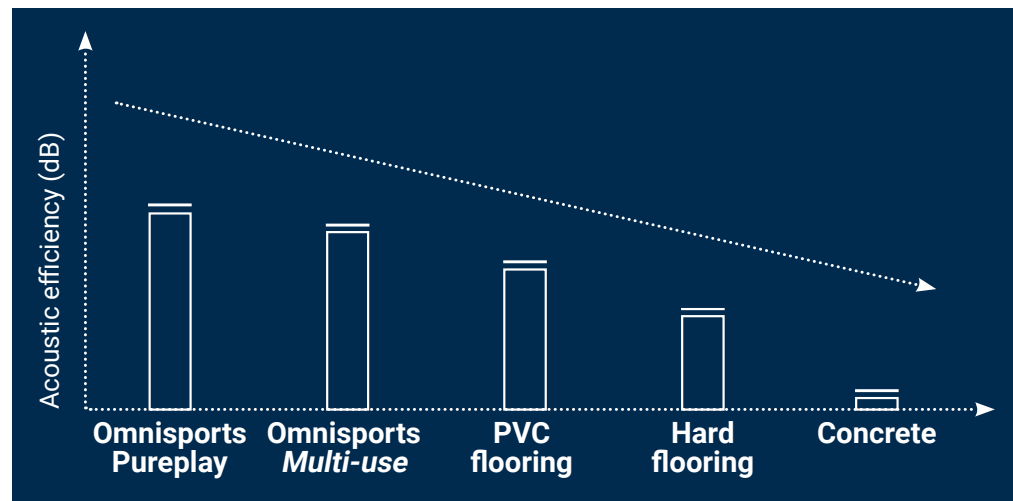
Because sustainable sport is integral to the wellbeing of our communities, preserving our ecosystems is a part of what drives all of our product innovation. After all, if there's no planet, there's no play. Our commitment to sustainability is focused and unwavering.

- OMNISPORTS PRODUCTS ARE 100% RECYCLABLE
- CONTRIBUTES TO FACILITY LEED CERTIFICATION
- TARKETT IS RECOGNIZED AS A WORLD LEADER IN SUSTAINABILITY



CUTS OUT THE NOISE TO FOCUS ON THE GAME

The Omnisports series is designed with a cushion vinyl backing that reduces noise levels and provides optimal acoustic comfort. 



NOTHING IS MORE IMPORTANT

THAN THE SAFETY OF YOUR ATHLETES

Indoor air quality is essential for athletes' health and especially children who are exposed to higher risk of indoor pollution due to immature lungs. The materials in the Omnisports range were carefully selected to deliver a surface that provides optimal indoor air quality.



PHthalate-FREE MANUFACTURING

As part of Tarkett's initiative for sustainability and eco-innovation, Omnisports is one of the only phthalate-free resilient sports floors available in North America.

- Improves the indoor environment and air quality
- Same components used in food containers and children's toys



ASTHMA & ALLERGY FRIENDLY

Omnisports was the first sports surface to be certified asthma & allergy friendly, providing a healthier sports flooring solution. When combined with Multi-Poxy Adhesive from Tarkett Sports, Omnisports Multi-Use, Active+ and PurePlay with popular GreenLay™ installation exceed all of the asthma & allergy friendly certification standards.

- Low VOC emissions
- Low allergen retention



LOW VOCs AND BETTER INDOOR AIR QUALITY

A healthy indoor environment begins with low levels of volatile organic compounds (VOCs).

- VOC emissions less than 10 micrograms per cubic meter*
A lower VOC emission rate than most other resilient sports floors
*VOCs after 28 days (ISO 16000)
- Complies with California Section 01350, the most stringent air quality regulation in the U.S.

TRUSTED AT ALL LEVELS

OVER 10,000 INSTALLATIONS IN NORTH AMERICA



Blue Springs Fieldhouse
Blue Springs, MO



City of Valle Vista
Valle Vista, CA



Trinity Lutheran
Jaynesville, MN



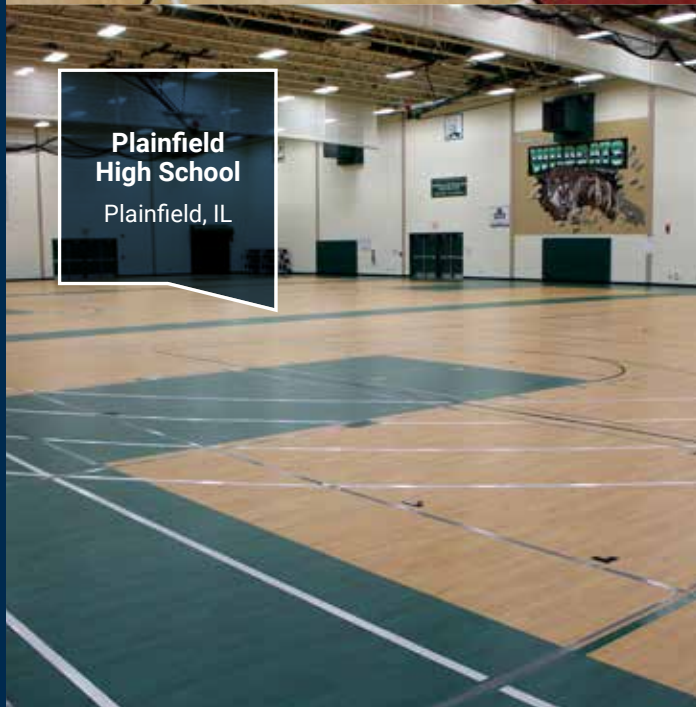
Algiers Charter School
New Orleans, LA



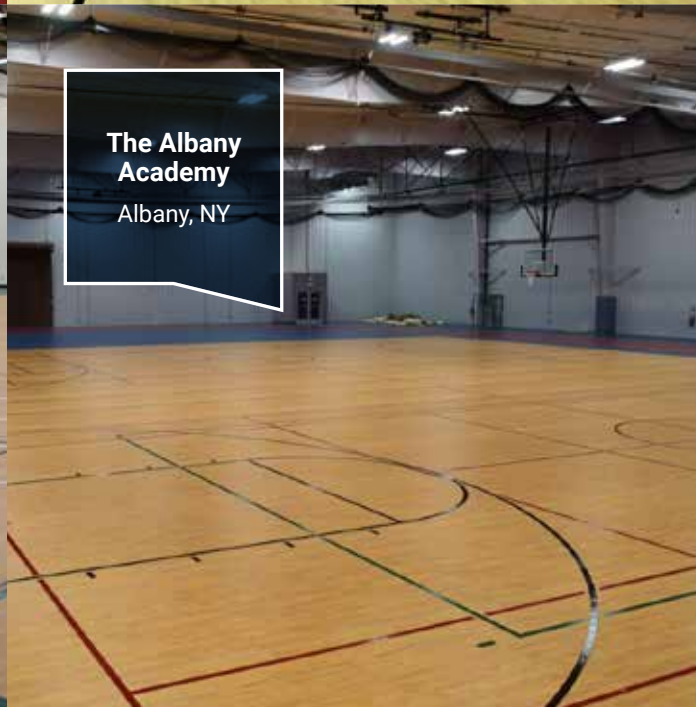
San Angelo Sports Complex
San Angelo, TX



Saint-James School
St. James, MD



Plainfield High School
Plainfield, IL



The Albany Academy
Albany, NY



Gililand Middle School
Tempe, AZ



Total Turf Experience
Pitman, NJ

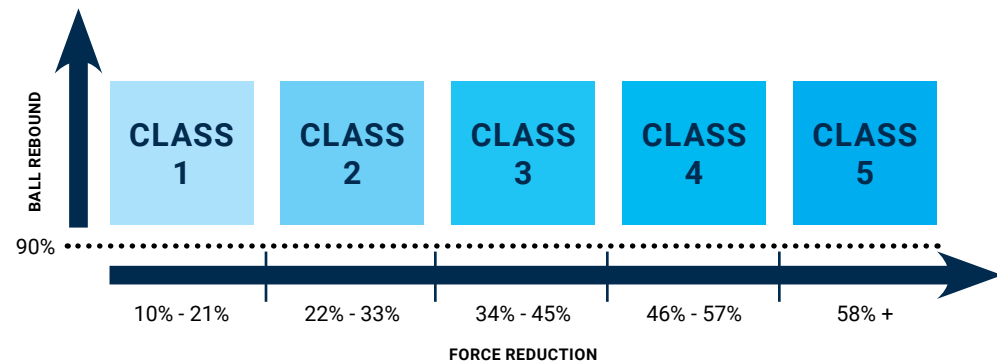
UNDERSTANDING SPORTS FLOORING

To help guide you to the right system for your facility, we rely on the independent flooring standard, ASTM F2772. This way, you can better evaluate and compare similar systems. Let's focus on the facts and cut out the noise.

HOW DOES THE SPORTS FLOORING STANDARD WORK?
It focuses on four critical areas:

1 FORCE REDUCTION (SHOCK ABSORPTION)

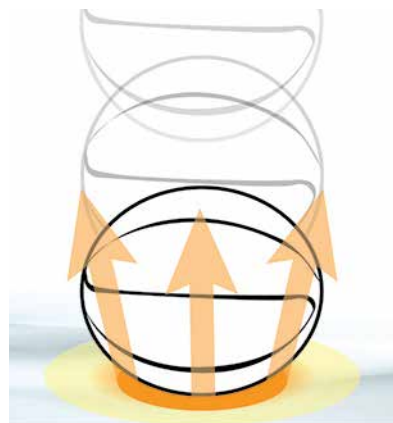
Force reduction (also called "shock absorption") evaluates a surface's ability to reduce impact force. The standard has set a minimum value of 10% force reduction and categorizes the remain range into five Classes, of which Class 5 has the highest force reduction.



2 BALL REBOUND

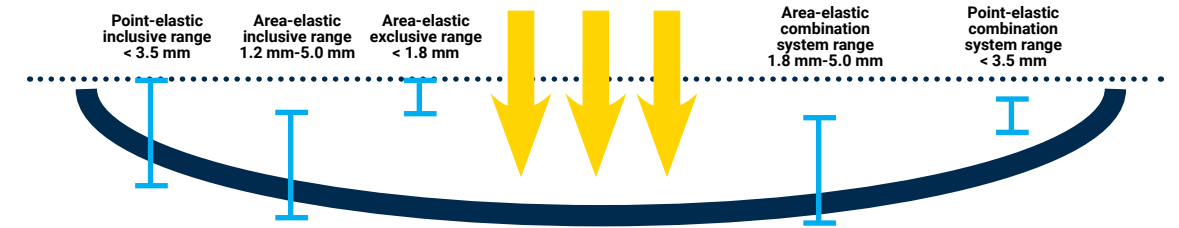
Ball rebound (also called ball bounce) is a mechanical property that determines a surface's suitability for basketball. It is tested according to ASTM F2117 and accounts for two parameters: performance level (average performance of test points must reach a minimum of 90%) and uniformity level (test point deviation cannot exceed 3% of the average of all tests). Ball rebound is based on the responsiveness of a ball and its interaction with the surface. It is calculated by comparing the ball's rebound height on the sports surface to the rebound height of the same ball on concrete.

This area is concluded as a pass or fail, no classes.



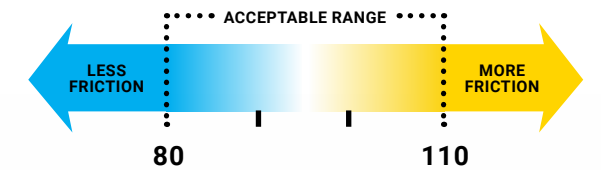
3 VERTICAL DEFORMATION

Vertical deformation values indicate the ability of the surface to deform under load. High deformation can affect the safety of the athlete, causing instability of the foot, while low deformation may cause injuries as a result of immediate impact force.



4 SURFACE FINISH EFFECT (FRICTION)

Surface finish effect describes a surface's response to a sliding foot, typically under dry conditions. It is tested according to ASTM E303 and accounts for two parameters: performance level (testing must achieve a value between 80-110) and uniformity level (individual tests cannot vary more than 4 points from the average value)



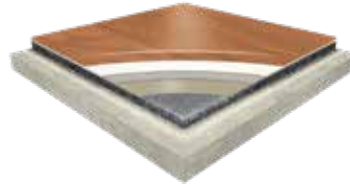
OMNISPORTS RANGE

**CLASS
1**

SPEED



HPL 7

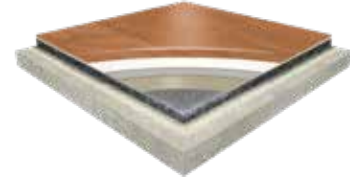


**CLASS
2**

MULTI-USE



HPL 9



**CLASS
3**

ACTIVE+

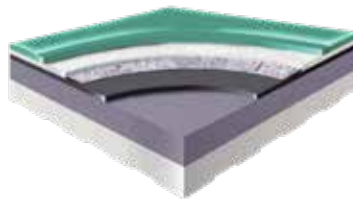


PUREPLAY



**CLASS
4**

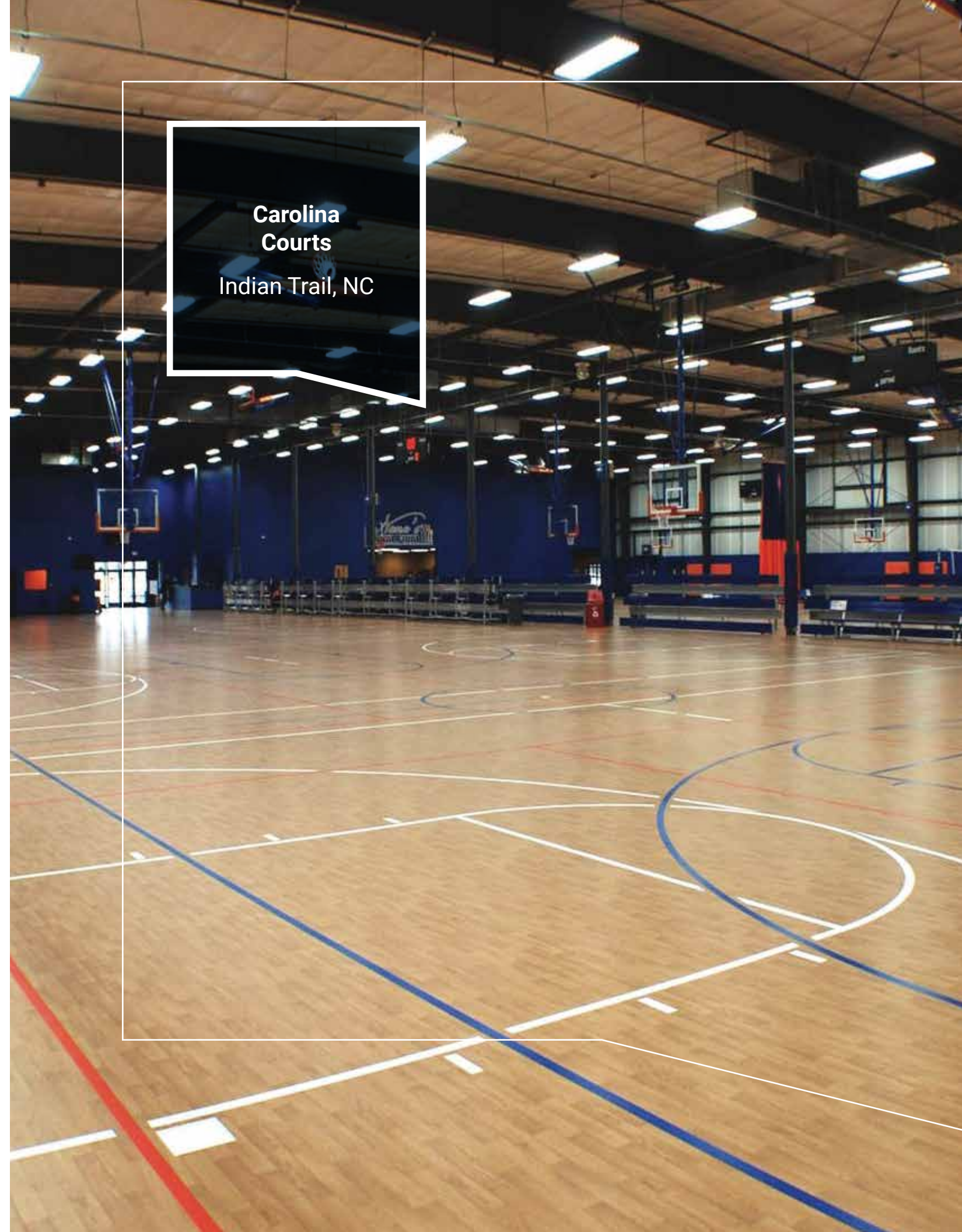
EXTREME

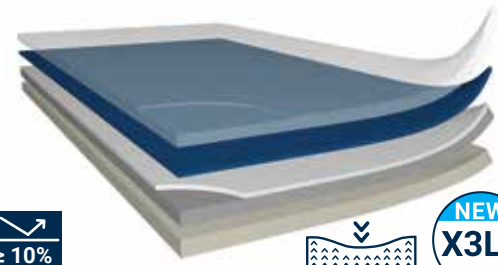


**CLASS
5**

LOOKING FOR A **CLASS 5** OPTION?
ASK US ABOUT OUR **LUMAFLEX** SYSTEMS

Carolina
Courts
Indian Trail, NC





NEW! **SPEED**

Ideal for walking and acoustic comfort in fitness, leisure and wellness areas

KEY FEATURES

- Ideal noise reduction
- High resistance to indentation marks: **0.18mm**
- High resistance to rolling loads
- Easy maintenance

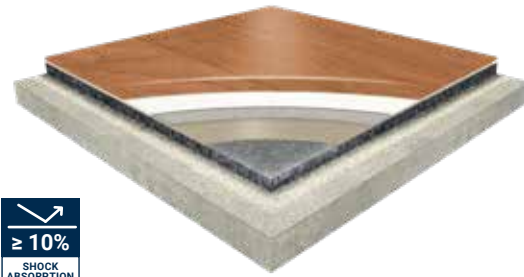


APPLICATIONS

Table tennis, badminton



FORMAT



HPL 7

Ideal for heavy bleachers and equipment as well as sports

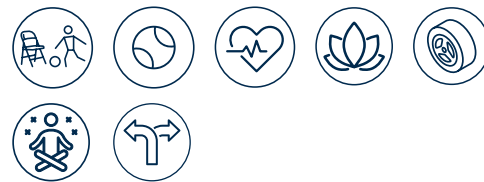
KEY FEATURES

- Class 1 shock absorption
- Tolerates static and rolling loads as well as any vulcanized rubber surface, up to **500 psi**
- Easy maintenance
- Phthalate-free manufacturing
- Consistent playability and a uniform texture of all material selected, regardless of color

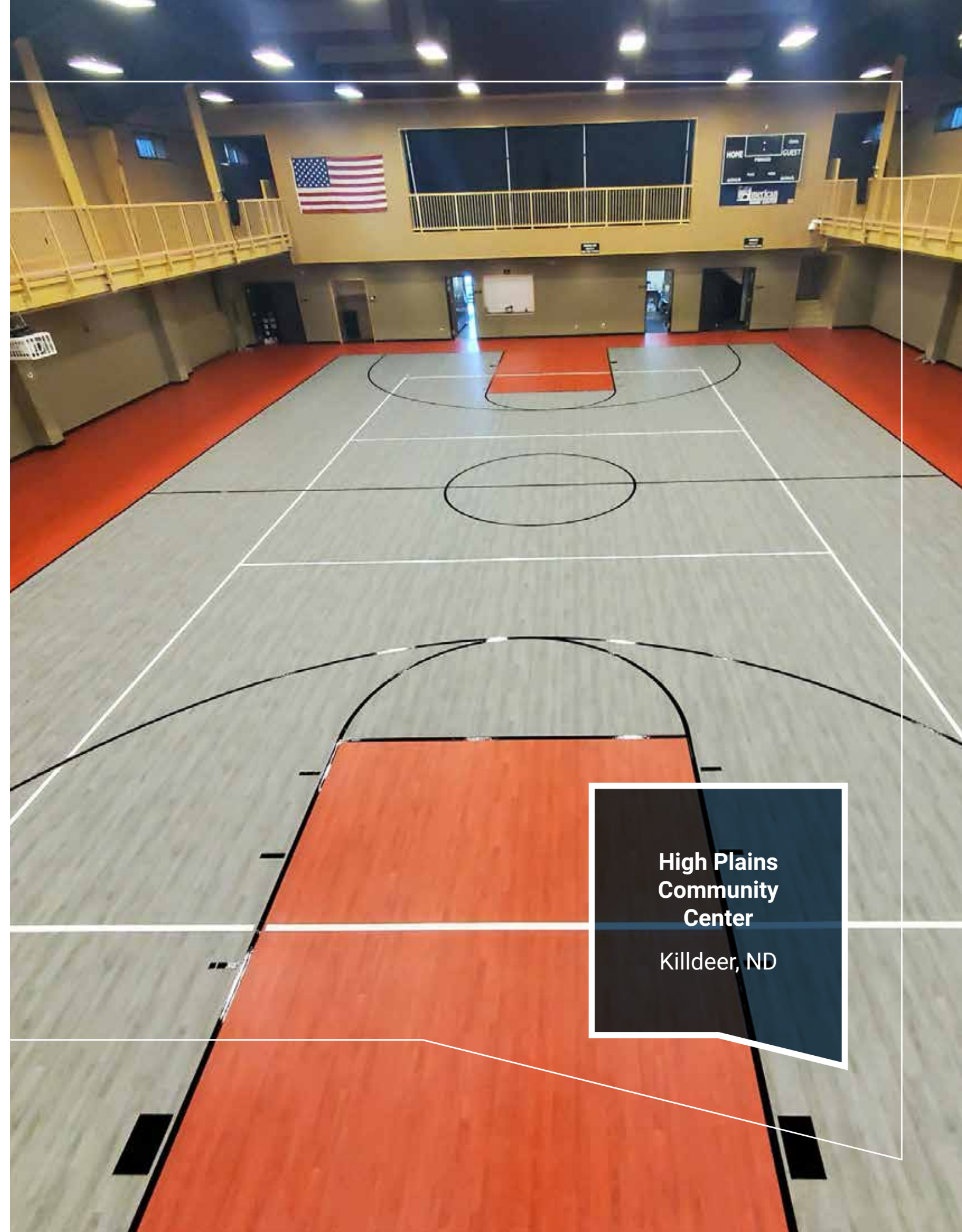


APPLICATIONS

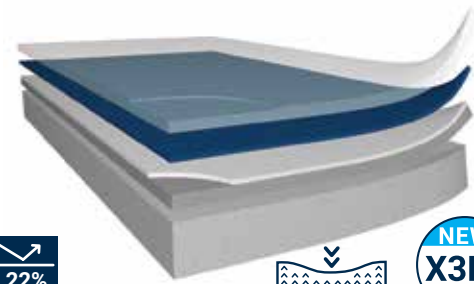
Multi-use, pickleball, fitness-cardio, wellness centers, roller sports, yoga, traffic areas



FORMAT



High Plains Community Center
Killdeer, ND



NEW! MULTI-USE

Ideal flooring for multi-sports practice and non-sporting events

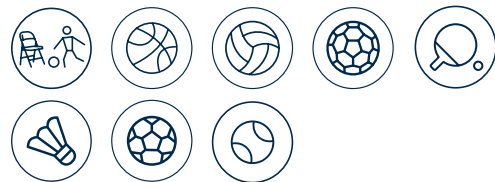
KEY FEATURES

- Class 2 shock absorption: **≥25%**
- Exceptional resistance to static loads (chairs, tables, bleachers,...): **≤0.10mm***
- Superior resistance to heavy rolling loads (trolleys...)
- Resistance to stains and scratches: **0.70mm PU reinforced wear layer**
- Available with **GreenLay™** exclusive installation method: **98% adhesive-free****



APPLICATIONS

Multi-sports: basketball, volleyball, handball, badminton, futsal, table tennis, pickleball... and non-sporting events: exams, elections, balls, public meetings, association meetings...

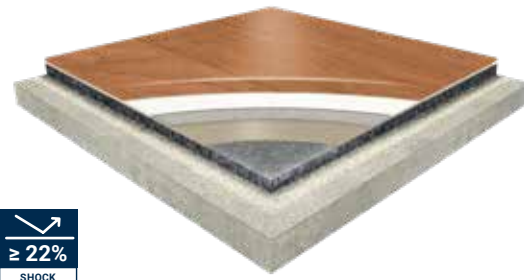


FORMAT



Roll
85.3' x 6.5'

*Chair with 176 lb. person during 5h.
**See page 35



HPL 9

Ideal for heavy bleachers and equipment as well as sports.

KEY FEATURES

- Class 2 shock absorption
- Tolerates static and rolling loads as well as any vulcanized rubber surface, up to **500 psi**
- Easy maintenance
- Phthalate-free manufacturing
- Consistent playability and a uniform texture of all material selected, regardless of color



APPLICATIONS

Multi-use, pickleball, fitness-cardio, wellness centers, roller sports, yoga, traffic areas



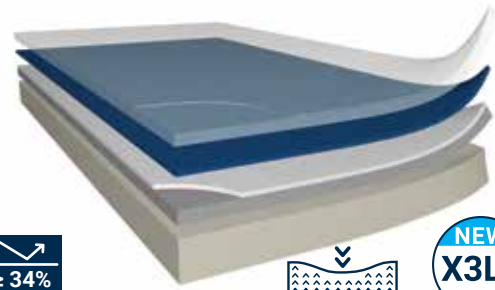
FORMAT



Roll
85.3' x 6.5'



Shady Spring Elementary School
Shady Spring, WV



NEW! ACTIVE +

Ideal balance of performance & comfort for multi-sports

KEY FEATURES

- Class 3 shock absorption: **≥35%**
- High noise reduction
- Excellent underfoot comfort for enhanced game experience and protection for athletes
- Easy maintenance



APPLICATIONS

Multi-sports: basketball, volleyball, handball, badminton, futsal, pickleball... and non-sporting events: exams, elections, balls, public meetings, association meetings...

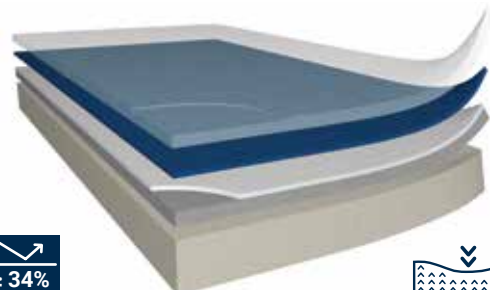


FORMAT



Roll
85.3' x 6.5'

* See page 35



PUREPLAY

Extreme protection, comfort and sports performances

KEY FEATURES

- Class 3 shock absorption: optimized cushion-vinyl construction, our thickest foam for excellent performance
- Excellent underfoot comfort for enhanced game experience and protection for athletes
- Resistance to stains and scratches: **0.80mm PU reinforced wear layer**
- Available with **GreenLay™** exclusive installation method: **98% adhesive-free***
- Easy maintenance



APPLICATIONS

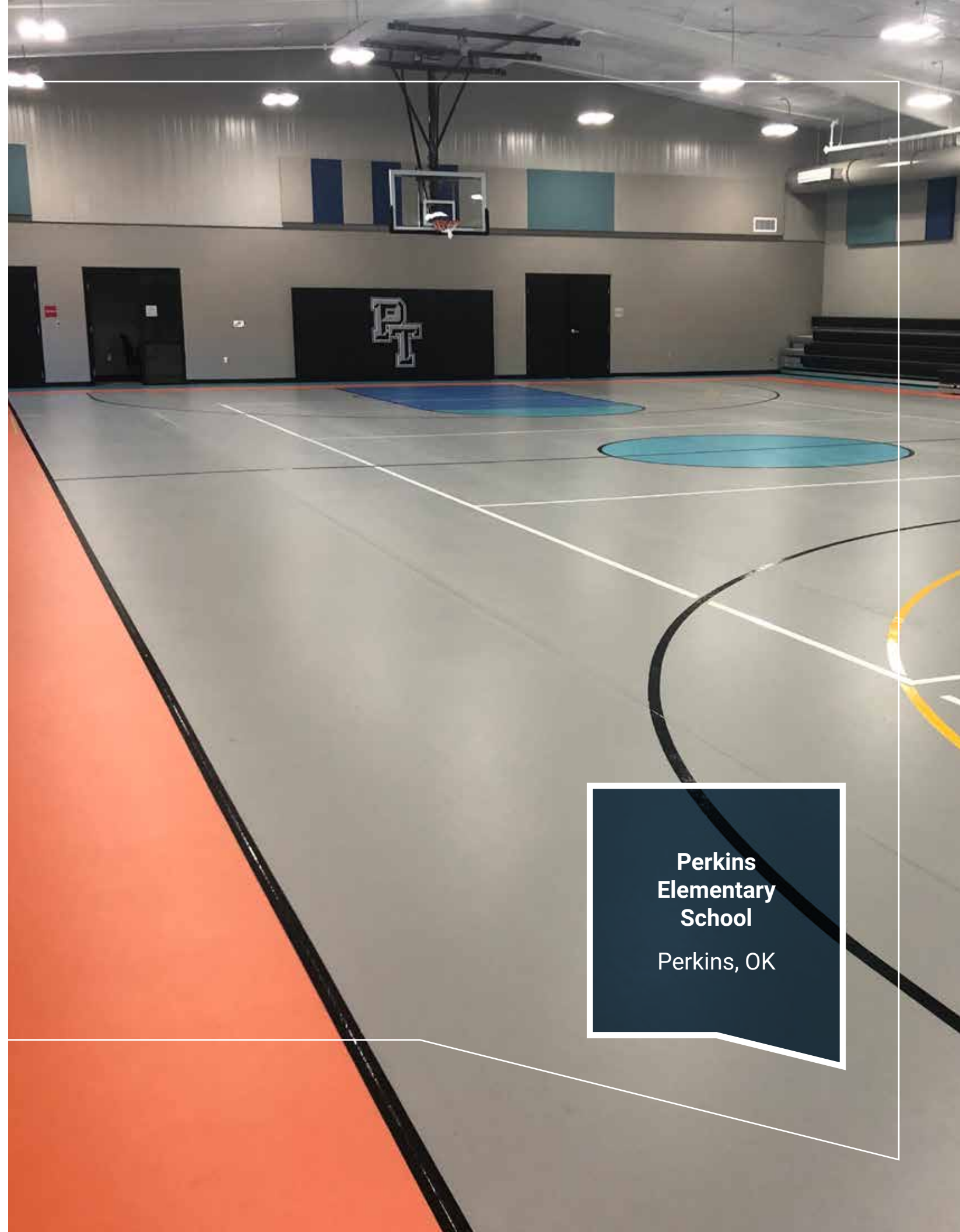
Multi-sports: basketball, volleyball, handball, futsal, table tennis, pickleball, yoga...



FORMAT



Roll
85.3' x 6.5'



Perkins
Elementary
School
Perkins, OK



OMNISPORTS EXTREME

The ultimate competitive basketball, volleyball, fitness and aerobics gym flooring

KEY FEATURES

- Class 4 shock level absorption
- Maximum noise reduction
- Easy maintenance
- Phthalate-free manufacturing
- Consistent playability and a uniform texture of all material selected, regardless of color
- Super-dimensional stability



APPLICATIONS

Multi-sports: basketball, volleyball, handball, futsal, table tennis, badminton, pickleball, fitness-aerobics, yoga...



FORMAT



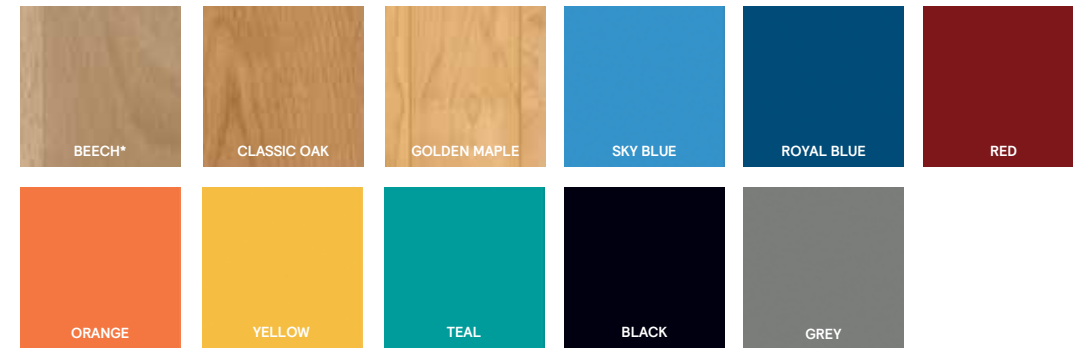
Cegep
Gerald-Godin
Quebec, Canada

STILL NOT ENOUGH COLORS?

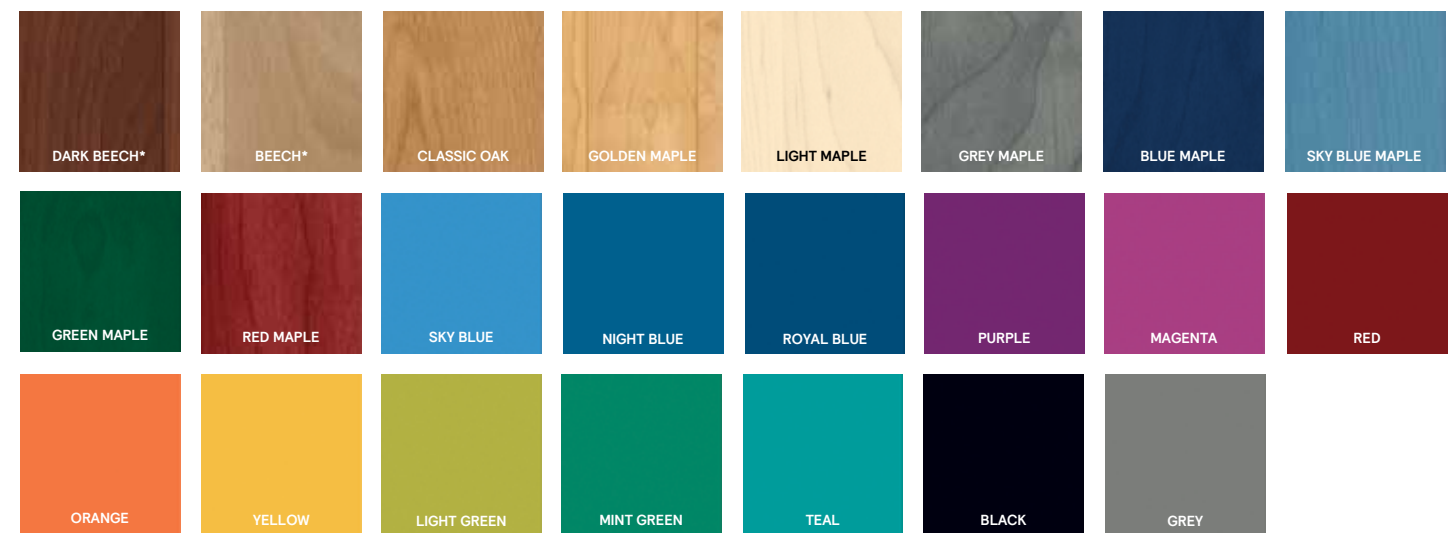
Don't worry!
You can also recreate your
team colors based on
other Tarkett collections.

Minimum quantity: 8,000 sq.ft.
(+/-10% by color)
Manufacturing lead time: 7 weeks

OMNISPORTS SPEED



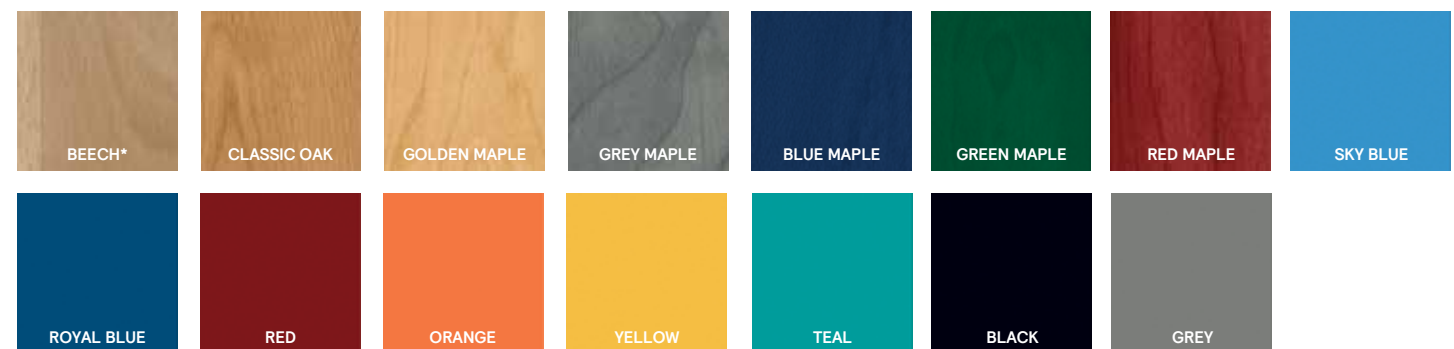
OMNISPORTS MULTI-USE / ACTIVE+ / PUREPLAY



OMNISPORTS EXTREME



OMNISPORTS HPL



OMNISPORTS IS A VERSATILE SPORTS SURFACE THAT GOES BEYOND THE NUMBER OF SPORTS AND EVENTS IT CAN HOST



UNIQUE 2M ROLL WIDTH

30% less welding required, decreasing the areas at risk of soiling.

Omnisports needs to be installed according to the conditions on site to ensure maximum performance and durability. A variety of installation methods are available to accommodate each facility's particular circumstances.

SUBFLOOR INSTALLATION

INSTALLATION TYPE	MULTI-SET	HS SPORT SPRAY	GREENLAY	MULTI-POXY	TARKOLAY WITH MULTI-POXY
Concrete Substrate Maximum Tolerances	83% RH 4% MC	90% RH 4.5% MC	92% RH 5% MC	98% RH 6% MC	Moisture Testing Not Required*
Omnisports Speed	✓	✓	✗	✓	✓
Omnisports Multi-Use	✓	✓	✓	✓	✓
Omnisports Active+	✓	✓	✓	✓	✓
Omnisports Pureplay	✓	✓	✓	✓	✓
Omnisports Extreme	✓	✓	✗	✓	✓
Omnisports Compact & HPL	✗	✗	✗	✓	✓

* For all systems, please review current installation recommendations for additional information regarding substrates, conditions, and methods. Some substrates may require additional or alternative treatments prior to the application of floor covering. Compatible substrates include: properly constructed and prepared concrete, wood, asphalt, and cementitious underlayments. Refer to current installation guidelines, ASTM F710, ACI 302.2R, and other industry publications including accessories for more information. Hot Yoga and Radiant Heated Slabs should use either Multi-Poxy or Tarkolay systems as conditions require. *RH is measured per ASTM F2170. *MC* is measured per ASTM F2659 for Surface and Impedance Probe.

TARKOLAY

Every flooring installation is different. In some cases, high moisture, cracks, joints, or other factors present challenges that require an underlayment. Tarkolay is a FloorScore-certified underlayment that isolates the flooring system away from the substrate, removing the potential for vapor pressure to form. Tarkolay also assists with installations over moving joints, minor cracks in concrete substrates, and existing surfaces that are adverse to standard installation methods. Only Multi-Poxy adhesive may be used with Tarkolay.

1. ISOLATION OF THE SPORTS SURFACE

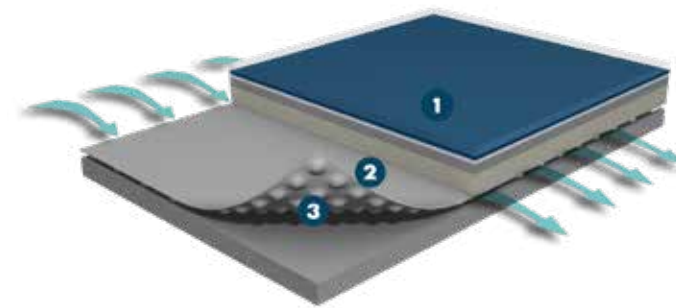
Tarkolay mitigates adverse conditions by separating the sports surface from the subfloor. Through isolation, an imperfect subfloor is less likely to affect the integrity of the surface installation.

2. DIMENSIONALLY STABLE UNDERLAYMENT

Tarkolay is a dimensionally stable underlayment with a smooth top surface for excellent adhesion to the sports floor.

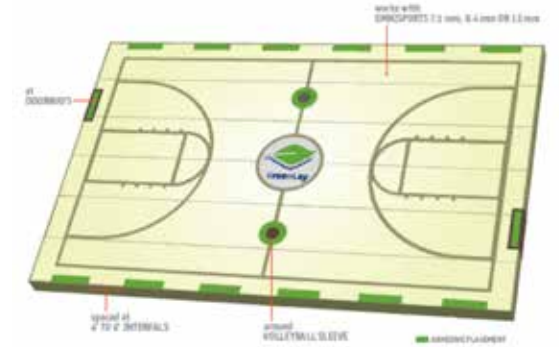
3. RAISED TEXTURE FOR DISPERSING WATER VAPOR

The embossed texture on the bottom of Tarkolay allows water vapor from the subfloor to dissipate without building pressure that would harm the integrity of the installation.



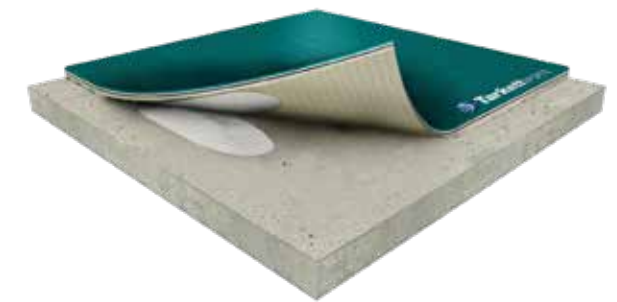
GREENLAY

GreenLay has revolutionized sports flooring installations as the new standard of performance and environmental responsibility. In an 8,000-square-foot gymnasium, less than one gallon of adhesive is used compared to nearly 64 gallons for a full-spread installation.



HOW IT WORKS

GreenLay uses small amounts of adhesive along the parallel walls of the court, in doorways and around volleyball sleeves, while Tarkotape from Tarkett secures each seam for welding. The Omnisports material does the rest with its excellent dimensional stability and virtually tension-free manufacturing process to make it the only resilient sports flooring that can be installed this way. In short, the superior quality of Omnisports makes GreenLay possible.



TARKETT MULTI-POXY

Tarkett Multi-Poxy is a specially formulated 2-component adhesive system for the installation of Tarkett Indoor Sports Flooring over porous and non-porous substrates. When part A and B are thoroughly mixed together and used as recommended, they form a reactive adhesive that cures to a tough, flexible film with excellent surface moisture resistance and adhesion to many difficult-to-bond-to substrates. Multi-Poxy is packaged in 4-gallon kits. Part A is packaged in a 5-gallon container, allowing for ease of mixing. Part B is packaged in a 2-gallon container and can be poured directly into the Part A container, or partial mixing can be easily accomplished in separate containers with a mix ratio of 1:1.

- Highly recommended
- Highly recommended with Lumaflex sub-construction
- Suitable

	OMNISPORTS						
	COMPACT	SPEED	HPL	MULTI-USE	ACTIVE+	PUREPLAY	EXTREME
		p. 22	p. 22, 24	p. 24	p. 26	p. 26	p. 28
Multi-sports	○	●	●	●	●	●	●
Multi-use	○	●	●	●	●	●	
Basketball	○	●	●	●	●	●	●
Volleyball	○	●	●	●	●	●	●
Handball	○	●	●	●	●	●	●
Futsal	○	●	●	●	●	●	●
Table tennis		●	●	●	●	●	●
Badminton		●	●	●	●	●	●
Pickleball	○	●	●	●	●	●	●
Fitness - aerobics	○		●	●	●	●	●
Fitness - cardio (bikes, treadmills, rowing machines,...)		●	●				
Wellness centers		●	●				
Roller sports and handisports	○		●				
Yoga			●	●	●	●	●
Traffic areas (corridors, entrance halls, meeting rooms,...)	●		●				

TECHNICAL DATA

CERTIFICATION & CLASSIFICATION	STANDARD	COMPACT	SPEED	HPL 7	HPL 9	MULTI-USE	ACTIVE+	PUREPLAY	EXTREME
Ball Rebound	ASTM F2772-11	See HPL Data	Passed	Passed	Passed	Passed	Passed	Passed	Passed
Force Reduction	ASTM F2772-11	See HPL Data	Class 1	Class 1	Class 2	Class 2	Class 3	Class 3	Class 4
Surface Finish Effect	ASTM F2772-11	See HPL Data	Passed	Passed	Passed	Passed	Passed	Passed	Passed
Vertical Deformation	ASTM F2772-11	See HPL Data	Passed	Passed	Passed	Passed	Passed	Passed	Passed
Below-Room Sound Insulation	ISO 717/02	N/A	20 dB	N/A	N/A	21 dB	21 dB	21 dB	21 dB
In-Room Sound Insulation	(NF S31-074)	N/A	Class A ≤65dB	N/A	N/A	Class A ≤65dB	Class A ≤65dB	Class A ≤65dB	Class A ≤65dB
Microbial Resistance	ASTM G21	No Growth	No Growth	No Growth	No Growth	No Growth	No Growth	No Growth	No Growth
Reaction to Fire	ASTM E648	Class 1 (Radiant Panel)	Class 1 (Radiant Panel)	Class 1 (Radiant Panel)	Class 1 (Radiant Panel)	Class 1 (Radiant Panel)	Class 1 (Radiant Panel)	Class 1 (Radiant Panel)	Class 1 (Radiant Panel)
Resistance to Impact	EN 1517	No Degradation	No Degradation	No Degradation	No Degradation	No Degradation	No Degradation	No Degradation	No Degradation
Rolling Load	EN 1569	See HPL Data	≤ 1.0 mm (No Degradation)	≤ 0.5 mm (No Degradation)	≤ 0.5 mm (No Degradation)	≤ 0.5 mm (No Degradation)	≤ 0.5 mm (No Degradation)	≤ 0.5 mm (No Degradation)	≤ 0.5 mm (No Degradation)
Roll Length	EN 426/EN 427	26 m (85.3')	23 m (75.5')	26 m (85.3')	26 m (85.3')	26 m (85.3')	26 m (85.3')	26 m (85.3')	15 m (49.2')
Roll Width	EN 426/EN 427	2 m (6.5')	2 m (6.5')	2 m (6.5')	2 m (6.5')	2 m (6.5')	2 m (6.5')	2 m (6.5')	2 m (6.5')
Stain Resistance	ASTM F925	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Static Load Tolerance	ASTM F970	See HPL Data	175 psi	500 psi	500 psi	175 psi	175 psi	175 psi	N/A
Taber Abrasion	ASTM D3389	0.02 g (1,000 Cycles)	0.02 g (1,000 Cycles)	0.02 g (1,000 Cycles)	0.02 g (1,000 Cycles)	0.02 g (1,000 Cycles)	0.02 g (1,000 Cycles)	0.02 g (1,000 Cycles)	N/A
Thickness	EN 428/EN 429	2.0 mm (0.079")	3.5 mm (0.138")	7 mm (0.276")	9 mm (0.354")	6.2 mm (0.244")	8.1 mm (0.319")	9.4 mm (0.37")	12 mm (0.47")
Wear Layer Performance Grade	ASTM F1303	Type 1, Grade 1, Commercial	Type 1, Grade 1, Commercial	Type 1, Grade 1, Commercial	Type 1, Grade 1, Commercial	Type 1, Grade 1, Commercial	Type 1, Grade 1, Commercial	Type 1, Grade 1, Commercial	Type 1, Grade 1, Commercial
Wear Layer Structure		2.0 mm (0.079")	2.0 mm	2.0 mm	2.0 mm	2.0 mm	2.0 mm	2.0 mm	2.0 mm
Wear Layer Thickness	ASTM F410/F1303	0.7 mm	0.65 mm	0.7 mm	0.7 mm	0.7 mm	0.7 mm	0.7 mm	0.76 mm
Weight	EN 430	3.1 kg/m ² (0.64 lbs./sq.ft)	3.29 kg/m ² (0.67 lbs./sq.ft.)	0.8 lbs./sq.ft. HPL	1.12 lbs./sq.ft. HPL	3.95 kg/m ² (0.81 lbs./sq.ft.)	4.7 kg/m ² (0.96 lbs./sq. ft.)	5.7 kg/m ² (1.17 lbs./sq.ft.)	7.1 kg/m ² (1.45 lbs./sq.ft.)

The above information is subject to modification for the benefit of further improvement. (01/2021). Tarkett Sports' instructions regarding installation, cleaning and maintenance should be observed. Please contact Tarkett for these instructions.





THE TARKETT SPORTS FAMILY - LEADERS IN SPORTS SURFACING



SCAN ME

888-364-6541

tarkettsportsindoor.com



Play to win

POLYTURF PLUS PAD & POUR



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A COMPLETE PACKAGE PLAYER	26

POLYTURF PLUS PAD & POUR

Everything we do, and the way we do it, is aimed to make the process easier for you. We focus on ensuring your experience is memorable and hassle-free.

We've known for a long time that a successful sports surface relies on a quality product installed by a quality team. We've built our PolyTurf Pad & Pour series by combining the best systems with the best people and partners. You can trust the renowned quality of PolyTurf Pad & Pour and the extensive experience of our team.

The pad & pour material is proudly American-made and supplied exclusively by our world-class producer, Beynon Sports.

We're ready to partner on your next project. Let's get started!

TARKETT SPORTS IS A WORLD LEADER IN ATHLETIC SURFACING,
OFFERING A COMPREHENSIVE PORTFOLIO OF INDOOR AND OUTDOOR SPORTS SURFACES.
OUR MISSION: TO OFFER SUSTAINABLE SPORTS SURFACES
THAT MAKE THE DIFFERENCE FOR ATHLETES.



TARKETT SPORTS BRAND

Tarkett Sports is a world leader in athletic surfacing, offering a comprehensive portfolio of sports flooring solutions through its brands: FieldTurf, Beynon Sports, Renner Sports, EasyTurf, GrassMaster, PlayMaster, and Tarkett Sports Indoor.



DESIGN & CONSTRUCTION EXPERTS

Tarkett Sports and our partners are some of the most experienced and knowledgeable teams in the industry. When it comes to the design and construction of your sports surface, we are the experts.



FINANCIALLY STABLE

The Tarkett Group is a worldwide leader in innovative flooring and sports surface solutions. Tarkett Sports Indoor is backed by unprecedented financial support and stability.



LEADING DURABILITY

Manufactured and installed with the highest attention to detail, Tarkett Sports Indoor's systems showcase proven durability.



EXPERIENCE

With over 10,000 installations in North America in the last 10 years, Tarkett Sports Indoor has the knowledge and expertise to make your sports facility a success.



TRUSTED

Tarkett Sports Indoor offers some of the most trusted sports flooring solutions for a variety of applications and programs.



ENDLESS PURSUIT OF INNOVATION

From the Dropzone rubber, PolyTurf Plus Pad & Pour system, Omnisports vinyl sports flooring, ClutchCourt wood, and LinoSport linoleum, our innovation and versatility extend beyond just sports. We're there to support your team.



SERVICE

We are as committed to your program as you are, and we're with you for the long term. When you buy from Tarkett Sports, you're buying from a company that knows how to take care of you.

Bernie Morelli
Recreation Centre
Hamilton, ON

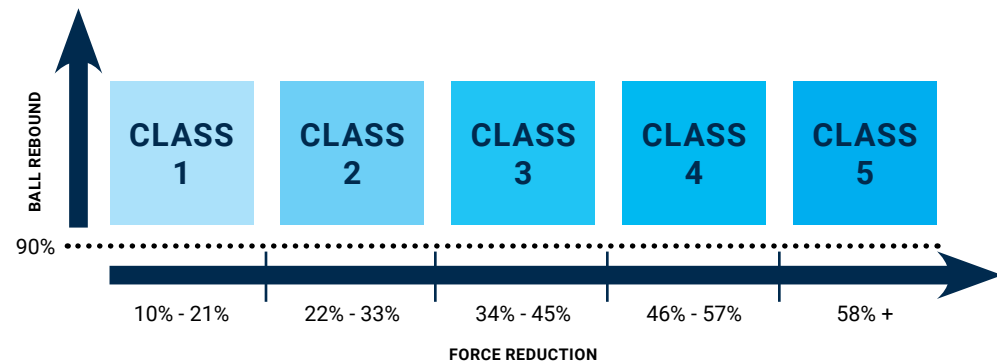
UNDERSTANDING SPORTS FLOORING

To help guide you to the right system for your facility, we rely on the independent flooring standard, ASTM F2772. This way, you can better evaluate and compare similar systems. Let's focus on the facts and cut out the noise.

HOW DOES THE SPORTS FLOORING STANDARD WORK?
It focuses on four critical areas:

1 FORCE REDUCTION (SHOCK ABSORPTION)

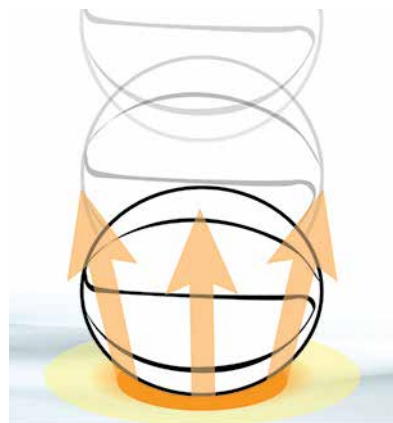
Force reduction (also called "shock absorption") evaluates a surface's ability to reduce impact force. The standard has set a minimum value of 10% force reduction and categorizes the remaining range into five Classes, of which Class 5 has the highest force reduction.



2 BALL REBOUND

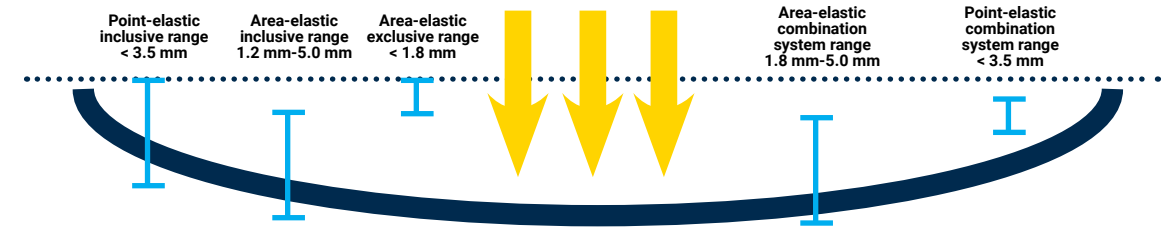
Ball rebound (also called ball bounce) is a mechanical property that determines a surface's suitability for basketball. It is tested according to ASTM F2117 and accounts for two parameters: performance level (average performance of test points must reach a minimum of 90%) and uniformity level (test point deviation cannot exceed 3% of the average of all tests). Ball rebound is based on the responsiveness of a ball and its interaction with the surface. It is calculated by comparing the ball's rebound height on the sports surface to the rebound height of the same ball on concrete.

This area is concluded as a pass or fail, with no classes.



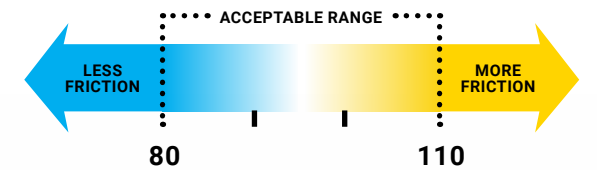
3 VERTICAL DEFORMATION

Vertical deformation values indicate the ability of the surface to deform under load. High deformation can affect the safety of the athlete, causing foot instability, while low deformation may cause injuries due to immediate impact force.



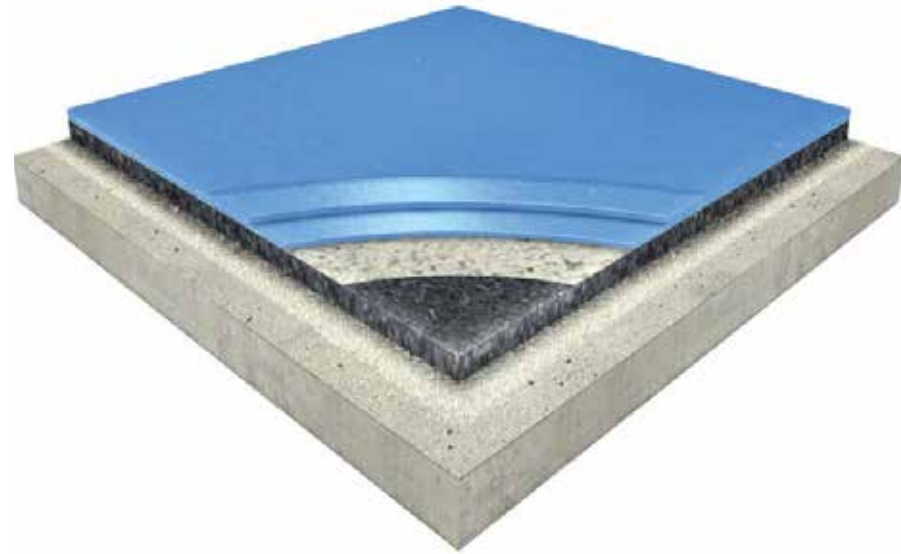
4 SURFACE FINISH EFFECT (FRICTION)

Surface finish effect describes a surface's response to a sliding foot, typically under dry conditions. It is tested according to ASTM E303 and accounts for two parameters: performance level (testing must achieve a value between 80-110) and uniformity level (individual tests cannot vary more than 4 points from the average value).



SO, WHAT IS PAD & POUR?

PolyTurf Plus Pad & Pour is a seamless sports floor designed to withstand various telescopic bleachers, tables, and chairs with maximum durability. It also provides a high-quality playing surface with shock absorption, precise game line markings, and stain resistance.



POINT-ELASTIC SYSTEM

Point Elastic Foam-Backed Surfaces have uniform performance across the whole playing surface. This means that every location on the floor will have almost identical shock absorption, ball rebound, and vertical deformation. In essence, a point-elastic floor interacts with each athlete on an individual basis.



USDA-CERTIFIED BIOBASED CONTENT

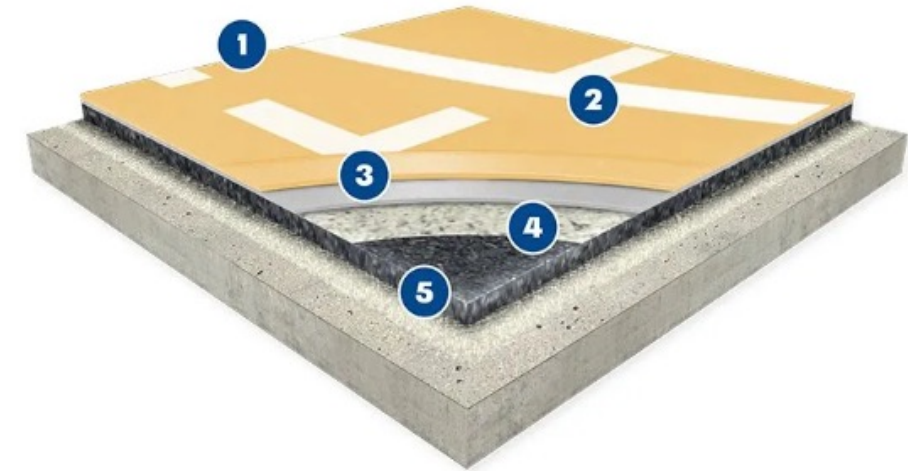
Tarkett Sports is proud to offer environmentally sustainable materials. Numerous polyurethane components utilized in our PolyTurf Plus Pad & Pour system are USDA Biopreferred certified.



GREENGUARD GOLD CERTIFICATION

PolyTurf Plus Pad & Pour is among the few sports floors to achieve this higher standard for indoor air quality. It is recognized by the Collaborative for High-Performance Schools (CHPS) Best Practice Manual for K-12 Schools and the LEED building rating system.

CUSHION, SEAL, PROTECT

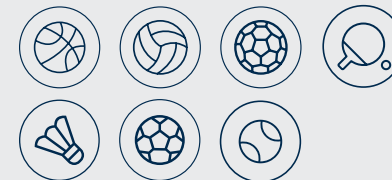


- 1 WATER-BASED ALIPHATIC COATING:**
This spray or roller-applied coating provides optimal game performance and stain resistance.
- 2 CHEMICALLY BONDED GAME LINES:**
Meticulously applied polyurethane marking paint creates precise and permanent game lines.
- 3 FORMULATED ELASTOMERIC RESIN:**
This resin layer provides exceptional ball rebound and extra durability to the system.
- 4 TWO-COMPONENT SEAL LAYER:**
The primary characteristic of PolyTurf Plus Pad & Pour is its seamless playing surface. This coating layer seals shock pad pores for a smooth and seamless gym floor.
- 5 RECYCLED RUBBER SHOCK PAD:**
Made of 100% recycled rubber, this shock pad base layer provides cushioning and shock absorption. It's available in 4 mm, 7 mm, and 9 mm thicknesses.

A SPORTS FLOOR FOR MANY APPLICATIONS

MULTI-SPORT GYMNASIUMS

Basketball, volleyball, handball, badminton, futsal, table tennis, and pickleball.

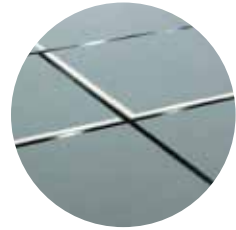


NON-SPORT APPLICATIONS

Useful for churches, military training facilities, recreational facilities, elections, and fieldhouses.

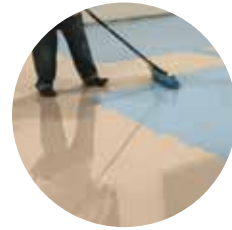


BENEFITS THAT JUST MAKE SENSE



SEAMLESS SURFACE

PolyTurf Plus Pad & Pour provides a seamless gym flooring solution that combines visual elegance with the added advantage of easy cleaning due to its seam-free design.



FAST INSTALLATION TIME

PolyTurf Plus Pad & Pour boasts an impressively rapid curing rate, allowing for a swift installation process and quick usability, saving valuable time.



SUPERIOR LOAD TOLERANCES

PolyTurf Plus Pad & Pour Systems offer excellent resistance to indentation marks and rolling loads. The surface can safely be used for events and recreational activities that require temporary equipment and furniture to be placed on the surface.



LASTING PERFORMANCE

Polyturf Plus Pad and Pour systems have proven longevity. The ability to renew the surface not only extends its lifespan but also allows customers to change or refresh the appearance as desired.



MORE COLOR OPTIONS

Tarkett Sports offers more color options for PolyTurf Plus Pad & Pour than any other pad and pour system on the market, allowing more customization for your gym floor.

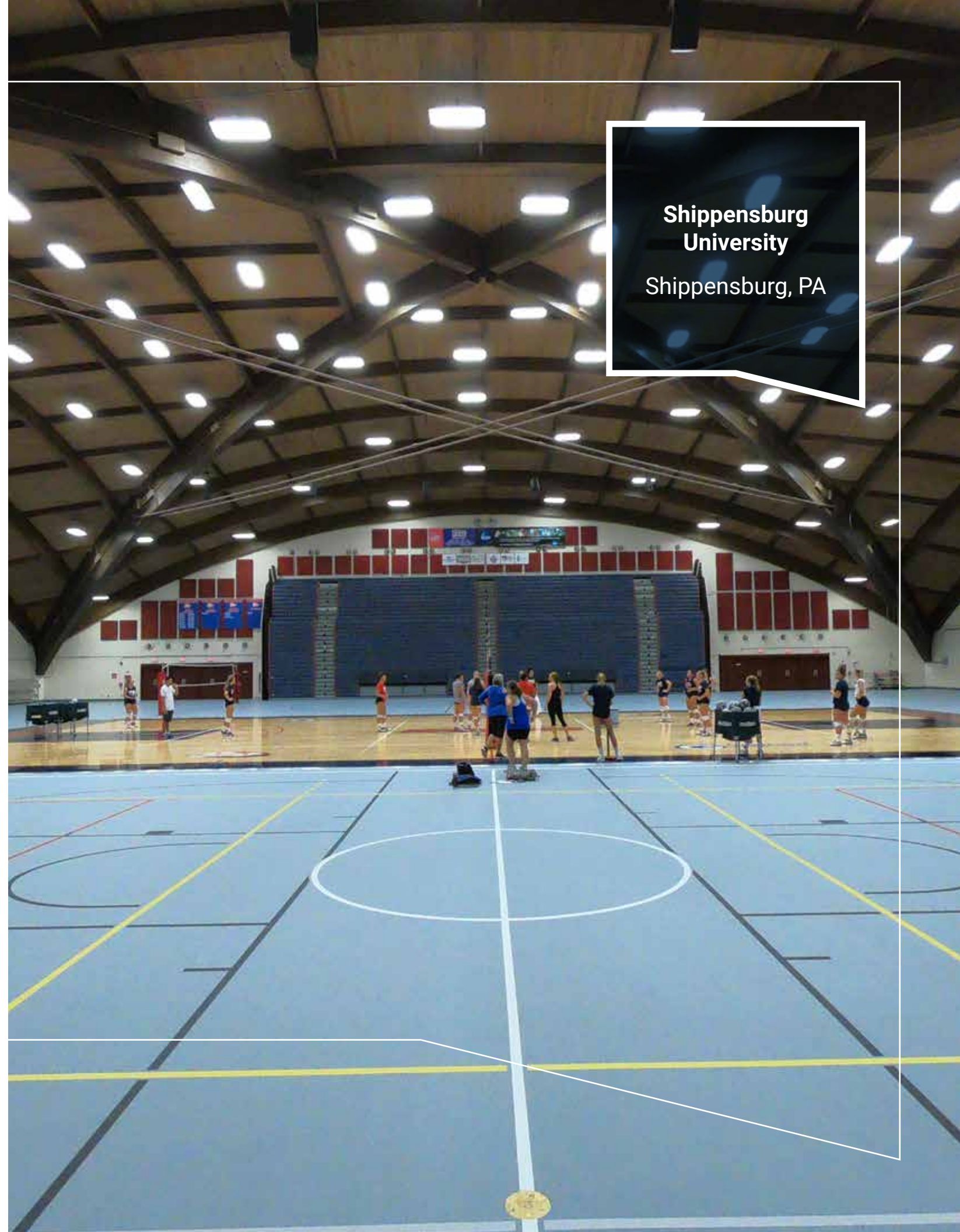


WARRANTY PROTECTION*

The quality and performance of PolyTurf Plus Pad & Pour is protected by Tarkett Sports with a comprehensive 30-year warranty. General Warranty terms apply.

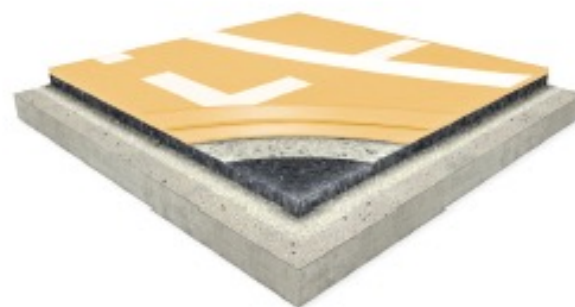
*Contact your Tarkett Sports Representative for more information regarding warranties, installation systems, and applications.

Shippensburg University
Shippensburg, PA



THE ULTIMATE INDOOR SPORTS FLOORING

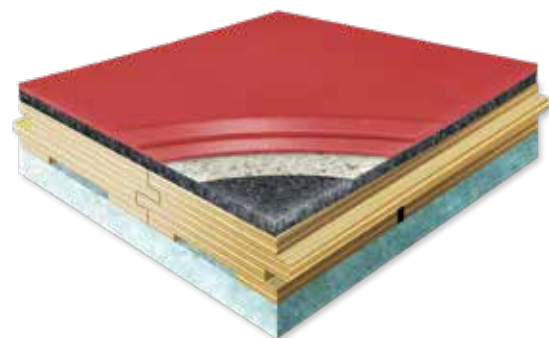
POLYTURF PLUS PAD & POUR



Available in 4mm, 7mm, & 9mm thicknesses. This field-constructed system includes a 100% recycled rubber base mat for comfort and shock absorption.



POLYTURF PLUS PAD & POUR WITH LUMAFLEX

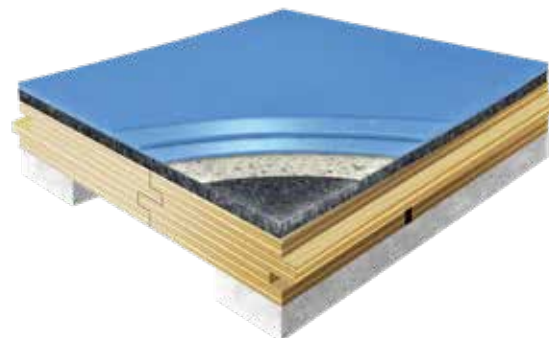


◀ LUMAFLEX

Shock-Absorbing Foam
Class 4 per ASTM F2772

The Lumaflex and Lumaflex Elite systems upgrade your PolyTurf Plus Pad & Pour floor by adding a layer of 18 mm birch plywood planks.

Regardless of the Lumaflex system, they can be modified to meet height requirements, especially when replacing a wood floor within an existing recessed slab.



◀ LUMAFLEX ELITE

Premium Elite Cushion
Class 5 per ASTM F2772

UNPARALLELED COMFORT, SAFETY, & PERFORMANCE



EXTREME DURABILITY, COMFORT & PERFORMANCE

The 18 mm birch plywood planks are made from an extremely stable species of wood that provides a uniform structure for resilient sports surfaces. Lumaflex is ASTM F2772 Class 4 and Class 5 certified, offering high shock absorption and more uniformity. It is one of the best solutions for reducing fatigue and increasing comfort.

THE PERFECT COMBINATION

Lumaflex combines point-elastic surface properties with an area-elastic substructure. This gives athletes significantly more comfort thanks to great vertical deformation and cushioning than they would experience with a basic area-elastic hardwood floor. By engaging both types of elasticity, Lumaflex responds to impact both locally and across the wider surface area. As a result of this dual response, they are widely regarded as one of the best sports floors for comfort, safety, and sports performance.

RELIABLE BONDING AND ASSEMBLY:

Each plywood plank incorporates an interlocking tongue-and-groove edge for fast and reliable installation.

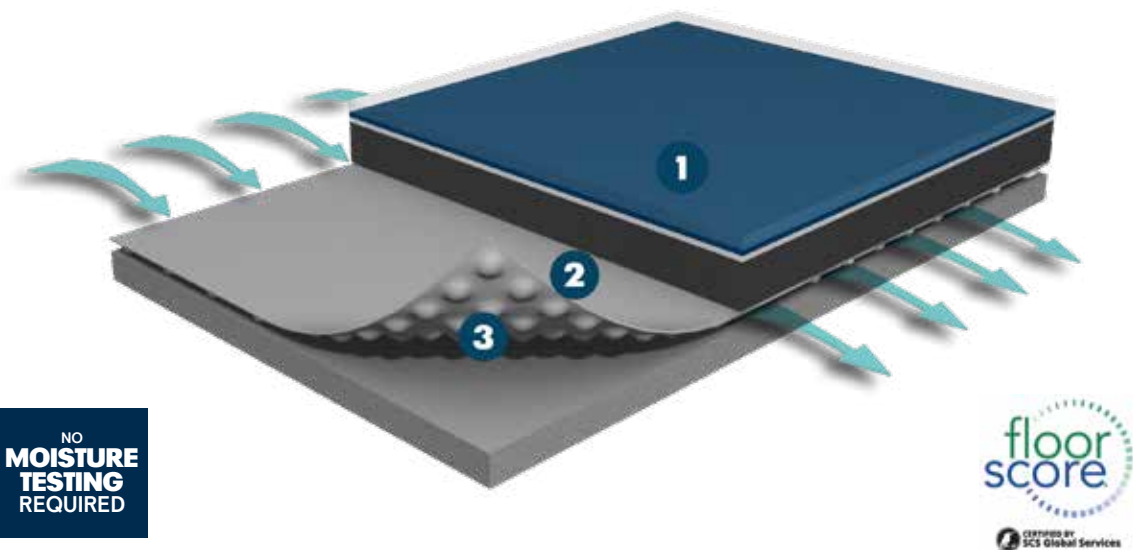
MULTI PURPOSE ADVANTAGE

Your hybrid floor is more than a high-performance surface; it is also a multipurpose floor with unlimited possibilities and benefits. There's no need for a floor cover because a Lumaflex system – combined with a PolyTurf Plus surface – is extremely durable.

ELEVATE YOUR GAME

POLYTURF PLUS PAD & POUR WITH TARKOLAY

Every flooring installation is different. In some cases, high moisture, cracks, joints, or other factors present challenges that require an underlayment. Tarkolay separates the flooring system from the slab, removing the ability for vapor pressure to form. Tarkolay can also assist with challenges from other concrete imperfections at the surface.



1

ISOLATION OF THE SPORTS SURFACE

Tarkolay mitigates adverse conditions by separating the sports surface from the subfloor. Through isolation, an imperfect subfloor is less likely to affect the integrity of the surface installation.

2

DIMENSIONALLY STABLE UNDERLAYMENT

Tarkolay is a dimensionally stable underlayment with a smooth surface for excellent adhesion to the sports floor.

3

RAISED TEXTURE FOR DISPERSING WATER VAPOR

The embossed texture of Tarkolay allows water vapor from the subfloor to dissipate without building pressure that would harm the integrity of the installation.

PERFORMANCE

Tarkolay can address concrete moisture conditions and does not require any initial moisture testing. It is also a FloorScore® certified underlayment that can resolve high moisture and other issues while still maintaining the highest standard of indoor air quality.



LOW VOCs AND BETTER INDOOR AIR QUALITY

- A healthy indoor environment begins with low levels of volatile organic compounds (VOCs).
- VOC emissions less than 10 micrograms per cubic meter*
A lower VOC emission rate than most other resilient sports floors
*VOCs after 28 days (ISO 16000)
- Complies with California Section 01350, the most stringent air quality regulations in the U.S.

INSTALLATION METHODS



MULTI-POXY ADHESIVE

installation using Tarkett's solvent-free Multi-Poxy adhesive, which allows moisture tolerance of up to 98% relative humidity per ASTM F2170.

BEYBOND 50 ADHESIVE:

installation using Beybond 50 two-part polyurethane adhesive, which allows moisture tolerance of up to 95% relative humidity per ASTM F2170.

TARKOLAY WITH MULTI-POXY:

installation over Tarkolay moisture barrier using Tarkett's solvent-free Multi-Poxy adhesive, which allows moisture tolerance of up to 100% relative humidity per ASTM F2170.

PARALYMPIC & POUPUS







Chula Vista
US Olympic
& Paralympic
Training Center
Chula Vista, CA



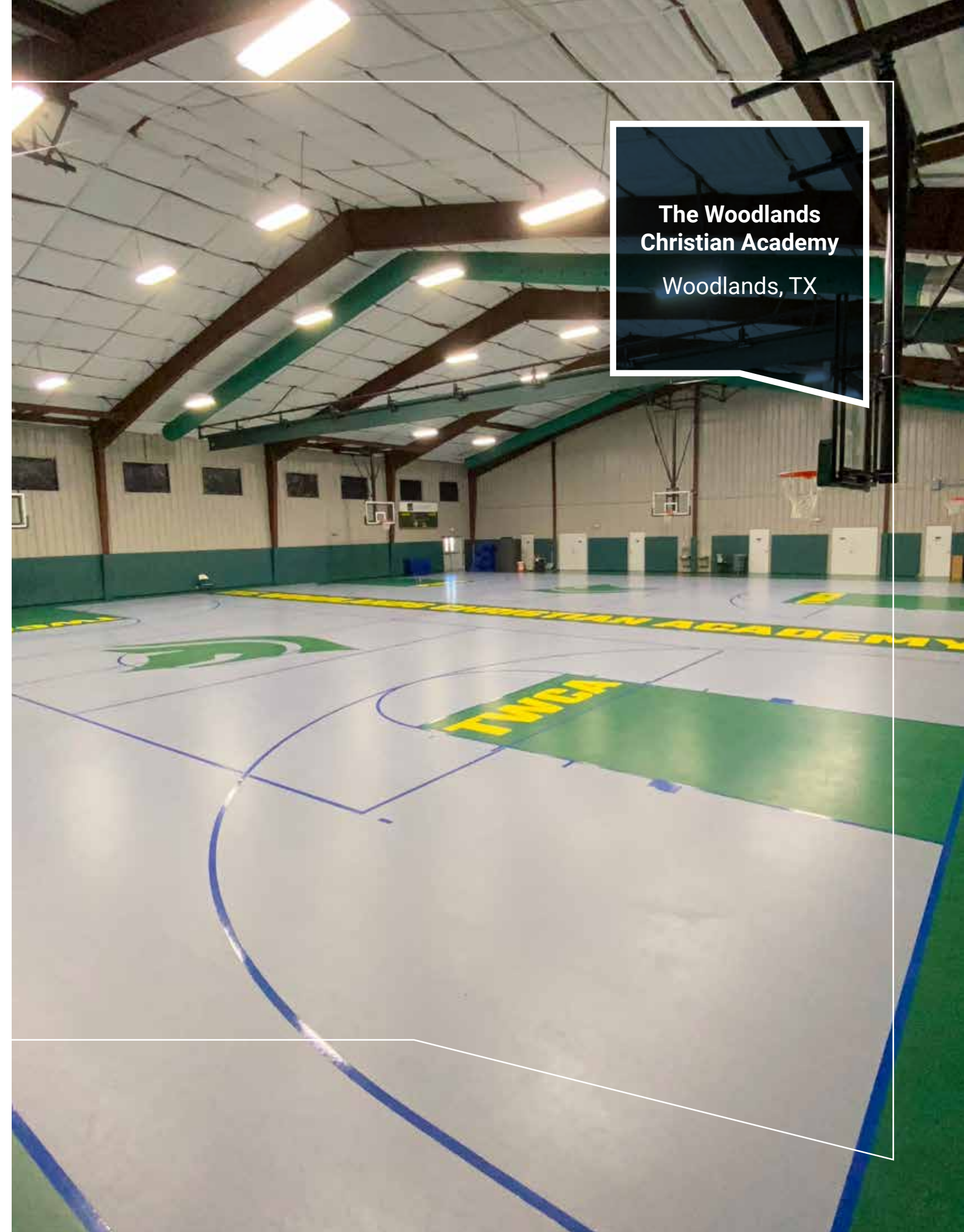
SPECIFICATIONS

4+2, 7+2, 9+2

TECHNICAL DATA

CERTIFICATION & CLASSIFICATION	STANDARDS	POLYTURF PLUS PAD & POUR 4+2	POLYTURF PLUS PAD & POUR 7+2	POLYTURF PLUS PAD & POUR 9+2
TECHNICAL CHARACTERISTICS				
Total Thickness		6.0 mm (0.236")	9.0 mm (0.354")	11.0 mm (0.433")
Weight (Base Mat)		2.59 kg/m2 (0.53 lbs./sq. ft.)	4.5 kg/m2 (0.93 lbs./sq. ft.)	5.86 kg/m2 (1.2 lbs./sq. ft.)
Roll Width (Base Mat)		1.5 m (59")	1.5 m (59")	1.5 m (59")
Roll Length (Base Mat)		25 m (82')	25 m (82')	25 m (82')
SPORTS CHARACTERISTICS				
Surface Finish Effect	ASTM F2772-11	Passed	Passed	Passed
Force Reduction	ASTM F2772-11	Class 1	Class 2	Class 2
Vertical Deformation	ASTM F2772-11	Passed	Passed	Passed
Ball Rebound	ASTM F2772-11	Passed	Passed	Passed
TECHNICAL REQUIREMENTS				
Reaction to Fire	ASTM E648	Class 1 (Radiant Panel)	Class 1 (Radiant Panel)	Class 1 (Radiant Panel)
Shore Hardness		80 (Shore A)	80 (Shore A)	80 (Shore A)
Tensile Strength	ASTM D412	3200 PSI	3200 PSI	3200 PSI
Elongation	ASTM D412	340%	340%	340%
Tear Strength	ASTM D624	360 PLI	360 PLI	360 PLI
Health Certifications		 	 	 
COLORS				
		50 Colors	50 Colors	50 Colors
WARRANTY				
Product and Wear		30 years	30 years	30years
Moisture Tolerance		10 years	10 years	10 years

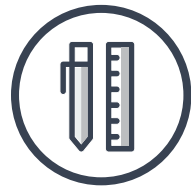
The Woodlands
Christian Academy
Woodlands, TX



MANUFACTURED BY A COMPANY YOU CAN TRUST



Beynon Sports is the premier choice for track & field surfacing. Beynon Sports' specialized high-performance synthetic athletic surfaces are designed for speed, competition, and daily training. Beynon controls all aspects of the manufacturing chain, which allows them to create the right product, regardless of the facility.



DESIGN

PolyTurf Plus Pad & Pour is proudly American-made. We provide a seamless polyurethane structural layer that is strong and durable. Its design and appearance are simple; its performance is anything but.



FORMULATION

Our philosophy on materials selection is simple: use only the best environmentally friendly, bio-based raw materials because we understand that the material choices we make today will affect your athletes for years to come.



MANUFACTURING

PolyTurf Plus Pad & Pour is manufactured in Hunt Valley, Maryland, USA. Our world-class plant is one of the most advanced in North America. The facility is one of the few in the industry to have its Quality Management Systems certified to ISO 9001-2015.



INSTALLATION

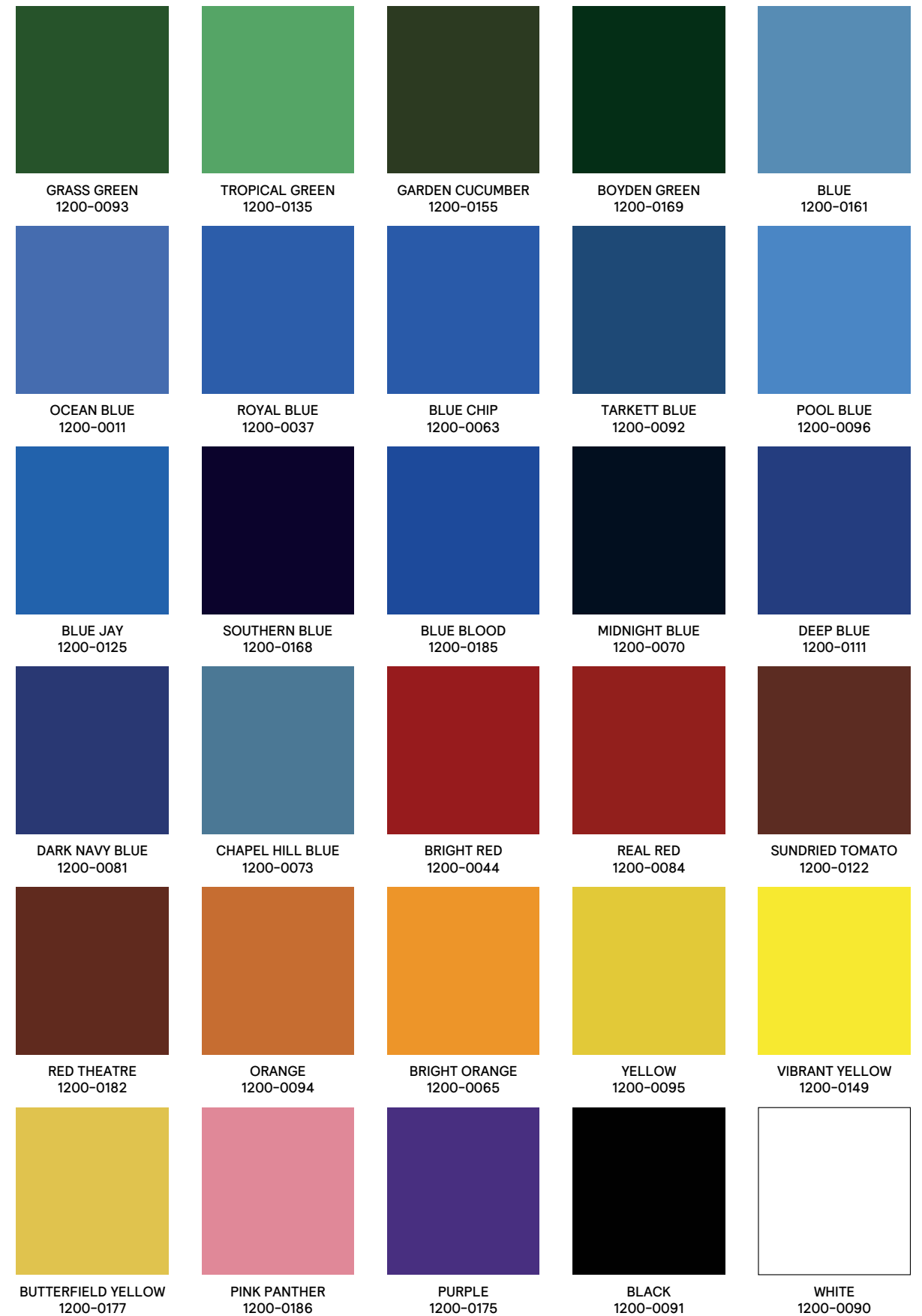
With an exceptionally quick curing rate, PolyTurf Plus Pad & Pour can be installed and ready to use in a relatively short time frame.



Channel Islands High School
Oxnard, CA

FIND YOUR PERFECT FLOORING MATCH

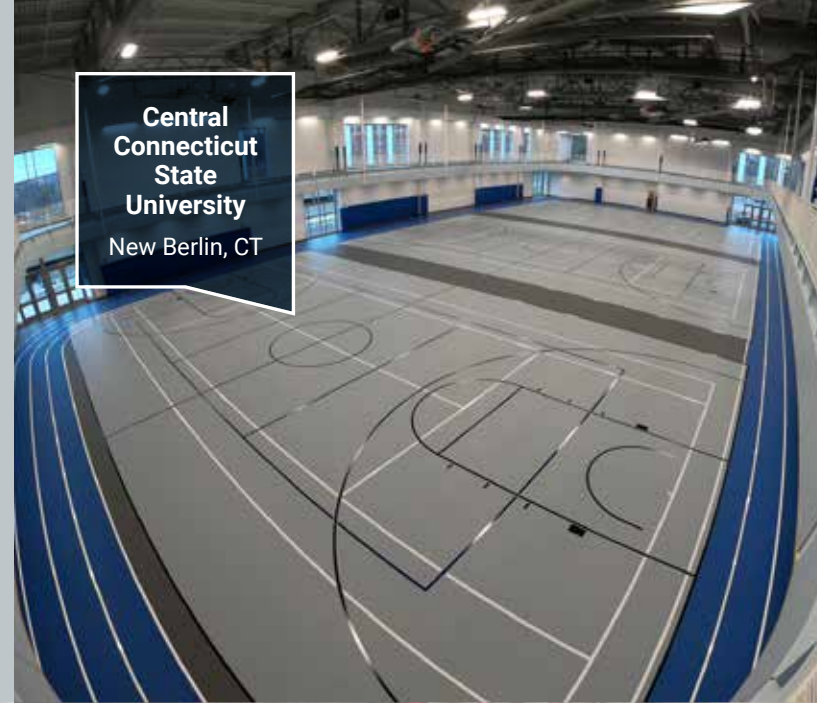
COLOR OPTIONS



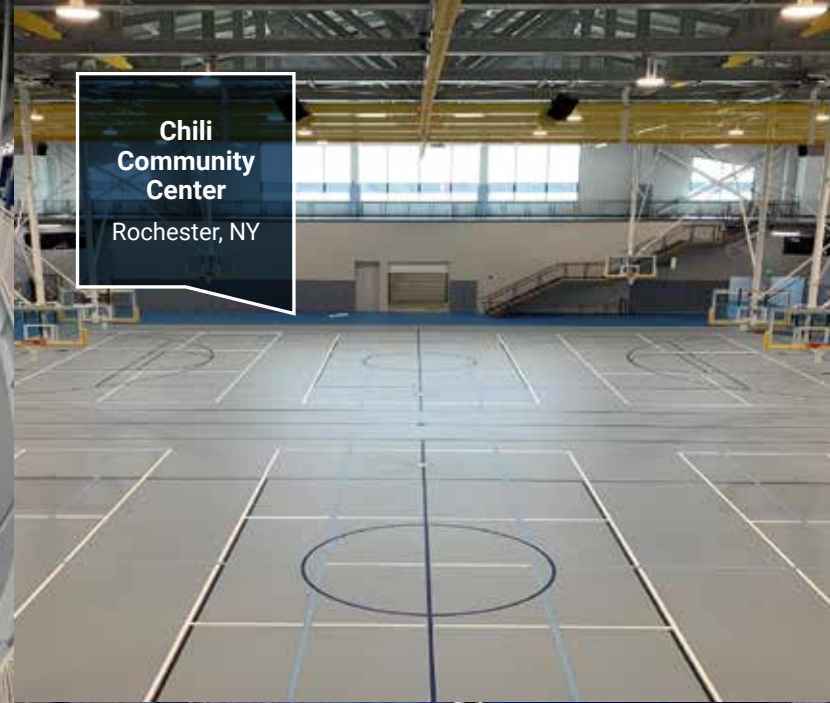
The images shown herein are intended for illustrative purposes only and are not exact representations of the actual products. Size, colors, and materials may vary.

TRUSTED AT ALL LEVELS

OVER 5,000 INSTALLATIONS IN NORTH AMERICA



Central Connecticut State University
New Berlin, CT



Chili Community Center
Rochester, NY



Greece Community Center
Greece, NY



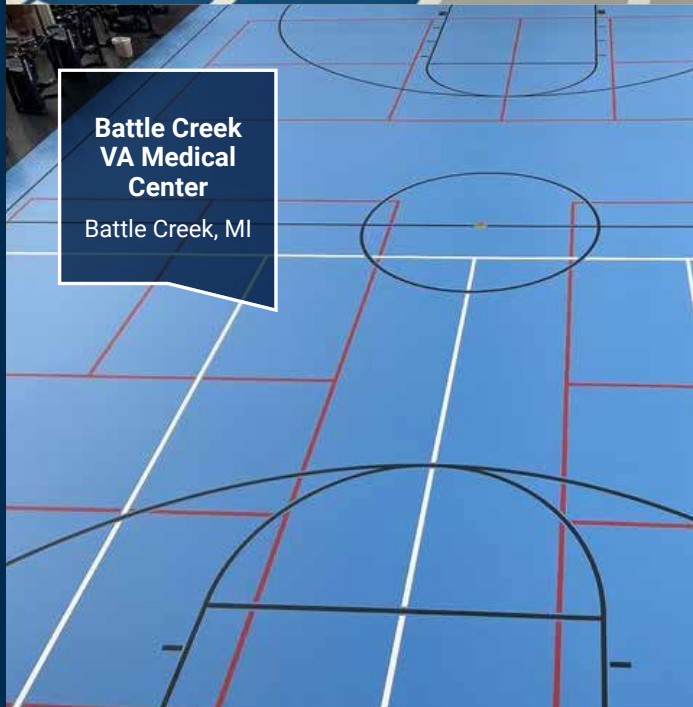
Anchorage School District
Anchorage, AK



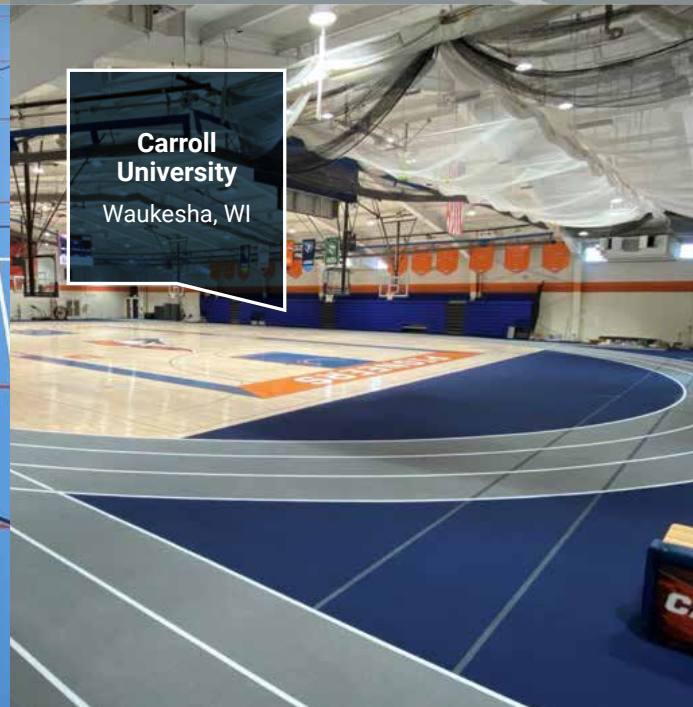
Frostburg State University
Frostburg, MD



JFK Recreation
Newark NJ



Battle Creek VA Medical Center
Battle Creek, MI



Carroll University
Waukesha, WI

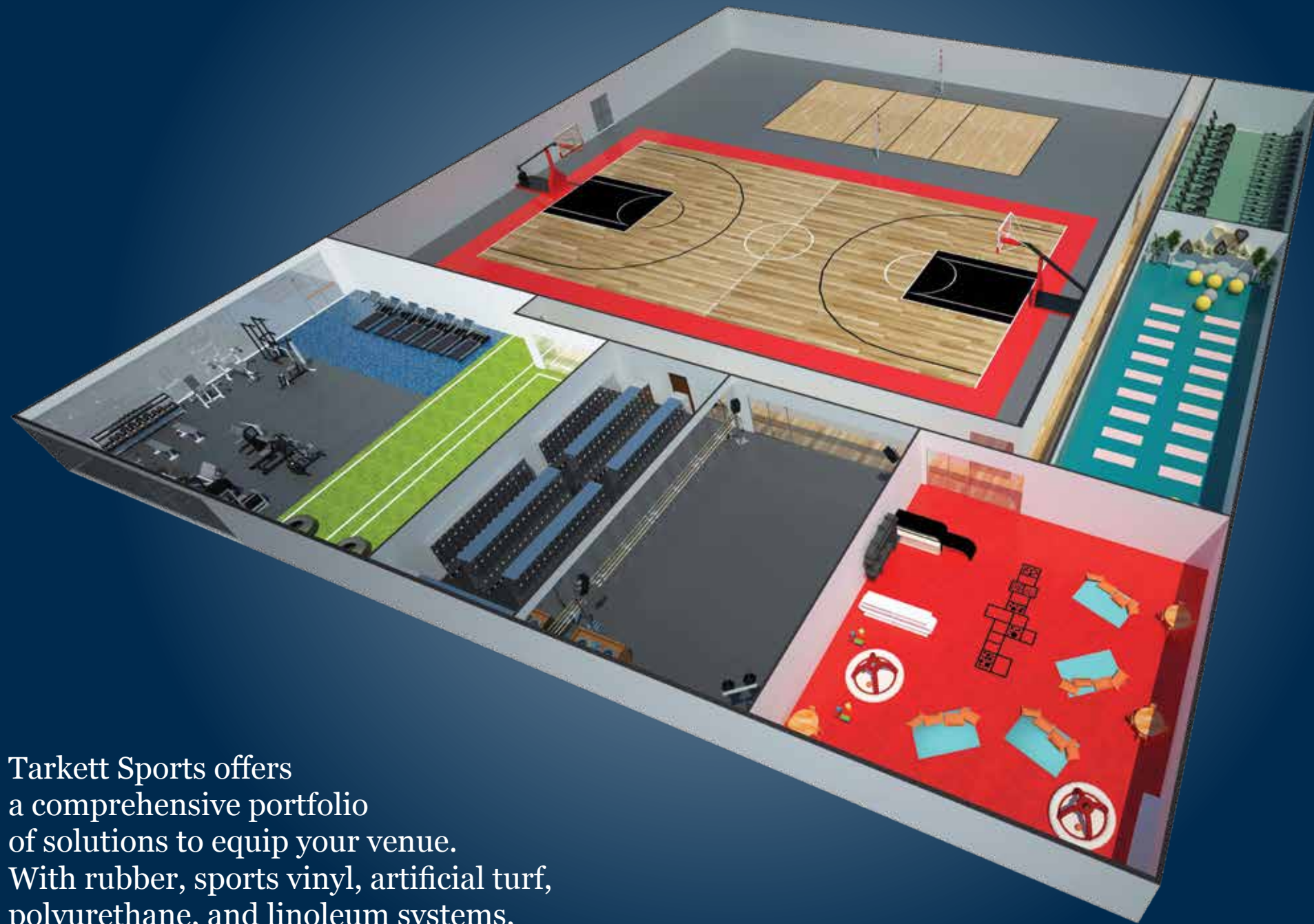


Middletown North High School
Middletown, NJ

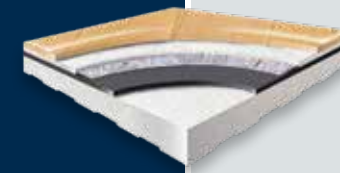


Vistara Sports Complex
Lewisville, TX

A COMPLETE PACKAGE PLAYER

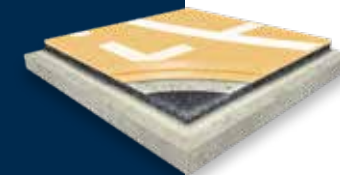


Tarkett Sports offers a comprehensive portfolio of solutions to equip your venue. With rubber, sports vinyl, artificial turf, polyurethane, and linoleum systems, we offer your program a complete package.



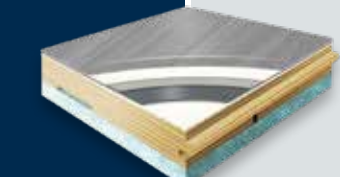
OMNISPORTS SPORTS VINYL

Applications: Gymnasium • Daycare • Multi-Purpose Rooms • Cafetorium • Yoga • Martial Arts



POLYTURF PLUS PAD & POUR POLYURETHANE

Applications: Multi-Purpose Rooms • Cafetorium • Gymnasium • Inline Skating



LUMAFLEX COMBINATION SYSTEM

Applications: Gymnasium • Multi-Purpose Rooms • Inline Skating • Aerobic & Fitness



CLUTCHCOURT HARDWOOD

Applications: Gymnasium (Basketball & Volleyball) • Aerobics • Racquetball



DROPZONE RUBBER

Applications: Weight Rooms • Strength & Cardio Equipment • Spinning • Training Turf • Functional & Extreme Training • Ice Rinks



DANCEFLOOR SPECIALTY VINYL

Applications: Dance Studio • Dance Stage



LINOSPORT LINOLEUM

Applications: Multi-Purpose Rooms • Gymnasium • Daycare



DROPTURF SYNTHETIC TURF

Applications: Recreation & Fitness

PLAY TO WIN

THE TARKETT SPORTS FAMILY - LEADERS IN SPORTS SURFACING



888-364-6541
tarkettsportsindoor.com



SUBSTITUTION REQUEST

(During the Bidding/Negotiating Stage)

Project: _____ Substitution Request Number: _____

From: _____

To: _____ Date: _____

A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Propose Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

A/E's REVIEW AND ACTION

- Substitution approved - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
- Substitution approved as noted - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
- Substitution rejected - Use specified materials.
- Substitution Request received too late - Use specified materials.

Signed by: _____

Date: _____

Supporting Data Attached: Drawings Product Data Samples Tests Reports _____



SUBSTITUTION REQUEST

(During the Bidding/Negotiating Stage)

Project: _____ Substitution Request Number: _____

From: _____

To: _____ Date: _____

A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Propose Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

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Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

A/E's REVIEW AND ACTION

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- Substitution Request received too late - Use specified materials.

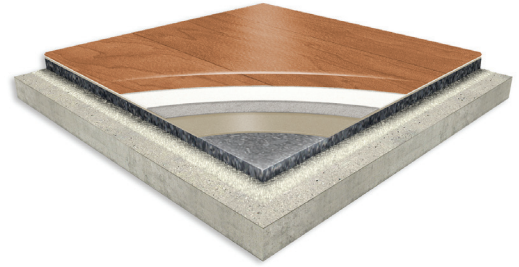
Signed by: _____

Date: _____

Supporting Data Attached: Drawings Product Data Samples Tests Reports _____

Description

Omnisports HPL is a vinyl flooring surface with a high density rubber underlayment. It provides exceptional resistance to static loads for use under heavy bleachers and other applications.



PROPERTY	STANDARD	VALUE
----------	----------	-------

SPORTS CHARACTERISTICS		
Ball Rebound	ASTM F2772-11	Passed
Force Reduction	ASTM F2772-11	Class 1
Surface Finish Effect	ASTM F2772-11	Passed
Vertical Deformation	ASTM F2772-11	Passed

TECHNICAL CHARACTERISTICS		
Reaction to Fire	ASTM E648	Class 1 (Radiant Panel)
Static Load	ASTM F970 (modified)	500 psi
Taber Abrasion	ASTM D3389	0.02 g (1,000 Cycles)
Total Thickness	—	7 mm (0.276")
Wear Layer Performance Grade	ASTM F1303	Type 1, Grade 1, Commercial
Wear Layer Structure	—	2.0 mm
Wear Layer Thickness	ASTM F410/F1303	0.7 mm
Roll Length (Surface)	EN 426/EN 427	26 m (85.3')
Roll Width (Surface)	EN 426/EN 427	2 m (6.5')
Thickness (Surface)	EN 428/EN 429	2.0 mm (0.079")
Weight (Surface)	EN 430	0.8 lbs./sq. ft.
Density (Underlayment)	ASTM D297	0.67 g/cm3
Elongation (Underlayment)	ASTM D412	120-125 min. (Die C)
Roll Width (Underlayment)	—	1.45 m (4.75')
Roll Length (Underlayment)	—	26 m (85.3')
Tear Strength (Underlayment)	ASTM D412	410-425 min. (Die C)

Compatible substrates include: properly constructed and prepared concrete, wood, asphalt, and cementitious underlayments. Refer to current installation guidelines, ASTM F710, ACI 302.2R, and other industry standard recommendations for more information. Tarkett Sports reserves the right to modify these specifications without affecting their compliance with standards. Some results may vary in relation to certain flexibilities found within specified testing procedures and manufacturing tolerances.

Warranty Protection

15-year wear layer and product defect coverage plus 15-year moisture tolerance coverage. Refer to sample warranty document for complete coverage.

Installation Methods

- Full Adhesive: installation using Tarkett's Multi- Poxy Adhesive over the entire area (moisture tolerance: 98% RH using Multi-Poxy)
- Tarkolay: installation over moisture barrier using Multi-Poxy Adhesive (no moisture testing required)

Environmental Facts and LEED

For environmental facts and LEED credits, visit: <https://www.tarkettsportsindoor.com/products/omnisports/omnisports-hpl/>

Maintenance Instructions

For a complete maintenance guide, visit: <https://www.tarkettsportsindoor.com/products/omnisports/omnisports-hpl/>

Available Color



Beech*



Golden Maple



Classic Oak*



Blue Maple



Grey



Black



Yellow



Orange



Red



Royal Blue



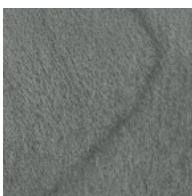
Sky Blue



Teal



Red Maple



Grey Maple



Green Maple

*This pattern has a 3" wide plank. Maple patterns have a width of 2 1/4".

The colors presented here are representations only. An actual sample is recommended for exact color evaluation and matching. Other Custom Colors available. Contact your Regional Sales Manager.

888.364.6541
tarkettsportsindoor.com

RFI detail

#5 Shoemaker Manufacturing Company



Status	Closed
Created on	Feb 4, 2025 by Matt Moser (WOLGAST CORPORATION)
RFI type	Default RFI workflow
Ball in court	Matt Moser (WOLGAST CORPORATION)
Answered	Feb 13, 2025 by Dustin DeWitt (The Collaborative)

Question

I am writing to request approval for Shoemaker Manufacturing as an equal to the specified make and model grilles and diffusers specified and scheduled in the bid documents.

Since 1947, Shoemaker Manufacturing Company has manufactured the highest quality grilles, registers, and diffusers.

Located in the shadow of the Stuart Range in Cle Elum, Washington, Shoemaker Manufacturing is known for its superior products and outstanding customer service in the commercial and residential HVAC marketplace.

Acquired by CSW Industrials in December 2021, Shoemaker plays a key role – along with Rectorseal and TruAire – in CSWI's Contractor Solutions segment. For 185 years combined, Shoemaker, TruAire, and Rectorseal have manufactured and supplied thousands of products for commercial and residential applications, primarily for professional tradesmen who have used them for generations.

Features and Benefits:

One stop shop for Multi Family, commercial, industrial, and code-driven fire rated products

Over 100,000 SKU's in catalog, with dynamic product configuration on Shoemaker website

You can't configure something we cannot make!

15 day lead time on most commercial projects

Products designed with installation in mind

All T-bars include 2" height ADC compliant round collar with bead for ease of install

Surface mount grilles have 1" frame that allows for easy attachment to wall/ceiling

Packaged well to prevent damage

Time saving "door to floor" delivery with product & pallet labeling specifications-just tell us what you want labeled.

Best in class inside, outside, and digital support systems

Custom sizes available at same lead time, with no minimum orders

Shoemaker is transitioning to a OBD standard on all residential/Multi Family products in 2024

Official response

Dustin DeWitt (The Collaborative): Rejected, Provide products by one of the specified manufacturers.

By *Dustin DeWitt (The Collaborative)* - Feb 13, 2025, 1:43 PM EST

References and Attachments

Files (1)

- [Shoemaker Approval Request.pdf](#)

Impact

Cost impact -

Schedule impact -

Other attributes

Priority Normal

Discipline -

Category -

Location -

Location details dickv@balfrey-johnston.com

External id -

Co-reviewer(s)

Spec Section -

Construction Phase Pre-Bid

Activities	By	At
<p>Christie Huver changed the status from Open Answered to Closed</p> <p>Official response: Dustin DeWitt (The Collaborative): Rejected, Provide products by one of the specified manufacturers. changed the watchers to Patrick Fritz (WOLGAST CORPORATION), Clinton Clark (WOLGAST CORPORATION), Matt Moser (WOLGAST CORPORATION)</p>	Christie Huver	Feb 13, 2025, 1:43 PM EST
<p>Christie Huver changed the status from Open In Review to Open Answered set Ball in court to Matt Moser (WOLGAST CORPORATION)</p>	Christie Huver	Feb 13, 2025, 1:43 PM EST
<p>Allison Schrecongost response was submitted by Christie Huver: See response from Dustin</p>	Christie Huver	Feb 13, 2025, 1:43 PM EST
<p>Dustin DeWitt added a response: Rejected, Provide products by one of the specified manufacturers.</p>	Dustin DeWitt	Feb 10, 2025, 9:16 AM EST
<p>Matt Moser added a reference to a File Shoemaker Approval Request.pdf</p>	Matt Moser	Feb 4, 2025, 8:43 AM EST
<p>Matt Moser (WOLGAST CORPORATION) created this RFI in Open In Review status and set Ball in court to Allison Schrecongost, Dustin DeWitt (The Collaborative).</p>	Matt Moser	Feb 4, 2025, 8:43 AM EST

CLARIFICATION REQUEST FORM

Date: _____

Wolgast Clarification Request #: _____

To: Wolgast Corporation
Matt Moser or **Christie Bigelow-Huver**
4835 Towne Centre Road, Suite 203
Saginaw, MI 48604
Phone (989) 790-9120, Fax (989) 790-9063

From: _____
Contractor Name

Contact Name

Email Address

Phone # _____ Fax # _____

Bid Division # and Name: _____

CSI Code (If Applicable): _____

Drawing #: _____ Detail or Item #: _____

Reason for Request: More Detail Needed Engineering Clarification Alternate Proposal Other

Project: **Oscoda Area Schools 2024 Bond Program**

Site Location: **BP 2 Community Center**

ITEM(S) FOR CLARIFICATION OF BID: (Please use one form for each item)

Please review and respond to the following item(s) for clarification:

RESPONSE: **ITEM TO BE INCLUDED IN ADDENDUM**

Construction Manager: _____
Signature Date

Architect: _____
Signature Date

END OF SECTION 00310



SUBSTITUTION REQUEST

(During the Bidding/Negotiating Stage)

Project: _____ Substitution Request Number: _____

From: _____

To: _____ Date: _____

A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

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- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted by: _____

Signed by: Dick Uedevoogd

Firm: _____

Address: _____

Telephone: _____

A/E's REVIEW AND ACTION

- Substitution approved - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
- Substitution approved as noted - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
- Substitution rejected - Use specified materials.
- Substitution Request received too late - Use specified materials.

Signed by: _____

Date: _____

Supporting Data Attached: Drawings Product Data Samples Tests Reports _____

RFI detail

#6 Existing Controls - Controls Solutions



Status	Closed
Created on	Feb 4, 2025 by Matt Moser (WOLGAST CORPORATION)
RFI type	Default RFI workflow
Ball in court	Matt Moser (WOLGAST CORPORATION)
Answered	Feb 13, 2025 by Dustin DeWitt (The Collaborative)

Question

Is there an existing district control system that this building will need to be interfaced with?

I see no control contractors or control systems are currently specified.

Official response

Dustin DeWitt (The Collaborative): HVAC control system being installed on the High School heating project is being provided by Control Solutions Inc. The system is Distech Controls with Niagara 4. The Community Center is to interface with that new system to provide an integrated interface for the campus.

See attached a revised Control System for HVAC specification. This section will be included in Addendum 1.

By **Dustin DeWitt** (The Collaborative) - Feb 13, 2025, 1:40 PM EST

Official response attachments

[230923 DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC \(KTS # 24-0219\).PDF](#), Feb 10, 2025, 9:21 AM EST

Impact

Cost impact -

Schedule impact -

Other attributes

Priority Normal

Discipline	-
Category	-
Location	-
Location details	dstrong@csibas.com
External id	-
Co-reviewer(s)	
Spec Section	-
Construction Phase	Pre-Bid

Activities	By	At
<p>Christie Huver changed the status from Open Answered to Closed</p> <p>Official response: Dustin DeWitt (The Collaborative): HVAC control system being installed on the High School heating project is being provided by Control Solutions Inc. The system is Distech Controls with Niagara 4. The Community Center is to interface with that new system to provide an integrated interface for the campus.</p> <p>See attached a revised Control System for HVAC specification. This section will be included in Addendum 1. changed the official response attachment to: 230923 DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC (KTS # 24-0219).PDF</p> <p>changed the watchers to Patrick Fritz (WOLGAST CORPORATION), Clinton Clark (WOLGAST CORPORATION), Matt Moser (WOLGAST CORPORATION)</p>	Christie Huver	Feb 13, 2025, 1:40 PM EST
<p>Christie Huver changed the status from Open In Review to Open Answered set Ball in court to Matt Moser (WOLGAST CORPORATION)</p>	Christie Huver	Feb 13, 2025, 1:40 PM EST
<p>Allison Schrecongost response was submitted by Christie Huver: see response from Dustin</p>	Christie Huver	Feb 13, 2025, 1:40 PM EST
<p>Dustin DeWitt added a response: HVAC control system being installed on the High School heating project is being provided by Control Solutions Inc. The system is Distech Controls with Niagara 4. The Community Center is to interface with that new system to provide an integrated interface for the campus. See attached a revised Control System for HVAC specification. This section will be included in Addendum 1. added the response attachment to: 230923 DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC (KTS # 24-0219).PDF</p>	Dustin DeWitt	Feb 10, 2025, 9:21 AM EST
<p>Matt Moser (WOLGAST CORPORATION) created this RFI in Open In Review status and set Ball in court to Allison Schrecongost, Dustin DeWitt (The Collaborative).</p>	Matt Moser	Feb 4, 2025, 8:54 AM EST

SECTION 230923
DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temperature control System (TCS), utilizing direct digital controls.
 - 1. The Temperature Control Contractor shall be herein referred to the TCC.

1.02 REFERENCE STANDARDS

- A. IEEE 142 - IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems; 2007, with Errata (2014).
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- C. NEMA ICS 1 - Industrial Control and Systems General Requirements; 2022.
- D. UL 506 - Standard for Specialty Transformers; Current Edition, Including All Revisions.
- E. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.
- F. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.03 RELATED WORK

- A. Products Supplied but Not Installed Under This Section:
 - 1. Control Actuators.
 - 2. HVAC Equipment
- B. Products Installed but Not Supplied Under This Section:
 - 1. See System Description below.
 - 2. The existing front-end controllers, equipment controllers, their present state of programming, current API & SKDs status, graphics, etc., must be field verified.
- C. Products existing or new with the Work of This Section:
 - 1. NOTE: All new equipment as noted on plans must be fully integrated per this specification and Sequence of Operations.
 - 2. Roof top units.
 - 3. Variable air volume boxes.
 - 4. Mini-split cooling only units.
 - 5. Other HVAC systems as noted on plans.
- D. Work Required Under Other Divisions Related to This Section:
 - 1. Power wiring to line side of equipment.
 - 2. Provision and wiring devices relating to fire alarm system.

1.04 RELATED SECTIONS

- A. Section 23 00 00 – HVAC, 230553 Identification for HVAC Piping and Equipment.

1.05 SYSTEM DESCRIPTION

- A. Scope: Furnish all labor, materials and equipment necessary for a complete and operating Tridium 4 with HTML/5 Temperature Control System (TCS), utilizing Direct Digital Bacnet Protocol Controls as noted on the drawings and as described herein. Drawings are diagrammatic only. All controllers furnished in this section shall communicate on a peer-to-peer bus over an open protocol bus (Examples: BACnet, Modbus).
 - 1. The intent of this specification is to provide a fully, non-proprietary, TCS comprised of non-proprietary equipment controller and front-end controller.
 - 2. System architecture shall fully support a multi-vendor environment and be able to integrate third party systems via existing vendor protocols including, as a minimum, BACnet and MODBUS and LonTalk. All new controllers shall be Bacnet protocol.

3. System architecture shall provide secure Web access using any of the current versions of Microsoft Edge, Mozilla Firefox, or Google Chrome browsers from any computer on the owner's LAN.
 4. All control devices furnished with this Section shall be programmable directly from the Niagara 4 Workbench embedded toolset upon completion of this project. The use of configurable or programmable controllers that require additional software tools for post-installation maintenance shall not be acceptable.
 5. The TCS server shall host all graphic files for the control system. All graphics and navigation schemes for this project shall Niagara 4 Framework server.
 6. The TCC shall coordinate the installation of the new Tridium 4 software onto a virtual server provided by Owner.
 - a. The TCC shall provide written request through the Construction Manager all necessary server requests, server requirements, IP addresses, etc., as part of the approved shop drawing process.
 7. Owner shall receive all Administrator level login and passwords for engineering toolset at first training session. The Owner shall have full licensing and full access rights for all network management, operating system server, engineering and programming software required for the ongoing maintenance and operation of the TCS.
 8. All hardware licenses and certificates shall be stored on a local external hard drive employing encrypted "safe boot" technology. TCC shall provide external drive device.
- B. NiCS REQUIREMENTS: All Niagara software licenses for this project shall have a 100% open, Tridium Niagara Compatibility Statement (NICS).
1. Brand ID = Open
 2. Station Compatibility In = All "*"
 3. Tool Compatibility In = Open or Open "All"
 4. Tool Compatibility Out = "All"
 - a. All Passwords shall be given to the Owner and shall be verified by the Engineer. THE OWNER AND CONTRACTOR MUST CREATE PASSWORD TOGETHER. NO RESETTING OR MANUFACTURER RESETTING OF PASSWORD IS AVAILABLE.
 5. Note: It is the requirement of this specification that the Tridium hardware and software system installed by the Contractor shall be 100% accessible by any other Contractor the Owner wishes to employ for the lifespan of the Tridium system (no less than 20 years). The NICS shall be set-up so that there is no limitation to the access, copying, and modification of programming, sequencing, coding, graphics, passwords, etc.
- C. All products of the TCS shall be provided with the following agency approvals. Verification that the approvals exist for all submitted products shall be provided on request, with the submittal package. Systems or products not currently offering the following approvals are not acceptable.
1. Federal Communications Commission (FCC), Rules and Regulations, Volume II -July 1986 Part 15 Class A Radio Frequency Devices.
 2. FCC, Part 15, Subpart B, Class B
 3. FCC, Part 15, Subpart C
 4. FCC, Part 15, Subpart J, Class A Computing Devices.
 5. UL 504 - Industrial Control Equipment.
 6. UL 506 - Specialty Transformers.
 7. UL 910 - Test Method for Fire and Smoke Characteristics of Electrical and Optical-Fiber Cables Used in Air-Handling Spaces.
 8. UL 916 - Energy Management Systems All.
 9. UL 1449 - Transient Voltage Suppression.
 10. Standard Test for Flame Propagation Height of Electrical and Optical - Fiber Cables Installed Vertically in Shafts.
 11. EIA/ANSI 232-E - Interface Between Data Technical Equipment and Data Circuit Terminal Equipment Employing Serial Binary Data Interchange.

12. EIA 455 - Standard Test Procedures for Fiber Optic Fibers, Cables, Transducers, Connecting and Terminating Devices.
13. IEEE C62.41- Surge Voltages in Low-Voltage AC Power Circuits.
14. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
 - a. NEMA 250 - Enclosures for Electrical Equipment.
 - b. NEMA ICS 1 - Industrial Controls and Systems.
 - c. NEMA ST 1 - Specialty Transformers.
 - d. NCSBC Compliance, Energy: Performance of control system shall meet or surpass the requirements of ASHRAE/IESNA 90.1-1999.
 - e. CE 61326.
 - f. C-Tick.
 - g. cUL.

1.06 SPECIFICATION NOMENCLATURE

- A. The term Control Contractor, Temperature Control Contractor (TCC) shall all serve as Contractor in this specification and project.
- B. Acronyms used in this specification are as follows:
 1. Actuator: Control device that opens or closes valve or damper in response to control signal.
 2. AI: Analog Input.
 3. AO: Analog Output.
 4. Analog: Continuously variable state over stated range of values.
 5. TCS: Temperature control System.
 6. DDC: Direct Digital Control.
 7. Discrete: Binary or digital state.
 8. DI: Discrete Input.
 9. DO: Discrete Output.
 10. FC: Fail Closed position of control device or actuator. Device moves to closed position on loss of control signal or energy source.
 11. FO: Fail open (position of control device or actuator). Device moves to open position on loss of control signal or energy source.
 12. GUI: Graphical User Interface.
 13. HVAC: Heating, Ventilating and Air Conditioning.
 14. IDC: Interoperable Digital Controller.
 15. ILC: Interoperable Lon Controller.
 16. LAN: Local Area Network.
 17. Modulating: Movement of a control device through an entire range of values, proportional to an infinitely variable input value.
 18. Motorized: Control device with actuator.
 19. NAC: Network Area Controller.
 20. NC: Normally closed position of switch after control signal is removed or normally closed position of manually operated valves or dampers.
 21. NO: Normally open position of switch after control signal is removed; or the open position of a controlled valve or damper after the control signal is removed; or the usual position of a manually operated valve.
 22. OSS: Operating System Server, host for system graphics, alarms, trends, etc.
 23. Operator: Same as actuator.
 24. PC: Personal Computer.
 25. Peer-to-Peer: Mode of communication between controllers in which each device connected to network has equal status and each shares its dataTCS values with all other devices connected to network.

26. P: Proportional control; control mode with continuous linear relationship between observed input signal and final controlled output element.
27. PI: Proportional-Integral control, control mode with continuous proportional output plus additional change in output TCSed on both amount and duration of change in controller variable (reset control).
28. PICS: BACnet Product Interoperability Compliance Statement.
29. PID: Proportional-Integral-Derivative control, control mode with continuous correction of final controller output element versus input signal TCSed on proportional error, its time history (reset) and rate at which it's changing (derivative).
30. Point: Analog or discrete instrument with addressable dataTCS value.
31. WAN: Wide Area Network.

1.07 SUBMITTALS

1. Shop Drawings:
 - a. See General Requirements and HVAC General Requirements.
 - b. Submit electronic, Portable Document Format (PDF), submittals to Construction Manager and Engineer for review.
 - c. Submit complete manufacturers shop drawings of all equipment, accessories and controls, including capacities, weights, dimensions, construction details, installation, controls, wiring diagrams, and motor data.
 - d. Approval of shop drawings is for general application only and is a service only and not considered as a guarantee of total compliance with or as relieving Contractor of basic responsibilities under all Contract Documents, and does not approve changes in time or cost.
 - e. After approval, each Contractor and Subcontractor is responsible to provide information to all other trades involved in or affected by installation of his equipment.
2. Operating and Maintenance Instruction and Manuals:
 - a. Each Contractor shall provide for all equipment (3) bound and indexed sets of operating and maintenance instructions to Engineer for approval. Manual shall include a complete set of shop drawings.
 - b. Submit manuals prior to Substantial Completion. Final payment and release of Retainage shall follow submission of manuals.

1.08 QUALITY ASSURANCE

- A. The Contractor shall have a full service DDC office within 100 miles (____) of the job site. This office shall be staffed with applications engineers, software engineers and field technicians. This office shall maintain parts inventory and shall have all testing and diagnostic equipment necessary to support this work, as well as staff trained in the use of this equipment.
- B. The project manager or lead installer and programmer of the project employed by the Contractor shall be available on-site, the same day within 4 hours of a requested service call.
- C. Single Source Responsibility of Supplier: The Control System Contractor shall be responsible for the complete installation and proper operation of the control system. The Control System Contractor shall exclusively be in the regular and customary business of design, installation and service of computerized temperature control systems similar in size and complexity to the system specified. The Control System Contractor shall be the manufacturer of the primary DDC system components or shall have been the authorized representative for the primary DDC components manufacturer for at least 5 years. All control panels shall be assembled by the Control System Contractor in a UL-Certified 508A panel shop.
- D. Equipment and Materials: Equipment and materials shall be cataloged products of manufacturers regularly engaged in the production and installation of HVAC control systems. Products shall be manufacturer's latest standard design and have been tested and proven in actual use.

1.09 PRE-INSTALLATION MEETINGS

- A. Coordinate with Construction Manager and/or Engineer.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Maintain integrity of shipping cartons for each piece of equipment and control device through shipping, storage and handling as required to prevent equipment damage. Store equipment and materials inside and protected from weather.

1.11 JOB CONDITIONS

- A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to insure that the Work will be carried out in an orderly fashion. It shall be this Contractor's responsibility to check the Contract Documents for possible conflicts between his Work and that of other crafts in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, air diffusers and structural and architectural features.

1.12 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Approved equipment controller manufacturers and front-end controller with supervisor:
 - 1. Distech Controls with Niagara 4 Installed by Control Solutions Inc. Alpena Mi 989-379-2404
- B. All approved TCS equipment shall be purchased direct from manufacturer and not through distribution.
- C. Substitutions: Not permitted.
- D. Temperature control system manufacturers must provide a single price to the Mechanical Contractor for temperature control system equipment complete for installation, that shall not include packaging of other HVAC equipment (air handlers, roof top units, boilers, pumps, etc.).
- E. Requests for substitutions must receive written pre-approved during the bidding period by the Engineer. The equipment supplier

2.02 GENERAL

- A. The Temperature Control System (TCS) shall be comprised of a network of interoperable, stand-alone digital controllers, a network area controller, graphics and programming and other control devices for a complete system as specified herein.
- B. The installed system shall provide secure password access to all features, functions and data contained in the overall TCS.
- C. Temperature Control System Project Summary:
 - 1. A new stand-alone server (or virtual server if provided by Owner) shall be provided and configured by the Temperature Control Contractor must install a new Tridium Niagara 4 platform. All new equipment, integration, and programming required for a fully operational platform must be provided by the Temperature Control Contractor.

2.03 OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURE

- A. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system utilizing Open protocols in one open, interoperable system.
- B. The supplied computer software shall employ object-oriented technology (OOT) for representation of all data and control devices within the system. Physical connection of any BACnet control equipment, such as rooftop units or boilers, shall be via Ethernet or IP.
- C. All components and controllers supplied under this contract shall be true "peer-to-peer" communicating devices. Components or controllers requiring "polling" by a host to pass data shall not be acceptable.

- D. The supplied system shall incorporate the ability to access all data using HTML5 enabled browsers without requiring proprietary operator interface and configuration programs or browser plug-ins. An Open DataTCS connectivity (ODBC) or Structured Query Language (SQL) compliant server dataTCS is required for all system dataTCS parameter storage. This data shall reside on the Operating System Server located in the Facilities Office on the LAN. Systems requiring proprietary dataTCS and user interface programs shall not be acceptable.
- E. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network. Systems employing a "flat" single tiered architecture shall not be acceptable.
 - 1. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 5 seconds for network connected user interfaces.
 - 2. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 60 seconds for remote or dial-up connected user interfaces.

2.04 TCS SERVER HARDWARE

- A. The Temperature Control Contractor shall include all necessary memory, hard drive, display and network cards, as requested by Owner based on the following:
 - 1. Refer to Tridium Niagara 4 (latest version) Minimum Requirements.
 - 2. Memory: 16 GB or more recommended for the Windows 64-bit version.
 - 3. Hard Drive: 256 GB minimum, more recommended depending on archiving requirements.
 - 4. Display: Video card and monitor capable of displaying 1024 x 768 pixel resolution or greater.
 - 5. Network Support: Ethernet adapter (10/100 Mb with RJ-45 connector).
 - 6. The TCC shall verify the hardware requirements and ensure enhanced TCS hardware performance capabilities are included for robust operation.
- B. The Temperature Control Contractor must include all necessary materials and labor to provide a complete installation of the TCS software onto the Owner Virtual Server.

2.05 SYSTEM NETWORK CONTROLLER (SNC)

- A. These controllers are designed to manage communications between the programmable equipment controllers (PEC), application specific controllers (ASC) and advanced unitary controllers (AUC) which are connected to its communications trunks, manage communications between itself and other system network controllers (SNC) and with any operator workstations (OWS) that are part of the TCS, and perform control and operating strategies for the system TCSed on information from any controller connected to the TCS.
- B. The controllers shall be fully programmable to meet the unique requirements of the facility it shall control.
- C. The controllers shall be capable of peer-to-peer communications with other SNC's and with any OWS connected to the TCS, whether the OWS is directly connected, connected via cellular modem or connected via the Internet.
- D. The communication protocols utilized for peer-to-peer communications between SNC's will be Niagara 4 BACnet TCP/IP and SNMP. Use of a proprietary communication protocol for peer-to-peer communications between SNC's is not allowed.
- E. The SNC shall employ a device count capacity license model that supports expansion capabilities.
- F. The SNC shall be enabled to support and shall be licensed with the following Open protocol drivers (client and server) by default:
 - 1. BACnet
 - 2. Lon
 - 3. MODBUS

4. SNMP
 5. KNX
- G. The SNC shall be capable of executing application control programs to provide:
1. Calendar functions.
 2. Scheduling.
 3. Trending.
 4. Alarm monitoring and routing.
 5. Time synchronization.
 6. Integration of LonWorks, BACnet, and MODBUS controller data.
 7. Network management functions for all SNC, PEC and ASC TCSed devices.
- H. The SNC shall provide the following hardware features as a minimum:
1. Two 10/100 Mbps Ethernet ports.
 2. Two Isolated RS-485 ports with biasing switches.
 3. 1 GB RAM
 4. 4 GB Flash Total Storage / 2 GB User Storage
 5. Wi-Fi (Client or WAP)
 6. USB Flash Drive
 7. High Speed Field Bus Expansion
 8. -20-60°C Ambient Operating Temperature
 9. Integrated 24 VAC/DC Global Power Supply
 10. MicroSD Memory Card Employing Encrypted Safe Boot Technology
- I. The SNC shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 16 simultaneous users.
- J. The SNC shall provide alarm recognition, storage, routing, management and analysis to supplement distributed capabilities of equipment or application specific controllers.
- K. The SNC shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via cellular modem, or wide-area network.
1. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including but not limited to:
 - a. Alarm.
 - b. Return to normal.
 - c. To default.
 - 1) Alarms shall be annunciated in any of the following manners as defined by the user:
 - d. Screen message text.
 - e. Email of complete alarm message to multiple recipients.
 - f. Graphics with flashing alarm object(s).
 - 1) The following shall be recorded by the SNC for each alarm (at a minimum):
 - g. Time and date.
 - h. Equipment (air handler #, access way, etc.).
 - i. Acknowledge time, date, and user who issued acknowledgement.
- L. Programming software and all controller "Setup Wizards" shall be embedded into the SNC.
- M. The SNC shall support the following security functions.
1. Module code signing to verify the author of programming tool and confirm that the code has not been altered or corrupted.
 2. Role-TCSed Access Control (RBAC) for managing user roles and permissions.
 3. Require users to use strong credentials.
 4. Data in Motion and Sensitive Data at Rest be encrypted.
 5. LDAP and Kerberos integration of access management.

- N. The SNC shall support the following data modeling structures to utilize Search; Hierarchy; Template; and Permission functionality:
 - 1. Metadata: Descriptive tags to define the structure of properties.
 - 2. Tagging: Process to apply metadata to components
 - 3. Tag Dictionary
- O. The SNC shall employ template functionality. Templates are a containerized set of configured data tags, graphics, histories, alarms... that are set to be deployed as a unit TCSed upon manufacturer's controller and relationships. All lower level communicating controllers (PEC, AUC, AVAV, VFD...) shall have an associated template file for reuse on future project additions.
- P. The SNC shall be provided with a 5 Year Software Maintenance license. Labor to implement not included.

2.06 PROGRAMMABLE EQUIPMENT CONTROLLER (PEC)

- A. All new HVAC control equipment controllers shall be accomplished using Native BACnet TCSed devices. Where the existing application has a LonMark profile or BTL Listed PICS defined, LonMark may be used. Where LonMark devices are not available for a particular application, devices TCSed on LonWorks shall be acceptable. For each LonWorks device that does not have LonMark certification, the device supplier shall provide an XIF file for the device. The controller platform shall provide options and advanced system functions, programmable and configurable using Niagara 4 Framework, that allow standard and customizable control solutions required in executing the "Sequence of Operation".
- B. All PECs shall be application programmable and shall at all times maintain their certification. All control sequences within or programmed into the PEC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery to be retained.
- C. The PEC shall provide LED indication of communication and controller performance to the technician, without cover removal.
- D. The PEC shall not require any external configuration tool or programming tool. All configuration and programming tasks shall be accomplished and accessible from within the Niagara 4 environment.
- E. The following integral and remote Inputs/Outputs shall be supported per each PEC:
 - 1. Eight integral dry contact digital inputs.
 - 2. Any two digital inputs may be configured as pulse counters with a maximum pulse read rate of 15 Hz.
 - 3. Eight integral analog inputs (configurable as 0-10V, 0-10,000 ohm or, 20K NTC).
 - 4. Six integral 4-20 ma analog outputs.
 - 5. Eight integral 24 Vac Triac digital outputs, configurable as maintained or floating motor control outputs.
 - 6. One integral 20 Vdc, 65-mA power supply for auxiliary devices.
 - 7. If a 20 Vdc 65-mA power supply terminal is not integral to the PEC, provide at each PEC a separate, fully isolated, enclosed, current limited and regulated UL listed auxiliary power supply for power to auxiliary devices.
- F. Each PEC shall have expansion ability to support additional I/O requirements through the use of remote input/output modules.
- G. PEC Controllers shall support at minimum the following control techniques:
 - 1. General-purpose control loops that can incorporate Demand Limit Control strategies, Set point reset, adaptive intelligent recovery, and time of day bypass.
 - a. General-purpose, non-linear control loops.
 - b. Start/stop Loops.
 - c. If/Then/Else logic loops.
 - d. Math Function loops (MIN, MAX, AVG, SUM, SUB, SQRT, MUL, DIV, ENTHALPY).

2.07 ADVANCED UNITARY CONTROLLER (AUC)

- A. The advanced unitary controller (AUC) platform shall be designed specifically to control HVAC - ventilation, filtration, heating, cooling, humidification, and distribution. Equipment includes: constant volume air handlers, VAV air handlers, packaged RTU, boilers, PTACs, pumps, fin-tube radiation. The control shall use LonMark or BACnet TCSed devices where the application has a LonMark profile or BTL Listed PICS defined. Where LonMark devices are not available for a particular application, devices TCSed on LonWorks shall be acceptable. For each LonWorks device that does not have LonMark certification, the device supplier shall provide an XIF file for the device. The controller platform shall provide options and advanced system functions, programmable and configurable using Niagara 4 Framework, that allow standard and customizable control solutions required in executing the "Sequence of Operation".
- B. Minimum Requirements:
1. The controller shall be fully programmable with full functionality on any Niagara 4 brand platform.
 - a. Support downloads to the controller from any brand of Niagara 4 platform.
 - b. Support uploads from the controller to any brand of Niagara 4 platform.
 - c. Support simulation/debug mode of the controller.
 - d. Maintain native GUI.
 - e. Native function-block programming software and all controller "Setup Wizards" shall be embedded within the Niagara 4 environment.
 2. The controller shall be capable of either integrating with other devices or stand-alone operation.
 3. The controller shall have two microprocessors. The Host processor contains on-chip FLASH program memory, FLASH information memory, and RAM to run the main HVAC application. The second processor for network communications. Controller memory minimum requirements include:
 - a. FLASH Memory Capacity: 60 Kilobytes with 8 Kilobytes for application program.
 - b. FLASH Memory settings retained for ten years.
 - c. RAM: 2 Kilobytes.
 4. The controller shall have an internal time clock with the ability to automatically revert from a master time clock on failure.
 - a. Operating Range: 24 hour, 365 day, multi-year calendar including day of week and configuration for automatic day-light savings time adjustment to occur on configured start and stop dates.
 - b. Accuracy: ± 1 minute per month at 77 degrees Fahrenheit (25 degrees Celsius).
 - c. Power Failure Backup: 24 hours at 32 degrees to 122 degrees Fahrenheit (0 degrees Celsius).
 5. The controller shall have Significant Event Notification, Periodic Update capability, and Failure Detect when network inputs fail to be detected within their configurable time frame.
 6. The controller shall have an internal DC power supply to power external sensors.
 - a. Power Output: 20 VDC $\pm 10\%$ at 75 mA.
 7. The controller shall have a visual indication (LED) of the status of the device:
 - a. Controller operating normally.
 - b. Controller in process of download.
 - c. Controller in manual mode under control of software tool.
 - d. Controller lost its configuration.
 - e. No power to controller, low voltage, or controller damage.
 - f. Processor and/or controller are not operating.
 8. The minimum controller Environmental ratings.
 - a. Operating Temperature Ambient Rating: -40 degrees to 150 degrees Fahrenheit (40 degrees Celsius).
 - b. Storage Temperature Ambient Rating: -40 degrees to 150 degrees Fahrenheit (40 degrees Celsius).

- c. Relative Humidity: 5% to 95% non-condensing.
 - 1) The controller shall have the additional approval requirements, listings, and approvals:
 - d. UL/cUL (E87741) listed under UL916 (Standard for Open Energy Management Equipment) with plenum rating.
 - e. CSA (LR95329-3) Listed.
 - f. Meets FCC Part 15, Subpart B, Class B (radiated emissions) requirements.
 - g. Meets Canadian standard C108.8 (radiated emissions).
 - h. Conforms requirements European Consortium standard EN 61000-6-1; 2001 (EU Immunity).
 - i. Conforms requirements European Consortium standard EN 61000-6-3; 2001 (EU Emission).
9. The controller housing shall be UL plenum rated mounting to either a panel or DIN rail (standard EN50022; 7.5mm x 35mm).
10. The controller shall have a mix of digital inputs (DI), digital Triac outputs (DO), analog outputs (AO), and universal inputs (UI).
- a. Analog outputs (AO) shall be capable of being configured as digital outputs (DO).
 - b. Input and Output wiring terminal strips shall be removable from the controller without disconnecting wiring.
 - c. Input and Output wiring terminals shall be designated with color coded labels.
 - d. Universal inputs shall be capable of being configured as binary inputs, resistive inputs, voltage inputs (0-10 VDC), or current inputs (4-20 mA).
 - e. The controller shall provide "continuous" automated loop tuning with an Adaptive Integral Algorithm Control Loop.
 - f. The controller platform shall have standard HVAC application programs that are modifiable to support both the traditional and specialized "sequence of operations" as outlined in Section 4.
 - g. Discharge air control and low limit.
 - h. Pressure-dependent dual duct without flow mixing.
 - i. Variable air volume with return flow tracking.
 - j. Economizer with differential enthalpy.
 - k. Minimum airflow coordinated with CO₂.
 - l. Unit ventilator cycle (1, 2, 3) 2-pipe.
 - m. Unit ventilator cycle (1, 2, 3) 2-pipe with face/bypass.
 - n. Unit ventilator cycle (1, 2, 3) 4-pipe.
 - o. Unit ventilator cycle (1, 2, 3) 4-pipe with EOC valve.

2.08 OTHER CONTROL SYSTEM HARDWARE

- A. Motorized control dampers that will not be integral to the equipment shall be furnished by the Control System Contractor. Control damper frames shall be constructed of galvanized steel, formed into changes and welded or riveted. Dampers shall be galvanized, with nylon bearings. Blade edge seals shall be vinyl or neoprene. Blade edge and tip seals shall be included for all dampers. Blades shall be 16-gauge minimum and 6 inches (152.4 mm) wide maximum and frame shall be of welded channel iron. Damper leakage shall not exceed 10 CFM per square foot, at 1.5 inches (38.1 mm) water gauge static pressure.
- B. Control damper actuators shall be furnished by the Control System Contractor. Two-position or proportional electric actuators shall be direct-mount type sized to provide a minimum of 5 inch (127 mm)-lb torque per square foot of damper area. Damper actuators shall be spring return type. Operators shall be heavy-duty electronic type for positioning automatic dampers in response to a control signal. Motor shall be of sufficient size to operate damper positively and smoothly to obtain correct sequence as indicated. All applications requiring proportional operation shall utilize truly proportional electric actuators. Honeywell is TCSis of design.

- C. Wall Mount Room Temperature sensors: Each room temperature sensor shall provide temperature indication to the digital controller, provide the capability for a software-limited occupant set point adjustment (warmer-cooler slider bar or switch) and limited operation override capability. Room Temperature Sensors shall be 20,000-ohm thermistor type with a temperature range of -40 to 140 degrees Fahrenheit (38 degrees Celsius). The sensor shall be complete with a decorative cover and suitable for mounting over a standard electrical utility box. These devices shall have an accuracy of 0.5 degrees Fahrenheit (0.24 degrees Celsius) over the entire range. Honeywell is TCSis of design.
- D. Duct-mounted and Outside Air Temperature Sensors: 20,000-ohm thermistor temperature sensors with an accuracy of ± 0.2 degrees Celsius. Outside air sensors shall include an integral sun shield. Duct-mounted sensors shall have an insertion measuring probe of a length appropriate for the duct size, with a temperature range of -40 to 160 degrees F (-38 to 71 degrees C). The sensor shall include a utility box and a gasket to prevent air leakage and vibration noise. For all mixed air and preheat air applications, install bendable averaging duct sensors with a minimum 8 feet (2438 mm) long sensor element. These devices shall have accuracy of 0.5 degrees Fahrenheit (0.24 degrees Celsius) over the entire range. Honeywell is TCSis of design.
- E. Humidity sensors shall be thin-film capacitive type sensor with on-board nonvolatile memory, accuracy to plus or minus two percent (2%) at 0 to 90% RH, 12 - 30 VDC input voltage, analog output (0 - 10 VDC or 4 - 20mA output). Operating range shall be 0 to 100% RH and 32 to 140 degrees Fahrenheit (____). Sensors shall be selected for wall, duct or outdoor type installation as appropriate. Honeywell is TCSis of design.
- F. Carbon Dioxide Sensors (CO₂): Sensors shall utilize Non-dispersive infrared technology (N.D.I.R.), repeatable to plus or minus 20 PPM. Sensor range shall be 0 - 2000 PPM. Accuracy shall be plus or minus five percent (5%) or 75 PPM, whichever is greater. Response shall be less than one minute. Input voltage shall be 20 to 30 VAC or DC. Output shall be 0 - 10 VDC. Sensor shall be wall or duct mounted type, as appropriate for the application, housed in a high impact plastic enclosure. Honeywell is TCSis of design.
- G. Current Sensitive Switches: Solid state, split core current switch that operates when the current level (sensed by the internal current transformer) exceeds the adjustable trip point. Current switch to include an integral LED for indication of trip condition and a current level below trip set point. Honeywell is TCSis of design.
- H. Differential Analog (duct) Static Pressure Transmitters Provide a pressure transmitter with integral capacitance type sensing and solid-state circuitry. Accuracy shall be plus or minus 1% of full range; range shall be selected for the specific application. Provide zero and span adjustment capability. Device shall have integral static pickup tube. Honeywell is TCSis of design.
- I. Differential Air Pressure Switches: Provide SPDT type, UL-approved, and selected for the appropriate operating range where applied. Switches shall have adjustable set points and barbed pressure tips. Honeywell is TCSis of design.
- J. Temperature Control Panels: Furnish temperature control panels of code gauge steel with locking doors for mounting all devices as shown. All electrical devices within a control panel shall be factory wired. Control panel shall be assembled by the TCS in a UL-Certified 508A panel shop. A complete set of 'as-built' control drawings (relating to the controls within that panel) shall be furnished within each control panel.
- K. Pipe and Duct Temperature sensing elements: 20,000-ohm thermistor temperature sensors with and accuracy of $\pm 1\%$ accuracy. Their range shall be -5 to 250 degrees Fahrenheit (____). Limited range sensors shall be acceptable provided they are capable of sensing the range expected for the point at the specified accuracy. Thermal wells with heat conductive gel shall be included. Honeywell is TCSis of design.

- L. Low Air Temperature Sensors: Provide SPST type switch, with 15 to 55 degrees Fahrenheit (____), range, vapor-charged temperature sensor. Honeywell model L482A, or approved equivalent.
- M. Variable Frequency Drives: The variable frequency drive (VFD) shall be designed specifically for use in Heating, Ventilation, and Air Conditioning (HVAC) applications in which speed control of the motor can be applied. The VFD, including all factory installed options, shall have UL & CSA approval. VFD's shall include communications capability with DDC TCS via built-in interface card (MODBUS or BACnet). Honeywell SmartVFD is TCSis of design.
- N. Relays: Start/stop relay model shall provide either momentary or maintained switching action as appropriate for the motor being started. All relays shall be plugged in, interchangeable, mounted on a sub TCSe and wired to numbered terminals strips. Relays installed in panels shall all be DPDT with indicating lamp. Relays installed outside of controlled devices shall be enclosed in a NEMA enclosure suitable for the location. Relays shall be labeled with UR symbol. RIB-style relays are acceptable for remote enable/disable.
- O. Transducers: Differential pressure transducers shall be electronic with a 4-20 mA output signal compatible to the Direct Digital Controller. Wetted parts shall be stainless steel. Unit shall be designed to operate in the pressure ranges involved.
- P. Control Power Transformers: Provide step-down transformers for all DDC controllers and devices as required. Transformers shall be sized for the load, but shall be sized for 50 watts, minimum. Transformers shall be UL listed Class 2 type, for 120 VAC/24 VAC operation. Honeywell is TCSis of design.
- Q. Line voltage protection: All DDC system control panels that are powered by 120 VAC circuits shall be provided with surge protection. This protection is in addition to any internal protection provided by the manufacturer. The protection shall meet UL, ULC 1449, IEEE C62.41B. A grounding conductor, (minimum 12 AWG), shall be brought to each control panel.

2.09 TCS SERVER & WEB BROWSER GUI - SYSTEM OVERVIEW

- A. The TCC Contractor shall provide system software TCS based on server/thin-client architecture, designed around the open standards of web technology. The TCS server shall communicate using Ethernet and TCP. Server shall be accessed using a web browser over Owner intranet and remotely over the Internet.
- B. The intent of the thin-client architecture is to provide the operator(s) complete access to the TCS system via a web browser. The thin-client web browser Graphical User Interface (GUI) shall be browser and operating system agnostic, meaning it will support HTML5 enabled browsers without requiring proprietary operator interface and configuration programs or browser plug-ins. Microsoft, Firefox, and Chrome browsers (current released versions), and Windows as well as non-Window operating systems.
- C. The TCS server software shall support at least the following server platforms (Windows 7, Windows 10). The TCS server software shall be developed and tested by the manufacturer of the system stand-alone controllers and network controllers/routers.
- D. The web browser GUI shall provide a completely interactive user interface and shall provide a HTML5 experience that supports the following features as a minimum:
 - 1. Trending.
 - 2. Scheduling.
 - 3. Electrical demand limiting.
 - 4. Duty Cycling.
 - 5. Downloading Memory to field devices.
 - 6. Real time 'live' Graphic Programs.
 - 7. Tree Navigation.
 - 8. Parameter change of properties.
 - 9. Set point adjustments.
 - 10. Alarm / event information.

11. Configuration of operators.
 12. Execution of global commands.
 13. Add, delete, and modify graphics and displayed data.
- E. Software Components: All software shall be the most current version. All software components of the TCS system software shall be provided and installed as part of this project. TCS software components shall include:
1. Server Software, DataTCSe and Web Browser Graphical User Interface.
 2. 5 Year Software Maintenance license. Labor to implement not included.
 3. Embedded System Configuration Utilities for future modifications to the system and controllers.
 4. Embedded Graphical Programming Tools.
 5. Embedded Direct Digital Control software.
 6. Embedded Application Software.
- F. TCS Server DataTCSe: The TCS server software shall utilize a Java DataTCSe Connectivity (JDBC) compatible dataTCSe such as: MS SQL 8.0, Oracle 8i or IBM DB2. TCS systems written to Non -Standard and/or Proprietary dataTCSeS are NOT acceptable.
- G. Thin Client - Web Browser TCSeD: The GUI shall be thin client or browser TCSeD and shall meet the following criteria:
1. Web Browser's for PC's: Only the current released browser (Edge/Firefox/Chrome) will be required as the GUI and a valid connection to the server network. No installation of any custom software shall be required on the operator's GUI workstation/client. Connection shall be over an intranet or the Internet.
 2. Secure Socket Layers: Communication between the Web Browser GUI and TCS server shall offer encryption using 128-bit encryption technology within Secure Socket Layers (SSL). Communication protocol shall be Hyper-Text Transfer Protocol (HTTP).

2.10 WEB BROWSER GRAPHICAL USER INTERFACE

- A. Web Browser Navigation: The Thin Client web browser GUI shall provide a comprehensive user interface. Using a collection of web pages, it shall be constructed to "feel" like a single application, and provide a complete and intuitive mouse/menu driven operator interface. It shall be possible to navigate through the system using a web browser to accomplish requirements of this specification. The Web Browser GUI shall (as a minimum) provide for navigation, and for display of animated graphics, schedules, alarms/events, live graphic programs, active graphic set point controls, configuration menus for operator access, reports and reporting actions for events.
- B. Login: On launching the web browser and selecting the appropriate domain name or IP address, the operator shall be presented with a login page that will require a login name and strong password. Navigation in the system shall be dependent on the operator's role-TCSeD application control privileges.
- C. Navigation: Navigation through the GUI shall be accomplished by clicking on the appropriate level of a navigation tree (consisting of an expandable and collapsible tree control like Microsoft's Explorer program) and/or by selecting dynamic links to other system graphics. Both the navigation tree and action pane shall be displayed simultaneously, enabling the operator to select a specific system or equipment and view the corresponding graphic. The navigation tree shall as a minimum provide the following views: Geographic, Network, Groups and Configuration.
1. Geographic View shall display a logical geographic hierarchy of the system including: cities, sites, buildings, building systems, floors, equipment and objects.
 2. Groups View shall display Scheduled Groups and custom reports.
 3. Configuration View shall display all the configuration categories (Operators, Schedule, Event, Reporting and Roles).
- D. Action Pane: The Action Pane shall provide several functional views for each subsystem specified. A functional view shall be accessed by clicking on the corresponding button:

1. Graphics: Using graphical format suitable for display in a web browser, graphics shall include aerial building/campus views, color building floor-plans, equipment drawings, active graphic set point controls, web content and other valid HTML elements. The data on each graphic page shall automatically refresh.
2. Dashboards: User customizable data using drag and drop HTML5 elements. Shall include Web Charts, Gauges, and other custom developed widgets for web browser. User shall have ability to save custom dashboards.
3. Search: User shall have multiple options for searching data TCSed upon Tags. Associated equipment, real time data, Properties, and Trends shall be available in result.
4. Properties: Shall include graphic controls and text for the following: Locking or overriding objects, demand strategies, and any other valid data required for setup. Changes made to the properties pages shall require the operator to depress an 'accept/cancel' button.
5. Schedules: Shall be used to create, modify/edit and view schedules TCSed on the systems hierarchy (using the navigation tree).
6. Alarms: Shall be used to view alarm information geographically (using the navigation tree), acknowledge alarms, sort alarms by category, actions and verify reporting actions.
7. Charting: Shall be used to display associated trend and historical data, modify colors, date range, axis and scaling. User shall have ability to create HTML charts through web browser without utilizing chart builder. User shall be able to drag and drop single or multiple data points, including schedules, and apply status colors for analysis.
8. Logic - Live Graphic Programs: Shall be used to display 'live' graphic programs of the control algorithm, (micro block programming) for the mechanical/electrical system selected in the navigation tree.
9. Other actions such as Print, Help, Command, and Logout shall be available via a drop-down window.
10. Color Graphics: The Web Browser GUI shall make extensive use of color in the graphic pane to communicate information related to set points and comfort. Animated .gifs or .jpg, vector scalable, active set point graphic controls shall be used to enhance usability. Graphics tools used to create Web Browser graphics shall be non-proprietary and conform to the following TCSic criteria:
11. Display Size: The GUI workstation software shall graphically display in a minimum of 1024 by 768 pixels 24 bit True Color.
12. General Graphic: General area maps shall show locations of controlled buildings in relation to local landmarks.
13. Color Floor Plans: Floor plan graphics shall show heating and cooling zones throughout the buildings in a range of colors, as selected by Owner. Provide a visual display of temperature relative to their respective set points. The colors shall be updated dynamically as a zone's actual comfort condition changes.
14. Mechanical Components: Mechanical system graphics shall show the type of mechanical system components serving any zone through the use of a pictorial representation of components. Selected I/O points being controlled or monitored for each piece of equipment shall be displayed with the appropriate engineering units. Animation shall be used for rotation or moving mechanical components to enhance usability. .
15. Minimum System Color Graphics: Color graphics shall be selected and displayed via a web browser for the following:
 16. Each piece of equipment monitored or controlled including each terminal unit.
 17. Each building.
 18. Each floor and zone controlled.

- E. Hierarchical Schedules: Utilizing the Navigation Tree displayed in the web browser GUI, an operator (with proper access credentials) shall be able to define a Normal, Holiday or Override schedule for an individual piece of equipment or room, or choose to apply a hierarchical schedule to the entire system, site or floor area. For example, Independence Day ' Holiday' for every level in the system would be created by clicking at the top of the geographic hierarchy defined in the Navigation Tree. No further operator intervention would be required and every control module in the system with would be automatically downloaded with the ' Independence Day' Holiday. All schedules that affect the system/area/equipment highlighted in the Navigation Tree shall be shown in a summary schedule table and graph.
1. Schedules: Schedules shall comply with the LonWorks and BACnet standards, (Schedule Object, Calendar Object, Weekly Schedule property and Exception Schedule property) and shall allow events to be scheduled TCSed on:
 - a. Types of schedule shall be Normal, Holiday or Override.
 - b. A specific date.
 - c. A range of dates.
 - d. Any combination of Month of Year (1-12, any), Week of Month (1-5, last, any), Day of Week (M-Sun, Any).
 - e. Wildcard (example, allow combinations like second Tuesday of every month).
 2. Schedule Categories: The system shall allow operators to define and edit scheduling categories (different types of "things" to be scheduled; for example, lighting, HVAC occupancy, etc.). The categories shall include: name, description, icon (to display in the hierarchy tree when icon option is selected) and type of value to be scheduled.
 3. Schedule Groups: In addition to hierarchical scheduling, operators shall be able to define functional Schedule Groups, comprised of an arbitrary group of areas/rooms/equipment scattered throughout the facility and site. For example, the operator shall be able to define an ' individual tenant' group - who may occupy different areas within a building or buildings. Schedules applied to the ' tenant group' shall automatically be downloaded to control modules affecting spaces occupied by the ' tenant group'.
 4. Intelligent Scheduling: The control system shall be intelligent enough to automatically turn on any supporting equipment needed to control the environment in an occupied space. If the operator schedules an individual room in a VAV system for occupancy, for example, the control logic shall automatically turn on the VAV air handling unit, chiller, boiler and/or any other equipment required to maintain the specified comfort and environmental conditions within the room.
 5. Partial Day Exceptions: Schedule events shall be able to accommodate a time range specified by the operator (ex: board meeting from 6 pm to 9 pm overrides Normal schedule for conference room).
 6. Schedule Summary Graph: The schedule summary graph shall clearly show Normal versus Holiday versus Override Schedules and the net operating schedule that results from all contributing schedules. Note: In case of priority conflict between schedules at the different geographic hierarchy, the schedule for the more detailed geographic level shall apply.
- F. Alarms: Alarms associated with a specific system, area, or equipment selected in the Navigation Tree, shall be displayed in the Action Pane by selecting an ' Alarms' view. Alarms, and reporting actions shall have the following capabilities:
1. Alarms View: Each Alarm shall display an Alarms Category (using a different icon for each alarm category), date/time of occurrence, current status, alarm report and a bold URL link to the associated graphic for the selected system, area or equipment. The URL link shall indicate the system location, address and other pertinent information. An operator shall easily be able to sort events, edit event templates and categories, acknowledge or force a return to normal in the Events View as specified in this section.
 2. Alarm Categories: The operator shall be able to create, edit or delete alarm categories such as HVAC, Maintenance, Fire, or Generator. An icon shall be associated with each alarm category, enabling the operator to easily sort through multiple events displayed.

3. Alarm Templates: Alarm template shall define different types of alarms and their associated properties. As a minimum, properties shall include a reference name, verbose description, severity of alarm, acknowledgement requirements, and high/low limit and out of range information.
4. Alarm Areas: Alarm Areas enable an operator to assign specific Alarm Categories to specific Alarm Reporting Actions. For example, it shall be possible for an operator to assign all HVAC Maintenance Alarm on the 1st floor of a building to email the technician responsible for maintenance. The Navigation Tree shall be used to setup Alarm Areas in the Graphic Pane.
5. Alarm Time/Date Stamp: All events shall be generated at the DDC control module level and comprise the Time/Date Stamp using the standalone control module time and date.
6. Alarm Configuration: Operators shall be able to define the type of Alarm generated per object. A 'network' view of the Navigation Tree shall expose all objects and their respective Alarm Configuration. Configuration shall include assignment of Alarm, type of Acknowledgement and notification for return to normal or fault status.
7. Alarm Summary Counter: The view of Alarm in the Graphic Pane shall provide a numeric counter, indicating how many Alarms are active (in alarm), require acknowledgement and total number of Alarms in the TCS Server dataTCSe.
8. Alarm Auto-Deletion: Alarms that are acknowledged and closed shall be auto-deleted from the dataTCSe and archived to a text file after an operator defined period.
9. Alarm Reporting Actions: Alarm Reporting Actions specified shall be automatically launched (under certain conditions) after an Alarm is received by the TCS server software. Operators shall be able to easily define these Reporting Actions using the Navigation Tree and Graphic Pane through the web browser GUI. Reporting Actions shall be as follows:
 10. Print: Alarm information shall be printed to the TCS server's PC or a networked printer.
 11. Email: Email shall be sent via any POP3-compatible e-mail server (most Internet Service Providers use POP3). Email messages may be copied to several email accounts. Note: Email reporting action shall also be used to support alphanumeric paging services, where email servers support pagers.
 12. File Write: The ASCII File write reporting action shall enable the operator to append operator defined alarm information to any alarm through a text file. The alarm information that is written to the file shall be completely definable by the operator. The operator may enter text or attach other data point information (such as AHU discharge temperature and fan condition upon a high room temperature alarm).
 13. Write Property: The write property reporting action updates a property value in a hardware module.
 14. SNMP: The Simple Network Management Protocol (SNMP) reporting action sends an SNMP trap to a network in response to receiving an alarm.
 15. Run External Program: The Run External Program reporting action launches specified program in response to an event.
- G. Trends: As system is engineered, all points shall be enabled to trend. Trends shall both be displayed and user configurable through the Web Browser GUI. Trends shall comprise analog, digital or calculated points simultaneously. A trend log's properties shall be editable using the Navigation Tree and Graphic Pane.
 1. Viewing Trends: The operator shall have the ability to view trends by using the Navigation Tree and selecting a Trends button in the Graphic Pane. The system shall allow y- and x-axis maximum ranges to be specified and shall be able to simultaneously graphically display multiple trends per graph.
 2. Local Trends: Trend data shall be collected locally by Multi-Equipment/Single Equipment general-purpose controllers, and periodically uploaded to the TCS server if historical trending is enabled for the object. Trend data, including run time hours and start time date shall be retained in non-volatile module memory. Systems that rely on a gateway/router to run trends are NOT acceptable.

3. Resolution. Sample intervals shall be as small as one second. Each trended point will have the ability to be trended at a different trend interval. When multiple points are selected for displays that have different trend intervals, the system will automatically scale the axis.
 4. Dynamic Update. Trends shall be able to dynamically update at operator-defined intervals.
 5. Zoom/Pan. It shall be possible to zoom-in on a particular section of a trend for more detailed examination and 'pan through' historical data by simply scrolling the mouse.
 6. Numeric Value Display. It shall be possible to pick any sample on a trend and have the numerical value displayed.
 7. Copy/Paste. The operator shall have the ability to pan through a historical trend and copy the data viewed to the clipboard using standard keystrokes (i.e. CTRL+C, CTRL+V).
- H. Security Access: Systems that are accessed from the web browser GUI to TCS server shall require a Login Name and Strong Password. Access to different areas of the TCS system shall be defined in terms of Role-TCSed Access Control privileges as specified:
1. Roles: Roles shall reflect the actual roles of different types of operators. Each role shall comprise a set of 'easily understood English language' privileges. Roles shall be defined in terms of View, Edit and Function Privileges.
 - a. View Privileges shall comprise: Navigation, Network, and Configuration Trees, Operators, Roles and Privileges, Alarm/Event Template and Reporting Action.
 - b. Edit Privileges shall comprise: Set point, Tuning and Logic, Manual Override, and Point Assignment Parameters.
 - c. Function Privileges shall comprise: Alarm/Event Acknowledgement, Control Module Memory Download, Upload, Schedules, Schedule Groups, Manual Commands, Print and Alarm/Event Maintenance.
 2. Geographic Assignment of Roles: Roles shall be geographically assigned using a similar expandable/collapsible navigation tree. For example, it shall be possible to assign two HVAC Technicians with similar competencies (and the same operator defined HVAC Role) to different areas of the system.

2.11 GRAPHICAL PROGRAMMING

- A. The system software shall include a Graphic Programming Language (GPL) for all DDC control algorithms resident in all control modules. Any system that does not use a drag and drop method of graphical icon programming shall not be accepted. All systems shall use a GPL method used to create a sequence of operations by assembling graphic microblocks that represent each of the commands or functions necessary to complete a control sequence. Microblocks represent common logical control devices used in conventional control systems, such as relays, switches, high signal selectors etc., in addition to the more complex DDC and energy management strategies such as PID loops and optimum start. Each microblock shall be interactive and contain the programming necessary to execute the function of the device it represents.
- B. Graphic programming shall be performed while on screen and using a mouse; each microblock shall be selected from a microblock library and assembled with other microblocks necessary to complete the specified sequence. Microblocks are then interconnected on screen using graphic "wires," each forming a logical connection. Once assembled, each logical grouping of microblocks and their interconnecting wires then forms a graphic function block which may be used to control any piece of equipment with a similar point configuration and sequence of operation.
- C. Graphic Sequence: The clarity of the graphic sequence shall be such that the operator has the ability to verify that system programming meets the specifications, without having to learn or interpret a manufacturer's unique programming language. The graphic programming shall be self-documenting and provide the operator with an understandable and exact representation of each sequence of operation.
- D. GPL Capabilities: The following is a minimum definition of the capabilities of the Graphic Programming software:

1. Function Block (FB): Shall be a collection of points, microblocks and wires which have been connected together for the specific purpose of controlling a piece of HVAC equipment or a single mechanical system.
2. Logical I/O: Input/Output points shall interface with the control modules in order to read various signals and/or values or to transmit signal or values to controlled devices.
3. Microblocks: Shall be software devices that are represented graphically and may be connected together to perform a specified sequence. A library of microblocks shall be submitted with the control contractors bid.
4. Wires: Shall be Graphical elements used to form logical connections between microblocks and between logical I/O.
5. Reference Labels: Labels shall be similar to wires in that they are used to form logical connections between two points. Labels shall form a connection by reference instead of a visual connection, i.e. two points labeled 'A' on a drawing are logically connected even though there is no wire between them.
6. Parameter: A parameter shall be a value that may be tied to the input of a microblock.
7. Properties: Dialog boxes shall appear after a microblock has been inserted which has editable parameters associated with it. Default parameter dialog boxes shall contain various editable and non-editable fields, and shall contain 'push buttons' for the purpose of selecting default parameter settings.
8. Icon: An icon shall be graphic representation of a software program. Each graphic microblock has an icon associated with it that graphically describes its function.
9. Menu-bar Icon: Shall be an icon that is displayed on the menu bar on the GPL screen, which represents its associated graphic microblock.
10. Live Graphical Programs: The Graphic Programming software shall support a 'live' mode, where all input/output data, calculated data and set points shall be displayed in a 'live' real-time mode.

2.12 LONWORKS NETWORK MANAGEMENT

- A. BACnet shall be the primary protocol used. Systems requiring the use of third-party LonWorks network management tools shall not be accepted.
- B. Network management shall include the following services: device identification, device installation, device configuration, device diagnostics, device maintenance and network variable binding.
- C. The Network configuration tool shall also provide diagnostics to identify devices on the network, to reset devices and to view health and status counters within devices.
- D. These tools shall provide the ability to "learn" an existing LonWorks network, regardless of what network management tool(s) were used to install the existing network, so that existing LonWorks devices and newly added devices are part of a single network management dataTCSe.
- E. The network management dataTCSe shall be resident in the Network Area Controller (NAC), ensuring that anyone with proper authorization has access to the network management dataTCSe at all times. Systems employing network management dataTCSe that are not resident, at all times and within the control system shall not be accepted.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.

- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. The temperature control contractor shall coordinate all work with Owner,
- D. Technical Services (IT) Department. Coordinate requirement for virtual network, IP addresses, and VPN. TCC shall provide all requested hardware, firmware, software, and programming requested by the Owner.

3.03 GENERAL

- A. Install system and materials in accordance with manufacturer's instructions, and as detailed on the project drawing set.
- B. Line and low voltage electrical connections to control equipment shown specified or shown on the control diagrams shall be furnished and installed by the Control System Contractor in accordance with these specifications.
- C. Equipment furnished by the Mechanical Contractor that is normally wired before installation shall be furnished completely wired. Control wiring normally performed in the field will be furnished and installed by the Control System Contractor.
- D. All control devices mounted on the face of control panels shall be clearly identified as to function and system served with permanently engraved phenolic labels.

3.04 WIRING

- A. All electrical control wiring to the control panels shall be the responsibility of the Control System Contractor.
- B. All wiring shall be in accordance with the Project Electrical Specifications (Division 26), the National Electrical Code and any applicable local codes. All control wiring shall be installed in raceways.
- C. Excess wire shall not be looped or coiled in the controller cabinet.
- D. Incorporate electrical noise suppression techniques in relay control circuits.
- E. There shall be no drilling on the controller cabinet after the controls are mounted inside.
- F. Careful stripping of wire while inside the cabinet is required to ensure that no wire strand fragments land on circuit boards.
- G. Use manufacturer-specified wire for all network connections.
- H. Use approved optical isolation and lightning protection when penetrating building envelope.
- I. Read installation instructions carefully. Any unavoidable deviations shall be approved by owner's rep prior to installation.

3.05 ACCEPTANCE TESTING

- A. Upon completion of the installation, the Control System Contractor shall load all system software and start-up the system. The Control System Contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to insure that the system is functioning in full accordance with these specifications.
- B. The Control System Contractor shall perform tests to verify proper performance of components, routines and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the DDC system operation.
- C. System Acceptance: Satisfactory completion is when the Control System Contractor has performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner's Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.
- D. The Third-party temperature control system commissioning agent will provide a written commissioning report.

- E. The TCC shall provide all necessary labor and materials required to meet the recommendations of the commissioning agent prior to system acceptance, project close-out, and release of retainage.
- F. Final written acceptance of the TCS shall be provided by the Owner.

3.06 OPERATOR TRAINING

- A. During system commissioning and at such time acceptable performance of the Control System hardware and software has been established, the Control System Contractor shall provide on-site operator instruction to the owner's operating personnel. Operator instruction shall be done during normal working hours and shall be performed by a competent representative familiar with the system hardware, software and accessories.
- B. The Control System Contractor shall provide minimum 32 total hours of comprehensive training in multiple sessions for system orientation, product maintenance and troubleshooting, programming and engineering. These classes are to be spread out during the 1st year warranty period. The first class starting after final commissioning and the last class is to be in the last month of 1-year warranty period.

3.07 WARRANTY PERIOD SERVICES

- A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of system acceptance.
- B. Within this period, upon notice by the Owner, any defects in the TCS due to faulty materials, methods of installation or workmanship shall be promptly repaired or replaced by the Control System Contractor at no expense to the Owner.
- C. Maintenance of Computer Software Programs: The Control System Contractor shall maintain all software during the standard first year warranty period. In addition, all factory or sub-vendor upgrades to software during the first year warranty period shall be added to the systems, when they become available, at no additional cost. In addition to first year standard warranty, software provided by Control System Contractor shall come with a 5 Year Software Maintenance license. All SNC and TCS Servers are included in this coverage. Labor to implement upgrades in years two through five are not included in standard warranty.
- D. Maintenance of Control Hardware: The Control System Contractor shall inspect, repair, replace, adjust, and calibrate, as required, the controllers, control devices and associated peripheral units during the warranty period. The Control System Contractor shall then furnish a report describing the status of the equipment, problem areas (if any) noticed during service work, and description of the corrective actions taken. The report shall clearly certify that all hardware is functioning correctly.
- E. Service Period: Calls for service by the Owner shall be honored within 24 hours and are not to be considered as part of routine maintenance.
- F. Service Documentation: A copy of the service report associated with each owner-initiated service call shall be provided to the owner.

3.08 WARRANTY ACCESS

- A. The Owner shall grant to the Temperature Control System Contractor reasonable access to the TCS during the warranty period. Remote access to the TCS (for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period) may be allowed.

3.09 OPERATION & MAINTENANCE MANUALS

- A. See General Requirements. O&M manuals shall include the following elements, as a minimum:
 1. As-built control drawings for all equipment.
 2. As-built Network Communications Diagram.
 3. General description and specifications for all components.
 4. Completed Performance Verification sheets.
 5. Completed Controller Checkout/Calibration Sheets.

3.10 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 230923

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RFI detail

#7 Panel Schedules & One Line



Status	Closed
Created on	Feb 4, 2025 by Christie Huver (WOLGAST CORPORATION)
RFI type	Default RFI workflow
Ball in court	Christie Huver (WOLGAST CORPORATION)
Answered	Feb 5, 2025 by Dustin DeWitt (The Collaborative)

Question

E6.01 & E7.01 - Please confirm amperage for panelboard RP1A and its feeder.
 - panel schedule indicates 100A
 - Oneline indicates 225A

Official response

Dustin DeWitt (The Collaborative): Provide 100A panelboard for RP1A as indicated on sheet E6.01, revise feeder for RP1A to 100A, 4W (4#2, #8GND, 1 1/4"C) and circuit breaker to 100A-3P on sheet E7.01.

By *Dustin DeWitt* (The Collaborative) - Feb 5, 2025, 8:24 AM EST

Impact

Cost impact -

Schedule impact -


Other attributes






Priority Normal

Discipline -

Category -

Location -

Location details	david@thunderbayelectric.com
External id	-
Co-reviewer(s)	 Allison Schrecongost
Construction Phase	Pre-Bid
Spec Section	-

Activities	By	At
<p>Christie Huver changed the status from  Open Answered to  Closed</p> <p>Official response: Dustin DeWitt (The Collaborative): Provide 100A panelboard for RP1A as indicated on sheet E6.01, revise feeder for RP1A to 100A, 4W (4#2, #8GND, 1 1/4"C) and circuit breaker to 100A-3P on sheet E7.01.</p>	Christie Huver	Feb 5, 2025, 11:19 AM EST
<p>Dustin DeWitt changed the status from  Open In Review to  Open Answered set Ball in court to Christie Huver (WOLGAST CORPORATION)</p>	Dustin DeWitt	Feb 5, 2025, 8:24 AM EST
<p>Dustin DeWitt added a response: Provide 100A panelboard for RP1A as indicated on sheet E6.01, revise feeder for RP1A to 100A, 4W (4#2, #8GND, 1 1/4"C) and circuit breaker to 100A-3P on sheet E7.01.</p>	Dustin DeWitt	Feb 5, 2025, 8:24 AM EST
<p>Christie Huver (WOLGAST CORPORATION) created this RFI in  Open In Review status and set Ball in court to Dustin DeWitt (The Collaborative).</p>	Christie Huver	Feb 4, 2025, 2:41 PM EST

RFI detail

#8 Sound Absorbing Wall & Ceiling Units Substitution Request



Status	Closed
Created on	Feb 5, 2025 by Christie Huver (WOLGAST CORPORATION)
RFI type	Default RFI workflow
Ball in court	Christie Huver (WOLGAST CORPORATION)
Answered	Feb 6, 2025 by Dustin DeWitt (The Collaborative)

Question

I am writing with regards to the Oscoda BP 2 New Community Center project in Oscoda, MI. I am submitting fräsch! for consideration as a comparable product to the specified products below:

Section 098430 P2.1B9

Kirei Simple Baffle: <https://www.kireiusa.com/products/simple-baffle>

VS

Frasch Skinny BAFL: <https://frasch.com/ceilings/skinny-bafl>

In addition to our highly competitive pricing (approx. 20-30% savings), we offer 4–6-week lead times, and unparalleled customer service that includes live installation support and no-cost hardware and shop drawings. Also note that just approving Fräsch stimulates increased price competition on your project.

For review, I have attached a substitution request form with a submittal package following the request where you can quickly access project references, spec sheets & installation instructions, color chart, competitive analysis/competitor comparison chart, and warranty info.

Please let me know if there is anything else you need to make this decision, and I will get it to you quickly. Thank you in advance for your time and consideration.

Official response

Dustin DeWitt (The Collaborative): Substitution rejected. Please see specs for list of acceptable manufacturers

By **Dustin DeWitt** (The Collaborative) - Feb 6, 2025, 9:07 AM EST

References and Attachments

Files (1)

- [Oscoda BP 2 New Community Center SR.pdf](#)

Impact

Cost impact -

Schedule impact -

Other attributes

Priority Normal

Discipline -

Category -

Location -

Location details -

External id -

Co-reviewer(s)  Allison Schrecongost

Construction Phase Pre-Bid

Spec Section -

Activities	By	At
Dustin DeWitt changed the status from Open In Review to Open Answered set Ball in court to Christie Huver (WOLGAST CORPORATION)	Dustin DeWitt	Feb 6, 2025, 9:07 AM EST
Dustin DeWitt added a response: Substitution rejected. Please see specs for list of acceptable acceptable manufacturers	Dustin DeWitt	Feb 6, 2025, 9:07 AM EST
cknezevich@frasch.com	Christie Huver	Feb 5, 2025, 10:33 AM EST
Christie Huver added a reference to a File Oscoda BP 2 New Community Center SR.pdf	Christie Huver	Feb 5, 2025, 10:31 AM EST
Christie Huver (WOLGAST CORPORATION) created this RFI in Open In Review status and set Ball in court to Dustin DeWitt (The Collaborative).	Christie Huver	Feb 5, 2025, 10:30 AM EST



**SUBSTITUTION
REQUEST
(During Bidding Phase)**

Project: Oscoda BP 2 New Community Center Substitution Request Number: _____
Oscoda, MI From: Camille Knezevich
To: The Collaborative Date: 2/4/25
Wolgast Corp A/E Project Number: _____
Re: Comparable Product Approval Contract For: Frasch! Acoustics

Specification Title: Sound-Absorbing Wall and Ceiling Units Description: Kirei Simple Baffle
Section: 098430 Page: _____ Article/Paragraph: 2.1B9

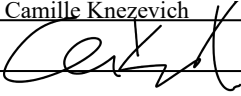
Proposed Substitution: Frasch! Skinny BAFL
Manufacturer: Frasch Address: Grand Prairie, TX Phone: 682.300.3005
Trade Name: _____ Model No.: _____

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted by: Camille Knezevich
Signed by: 
Firm: Frasch! Acoustics
Address: 1425 Avenue R
Grand Prairie, TX 75050
Telephone: 682.200.3005

A/E's REVIEW AND ACTION

- Substitution approved - Make submittals in accordance with Specification Section 01 60 00 Product Requirements.
- Substitution approved as noted - Make submittals in accordance with Specification Section 01 60 00 Product Requirements.
- Substitution rejected - Use specified materials.
- Substitution Request received too late - Use specified materials.

Signed by: _____ Date: _____

Supporting Data Attached: Drawings Product Data Samples Tests Reports _____

fräsch![®]

FRÄSCH
SUBSTITUTION
REQUEST PACKAGE

2024

What Sets Us Apart

EASY TO WORK WITH FROM START TO FINISH!



24- HOUR QUOTES

Using our Portal



CUSTOMIZATION

All products are made to order so we can align to your specification



TECHNICAL SUPPORT

Installation guidance & training before the installation



HARDWARE

Included in our quotes and verified before shipping



SHORT LEAD TIME

6-8 Weeks + 15 day quick ship



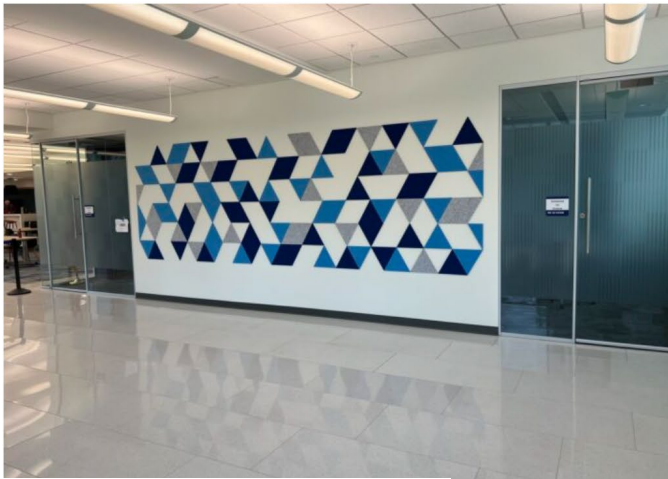
FRÄSCH PROJECT REFERENCES

PROJECT NAME	PROJECT LOCATION	PRODUCT(S) USED	ARCHITECT/CONTRACTOR	PROJECT LINK
Port of Galveston	Galveston, TX	SKINNY BAFL	Advantage Interior Supply	fräsch.com/portfolio/project-portfolio-port-of-galveston/
Rolls-Royce Corporate Offices		TRIANGLE	Bolt Construction	fräsch.com/portfolio/project-portfolio-rolls-royce-corporate-offices/
SynerFuse, Inc	Eden Prairie, MN	HEX CLOUD, RIPL, CLASSIC BAFL, LIT BAFL, TIMBER, NET, BLADE BAFL, SKINNY BAFL, PANL, SPOKE, LINYFELT	Sonus Interiors	fräsch.com/portfolio/project-portfolio-synerfuse/
Center for Ambulatory and Minimally Invasive Surgery	Eatontown, NJ	STRATAWOOD	DePalma Contracting, Inc	fräsch.com/portfolio/project-portfolio-eatontown/
Gray Reed	Houston, TX	BLADE BAFL, BOX BAFL, BARL BAFL (CUSTOM)	Clunn Acoustical Systems	fräsch.com/portfolio/project-portfolio-gray-reed/
Great Pacific Media	Burnaby, BC	LINYFELT, SKINNY BAFL	SSDG Interiors, Inc	fräsch.com/portfolio/project-portfolio-great-pacific-media/
Kiwetinohk Energy Corporation	Calgary, AB	GEAR WALL	Dynamic Drywall Interiors, Ltd	fräsch.com/portfolio/project-portfolio-kiwetinohk-energy-corporation/
Lovett Industrial	Houston, TX	BLADE BAFL	Laser Acoustics	fräsch.com/portfolio/project-portfolio-lovett-industrial/
Vega		BLADE BAFL, STRATAWOOD	34F Design	fräsch.com/portfolio/project-portfolio-vega/
Shawnee Mission Northwest High School	Shawnee, KS	BAFL PLUS, DIAMOND, LINYFELT, TRIANGLES	Perspective Architecture + Design	fräsch.com/portfolio/project-portfolio-shawnee-mission-northwest-high-school/
Northeast Lakeview College	San Antonio, TX	DEW, CLASSIC BAFL	Workplace Resources	fräsch.com/portfolio/project-portfolio-northeast-lakeview-college/
Health Care System Auditorium		LINYFELT	Duggan and Marcon Inc.	fräsch.com/portfolio/project-portfolio-health-care-auditorium/
Dignity Health	Phoenix, AZ	STRATAWOOD	Orcutt Winslow	fräsch.com/portfolio/project-portfolio-dignity-health/
Toro		BAFL KIT	Macphee Contract Solutions	fräsch.com/portfolio/project-portfolio-toro/
Florence Elementary - Keller ISD	Southlake, TX	PLUS BAFL, CLOUD-ROUND-LIT	Vaden's Acoustics / VLK Architects	fräsch.com/portfolio/project-portfolio-florence-elementary/
Texas A&M Commerce	Texas A&M	WAFL BAFL, LINYFELT	Lasco	fräsch.com/portfolio/project-portfolio-texas-am-commerce/
OSU College of Osteopathic Medicine at the Cherokee Nation		PANL	Childers Architect	fräsch.com/portfolio/project-portfolio-osu-college-of-osteopathy/
Lonestar Electric		BAFL, FENS, BRIK 2.0		fräsch.com/portfolio/project-portfolio-lonestar-electric/

PROJECT NAME	PROJECT LOCATION	PRODUCT(S) USED	ARCHITECT/CONTRACTOR	PROJECT LINK
Conejo Mexican Restaurant	Richmond, VA	CLOUD-ROUND		fräsch.com/portfolio/project-portfolio-conejo-mexican-restaurant/
Marriott Vacations Worldwide	Vail, CO	STRATAWOOD LITE, PET SHEETS	Pure Install	fräsch.com/portfolio/project-portfolio-marriott-vacations-worldwide/
Lululemon Mall of America	Bloomington, MN	CUSTOM WAVY BAFL	MBH Architects	fräsch.com/portfolio/project-portfolio-lululemon/
Booz Allen Hamilton at First Hawaii Center	Honolulu, HI	CANOE BAFL	J. Kadowaki, Inc	fräsch.com/portfolio/project-portfolio-booz-allen-hamilton/
Glow Facial Bar	Warner Robins, GA	PANL	SMR Interiors	fräsch.com/portfolio/project-portfolio-glow-facial-bar/
Stagen	Dallas, TX	ACOUSTICAL DOME/EGG		fräsch.com/portfolio/project-portfolio-stagen/
Outfront Media, Inc	Dallas, TX	BAFL, LIT BAFL		fräsch.com/portfolio/project-portfolio-outfront-media/
Legacy Town Center III Fitness Center	Plano, TX	3D HEX	Entos Design	fräsch.com/portfolio/project-portfolio-legacy-town-center/
Planet Fitness Offices	Austin, TX	BAFL, LIT BAFL		fräsch.com/portfolio/project-portfolio-planet-fitness/
Marek Brothers	Dallas, TX	BRIK, CLIF		fräsch.com/portfolio/project-portfolio-marek/
DefiSolutions	Westlake, TX	BRIK, PILO	Phoenix Acoustical Solutions	fräsch.com/portfolio/project-portfolio-defisolutions/
Gartner, Inc	Irving, TX	BRIK - Acoustical Wall Treatments	Balfour Beatty	fräsch.com/portfolio/case-study-brik-wall/
Sun Holding, Inc		PANL - Acoustical Lasercut Divider Screens		fräsch.com/portfolio/case-study-panl-dividers/
Lidl	Arlington, VA	BRIK, BAFL	Ethosource	fräsch.com/portfolio/project-portfolio-lidl/
Como Community Center	Fort Worth, TX	CUSTOM ART WALL	HKS	fräsch.com/portfolio/project-portfolio-como-community-center/
Royer Interiors	Fort Worth, TX	CHIPS, 3D-HEX		fräsch.com/portfolio/project-portfolio-royer/
Texas Specialty Sand		BAFL - Acoustical Ceiling Baffles		fräsch.com/portfolio/case-study-bafl-ceiling/
Imaginuity	Dallas, TX	PRIVACY PANEL		fräsch.com/portfolio/project-portfolio-imaginuity/
HOK Offices	Tampa, FL	BRIK, HEX-BRIK, PANL	HOK	fräsch.com/portfolio/project-portfolio-hok-tampa-offices/
Gartner	Stamford, CT	BRIK	HOK	fräsch.com/portfolio/project-portfolio-gartner-stamford/
PGA Headquarters	Frisco, TX	DIAMOND TILES	Page Architects	fräsch.com/portfolio/project-portfolio-pga-headquarters-frisco-tx/



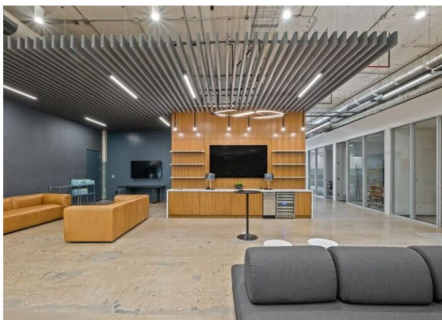
Port of Galveston



Rolls-Royce Corporate Offices



Synerfuse



Lovett Industrial



Vega



Shawnee Mission Northwest High School



Center for Ambulatory and Minimally Invasive Surgery



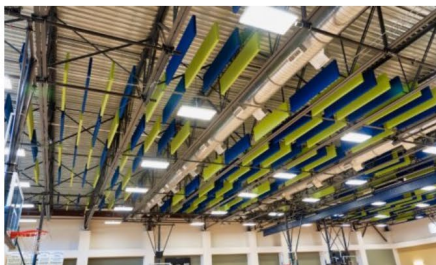
Gray Reed



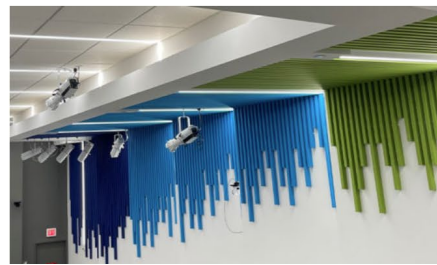
Great Pacific Media



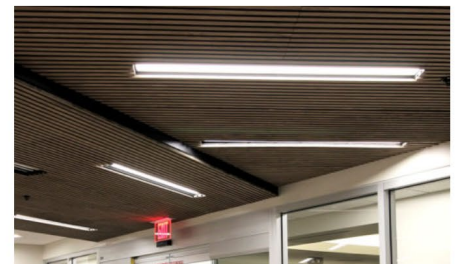
Kiwetinohk Energy Corporation



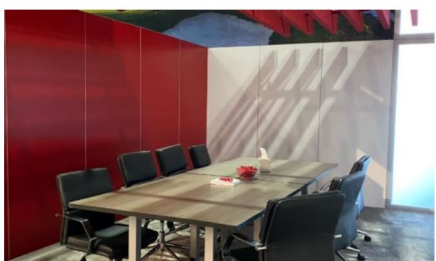
Alamo College



Health Care Systems Auditorium



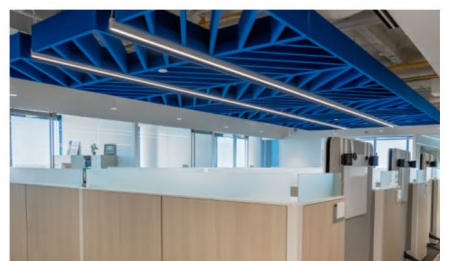
Dignity Health



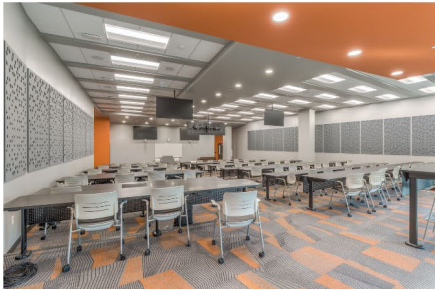
Toro Offices



Florence Elementary - Keller ISD



Texas A&M Commerce



OSU College of Osteopathy



Lonestar Electric



Conejo Mexican Restaurant



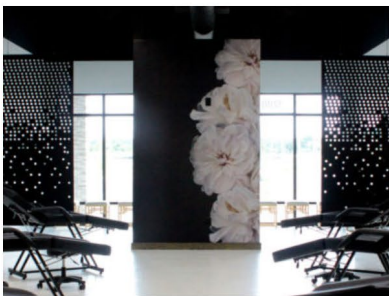
Marriot Vacations Worldwide



Lululemon



Booz Allen



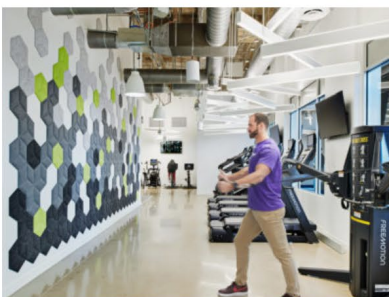
Glow



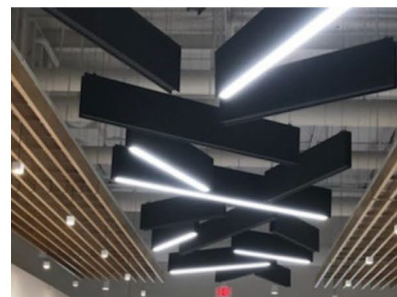
Stagen



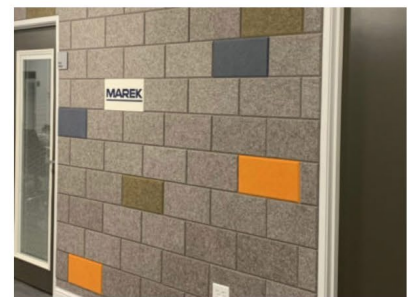
Outfront Media



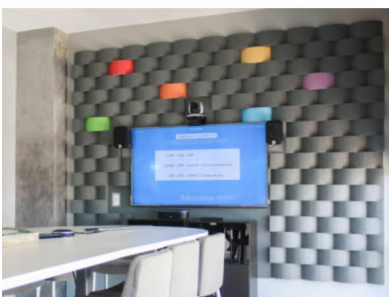
Legacy Fitness



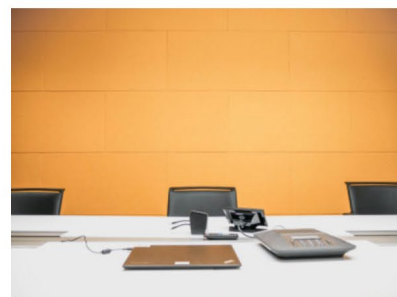
Planet Fitness



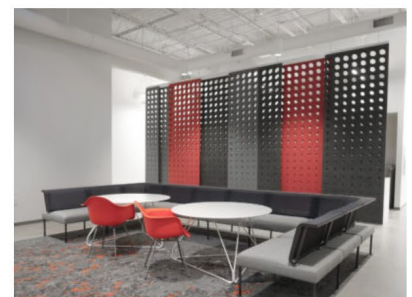
Marek



defiSolutions



Gartner



Sun Holdings



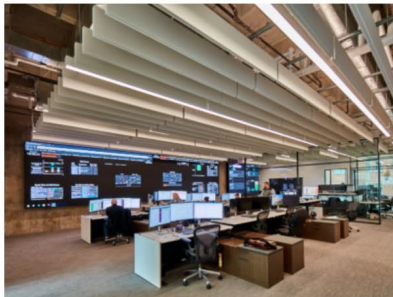
Lidl



Como



Royer



Specialty Sand



Inginuity



Library



HOK



Gartner Stamford



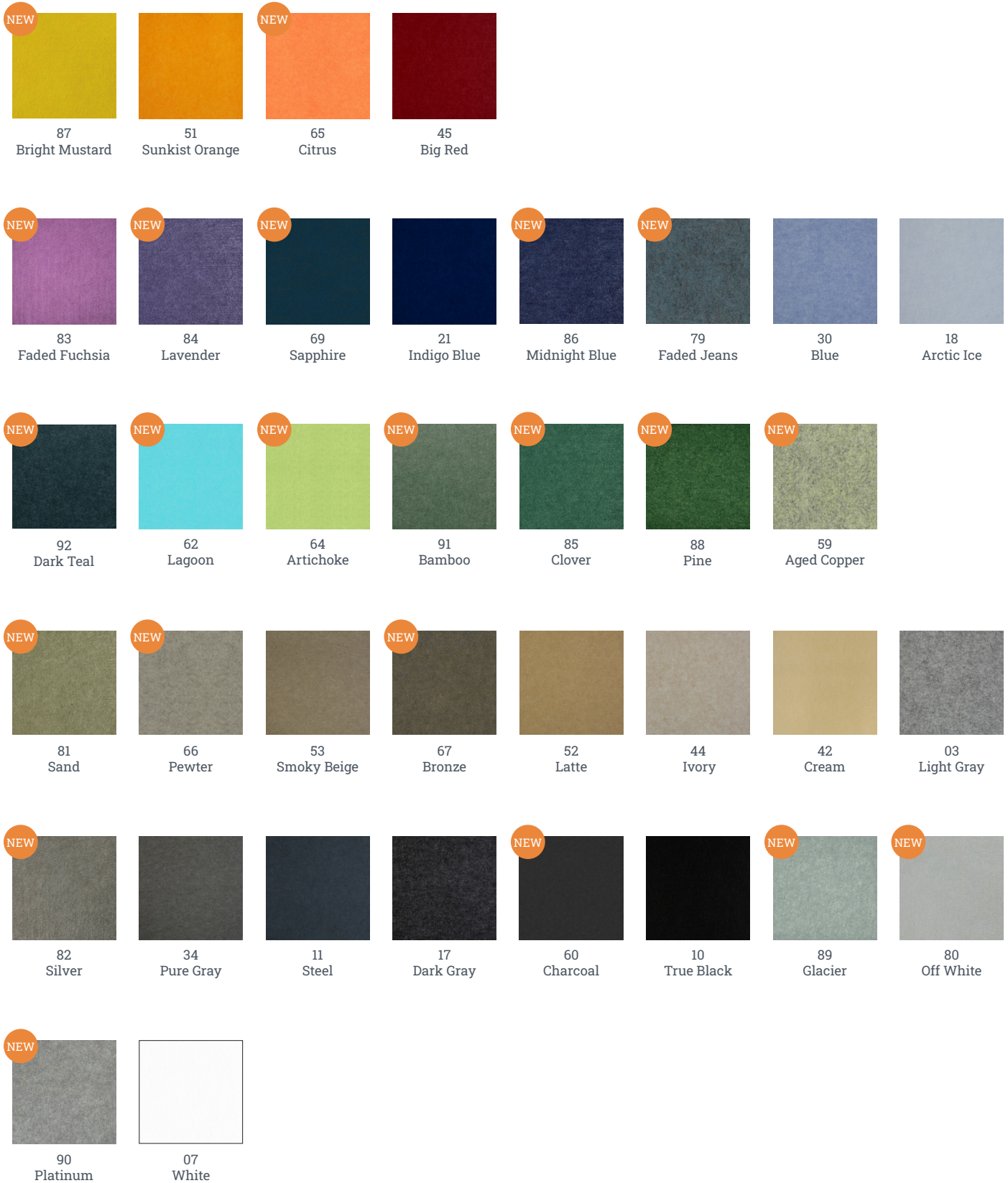
PGA Headquarters – Frisco, TX

Resources

Fräsch Project Portfolio: fräsch.com/portfolio

Specs Sheets and Installation Instructions: fräsch.com/specs-and-downloads

9mm Colors



Woodprint



02P
Pecan Medium
Brown*



01P
Birch Light
Brown*



03P
Rich Soil*



04P
Grey Wash*

Heritage Colors



36
Berry



43
Lava



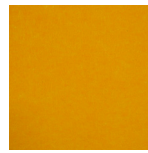
55
Tangerine



41
Marigold



50
Caramel



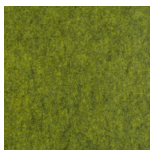
22
Yellow



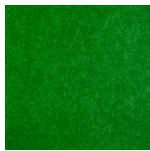
39
Green Apple



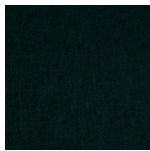
12
Moss



48
Avocado



05
Dark Green



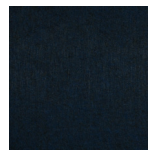
47
Emerald



56
Azure



19
Denim



09
Deep Blue



08
Eggplant



49
Brunette



54
Espresso



35
Speckled Earth



02
Taupe



42
Cream

Heritage Colors are available for any previously specified project

12mm Colors



73-12
Heathered
Mustard



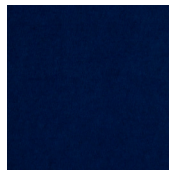
68-12
Heathered
Amber



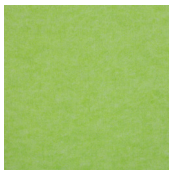
45-12
Big Red



77-12
Heathered Violet



21-12
Indigo Blue



39-12
Green Apple



05-12
Dark Green



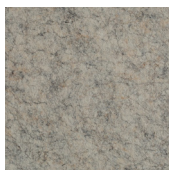
70-12
Heathered
Foliage



72-12
Heathered
Lagoon



76-12
Heathered
Teal



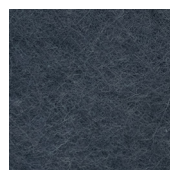
71-12
Heathered
Granite



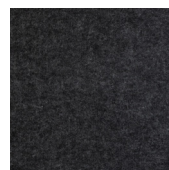
75-12
Heathered
Oatmeal



02-12
Taupe



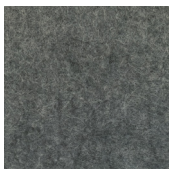
63-12
Medium Gray



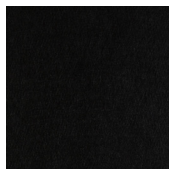
17-12
Dark Gray



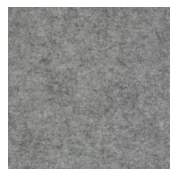
34-12
Pure Gray



78-12
Heathered Quartz



10-12
True Black



03-12
Light Gray



74-12
Heathered
Slate



07-12
White



2024 COMPETITIVE ANALYSIS

Manufacturer	Product Applications								PET Colors	Lead time (weeks)	Hardware Included	Live Tech Support	Digital Printing	Size Modifications	Acoustic Calculator	CEU Platform	Limited Distribution	CET	Revit	AutoCAD	Price Point	
	Ceiling	Walls	Divider	T-Grid	Wood	Formed	Lighting	Custom														
Fräsch	✓	✓	✓	✓	✓	✓	✓	✓	59	4-6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	\$\$
3Form	*	*	*	*	*				21	6-8	✗	✗	✗	✓	✗	✓	✓	✓	✗	✓	\$\$\$\$	
Acoufelt	*	*	*	*	*			*	29	8-10	✗	✗	✗	✓	✗	✗	✗	✗	✗	✗	✗	\$\$\$\$
Arktura	*	*	*	*	*	*	*	*	24	8-12	✗	✗	✗	✓	✗	✗	✗	✗	✓	✓	\$\$\$\$\$	
Autex	*	*	*	*	*	*			18	8-10	✗	✗	✗	✓	✗	✗	✗	✗	✗	✗	✗	\$\$\$\$
Buzzispace	*	*	*			*	*		8	10-12	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	\$\$\$\$\$	
EzoBoard	*	*	*	*	*				29	10-12	✗	✗	✗	✓	✗	✗	✗	✗	✗	✗	✗	\$\$\$
FilzFelt	*	*	*	*	*	*	*	*	96	8-10	✗	✗	✗	✓	✗	✗	✗	✗	✓	✗	\$\$\$\$\$	
Focal Point	*			*		*			24	10-12	✗	✗	✗	✓	✗	✗	✗	✗	✓	✗	\$\$\$\$\$	
Kirei	*	*	*	*	*	*			33	8-10	✗	✗	✗	✓	✗	✗	✗	✗	✗	✗	✗	\$\$\$
MPS	*	*	*	*	*	*	*		30	6-8	✗	✗	✗	✓	✓	✗	✗	✗	✓	✓	\$\$\$	
SXwSound	*	*	*	*	*	*			50	12-18	✗	✗	✗	✗	✗	✗	✗	✓	✓	✓	\$\$\$\$	
Soelberg	*	*	*	*		*			40	10-12	✗	✗	✗	✓	✗	✗	✗	✗	✗	✓	\$\$\$\$	
TURF	*	*	*	*	*	*	*	*	70	8-10	✗	✗	✗	✓	✗	✗	✗	✗	✓	✓	\$\$\$\$	
Unika Vaev	*	*	*	*		*	*	*	34	6-14	✗	✗	✗	✓	✗	✗	✗	✗	✓	✗	\$\$\$\$	
Zintra-MDC	*	*		*	*	*		*	28	6-8	✗	✗	✓	✓	✗	✗	✗	✗	✓	✗	\$\$\$	

Warranty

Fräsch warrants to the original purchaser that all products under normal use shall meet their respective specifications (published sound absorption coefficients have been generated under controlled laboratory conditions and may not be replicated in other situations) as set forth in the current Fräsch price book for a period of five (5) years from the date of delivery. If a product fails to conform to this limited warranty during the first two years after date of shipment, upon prompt written notice, Fräsch will, at its option, repair, replace, or refund the purchase price of, the affected product. This warranty does not apply to other third party acts or omissions, user modifications or installation, or unusual atmospheric or environmental conditions. ALL OTHER WARRANTIES, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE ARE EXPRESSLY DISCLAIMED.

QUALIFICATIONS This warranty is applicable to product dispatched from the manufacturer from onwards. • This warranty applies to the original owner / purchaser of the product only. • All claims under this warranty must be communicated to a local authorized service agent or distributor of Fräsch. • Fräsch reserves the right to determine the cause of a claim and correct action required to address any claims under this warranty. • Unauthorized servicing immediately renders any warranty null and void. Financial reimbursement will not be paid for any work carried out by an unauthorized third party. • The express warranties contained herein are in lieu of all other warranties, express or implied.

INCLUSIONS All parts and labor required to return the product back to full use. • Pick-up and re-delivery of any product that cannot be serviced on site. • Normal use of product in a general office / administration environment.

EXCLUSIONS Normal wear and tear (scratches, etc.) and/or user abuse. • Third party fabrics, foams and laminated board (HPL & LPL), or other third party supplied product: all will be covered by their own proprietary warranty. • Any damage arising from water, heat and/or direct sunlight: these sources can have a damaging effect on most surfaces.



PET Cleaning & Disinfecting Guide

Dust & Dirt Removal

1. If there is visible dust or dirt embedded in the material, use a bristle brush to loosen it. Avoid excess pressure.
2. Vacuum loose dust and dirt thoroughly from the material.

Cleaning & Maintenance

1. Remove any loose dust and dirt (see above).
2. Pat any spills as soon as possible to avoid liquids from absorbing into the material.
3. Apply a mild detergent or soap and water with a hand spray application. Avoid over-soaking the surface.
4. Allow the surface to air dry.

Stain Removal

1. Saturate a lint-free cloth with a mild detergent or soap and water solution.
2. Gently pat the stain starting from the outer edge and moving inward.
3. If required, get another cleaning cloth and repeat the procedure until there is no more transfer of dirt to the cloth.
4. Once the stain is removed, soak up all remaining cleaning solution with a dry cloth.
5. Use a clean cloth or sponge soaked in water to remove any other residue.
6. Allow the surface to air dry.

Disinfection

1. Choose one of the recommended disinfectants*.
2. Mist the surface of the material with a hand spray applicator. Apply generously.
3. Allow material to air dry.

* For disinfection, common household EPA-registered disinfectants should be effective.

* Please refer to the EPA-approved list of products effective against the virus that causes COVID-19.

* A diluted solution of household bleach (at least 1000 ppm sodium hypochlorite) can be sprayed on. Prepare a bleach solution by combining 1/3 C bleach per gallon of water. Bleach solutions will remain effective for a time period of up to 24 hours.

PRODUCT COMPARISON

BAFL: BLADE, PLUS, CLASSIC

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	BAFL Blade Plus Classic	1.1	BLADE: L: 48", 72", 95" H: 8", 10", 12" T: 1.5", 2.75" Customizable PLUS: L: 24", 48", 72", 95" H: 8", 10", 12" T: 1.5", 2.75" Customizable CLASSIC: L: 24", 48", 72", 95" H: 10", 12" T: 2.75" Customizable	100% PET (55% recycled content)
TURF	BEAM Baffle SLAB Baffle Datum Baffle	BEAM: 1.5 SLAB: 1.5 Datum Baffle Spaced 12" O.C; NRC .90 Datum Baffle Spaced 8" O.C; NRC 1.10 Datum Baffle Spaced 6" O.C; NRC 1.35		Polyester (PET) felt 60% pre-consumer recycled
ARKTURA	Soundbar	.50-1.15	3" Width Heights: 4", 6" & 10" Imperial 10cm, 15cm, & 25.5cm Metric Lengths: 2', 3', 4', 5', 6', 7', 8', & 9' Imperial 60, 90, 120, 150, 180, 210, 240, 274.5cm Metric 4" Width Heights: 6" & 10" Imperial 15cm & 25.5cm Metric Lengths: 2', 3', 4', 5', 6', 7', & 8' Imperial 60, 90, 120, 150, 180, 210, 240cm Metric	PET
ARMSTRONG	N/A	-	-	-
Kirei	Echosky, O baffle, Imple Baffle		12 different sizes	100% PET (60% post-consumer recycled)
Acoufelt	Linear, Sway, Truss, Reveal	0.75	12" - 110" Length 4" - 24" Height	100% PET (60% post-consumer recycled)
Unika Vaev	Beam Baffle, Ecoustic Blade, Ecoustic Sculptwood	0.85	Narrow: 48" x 4" x 7.25" (L x W x H) Wide: 48" x 5.5" x 6.5" (L x W x H)	100% PET
FilzFelt	Akustika 10 Baffle, Akustika 25 Baffle, ARO Baffle 1	0.9	Minimum: 6 sq ft (0.56 sq m) Maximum: 1'-8" x 9'-8" (50.8 x 294.6 cm) Thickness 1 11/16 in (42.6 mm)	100% PET (60% post-consumer recycled)
MPS	Joist Baffle, Creep Baffle, Slim Baffle, Slim Led Baffle			
MDC/Zintra	Zintra Baffles Square	.45-.90	Small: 48" x 48" Large: 48" x 108"	100% Polyester

PRODUCT COMPARISON

LIT BAFL: CLASSIC, BLADE

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	Lit Bafl Classic/Blade	1.1	LIT BAFL-Classic Length 47.24", 71.96", 95" Width 2.72" Height 11.8"	100% Polyethylene Terephthalate (PET) 55% Recycled Content
TURF	BEAM Lit, SLAB lit			Polyester (PET) felt 60% pre-consumer recycled
ARKTURA	Lit Soundbar	.50-1.15	3" Width Heights: 4", 6" & 10" Imperial 10cm, 15cm, & 25.5cm Metric Lengths: 2', 3', 4', 5', 6', 7', 8', & 9' Imperial 60, 90, 120, 150, 180, 210, 240, 274.5cm Metric 4" Width Heights: 6" & 10" Imperial 15cm & 25.5cm Metric Lengths: 2', 3', 4', 5', 6', 7', & 8' Imperial 60, 90, 120, 150, 180, 210, 240cm Metric	PET12mm Soft Sound® (PET)
ARMSTRONG	N/A	-	-	-
Kirei	N/A	-	-	-
Acoufelt	N/A	-	-	-
Unika Vaev	N/A	-	-	-
FilzFelt	N/A	-	-	-
MPS	Joist LED Baffle,			
MDC/Zintra	N/A	-	-	-

PRODUCT COMPARISON

LIT BAFL: CLASSIC, BLADE

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	Bafl Skinny	0.75	L: 48", 72", 95" H: 12" T: 9mm Customizable	100% PET (55% recycled content)
TURF	Carved, Contour, Ridge, Straight, Torrent, Doppelganger, Reveal, Timber, Swell	0.85		Polyester (PET) felt 60% pre-consumer recycled
ARKTURA	Atmosphera Swell, Surf, Rise, Line, Strata. Atmosphera Adaptive Versa, Versa 3D, Analog, Analog 3D, Sound Edge	True NRC® 1.15: SoundBar® (4"x10"x96") 6" O.C ; F-100 Method True NRC® 0.90: SoundBar® (4"x10"x96") 12" O.C ; F-100 Method True NRC® 0.55: SoundBar® (3"x10"x96") 6" O.C ; F-100 Method True NRC® 0.40: SoundBar® (3"x10"x96") 12" O.C ; F-100 Method True NRC® 0.60: SoundBar® (4"x10"x96") 12" O.C ; E300 Method True NRC® 0.50: SoundBar® (3"x10"x96") 12" O.C ; E300 Method	7'-6" x 7'-6" x 1' Imperial 230cm x 230cm x 30cm Metric	PET
ARMSTRONG	FELTWORKS Blades - VARAFFIX Reinforced Rectangular, Ebbs & Flows Kits, Peaks & Valleys Kits, FELTWORKS Blades Rectangular Panels	0.85	6" x 48" 6" x 96" 8" x 48" 8" x 96" 10" x 48" 10" x 96" 3/8" thickness	Felt (Recycled PET)
Kirei	Capsule Baffle, Cut-out Baffle, Echosky, I baffle, Pointed Baffle, Spline Baffles, Void Baffles	0.6	40" Baffle 40 in. x 11.5 in. 0.47 in. 0.94 in. 20 - 34 in. 2 lbs 2.5 lbs 3.3 48" Baffle 48 in. x 11.5 in. 0.47 in. 0.94 in. 28 - 42 in. 2.5 lbs 3 lbs 4 72" Baffle 72 in. x 11.5 in. 0.47 in. 0.94 in. 52 - 66 in. 3.75 lbs 4.25 lbs 6 96" Baffle 96 in. x 11.5 in. 0.47 in. 0.94 in.	100% PET (60% post-consumer recycled)
Acoufelt	Ripple, Wing, Arc, Curve, Groove, Step, Fan	0.75	12" - 110" LENGTH 4" - 24" HEIGHT	100% PET (60% post-consumer recycled)
Unika Vaev	Ecooustic Banner, Incline, Ecooustic Sculpt	.75-.95	.47" (12mm) or .94" (24mm) 106.3" x 5.9" (2700mm x 150mm) 106.3" x 7.9" (2700mm x 200mm) 106.3" x 11.8" (2700mm x 300mm)	100% PET
FilzFelt	Akustika 25 Baffle	1.2	Minimum: 6 sq ft (0.56 sq m) Maximum for Suspended: 4'-0" x 8'-0" Maximum for Ceiling Mounted: 1'-6" x 8'-0"	100% Wool Design Felt + Akustika 25 Substrate (60% pre-consumer recycled content)
MPS	Straight Baffle, Crete Baffle, Londe Baffle, Notch baffle, Skyline Baffle, Wall Fin			
MDC/Zintra	Zintra Baffles Square, Bolt, canyon, Ridges, Swell, George, Louvre, Blades	.45-.90	Small: 48" x 48" Large: 48" x 108"	100% Polyester

PRODUCT COMPARISON

CLOUD

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	Cloud (SQ, Circle, Triangle, Hex)	1.3	<p>Square: Weight 15 lbs. Length 47" Width 47" Height 2.75"</p> <p>Circle: Weight 10 lbs. Width (Diameter) 47" Height 2.75"</p> <p>Triangle: Weight 10 lbs. Width (Diameter) 47" Height 2.75"</p> <p>Hex: Weight 8 lbs. Length 45" Width 39" Height 2"</p>	100% Polyethylene Terephthalate (PET) 55% Recycled Content
TURF	N/A	-	-	-
ARKTURA	N/A	-	-	-
ARMSTRONG	FELTWORKS Acoustical Ceiling Panels	0.75	<p>24" x 48" x 1" 48" x 48" x 1" 48" x 96" x 1"</p>	Felt (PET)
Kirei	Deep Clouds, Flat Clouds		<p>Hex Cloud 35.97 in. x 31.16 in. 2.5 in. 6 lbs Rectangle Small Cloud 41 in. x 18 in. 2.5 in. 4 lbs Rectangle Large Cloud 88 in. x 41 in. 2.5 in. 16 lbs Square Small Cloud 18 in. x 18 in. 2.5 in. 2 lbs Square Large Cloud 41 in. x 41 in. 2.5 in. 8 lbs</p>	100% PET (60% post-consumer recycled)
Acoufelt	Rectangle, Circle, Hexagon	12mm: .45 24mm: .60	<p>Rectangle: 12"W x 6"H 18"W x 9"H 24"W x 12"H Circle: 12"W x 12"H 18"W x 18"H 24"W x 24"H Hexagon: 12"W x 10.39"H 9"W x 15.59"H 12"W x 20.78H</p>	100% PET (60% post-consumer recycled)
Unika Vaev	N/A	-	-	-
FilzFelt	Akustika 10 Suspended, Akustika 25 Ceiling, Akustika 25 Suspended	0.8	<p>Minimum: 6 sq ft (0.56 sq m) Maximum: 4'-0" x 8'-0" (121.9 x 243.8 cm) Thickness 7/8 in (47 mm) (includes Interlock Mounting System)</p>	100% Wool Design Felt + Akustika 25 Substrate (60% pre-consumer recycled content)
MPS	Startus			
MDC/Zintra	N/A	-	-	-

PRODUCT COMPARISON

PANL

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	Panl Hanging/Wall Mounted/Track	0.75	Length 48" Height 96" Width .35" Weight 1.02 Lbs. Customizing Options: Sizing & Perforated and print options.	100% Polyethylene Terephthalate (PET) 55% Recycled Content
TURF	Flow, Static	0.5	INDIVIDUAL PANEL SIZE Up to 48" x 120" THICKNESS 9 mm	Polyester (PET) felt 60% pre-consumer recycled
ARKTURA	Softscreen Groove, Frequency, Solid, Stellar, Rain, Slant, Slcazar, Glimmer, Cora		4' x 8'-0 7/8" x 1/2" (3/4" w/ Channel) Imperial 122cm x 246.2cm x 1.3cm (2cm w/ Channel) Metric 4' x 9'-0 7/8" x 1/2" (3/4" w/ Channel) Imperial 122cm x 276.2cm x 1.3cm (2cm w/ Channel) Metric	PET12mm Soft Sound® (PET) and Aluminum
ARMSTRONG	N/A	-	-	-
Kirei	EchoScreen Classic			
Acoufelt	Cut Screen Panels	12mm: .45 24mm: .60	48"x 96" 48" x 108"	100% Polyester (60% recycled)
Unika Vaev	Ecoustic Panel	.3-1.0	107.1" x 47.6"	100% PET (up to 80% recycled PET)
FilzFelt	Chevron Block,	0.5	Tile SizesChevron A: 1'-5" x 4 1/4" (43.1 x 10.8 cm) Chevron B: 1'-5" x 4 1/4" (43.1 x 10.8 cm) Tile Thickness1/2 in (13 mm)	100% Wool Design Felt + Akustika 10 Substrate (60% post-consumer recycled content)
MPS	Mur			
MDC/Zintra	Zintra Patterns , Zintra Sliding Screens	.45-.95	PATTERNS ONLY 48" x 108" x 0.5" 23.8" x 47.8" x 0.5" 23.8" x 23.8" x 0.5"] PATTERNS ON BACKER 48" x 108" x 1" 23.8" x 47.8" x 1" 23.8" x 23.8" x 1"	100% PET

PRODUCT COMPARISON

STRATAWOOD

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	Stratawood (Ceiling & Wall)	0.75	STRATAWOOD Single Panel Size 24" x 96" x 0.87" Slat Width 24.6mm – 24.7mm Spacing Width 15mm Weight 27lbs STRATAWOOD LITE Panel Size 24" x 96" x 0.37" Slat Width 25.6mm – 25.7mm Spacing Width 14mm Weight 4.8lbs	STRATA 9mm 100% PET MDF, Wood Veneer STRATA LITE 9mm 100% PET, Wood Veneer
TURF	N/A			
ARKTURA	N/A	True NRC® (Mount Type A) Solid: 0.40 ; Slant: 0.35 ; Frequency: 0.35 ; Glimmer: 0.35 ; Stellar: 0.40 Alcazar: 0.30 ; Cora: 0.25 ; Rain: 0.40 ; Stack: 0.25 ; Trace: 0.25	-	-
ARMSTRONG	N/A	-	-	-
Kirei	N/A	-	-	-
Acoufelt	N/A	-	-	-
Unika Vaev	Ecoustic Timber Blade	0.47	12" (W) x 106.3" (L) (305 x 2700mm)	100% PEFC-certified wood & acoustic scrim
FilzFelt	N/A	-	-	-
MPS	N/A	-	-	-
MDC/Zintra	N/A	-	-	-

LINYFELT

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	Linyfelt (Ceiling & Wall)	0.60 – 1.00	Length 95" Width 22.5" Height 2.25", 3.25", 4" and 5"	100% Polyethylene Terephthalate (PET) 55% Recycled Content
TURF	Arbor	.55-.95	Standard Lengths: 48"L, 72"L, 96"L, 120"L Standard Sections: 2"W x 2"D or 2.875"W x 1.5"D	Polyester (PET) felt 60% pre-consumer recycled
ARKTURA	N/A	-	-	-
ARMSTRONG	N/A	-	-	-
Kirei	N/A	-	-	-
Acoufelt	Linear	0.75	12"-110" Length 4" - 24" Height	FilaSorb
Unika Vaev	N/A	-	-	-
FilzFelt	N/A	-	-	-
MPS	Arete			
MDC/Zintra	Zintra Sticks	.45-.90	37.5"W x 108"H	100% Polyester

PRODUCT COMPARISON

VIBE

VIBE-NAMI (SOLID) comes fully constructed, simply plan your layout area and mount VIBE-NAMI (SOLID) with impeller clips directly onto your wall surface. Custom installing may be requested for other wall type.

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	Vibe 2'x2' (Ceiling & Wall)	Walls: 0.85 Ceilings: 1.0	Length 24" Width 24" Height 4"	100% Polyethylene Terephthalate (PET) 55% Recycled Content
TURF	N/A			-
ARKTURA	N/A	-	-	-
ARMSTRONG	N/A	-	-	-
Kirei	Dune	0.6	19.69 in. x 19.69 in. 1.97 in	100% PET (27% post-consumer recycled)
Acoufelt	N/A	-	-	-
Unika Vaev	N/A	-	-	-
FilzFelt	N/A	-	-	-
MPS	N/A	-	-	-
MDC/Zintra	N/A	-	-	-

HEX

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	Hex (Flat & 3D)	0.30 - 0.75	Weight 0.22 Lbs. Length 13" Width 15" Height 0.35"	100% Polyethylene Terephthalate (PET) 55% Recycled Content
TURF	Hive	0.25	Standard Tiles 11.75"W x 13.5"L Standard Depth 9mm, 18mm	Polyester (PET) felt 60% pre-consumer recycled
ARKTURA	N/A	-	-	-
ARMSTRONG	N/A	-	-	-
Kirei	N/A	-	-	-
Acoufelt	N/A	-	-	-
Unika Vaev	N/A	-	-	-
FilzFelt	N/A	-	-	-
MPS	Coligo Hexagon			
MDC/Zintra	N/A	-	-	-

PRODUCT COMPARISON

HEX

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	Hex (Flat & 3D)	0.30 - 0.75	Weight 0.22 Lbs. Length 13" Width 15" Height 0.35"	100% Polyethylene Terephthalate (PET) 55% Recycled Content
TURF	Hive	0.25	Standard Tiles 11.75"W x 13.5"L Standard Depth 9mm, 18mm	Polyester (PET) felt 60% pre-consumer recycled
ARKTURA	N/A	-	-	-
ARMSTRONG	N/A	-	-	-
Kirei	N/A	-	-	-
Acoufelt	N/A	-	-	-
Unika Vaev	N/A	-	-	-
FilzFelt	N/A	-	-	-
MPS	Coligo Hexagon			
MDC/Zintra	N/A	-	-	-

PRODUCT COMPARISON

BRIK

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	Brik 1.0	.30 - .75	Weight 2.1 Lbs Length 47" Width 23 1/2" Height .35"	100% Polyethylene Terephthalate (PET) 55% recycled content
TURF	Plank, Slash, Tangram	0.25	Plank: STANDARD LENGTHS 11.75" L, 23.5" L, 47" L STANDARD HEIGHTS 3" H, 4.5" H, 6" H Slash: Standard Tiles 6"W x 18"L Standard Depth 9mm, 18mm Tangram: Standard Tiles & Depths 12"W x 12"L, 24"W x 24"L 9mm, 18mm	Polyester (PET) felt 60% pre-consumer recycled
ARKTURA	N/A	-	-	-
ARMSTRONG	FELTWORKS Acoustical Wall Panels	0.75	24" x 48" x 1" 48" x 48" x 1" 48" x 96" x 1"	Felt (PET)
Kirei	Balance, Subway	0.65	325 Tile: 12.8 in. x 12.8 in. 0.94 in. 650 Tile: 25.6 in. x 12.8 in. 0.94 in. 1300 Tile: 51.2 in. x 12.8 in. 0.94 in.	PET felt made with at least 60% post-consumer content.
Acoufelt	Solid Panels, Solid Tiles and Shapes	.45-.60	48" x 108"	100% PET , 60% Recycled
Unika Vaev	E3 Tiles, Ecooustic Flat, Ecooustic Timber	.40-.50	8.75" x 7.5" x 0.47" or 0.53" 17.5" x 15.15" x 0.47" or 0.53" 17.5" x 15.15" x 0.47" or 0.53" 35" x 30.5" x 0.47" or 0.53" 26.25" x 22.73" x 0.47" or 0.53" 52.5" x 45.45" x 0.47" or 0.53"	100% PET (up to 80% recycled content)
FilzFelt	Akustika 10 Wall, ARO Block 4, Chevron Block, Square Block, Vase Block	0.5	Tile Sizes Chevron A: 1'-5" x 4 1/4" (43.1 x 10.8 cm) Chevron B: 1'-5" x 4 1/4" (43.1 x 10.8 cm) Tile Thickness: 1/2 in (13 mm)	100% Wool Design Felt + Akustika 10 Substrate (60% post-consumer recycled content)
MPS	Coligo Diamond, Square, Triangle, Rectangle, Circle			
MDC/Zintra	Zintra Shapes Circle, triangle, Square, Rectangle, Hexagonal,	.45-.90	Various Sizes	100% PET

PRODUCT COMPARISON

BRİK 2.0

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	Brik 2.0	0.5	Weight 0.37 – 2.28 Lbs. Length 10.5", 21", 42" Width 10.5", 21" Height 1", 1.5"	100% Polyethylene Terephthalate (PET) 55% recycled content
TURF	N/A	-	-	-
ARKTURA	N/A	-	-	-
ARMSTRONG	FELTWORKS Acoustical Ceiling Panels	0.75	24" x 48" x 1" 48" x 48" x 1" 48" x 96" x 1"	Felt (PET)
Kirei	N/A	-	-	-
Acoufelt	WoodbeQuiet Slats	12mm: .45 24mm: .60	48" x 110"	100% PET, 60% Recycled
Unika Vaev	Madera Plank, SibeI Wall Tile	0.4	6": Lengths: 32" / 48" / 96" 8": Lengths: 32" / 48" / 96" 10": Lengths: 32" / 48" / 96"	100% PET
FilzFelt	Muro Plus, Rectangle Block	0.9	Minimum: 1'-6" x 1'-0" (45.7 x 30.5 cm) Maximum: 3'-5" x 3'-5" in (104.1 x 104.1 cm)	100% Wool Design Felt + Akustika 10 Substrate (60% post-consumer recycled content)
MPS	N/A	-	-	-
MDC/Zintra	Zintra Box Tiles	.45-.95	9.8" x 9.8" x 1" 9.8" x 9.8" x 1.8" 9.8" x 19.5" x 0.5" 9.8" x 19.5" x 1" 9.8" x 19.5" x 1.8" 19.5" x 19.5" x 0.5" 19.5" x 19.5" x 1" 19.5" x 19.5" x 1.8"	100% PET

PRODUCT COMPARISON

BRİK FLOW

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	Brik Flow	0.65-0.80	Length 24" Width 24" Thickness 9mm	100% Polyethylene Terephthalate (PET) 55% recycled content
TURF	Labyrinth, Petal, Groove	NRC 0.25 (9mm) NRC 0.40 (18mm)	Standard Tiles 12"W x 12"L, 24"W x 24"L 9mm, 18mm	Polyester (PET) felt 60% pre-consumer recycled
ARKTURA	Soft Sound Tiles		1x2: 1'-11 5/8" x 11 3/4" x 1/2" Imperial 60cm x 30cm x 1.3cm Metric 1x4: 3'-11 1/4" x 11 3/4" x 1/2" Imperial 120cm x 30cm x 1.3cm Metric 2x2: 1'-11 5/8" x 1'-11 5/8" x 1/2" Imperial 60cm x 60cm x 1.3cm Metric 2x4: 3'-11 1/4" x 1'-11 5/8" x 1/2" Imperial 120cm x 60cm x 1.3cm Metric 4x4: 3'-11 1/4" x 3'-11 1/4" x 1/2" Imperial 120cm x 120cm x 1.3cm Metric	PET
ARMSTRONG	N/A			
Kirei	Braid, Groovy, Zen, Vee	0.4	12mm Panel 46 in. x 108 in. 0.47 in 24mm Panel 46 in. x 108 in. 0.94 in	100% PET (60% post-consumer recycled)
Acoufelt	Fracture	12mm: .45 24mm: .60	48" x 108"	100% PET (60% post-consumer recycled)
Unika Vaev	Ecoustic V-Panels	.40-.85	43.3" x 106.3" 43.3" x 108.3" 43.3" x 105.1" 43.3" x 102.8"	100% PET
FilzFelt	Barcode , Ribsy	0.35	2'-0" x 6" (61 x 15.2 cm)	100% Wool Design Felt + Cork Composite Backing
MPS	Collaire			
MDC/Zintra	Etch, Organic ETCH	.45-.95	48" x 108" x 0.5"	100% Polyester

NEST

NEST comes with special 4-way brackets for stability and easy connectivity. Aircraft Cables and Griplocks are included. The ceiling fastener is provided by an installer.

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	Nest	0.95	Assembled Dimensions Dimensions 72" L x 72" W x 6" H Weight 8.57lbs	9mm PET manufactured with 55% post-consumer recycled content. Designed with center airgaps for best performance. Russian Birch Plywood
TURF	N/A	-	-	-
ARKTURA	Softgrid Trella		5'-2 3/8" x 9'-0" (Min. 5 3/4" Max. 8")	PET12mm Soft Sound® (PET), Stainless Steel
ARMSTRONG	N/A	-	-	-
Kirei	N/A	-	-	-
Acoufelt	N/A	-	-	-
Unika Vaev	N/A	-	-	-
FilzFelt	N/A	-	-	-
MPS	N/A	-	-	-
MDC/Zintra	Drante	0.95	48" x 48" x 5.5" 72" x 72" x 9"	100% PET

PRODUCT COMPARISON

NET

The NET comes with special 4-way brackets for stability and easy connectivity. Aircraft Cables and Griplocks are included. The ceiling fastener is provided by an installer.

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	Net	1.25	Type 1 48" L x 48" W x 12" H - Weight: 16.5lbs	9mm PET manufactured with 55% post-consumer recycled content. Designed with center airgaps for best performance. Russian Birch Plywood
TURF	N/A	-	-	-
ARKTURA	Softgrid Slope, Dome, Sine	0.7	7'-6" x 7'-6" x 1'-0 3/8" Imperial 229cm x 229cm x 32cm Metric	PET
ARMSTRONG	FELTWORKS Open Cell Ebbs & Flows Kits, FELTWORKS Open Cell Peaks & Valleys Kits, FELTWORKS Open Cell Rectangles Kits	0.8	48" x 48" 48" x 96" 96" x 48" 96" x 96"	Felt (PET)
Kirei	N/A	-	-	-
Acoufelt	Solus	0.75	40" x 48" 52" x 48" 64" x 48"	Filasorb
Unika Vaev	Ecoustic Arbor	0.85	48" x 48" x 4.25" - 7.25"	100% PET (>65% recycled content)
FilzFelt	N/A	-	-	-
MPS	Grille			
MDC/Zintra	Cloud Clochette, Square, Warp, Yoofoe	0.95		100% PET

CUSTOM VE

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	Custom VE			
TURF	Switchblade	ACT (CONTROL) NRC .65 (Material) AF MODULES NRC .85 (Material) BF MODULES NRC .80 (Material)	Standard Size 24"L x 27mm W Connection Options 9mm Palette Color Standard Depths 2.5"D, 6"D, 9.375"D	9 mm PET, up to 60% recycled content
ARKTURA	N/A	-	-	-
ARMSTRONG	N/A	-	-	-
Kirei	N/A	-	-	-
Acoufelt	N/A	-	-	-
Unika Vaev	N/A	-	-	-
FilzFelt	N/A	-	-	-
MPS	N/A	-	-	-
MDC/Zintra	N/A	-	-	-

PRODUCT COMPARISON

CUSTOM VE

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	Custom VE			
TURF	Slice	0.85	Standard Size 24"L x 24"W Standard Depths 4"D, 6"D, 10"D, 12"D 9mm	Polyester (PET) felt 60% pre-consumer recycled
ARKTURA	N/A	-	-	-
ARMSTRONG	N/A	-	-	-
Kirei	N/A	-	-	-
Acoufelt	N/A	-	-	-
Unika Vaev	N/A	-	-	-
FilzFelt	N/A	-	-	-
MPS	N/A	-	-	-
MDC/Zintra	N/A	-	-	-

HASHTAG

Installation requires minimal assembly of pre-assembles panels and suspension hardware.

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	Hashtag	1.1	Length 171" Width 171" Height 10"	9mm PET manufactured with 55% post-consumer recycled content. Designed with center airgaps for best performance. Russian Birch Plywood
TURF	Plaid	.60-.90	Small Range Profile $P \leq 12"$ Medium Range Profile $12" < P \leq 16"$ Large Range Profile $16" < P \leq 24"$	Polyester (PET) felt 60% pre-consumer recycled
ARKTURA	Softspan 48, 48A, 96, 24	0.45	8' x 8' x 10" Imperial 244cm x 244cm x 25cm Metric	PET
ARMSTRONG	N/A	-	-	-
Kirei	N/A	-	-	-
Acoufelt	N/A	-	-	-
Unika Vaev	Ecoustic Sculpt Coffered Tile	.65-1	24" x 24", 48" x 24"	100% PET
FilzFelt	N/A	-	-	-
MPS	Frame			
MDC/Zintra	N/A	-	-	-

PRODUCT COMPARISON

VIBE COFR

COFR is installed into pre-existing T-Grid ceiling extrusions. See the COFR installation manual for details.

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	VIBE-COFR	1	Length 23.75" Width 23.75" Height 4"	100% Polyethylene Terephthalate (PET) 55% Recycled Content
TURF	Port	1	Standard Size 24"L x 24"W x 4"D Standard Profiles 0, 4, 10, 16	Polyester (PET) felt 60% pre-consumer recycled
ARKTURA	N/A			
ARMSTRONG	N/A			
Kirei	N/A			
Acoufelt	N/A			
Unika Vaev	Cofferred Ceiling Tile	0.85	(L) 24" x (W) 24" x (D) 1.5" or 2.8"	100% PET
FilzFelt	N/A			
MPS	N/A			
MDC/Zintra	N/A			

CUSTOM VE

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	Custom VE			
TURF	Barcode	1.05	Standard Ceiling Panel 24"W x 48"L Standard Wall Panel 24"W x 120"L	Polyester (PET) felt 60% pre-consumer recycled
ARKTURA	N/A	-	-	-
ARMSTRONG	N/A	-	-	-
Kirei	N/A	-	-	-
Acoufelt	N/A	-	-	-
Unika Vaev	N/A	-	-	-
FilzFelt	ARO Grid 1	0.8	2'-0" x 2'-0" x 1'-0" (61.0 x 61.0 x 30.5 cm)	Akustika 10 (60% post-consumer recycled content)
MPS	N/A	-	-	-
MDC/Zintra	N/A	-	-	-

PRODUCT COMPARISON

CUSTOM VE

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	Custom VE			
TURF	Grille	.95-1	Standard Ceiling Panel 24"W x 48"L Standard Wall Panel 24"W x 120"L	Polyester (PET) felt 60% pre-consumer recycled
ARKTURA	N/A	-	-	-
ARMSTRONG	N/A	-	-	-
Kirei	N/A	-	-	-
Acoufelt	N/A	-	-	-
Unika Vaev	N/A	-	-	-
FilzFelt	ARO Grid 2	0.8	2'-0" x 2'-0" x 1'-0" (61.0 x 61.0 x 30.5 cm)	Akustika 10 (60% post-consumer recycled content)
MPS	N/A	-	-	-
MDC/Zintra	N/A	-	-	-

CUSTOM VE

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	Custom VE			
TURF	Linear	.95-1	Standard Ceiling Panel 24"W x 48"L Standard Wall Panel 24"W x 120"L	Polyester (PET) felt 60% pre-consumer recycled
ARKTURA	N/A	-	-	-
ARMSTRONG	N/A	-	-	-
Kirei	N/A	-	-	-
Acoufelt	N/A	-	-	-
Unika Vaev	N/A	-	-	-
FilzFelt	ARO Grid 3	0.45	2'-0" x 2'-0" x 8" (61.0 x 61.0 x 20.3 cm)	Akustika 10 (60% post-consumer recycled content)
MPS	N/A	-	-	-
MDC/Zintra	N/A	-	-	-

CUSTOM VE

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	Custom VE			
TURF	Metro	1.2	Variable Length 12"L Min - 119"L Max Standard Width 20"W Standard Depth 2"D	Polyester (PET) felt 60% pre-consumer recycled
ARKTURA	N/A	-	-	-
ARMSTRONG	N/A	-	-	-
Kirei	N/A	-	-	-
Acoufelt	N/A	-	-	-
Unika Vaev	N/A	-	-	-
FilzFelt	N/A	-	-	-
MPS	N/A	-	-	-
MDC/Zintra	N/A	-	-	-

PRODUCT COMPARISON

LOOP BAFL

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	Loop Baffle		Large: LENGTH 95" WIDTH 3.5" HEIGHT 9.5" Small: LENGTH 47" WIDTH 3.5" HEIGHT 9.5"	100% Polyethylene Terephthalate (PET) 55% Recycled Content
TURF	Drop	0.85	Variable Length 12"L Min - 119"L Max Small Range 12" ≤ L < 36" Medium Range 36" ≤ L < 72" Large Range 72" ≤ L ≤ 119" Variable Depth 6"D Min - 20"D Max	Polyester (PET) felt 60% pre-consumer recycled
ARKTURA	N/A	-	-	-
ARMSTRONG	N/A	-	-	-
Kirei	N/A	-	-	-
Acoufelt	N/A	-	-	-
Unika Vaev	N/A	-	-	-
FilzFelt	N/A	-	-	-
MPS	N/A	-	-	-
MDC/Zintra	N/A	-	-	-

TRI BAFL

TRI BAFL comes with two perfectly placed and preinstalled 18mm Brackets for easy connectivity and quick install. Griplocks and Aircraft Cable are included. The ceiling fastener is provided by an installer.

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	Tri Baffle	1.1	Weight 2.8lbs, 5.6lbs Length 47.25", 95" Width 4" Height 14"	100% Polyethylene Terephthalate (PET) 55% Recycled Content
TURF	Wedge	1.55	Width & Depth 2.25"W x 8.68"D Variable Length 12"L Min - 119"L Max Small Range 12" ≤ L < 36" Medium Range 36" ≤ L < 72" Large Range 72" ≤ L ≤ 119"	Polyester (PET) felt 60% pre-consumer recycled
ARKTURA	N/A	-	-	-
ARMSTRONG	N/A	-	-	-
Kirei	N/A	-	-	-
Acoufelt	N/A	-	-	-
Unika Vaev	N/A	-	-	-
FilzFelt	N/A	-	-	-
MPS	N/A	-	-	-
MDC/Zintra	N/A	-	-	-

PRODUCT COMPARISON

STELLA

STELLA comes with both threaded rod and aircraft cable connections for easy connectivity and quick installation. Threaded Rod, Aircraft Cables, Coupling Nut and Cable Grippers are included. Ceiling fastener is provided by the installer.

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	Stella	1.3	Single 33"L x 29"W x 7"H, 3 lbs Set of 3 58"L x 58"W x 7" H, 9 lbs	100% Polyethylene Terephthalate (PET) 55% Recycled Content
TURF	N/A	-	-	-
ARKTURA	Trisoft, Soundstar	0.75	4' 8" x 4' 1/2" (node center to center) x 5" Imperial 142cm x 123cm (noce center to center) x 13cm Metric	12MM
ARMSTRONG	N/A	-	-	-
Kirei	Echostar	.50-1.20	35.8 in. x 31.2 in. 5.5 - 5.7 in	100% PET (60% post-consumer recycled)
Acoufelt	N/A	-	-	-
Unika Vaev	N/A	-	-	-
FilzFelt	N/A	-	-	-
MPS	N/A	-	-	-
MDC/Zintra	N/A	-	-	-

PET SHEETS

BRAND	PRODUCT	NRC	DIMENSIONS	MATERIAL
FRASCH	PET Sheets (Solid, Printed)	9mm: .65-.80 12mm: .65-.85	9mm: 96" x 48" 12mm: 96" x 48"	100% Polyethylene Terephthalate (PET) 55% Recycled Content 100% Recyclable
TURF	N/A	-	-	-
ARKTURA	N/A	-	-	-
ARMSTRONG	N/A	-	-	-
Kirei	Pet Panels, EchoPanels Print	0.45	12mm Panel 47.24 in. x 110.24 in. 0.47 in. 24mm Panel 47.24 in. x 110.24 in. 0.94 in.	100% PET (60% post-consumer)
Acoufelt	Solid Panel, Printed Panel, Woodbe Quiet	up to .60	12", 18", 24", 30", 36", 42", 48" Width, 12"-110" Heights	FilaSorb
Unika Vaev	Ecoustic Panel, Visualacoustiq	.3-1	107.1" x 47.6" nominally	100% PET (up to 80% recycled PET)
FilzFelt	N/A	-	-	-
MPS	N/A	-	-	-
MDC/Zintra	Zintra Sheets	.45-.90	4' x 9' x 1/2" with dimensional texture up to 1"	100% Polyester

RFI detail

#9 Material SS3



Status	Closed
Created on	Feb 5, 2025 by Christie Huver (WOLGAST CORPORATION)
RFI type	Default RFI workflow
Ball in court	Christie Huver (WOLGAST CORPORATION)
Answered	Feb 6, 2025 by Dustin DeWitt (The Collaborative)

Question

In the screenshot attached it is calling for SS3 and there is no SS3 in the material schedule. Should this be SS1 or SS2? This is on page A7.20.

Official response

Dustin DeWitt (The Collaborative): The Horizontal surface of the sink in TLT/SHOWER 011 should be SS2 not SS3.

By *Dustin DeWitt (The Collaborative)* - Feb 6, 2025, 10:13 AM EST

References and Attachments**Files (1)**

- [H SS3 RFI.png](#)

Impact


Cost impact -






Schedule impact -

Other attributes

Priority Normal

Discipline -

Category	-
Location	-
Location details	kkasper@firstcutmillwork.com
External id	-
Co-reviewer(s)	 Allison Schrecongost
Construction Phase	Pre-Bid
Spec Section	-

Activities	By	At
Christie Huver changed the status from  Open Answered to  Closed Official response: Dustin DeWitt (The Collaborative): The Horizontal surface of the sink in TLT/SHOWER 011 should be SS2 not SS3.	Christie Huver	Feb 10, 2025, 9:44 AM EST
Dustin DeWitt changed the status from  Open In Review to  Open Answered set Ball in court to Christie Huver (WOLGAST CORPORATION)	Dustin DeWitt	Feb 6, 2025, 10:13 AM EST
Dustin DeWitt added a response: The Horizontal surface of the sink in TLT/SHOWER 011 should be SS2 not SS3.	Dustin DeWitt	Feb 6, 2025, 10:13 AM EST
Christie Huver added a reference to a File H SS3 RFI.png	Christie Huver	Feb 5, 2025, 10:43 AM EST
Christie Huver (WOLGAST CORPORATION) created this RFI in  Open In Review status and set Ball in court to Dustin DeWitt (The Collaborative).	Christie Huver	Feb 5, 2025, 10:43 AM EST

RFI detail

#10 Wall Panels



Status	Closed
Created on	Feb 5, 2025 by Matt Moser (WOLGAST CORPORATION)
RFI type	Default RFI workflow
Ball in court	Matt Moser (WOLGAST CORPORATION)
Answered	Feb 13, 2025 by Dustin DeWitt (The Collaborative)

Question

I am sending this email in reference to the print A3.0 callout of MP-1 and MP-3 (Omega light clip and caulk) siding in the office area. The rest of the building is MP-2 MBCI 36" wide metal panel. We are a well-established metal building erector and very familiar with most of the materials used in PEMB's. This Omega material is very uncommon, at least in our experience. I looked it up online to see what it is and how to install it. It looks like it would be a bit labor intense and slow to install properly. Needless to say, we are not skilled in this material. I think we could install it, but it would not be an efficient process and therefore add additional cost.

We would be very interested in doing this project and have worked with Wolgast on many occasions. I would recommend several possible alternatives; the easiest alternative would be to use a standard metal wall panel with a different profile to obtain a contrast to the primary sheeting material on the rest of the building. This would be a much cheaper option and there are some attractive surfaces that could provide the esthetic contrast. Another option would be insulated wall panels which would provide an appearance similar to what your rendering shows and would not require additional insulation as the panels are already insulated. A 3- or 4-inch panel provides excellent R value and is simpler to install. The third option is to find an installer familiar with this system, to do the office siding. I am certainly willing to search one out and try to get a quote for that portion of the building.

If you are interested in my personal recommendation, I would go with the Insulated wall panel, It is the best of all world's, esthetics and function.

Official response

Dustin DeWitt (The Collaborative): Substitution for wall panels rejected. See specs for a list of acceptable manufacturers. Also please submit proper substitution documentation for any further requests.

By **Dustin DeWitt** (The Collaborative) - Feb 13, 2025, 1:37 PM EST

Impact

Cost impact -

Schedule impact -

Other attributes

Priority Normal

Discipline -

Category -

Location -

Location details tom@tridentconstructiongp.com

External id -

Co-reviewer(s)

Spec Section -

Construction Phase Pre-Bid

Activities	By	At
<p>Christie Huver changed the status from Open Answered to Closed</p> <p>Official response: Dustin DeWitt (The Collaborative): Substitution for wall panels rejected. See specs for a list of acceptable manufacturers. Also please submit proper substitution documentation for any further requests.</p>	Christie Huver	Feb 13, 2025, 1:37 PM EST
<p>Christie Huver changed the status from Open In Review to Open Answered set Ball in court to Matt Moser (WOLGAST CORPORATION)</p>	Christie Huver	Feb 13, 2025, 1:37 PM EST
<p>Allison Schrecongost response was submitted by Christie Huver: Per Dustin's response</p>	Christie Huver	Feb 13, 2025, 1:37 PM EST
<p>Dustin DeWitt added a response: Substitution for wall panels rejected. See specs for a list of acceptable manufacturers. Also please submit proper substitution documentation for any further requests.</p>	Dustin DeWitt	Feb 6, 2025, 9:29 AM EST
<p>Matt Moser (WOLGAST CORPORATION) created this RFI in Open In Review status and set Ball in court to Allison Schrecongost, Dustin DeWitt (The Collaborative).</p>	Matt Moser	Feb 5, 2025, 4:08 PM EST

RFI detail

#11 Light Poles - Thunderbay Electric



Status	Closed
Created on	Feb 5, 2025 by Matt Moser (WOLGAST CORPORATION)
RFI type	Default RFI workflow
Ball in court	Matt Moser (WOLGAST CORPORATION)
Answered	Feb 13, 2025 by Dustin DeWitt (The Collaborative)

Question

Please clarify design intent for (4) existing wood poles shown on ES.01 in E-W line across parking lot. For simplicity, will refer to western pole as 'A', and continuing B, C, D to East. A & D noted as pole + fixture existing to remain. No conflict noted. B & C noted as pole + fixture to remain. Also keynoted for new dimming, motion sensing, and photocell control. 'FLP10' by each pole appears to be a new fixture. Maybe FB10 from fixture schedule? Do existing fixtures remain? How many new fixtures per pole? Does 1" C refer to a new underground 1" conduit between poles?

Official response

Dustin DeWitt (The Collaborative): See attached,
By **Dustin DeWitt** (The Collaborative) - Feb 13, 2025, 1:34 PM EST

Official response attachments

[107253_RFI 011 - REVIEWED.PDF](#), Feb 10, 2025, 9:10 AM EST

References and Attachments

Files (1)

- [Clarification Request_TBE 05_250205.pdf](#)

Impact

Cost impact -

Schedule impact -

Other attributes

Priority Normal

Discipline -

Category -

Location -

Location details david@thunderbayelectric.com

External id -

Co-reviewer(s)

Spec Section -

Construction Phase Pre-Bid

Activities	By	At
<p>Christie Huver changed the status from Open Answered to Closed</p> <p>Official response: Dustin DeWitt (The Collaborative): See attached, changed the official response attachment to: 107253_RFI 011 - REVIEWED.PDF.</p> <p>changed the watchers to Patrick Fritz (WOLGAST CORPORATION), Clinton Clark (WOLGAST CORPORATION), Matt Moser (WOLGAST CORPORATION)</p>	Christie Huver	Feb 13, 2025, 1:34 PM EST
<p>Christie Huver changed the status from Open In Review to Open Answered set Ball in court to Matt Moser (WOLGAST CORPORATION)</p>	Christie Huver	Feb 13, 2025, 1:34 PM EST
<p>Allison Schrecongost response was submitted by Christie Huver: See Dustin's response</p>	Christie Huver	Feb 13, 2025, 1:34 PM EST
<p>Dustin DeWitt added a response: See attached, added the response attachment to: 107253_RFI 011 - REVIEWED.PDF.</p>	Dustin DeWitt	Feb 10, 2025, 9:10 AM EST
<p>Matt Moser added a reference to a File Clarification Request_TBE 05_250205.pdf</p>	Matt Moser	Feb 5, 2025, 4:17 PM EST
<p>Matt Moser (WOLGAST CORPORATION) created this RFI in Open In Review status and set Ball in court to Allison Schrecongost, Dustin DeWitt (The Collaborative).</p>	Matt Moser	Feb 5, 2025, 4:17 PM EST

RFI detail

#11 Light Poles - Thunderbay Electric



Status	■ Open In Review
Created on	Feb 5, 2025 by Matt Moser (WOLGAST CORPORATION)
RFI type	Default RFI workflow
Ball in court	Dustin DeWitt (The Collaborative) Allison Schrecongost
Due date	Feb 8, 2025

Question

Please clarify design intent for (4) existing wood poles shown on ES.01 in E-W line across parking lot. For simplicity, will refer to western pole as 'A', and continuing B, C, D to East. A & D noted as pole + fixture existing to remain. No conflict noted. B & C noted as pole + fixture to remain. Also keynoted for new dimming, motion sensing, and photocell control. 'FLP10' by each pole appears to be a new fixture. Maybe FB10 from fixture schedule? Do existing fixtures remain? How many new fixtures per pole? Does 1"C refer to a new underground 1" conduit between poles?

References and Attachments

Files (1)

- [Clarification Request_TBE 05_250205.pdf](#)

Impact

Cost impact -

Schedule impact -

Other attributes

Priority Normal

Discipline -

Category	-
Location	-
Location details	david@thunderbayelectric.com
External id	-
Co-reviewer(s)	
Construction Phase	Pre-Bid
Spec Section	-

Activities	By	At
Matt Moser added a reference to a File Clarification Request_TBE 05_250205.pdf	Matt Moser	Feb 5, 2025, 4:17 PM EST
Matt Moser (WOLGAST CORPORATION) created this RFI in Open In Review status and set Ball in court to Allison Schrecongost, Dustin DeWitt (The Collaborative).	Matt Moser	Feb 5, 2025, 4:17 PM EST

CLARIFICATION REQUEST FORM

Date: 2/05/25

Wolgast Clarification Request #: _____

To: Wolgast Corporation
Matt Moser or Christie Bigelow-Huver
4835 Towne Centre Road, Suite 203
Saginaw, MI 48604
Phone (989) 790-9120, Fax (989) 790-9063

From: Thunder Bay Electric, Inc
Contractor Name: David Hammerquist
Contact Name: david@thunderbayelectric.com
Email Address: (989) 354-2840
Phone #: Fax #:

Bid Division # and Name: 260000 - Electrical

CSI Code (If Applicable): _____

Drawing #: ES.01, E6.01 Detail or Item #: Site plan, light fixture schedule

Reason for Request: [] More Detail Needed [X] Engineering Clarification [] Alternate Proposal [] Other

Project: Oscoda Area Schools 2024 Bond Program

Site Location: BP 2 Community Center

ITEM(S) FOR CLARIFICATION OF BID: (Please use one form for each item)

Please review and respond to the following item(s) for clarification:

Please clarify design intent for (4) existing wood poles in E-W line across parking lot. For simplicity, will refer to western pole as 'A', and continuing B, C, D to East. A & D noted as pole + fixture existing to remain. No conflict noted. B & C noted as pole + fixture to remain. Also keynoted for new dimming, motion sensing, and photocell control. 'FLP10' by each pole appears to be a new fixture. Maybe FB10 from fixture schedule? Do existing fixtures remain? How many new fixtures per pole? Does 1"C refer to a new underground 1" conduit between poles?

RESPONSE: [] ITEM TO BE INCLUDED IN ADDENDUM

'FLP10' by each pole is a typographical error and should be 'FB10'. These are new light fixtures. The existing fixtures point to the north and are to remain. Existing fixtures are most likely on a utility supplied circuit. There is one (1) new fixture per pole and each are directed south into the new parking lot. 1"C does refer to a new underground 1" conduit between poles.

A Zelanka
KTS Engineering Group
02/07/2025

Construction Manager: _____
Signature Date

Architect: _____
Signature Date

END OF SECTION 00310

CLARIFICATION REQUEST FORM

Date: 2/05/25

Wolgast Clarification Request #: _____

To: Wolgast Corporation
Matt Moser or **Christie Bigelow-Huver**
4835 Towne Centre Road, Suite 203
Saginaw, MI 48604
Phone (989) 790-9120, Fax (989) 790-9063

From: Thunder Bay Electric, Inc
Contractor Name David Hammerquist
Contact Name david@thunderbayelectric.com
Email Address (989) 354-2840
Phone # _____ Fax # _____

Bid Division # and Name: 260000 - Electrical

CSI Code (If Applicable): _____

Drawing #: ES.01, E6.01 Detail or Item #: Site plan, light fixture schedule

Reason for Request: More Detail Needed Engineering Clarification Alternate Proposal Other

Project: Oscoda Area Schools 2024 Bond Program

Site Location: BP 2 Community Center

ITEM(S) FOR CLARIFICATION OF BID: (Please use one form for each item)

Please review and respond to the following item(s) for clarification:

Please clarify design intent for (4) existing wood poles in E-W line across parking lot. For simplicity, will refer to western pole as 'A', and continuing B, C, D to East. A & D noted as pole + fixture existing to remain. No conflict noted. B & C noted as pole + fixture to remain. Also keynoted for new dimming, motion sensing, and photocell control. 'FLP10' by each pole appears to be a new fixture. Maybe FB10 from fixture schedule? Do existing fixtures remain? How many new fixtures per pole? Does 1"C refer to a new underground 1" conduit between poles?

RESPONSE: ITEM TO BE INCLUDED IN ADDENDUM

Construction Manager: _____
Signature Date

Architect: _____
Signature Date

END OF SECTION 00310

RFI detail

#12 Locker Substitution Request



Status	<input type="checkbox"/> Open <input checked="" type="checkbox"/> Closed
Created on	Feb 6, 2025 by Christie Huver (WOLGAST CORPORATION)
RFI type	Default RFI workflow
Ball in court	Christie Huver (WOLGAST CORPORATION)
Answered	Feb 6, 2025 by Dustin DeWitt (The Collaborative)

Question

Attached please find the information for Summit Lockers for consideration to be approved as an acceptable manufacturer.

Official response

Dustin DeWitt (The Collaborative): Substitution Approved

By *Dustin DeWitt* (The Collaborative) - Feb 6, 2025, 10:32 AM EST

References and Attachments

Files (4)

- [Bid Clarification Form - Summit Lockers.pdf](#)
- [Oscoda Area Schools - Community Center.pdf](#)
- [Summit-Lockers-Phenolic-Locker-Data-Sheet.pdf](#)
- [Summit-Lockers-Phenolic-Locker-Specification.pdf](#)






Impact

Cost impact -

Schedule impact -

Other attributes

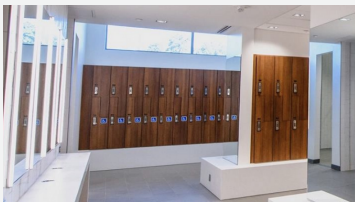
Priority	Normal
Discipline	-
Category	-
Location	-
Location details	treva@summitlockers.com
External id	-
Co-reviewer(s)	 Allison Schrecongost
Construction Phase	Pre-Bid
Spec Section	-

Activities	By	At
Christie Huver changed the status from  Open Answered to  Closed Official response: Dustin DeWitt (The Collaborative): Substitution Approved	Christie Huver	Feb 10, 2025, 9:45 AM EST
Dustin DeWitt changed the status from  Open In Review to  Open Answered set Ball in court to Christie Huver (WOLGAST CORPORATION)	Dustin DeWitt	Feb 6, 2025, 10:32 AM EST
Dustin DeWitt added a response: Substitution Approved	Dustin DeWitt	Feb 6, 2025, 10:32 AM EST
Christie Huver added a reference to a File Oscoda Area Schools - Community Center.pdf	Christie Huver	Feb 6, 2025, 9:20 AM EST
Christie Huver added a reference to a File Summit-Lockers-Phenolic-Locker-Specification.pdf	Christie Huver	Feb 6, 2025, 9:20 AM EST
Christie Huver added a reference to a File Summit-Lockers-Phenolic-Locker-Data-Sheet.pdf	Christie Huver	Feb 6, 2025, 9:20 AM EST
Christie Huver added a reference to a File Bid Clarification Form - Summit Lockers.pdf	Christie Huver	Feb 6, 2025, 9:20 AM EST
Christie Huver (WOLGAST CORPORATION) created this RFI in  Open In Review status and set Ball in court to Dustin DeWitt (The Collaborative).	Christie Huver	Feb 6, 2025, 9:20 AM EST



SUMMIT LOCKERS PHENOLIC LOCKER

Completely Customizable | Durable | Low Maintenance | Luxurious Look



Overlay Doors

Full sized / overlay doors increase the usable size of each locker for optimal usage.

Hygienic

Non-porous surfaces which make Summit's lockers safe and easy to clean.

Mortised Joints

Mortise and tenon joints lock pieces together using stainless steel screws for superior strength and durability.

Ventilation

Our lockers are designed with ventilation in mind with space around the doors to provide multi-directional ventilation.

Water Resistant

INNOVATIVE LOCKERS

Summit Standard Phenolic Locker

Standard Configurations

Construction

Mortise and Tenon Joints
Full Overlay Doors
Stainless Steel Fasteners
Multi - Directional Ventilation

Material Thickness

Top, Bottom & Shelves - White - 3/8"
Sides & Backs - White - 5/16"
Doors & Trim - Std. Colors - 1/2"

Sizes

Height - 60", 72", 84"
Width - 12", 15", 18", 20"
Depth - 12", 15", 18", 20"

Hinges

Concealed 6-Knuckle Stainless Steel

Lock

Hasp for padlock

Fire Rating

Class B

Base

Not Included

Top

Flat-Unfinished: White

1-Tier



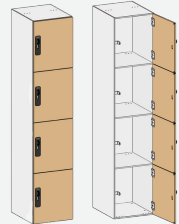
2-Tier



3-Tier



4-Tier



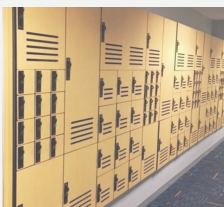
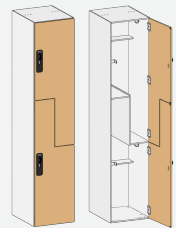
5-Tier



6-Tier



Z-Tier



INNOVATIVE LOCKERS

Phenolic Locker Customizations

Material Thickness

- 3/8" sides and shelves
- 3/8" sides and 1/2" shelves
- 1/2" sides and shelves

Hinges

- 180° Hinge (ADA Compliant)
- Continuous Stainless Steel
- Euro Hinge
- Soft-Close Hinges

Fire Rating

- Class A

Top

- Sloped
- Flat Finished
- Front Facia

Base

- Adjustable Base w/ Toe Kick
- Integral Base

Sizes

Custom sizes available upon request.

Lock Vendors

- | | |
|--------------|------------------|
| DigiLock® | Lowe & Fletcher® |
| CODELOCKS® | OMJAR® |
| ZEPHYR Lock® | Gantner® |
| Master Lock® | |

Color

- Custom Color Interior
- Through-Color Phenolic

Other

- Logo Engraving
- Through Door Ventilation
- Stay Closed Door Magnets
- Stainless Steel Coat Rod
- Shoulder pad/Helmet Rack
- USB Outlets
- LED Lighting



Don't see your option listed? *Just ask.*

All locker orders are tailored to fit your needs.

FOR YOUR NEXT PROJECT, PLEASE CALL 803-403-8816,
YOU MAY ALSO EMAIL YOUR QUESTIONS TO INFO@SUMMITLOCKERS.COM





Summit Lockers Inc., 138 McLeod Road, Columbia, SC 29203, www.summitlockers.com

Section 10 51 29 Phenolic Lockers

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Phenolic Lockers
- B. Phenolic Benches

1.2 RELATED REQUIREMENTS

- A. Project drawings, meetings, and general provisions of the contract. This includes but is not limited to general materials, supplementary materials, and material testing.

1.3 SUBMITTALS

- A. Comply with procedures and quantities as indicated in Division 1 'Submittal Procedure Section'.
- B. Shop Drawings: Submit shop drawings indicating room sizes, layout, locker dimensions, material thickness, trim, hardware, finishes, locks, base, doors, accessories, and installation details.
- C. Product Data: Submit manufacturer's technical data for materials, fabrication, finishing, fastenings, hardware, and installation details.
- D. Samples: Submit samples of edge details, colors, patterns, finishes, and textures.

1.4 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Fabricator shall be capable of providing field service representation.
 - 2. Installer shall be approved by the manufacturer and have experience in performing work of similar size and scope.
 - 3. Parts shall be structurally sound and clear of defects, in material as well as construction covered under the full warranty period.
- B. Pre-Installation Meeting: Conduct pre-installation meeting prior to installation to verify project requirements and conditions.

1.5 DELIVERY, STORAGE, and HANDLING

- A. Storage and Handling: Store materials in an enclosed shelter providing protection from damage, temperature, humidity, and exposure to the elements.
- B. Delivery: Deliver materials in the manufacturer's original protective packaging and store lockers until ready for installation.

1.6 PROJECT CONDITIONS AND COORDINATION

- A. Field Measurements: Before material fabrication, verify actual field measurements and show actual measurements on shop drawings.
- B. Coordination: Coordinate field measurements with fabrication schedule and construction progress to avoid construction delays.

1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to replace phenolic locker components that fail in materials or workmanship within specified warranty period.
 - 1. Submit executed copy of Summit Lockers 20-year warranty against defects in material signed by an authorized representative of Summit Lockers.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Phenolic Lockers
 - 1. Basis of Design: Drawings and specifications are based on Summit Phenolic Lockers; 138 McLeod Road, Columbia, SC 29203, Phone: (803)403-8816, Email: info@summitlockers.com
 - 2. Substitutions: Not permitted.

2.2 MATERIALS

- A. Decorative papers impregnated with a melamine resin on faces with a clear protective overcoat and integrally compression molded within a core consisting of solid phenolic impregnated kraft papers.
 - 1. Fire Rating: Core or panel material shall meet fire Class B resistance per ASTM E84. Class A per ASTM E84 is available upon request.
- B. Material Thickness:
 - 1. Doors, End Panels, Filler Panels, Sloped Top – 1/2" (13mm)
 - 2. Tops, Bottoms, Shelves – 3/8" (10mm)
 - 3. Sides, Backs – Minimum 5/16" (8mm)
 - 4. Wall Mounting Cleats – 1/2" (13mm)
- C. Locker Bodies:
 - 1. Solid phenolic composite material with ventilation holes.

2. Mortise and Tenon Joints: All tops, bottoms, and shelves use mortised joints and are secured with mechanical fasteners.
 3. Exposed Edges: Straight profile; eased edges to remove sharpness, machine polished and free from tooling imperfections.
 4. Body Color: Summit's standard Frosty White unless other color specified.
 5. Door Color: As selected by architect.
- D. Locker Doors:
1. Full overlay, covering full width and height of locker body; eased edge corners.
 2. Door Fastening: Blind fastening unless through bolts are requested.
 3. Door Color: As selected by Architect from manufacturer's full range of standard colors.

2.3 HARDWARE

- A. Hinges: Concealed 6-Knuckle Stainless Steel hinge. Opens 90°. Include three (3) hinges for doors > 36" tall or two (2) for all other heights.
- B. Hooks: (2) Stainless Steel hooks per opening for all openings 30" tall or greater. Plastic and nylon are not acceptable.
- C. Fasteners: All fasteners shall be Stainless Steel.
- D. Locks: Stainless Steel hasp bar for customer supplied padlock.
 1. Other locks as specified. Options include but are not limited to: Digital Day Use, Digital Assigned Use, Mechanical Day Use, Mechanical Assigned Use, Key Lock, Coin Retain Lock, Coin Return Lock, Combination Lock, Card Locks, Smart Locks.
- E. Number Identification Plates:
 1. Material: 1.75" x 6.25" black plastic with reverse engraved numbers and surface mounted with permanent adhesive.
 2. Fonts to be a minimum of ½" high and up to four characters.
 3. Numbering sequence to be provided by Architect.

2.4 VENTILATION

- A. Vertical Ventilation: Provide six 5/16" (8mm) diameter ventilation holes on tops, bottoms, and intermediate shelves. Provide three 5/16" (8mm) diameter ventilation holes on "Z" type intermediary shelves.
- B. Horizontal Ventilation: Provide ventilation around the edge of the door equal to at least 1.43 square inches of ventilation surface area per linear foot of door perimeter.

2.5 BENCHES

- A. Phenolic Benches: Decorative papers impregnated with a melamine resin on faces with a clear protective overcoat and integrally compression molded within a core consisting of solid phenolic impregnated kraft papers.

1. Bench Tops: 3/4" thick solid phenolic composite material
2. *Choose all that apply:*
 - i. Powder coated steel pedestal locker bench: 3/4" thick by 12" wide solid phenolic top installed on powder coated steel pedestals.
 - i. Stainless steel pedestal locker bench: 3/4" thick by 12" wide solid phenolic top installed on stainless steel pedestals.
 - ii. ADA pedestal locker bench: 3/4" thick, 24" wide by 48" long solid phenolic top installed on four (4) black powder coated aluminum pedestals.
 - iii. ADA pedestal locker bench: 3/4" thick, 24" wide by 48" long solid phenolic top installed on four (4) stainless steel pedestals.
 - iv. ADA pedestal locker bench with backrest: 3/4" thick, 24" wide by 48" long solid phenolic top installed on two (2) stainless steel pedestal brackets.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine site conditions before locker installation. Notify architect of unacceptable areas.
- B. Do not install lockers until unacceptable conditions have been corrected.

3.2 INSTALLATION

- A. Install lockers in locations as shown on shop drawings per manufacturer's instructions.
- B. Install lockers installed secured, plumb, level, square, and flush. Base by others must be flat and level.
- C. Install all required trim, fillers, end panels, and closures per manufacturer's instructions.
- D. Use hardware supplied or recommended by the manufacturer.
- E. Attach number plates to doors as indicated on shop drawings.
- F. Correct and/or replace damaged components as directed by architect.

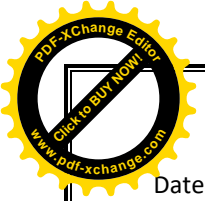
3.3 ADJUSTMENT

- A. Adjust doors and locks for smooth operation without binding.
- B. Lubricate door hinges and locks per manufacturer's instructions.

3.4 CLEANING

- A. Clean all surfaces in accordance with manufacturer's instructions. Do not use abrasive cleaners.
- B. Dry surfaces with a soft, clean, non-abrasive cotton cloth.

END OF SECTION 10 51 29



CLARIFICATION REQUEST FORM

Date: 02/05/25

Wolgast Clarification Request #: _____

To: Wolgast Corporation
Matt Moser or Christie Bigelow-Huver
4835 Towne Centre Road, Suite 203
Saginaw, MI 48604
Phone (989) 790-9120, Fax (989) 790-9063

From: Summit Lockers - Locker Manufacturer
Contractor Name Treva Cannon
Contact Name treva@summitlockers.com
Email Address 803.941.7087
Phone # Fax #

Bid Division # and Name: SECTION 105129 - PHENOLIC LOCKERS

CSI Code (If Applicable): _____

Drawing #: _____ Detail or Item #: Phenolic Lockers

Reason for Request: [] More Detail Needed [] Engineering Clarification [X] Alternate Proposal [] Other

Project: Oscoda Area Schools 2024 Bond Program

Site Location: BP 2 Community Center

ITEM(S) FOR CLARIFICATION OF BID: (Please use one form for each item)

Please review and respond to the following item(s) for clarification:

We would like to be added as an acceptable manufacturer for phenolic lockers for this project. I will send additional attachments for the architect to review.

RESPONSE: [] ITEM TO BE INCLUDED IN ADDENDUM

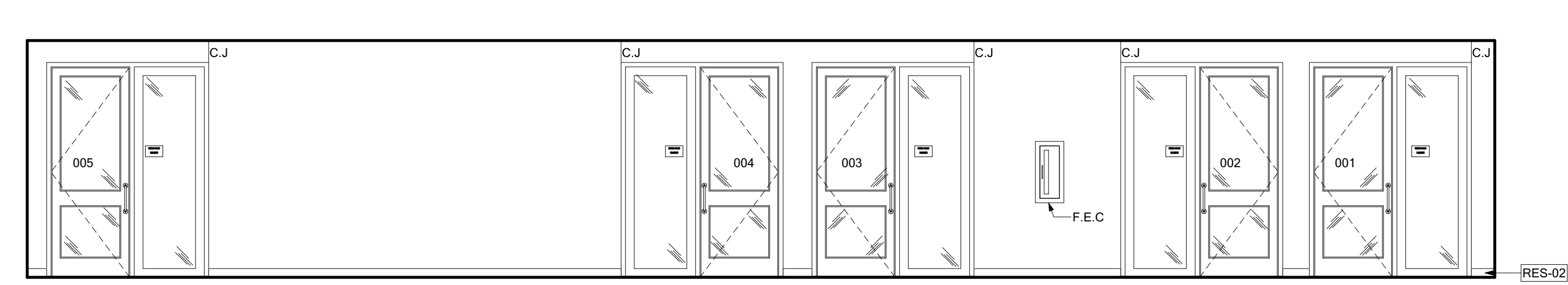
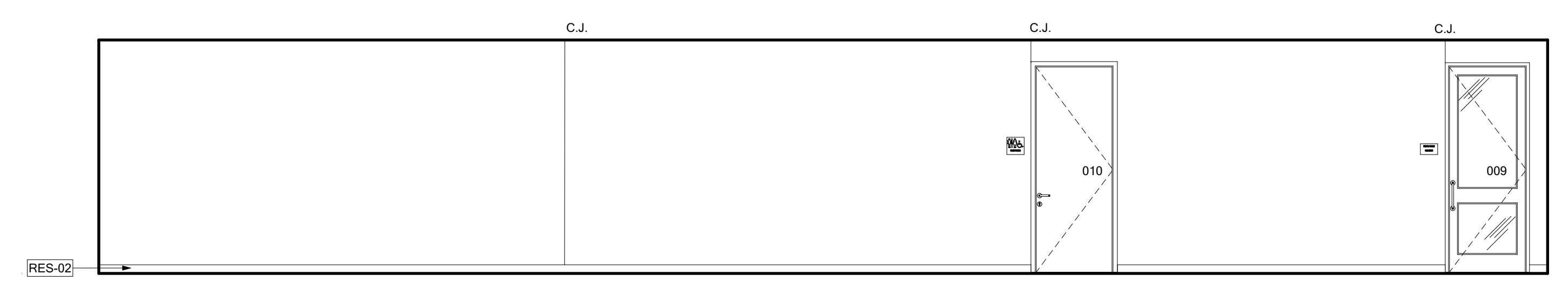
Construction Manager: _____
Signature Date

Architect: _____
Signature Date

END OF SECTION 00310

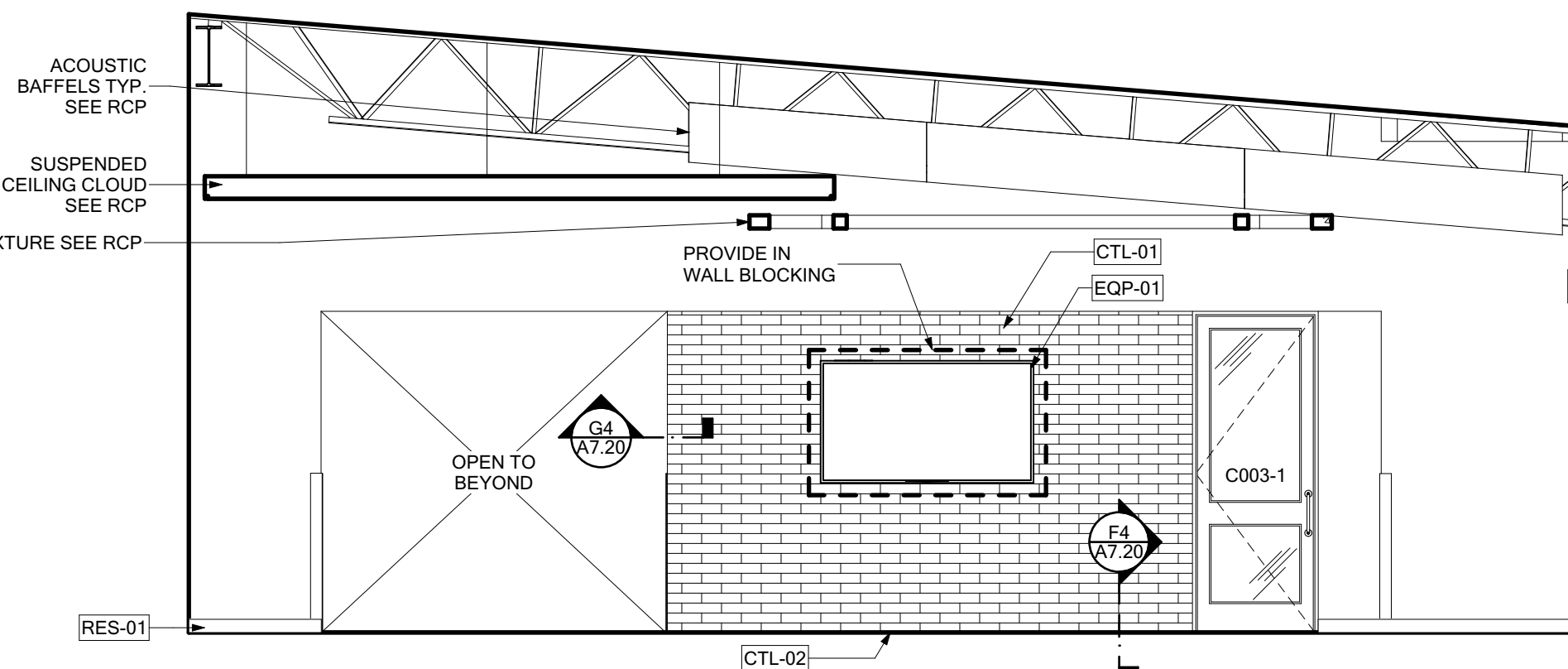
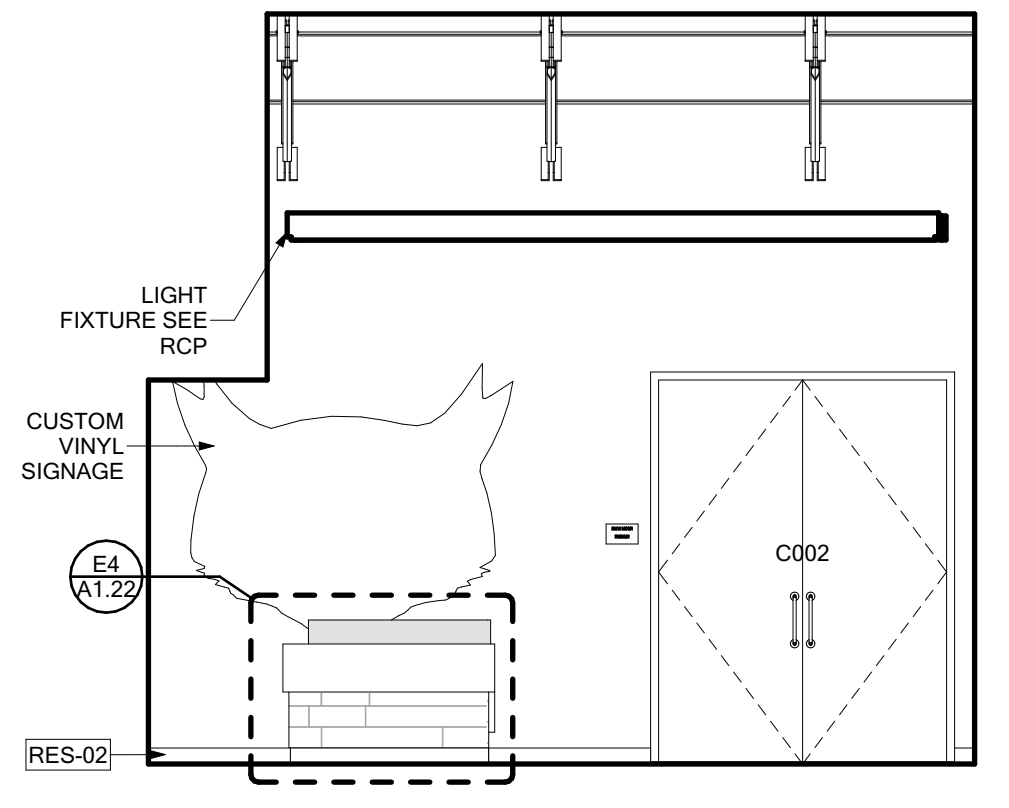
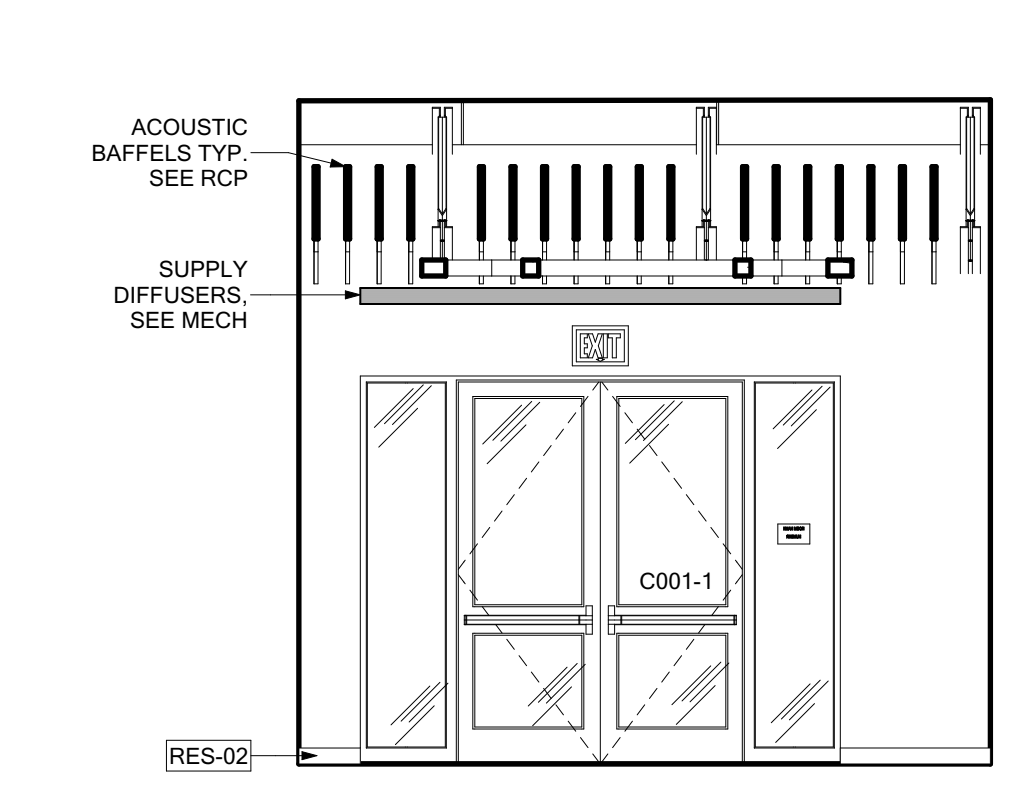


- KEYNOTES:**
(NOTE: NOT ALL NUMBERS ARE USED)
- CLG. CEILINGS (SEE REFLECTED CEILING PLANS)
- CSW. CASEWORK
 CSW-01 CABINET
 CSW-02 SHELVING
 CSW-03 COUNTERTOP
 CSW-04 SUPPORT BRACKET
 CSW-05 BACKPLASH
 CSW-06 REMOVABLE SKIRT
 CSW-07 COAT ROD
 CSW-08 BENCH
- CTL. CERAMIC TILING
 CTL-01 TILE
 CTL-02 METAL TRIM (SEE BASE / WALL CORNERS DETAILS)
 CTL-03 BULLNOSE TILE
 CTL-04 TILE WALL BASE
- DOM. DOMESTIC APPLIANCES
 DOM-01 DOMESTIC REFRIGERATOR (OPCI)
 DOM-02 DOMESTIC MICROWAVE (OPCI)
 DOM-03 DOMESTIC WALL OVEN (OPCI)
 DOM-04 DOMESTIC DISHWASHER (OPCI)
- EQP. EQUIPMENT
 EQP-01 MONITOR, PROVIDE IN WALL BLOCKING AS NEEDED (OPCI)
 EQP-02 PROJECTION SCREEN (OPCI)
 EQP-03 MARKERBOARD, BACK PAINTED GLASS SEE FINISH PLAN (OPCI)
 EQP-04 MARKERBOARD (OPCI)
 EQP-05 COPY-PRINTER (OPCI)
- EWC. ELECTRIC WATER COOLER
 EWC-01 ELECTRIC WATER COOLER
 EWC-02 ELECTRIC WATER COOLER W/BOTTLE FILLER
- LKR. LOCKERS
 LKR-01 LOCKER
 LKR-02 LOCKER END PANEL
 LKR-03 SLOPING TOP
 LKR-04 LOCKER FILLER PANEL
 LKR-05 LOCKER ROOM BENCH
- RES. RESILIENT FLOORING AND ACCESSORIES
 RES-01 RESILIENT FLOORING
 RES-02 RESILIENT BASE
- SSU. SOLID SURFACE
 SSU-01 SOLID SURFACE MATERIAL, SEE FINISH SCHEDULE
- TLT. TOILET PARTITIONS AND ACCESSORIES
 TLT-01 TOILET / URINAL PARTITION
 TLT-02 PLUMBING PIPING PROTECTION
- WDF. ROUGH WOOD FRAMING (FRT LND)
 WDF-01 WOOD BLOCKING
- WFN. WOOD FINISH CARPENTRY
 WFN-01 WOOD TRIM
 WFN-02 WOOD VENEER TRIM PANEL
 WFN-03 WOOD BASE
 WFN-04 WOOD FINISH FLOORING



F6 CORRIDOR C003 SOUTH
SCALE: 1/4" = 1'-0"

F2 CORRIDOR C003 NORTH
SCALE: 1/4" = 1'-0"

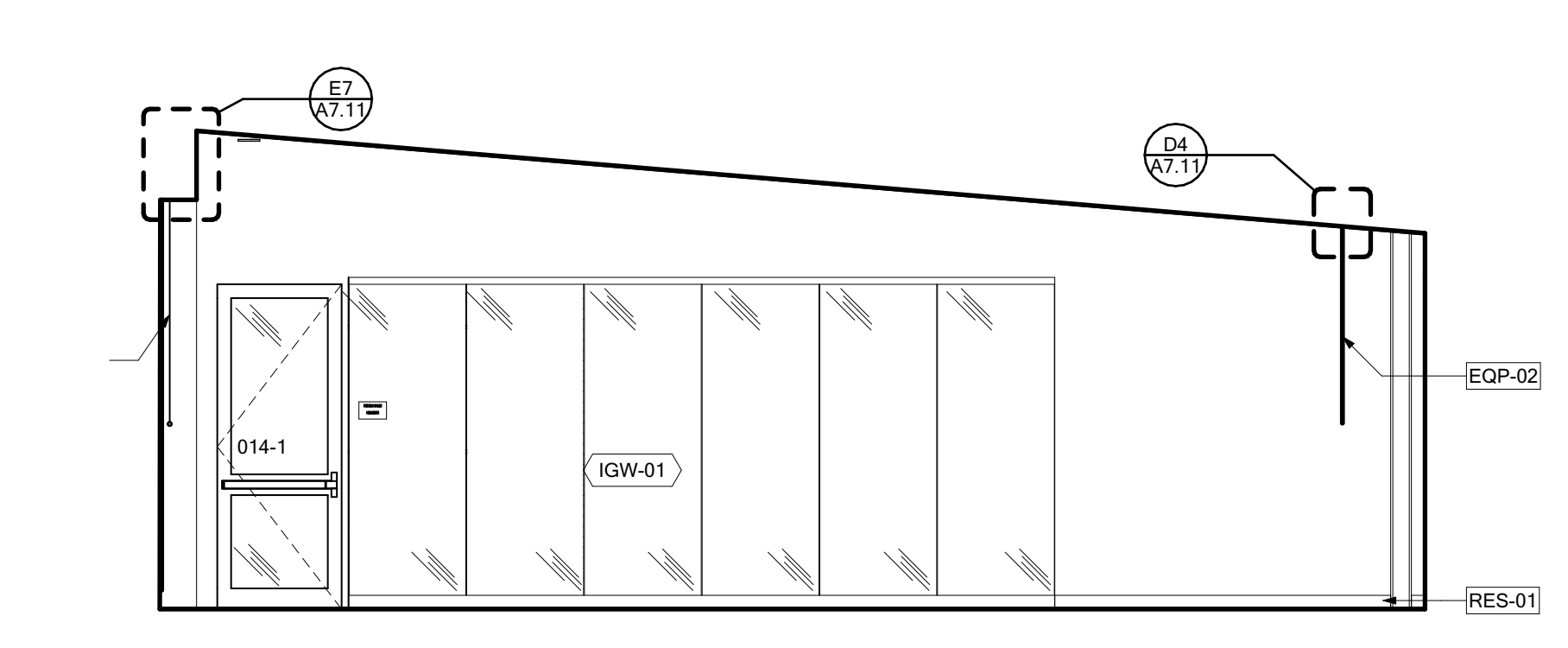
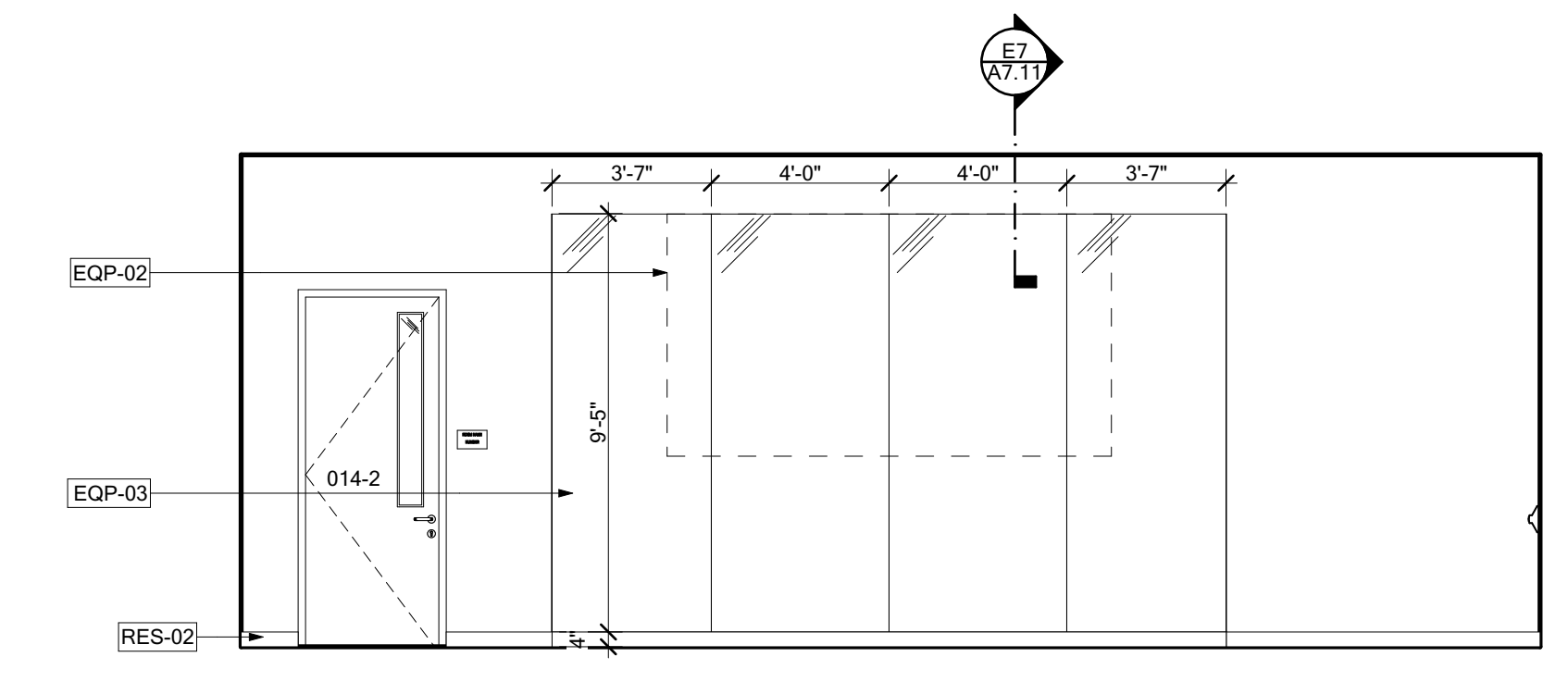
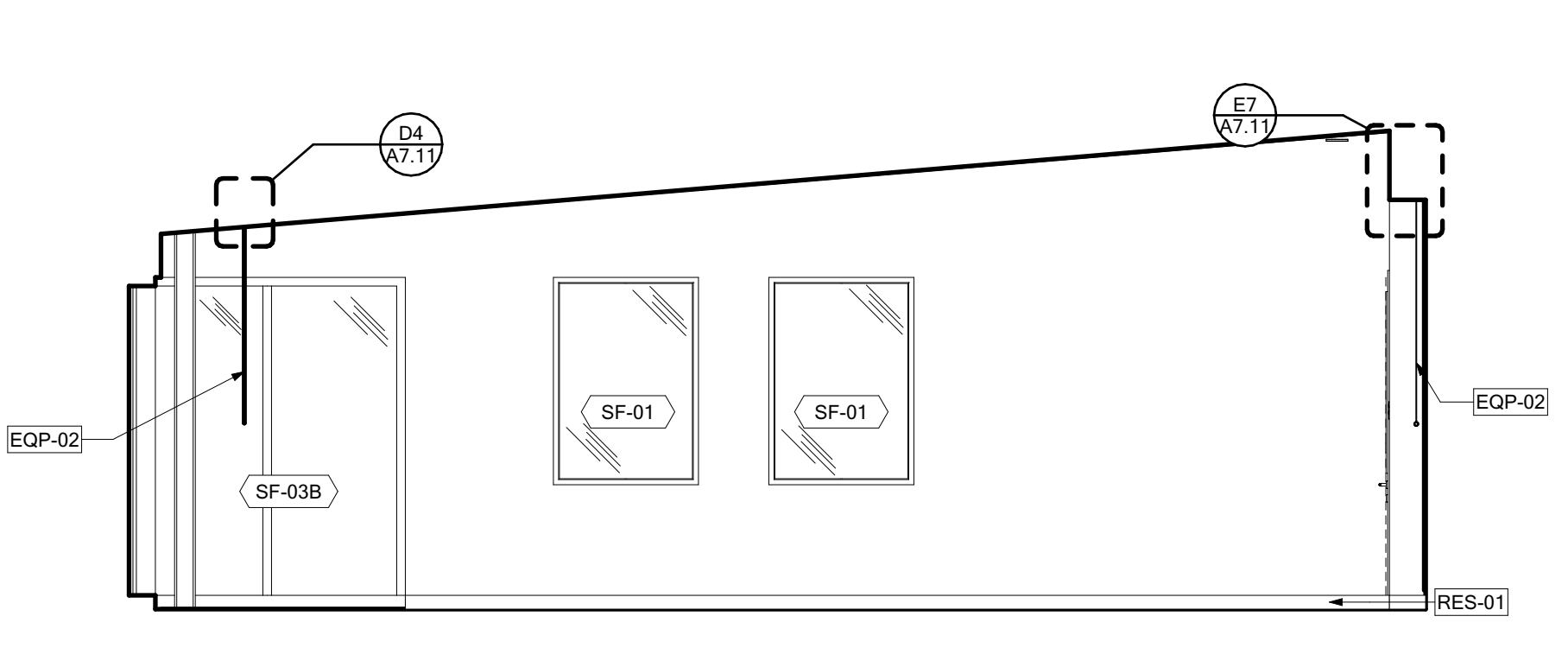
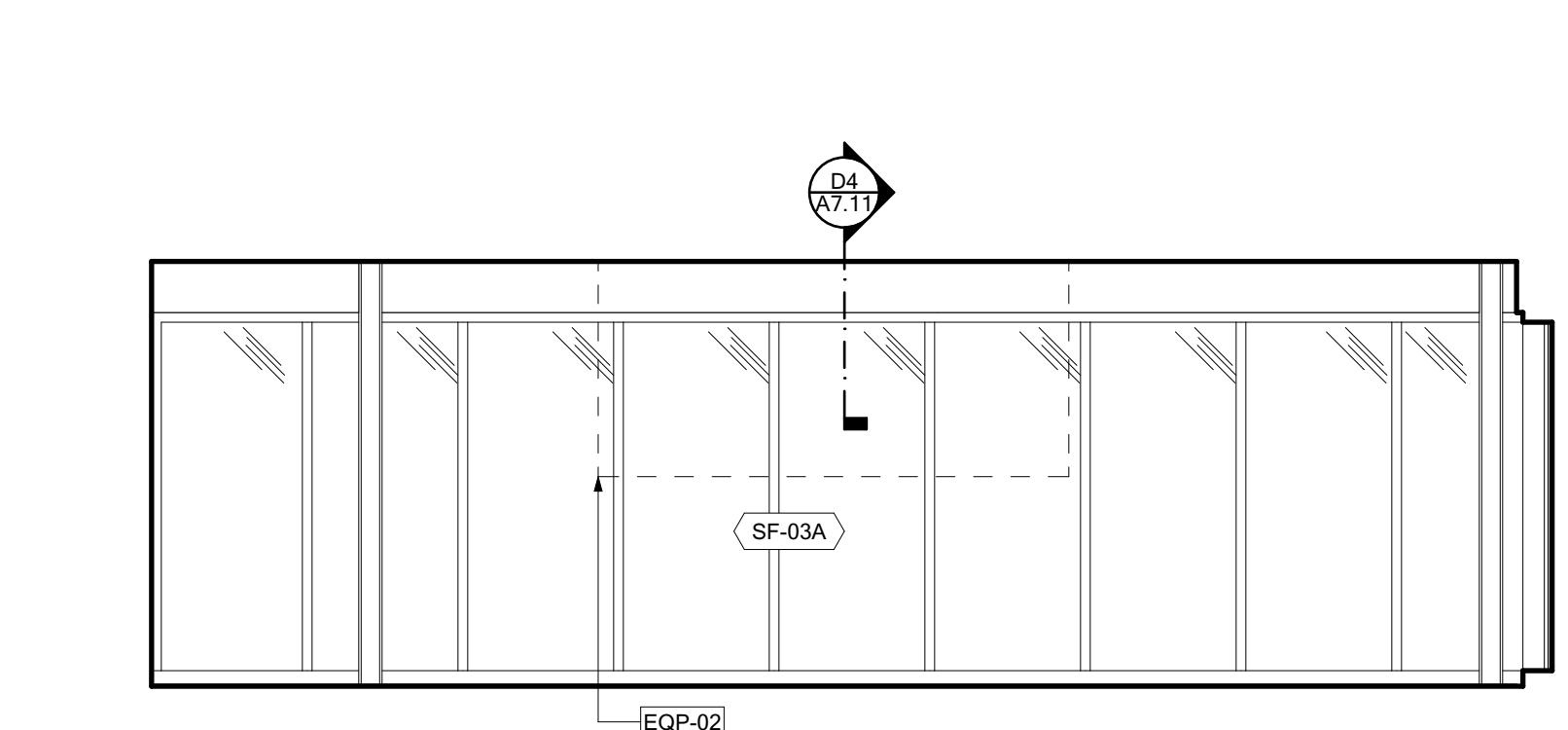


E8 LOBBY NORTH
SCALE: 1/4" = 1'-0"

E5 LOBBY EAST
SCALE: 1/4" = 1'-0"

E4 LOBBY SOUTH
SCALE: 1/4" = 1'-0"

E2 LOBBY WEST
SCALE: 1/4" = 1'-0"

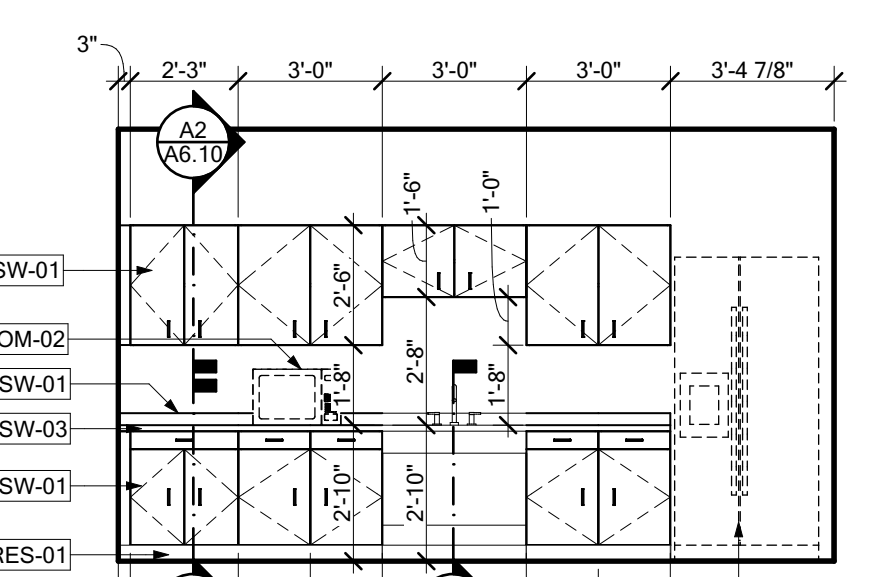
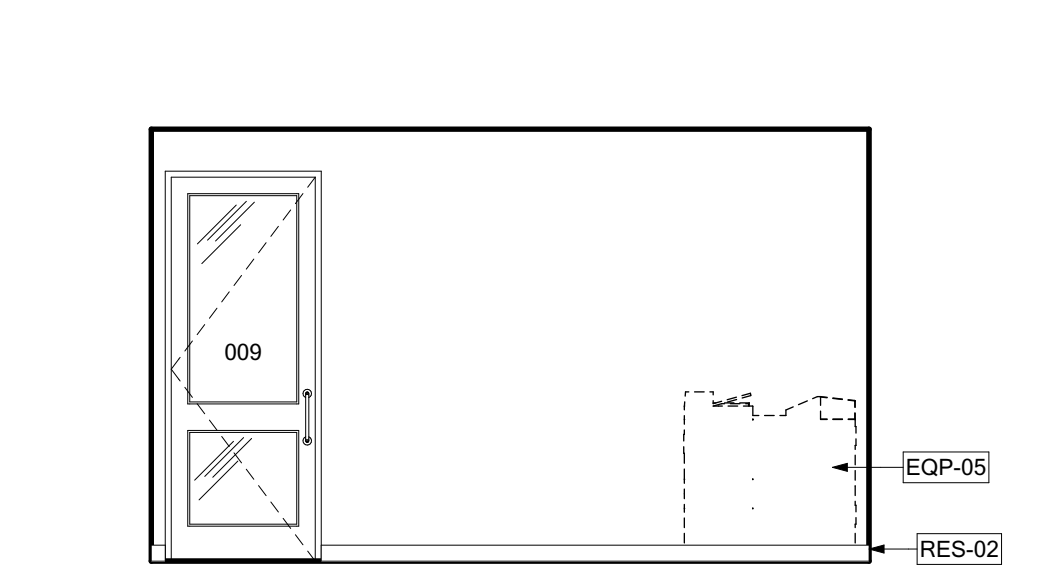


C7 BOARD ROOM 014 NORTH
SCALE: 1/4" = 1'-0"

C5 BOARD ROOM 014 EAST
SCALE: 1/4" = 1'-0"

C3 BOARD ROOM 014 SOUTH
SCALE: 1/4" = 1'-0"

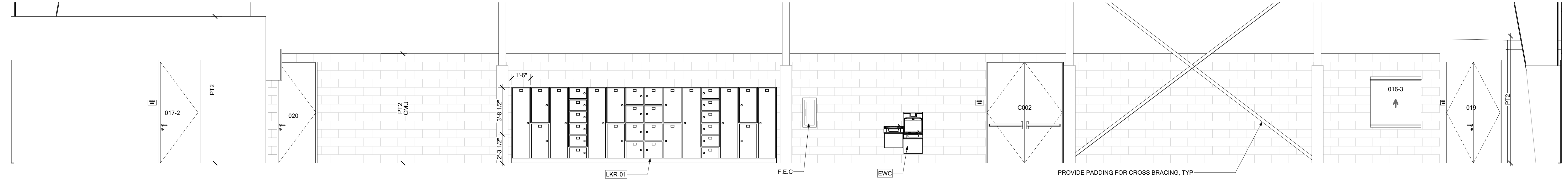
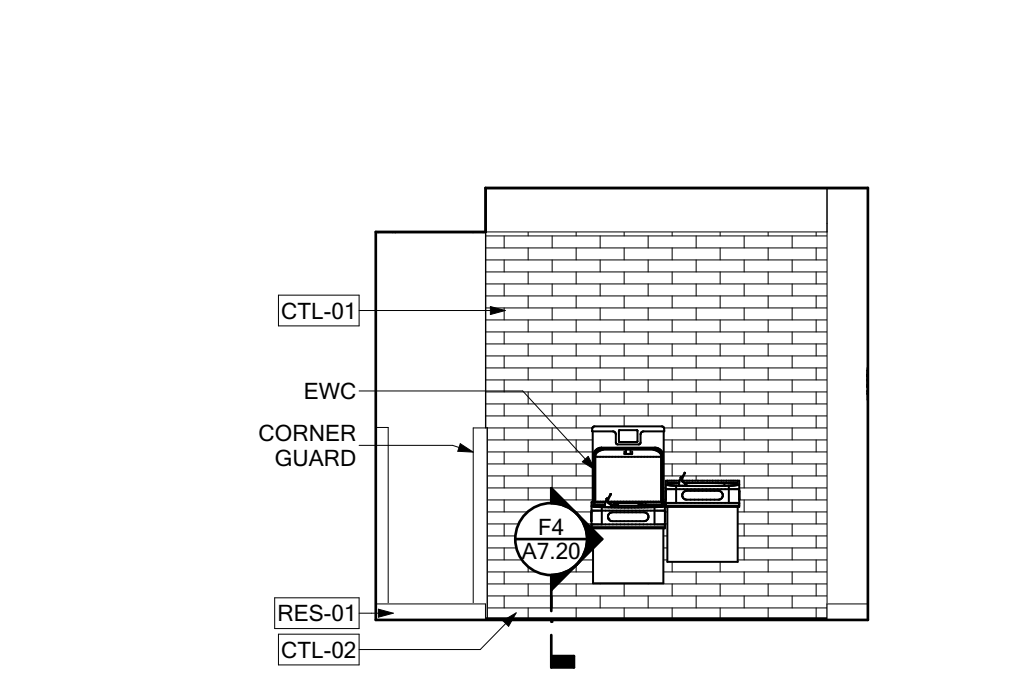
C1 BOARD ROOM 014 WEST
SCALE: 1/4" = 1'-0"



B8 WORK ROOM 009 NORTH
SCALE: 1/4" = 1'-0"

B7 WORK ROOM 009 EAST
SCALE: 1/4" = 1'-0"

B6 WORK ROOM 009 SOUTH
SCALE: 1/4" = 1'-0"



A8 C005 VEST
SCALE: 1/4" = 1'-0"

A1 FIELD HOUSE NORTH
SCALE: 1/4" = 1'-0"

PROJECT TITLE
OSCODA AREA SCHOOLS

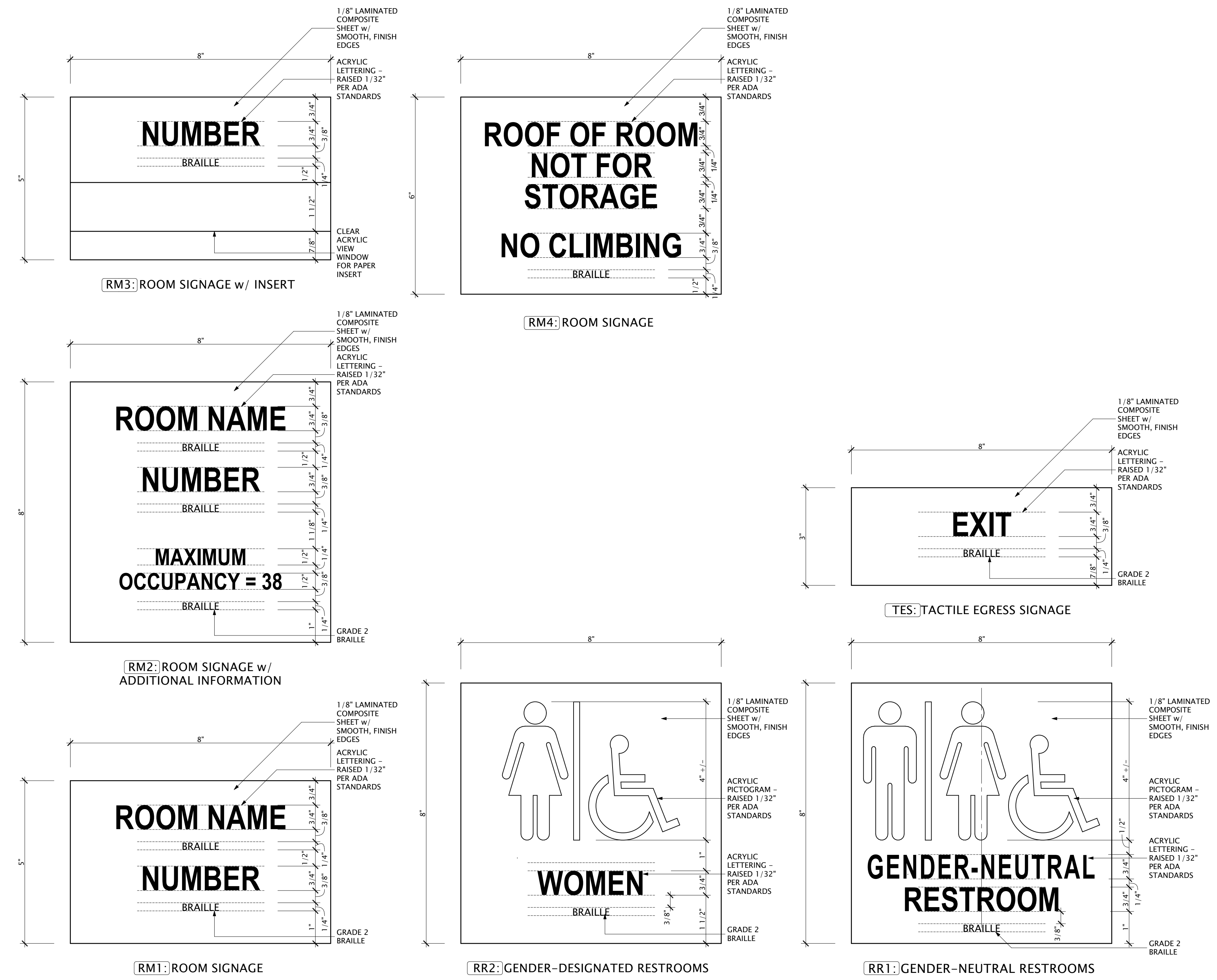
NEW COMMUNITY CENTER
3550 E River Rd,
Oscoda, MI, 48750

12/18/2024	CD/RD
10/11/2024	DESIGN DEVELOPMENT
08/16/2024	SCHEMATIC DESIGN

TC JOB NO. 107253
OWNER JOB NO. #Client Project No.

SHEET TITLE
INTERIOR ELEVATIONS

SHEET NO.
A6.00



C1 SIGNAGE DETAILS 6"
SCALE: 6" = 1'-0"

PROJECT TITLE
OSCODA AREA SCHOOLS

NEW COMMUNITY CENTER

3550 E River Rd,
Oscoda, MI, 48750

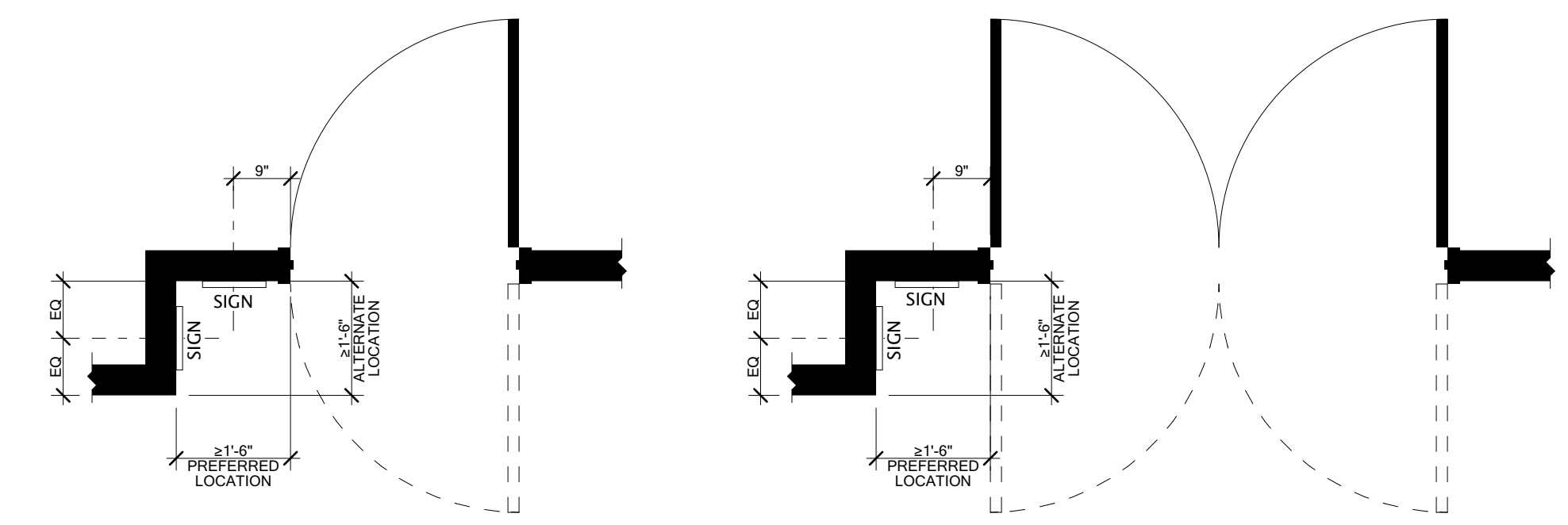
12/18/2024	CD/BD
10/11/2024	DESIGN DEVELOPMENT
08/16/2024	SCHEMATIC DESIGN

TC JOB NO. 107253
OWNER JOB NO. #Client Project No.

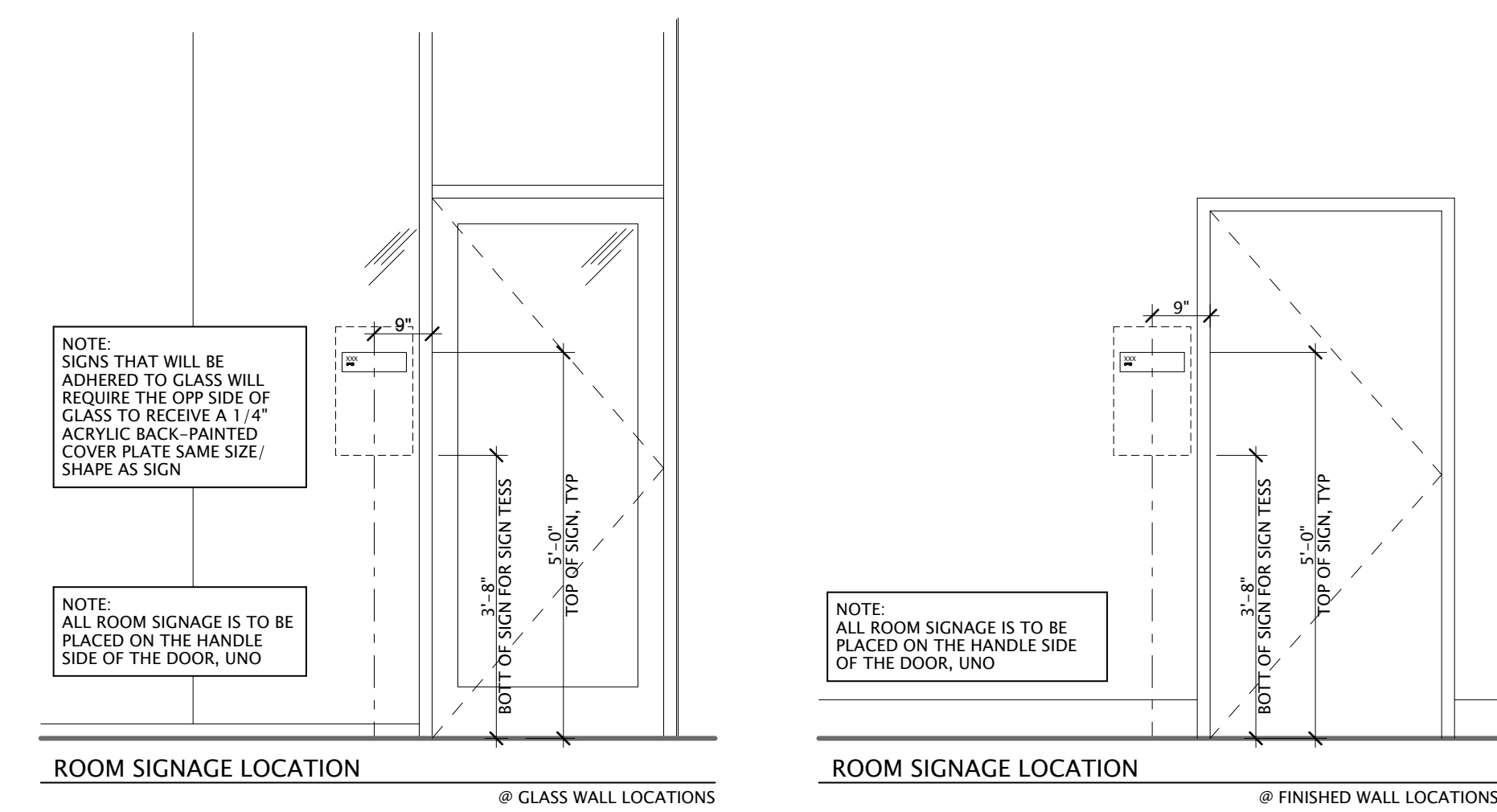
SHEET TITLE
SIGNAGE DETAILS

SHEET NO.

A8.11



ALTERNATE ROOM SIGNAGE LOCATIONS



A1 TYPICAL SIGN LOCATIONS
SCALE: 1/2" = 1'-0"



Bid Division: 105100 –Lockers

Bid to Include:

Total Responsibility for Specification Sections:
 Section 105129 – Phenolic Lockers

Limited Responsibility for Specification Sections (as it relates to work in this Bid Division):
 Section 079200 – Joint Sealant (as it relates to work in this bid division)

Provide all labor, materials, tools, and equipment necessary to perform the work of the specified bid sections. The contractor must also furnish, deliver, unload, store, protect, erect and install all items required for the completion of the work of this bid division in compliance with all drawings and specifications for a complete operational system including but not limited to:

General Inclusions:

1. There is no general contractor associated with this project; any and all reference to a “general contractor” related to the work of this bid division shall be understood to mean the contractor of this bid division.
2. The contractor for this bid division work is required to include but is not limited to all items, services, tasks, materials, personnel, equipment, etc. identified in this bid division description regardless of the presence of language in other bid division descriptions that is the same or is similar to that found in this contractor’s bid division description.
3. Coordination of the work of this bid division with any and all work of other bid division contractors for the scheduling and integration of the work of this contractor.
4. All contractors are responsible for the entire set of plans and specifications; including tables, schedules, and notes.
5. Provide continuous housekeeping and clean-up, and proper legal off-site disposal of any debris generated by this Bid Division’s work.
6. Contractor is responsible for own dumpster(s) and all removal and disposal charges thereof. (Use of the Owner’s dumpsters is strictly prohibited.)
7. All Contractors are required to inspect the existing project components and are to include all work necessary to complete the work to deliver a fully operational system in compliance with all governing codes.
8. This Contractor shall be responsible for performing all work in full compliance with all health and safety standards including Asbestos Awareness and Notification, Lead Paint Abatement, and all MIOSHA Standards. This Contractor shall also be responsible for satisfying all safety violations and/or fines resulting from the actions or lack of action by this Contractor at the sole expense of this Contractor.
9. Any contractor who compounds a mistake by installing their product on another Contractor’s obvious faulty work will assume responsibility for repair of said work.
10. This contractor shall repair and restore any damaged area to an original or better condition with no detectable evidence that the area has been repaired. Repairs must be done by personnel qualified in the execution of the work skilled and licensed in that trade. Whenever possible, repairs to work shall be done by the original installer of the work.
11. Submittal of all insurance, performance labor and material bonds as required, and schedule of values, within (2) two weeks of contract award.
12. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
13. Provide all layout and measurements required to perform the work of this Bid Division.
14. The Owner reserves the right to salvage any materials removed from the site during the duration of the project.
15. Coordinate delivery of materials with Construction Manager (48 hours) in advance of the delivery, and provide proper personnel and equipment to perform the unloading.
16. Contractor shall submit to the field construction manager a complete written daily field report stating the work being done on site and the number of employees performing the work for each day the Contractor has representatives on site.

Wolgast Corporation – Construction Management



SECTION 105129 - PHENOLIC LOCKERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Phenolic lockers.

1.2 RELATED REQUIREMENTS

- A. Section {id#230} - {t#230}: Wood blocking and nailers.

1.3 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's published data on locker construction, sizes and accessories.
- C. Shop Drawings: Indicate locker plan layout, numbering plan and key codes.
- D. Samples: Submit two samples 6 by 6 inches in size, of each color scheduled.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect locker finish and adjacent surfaces from damage.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
- B. Failures include, but are not limited to, the following:
 - 1. Structural failures.
 - 2. Faulty operation of latches and other door hardware
- C. Warranty Period: 10 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design:



1. PSiSC; www.psiscc.com.

B. Other Acceptable Manufacturers:

1. ASI Storage Solutions: www.asi-storage.com/#sle.
2. Grid: www.builtbygrid.com/#sle.
3. List Industries, Inc: www.listindustries.com/#sle.

2.2 LOCKER APPLICATIONS

A. Lockers: As indicated on drawings.

1. Width: 18 inches.
2. Depth: 18 inches.
3. Height: 72 inches.
4. Locker Configuration: As indicated on drawings.

2.3 PHENOLIC LOCKERS

A. Lockers: Factory assembled, made of phenolic core panels with mortise and tenon joints and stainless steel mechanical joint fasteners; fully finished inside and out; each locker capable of standing alone.

1. Doors: Full overlay, covering full width and height of locker body; square edges.
2. Hinges: Consealed type from 14 Gauge Type 304 Stainless Steel.
3. Coat Hooks: 11 Gauge Type 304 Stainless Steel with a satin finish.
4. Locker Legs: Provide Locker Legs for all lockers except recessed and base mounted lockers.
5. Built-In Digital Keypad Lock: Battery-powered lock with alphanumeric keypad for 4-digit access code; optional access with programming, manager bypass, or user key.
6. Panel Core Exposed at Edges: Machine polished, without chips or tool marks; square edge unless otherwise indicated.
7. Where locker ends or sides are exposed, finish the same as fronts or provide extra panels to match fronts.
8. Door Color: As selected by Architect.
9. Body Color: Manufacturer's standard white color.



10. Fasteners for Accessories and Locking Mechanisms: Tamperproof type.
- B. Phenolic Core Panels: Nonporous phenolic resin and paper core formed under high pressure, with natural colored finished edges, integral melamine surface, matte finish, and uniform surface appearance; glued laminated panels not acceptable.
 1. Surface Burning Characteristics: Flame spread index of 75 or less, and smoke developed index of 450 or less; when tested in accordance with ASTM E84.
- C. Number Plates: Manufacturer's standard, minimum 4-digit, permanently attached with adhesive; may be field installed. Number Plate shall be engraved from the back side to prevent the accumulation of dirt and grime.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that prepared bases are in correct position and configuration.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install lockers plumb and square.
- C. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds.
- D. Bolt adjoining locker units together to provide rigid installation.
- E. Install end panels, filler panels, and sloped tops.
- F. Install accessories.

3.3 CLEANING

- A. Clean locker interiors and exterior surfaces.

END OF SECTION 105129

RFI detail

#13 Isimet Panic Button



Status	Closed
Created on	Feb 6, 2025 by Matt Moser (WOLGAST CORPORATION)
RFI type	Default RFI workflow
Ball in court	Matt Moser (WOLGAST CORPORATION)
Answered	Feb 13, 2025 by Dustin DeWitt (The Collaborative)

Question

Drawing E1.01 shows the Isimet Alarm System, is there any additional information that can be provided for this system?

Official response

Dustin DeWitt (The Collaborative): Please see attached PDF

By *Dustin DeWitt* (The Collaborative) - Feb 13, 2025, 1:31 PM EST

Official response attachments

[RFI #13 ISIMET PANIC BUTTON - REVIEWED.PDF](#), Feb 6, 2025, 11:08 AM EST

Impact

Cost impact -

Schedule impact -

Other attributes

Priority Normal

Discipline -

Category -

Location	-
Location details	david@thunderbayelectric.com
External id	-
Co-reviewer(s)	
Spec Section	-
Construction Phase	Pre-Bid

Activities	By	At
<p>Christie Huver changed the status from Open Answered to Closed</p> <p>Official response: Dustin DeWitt (The Collaborative): Please see attached PDF changed the official response attachment to: RFI #13 ISIMET PANIC BUTTON - REVIEWED.PDF. changed the watchers to Patrick Fritz (WOLGAST CORPORATION), Clinton Clark (WOLGAST CORPORATION), Matt Moser (WOLGAST CORPORATION)</p>	Christie Huver	Feb 13, 2025, 1:32 PM EST
<p>Christie Huver changed the status from Open In Review to Open Answered set Ball in court to Matt Moser (WOLGAST CORPORATION)</p>	Christie Huver	Feb 13, 2025, 1:31 PM EST
<p>Allison Schrecongost response was submitted by Christie Huver: see Dustin's Response</p>	Christie Huver	Feb 13, 2025, 1:31 PM EST
<p>Dustin DeWitt added a response: Please see attached PDF added the response attachment to: RFI #13 ISIMET PANIC BUTTON - REVIEWED.PDF.</p>	Dustin DeWitt	Feb 6, 2025, 11:08 AM EST
<p>Matt Moser (WOLGAST CORPORATION) created this RFI in Open In Review status and set Ball in court to Allison Schrecongost, Dustin DeWitt (The Collaborative).</p>	Matt Moser	Feb 6, 2025, 9:22 AM EST

Details

Question

Drawing E1.01 shows the Isimet Alarm System, is there any additional information that can be provided for this system?

Status

OPEN

Ball in court

Allison Schrecongost, Dustin DeWitt (The Collaborative)

Due Date

February 09, 2025

Participants

Creator

Matt Moser (WOLGAST CORPORATION)

Manager

Matt Moser (WOLGAST CORPORATION)

Reviewers

Allison Schrecongost, Dustin DeWitt (The Collaborative)

Watchers

Patrick Fritz (WOLGAST CORPORATION), Christie Huver (WOLGAST CORPORATION), Clinton Clark (WOLGAST CORPORATION)

See attachment.

A Zelanka

KTS Engineering Group

02/06/2025

ISIMET

Fire Pit, Gas Grill and Heater Gas Controller

Model: BGC

Safeguards Fire Pits, Gas Grills and Heaters.

IDEAL Applications:

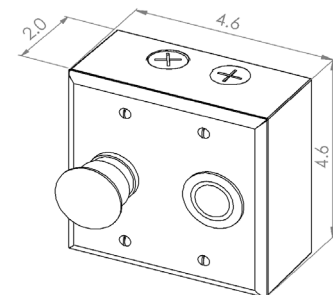
- Hotels, Condos, Apartments, Outdoor spaces, Restaurants.

Operational Features:

- **Eliminates gas from being left on.**
 - Field Configurable Timer: 30 min, 1 hour, 2 hours, 4 hours, 8 hours, or 12 hours
- **Limits Access and Easy to Use.**
 - Day and Time of Day Control. (With Optional 7-Day Timer.)
 - Optional Keyed-Reset Stop Button.
- **LED Notifications:**
 - Green: Gas is ON.
 - Red: Gas is OFF.
 - Green flashing: 5 minutes or less remaining in run time.
 - Red flashing: Emergency State (Gas OFF.)
- **Secondary output (120 VAC) for controlling an igniter or glow plug.**
 - Configurable to 5, 10, 15, 30, 45, or 60 Seconds.
- **Stop Button:** For Easy Shutdown.
- **Emergency Input:** Building Emergency or additional Panic Button Input.



Front View



Isometric View

Physical Features:

- **Surface-Mount Box:** Metal 4.6-inch x 4.6-inch x 2-inch
- **Front Cover:** Brushed Stainless Steel 4.6-inch x 4.6-inch
- **Weatherproof, Outdoor rated Controller.**

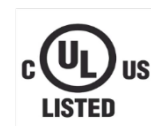
Standard Items:

Gas Activation Method	Push Button (IP65 rated)
Wall Mounting Method	Surface Mount
Box	Metal Double-Gang
Cover Plate	Brushed Stainless Steel

Designed in the USA!

Made in the USA!

Tech Support all in the USA!





OPTIONS

Gas De-activation Button	<ul style="list-style-type: none"> • Mushroom Stop Button: Standard 40mm mushroom style IPO • Flush Mount Stop Button • Keyed Reset Mushroom Stop Button. <i>(Prevents unauthorized access)</i>
Gas Valve	<ul style="list-style-type: none"> • UL Self-Closing Electronic Ball Valves (Sizes: ½ in, ¾ in, or 1 in) <i>ISIMET recommends Self-Closing Electronic Ball Valves.</i> <i>(Reasons: Reliability, Heat, Noise, Energy Savings, open port advantages...)</i> • UL Solenoids (Sizes ½-in, ¾-in, 1-in, 1 ¼- in, 1 1/2- in, or 2-in.)
Valve Assembly <i>(See photo below.)</i>	<ul style="list-style-type: none"> • Y-strainer, Solenoid, 2xUnions, and a ¼-Turn Manual Ball Valve
7-Day Timer (Time of Day or Day-of-Week Control)	<ul style="list-style-type: none"> • 7-Day Programmable Timer * Installs in a standard single-gang box (not included).
Post Mounting <i>(See photo below.)</i>	<ul style="list-style-type: none"> • Pedestal Mount with Flange • Pedestal Mount without Flange.

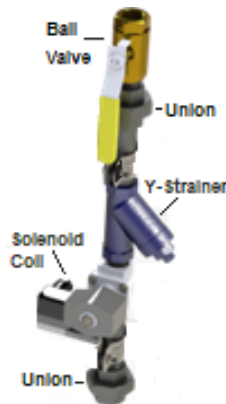
Field Configurable Times:

- **Gas Shutdown Times:** 30 minutes, 1-hour, 2-hours, 4-hours, 8-hours and 12-hours. *(Default is 1 hour)*
- **120 VAC igniter or Glow plug Times:** 5, 10, 15, 30, 45 and 60 Seconds. *(Disabled by default)*

Post/Pedestal Options



Valve Assembly



Solenoid



Self-Closing Electronic Ball Valve



7-Day Timer



Reference Photos

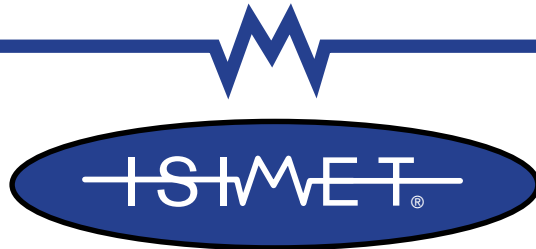
BGC - - - - -

(Enable Gas) P: Push Button	(Disable Gas) M: Mushroom Button B: Stop Button K: Keyed Reset	(Mounting) S: Weatherproof Surface Mount ¹	(24V Output Timer)² 0: 30 minutes 1: 1 hour 2: 2 hours 3: 4 hours 4: 8 hours 5: 12 hours	(120V Output Timer) 0: Same as 24V Output 1: 5 seconds 2: 10 seconds 3: 15 seconds 4: 30 seconds 5: 45 seconds 6: 60 seconds	Additional Options T: 7-Day Timer ³
---------------------------------------	--	---	--	--	--

¹Metal Weatherproof Box

²Field Configurable. Default Shutdown Timer is set to one hour.

³Add a 7-day, 24-hour programmable light switch timer with battery backup for day/time-of-day control.



The Leader in Utility Safety Controls since 2000

Fire Pit and Gas Grill Controller (Model BGC)

FOR HOTELS, APARTMENTS, CONDOS & RECREATION AREAS



Controls access to firepits and gas grills

- Controls length of use—automatic gas shutoff after predetermined time
- Ability to control time of day gas is available (with optional 7-Day Programmable Timer Switch)
- Prevents unauthorized and unattended use
- Conserves gas

Easy to operate

- Simply press button to activate gas
- Green indicates “Gas On”
- Red indicates “Gas Off”
- Flashing green indicates gas flow will cease in five minutes

Weatherproof stainless steel cover and powder-coated metal box standard



The ISIMET advantage.
www.isimet.com
(903) 781-6994





Fire Pit and Gas Grill Controller (Model BGC)

FOR COMMUNITY GAS GRILLS AND FIRE PITS

Features

- Size 4.56" x 4.56" x 2.25"
- Mushroom "Stop" button standard
- Surface mount standard

Options

- Keyed reset available
- Flush "Stop" button available
- 7-day programmable timer switch

System choices

- Complete system: controller & electronic ball valve, 1/2", 3/4", 1" valve size (lowest maintenance/power consumption)
- Controller & solenoid
- Controller only
- Master Controller—controls/disables multiple grills and firepits

Flush "Stop" button



Keyed reset



Recommended

To order, please contact:



The ISIMET advantage.
www.isimet.com
(903) 781-6994

Visit isimet.com for details.
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Patent Pending
Rev 1-12-24



BGC Submittal

Equipment Specifications Model #:

BGC-

Enable Gas Option:

P (Push Button) *(Standard)*

Disable Gas Option:

M (Mushroom Stop Button) *(Preferred)*

B (Flush Stop Button)

K (Keyed Reset Mushroom Stop Button)

Mounting Option:

S (Surface Mount) – Weatherproof Metal Double-Gang Box *(Standard)*

24 VDC Output (Primary Output)

Automatic Shutdown Timer *(Field Configurable, additional timeout options available):*

30 minutes 1 hour 2 hours

4 hours 8 hours 12 hours

120 VAC Output (Secondary Output):

Standard *(120V turns on/off with 24VDC primary circuit)*

Igniter/Glow Plug Timeout *(Select Time)*

5 seconds 10 seconds 15 seconds

30 seconds 45 seconds 60 seconds

Time of Day Functionality:

Add 7-Day Programmable Timer Decora Switch*

* Installs in a standard single-gang box (not included).

Model Number:

BGC -


(Enable Gas) P: Push Button	(Disable Gas) M: Mushroom Button B: Stop Button K: Keyed Reset	(Mounting) S: Weatherproof Surface Mount ¹	(24V Output Timer)² 0: 30 minutes 1: 1 hour 2: 2 hours 3: 4 hours 4: 8 hours 5: 12 hours	(120V Output Timer) 0: Same as 24V Output 1: 5 seconds 2: 10 seconds 3: 15 seconds 4: 30 seconds 5: 45 seconds 6: 60 seconds	Additional Options T: 7-Day Timer ³
---------------------------------------	--	---	--	--	--

¹Metal Weatherproof Box

²Field Configurable. Default Shutdown Timer is set to one hour.

³Add a 7-day, 24-hour programmable light switch timer with battery backup for day/time-of-day control.

ISIMET JOB #: _____



Model: BGC*
(4.56-in H x 4.56-in W x 3.54-in D)

Project Owner:

Project Name:

Project Address:

Notes:



BGC Submittal

Additional Items: (These options may require a separate line item and/or submittal to be processed.)

Solenoid/EBV Model #:

S-

Valve Option:

- None
- Electronic Ball Valve (Full Port, Self-Closing) [1/2" - 1" Only]

ISIMET recommends Electronic Ball Valves

- Solenoid [1/2" - 2"]

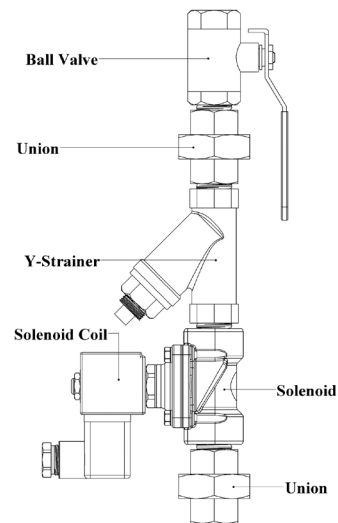
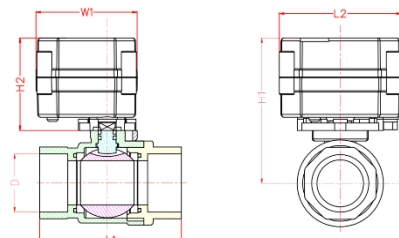
Valve Size (inches):

- 1/2 3/4 1 *EBV Sizes Only*
- 1-1/4 1-1/2 2

Valve Assembly:

- Includes 2x Unions and 1/4-Turn Manual Ball Valve
- Add 80-mesh Y-Strainer

ISIMET also offers S-Series Enclosures, Rack Assemblies, Valve Assemblies, and other options.



Solenoid/EBV Specifications:

ISIMET Model	Port Size	Orifice Size	Seat Material	Min. Pressure	Flow Factor	Operation Pressure		24 VDC	
						Air/Gas	Water	Inrush	Holding
Units	in	in		psi	psi	psi	psi	VA	VA
S-301	1/2	0.71	BUNA	0	4	3	-	19	19
S-302	3/4	0.71	BUNA	0	4.9	3	-	19	19
S-303	1	1.26	BUNA	0	12	0.75	-	19	19
S-304	1 1/4	1.26	BUNA	0	14	0.75	-	19	19
S-305	1 1/2	1.89	BUNA	0.015	41	3	-	19	19
S-306	2	2.00	BUNA	0.015	50	3	-	19	19
S-951	1/2	Full Port	Buna-N	0	Full Port	45	-	-	-
S-952	3/4	Full Port	Buna-N	0	Full Port	45	-	-	-
S-953	1	Full Port	Buna-N	0	Full Port	45	-	-	-

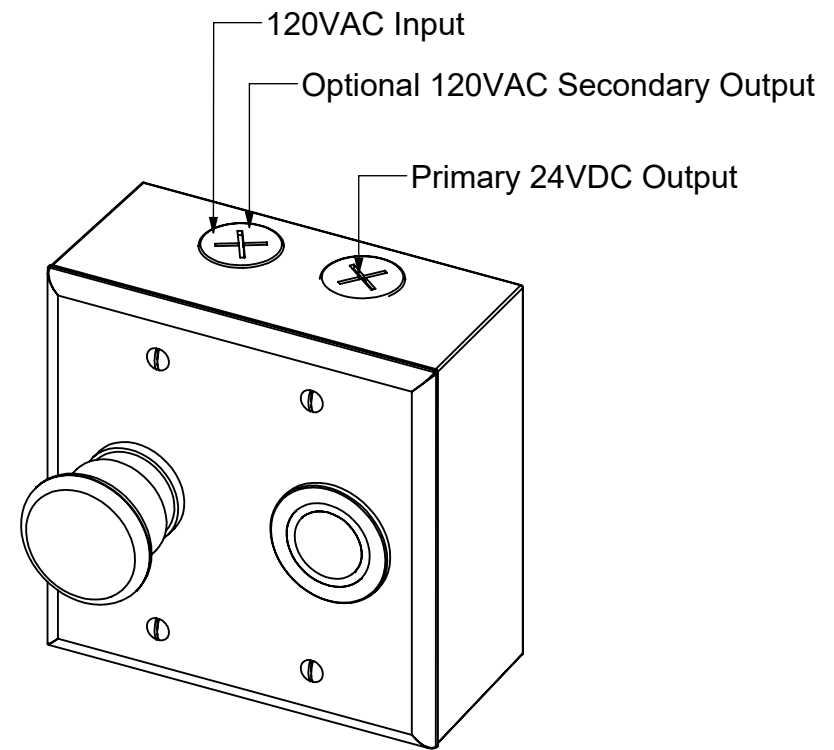
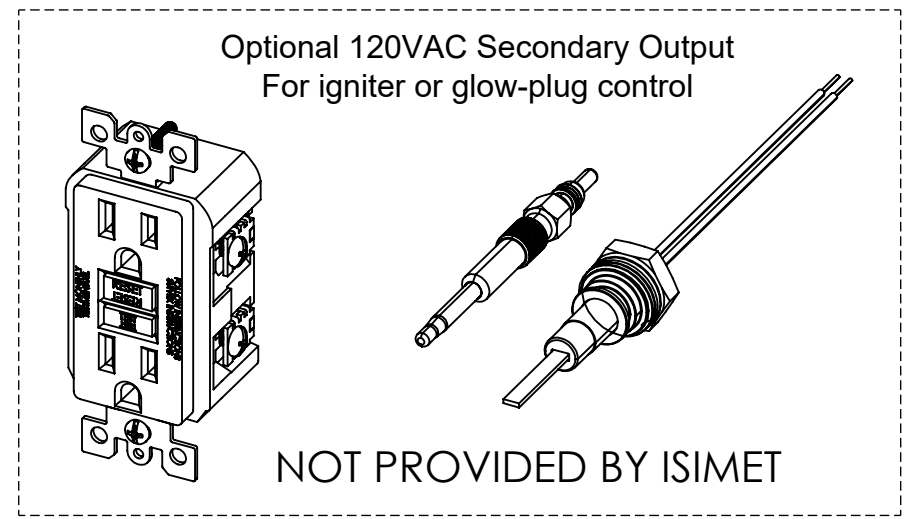
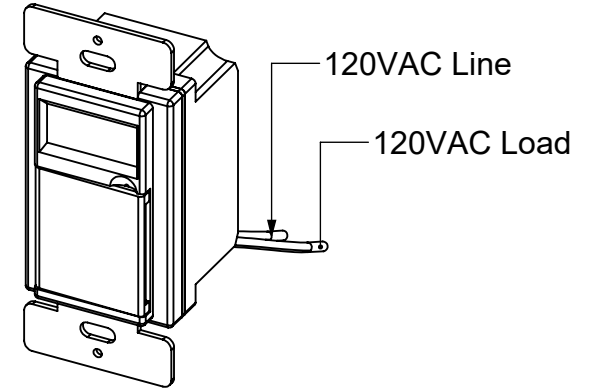
Series 300 are Fuel gas, Aluminum construction Normally Closed Solenoid Valves. (Designed for low pressure fuel gas applications.)
 Series 900 are Stainless-Steel Electronic Ball Valves that automatically close when power is lost.

Additional BGC Options: (Requires Separate Line Item to Order)

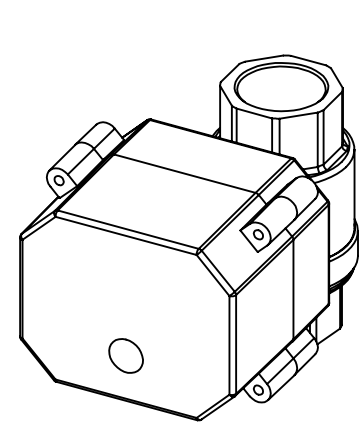
- Add Rooftop Pedestal Mount with Flange
- Add Yard-Style Pedestal Mount without Flange

NAME	BGC Engineering Drawing		PART NO.	SCALE	1:2	REVISION	A Created Drawing	BY	CH	EC	DATE	12/18/2023
	FOR	Firepit and Grill Controllers										
MATERIAL	Varies		TOLERANCE UNLESS SPECIFIED	DECIMALS: ±.01	TWO PLACE	THREE PLACE	FRACTIONS: ±1/32	ANGLES: ±0.5°	SURFACE TEXTURE	32		
ISIMET, LLC												

7-Day Programmable Timer (Optional)

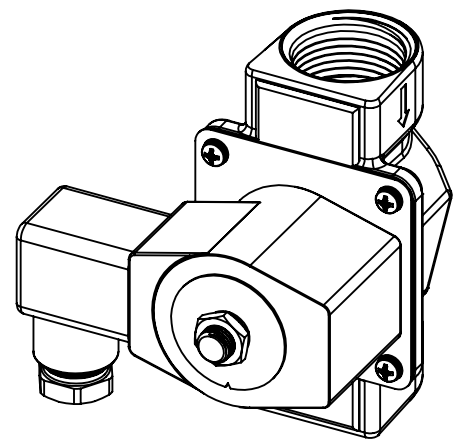


ISIMET Firepit and Gas Grill Controller Model BGC



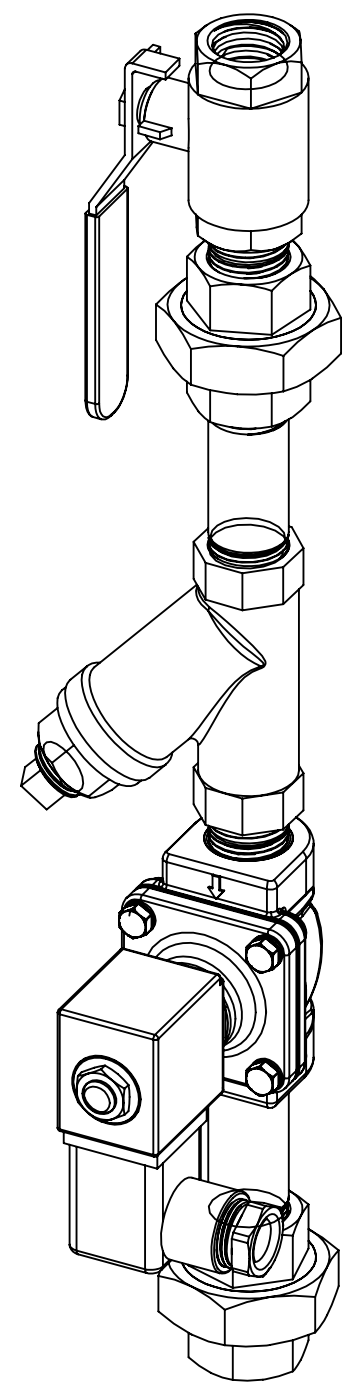
Electronic Ball Valve (EBV) 900 Series (24VDC, 1/2" to 1")

OR



ISIMET Solenoid 300 Series (24VDC, 1/2" to 1-1/2")

OR

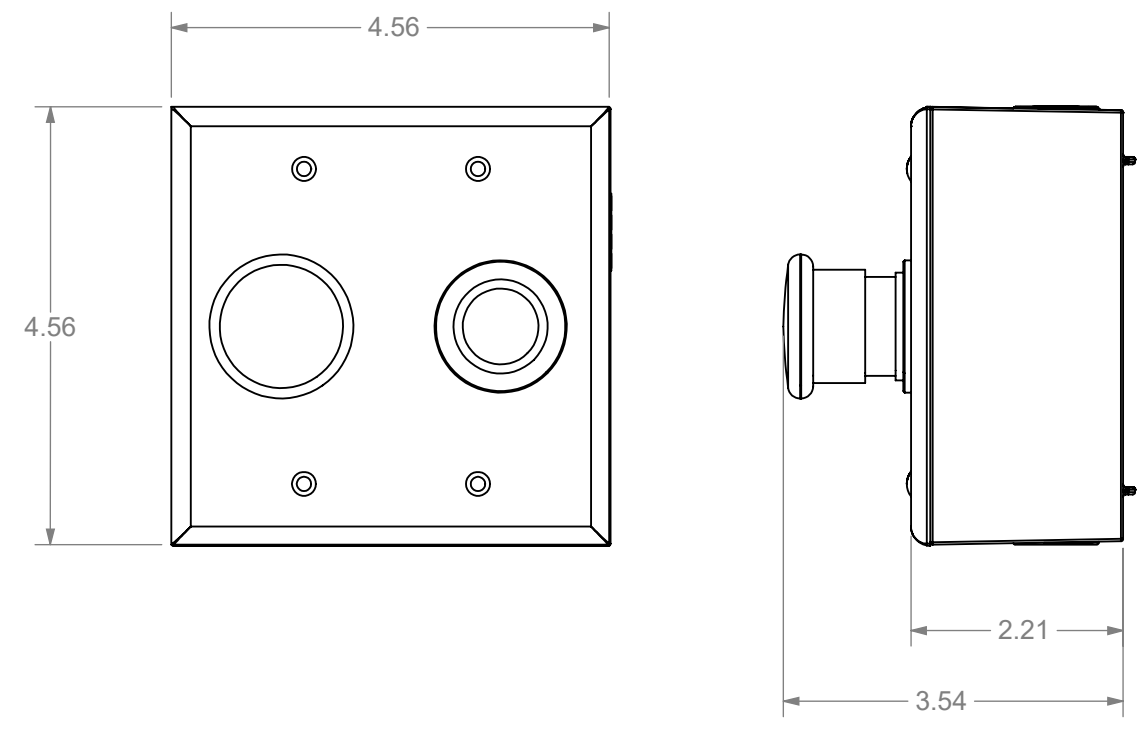


ISIMET Valve Assembly EBV or Solenoid (with or without Y-Strainer)

Notes:

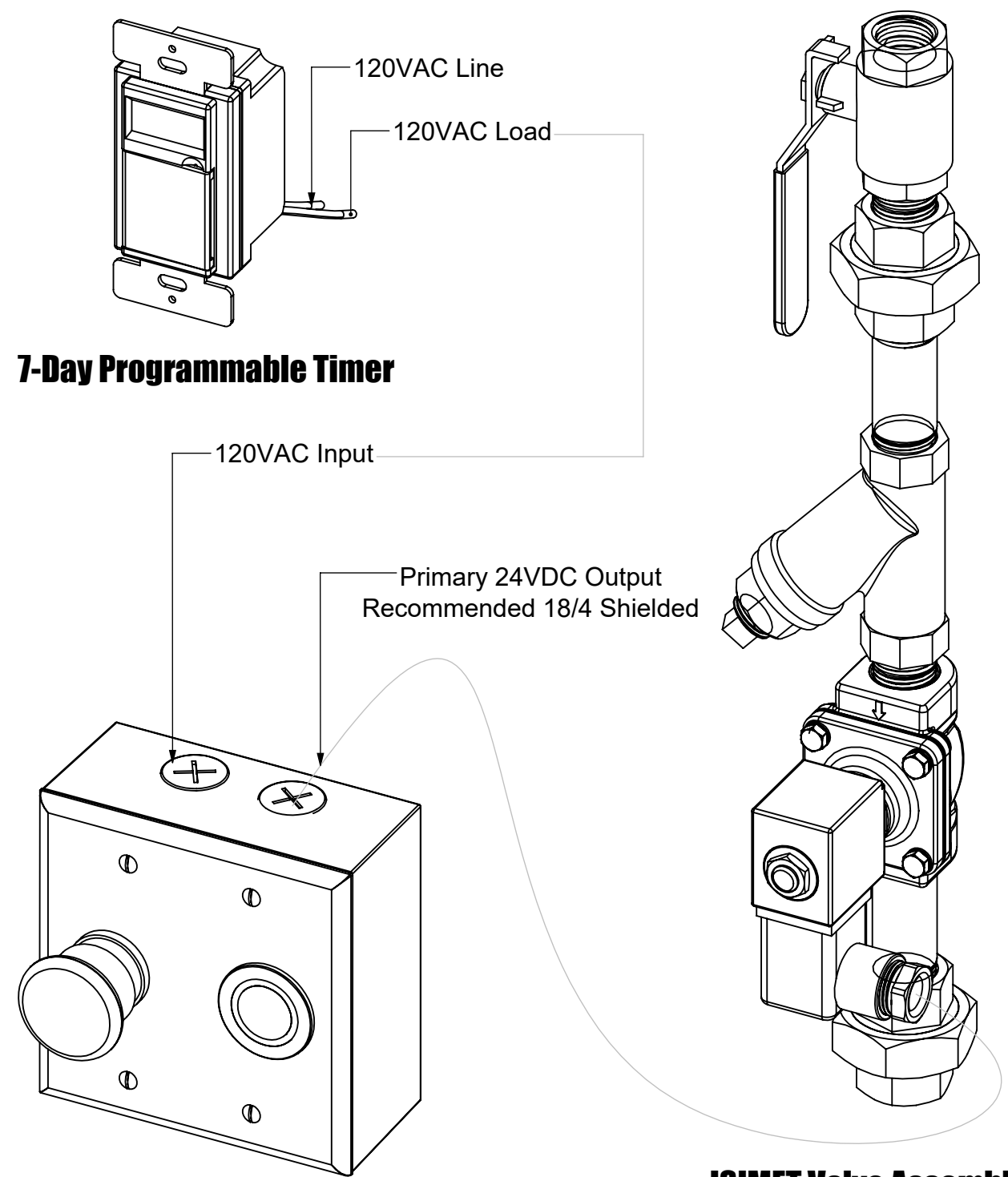
1	ISIMET Firepit and Gas Grill Controller, Model: BGC (120VAC Input, 24VDC Output)
2	7-Day Programmable Timer (Optional) - (120VAC Input, 120VAC Output, Battery Backup)
3	ISIMET Gas Valve Assembly (Includes 2x Unions, Manual Ball Valve, Y-Strainer, and Valve)
4	ISIMET Gas Electronic Ball Valve - 900 Series (Full-Port, 24VDC, Automatic Closing)
5	ISIMET Gas Solenoid - 300 Series (24VDC, Normally-Closed)

NAME	BGC Engineering Drawing		SCALE	1:2	ISIMET	PART NO.	BY	CH	EC	DATE	
	FOR	Firepit and Grill Grill Controllers					GY			12/18/2023	
	MATERIAL	Varies									
	ISIMET, LLC										
TOLERANCE UNLESS SPECIFIED		REVISION		A		Created Drawing					
DECIMALS: ±.01		B		B							
TWO PLACE ±.005		C		C							
THREE PLACE ±.0005		D		D							
FRACTIONS: ±.1/32											
ANGLES: ±0.5°											
SURFACE TEXTURE: 32√											



Dimensional Drawing of BGC

Typical Wiring Layout



ISIMET Firepit and Gas Grill Controller Model BGC

ISIMET Valve Assembly EBV or Solenoid

ISIMET

Fire Pit & Gas Grill Controller

Model: BGC

Installation Manual

ISIMET BGC
Installation Manual

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Patent Pending

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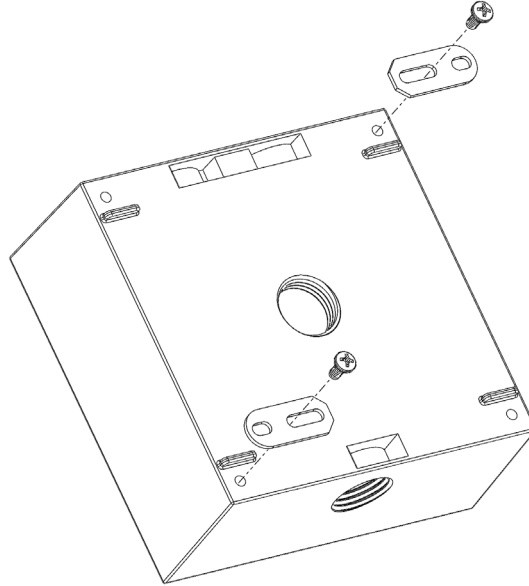


Mounting the BGC

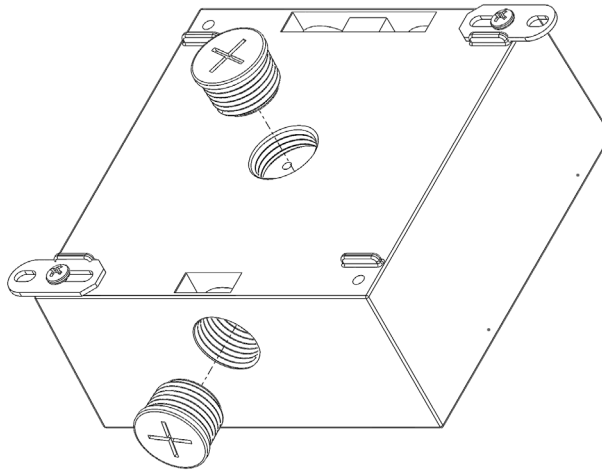
The BGC must be mounted in a location that is easily and readily accessible. The installation height of the BGC must comply with ADA standards. The BGC was designed to be Surface Mounted. While the BGC is outdoor rated, it should be installed under an overhang or location that provides adequate protection from direct sunlight and rain.

Surface Mount Installation

1. Install the surface mount brackets to the double-gang box using the included screws.

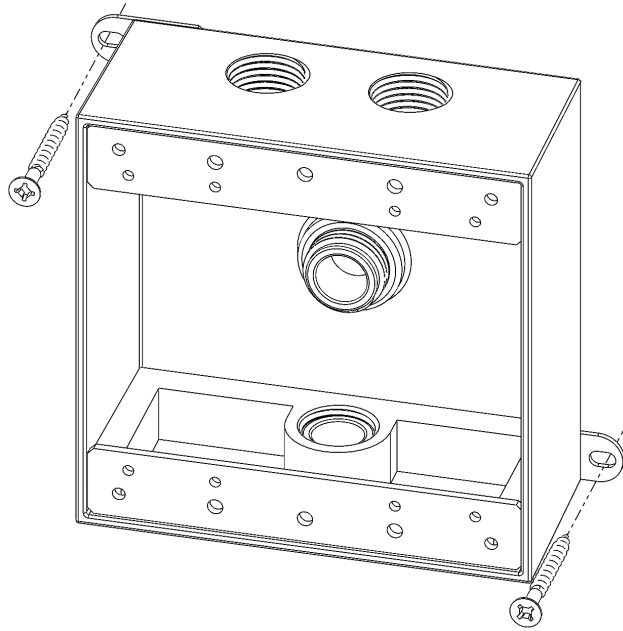


2. Install the two knockout plugs into the unused knockouts of the double-gang box.

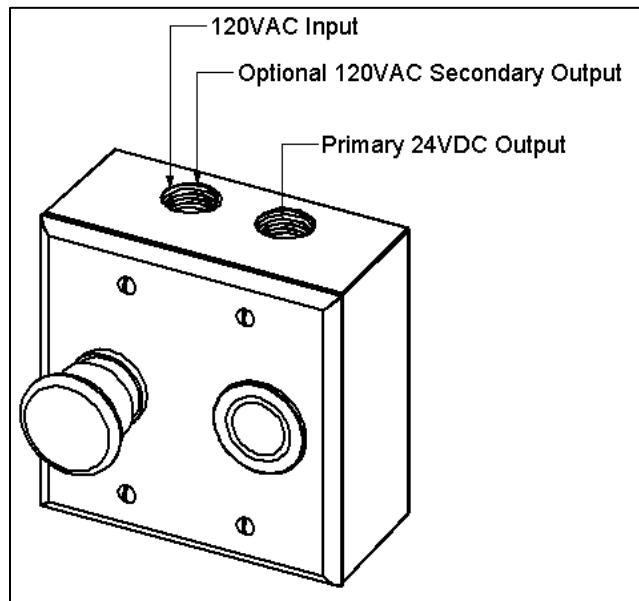


Note: It is recommended to use silicone sealant on the threads for outdoor applications.

3. Attach the double-gang box using appropriate screws (not included).



4. Install appropriate connectors and conduit between the BGC and power source (120V) and the BGC and the gas valve (24VDC).



Recommended wire sizes:

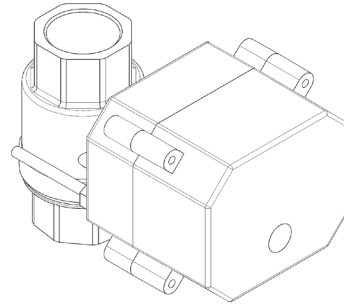
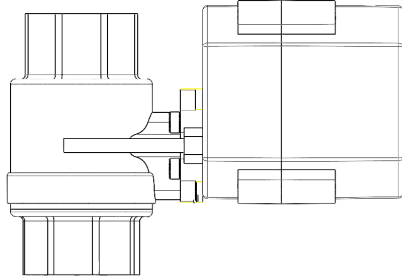
14AWG for the 120VAC and 18AWG for the gas valve

Mounting the Electronic Ball Valve (EBV) or Solenoid

A licensed installer should complete this section following all National and Local Codes.

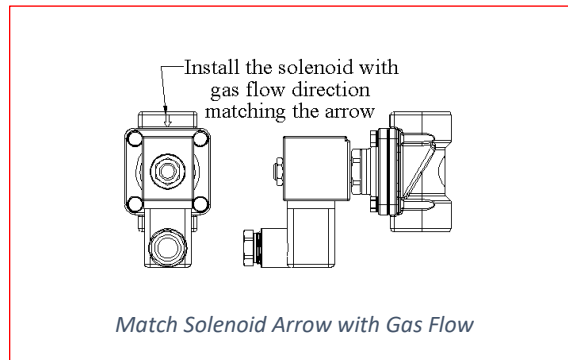
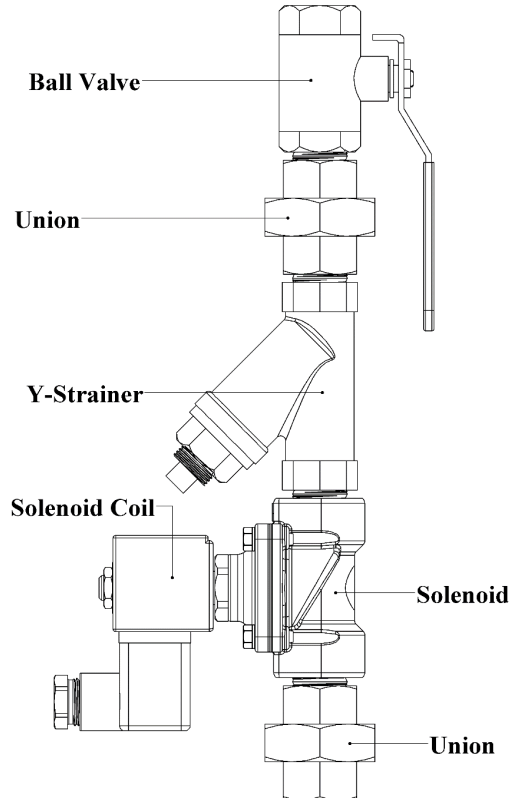
ISIMET's Electronic Ball Valve Installation Recommendations:

- ISIMET's electronic ball valves are the preferred gas valve for the BGC.
- Orientation and gas flow direction do NOT matter for electronic ball valves.
- Electronic ball valves do NOT have to be removed to flush the piping systems prior to initial startup. Simply open the valve, and flush the system prior to initial startup.



Solenoid Installation Recommendations:

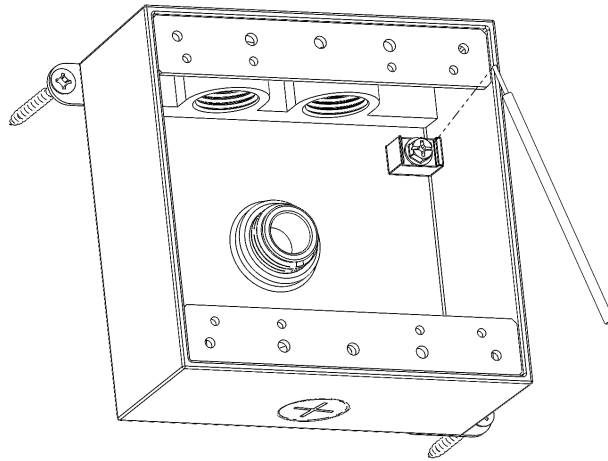
- Solenoid must be rated for 24VDC.
- ISIMET's Valve Assembly typically includes a Solenoid Assembly (see below), which includes a Y-Strainer, manual Ball Valve, and two Unions.
- The solenoids should be installed with an access panel for maintenance and/or service if not installed with an S-Series Enclosure.
- Remove the solenoid assemblies and flush the piping systems prior to initial startup.



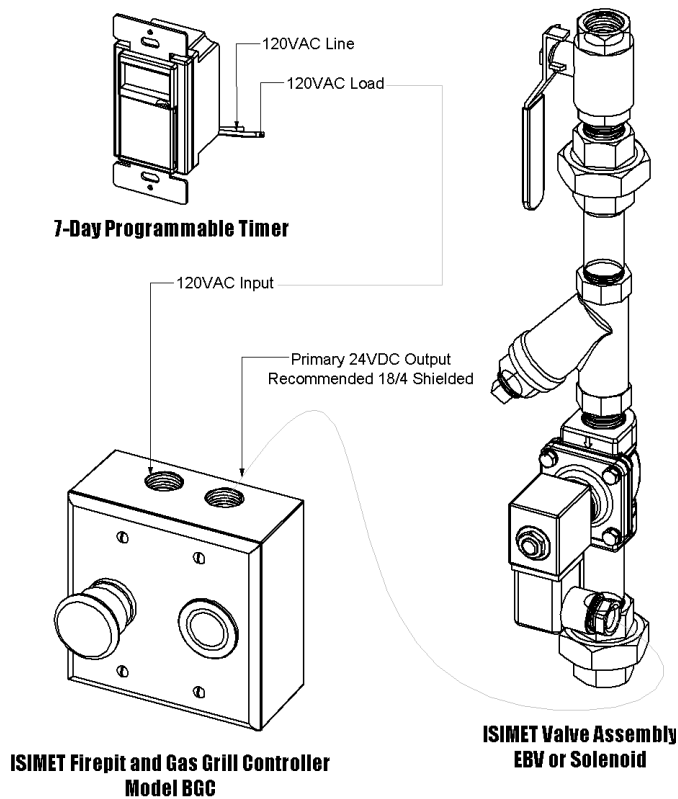
Wiring the BGC

A licensed electrical contractor should perform all 120VAC wiring following all electrical codes and procedures. Low-Voltage and control wiring should be isolated from any line voltages and use 18 AWG minimum. **Warning: All Inputs MUST be Dry-Contact (Voltage-Free)!**

1. Install a ground pigtail wire using the supplied ground screw. The metal box must be grounded per NEC NFPA 70.



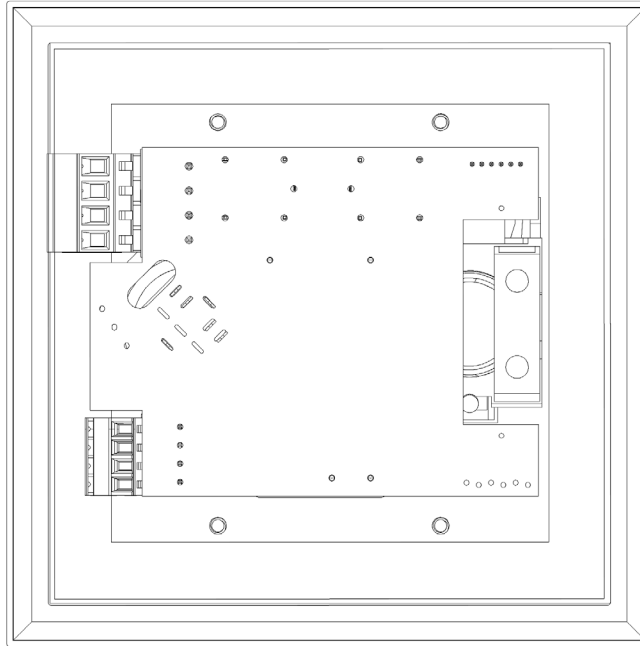
2. Attach the appropriate conduit to the BGC and connect the wires as needed:



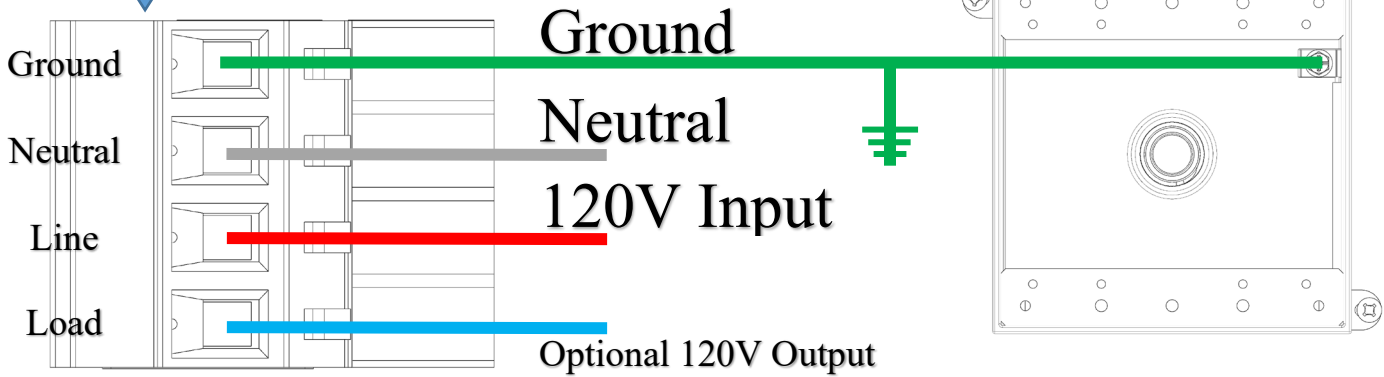
Typical Wiring Layout for the BGC

BGC High-Voltage Wiring Instructions

1. Remove the High-Voltage terminal block and connect the wires as shown below:



BGC (High-Voltage) Wiring Diagram



BGC Label

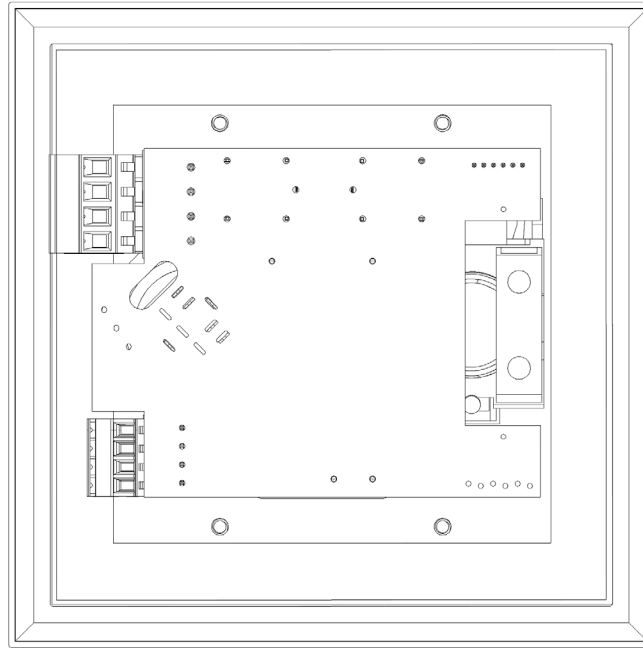
Description

<i>Ground Symbol</i>	<i>120VAC Ground</i>
<i>Neutral</i>	<i>120VAC Neutral</i>
<i>Line</i>	<i>120VAC Line</i>
<i>Load</i>	<i>Optional Igniter or Glow Plug output</i>

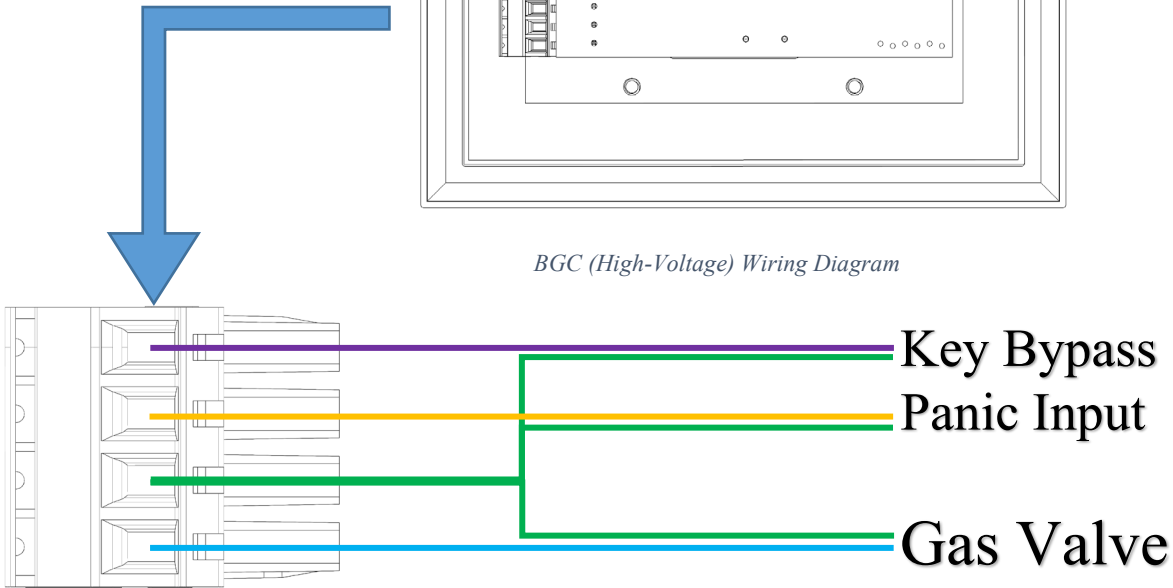
BGC Low-Voltage Wiring Instructions

Recommended: 18/4 Shielded Wire

1. Remove the Low-Voltage terminal block and connect the wires as shown below:



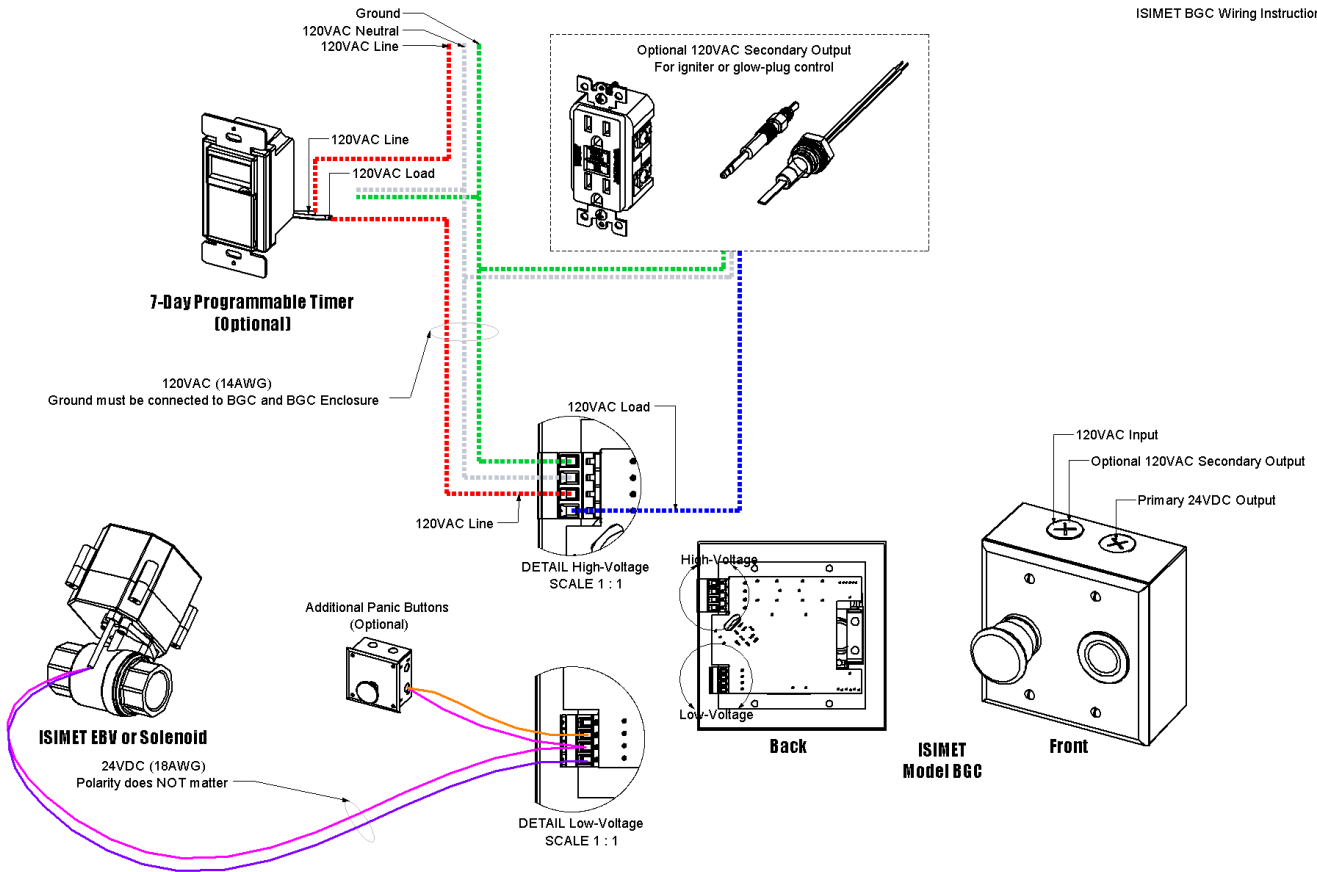
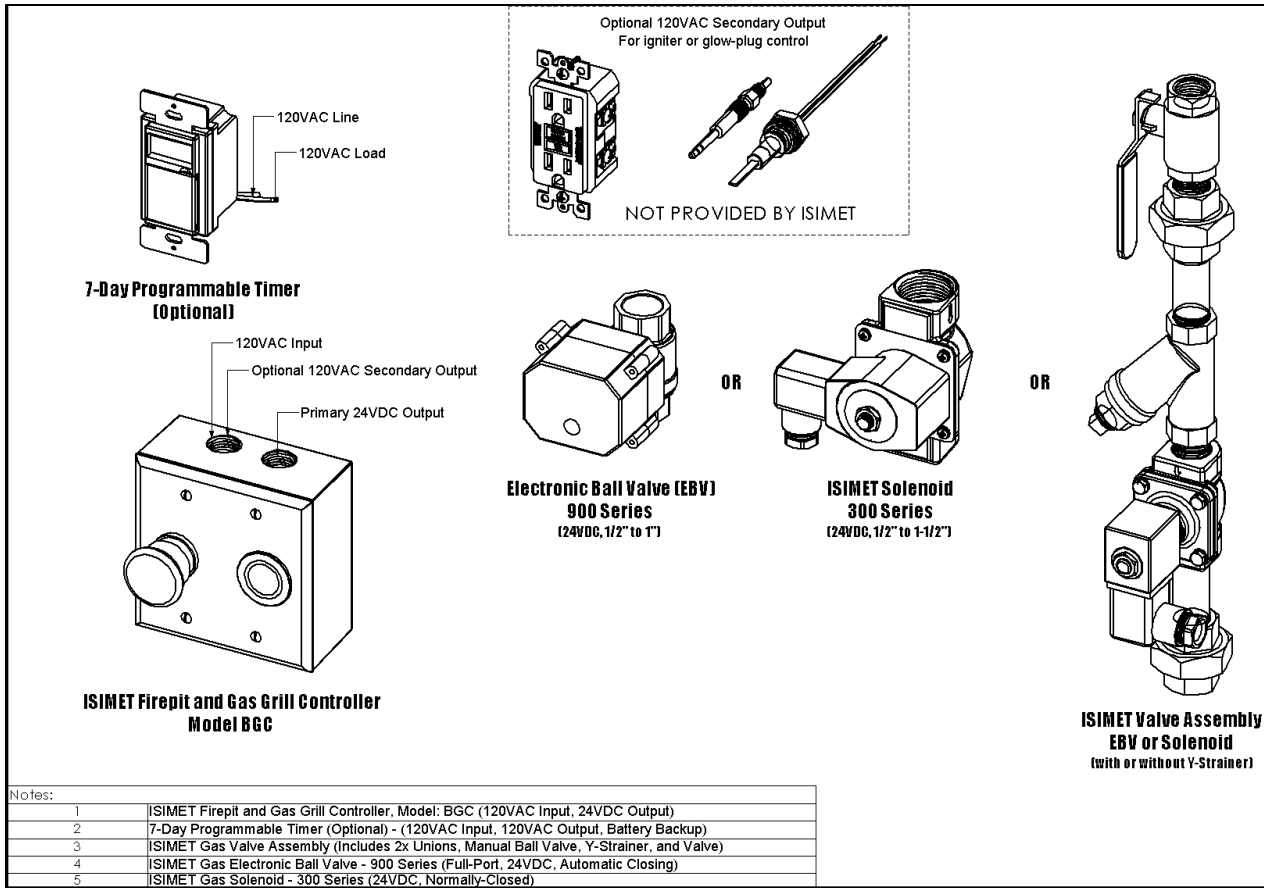
BGC (High-Voltage) Wiring Diagram



BGC Label

Description

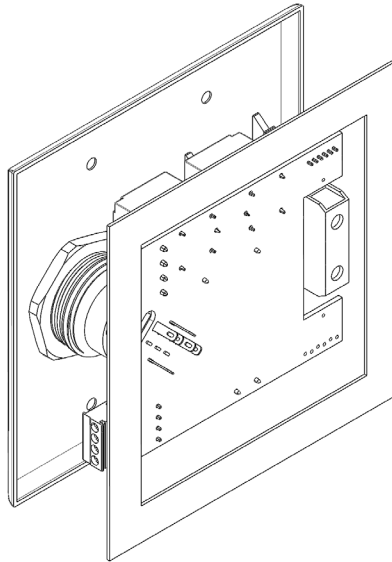
<i>Key</i>	<i>Key Bypass – Enables the Gas (Normally-Open Dry-Contact)</i>
<i>Panic</i>	<i>Emergency Shutoff Input (Normally-Open Dry-Contact)</i>
<i>Ground Symbol</i>	<i>Common</i>
<i>+24V</i>	<i>Gas Control Output (24V Electronic Ball Valve or Solenoid)</i>



Completing the BGC Installation

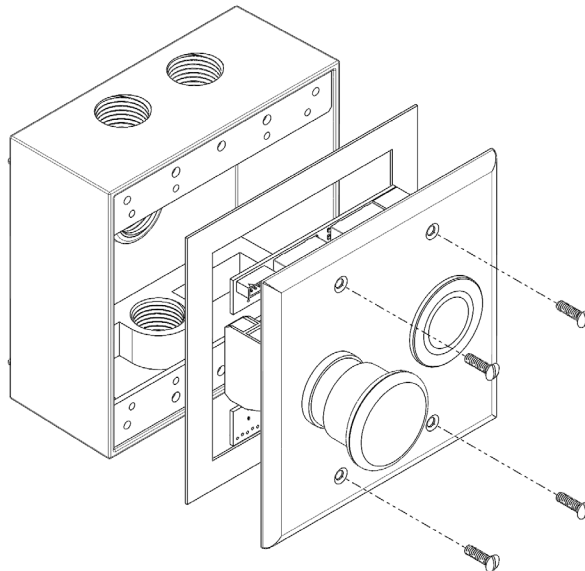
Attach the BGC Front Cover Assembly to the Double-Gang Box

1. The included weather foam gasket should be attached to the BGC Front Cover Assembly.



Weather Foam Gasket

2. Attach the BGC Front Cover Assembly using the included screws and make sure the foam gasket is centered to prevent water from entering the enclosure.



BGC Install Front Cover Assembly

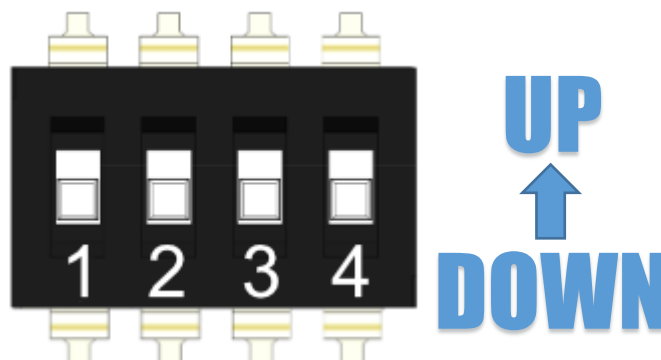
3. Turn on the power to the unit and test the functionality.

Configuring the BGC

The BGC will come preconfigured from the factory to turn the gas off after 1 hour; however, the configuration can easily be changed to an alternate timeout setting. The BGC time settings are adjusted by removing the front cover and adjusting the Timer Config DIP switch.

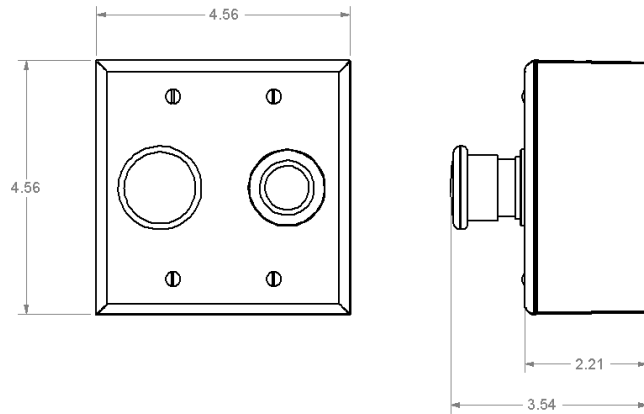
BGC Timing Configuration Settings

Timeout Setting	Timer Config 1	Timer Config 2	Timer Config 3	Timer Config 4
10 minutes	DOWN	DOWN	DOWN	DOWN
15 minutes	DOWN	DOWN	DOWN	UP
20 minutes	DOWN	DOWN	UP	DOWN
30 minutes	DOWN	DOWN	UP	UP
45 minutes	DOWN	UP	DOWN	DOWN
1 hour	DOWN	UP	DOWN	UP
2 hours	DOWN	UP	UP	DOWN
3 hours	DOWN	UP	UP	UP
4 hours	UP	DOWN	DOWN	DOWN
6 hours	UP	DOWN	DOWN	UP
8 hours	UP	DOWN	UP	DOWN
10 hours	UP	DOWN	UP	UP
12 hours	UP	UP	DOWN	DOWN
14 hours	UP	UP	DOWN	UP
16 hours	UP	UP	UP	DOWN
20 hours	UP	UP	UP	UP



Electrical Specifications

The BGC Utility Controller system is designed to be used with 15A/120VAC line voltage and a 24VDC Circuit Output.



Dimensional Drawing of BGC

BGC

100-240VAC (50/60Hz) Line Voltage Input

Line Input Current (1A + igniter/glow-plug)

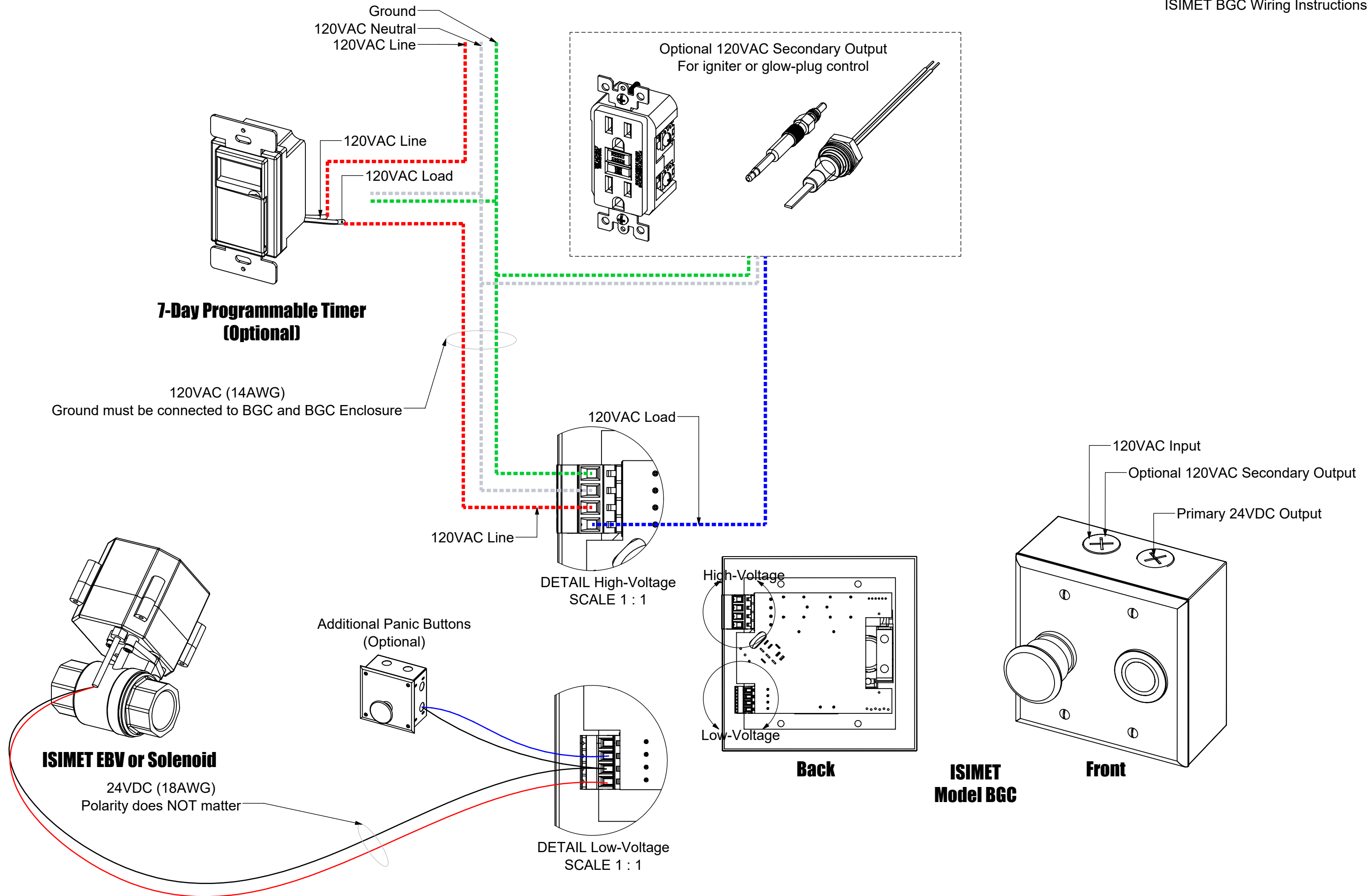
24VDC Circuit Output (Max 0.9A)

24VDC Output (Max 20W)

**Low-Voltage Short-Circuit Protection
(No Fuses)**

Line-Voltage Wire Size: 14 AWG Recommended

Control Wire Size: 18 AWG Recommended



RFI detail

#14 A4.20 - Detail C2



Status	Closed
Created on	Feb 6, 2025 by Matt Moser (WOLGAST CORPORATION)
RFI type	Default RFI workflow
Ball in court	Matt Moser (WOLGAST CORPORATION)
Answered	Feb 13, 2025 by Dustin DeWitt (The Collaborative)

Question

Please see detail section C2 on Page A4.20. It is calling for rigid insulation board and looks to be hat channel over the block wall. My question is it necessary for seven hat channels and are we to cut the rigid foam board to fit?

Official response

Dustin DeWitt (The Collaborative): Detail A7/4.10 notes them as Z furring and the amount provided should be designed to work with the PEMB metal panel system and rigid insulation.

By Dustin DeWitt (The Collaborative) - Feb 13, 2025, 1:29 PM EST

References and Attachments

Files (1)

- [107253_20241221_Oscoda - New Cy Center - Bid-Permit Drawings 32.pdf](#)

Impact

Cost impact -

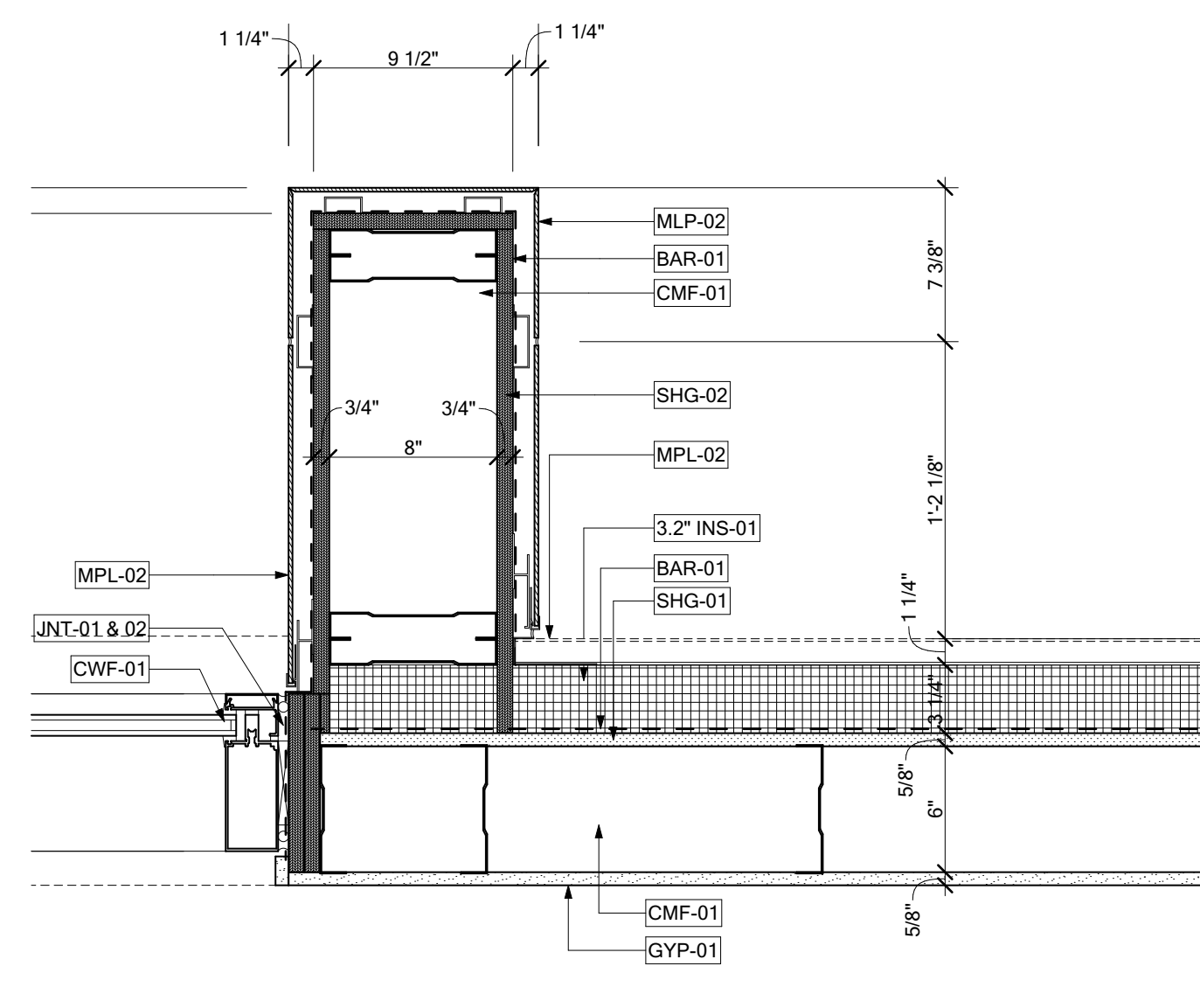
Schedule impact -

Other attributes

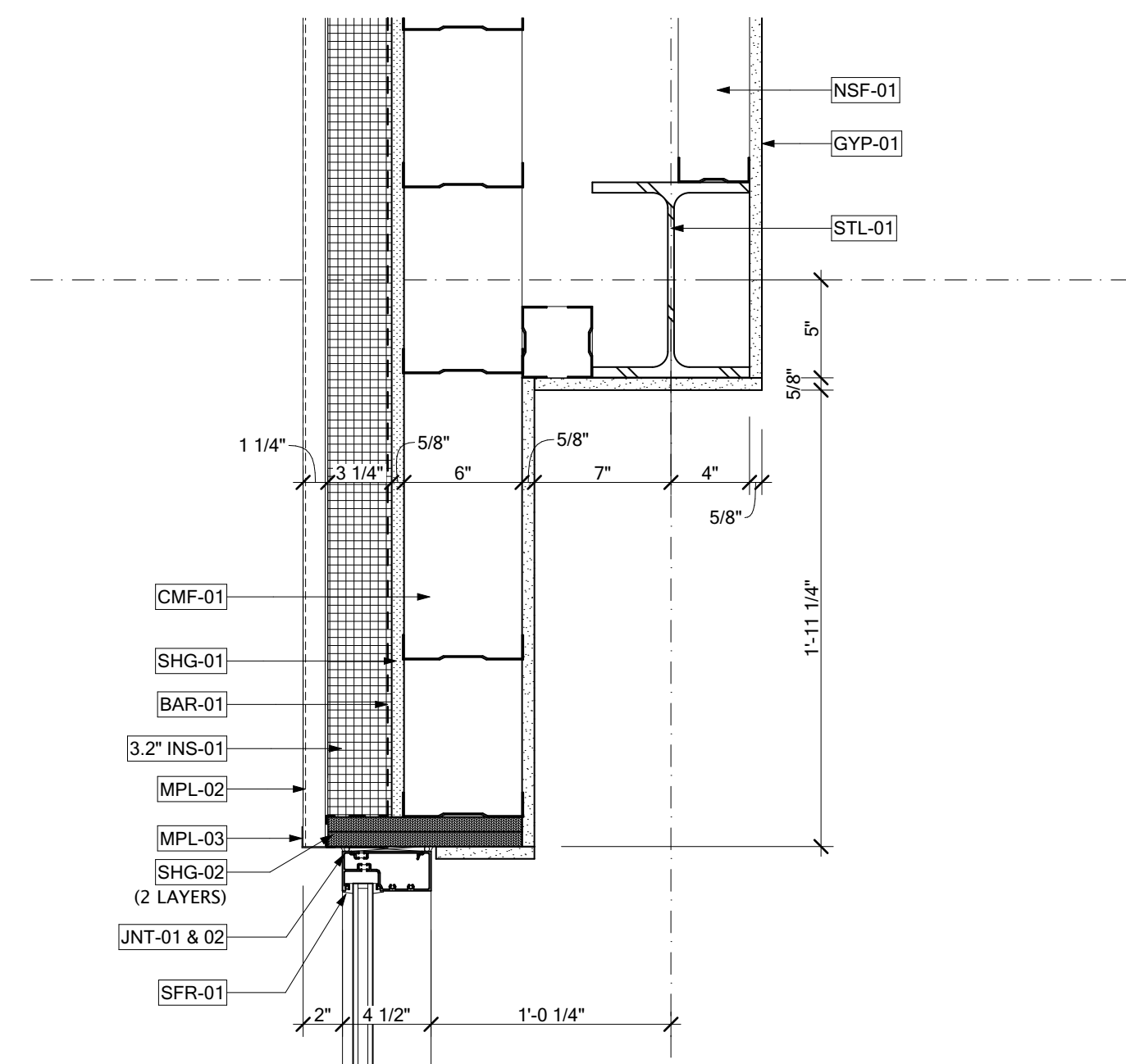
Priority Normal

Discipline	-
Category	-
Location	-
Location details	ronz@woodruffcontracting.com
External id	-
Co-reviewer(s)	
Spec Section	-
Construction Phase	Pre-Bid

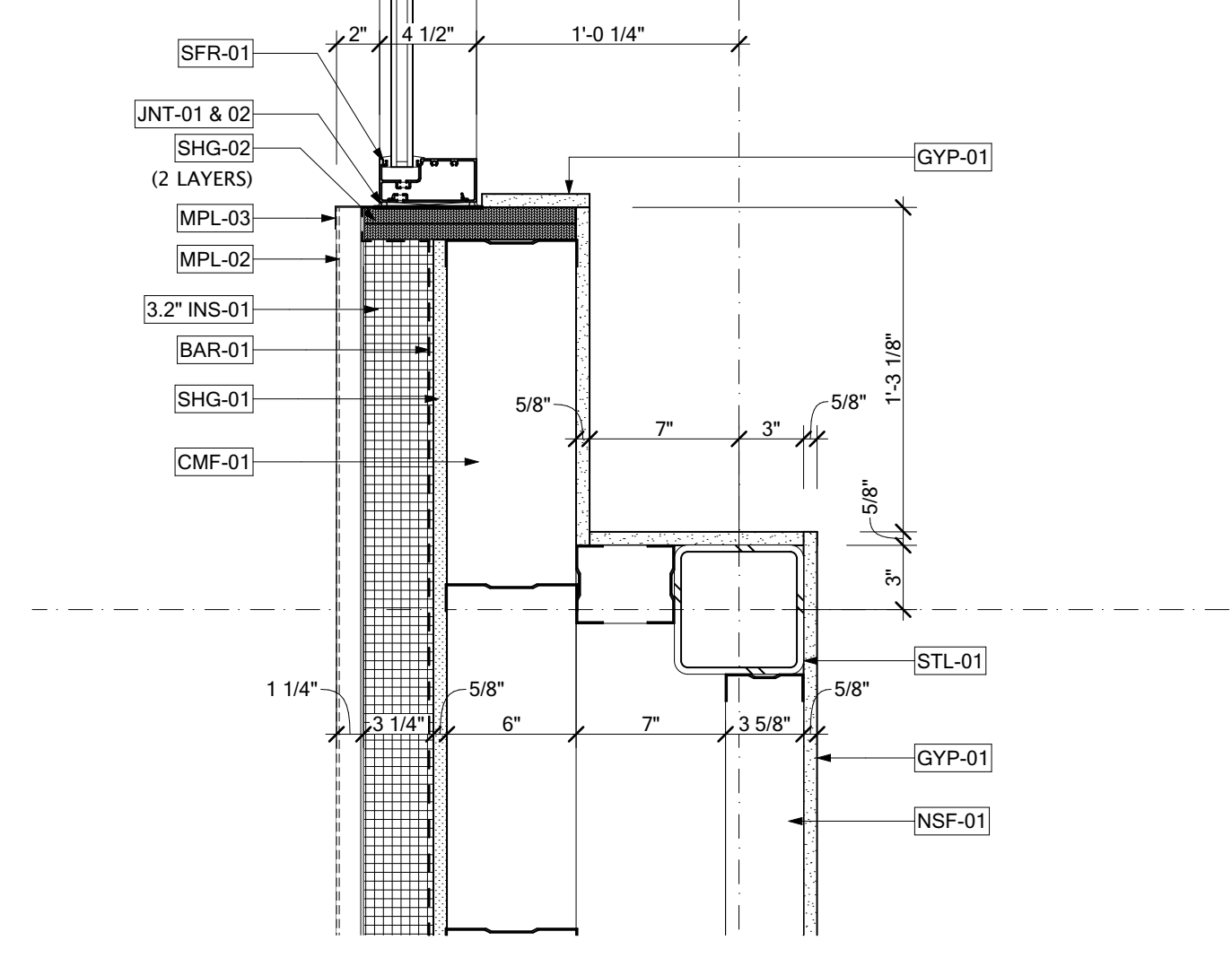
Activities	By	At
<p>Christie Huver changed the status from Open Answered to Closed</p> <p>Official response: Dustin DeWitt (The Collaborative): Detail A7/4.10 notes them as Z furring and the amount provided should be designed to work with the PEMB metal panel system and rigid insulation. changed the watchers to Patrick Fritz (WOLGAST CORPORATION), Clinton Clark (WOLGAST CORPORATION), Matt Moser (WOLGAST CORPORATION)</p>	Christie Huver	Feb 13, 2025, 1:29 PM EST
<p>Christie Huver changed the status from Open In Review to Open Answered set Ball in court to Matt Moser (WOLGAST CORPORATION)</p>	Christie Huver	Feb 13, 2025, 1:29 PM EST
<p>Allison Schrecongost response was submitted by Christie Huver: See Dustin's Response</p>	Christie Huver	Feb 13, 2025, 1:29 PM EST
<p>Dustin DeWitt added a response: Detail A7/4.10 notes them as Z furring and the amount provided should be designed to work with the PEMB metal panel system and rigid insulation.</p>	Dustin DeWitt	Feb 6, 2025, 11:25 AM EST
<p>Matt Moser added a reference to a File 107253_20241221_Oscoda - New Cy Center - Bid-Permit Drawings 32.pdf</p>	Matt Moser	Feb 6, 2025, 10:12 AM EST
<p>Matt Moser (WOLGAST CORPORATION) created this RFI in Open In Review status and set Ball in court to Allison Schrecongost, Dustin DeWitt (The Collaborative).</p>	Matt Moser	Feb 6, 2025, 10:12 AM EST



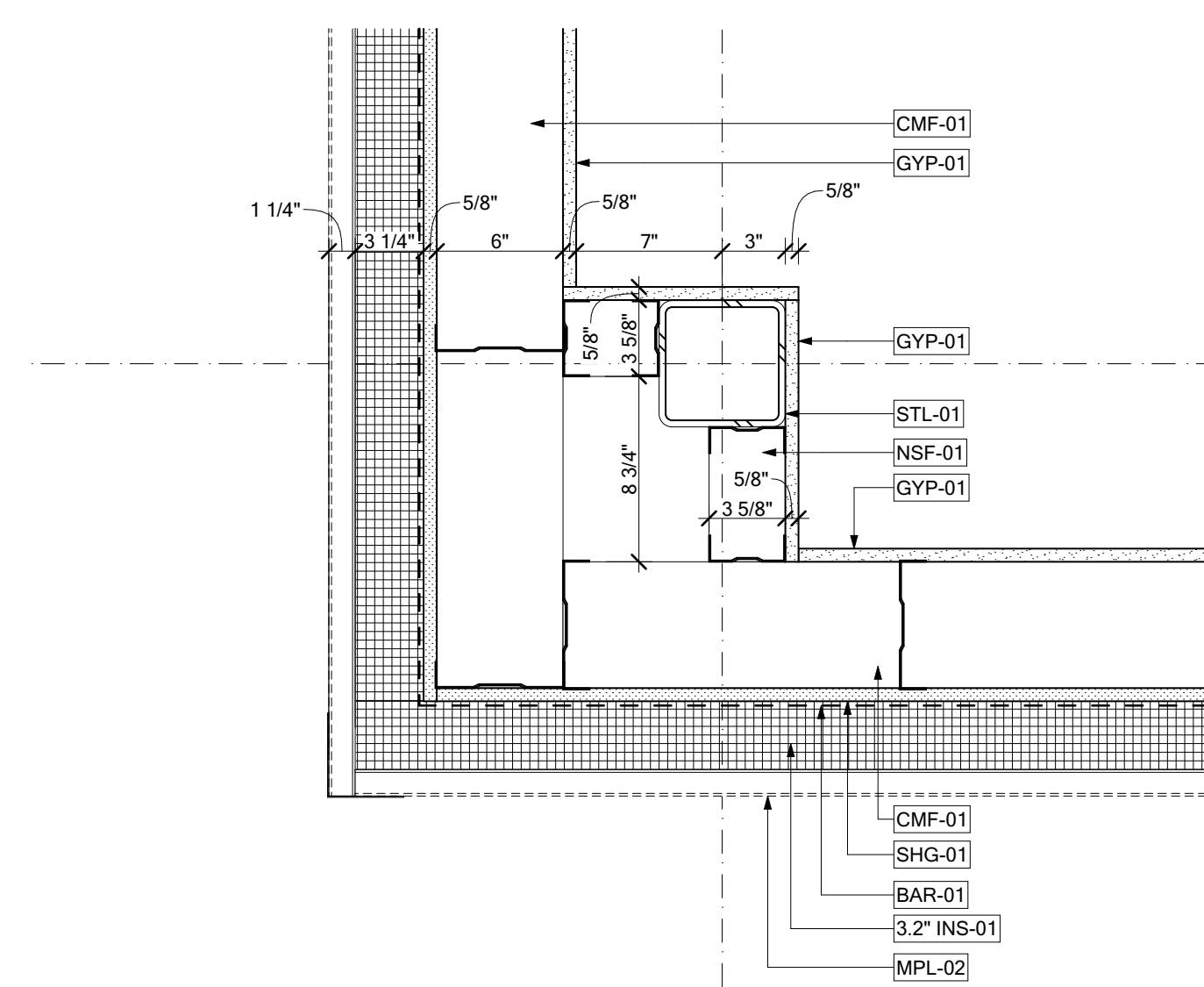
F6 PLAN DETAIL
SCALE: 1 1/2" = 1'-0"



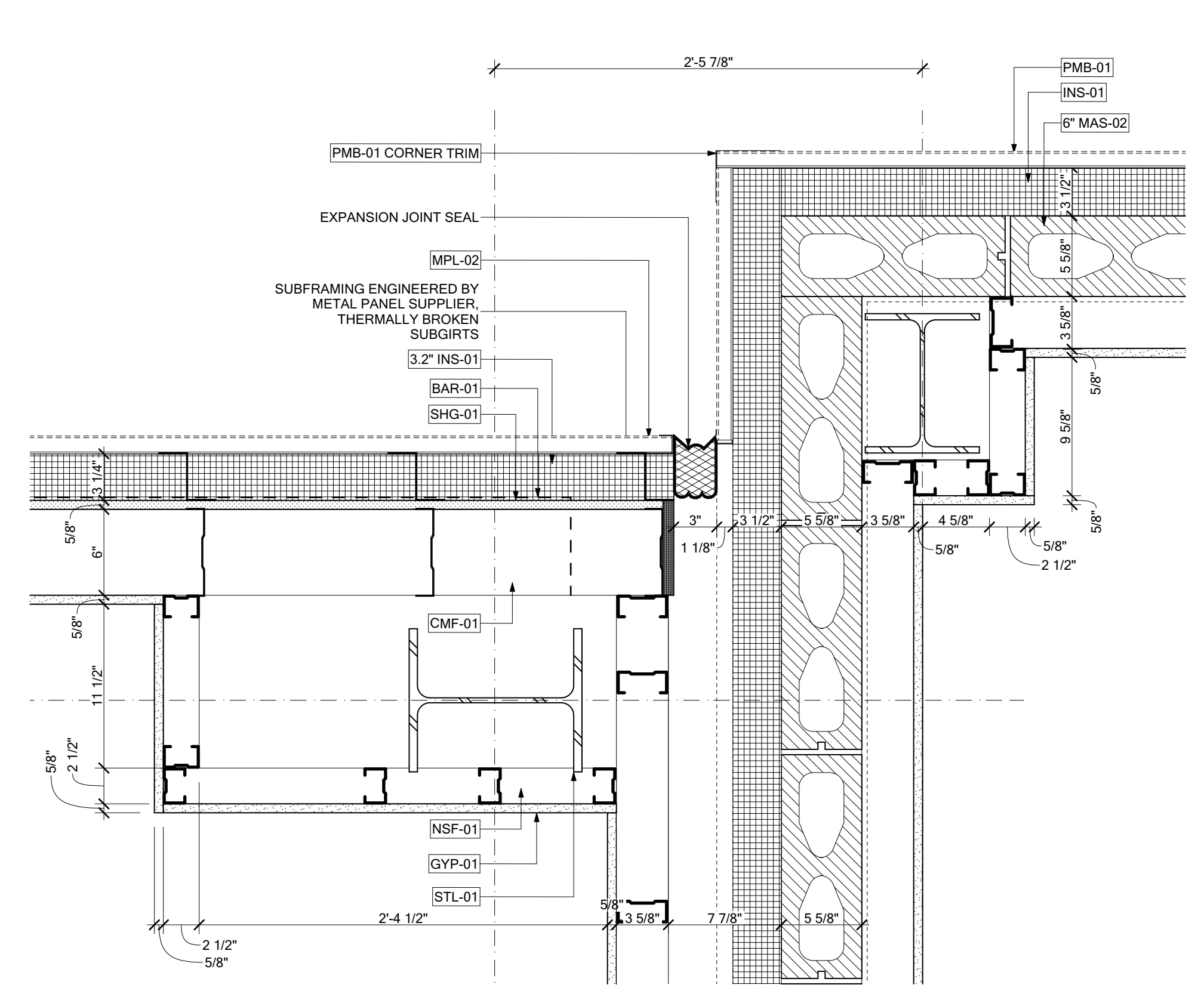
D6 PLAN DETAIL
SCALE: 1 1/2" = 1'-0"



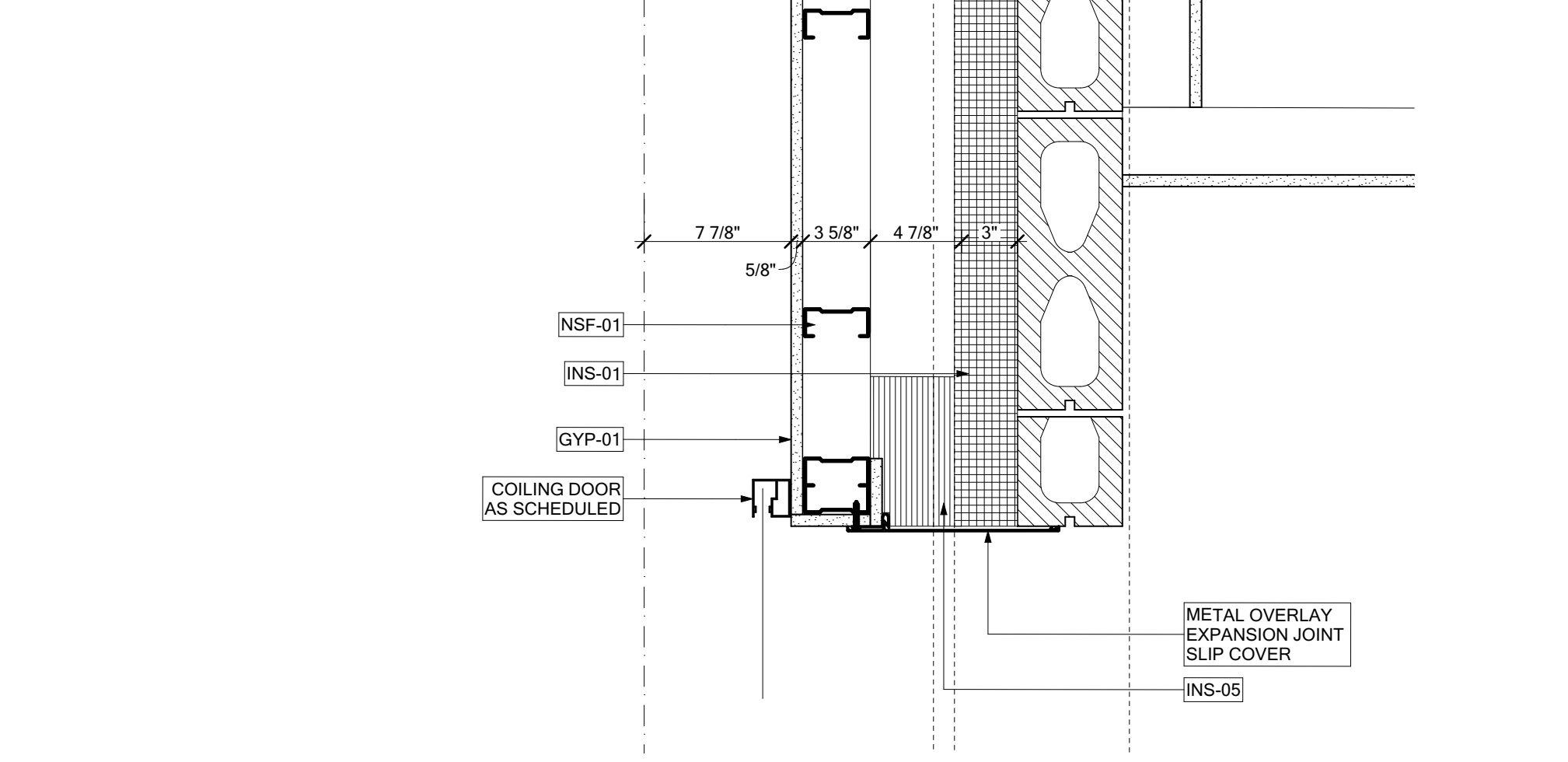
B6 PLAN DETAIL
SCALE: 1 1/2" = 1'-0"



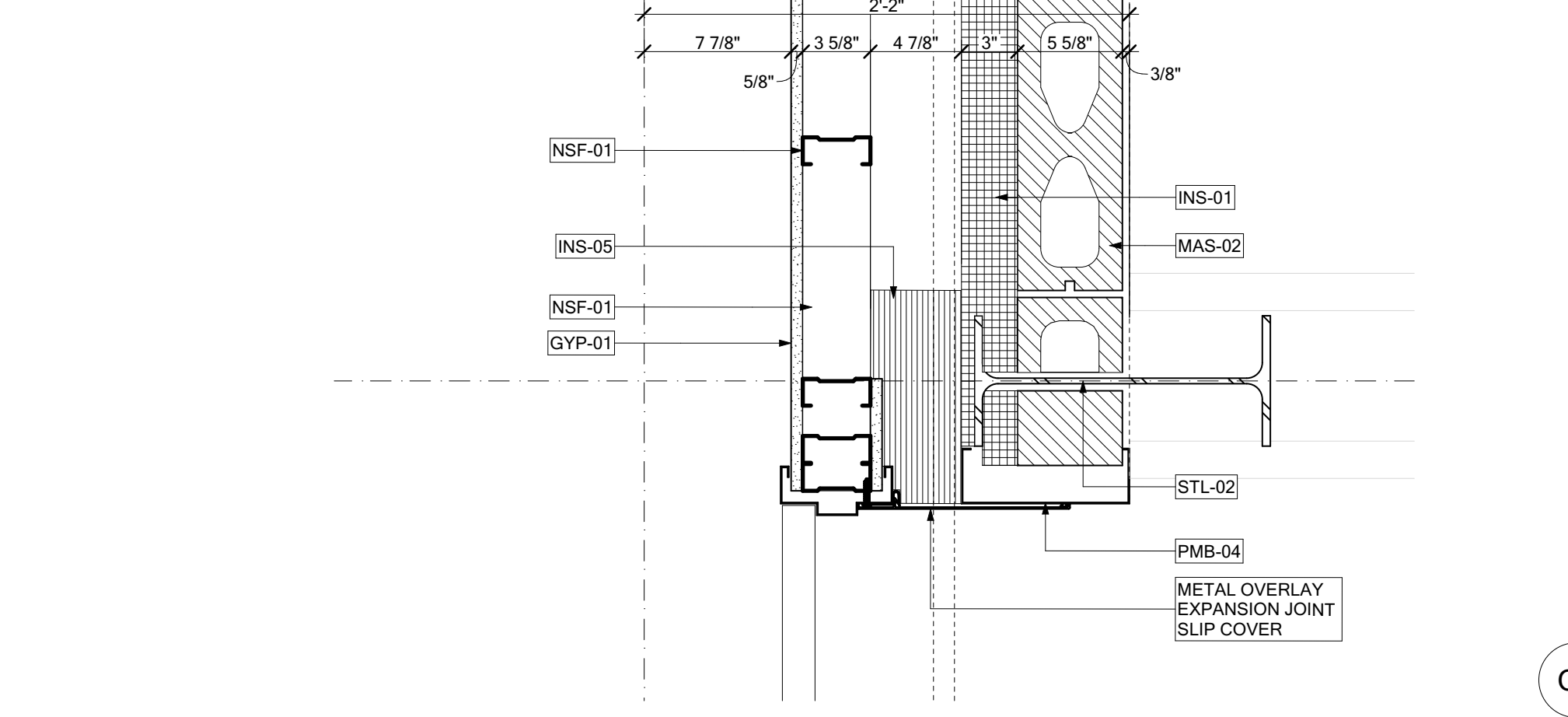
A6 PLAN DETAIL
SCALE: 1 1/2" = 1'-0"



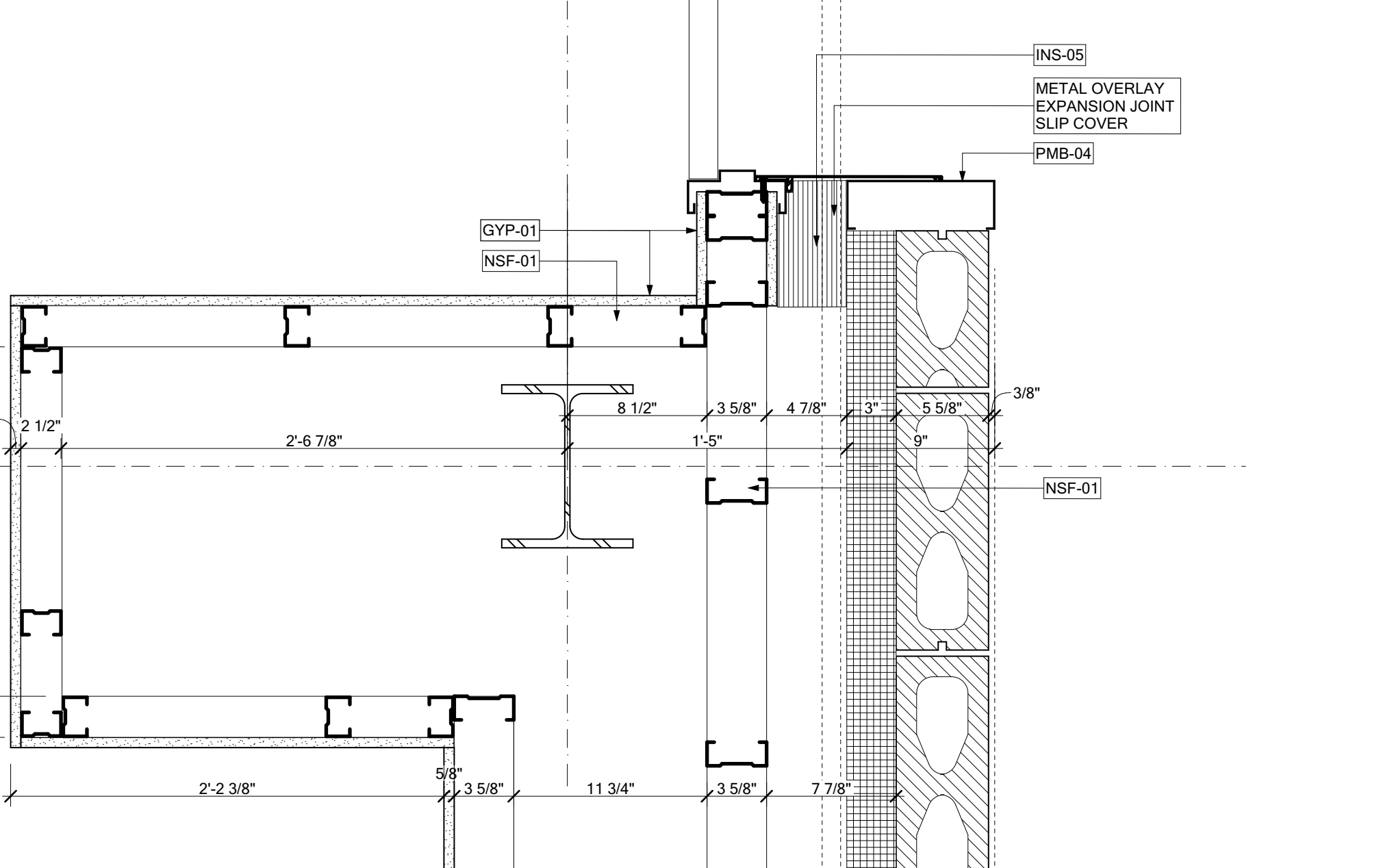
E3 PLAN DETAIL
SCALE: 1 1/2" = 1'-0"



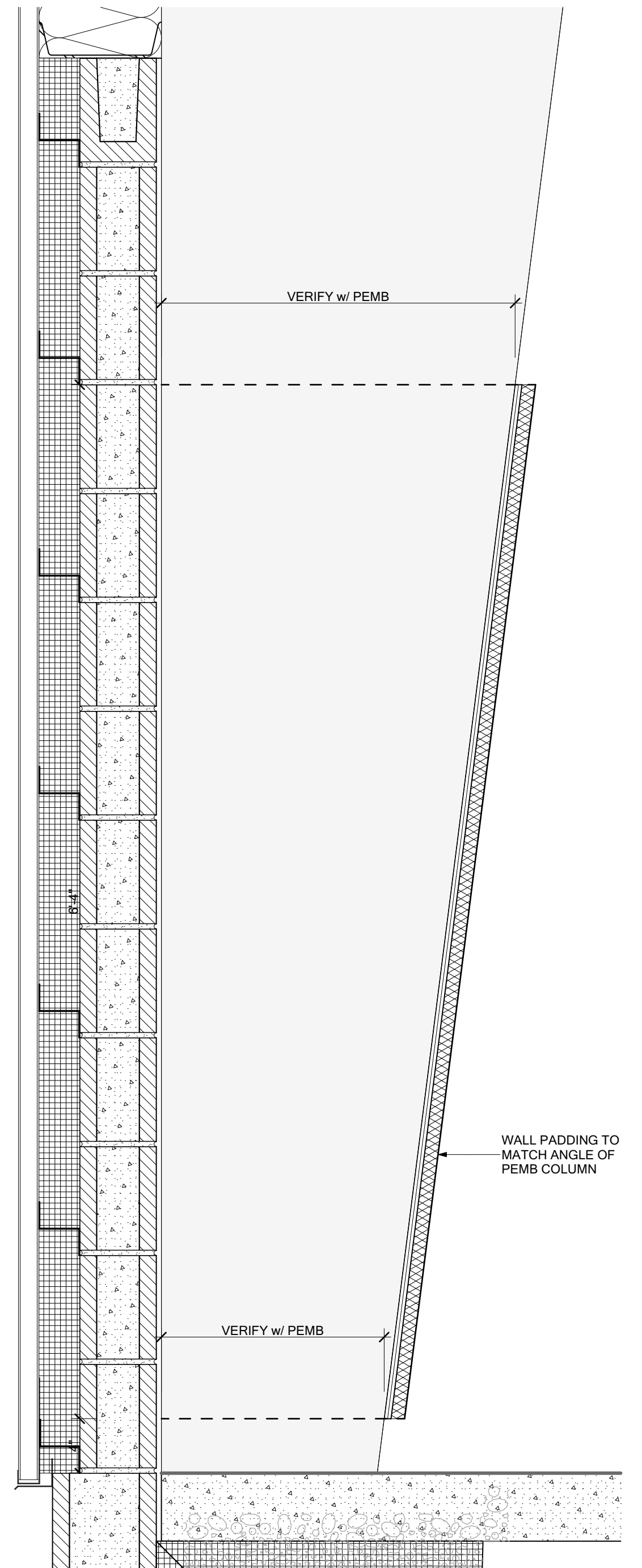
D3 PLAN DETAIL
SCALE: 1 1/2" = 1'-0"



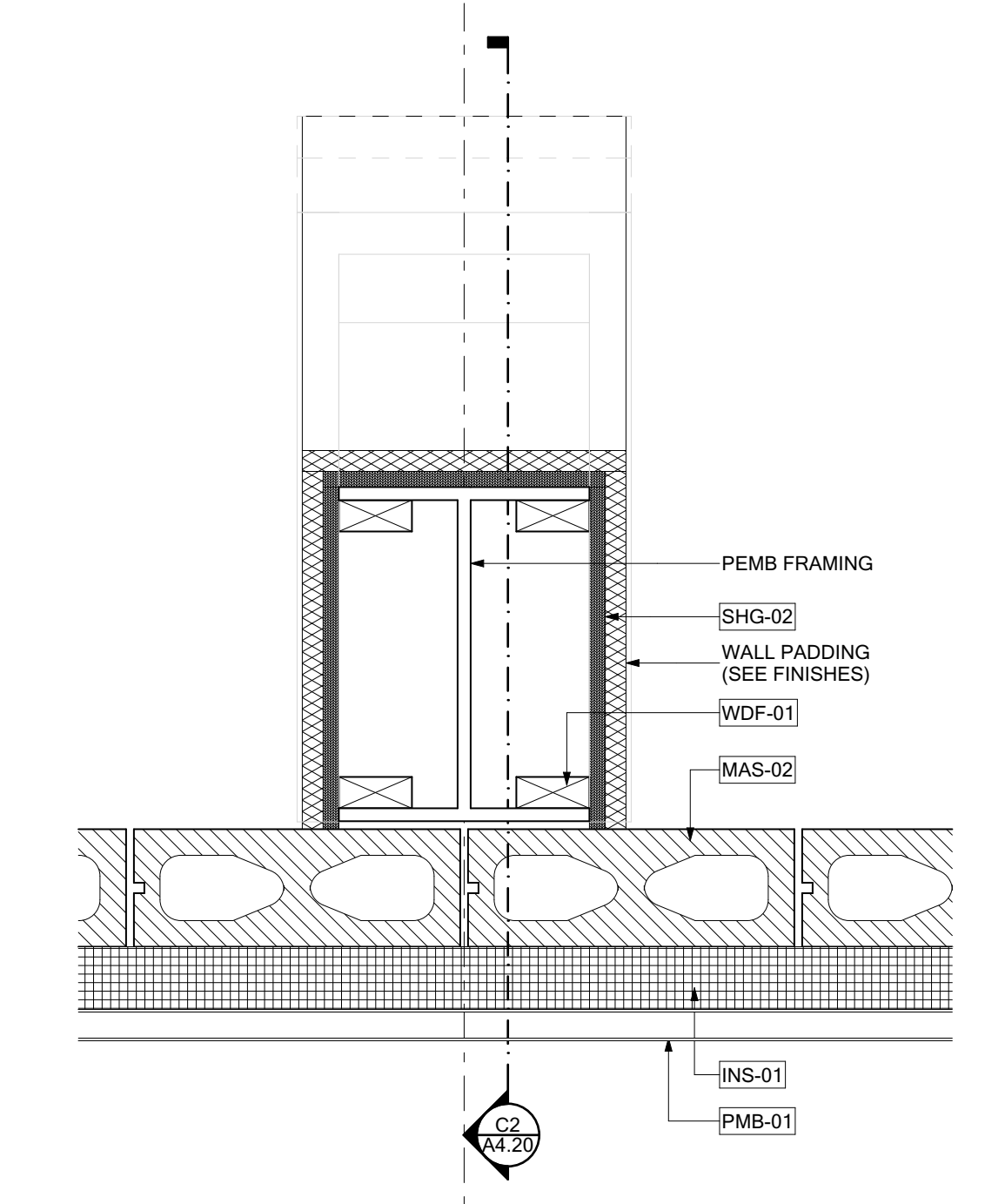
C3 PLAN DETAIL
SCALE: 1 1/2" = 1'-0"



A3 PLAN DETAIL
SCALE: 1 1/2" = 1'-0"



C2 SECTION DETAIL
SCALE: 1 1/2" = 1'-0"



A2 PLAN DETAIL
SCALE: 1 1/2" = 1'-0"

KEYNOTES:
(NOTE: NOT ALL NUMBERS ARE USED)

BAR- VAPOR, AIR, AND WEATHER BARRIERS
 BAR-01 VAPOR-RETARDING AIR BARRIER SYSTEM
 BAR-02 VAPOR-PERMEABLE AIR BARRIER SYSTEM
 BAR-03 VAPOR-PERMEABLE WATER-RESISTIVE BARRIER
 BAR-04 BARRIER TRANSITION SHEET
 BAR-05 APPLIED DAMPPROOFING

CLG- CEILING(S)
 CLG-01 SEE REFLECTED CEILING PLANS A7 00 SERIES SHEETS

CMF- COLD-FORMED METAL FRAMING
 CMF-01 COLD-FORMED METAL FRAMING
 CMF-02 COLD-FORMED DEFLECTION TRACK
 CMF-03 COLD-FORMED CLIP ANGLE
 CMF-04 COLD-FORMED BOX HEADER

CON- CONCRETE
 CON-01 CAST-IN-PLACE CONCRETE
 CON-02 UNDERSLAB VAPOR RETARDER
 CON-03 EXPANSION JOINT FILLER
 CON-04 PRECAST CONCRETE PLANK
 CON-05 PRECAST CONCRETE PANEL

CWF- CURTAIN WALL FRAMING
 CWF-01 CURTAIN WALL FRAMING SYSTEM
 CWF-02 CURTAIN WALL ANCHOR CLIP

DEK- METAL DECKING
 DEK-01 STEEL DECKING
 DEK-02 STEEL ACOUSTICAL DECKING

FLR- FLOORING
 FLR-01 CARPET

FST- FIRE STOPPING, SEALANTS, AND RESISTIVE MATERIALS
 FST-01 FIRESTOPPING
 FST-02 FIRE SEALANT
 FST-03 SPRAY-APPLIED FIRE-RESISTIVE MATERIAL
 FST-04 INTUMESCENT COATING

GLA- GLAZING
 GLA-01 MONOLITHIC GLAZING
 GLA-02 INSULATED GLAZING UNIT

GYP- GYPSUM BOARD ASSEMBLIES
 GYP-01 GYPSUM BOARD
 GYP-02 GLASS MAT-FACED GYPSUM BOARD
 GYP-03 CONTROL JOINT
 GYP-04 CORNER BEAD
 GYP-05 J-BEAD
 GYP-06 F-REVEAL
 GYP-07 U-REVEAL
 GYP-08 Z-REVEAL
 GYP-09 CEMENT BACKER BOARD

HMD- HOLLOW METAL DOORS AND FRAMES
 HMD-01 HOLLOW METAL DOOR FRAME
 HMD-02 HOLLOW METAL WINDOW OPENING
 HMD-03 HOLLOW METAL DOOR

INS- INSULATION
 INS-01 RIGID INSULATION BOARD
 INS-02 SPRAYED-FORM INSULATION
 INS-03 THERMAL BATT INSULATION
 INS-04 ACOUSTICAL BATT INSULATION

JNT- JOINT SEALANTS
 JNT-01 JOINT SEALANT
 JNT-02 BACKER ROD
 JNT-03 ACOUSTICAL SEALANT
 JNT-04 PREFORMED JOINT SEAL
 JNT-05 BUILDING EXPANSION JOINT ASSEMBLY

JST- STEEL JOISTS
 JST-01 STEEL JOIST
 JST-02 STEEL JOIST GIRDER
 JST-03 BEARING PLATE
 JST-04 JOIST SUBSTITUTE

MAS- MASONRY (GENERAL)
 MAS-01 BRICK MASONRY
 MAS-02 CONCRETE MASONRY UNIT
 MAS-03 DECORATIVE CMU VENEER
 MAS-04 FLASHING
 MAS-05 VENEER ANCHOR
 MAS-06 MASONRY WEEP, 24" O.C.
 MAS-07 PRESSURE EQUALIZATION VENT, 24" O.C.
 MAS-08 CAVITY DRAINAGE MATERIAL
 MAS-09 GROUT
 MAS-10 PREFORMED MASONRY CONTROL JOINT
 MAS-11 LINTEL
 MAS-12 SOLID CONCRETE MASONRY UNIT
 MAS-13 CMU BOND BEAM
 MAS-14 CMU FLASHING PAN
 MAS-15 FLASHING TERMINATION BAR

MPL- METAL PANELS
 MPL-01 ARCHITECTURAL METAL PANEL
 MPL-02 METAL COMPOSITE MATERIAL PANEL
 MPL-03 FLASHING TO MATCH METAL PANEL
 MPL-06 METAL SOFFIT PANEL

NSF- NON-STRUCTURAL METAL FRAMING
 NSF-01 NON-STRUCTURAL METAL FRAMING (3 5/8" UNO)
 NSF-02 NON-STRUCTURAL DEFLECTION TRACK
 NSF-03 HAT CHANNEL FURRING (1 1/2" UNO)
 NSF-04 RESILIENT CHANNEL FURRING
 NSF-05 Z-FURRING
 NSF-06 NON-STRUCTURAL CLIP ANGLE
 NSF-07 SHAFT WALL FRAMING
 NSF-08 J-TRACK
 NSF-09 FRAMING TRACK

OHD- OVERHEAD DOORS
 OHD-01 OVERHEAD COILING INSULATED DOOR
 OHD-03 OVERHEAD COILING SHUTTER

PMB- PRE ENGINEERED METAL BUILDING
 PMB-01 METAL WALL PANEL
 PMB-02 METAL BUILDING FRAME
 PMB-03 METAL BUILDING FRAME
 PMB-04 GIRT
 PMB-05 PURLIN
 PMB-06 EAVE / RAKE FRAMING
 PMB-07 TRIM

RFG- ROOFING
 RFG-01 SINGLE-PLY MEMBRANE ROOFING
 RFG-02 ROOF MEMBRANE FLASHING
 RFG-03 ROOFING INSULATION
 RFG-04 TAPERED ROOFING INSULATION
 RFG-05 ROOFING VAPOR RETARDER
 RFG-06 TERMINATION BAR
 RFG-07 PREFORMED PIPE BOOT
 RFG-08 STANDING-SEAM METAL ROOFING
 RFG-09 STANDING-SEAM ROOF FLASHING
 RFG-10 ROOFING UNDERLAYMENT
 RFG-12 CONTINUOUS ICE & WATER SHIELD

RNF- REINFORCING STEEL
 RNF-01 REINFORCING BAR
 RNF-02 WELDED WIRE MESH

SFR- STOREFRONT FRAMING
 SFR-01 STOREFRONT FRAMING SYSTEM
 SFR-02 COMPENSATING HEAD RECEPTOR
 SFR-03 EXTRUDED SILL FLASHING
 SFR-04 STOREFRONT ENTRANCE
 SFR-05 BRAKE METAL TRIM TO MATCH FRAMING
 SFR-06 PREFINISHED FLASHING TO MATCH FRAMING

SHD- WINDOW SHADES
 SHD-01 ROLLING WINDOW SHADE

SHG- SHEATHING
 SHG-01 FIBERGLASS MAT GYPSUM SHEATHING
 SHG-02 PLYWOOD SHEATHING (3/4" FRT UNO)
 SHG-03 NAIL BASE SHEATHING (3 1/8" TOTAL THICKNESS UNO)

SHM- SHEET METAL FABRICATIONS
 SHM-01 GUTTER
 SHM-02 DOWNSPOUT
 SHM-03 GRAVEL STOP
 SHM-04 COPING
 SHM-05 SHEET METAL FLASHING
 SHM-06 Drip EDGE
 SHM-07 COUNTERFLASHING

SSU- SOLID SURFACE
 SSU-01 SOLID SURFACE MATERIAL, SEE FINISH SCHEDULE

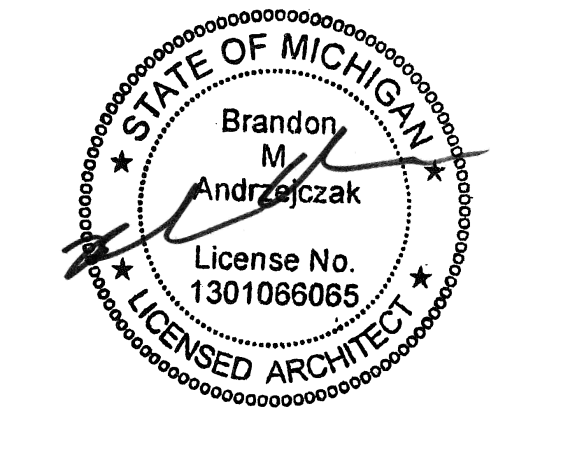
STL- STRUCTURAL STEEL
 STL-01 STEEL COLUMN
 STL-02 STEEL BEAM
 STL-03 STEEL PLATE
 STL-04 STEEL ANGLE
 STL-05 STEEL CHANNEL
 STL-06 STEEL WIDE FLANGE BEAM
 STL-07 STEEL RECTANGULAR TUBE
 STL-08 STEEL ROUND TUBE

STN- STONE MASONRY
 STN-01 STONE VENEER MASONRY
 STN-02 STONE WALL CAP

WFN- WOOD FINISH CARPENTRY
 WFN-01 WOOD TRIM
 WFN-02 WOOD VENEER TRIM PANEL
 WFN-03 WOOD BASE
 WFN-04 WOOD FINISH FLOORING

WDF- ROUGH WOOD FRAMING (FRT UNO)
 WDF-01 WOOD BLOCKING
 WDF-02 WOOD FRAMING (2X4 UNO)
 WDF-03 WOOD FURRING

WIN- WINDOWS
 WIN-01 WINDOW



PROJECT TITLE
 OSCODA AREA SCHOOLS

NEW COMMUNITY CENTER
 3550 E River Rd,
 Oscoda, MI, 48750

12/18/2024	CD/BD
10/11/2024	DESIGN DEVELOPMENT
08/16/2024	SCHEMATIC DESIGN

TC JOB NO. 107253
 OWNER JOB NO. #Client Project No.

SHEET TITLE
 PLAN DETAILS

Bid RFI 15 Mesh & Rebar

Question

Question

Please see the attached conversions for the Oscoda Public schools project. I hope you and the team can see some value in removing some of the wire mesh and rebar in this project. Let me know if you have any questions or if the architect has any questions.

Suggested answer

Unspecified

General information

Status	Due date	Cost impact	Co-reviewers
Closed	Feb 13, 2025	Unspecified	Allison Schrecongost
RFI type	Location	Schedule impact	Watchers (3)
Default RFI workflow	Unspecified	Unspecified	Patrick Fritz (WOLGAST CORPORATION)
Ball in court	Location details		Clinton Clark (WOLGAST CORPORATION)
Christie Huver (WOLGAST CORPORATION)	kmaly@fortacorp.com		Matt Moser (WOLGAST CORPORATION)

Ball in court	Response date	Response type	Response	Attachments
> Dustin DeWitt (The Collaborative)	Feb 11, 2025	Answer	Substitution requests for steel fibers and/or poly fibers (macro fibers or micro fibers) will be accepted during construction submittals. Dosage will be provided by the fiber manufacturer. Fibers may be substituted for conventional welded wire reinforcing on the administration area floor slab, field house floor slab, housekeeping pads, and light-duty exterior equipment pads. Fiber substitution will be rejected for wall...	

Additional information

Priority	External ID
----------	-------------

References (2)

Add references



RFI detail

#16 Gas Pipe Size



Status	Closed
Created on	Feb 10, 2025 by Matt Moser (WOLGAST CORPORATION)
RFI type	Default RFI workflow
Ball in court	Matt Moser (WOLGAST CORPORATION)
Answered	Feb 13, 2025 by Dustin DeWitt (The Collaborative)

Question

Can you tell me what the diameter of the gas pipe that goes to the exterior units. I do not see it listed anywhere on sheet M1.01?

Official response

Dustin DeWitt (The Collaborative): Gas piping at meter to be 3"Ø manifold with branches for:

1. RTU-1&2 --> 3"Ø to RTU-2
2"Ø from tee at RTU-2 to RTU-1
2. RTU-3 --> 1-1/4"Ø
3. Gas grill --> 3/4"Ø

By **Dustin DeWitt** (The Collaborative) - Feb 13, 2025, 1:26 PM EST






Impact

Cost impact	-
Schedule impact	-

Other attributes

Priority	Normal
Discipline	-
Category	-

Location	-
Location details	ericb@jejohnson.com
External id	-
Co-reviewer(s)	
Spec Section	-
Construction Phase	Pre-Bid

Activities	By	At
<p>Christie Huver changed the status from  Open Answered to  Closed</p> <p>Official response: Dustin DeWitt (The Collaborative): Gas piping at meter to be 3"Ø manifold with branches for: 1. RTU-1&2 --> 3"Ø to RTU-2 2"Ø from tee at RTU-2 to RTU-1 2. RTU-3 --> 1-1/4"Ø 3. Gas grill --> 3/4"Ø changed the watchers to Patrick Fritz (WOLGAST CORPORATION), Clinton Clark (WOLGAST CORPORATION)</p>	Christie Huver	Feb 13, 2025, 1:26 PM EST
<p>Christie Huver changed the status from  Open In Review to  Open Answered set Ball in court to Matt Moser (WOLGAST CORPORATION)</p>	Christie Huver	Feb 13, 2025, 1:26 PM EST
<p>Allison Schrecongost response was submitted by Christie Huver: Per Dustin's response</p>	Christie Huver	Feb 13, 2025, 1:26 PM EST
<p>Dustin DeWitt added a response: Gas piping at meter to be 3"Ø manifold with branches for: 1. RTU-1&2 --> 3"Ø to RTU-2 2"Ø from tee at RTU-2 to RTU-1 2. RTU-3 --> 1-1/4"Ø 3. Gas grill --> 3/4"Ø</p>	Dustin DeWitt	Feb 12, 2025, 8:02 AM EST
<p>Matt Moser (WOLGAST CORPORATION) created this RFI in  Open In Review status and set Ball in court to Allison Schrecongost, Dustin DeWitt (The Collaborative).</p>	Matt Moser	Feb 10, 2025, 4:12 PM EST

RFI detail

#17 Sport Equipment



Status	Closed
Created on	Feb 10, 2025 by Matt Moser (WOLGAST CORPORATION)
RFI type	Default RFI workflow
Ball in court	Matt Moser (WOLGAST CORPORATION)
Answered	Feb 13, 2025 by Dustin DeWitt (The Collaborative)

Question

Please clarify is structural steel will be supplying support steel between PEMB main frames to support basketball backtops?

Please see attached Steel-By-Others Guide for information on location of steel necessary for PEMB projects.

Please clarify that structural steel will be provided for perimeter divider curtains.

Please clarify if attachment to purlins is acceptable for batting cages and curtains (that divide the basketball courts and batting cages) .

I've attached photos of similar projects where batting cages and curtains are attached to the purlins.

Please note that drawing E1.02 does not accurately represent the number of gym curtain motor/power locations necessary. Layout for curtain motors is TBD; however, there will be a minimum of 6 locations.

Please note that drawing E1.02 does not show motor/power requirements for batting cages. There will be two (2) batting cage motors.

Official response

Dustin DeWitt (The Collaborative): See attached file for answers to each question.

By *Dustin DeWitt* (The Collaborative) - Feb 13, 2025, 1:23 PM EST

Official response attachments

[107253_RFI 017 - REVIEWED.PDF](#), Feb 11, 2025, 1:09 PM EST

References and Attachments

Files (5)

- BrightonIndoorPractice_Photo13.jpg
- BrightonIndoorPractice_Photo14.jpg
- BrightonIndoorPractice_Photo15.jpg
- E1.02--Electrical Clerestory Plan - Power.pdf
- PSS Steel-by-Others Guide.pdf

Impact

Cost impact -

Schedule impact -

Other attributes

Priority Normal

Discipline -

Category -

Location -

Location details -

External id -

Co-reviewer(s)

Spec Section -

Construction Phase Pre-Bid

Activities	By	At
<p>Christie Huver changed the status from Open Answered to Closed</p> <p>Official response: Dustin DeWitt (The Collaborative): See attached file for answers to each question. changed the official response attachment to: 107253_RFI 017 - REVIEWED.PDF.</p>	Christie Huver	Feb 13, 2025, 1:23 PM EST
<p>Christie Huver changed the status from Open In Review to Open Answered set Ball in court to Matt Moser (WOLGAST CORPORATION)</p>	Christie Huver	Feb 13, 2025, 1:23 PM EST
<p>Allison Schrecongost response was submitted by Christie Huver: Per Dustin's Response</p>	Christie Huver	Feb 13, 2025, 1:23 PM EST
<p>Dustin DeWitt added a response: See attached file for answers to each question. added the response attachment to: 107253_RFI 017 - REVIEWED.PDF.</p>	Dustin DeWitt	Feb 11, 2025, 1:09 PM EST
<p>Matt Moser added a reference to a File E1.02--Electrical Clerestory Plan - Power.pdf</p>	Matt Moser	Feb 10, 2025, 4:15 PM EST
<p>Matt Moser added a reference to a File BrightonIndoorPractice_Photo15.jpg</p>	Matt Moser	Feb 10, 2025, 4:15 PM EST
<p>Matt Moser added a reference to a File BrightonIndoorPractice_Photo14.jpg</p>	Matt Moser	Feb 10, 2025, 4:15 PM EST
<p>Matt Moser added a reference to a File BrightonIndoorPractice_Photo13.jpg</p>	Matt Moser	Feb 10, 2025, 4:15 PM EST
<p>Matt Moser added a reference to a File PSS Steel-by-Others Guide.pdf</p>	Matt Moser	Feb 10, 2025, 4:15 PM EST
<p>Matt Moser (WOLGAST CORPORATION) created this RFI in Open In Review status and set Ball in court to Allison Schrecongost, Dustin DeWitt (The Collaborative).</p>	Matt Moser	Feb 10, 2025, 4:15 PM EST

RFI detail

#17 Sport Equipment



Status	■ Open In Review
Created on	Feb 10, 2025 by Matt Moser (WOLGAST CORPORATION)
RFI type	Default RFI workflow
Ball in court	Dustin DeWitt (The Collaborative) Allison Schrecongost
Due date	Feb 13, 2025

Question

Please clarify is structural steel will be supplying support steel between PEMB main frames to support basketball backtops? **Structural steel or cold-formed steel purlins are both acceptable to support basketball equipment; this determination will be made by the delegated PEMB engineer / designer / manufacturer. Loads are provided in S0.01.**

~~Please see attached Steel-By-Others Guide for information on location of steel necessary for PEMB projects.~~

Please clarify that structural steel will be provided for perimeter divider curtains.

Structural steel or cold-formed steel purlins are both acceptable to support basketball equipment; this determination will be made by the delegated PEMB engineer / designer / manufacturer. Loads are provided in S0.01.

Please clarify if attachment to purlins is acceptable for batting cages and curtains (that divide the basketball courts and batting cages).

Structural steel or cold-formed steel purlins are both acceptable to support basketball equipment; this determination will be made by the delegated PEMB engineer / designer / manufacturer.

~~I've attached photos of similar projects where batting cages and curtains are attached to the purlins.~~

Please note that drawing E1.02 does not accurately represent the number of gym curtain motor/power locations necessary. Layout for curtain motors is TBD; however, there will be a minimum of 6 locations. **Provide additional (3) 20A-1P circuits RP1B-23, RP1B-25, RP1B-27 for curtain motors, revise power locations as necessary. AAZ, KTS, 02/11/2025.**

Please note that drawing E1.02 does not show motor/power requirements for batting cages. There will be two (2) batting cage motors. **Provide (2) 20A-1P circuits RP1B-29, RP1B-31 for batting cage motors. Verify exact motor locations. AAZ, KTS Engineering Group, 02/11/2025.**

References and Attachments

Files (5)

- BrightonIndoorPractice_Photo13.jpg
- BrightonIndoorPractice_Photo14.jpg
- BrightonIndoorPractice_Photo15.jpg
- E1.02--Electrical Clerestory Plan - Power.pdf

- [PSS Steel-by-Others Guide.pdf](#)

Impact

Cost impact -

Schedule impact -

Other attributes

Priority Normal

Discipline -

Category -

Location -

Location details -

External id -

Co-reviewer(s)

Construction Phase Pre-Bid

Spec Section -

Activities	By	At
Matt Moser added a reference to a File E1.02--Electrical Clerestory Plan - Power.pdf	Matt Moser	Feb 10, 2025, 4:15 PM EST
Matt Moser added a reference to a File BrightonIndoorPractice_Photo15.jpg	Matt Moser	Feb 10, 2025, 4:15 PM EST
Matt Moser added a reference to a File BrightonIndoorPractice_Photo14.jpg	Matt Moser	Feb 10, 2025, 4:15 PM EST
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BASKETBALL UNIT COMPOSITIONS FOR STEEL BY OTHERS CONNECTION VARIETIES



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Front-Braced Front-Folding (3106/3107) Parallel “Steel-by-Others” Installation Guide.....6

Side-Braced Side-Folding Parallel (3108/3109) “Steel-by-Others” Installation Guide.....7

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Equipment & Structural Plan Example for Floor Plan Field Check Guide.....9

Structural Elevation Field Check Guide.....10

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BASKETBALL BACKSTOP STRUCTURAL ATTACHMENT OPTIONS

This manual was created to benefit each party involved with the placement of steel-by-others within pre-engineered building structures, to support basketball backstop structure provided by Performance Sports Systems (PSS). Pricing of a basketball backstop may vary depending upon the superstructure required. Installation may rely on purlins, mainframes, cradling, obstruction, or steel installed by a general contractor. All tubing to bridge or cradle necessary gaps to be provided by PSS.

Superstructure attachments may be designed to fit building needs. For example, if the purlins are insufficient to support overhead superstructure, then additional steel may be installed by others, or bridge pipe may be necessary, to allow the gym equipment to attach. The purpose of this guide is to help determine the location of steel by others. In PSS' experience, when steel placement has not been installed per instruction, the basketball unit may not line up with the court layout. If predetermined locations are used, PSS will provide superstructure to account for any variance.

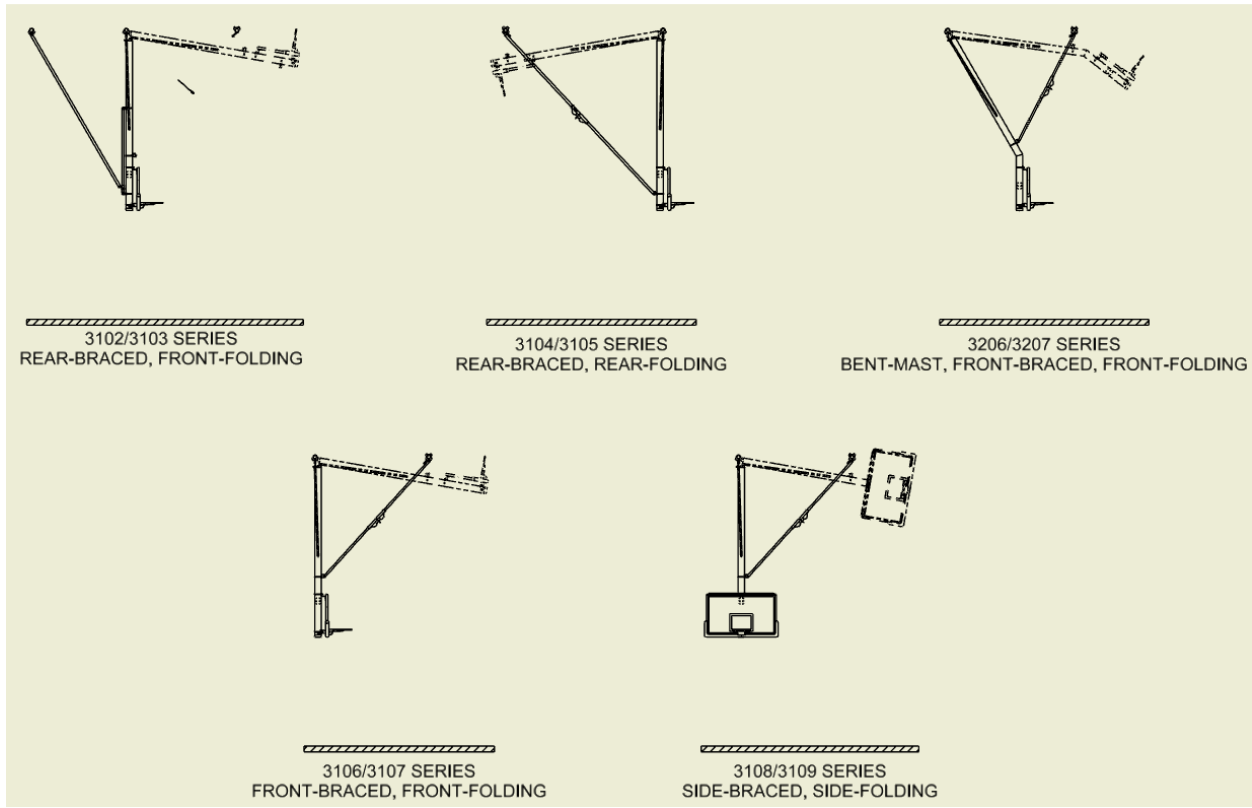
Depending upon the quality of information provided, revisions can occur throughout the process of development. As new or updated building information arises, the equipment and its superstructure may change in design. Gym equipment is custom designed for each building. Backstop feasibility may vary upon specifications, location of unit within building, or obstruction circumstances. Backstop design is manipulated depending on acceptability of wall attaching and obstructions such as HVAC, Sprinkler Pipes, Lights, Fans, etc.

For clarification, "Pre-engineered Metal Building" can be interchangeable with any building structure, "Face-of-Bank" is the front of the backboard, "Red-Iron-Beam" is the same as a mainframe, "bar joist" is the same as a truss, "Steel-by-others" is an additional I-Beam installed by a party other than PSS, "superstructure" is the overhead piping provided by PSS for a basketball unit to attach to the building, and "backstop" is a basketball unit of any style.

(3106/3107) Front-Braced Front-Folding units are PSS' most commonly selected basketball backstop. This guide utilizes this model for most examples. As specified above, unit and superstructure may be modified to fit custom building specifications as needed. The engineering team at PSS will work with provided information to ensure that the most optimal and efficient design will be chosen for your project. Please keep in mind that designs may vary when produced, due to changes in field conditions and/or information provided.

Pages 5-8 provide an example of standard "steel by others" with various types of PSS basketball units. This document provides very basic information regarding sizes and spacing of steel. Pages 5-14 serve as examples (with proper verbiage used by PSS) in different scenarios.

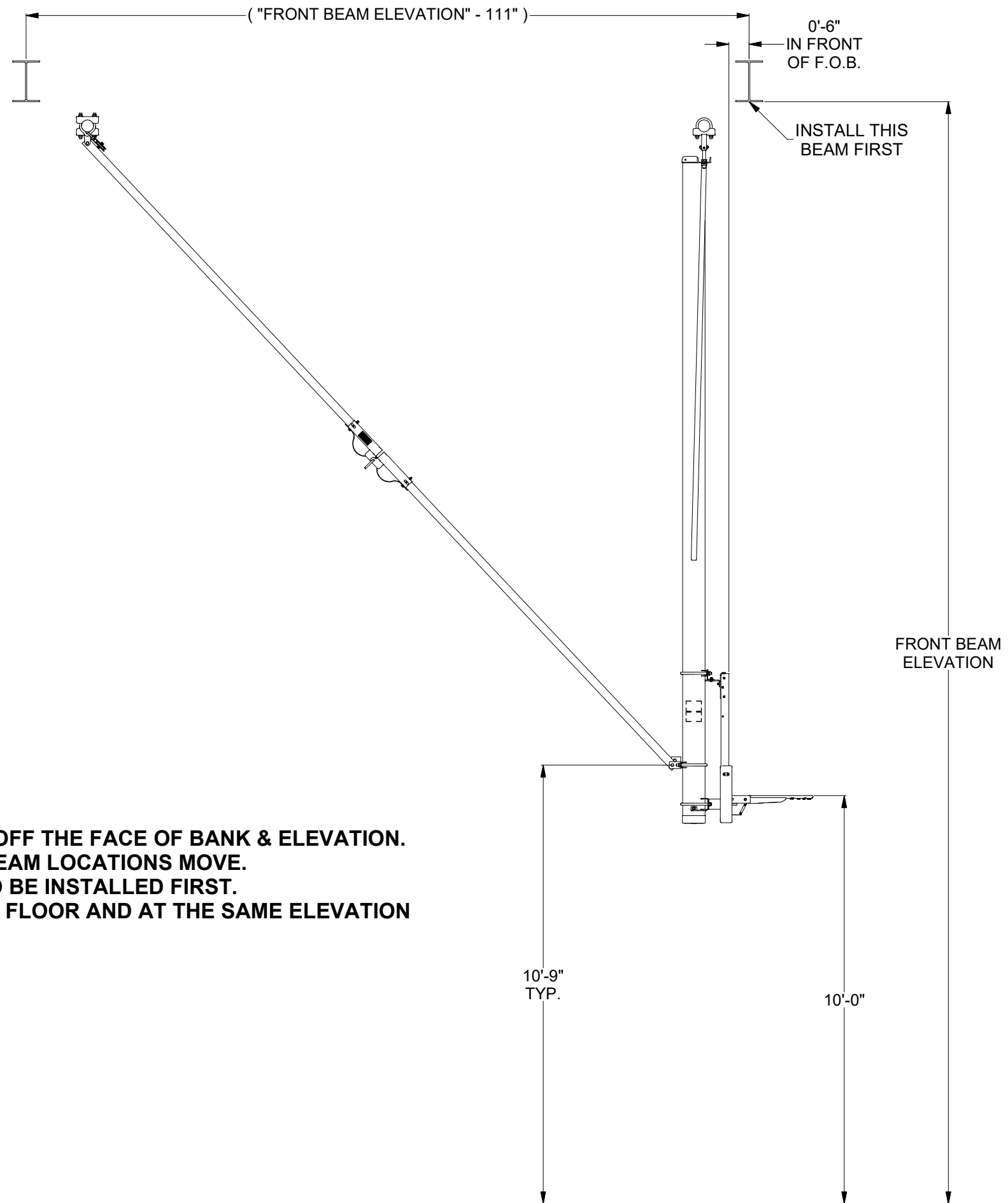
COMMON STYLES OF PSS BASKETBALL EQUIPMENT



THINGS TO KEEP IN MIND...

1. This is a permanent structure
2. The building structure must be able to support the load and forces of a basketball backstop in the down (play) and folded (stored) position. The loads provided by PSS should be reviewed by the project architect and structural engineer to verify attachment locations are structurally sound.
3. Note that design may vary when produced, due to changes in field conditions and/or information provided.
4. Supplementary steel-by-others may be required after design completion. The additional steel should be installed by a General Contractor, per PSS instruction, as specified by the architect.
5. Note the additional steel requirement for a 3102/3103 (rear-braced front-folding style unit) due to the third attachment point, in comparison to the typical two of other basketball backstop series.

ALL NOTES TYP. FOR ELEVATIONS



NOTES:

- 1.) THE EQUATION FOR THE I-BEAM LOCATIONS IS BASED OFF THE FACE OF BANK & ELEVATION.
- 2.) IF THE FACE OF BANK LOCATION MOVES, THEN THE I-BEAM LOCATIONS MOVE.
- 3.) THE I-BEAM IN FRONT OF THE FACE OF BANK NEEDS TO BE INSTALLED FIRST.
- 4.) PSS PREFERS THE I-BEAMS TO BE PARALLEL WITH THE FLOOR AND AT THE SAME ELEVATION

3104/3105 - I-BEAMS BY OTHERS

ORDER NUMBER

PROJECT NAME

DEALER NAME

DEALER ORDER NUMBER

QUOTE #

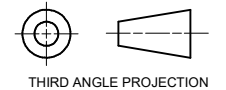
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YEAGER	7/29/2020

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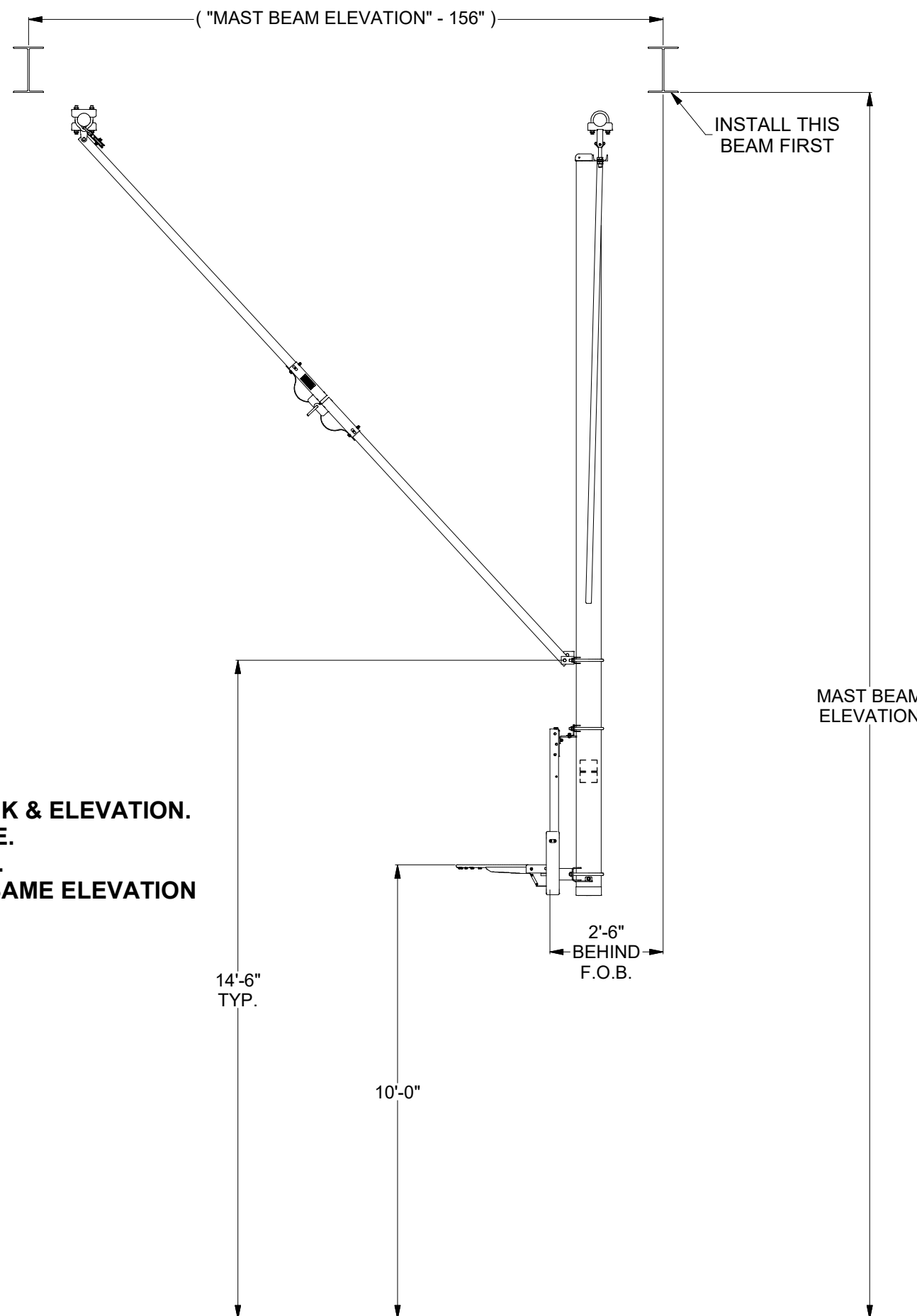
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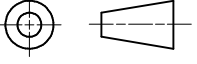
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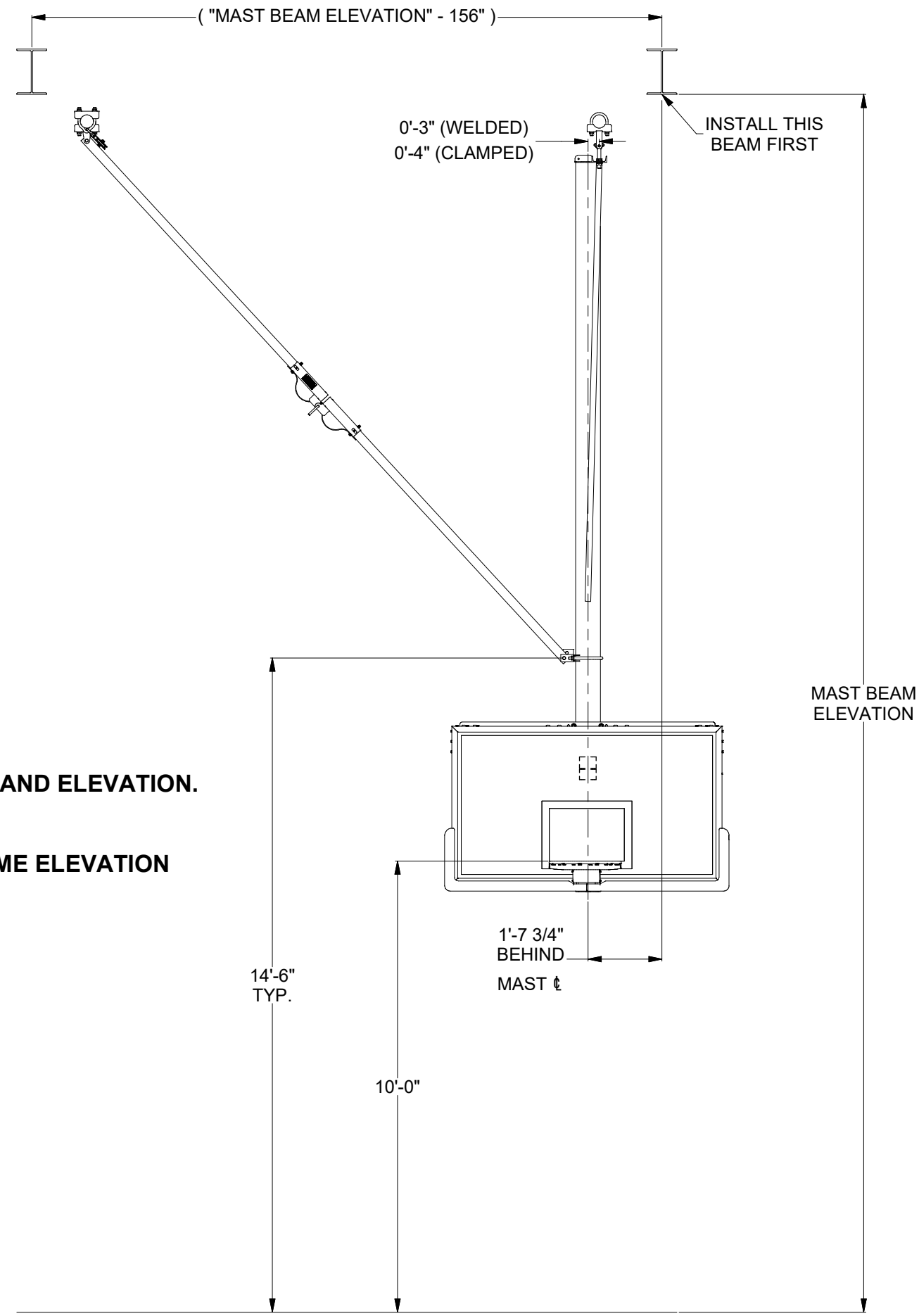
3104/3105 I-BEAM ELEVATION

FILE #



- NOTES:**
- 1.) THE EQUATION FOR THE I-BEAM LOCATIONS IS BASED OFF THE FACE OF BANK & ELEVATION.
 - 2.) IF THE FACE OF BANK LOCATION MOVES, THEN THE I-BEAM LOCATIONS MOVE.
 - 3.) THE I-BEAM IN FRONT OF THE FACE OF BANK NEEDS TO BE INSTALLED FIRST.
 - 4.) PSS PREFERS THE I-BEAMS TO BE PARALLEL WITH THE FLOOR AND AT THE SAME ELEVATION

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3106/3107 I-BEAM ELEVATION		
FILE #		
SHEET 6 OF 20		



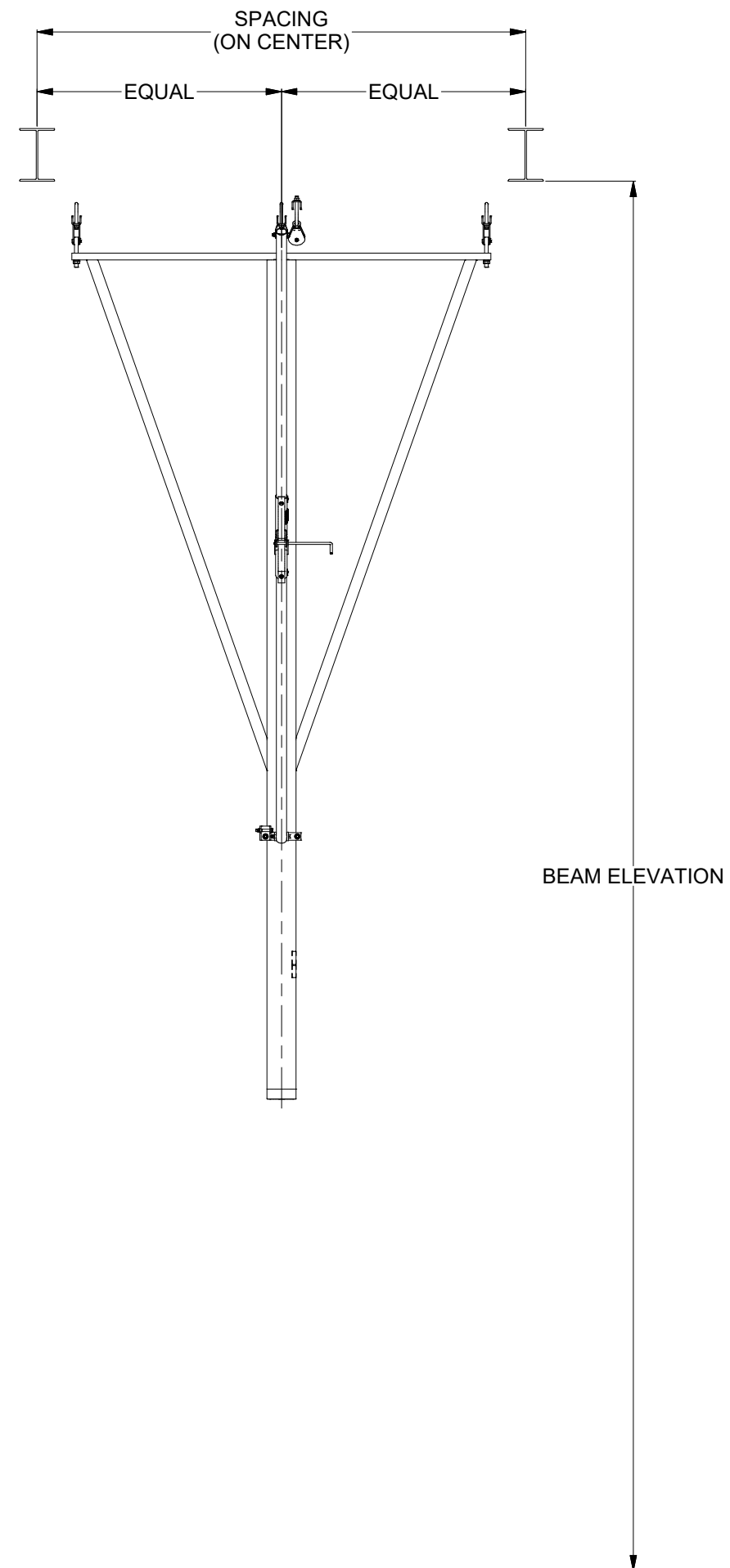
- NOTES:**
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REV	DATE	BY
3108/3109 I-BEAM ELEVATION		
FILE #		
SHEET 7 OF 20		

BEAM ELEVATION	SPACING
BELOW 20' WELDED	78" O.C.
20'-31' WELDED	112" O.C.
30'-32' CLAMPED	148" O.C.
33'-35' CLAMPED	177" O.C.
36'-42' CLAMPED	213" O.C.

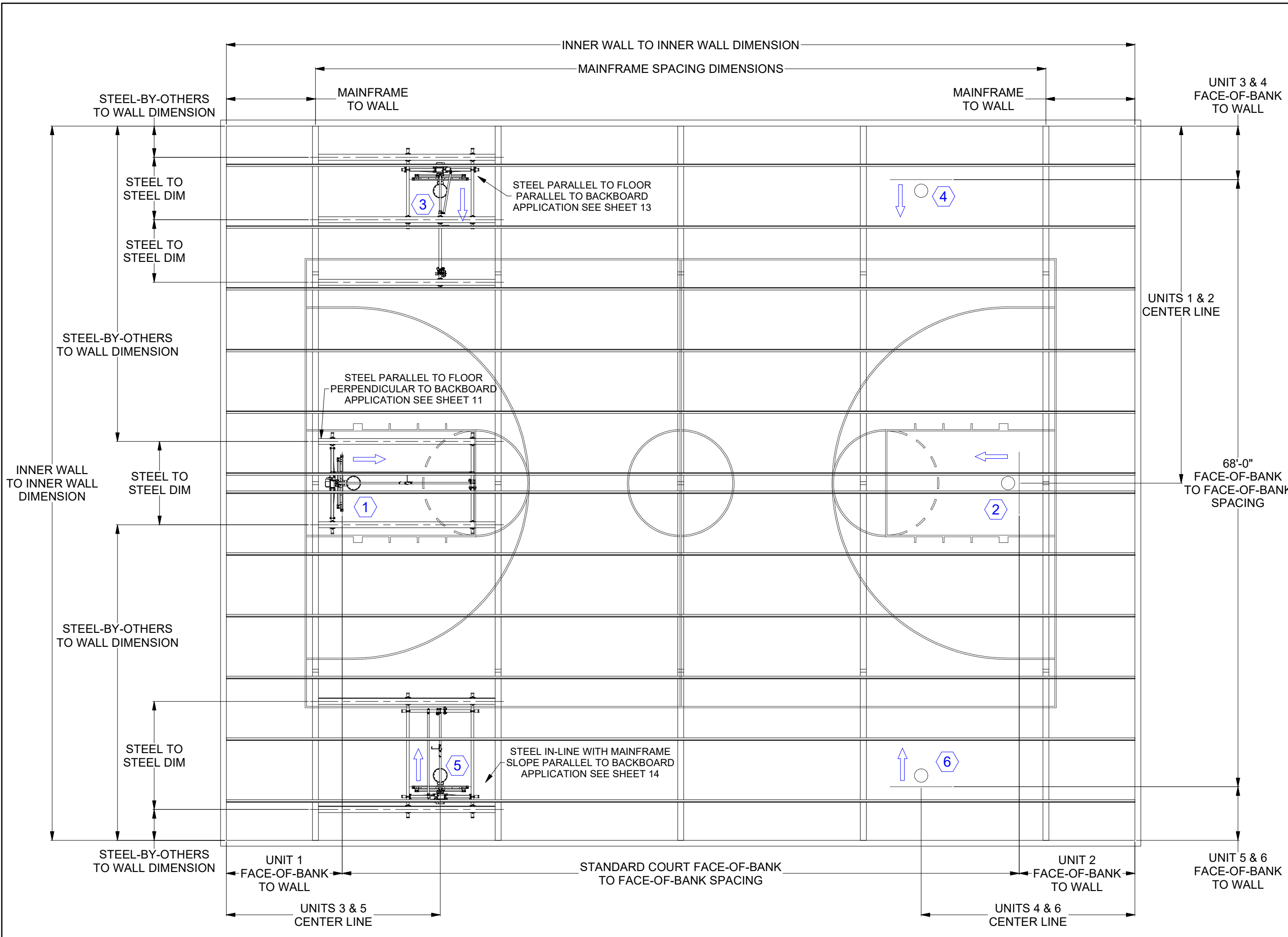
NOTES:

- 1.) THE EQUATION FOR THE I-BEAM LOCATIONS IS BASED OFF THE BEAM ELEVATION.
- 2.) IF THE FACE OF BANK LOCATION MOVES, THEN THE I-BEAM LOCATIONS MOVE.
- 3.) PSS PREFERS THE I-BEAMS TO BE PARALLEL WITH THE FLOOR AND AT THE SAME ELEVATION
- 4.) REVIEW THE CHART FOR THE REQUIRED BEAM SPACING.



ALL SINGLE MAST UNITS - I-BEAMS BY OTHERS

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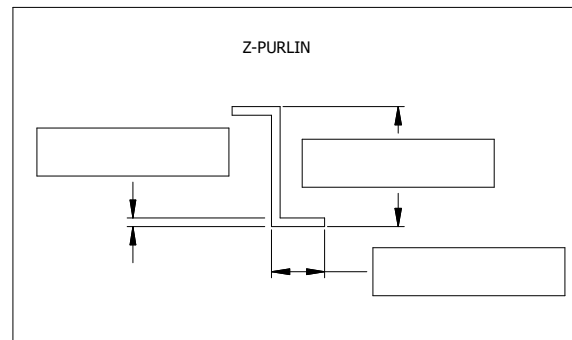
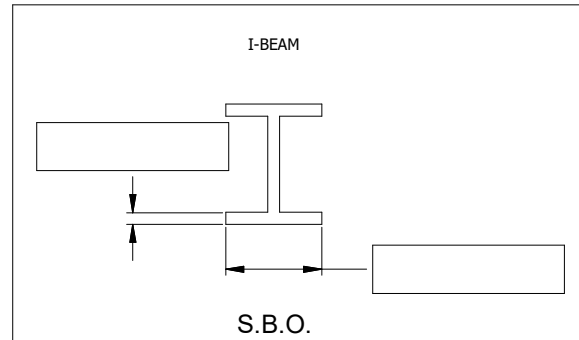
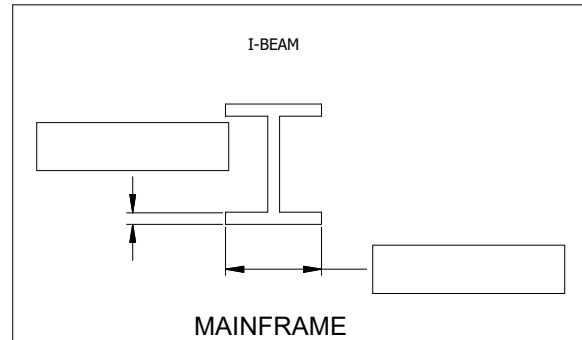
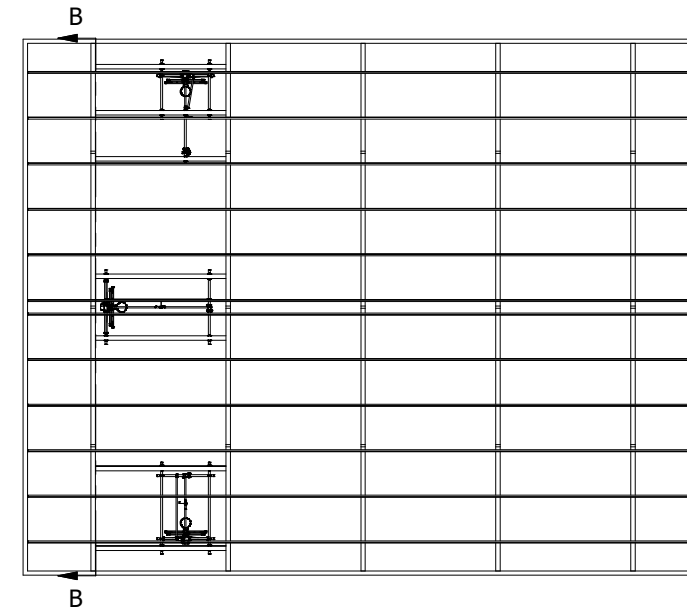
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EQUIPMENT & STRUCTURAL PLAN		
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SHEET 9 OF 20		

1. VERIFY FINISHED FLOOR THICKNESS _____
2. WALL MATERIAL AT CONNECTION HEIGHT _____
3. LIGHTS INSTALLED DURING FIELD CHECK YES NO
4. CAN THE LIGHTS BE MOVED YES NO
5. HVAC INSTALLED DURING FIELD CHECK YES NO
6. CAN THE HVAC BE MOVED YES NO
7. STEEL BY OTHER ORIENTATION FLAT SLOPED

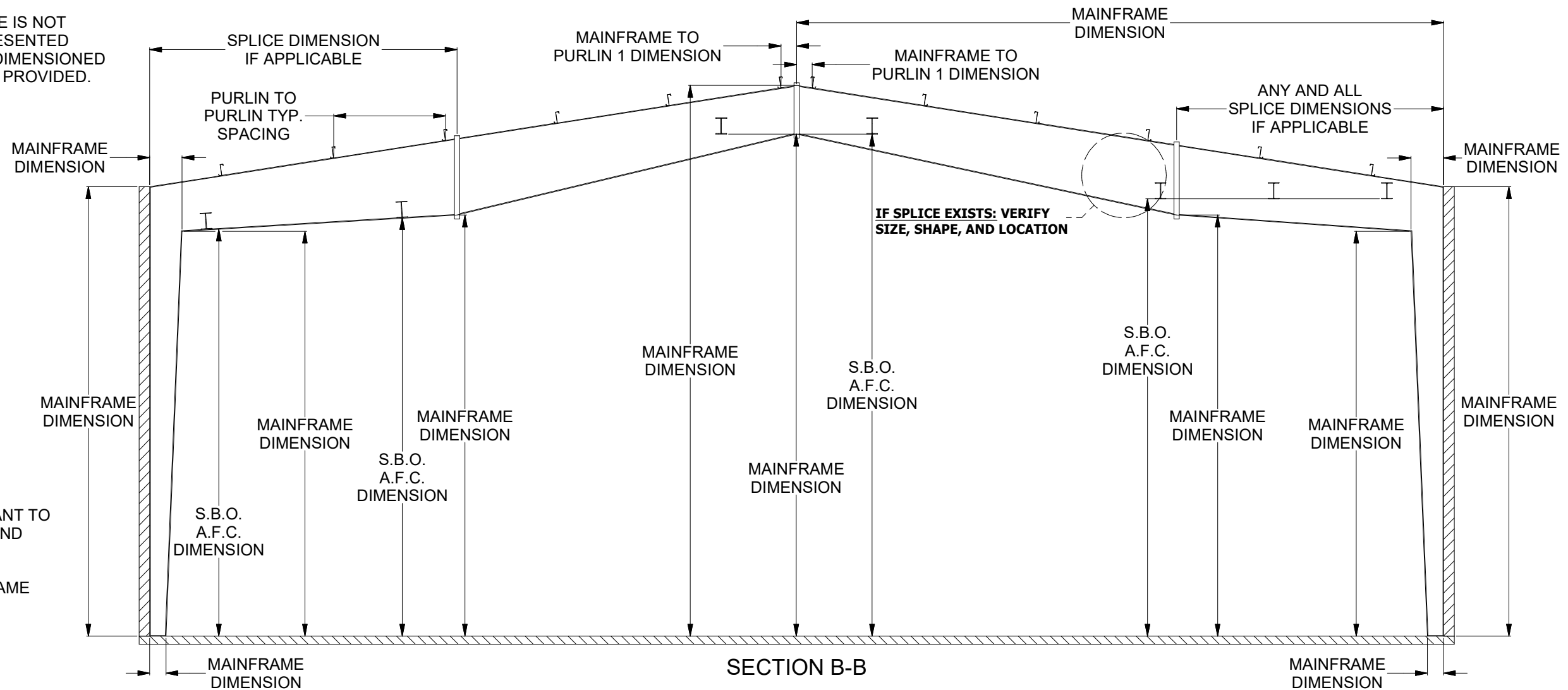
NOTES:

1.) I-BEAMS BY OTHERS MUST BE INSTALLED +/- 1" PER LOCATIONS SHOWN OR ADDITIONAL COST MAY BE REQUIRED.

PROVIDE DIMENSIONS OF BUILDING STRUCTURE. IF THESE DIMENSIONS ARE NOT SPECIFIED, STANDARD SIZE CLAMPS WILL BE USED.



NOTE: IF STRUCTURE IS NOT ACCURATELY REPRESENTED BY IMAGE, A FULLY DIMENSIONED SKETCH SHOULD BE PROVIDED.



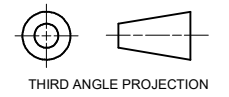
NOTE: IT IS IMPORTANT TO PROVIDE HEIGHTS AND DISTANCES TO ALL CHANGES IN PITCH ALONG THE MAINFRAME BOTTOM CHORD.

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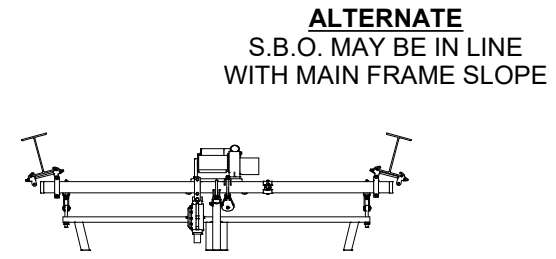
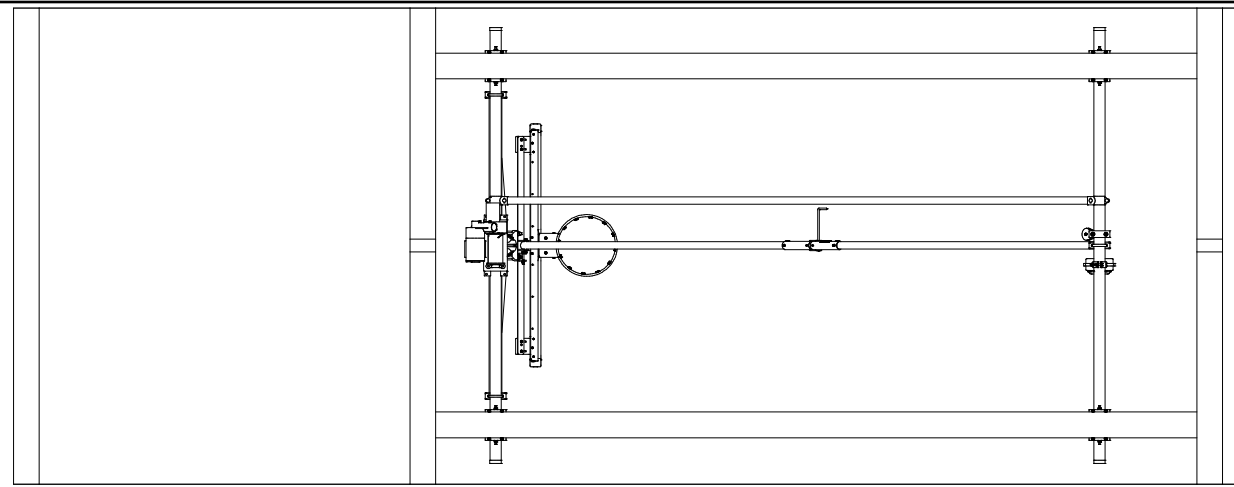
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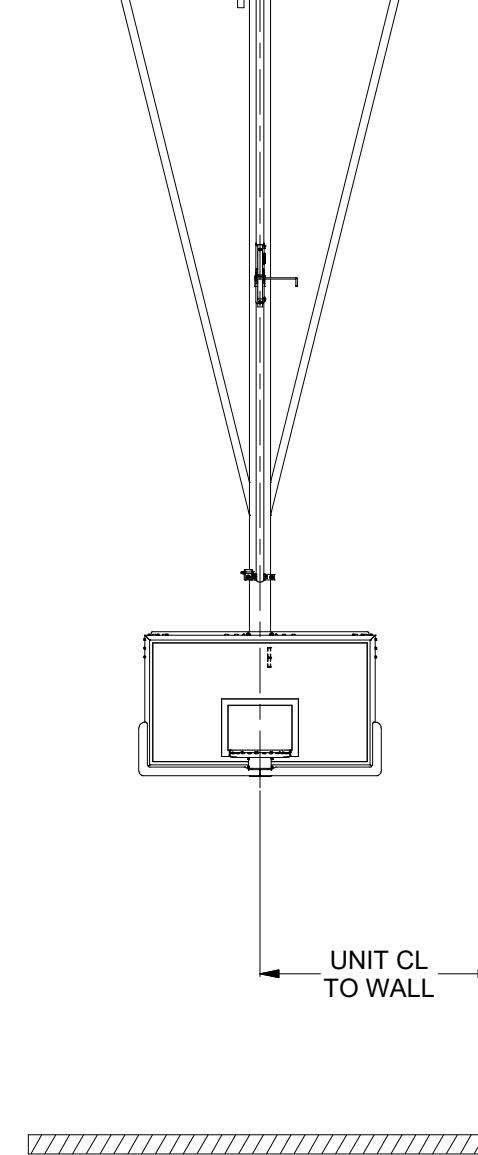
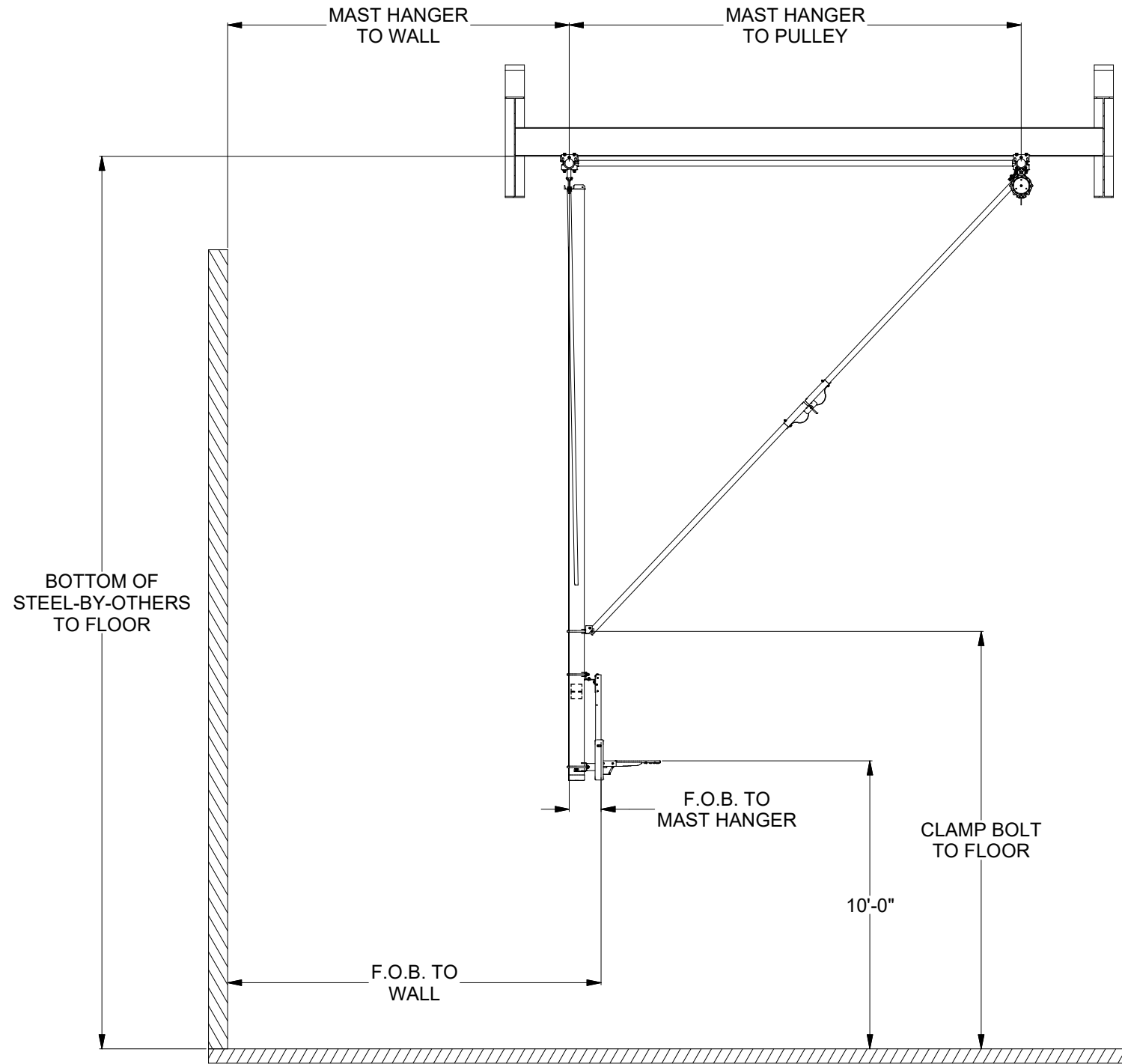
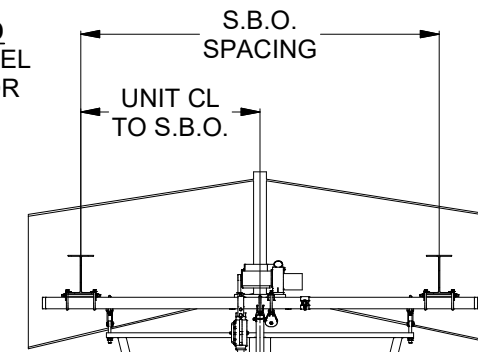
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REV	DATE	BY
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SHEET 10 OF 20		



PREFERRED
S.B.O. PARALLEL
TO THE FLOOR



FLAT & LEVEL STEEL-BY-OTHERS
STEEL PERPENDICULAR TO BACKBOARD

ORDER NUMBER

PROJECT NAME

DEALER NAME

DEALER ORDER NUMBER

QUOTE #

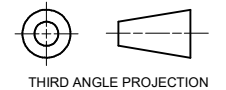
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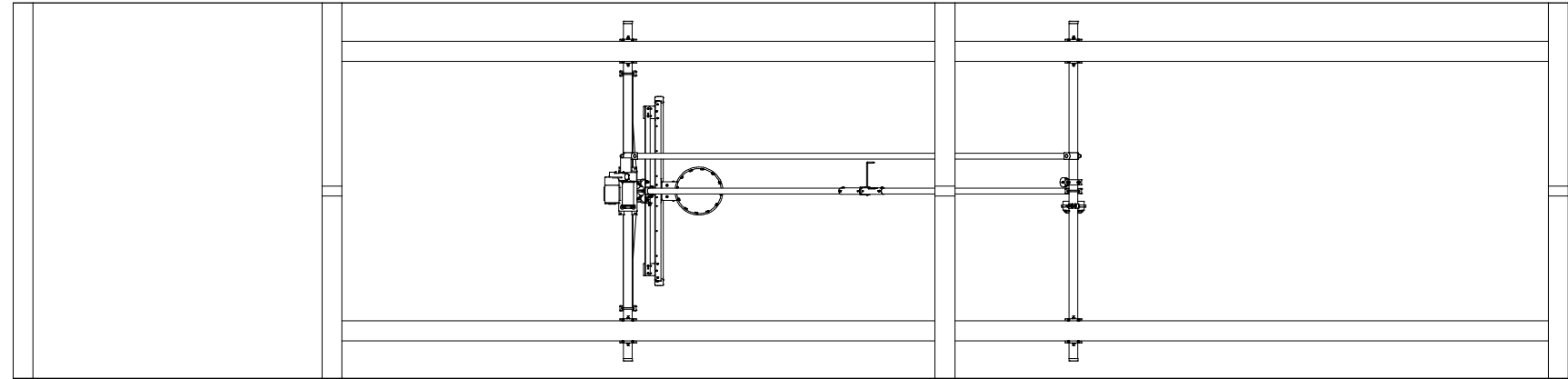
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UNIT ELEVATION

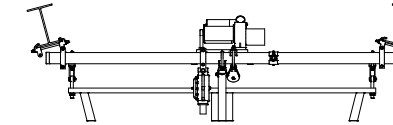
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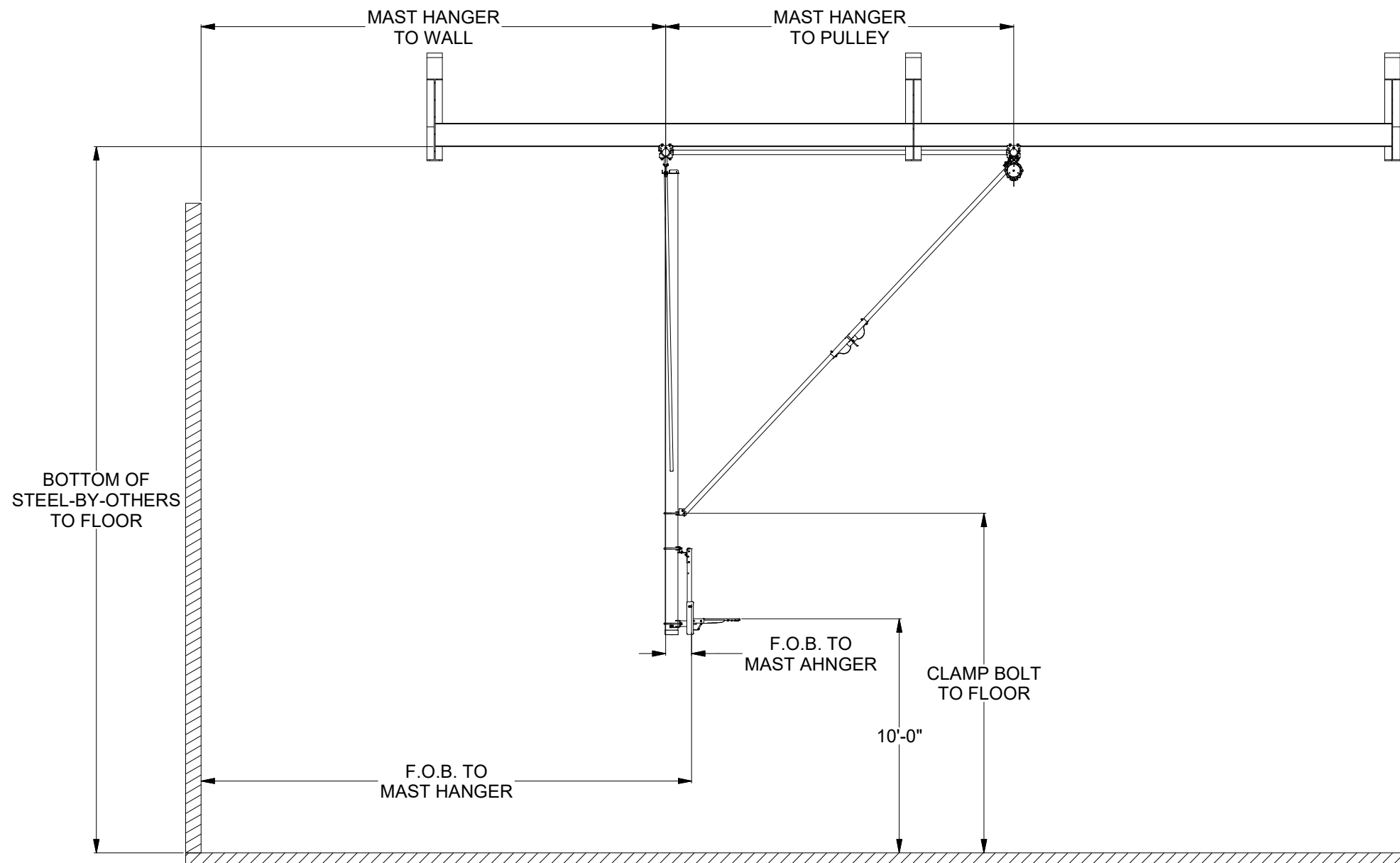
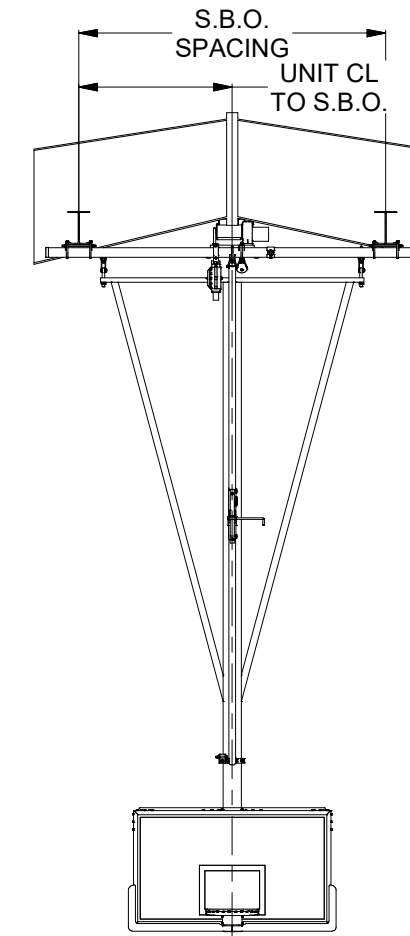
- NOTES:**
 1) SEE EQUIPMENT LIST ON PARTS COVER PAGE.
 2) VERIFY ANY OBSTRUCTIONS TO ATTACHMENT POINTS.



ALTERNATE
 S.B.O. MAY BE IN LINE
 WITH MAIN FRAME SLOPE



PREFERRED
 S.B.O. PARALLEL
 TO THE FLOOR



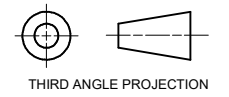
**FLAT & LEVEL STEEL-BY-OTHERS
 STEEL PERPENDICULAR TO BACKBOARD**

ORDER NUMBER	
PROJECT NAME	
DEALER NAME	
DEALER ORDER NUMBER	
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YEAGER	7/29/2020
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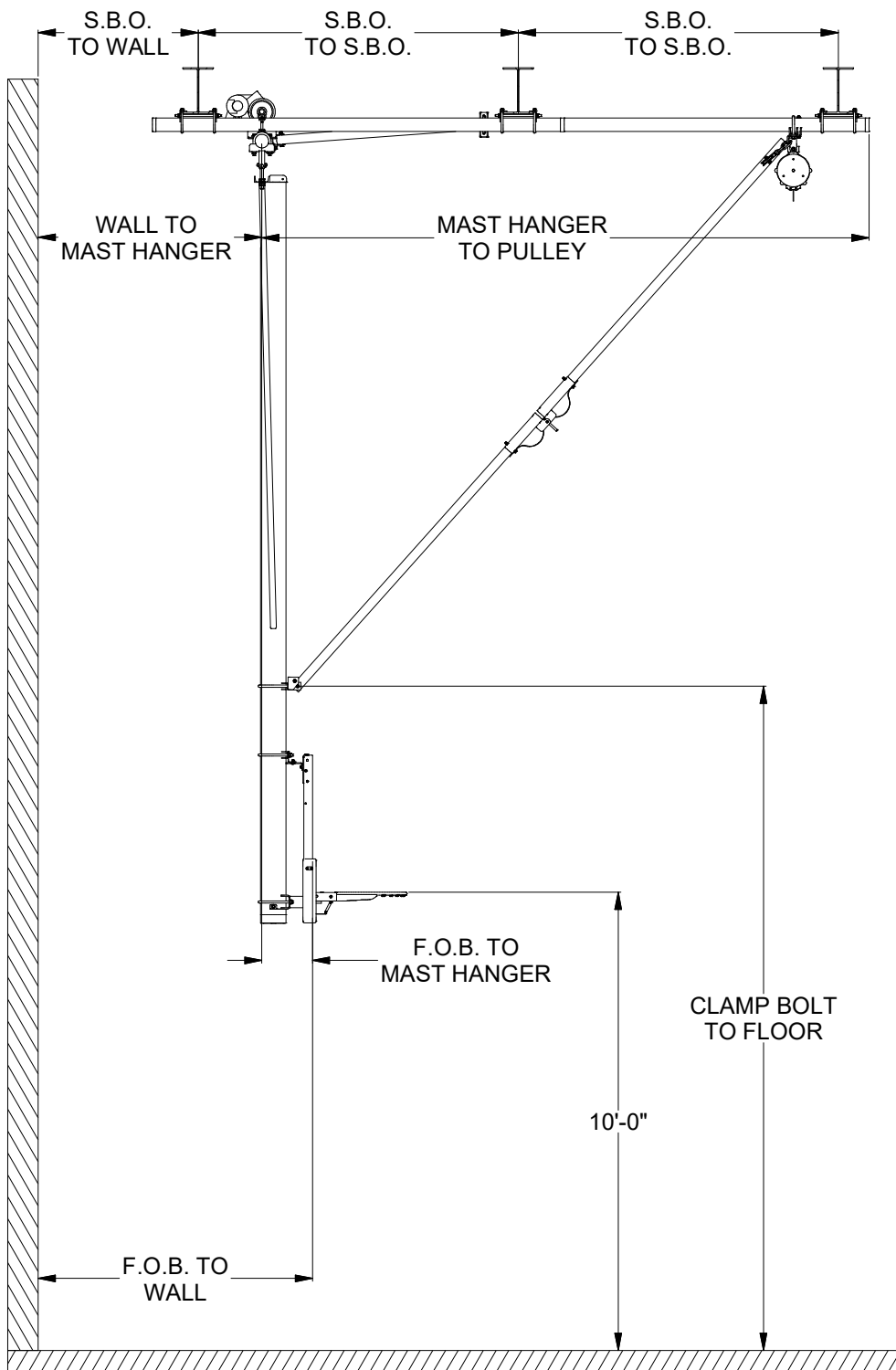
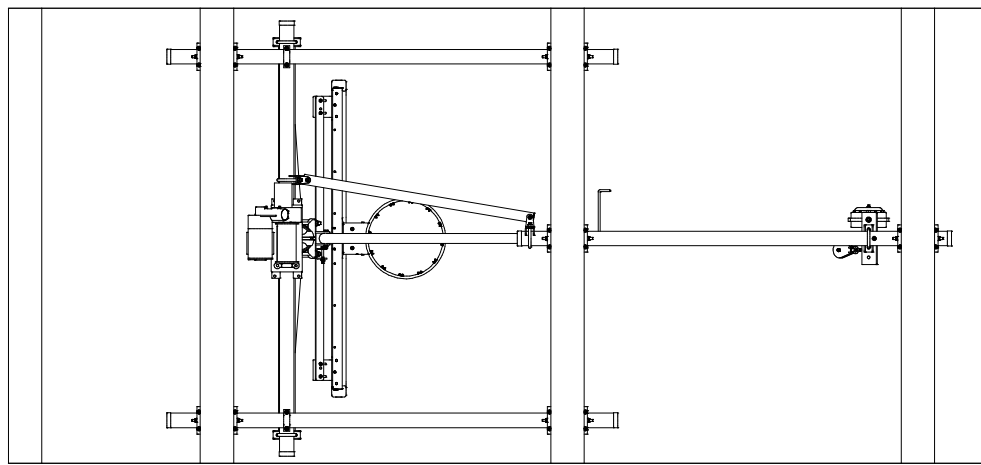
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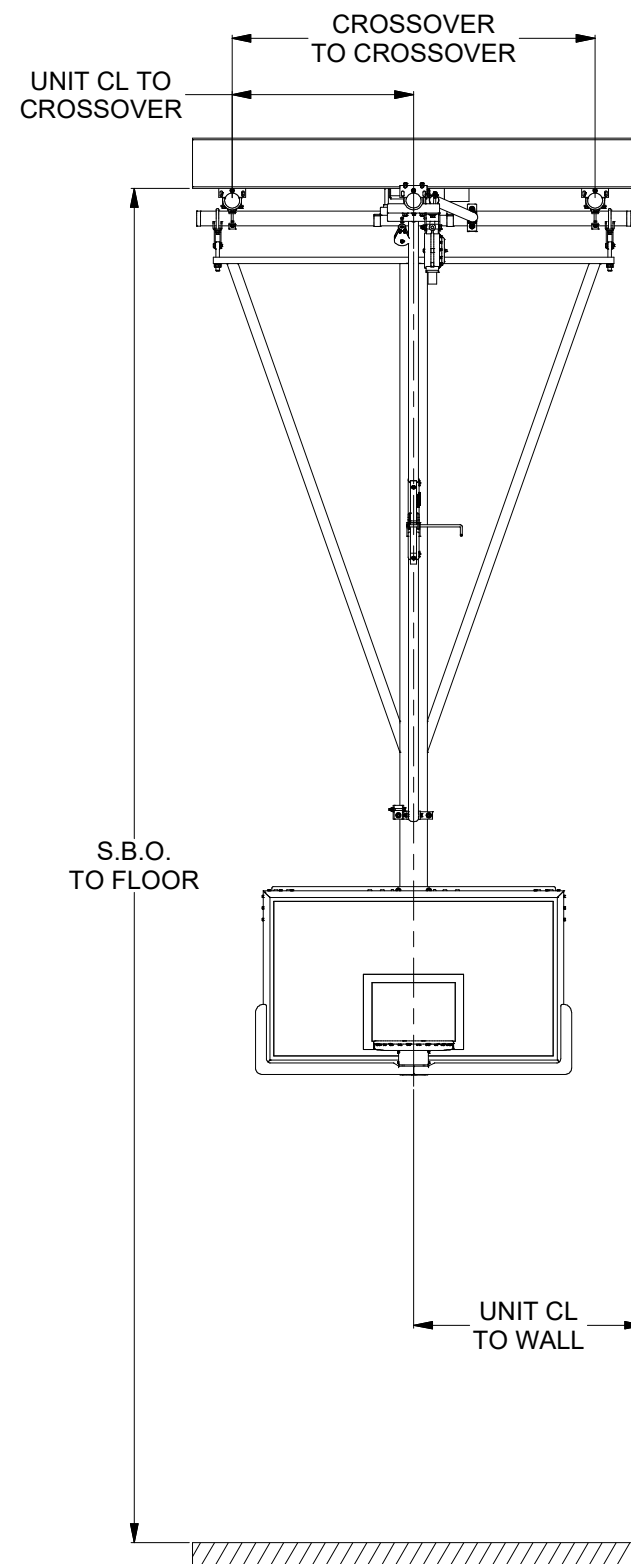


**SHEET NOT REQUIRED
 FOR FIELD CHECK**

REV	DATE	BY
UNIT ELEVATION		
FILE #		
SHEET 12 OF 20		



**FLAT & LEVEL STEEL-BY-OTHERS
STEEL PARALLEL TO BACKBOARD**



ORDER NUMBER

PROJECT NAME

DEALER NAME

DEALER ORDER NUMBER

QUOTE #

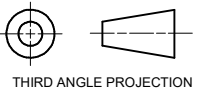
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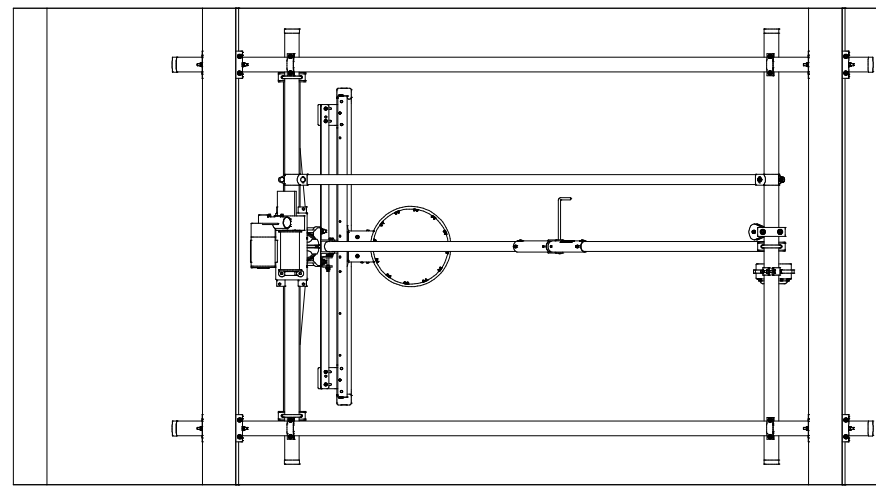


THIRD ANGLE PROJECTION

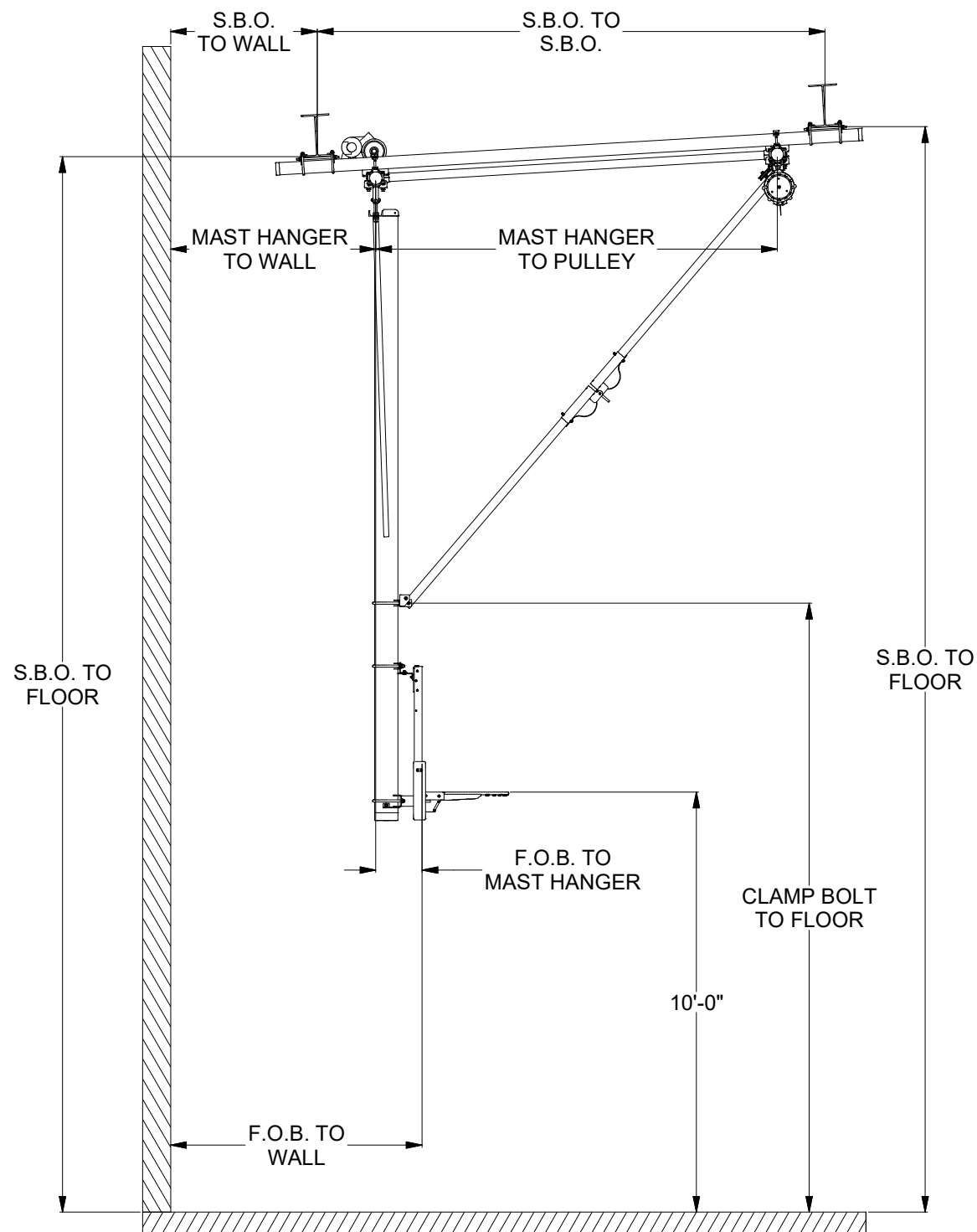
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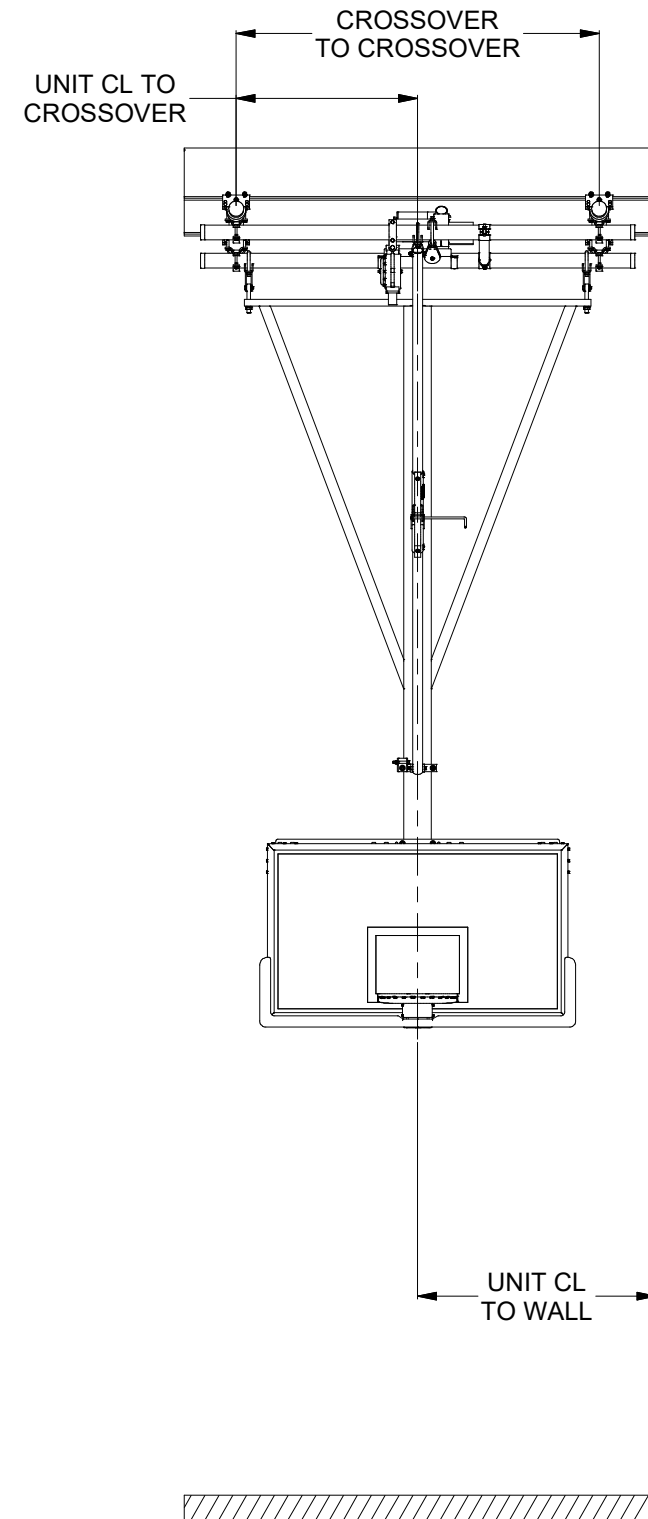
FILE #



NOTE: SINGLE PULL-UP STRUCTURE ONLY AVAILABLE ON FLAT S.B.O. SITUATIONS, SEE SHEET 13. ANY INCLINE OR DECLINE IN S.B.O. WILL NEED THIS STYLE OVERHEAD STRUCTURAL ATTACHMENT METHOD TO ALLOW PROPER FOLD.



**SLOPED STEEL-BY-OTHERS
STEEL PARALLEL TO BACKBOARD**



ORDER NUMBER

PROJECT NAME

DEALER NAME

DEALER ORDER NUMBER

QUOTE #

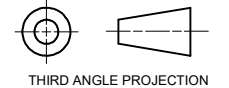
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THIRD ANGLE PROJECTION

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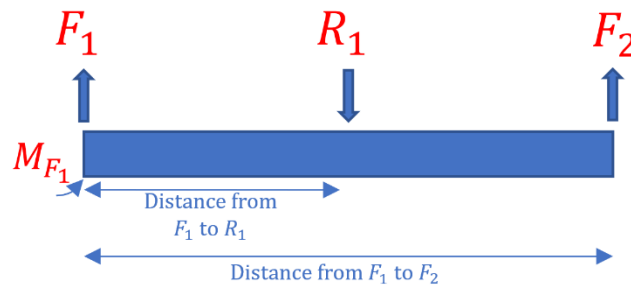
UNIT ELEVATION

FILE #

Standard Unit Loads & Point Load Calculations

PSS offers generic loads for each basketball backstop series dependent on unit height. These load calculation sheets add an additional 300 to 480 pounds scaled over increased height increments to account for overhead superstructure and accessories. The calculations change from welded to clamped basketball backstops styles. A welded unit typically is used for truss heights up to 32'-0" and a clamped unit allows for heights above this threshold; however, clamped units are available within the welded height limitations as well. These generic loads are simply the overall load of the basketball backstop structure in its entirety, while a point load is the exact weight at each point of contact with the building structure. (i.e. how much weight is being applied per beam clamp, specific to the basketball backstop design). PSS Engineers can provide specific point load calculations upon request.

For this point load calculation example, a Front-Braced Front-Folding basketball unit (3107 Series) are used with a truss height of 31'-0" based upon the Flat & Level Steel-by-Others with Steel Perpendicular to Backboard (example from Sheet 11) and is shown on Sheet 17. The generic load calculations used are provided on Sheet 30. The loads calculated on this sheet are for the total loads from the hanging structure, spread among the mast hangers or pulley. In this example, static loads are shown for the mast at the center of mass location. There are alternative options for static vs dynamic loads, as well as down vs folded positions. This can be found under 'combined loads' in the table on the generic load sheet.



The above diagram illustrates the loads on the mast as shown on Sheet 17. R_1 is the reaction force taken from the generic load calculation sheet acting at the center of mass along the pipe from both mast hangers. F_1 and F_2 denote the forces acting upon the truss from the mast (point loads) at beam attachments. In order to determine these loads, we need two equations.

Step 1: The first equation is used to determine one of the two load/force values. Summation of the Forces in the Y Direction.

$$\text{Sum of Forces} = 0 = F_1 - R_1 + F_2$$

Step 2: The second equation is used to determine the second of the two load/force values. Summation of the Moments taken around the point where F_1 is acting.

$$\text{Sum of Moments about } F_1 = 0 = (F_1)(0) - (R_1)(\text{Distance from } F_1 \text{ to } R_1) + (F_2)(\text{Distance from } F_1 \text{ to } F_2)$$

Step 3: Solve for F_2 from the Sum of Moments (equation 2) because F_1 will be eliminated from the equation, resulting with a solution to one of the unknown loads/forces.

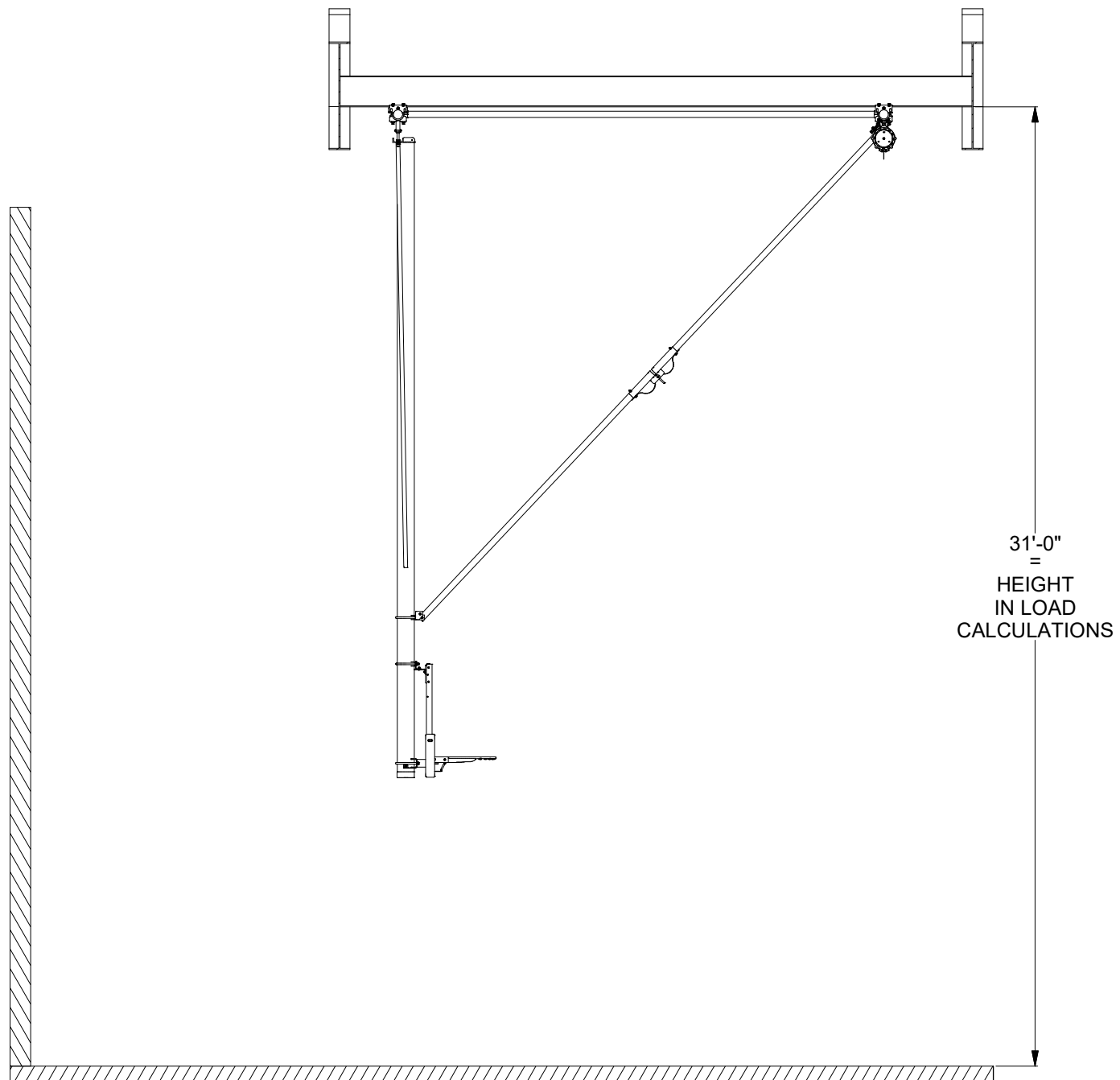
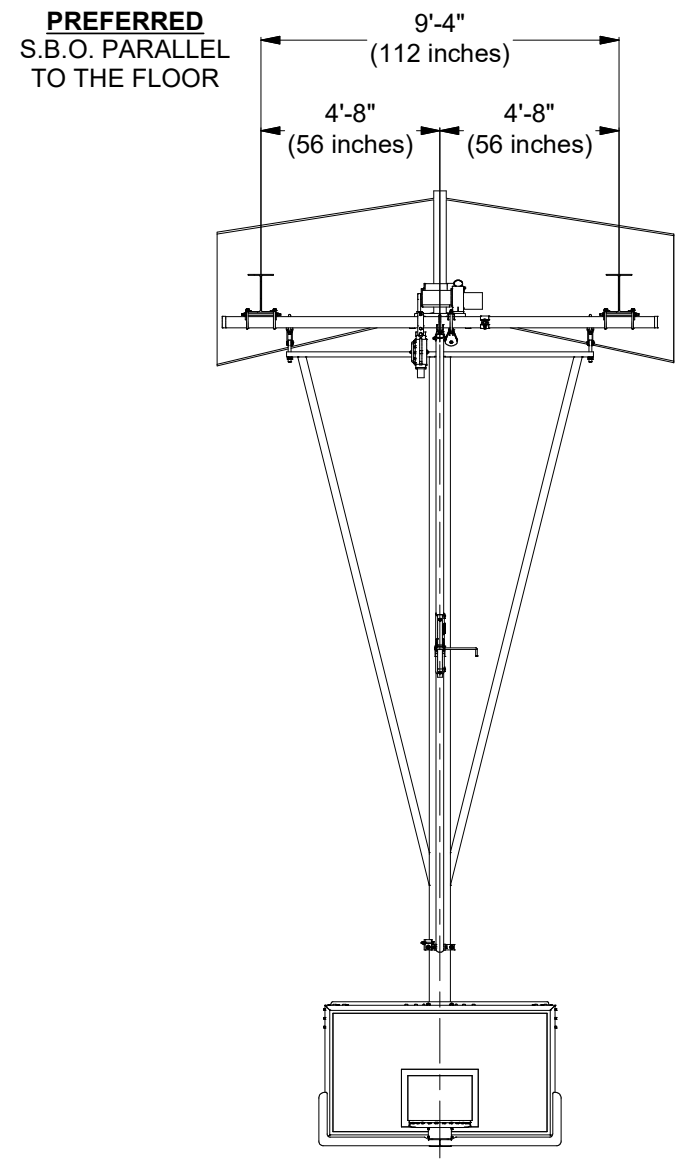
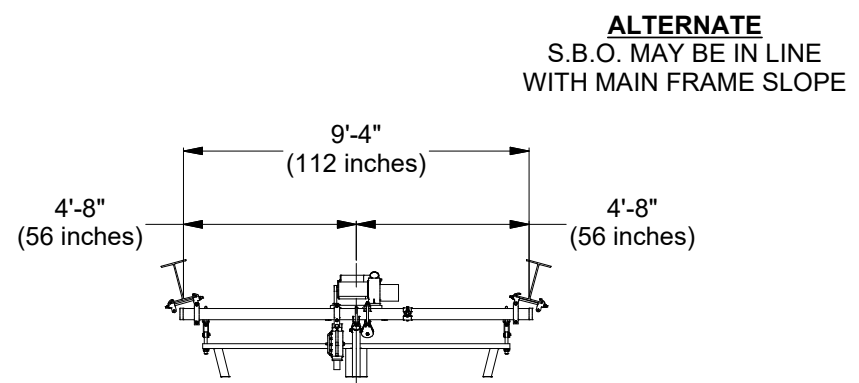
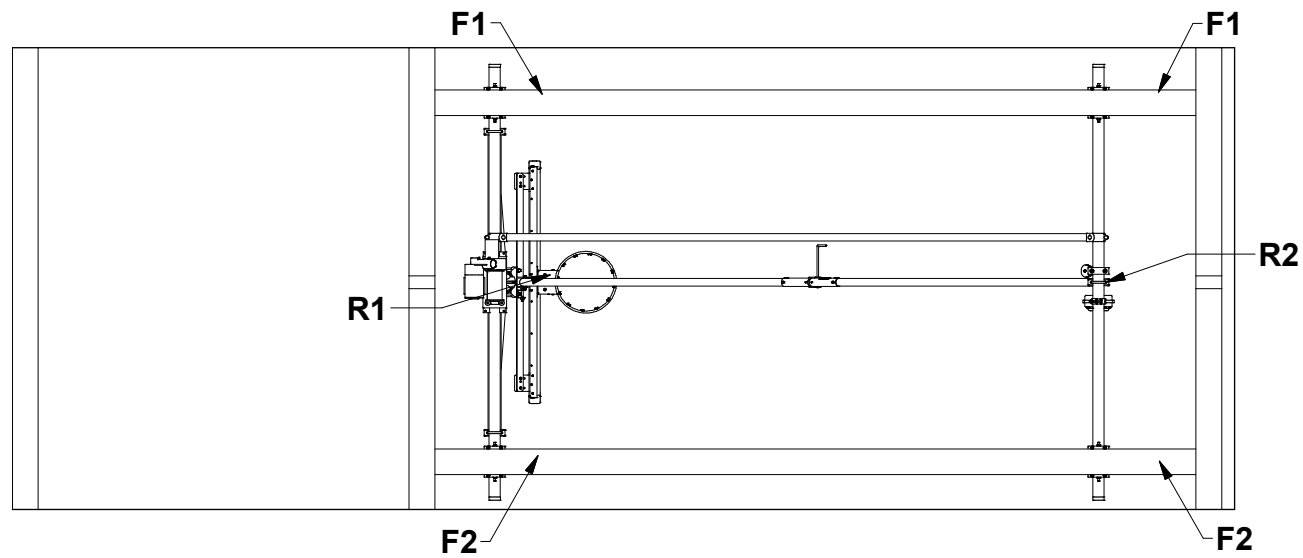
$$\text{Sum of Moments about } F_1 = 0 = (F_1)(0) - (888\text{lbs})(56\text{inches}) + (F_2)(112\text{inches})$$

$$F_2 = \frac{(888\text{lbs})(56\text{inches})}{(112\text{inches})} \quad F_2 = 444\text{lbs}$$

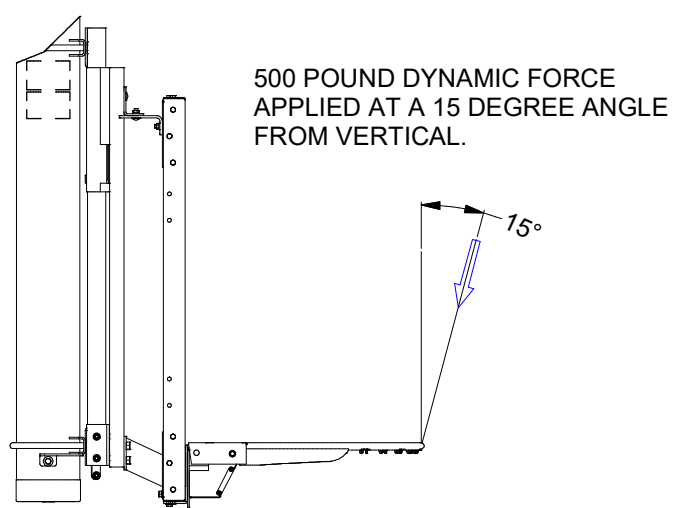
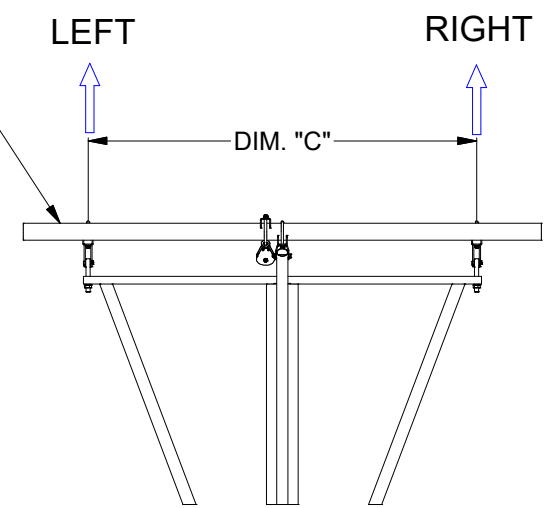
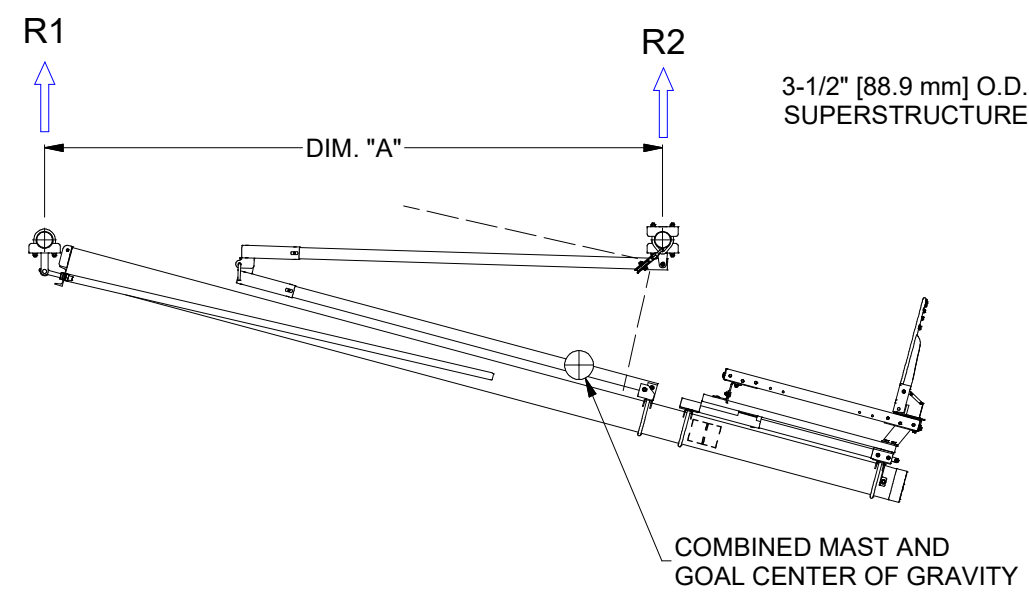
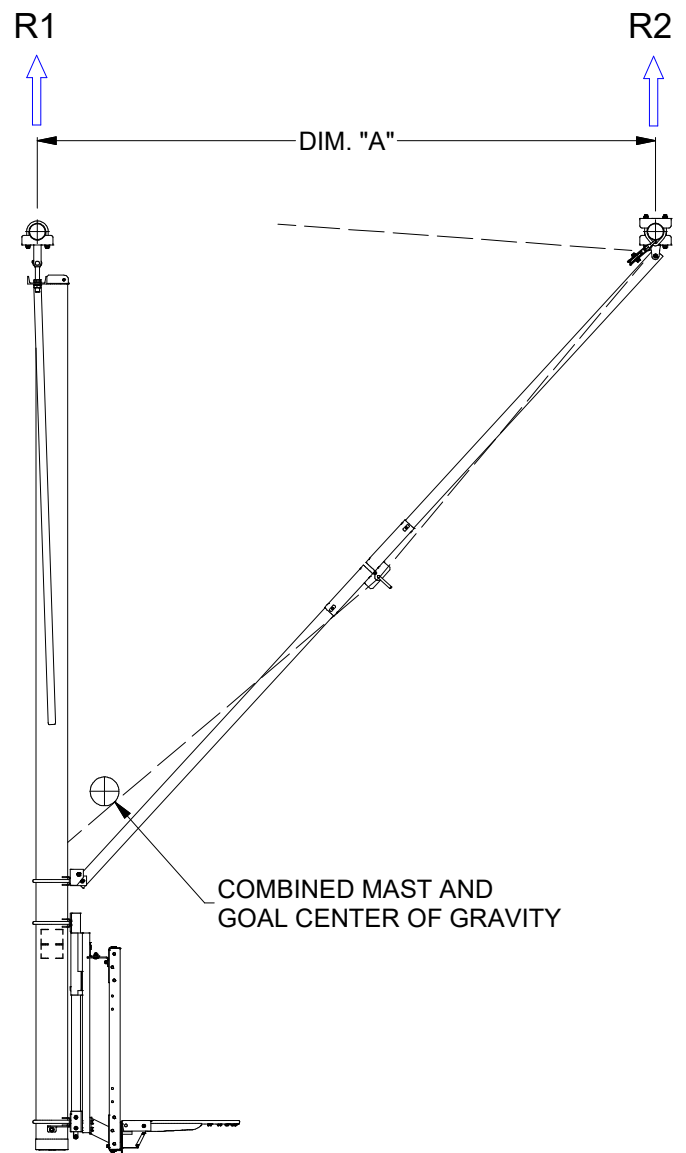
Step 4: Solving for F_1 from the Sum of Forces equation now that F_2 is a known value.

$$F_1 = 888\text{lbs} - F_2 \quad F_1 = 888\text{lbs} - 444\text{lbs} \quad F_1 = 444\text{lbs}$$

The alternatives scenario loads can be utilized in the same way; the mast vs pulley, a non-centered situation, static vs dynamic, folded or down position, or any other combination of series and height scenarios.



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REV	DATE	BY
3107 DIMENSIONS FOR LOADS		
FILE #		
SHEET 17 OF 20		



NOTE: DYNAMIC FORCES ARE ESTIMATED RESULTANTS OF FORCES APPLIED BY A 300 POUND PLAYER EXECUTING A SLAM DUNK AND HANGING FROM THE RIM.

TRUSS HEIGHT (FT)	31 Ft - 0 In		ABOVE FINISHED FLOOR		THE COMBINED LOADS REPRESENT THE TOTAL INSTALLATION LOADS AND ARE COMPRISED OF THE BACKSTOP ONLY LOADS PLUS THE SUPERSTRUCTURE AND ACCESSORIES LOADS											
DIMENSION "A"	15' - 9"															
DIMENSION "C"	7' - 10"															
STATIC REACTION LOADS Version 8.1																
BACKSTOP UNIT ONLY							SUPERSTRUCTURE AND ACCESSORIES			COMBINED LOADS						
DOWN POSITION				FOLDED POSITION						DOWN POSITION			FOLDED POSITION			
TOTAL	LEFT	RIGHT	TOTAL	LEFT	RIGHT	TOTAL				LEFT	RIGHT	TOTAL	LEFT	RIGHT	TOTAL	LEFT
R1 (Lbs)	648	324	324	140	70	70	240	120	120	888	444	444	380	190	190	
R2 (Lbs)	97	48	48	604	302	302	240	120	120	337	168	168	844	422	422	
HOIST CABLE PULL (Lbs)	0			625												
TOTAL LOADS INCLUDING STATIC & DYNAMIC																
BACKSTOP UNIT ONLY							SUPERSTRUCTURE AND ACCESSORIES			COMBINED LOADS						
DOWN POSITION				FOLDED POSITION						DOWN POSITION			FOLDED POSITION			
TOTAL	LEFT	RIGHT	TOTAL	LEFT	RIGHT	TOTAL				LEFT	RIGHT	TOTAL	LEFT	RIGHT	TOTAL	LEFT
R1 (Lbs)	880	440	440				240	120	120	1120	560	560				
R2 (Lbs)	347	174	174				240	120	120	587	294	294				
STATIC WEIGHTS & CG																
BACKSTOP UNIT ONLY							SUPERSTRUCTURE AND ACCESSORIES									
DOWN POSITION				FOLDED POSITION												
WEIGHT (Lbs)	"X" DIM (in)	"Y" DIM (in)	"X" DIM (in)	"Y" DIM (in)	WEIGHT (Lbs)	"X" DIM (in)								"Y" DIM (in)		
COMBINED MAST, GOAL, & BACKBOARD	690	9.43	164.35	161.19	33.43	STRUCTURE AND ACCESSORIES	480	94.47	1.75							
MAST SIDE BRACE	28	67.43	114.00	52.13	-2.88											
SUPPORT SIDE BRACE	27	127.15	70.50	56.06	-3.44											
TOTAL	744															

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PROJECT NAME

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DEALER ORDER NUMBER

QUOTE #

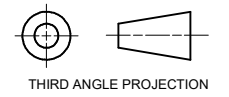
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PSS
PERFORMANCE SPORTS SYSTEMS

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NOTE:
Gared Holdings, LLC (Performance Sports Systems & Gared Sports) assumes no responsibility for the design integrity of the building structure.

MODEL 3106
OR
MODEL 3107

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LOAD CALCULATION

FILE #



Gared Holdings, LLC
9200 East 146th Street, Suite A
Noblesville, Indiana 46060
317-774-9840

August 26,2020

Subject: Overhead Support Structure

Performance Sports Systems is committed to the safety and reliability of all equipment we supply. In the interest of safety and reliability, we design our connecting clamps to the highest standards, test them in house, and continually review their performance. We understand the needs of our customers and dealers to have these same clamps tested by independent labs to validate our findings and provide unbiased and documented results. In order to address those needs we have hired an independent laboratory with multiple accreditations to test the clamps used in our overhead structure. The testing performed validates, and confirms, the structural integrity of clamps we offer.

These results are as follows (see next page for clamp illustration):

- Beam Clamp assemblies exhibited failure at loads exceeding 24,850 lbs.
- Extended Swing Hanger assemblies exhibited failure at loads exceeding 16,850 lbs.
- Swing Hanger assemblies, Travel Hinge assemblies, and Swing Hinge assemblies exhibited failure at loads exceeding 14,450 lbs.
- Purlin Attachment assemblies exhibited failure at loads exceeding 11,750 lbs.
- Mast Hinge assemblies exhibited failure at loads exceeding 10,850 lbs.
- Travel Ring assemblies exhibited failure at loads exceeding 10,050 lbs.
- Swivel Beam Clamp assemblies exhibited failure at loads exceeding 7,550 lbs.

Specific failure loads of specific part numbers are available upon request.

Upon request these loads can be applied to calculate safety factors in our assemblies of 50:1 for structural frame hangers, and 60:1 for structure support fittings during the design process.

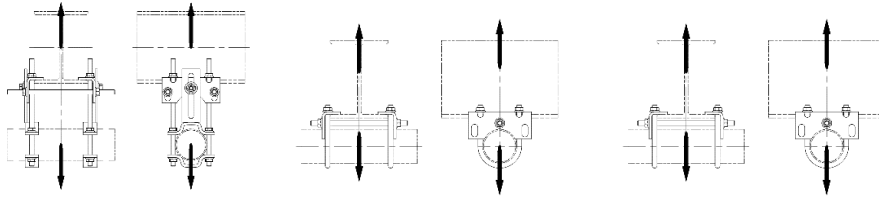
Sincerely,

A handwritten signature in black ink, appearing to read 'Matt Phelps', is written over a light blue horizontal line.

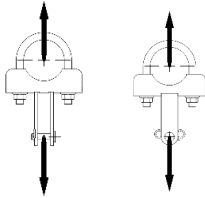
Matt Phelps

Mechanical Engineer, New Product Development
Gared Holdings LLC
9200 E 146th Street Ste. A
Noblesville, IN 46060
mphelps@garedholdings.com

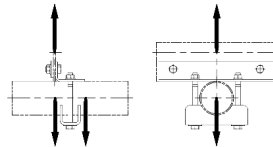
Beam Clamp Assemblies:



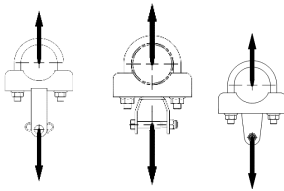
Extended Swing Hanger assemblies:



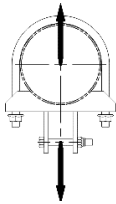
Purlin Attachment assembly:



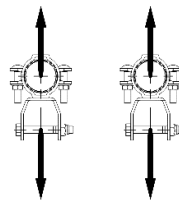
Swing Hanger assemblies, Travel Hinge assemblies, and Swing Hinge assemblies:



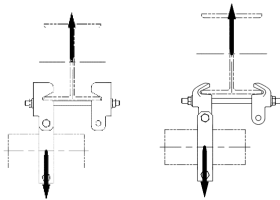
Mast Hinge assembly:



Travel Ring assembly:



Swivel Beam Clamp assemblies:



KEY NOTES:

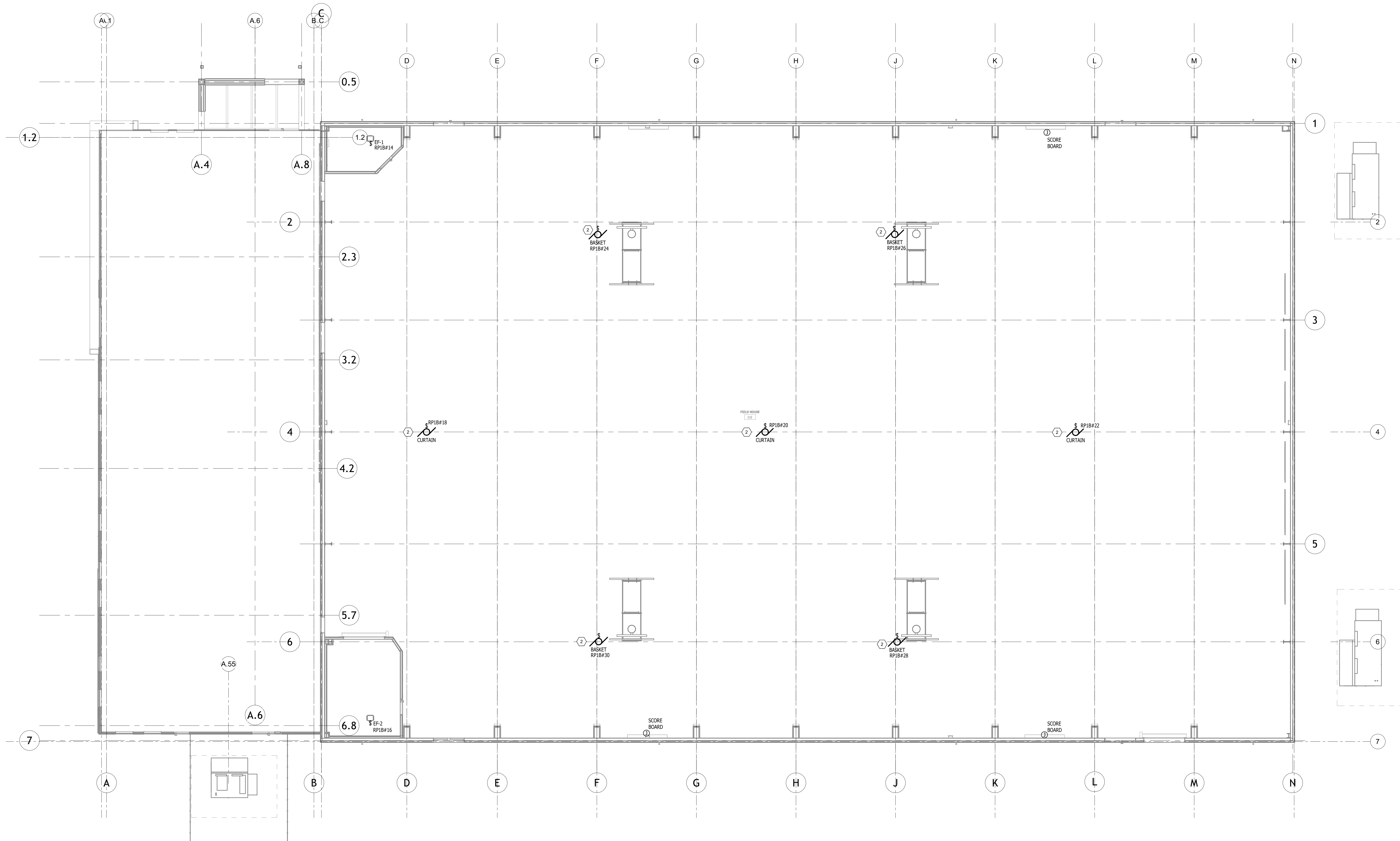
2 MOTOR RATED DISCONNECT SWITCH FOR CEILING EQUIPMENT. COORDINATE RATING WITH EQUIPMENT SELECTION AND MANUFACTURER REQUIREMENTS.

THE COLLABORATIVE

MEP CONSULTING ENGINEER

KTS ENGINEERING

491 E. WRIGHT AVE.
SHEPHERD, MI 48883
(PH) 989-567-1100
info@KTSEngineeringGroup.com
KTS PROJECT NO. 24-0219



PROJECT TITLE
OSCODA AREA SCHOOLS

NEW COMMUNITY CENTER

3550 E River Rd
Oscoda, MI 48750

12/18/2024 CD / BID

TC JOB NO. 107167
OWNER JOB NO.

SHEET TITLE
ELECTRICAL CLERESTORY PLAN
- POWER

SHEET NO.
E1.02



BASKETBALL UNIT COMPOSITIONS FOR STEEL BY OTHERS CONNECTION VARIETIES



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Front-Braced Front-Folding (3106/3107) Parallel “Steel-by-Others” Installation Guide.....6

Side-Braced Side-Folding Parallel (3108/3109) “Steel-by-Others” Installation Guide.....7

All Single Mast Units Perpendicular “Steel-by-Others” Installation Guide.....8

Equipment & Structural Plan Example for Floor Plan Field Check Guide.....9

Structural Elevation Field Check Guide.....10

“Steel-by-Others” Basketball Structures11-14

Load Calculation and Point Load Calculation Breakdown.....15-18

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BASKETBALL BACKSTOP STRUCTURAL ATTACHMENT OPTIONS

This manual was created to benefit each party involved with the placement of steel-by-others within pre-engineered building structures, to support basketball backstop structure provided by Performance Sports Systems (PSS). Pricing of a basketball backstop may vary depending upon the superstructure required. Installation may rely on purlins, mainframes, cradling, obstruction, or steel installed by a general contractor. All tubing to bridge or cradle necessary gaps to be provided by PSS.

Superstructure attachments may be designed to fit building needs. For example, if the purlins are insufficient to support overhead superstructure, then additional steel may be installed by others, or bridge pipe may be necessary, to allow the gym equipment to attach. The purpose of this guide is to help determine the location of steel by others. In PSS' experience, when steel placement has not been installed per instruction, the basketball unit may not line up with the court layout. If predetermined locations are used, PSS will provide superstructure to account for any variance.

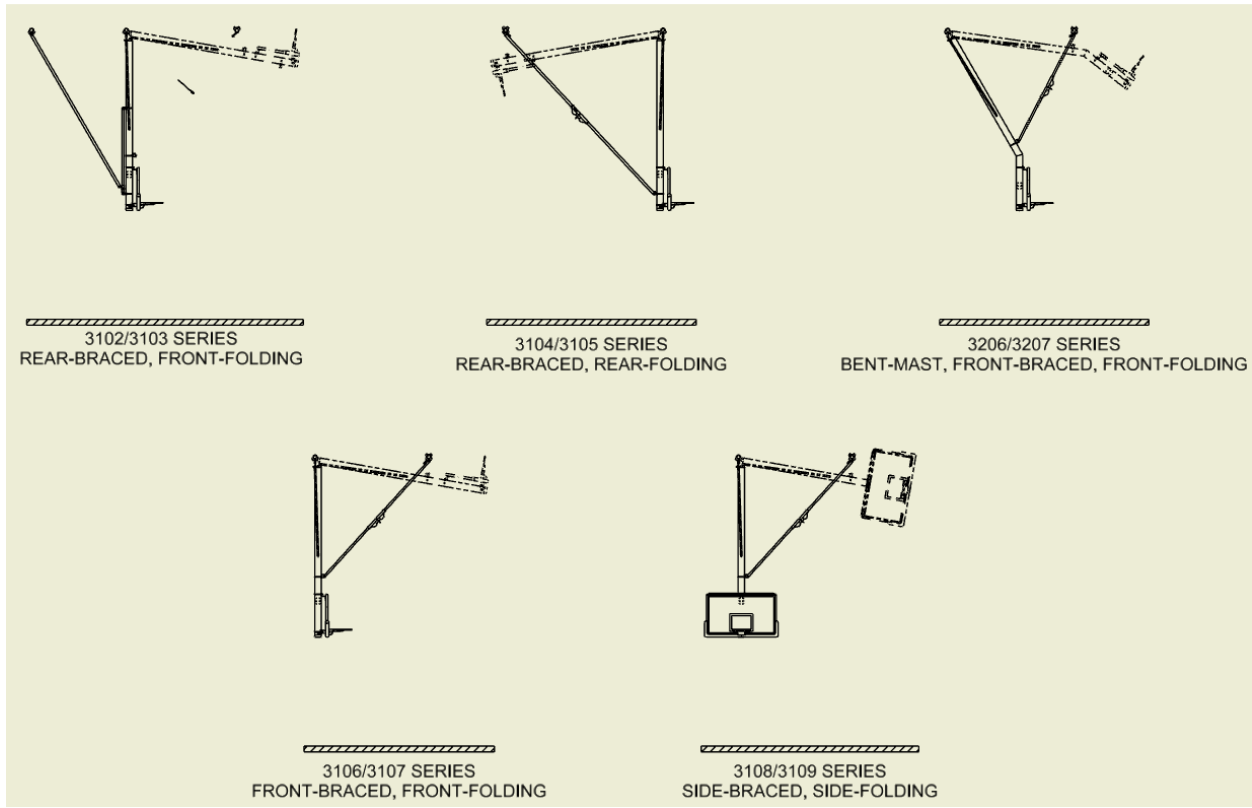
Depending upon the quality of information provided, revisions can occur throughout the process of development. As new or updated building information arises, the equipment and its superstructure may change in design. Gym equipment is custom designed for each building. Backstop feasibility may vary upon specifications, location of unit within building, or obstruction circumstances. Backstop design is manipulated depending on acceptability of wall attaching and obstructions such as HVAC, Sprinkler Pipes, Lights, Fans, etc.

For clarification, "Pre-engineered Metal Building" can be interchangeable with any building structure, "Face-of-Bank" is the front of the backboard, "Red-Iron-Beam" is the same as a mainframe, "bar joist" is the same as a truss, "Steel-by-others" is an additional I-Beam installed by a party other than PSS, "superstructure" is the overhead piping provided by PSS for a basketball unit to attach to the building, and "backstop" is a basketball unit of any style.

(3106/3107) Front-Braced Front-Folding units are PSS' most commonly selected basketball backstop. This guide utilizes this model for most examples. As specified above, unit and superstructure may be modified to fit custom building specifications as needed. The engineering team at PSS will work with provided information to ensure that the most optimal and efficient design will be chosen for your project. Please keep in mind that designs may vary when produced, due to changes in field conditions and/or information provided.

Pages 5-8 provide an example of standard "steel by others" with various types of PSS basketball units. This document provides very basic information regarding sizes and spacing of steel. Pages 5-14 serve as examples (with proper verbiage used by PSS) in different scenarios.

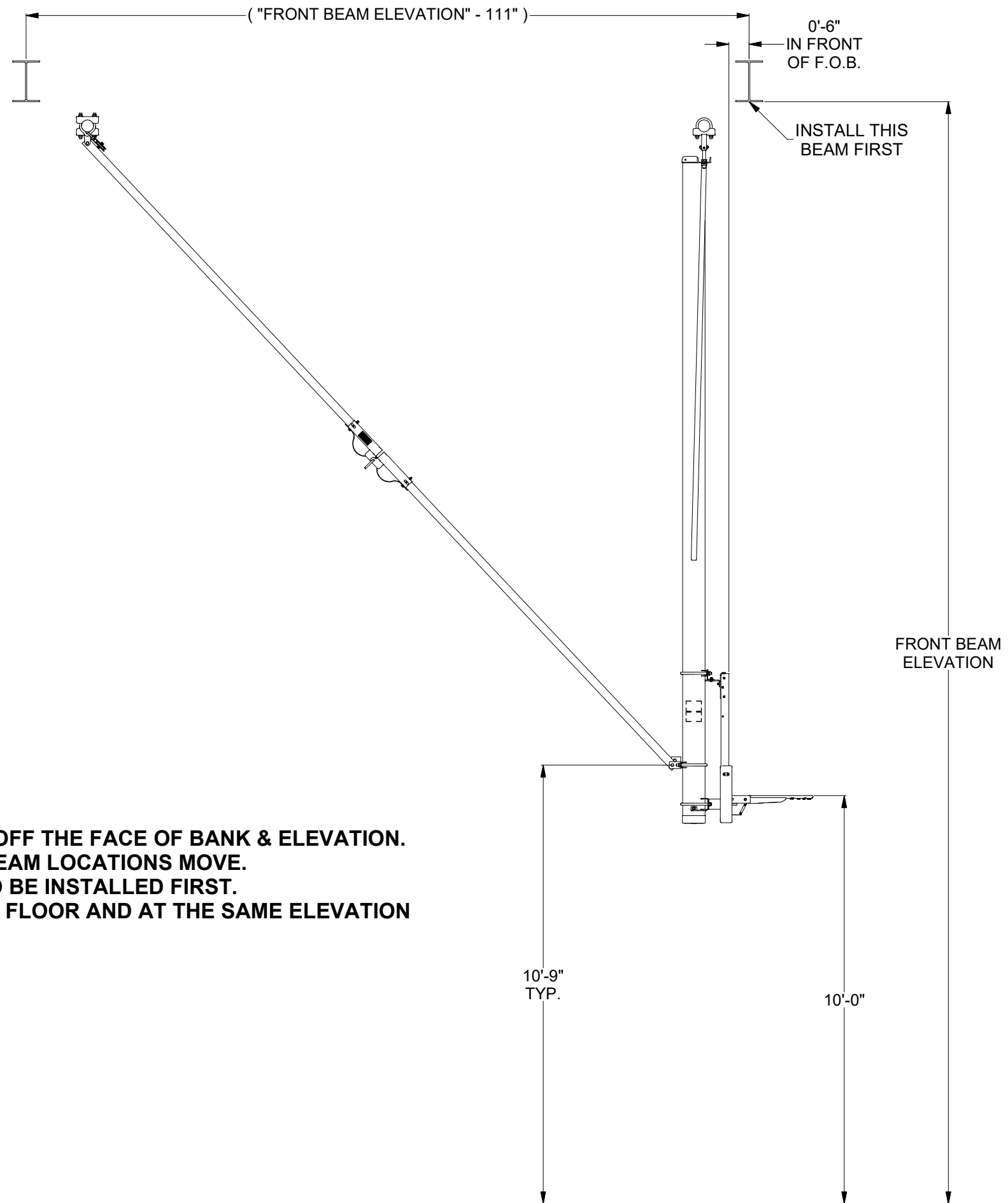
COMMON STYLES OF PSS BASKETBALL EQUIPMENT



THINGS TO KEEP IN MIND...

1. This is a permanent structure
2. The building structure must be able to support the load and forces of a basketball backstop in the down (play) and folded (stored) position. The loads provided by PSS should be reviewed by the project architect and structural engineer to verify attachment locations are structurally sound.
3. Note that design may vary when produced, due to changes in field conditions and/or information provided.
4. Supplementary steel-by-others may be required after design completion. The additional steel should be installed by a General Contractor, per PSS instruction, as specified by the architect.
5. Note the additional steel requirement for a 3102/3103 (rear-braced front-folding style unit) due to the third attachment point, in comparison to the typical two of other basketball backstop series.

ALL NOTES TYP. FOR ELEVATIONS



NOTES:

- 1.) THE EQUATION FOR THE I-BEAM LOCATIONS IS BASED OFF THE FACE OF BANK & ELEVATION.
- 2.) IF THE FACE OF BANK LOCATION MOVES, THEN THE I-BEAM LOCATIONS MOVE.
- 3.) THE I-BEAM IN FRONT OF THE FACE OF BANK NEEDS TO BE INSTALLED FIRST.
- 4.) PSS PREFERS THE I-BEAMS TO BE PARALLEL WITH THE FLOOR AND AT THE SAME ELEVATION

3104/3105 - I-BEAMS BY OTHERS

ORDER NUMBER

PROJECT NAME

DEALER NAME

DEALER ORDER NUMBER

QUOTE #

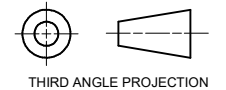
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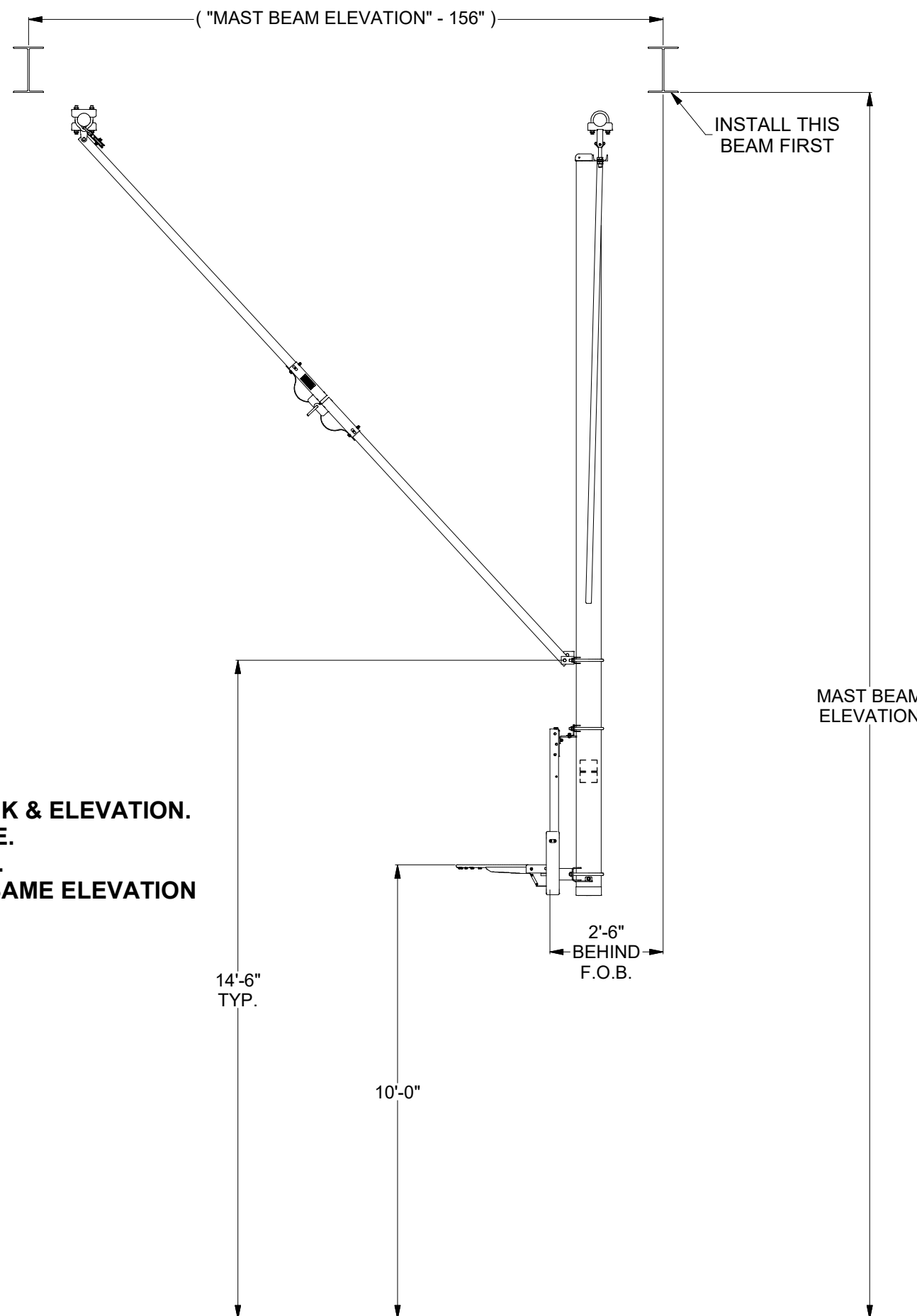
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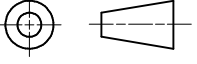
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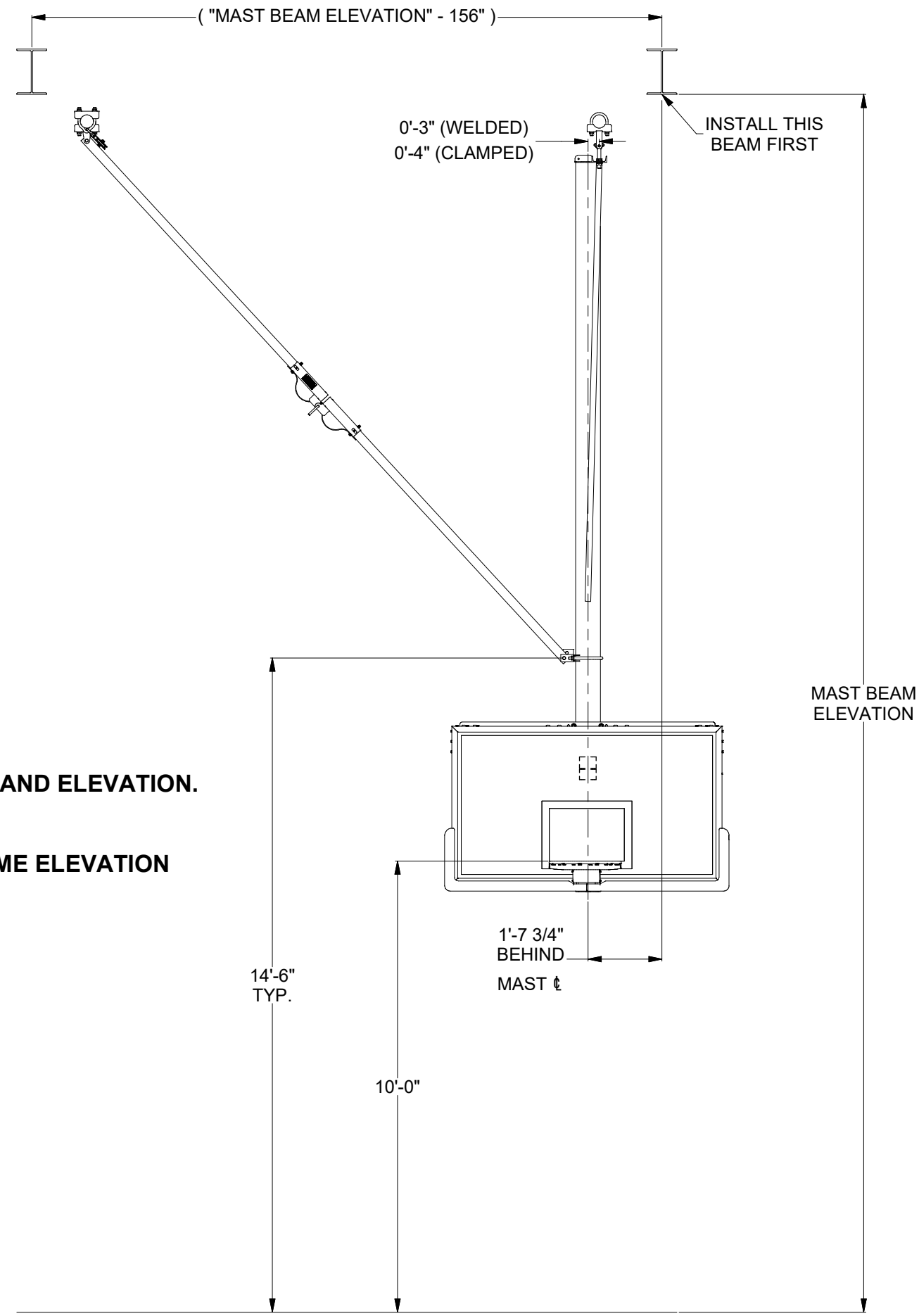
3104/3105 I-BEAM ELEVATION

FILE #



- NOTES:**
- 1.) THE EQUATION FOR THE I-BEAM LOCATIONS IS BASED OFF THE FACE OF BANK & ELEVATION.
 - 2.) IF THE FACE OF BANK LOCATION MOVES, THEN THE I-BEAM LOCATIONS MOVE.
 - 3.) THE I-BEAM IN FRONT OF THE FACE OF BANK NEEDS TO BE INSTALLED FIRST.
 - 4.) PSS PREFERS THE I-BEAMS TO BE PARALLEL WITH THE FLOOR AND AT THE SAME ELEVATION

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DEALER NAME	
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3106/3107 I-BEAM ELEVATION	
FILE #	
SHEET 6 OF 20	



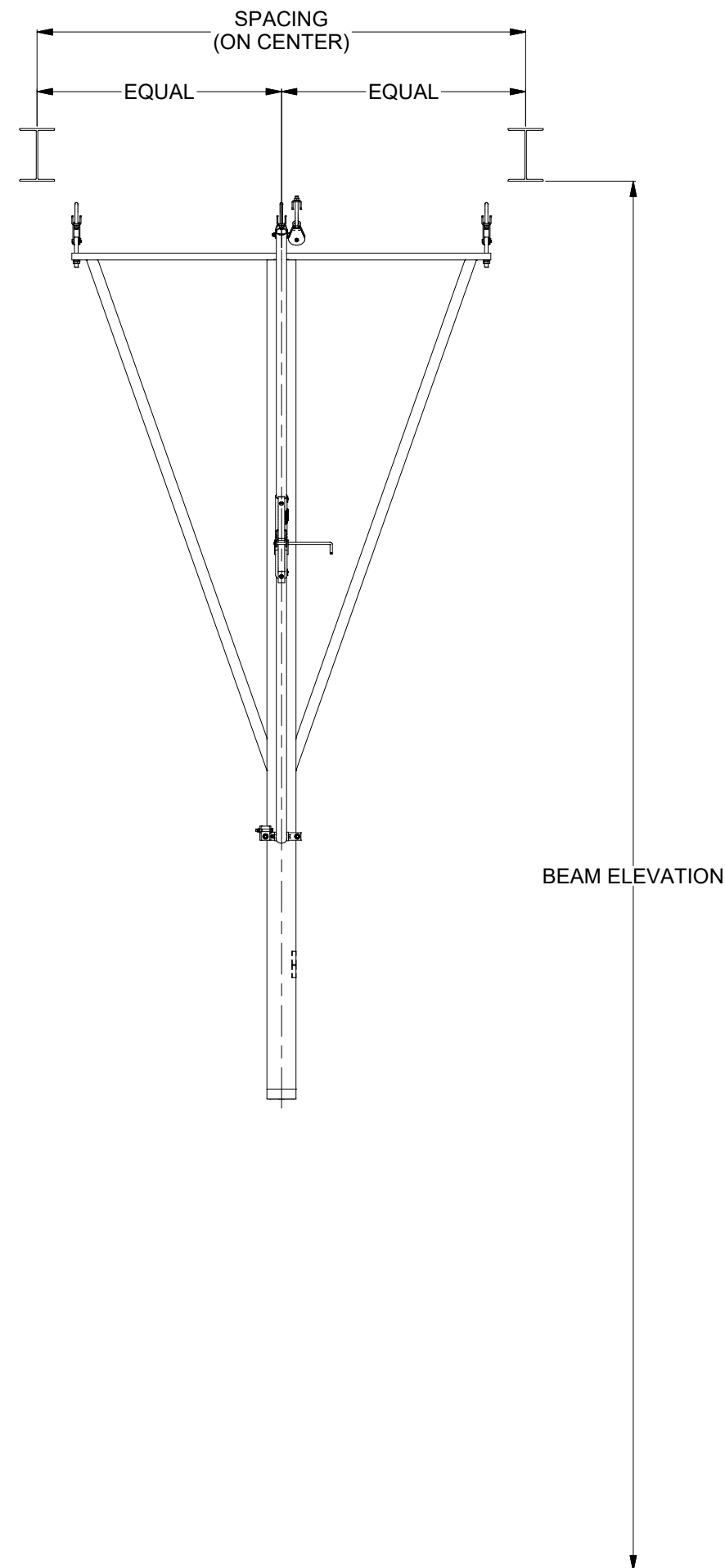
- NOTES:**
- 1.) THE EQUATION FOR THE I-BEAM LOCATIONS IS BASED OFF THE FACE OF BANK AND ELEVATION.
 - 2.) IF THE FACE OF BANK LOCATION MOVES, THEN THE I-BEAM LOCATIONS MOVE.
 - 3.) THE I-BEAM IN FRONT OF THE FACE OF BANK NEEDS TO BE INSTALLED FIRST.
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3108/3109 I-BEAM ELEVATION		
FILE #		
SHEET 7 OF 20		

BEAM ELEVATION	SPACING
BELOW 20' WELDED	78" O.C.
20'-31' WELDED	112" O.C.
30'-32' CLAMPED	148" O.C.
33'-35' CLAMPED	177" O.C.
36'-42' CLAMPED	213" O.C.

NOTES:

- 1.) THE EQUATION FOR THE I-BEAM LOCATIONS IS BASED OFF THE BEAM ELEVATION.
- 2.) IF THE FACE OF BANK LOCATION MOVES, THEN THE I-BEAM LOCATIONS MOVE.
- 3.) PSS PREFERS THE I-BEAMS TO BE PARALLEL WITH THE FLOOR AND AT THE SAME ELEVATION
- 4.) REVIEW THE CHART FOR THE REQUIRED BEAM SPACING.



ALL SINGLE MAST UNITS - I-BEAMS BY OTHERS

ORDER NUMBER

PROJECT NAME

DEALER NAME

DEALER ORDER NUMBER

QUOTE #

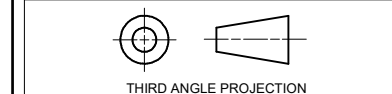
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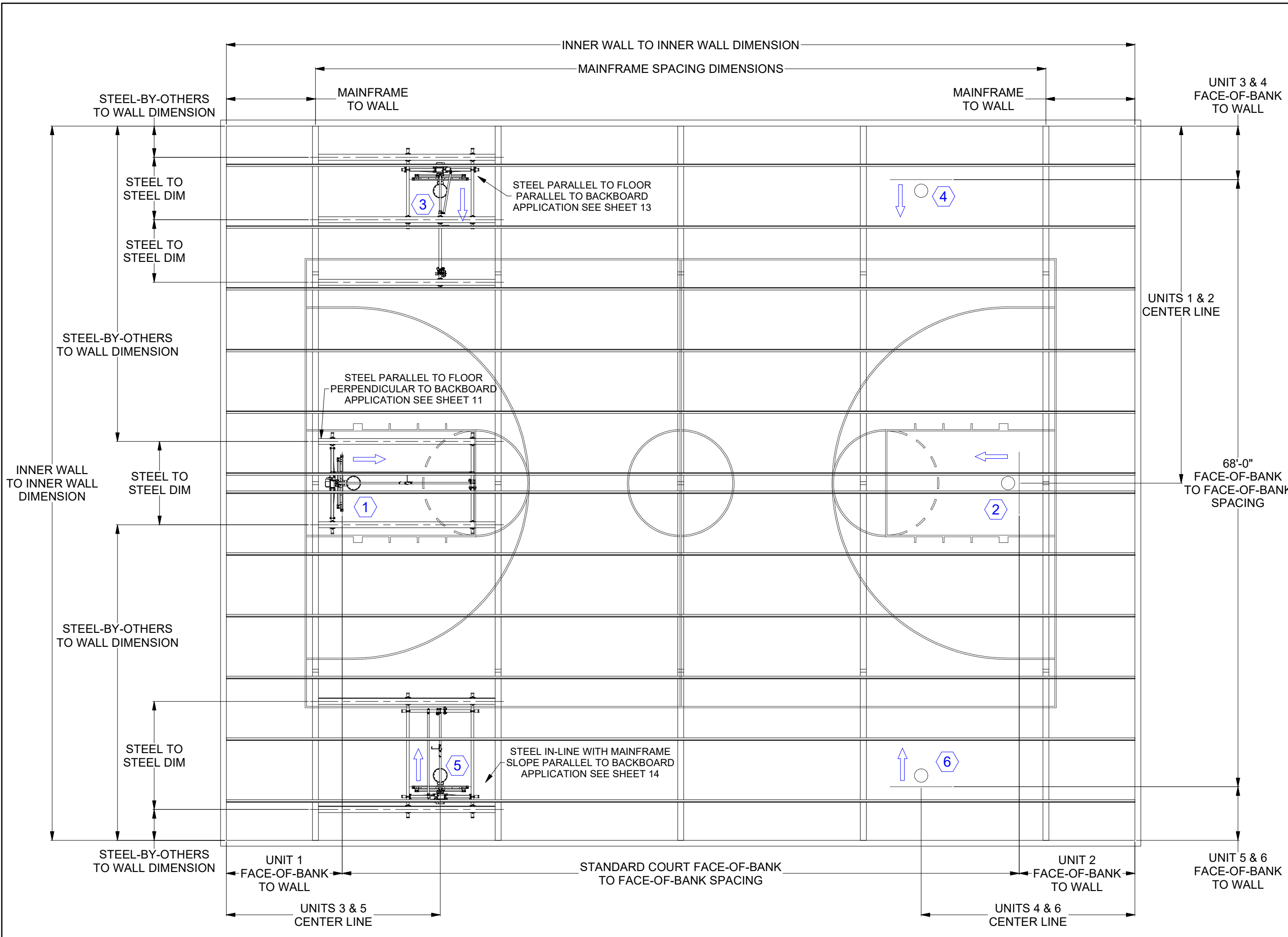
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SINGLE MAST SPACING

FILE #



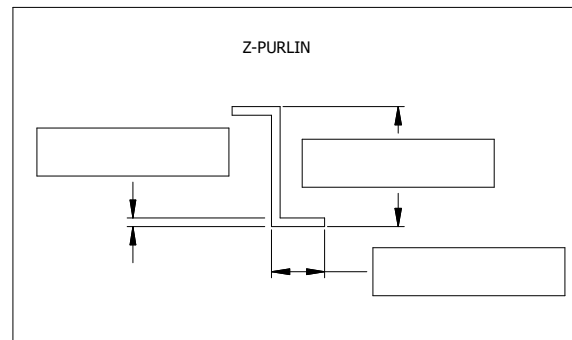
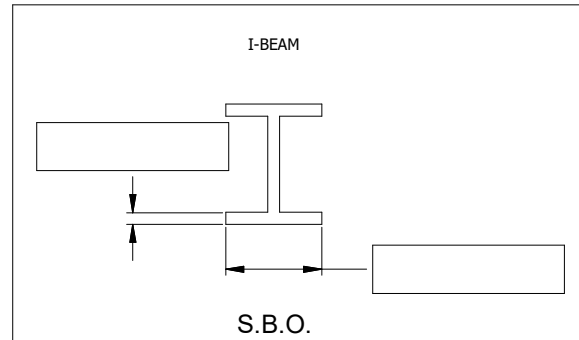
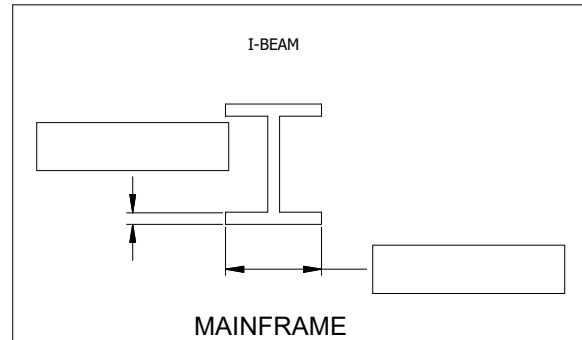
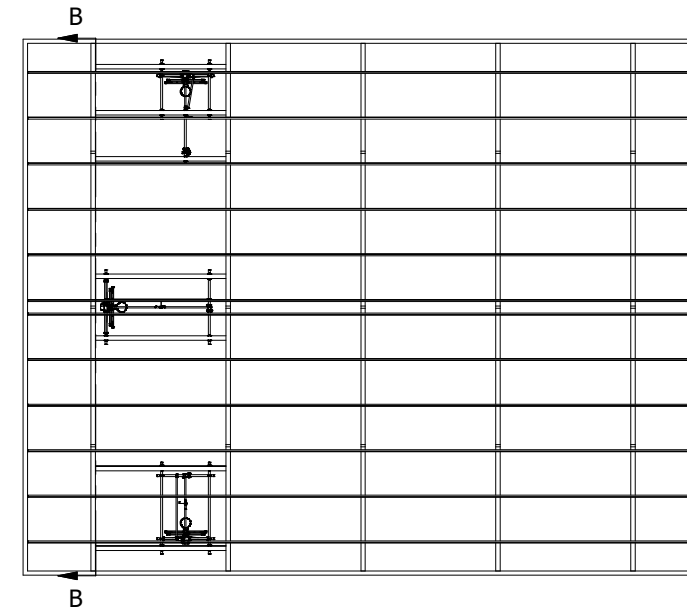
ORDER NUMBER		
PROJECT NAME		
DEALER NAME		
DEALER ORDER NUMBER		
QUOTE #		
DRAWN BY	DATE	
YEAGER	7/29/2020	
APPROVED BY	DATE	
Gared Holdings, LLC 9200 E. 146th St. Noblesville, IN 46060		
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 THIRD ANGLE PROJECTION		
 NORTH		
REV	DATE	BY
EQUIPMENT & STRUCTURAL PLAN		
FILE #		
SHEET 9 OF 20		

1. VERIFY FINISHED FLOOR THICKNESS _____
2. WALL MATERIAL AT CONNECTION HEIGHT _____
3. LIGHTS INSTALLED DURING FIELD CHECK YES NO
4. CAN THE LIGHTS BE MOVED YES NO
5. HVAC INSTALLED DURING FIELD CHECK YES NO
6. CAN THE HVAC BE MOVED YES NO
7. STEEL BY OTHER ORIENTATION FLAT SLOPED

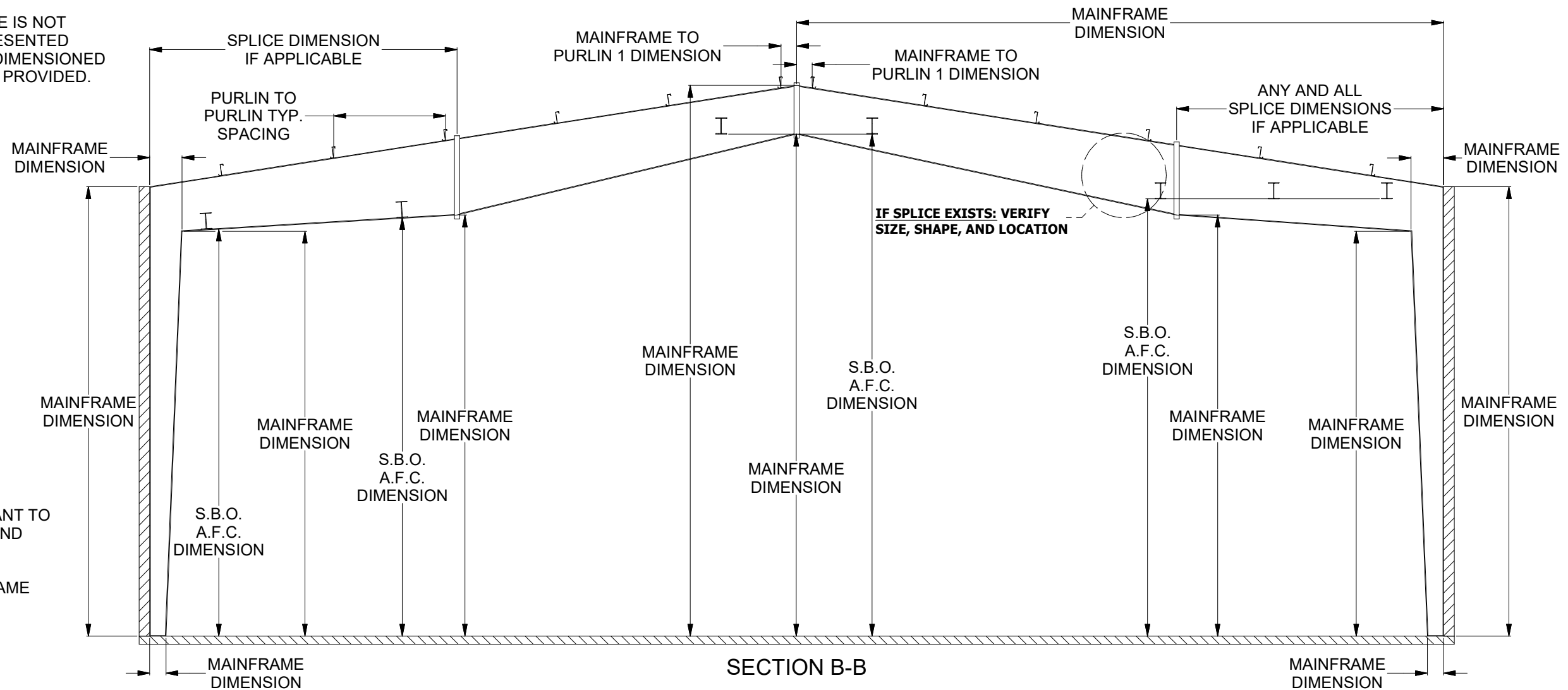
NOTES:

1.) I-BEAMS BY OTHERS MUST BE INSTALLED +/- 1" PER LOCATIONS SHOWN OR ADDITIONAL COST MAY BE REQUIRED.

PROVIDE DIMENSIONS OF BUILDING STRUCTURE. IF THESE DIMENSIONS ARE NOT SPECIFIED, STANDARD SIZE CLAMPS WILL BE USED.



NOTE: IF STRUCTURE IS NOT ACCURATELY REPRESENTED BY IMAGE, A FULLY DIMENSIONED SKETCH SHOULD BE PROVIDED.



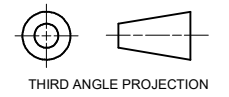
NOTE: IT IS IMPORTANT TO PROVIDE HEIGHTS AND DISTANCES TO ALL CHANGES IN PITCH ALONG THE MAINFRAME BOTTOM CHORD.

ORDER NUMBER	
PROJECT NAME	
DEALER NAME	
DEALER ORDER NUMBER	
QUOTE #	
DRAWN BY	DATE
YEAGER	7/29/2020
APPROVED BY	DATE

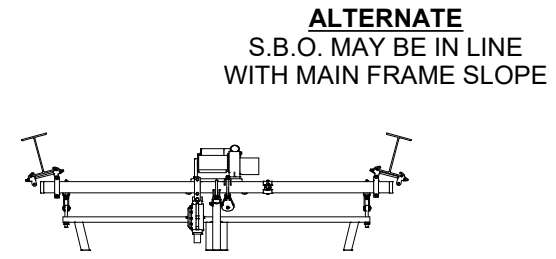
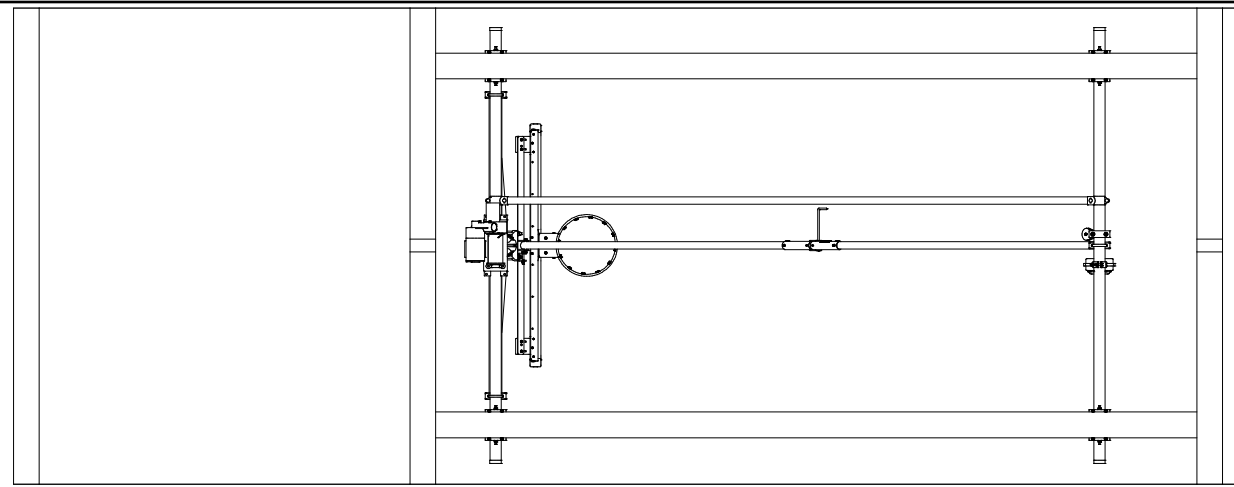
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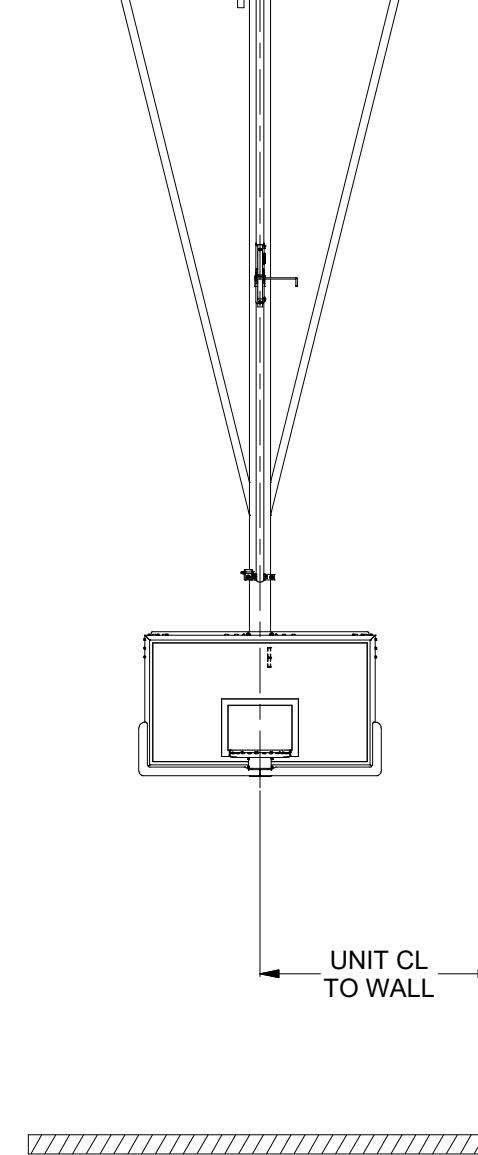
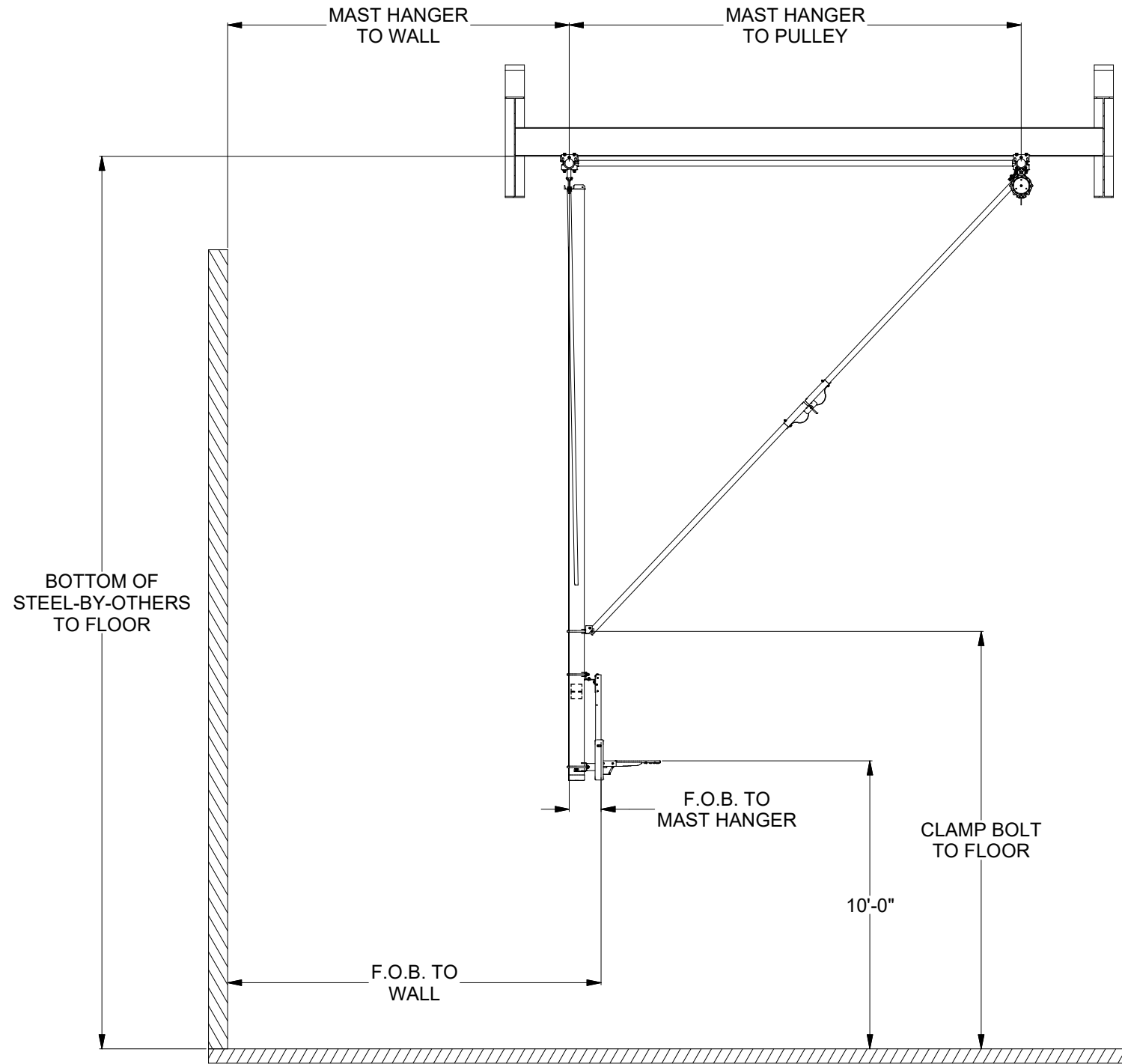
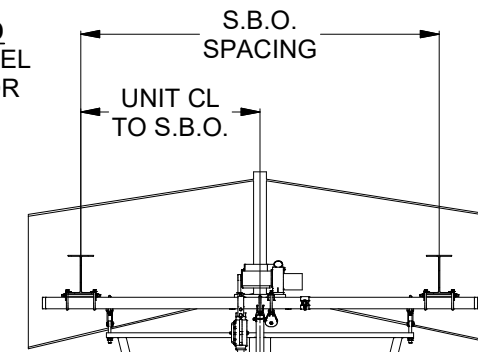
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REV	DATE	BY
STRUCTURAL ELEVATION		
FILE #		
SHEET 10 OF 20		



PREFERRED
S.B.O. PARALLEL
TO THE FLOOR



FLAT & LEVEL STEEL-BY-OTHERS
STEEL PERPENDICULAR TO BACKBOARD

ORDER NUMBER

PROJECT NAME

DEALER NAME

DEALER ORDER NUMBER

QUOTE #

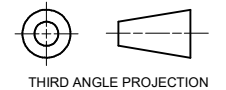
DRAWN BY	DATE
YEAGER	7/29/2020

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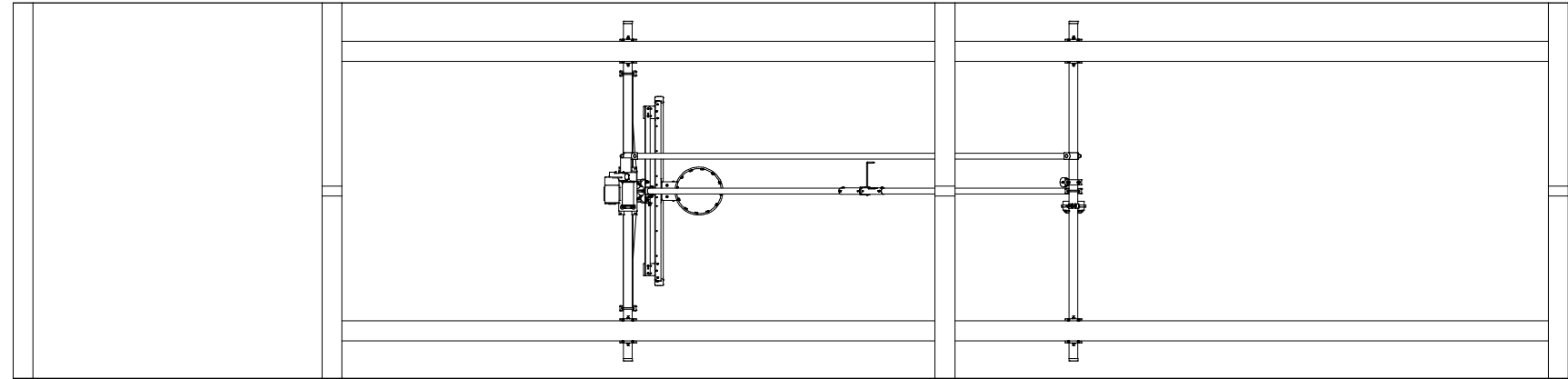
REV	DATE	BY

UNIT ELEVATION

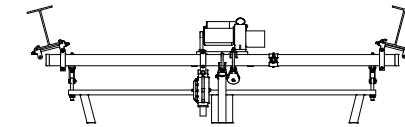
FILE #

THIS SHEET NOT REQUIRED FOR FIELD CHECK

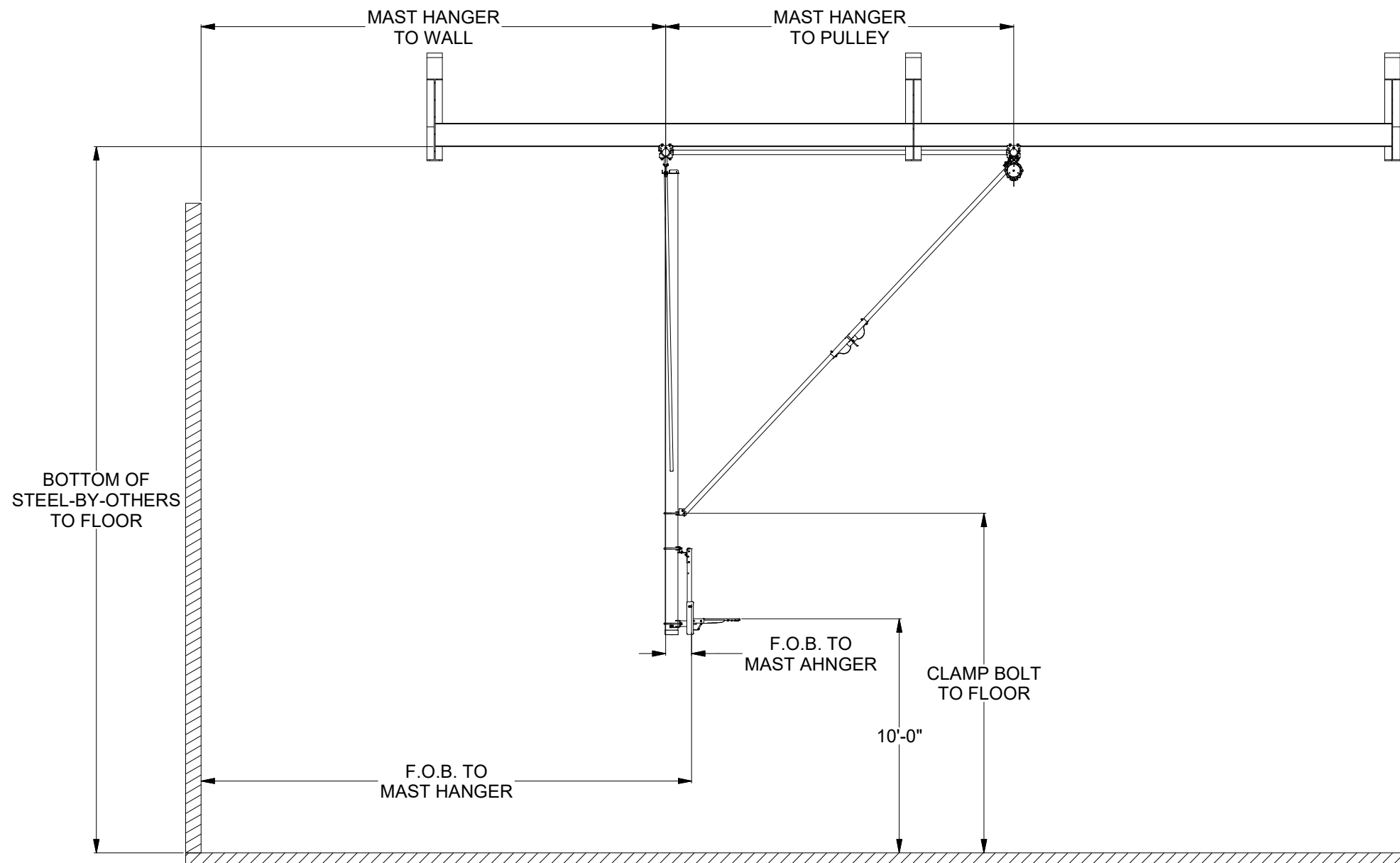
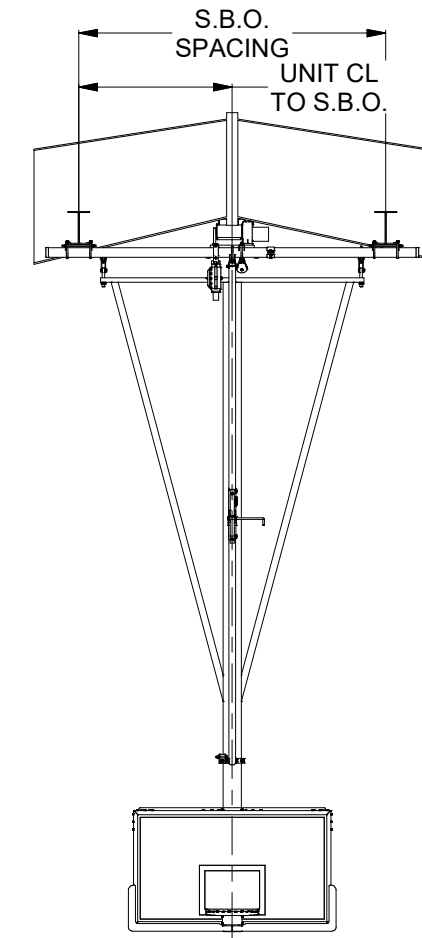
- NOTES:**
 1) SEE EQUIPMENT LIST ON PARTS COVER PAGE.
 2) VERIFY ANY OBSTRUCTIONS TO ATTACHMENT POINTS.



ALTERNATE
 S.B.O. MAY BE IN LINE
 WITH MAIN FRAME SLOPE



PREFERRED
 S.B.O. PARALLEL
 TO THE FLOOR



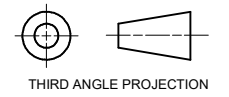
**FLAT & LEVEL STEEL-BY-OTHERS
 STEEL PERPENDICULAR TO BACKBOARD**

ORDER NUMBER	
PROJECT NAME	
DEALER NAME	
DEALER ORDER NUMBER	
QUOTE #	
DRAWN BY	DATE
YEAGER	7/29/2020
APPROVED BY	DATE

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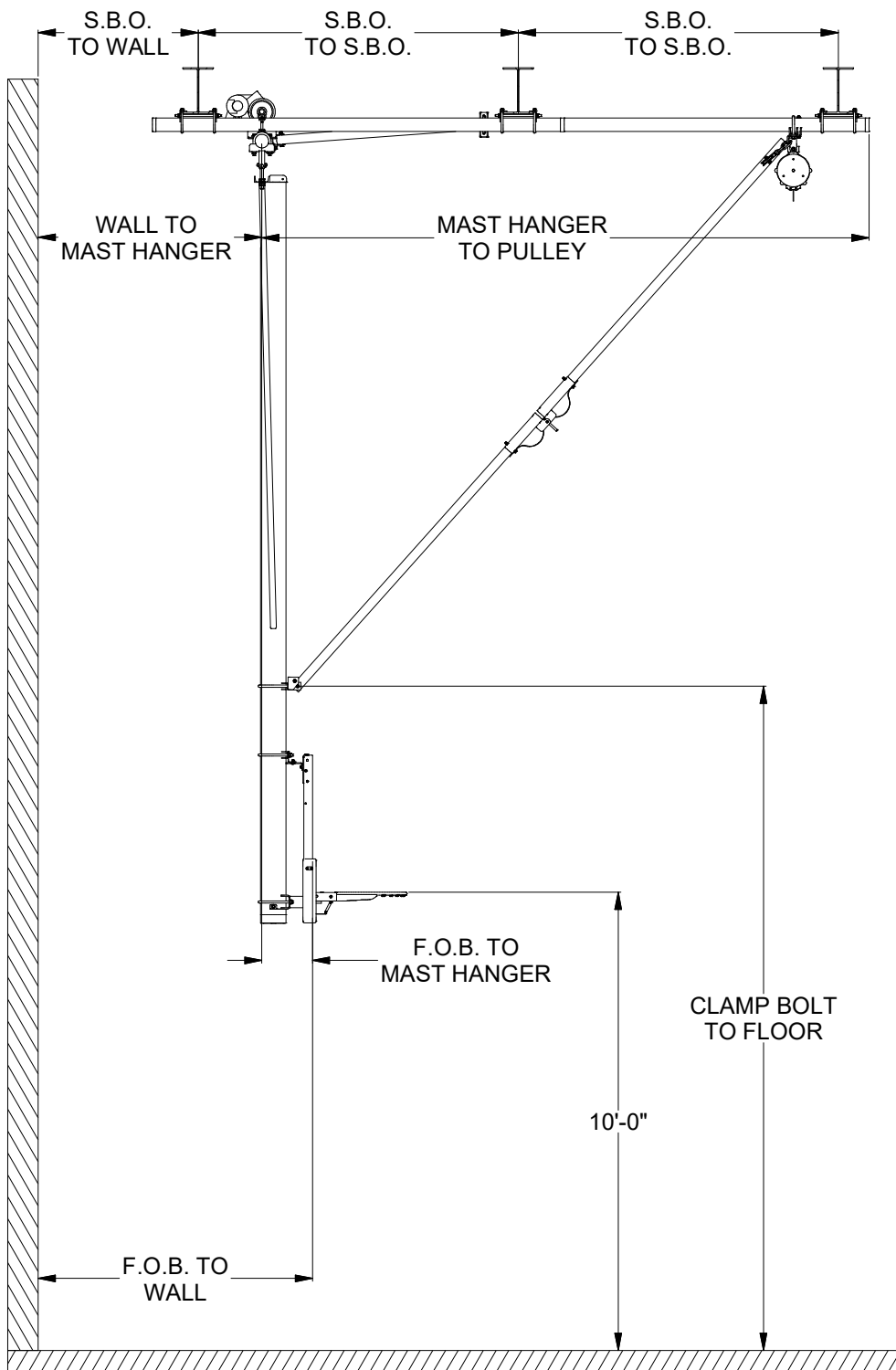
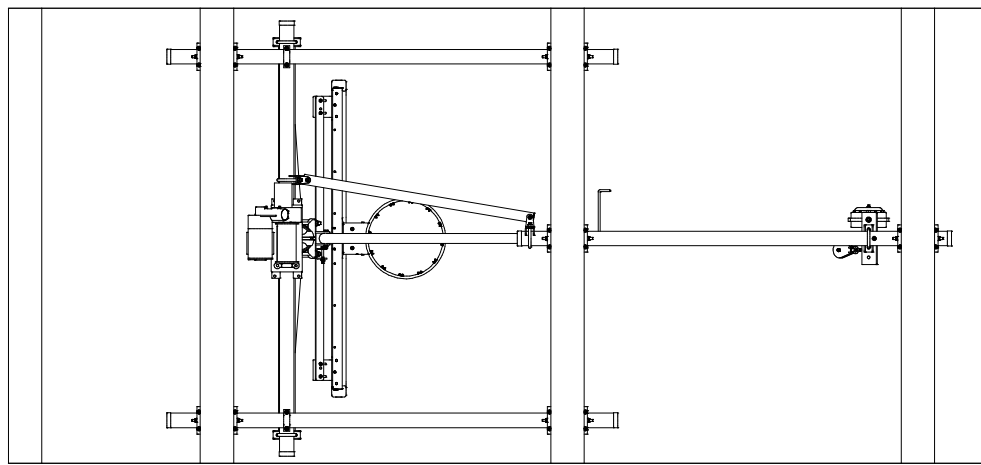
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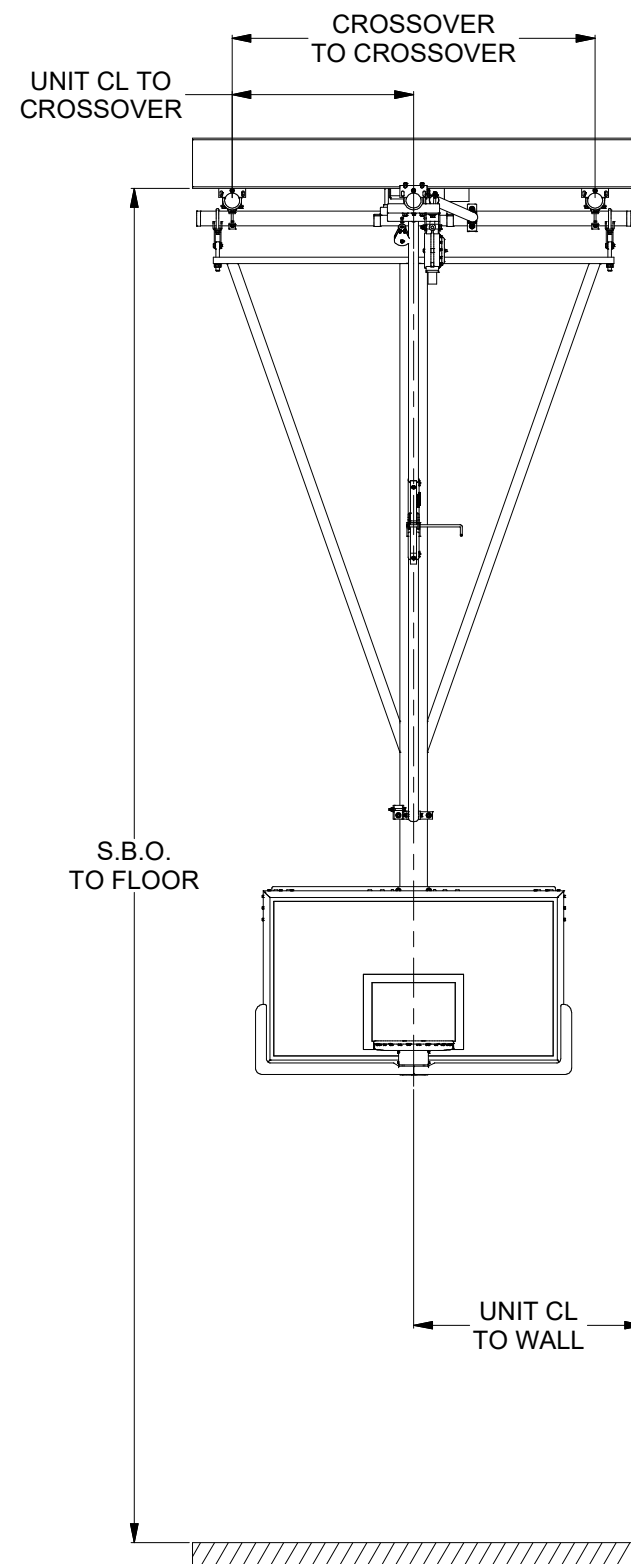


**SHEET NOT REQUIRED
 FOR FIELD CHECK**

REV	DATE	BY
UNIT ELEVATION		
FILE #		
SHEET 12 OF 20		



**FLAT & LEVEL STEEL-BY-OTHERS
STEEL PARALLEL TO BACKBOARD**



ORDER NUMBER

PROJECT NAME

DEALER NAME

DEALER ORDER NUMBER

QUOTE #

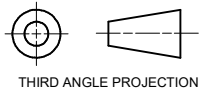
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YEAGER	7/29/2020

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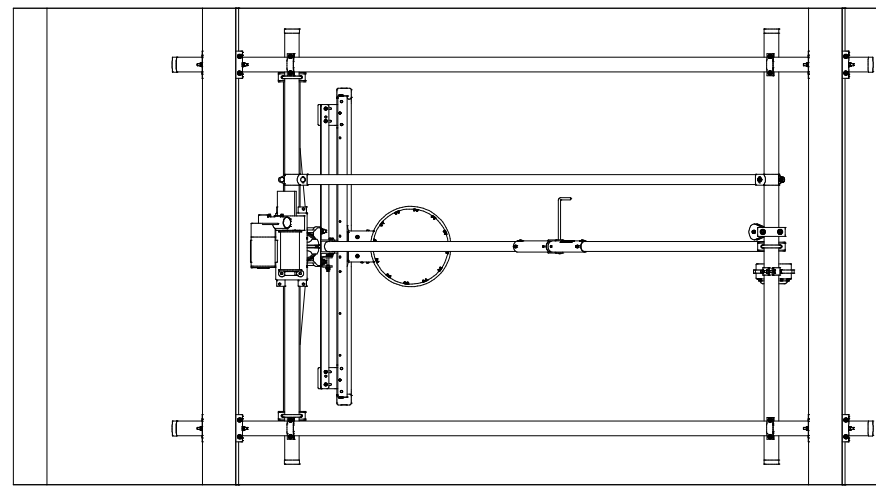
THIRD ANGLE PROJECTION

REV	DATE	BY
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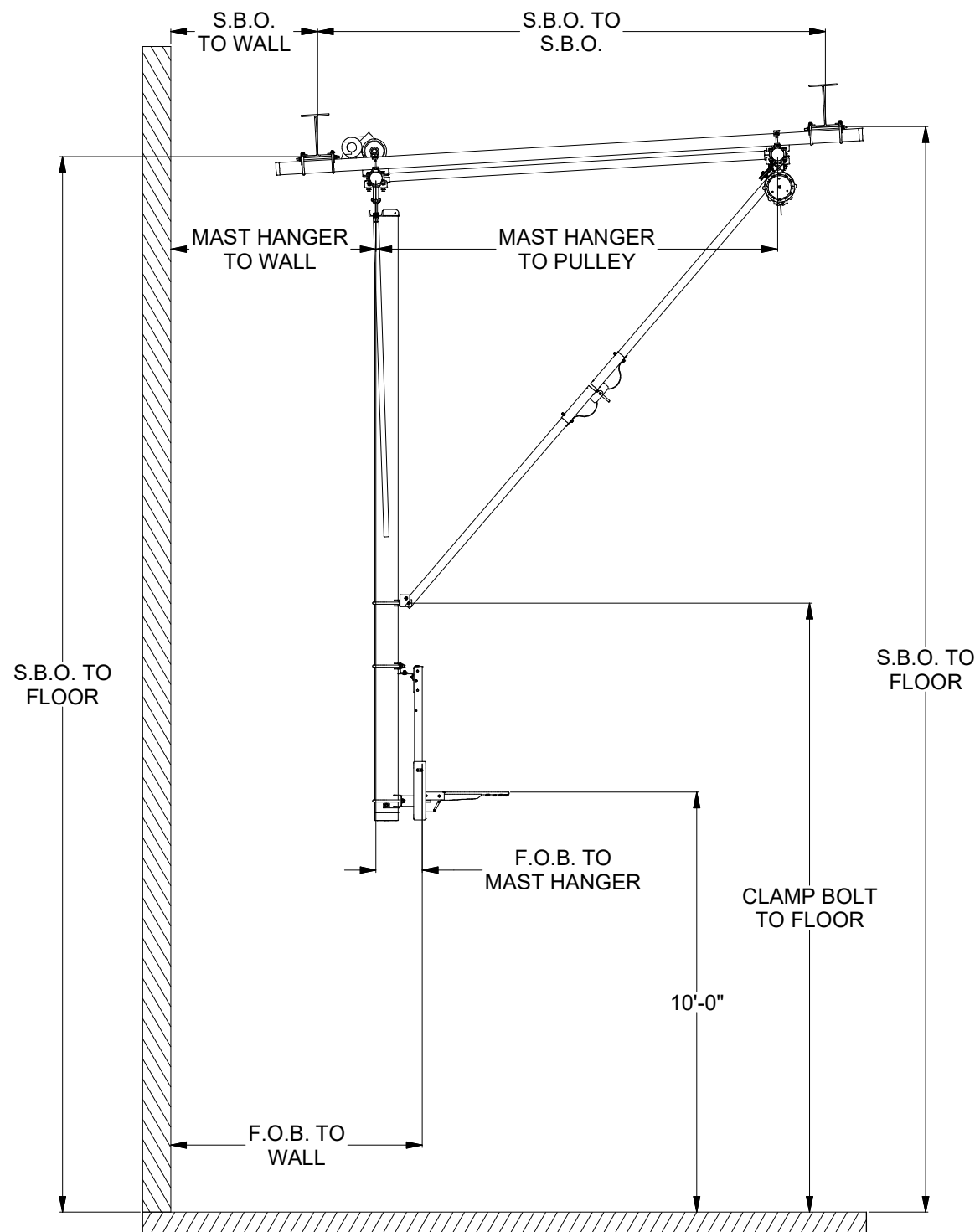
UNIT ELEVATION

FILE #

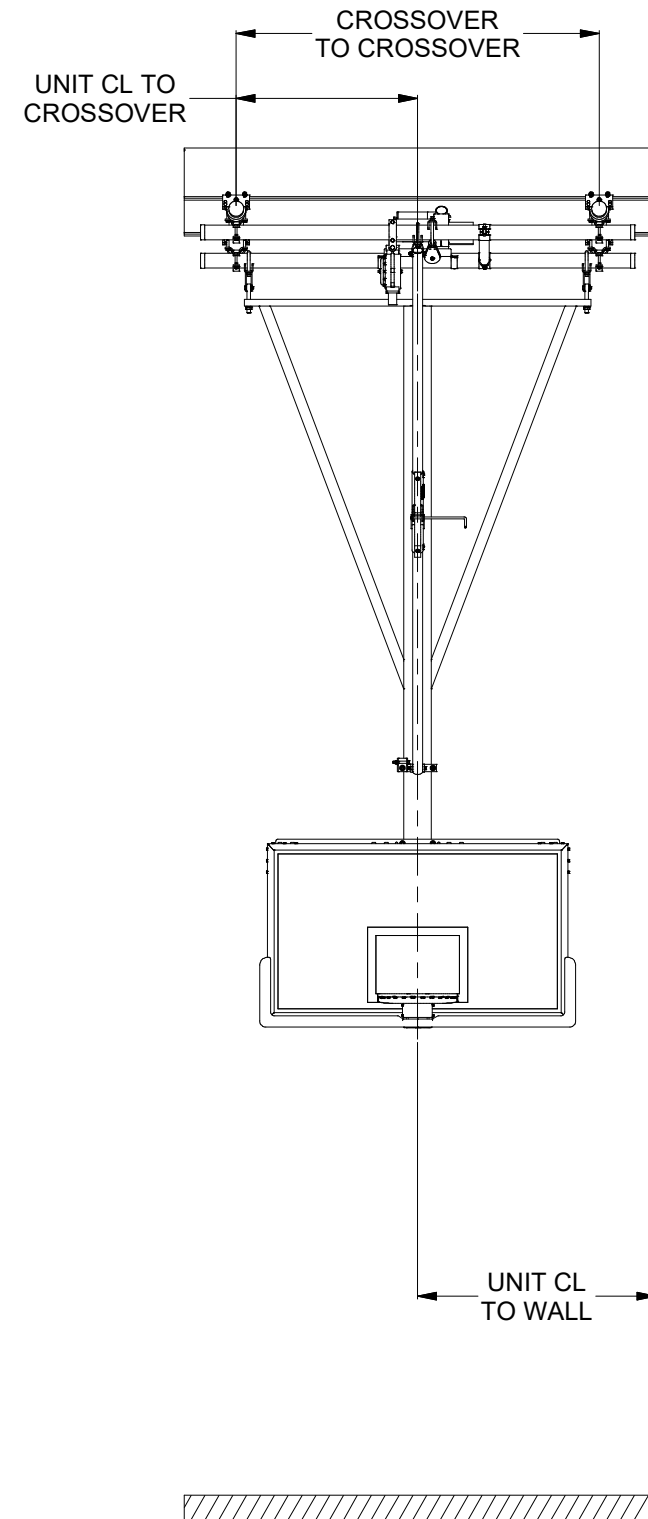
SHEET 13 OF 20



NOTE: SINGLE PULL-UP STRUCTURE ONLY AVAILABLE ON FLAT S.B.O. SITUATIONS, SEE SHEET 13. ANY INCLINE OR DECLINE IN S.B.O. WILL NEED THIS STYLE OVERHEAD STRUCTURAL ATTACHMENT METHOD TO ALLOW PROPER FOLD.



**SLOPED STEEL-BY-OTHERS
STEEL PARALLEL TO BACKBOARD**

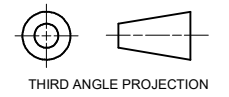


ORDER NUMBER	
PROJECT NAME	
DEALER NAME	
DEALER ORDER NUMBER	
QUOTE #	
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YEAGER	7/29/2020
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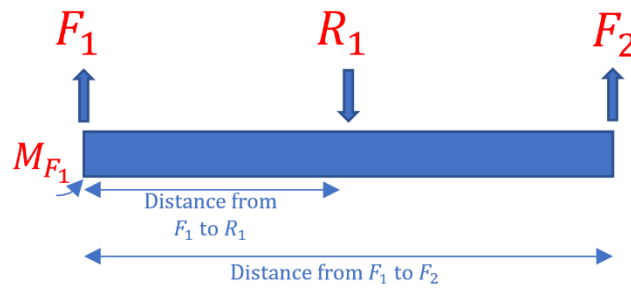


REV	DATE	BY
UNIT ELEVATION		
FILE #		
SHEET 14 OF 20		

Standard Unit Loads & Point Load Calculations

PSS offers generic loads for each basketball backstop series dependent on unit height. These load calculation sheets add an additional 300 to 480 pounds scaled over increased height increments to account for overhead superstructure and accessories. The calculations change from welded to clamped basketball backstops styles. A welded unit typically is used for truss heights up to 32'-0" and a clamped unit allows for heights above this threshold; however, clamped units are available within the welded height limitations as well. These generic loads are simply the overall load of the basketball backstop structure in its entirety, while a point load is the exact weight at each point of contact with the building structure. (i.e. how much weight is being applied per beam clamp, specific to the basketball backstop design). PSS Engineers can provide specific point load calculations upon request.

For this point load calculation example, a Front-Braced Front-Folding basketball unit (3107 Series) are used with a truss height of 31'-0" based upon the Flat & Level Steel-by-Others with Steel Perpendicular to Backboard (example from Sheet 11) and is shown on Sheet 17. The generic load calculations used are provided on Sheet 30. The loads calculated on this sheet are for the total loads from the hanging structure, spread among the mast hangers or pulley. In this example, static loads are shown for the mast at the center of mass location. There are alternative options for static vs dynamic loads, as well as down vs folded positions. This can be found under 'combined loads' in the table on the generic load sheet.



The above diagram illustrates the loads on the mast as shown on Sheet 17. R_1 is the reaction force taken from the generic load calculation sheet acting at the center of mass along the pipe from both mast hangers. F_1 and F_2 denote the forces acting upon the truss from the mast (point loads) at beam attachments. In order to determine these loads, we need two equations.

Step 1: The first equation is used to determine one of the two load/force values. Summation of the Forces in the Y Direction.

$$\text{Sum of Forces} = 0 = F_1 - R_1 + F_2$$

Step 2: The second equation is used to determine the second of the two load/force values. Summation of the Moments taken around the point where F_1 is acting.

$$\text{Sum of Moments about } F_1 = 0 = (F_1)(0) - (R_1)(\text{Distance from } F_1 \text{ to } R_1) + (F_2)(\text{Distance from } F_1 \text{ to } F_2)$$

Step 3: Solve for F_2 from the Sum of Moments (equation 2) because F_1 will be eliminated from the equation, resulting with a solution to one of the unknown loads/forces.

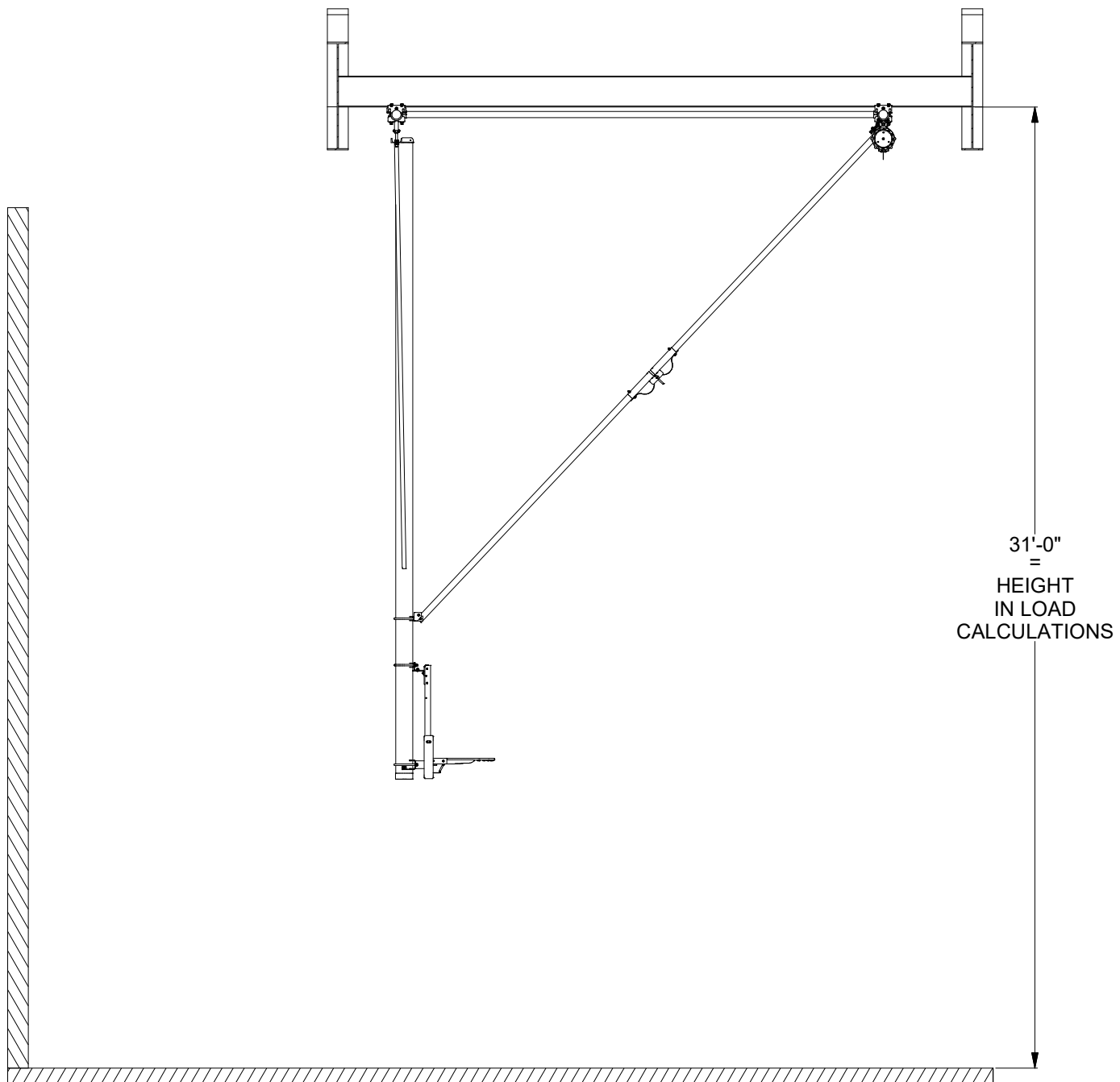
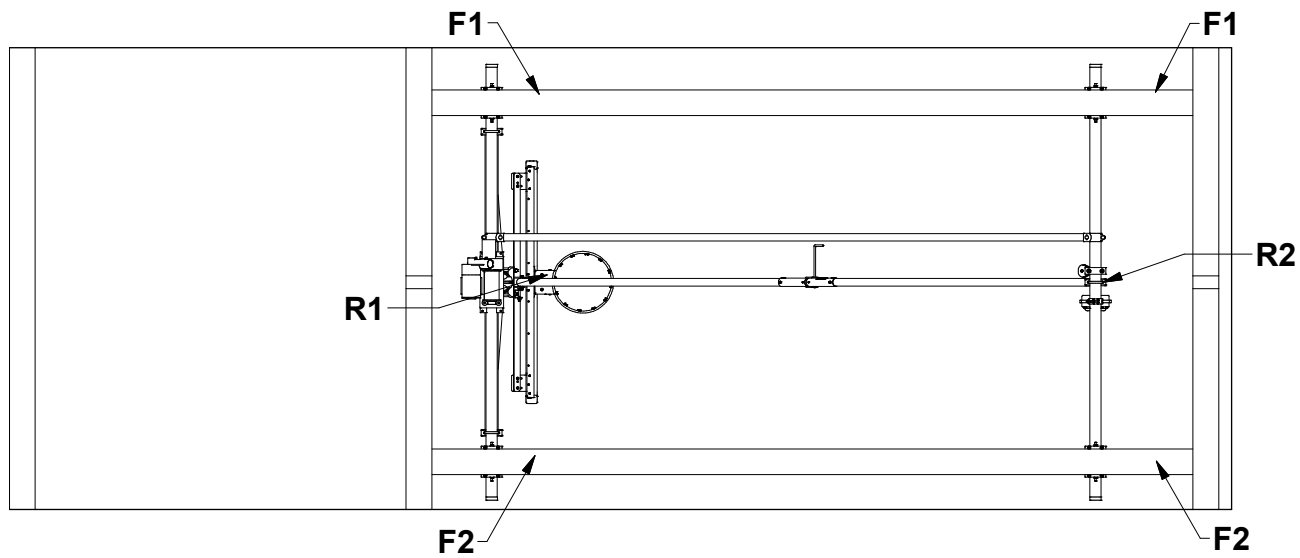
$$\text{Sum of Moments about } F_1 = 0 = (F_1)(0) - (888\text{lbs})(56\text{inches}) + (F_2)(112\text{inches})$$

$$F_2 = \frac{(888\text{lbs})(56\text{inches})}{(112\text{inches})} \quad F_2 = 444\text{lbs}$$

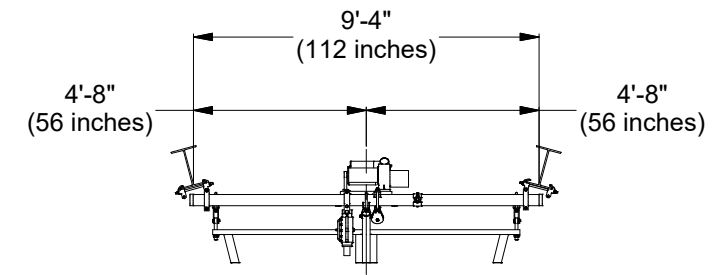
Step 4: Solving for F_1 from the Sum of Forces equation now that F_2 is a known value.

$$F_1 = 888\text{lbs} - F_2 \quad F_1 = 888\text{lbs} - 444\text{lbs} \quad F_1 = 444\text{lbs}$$

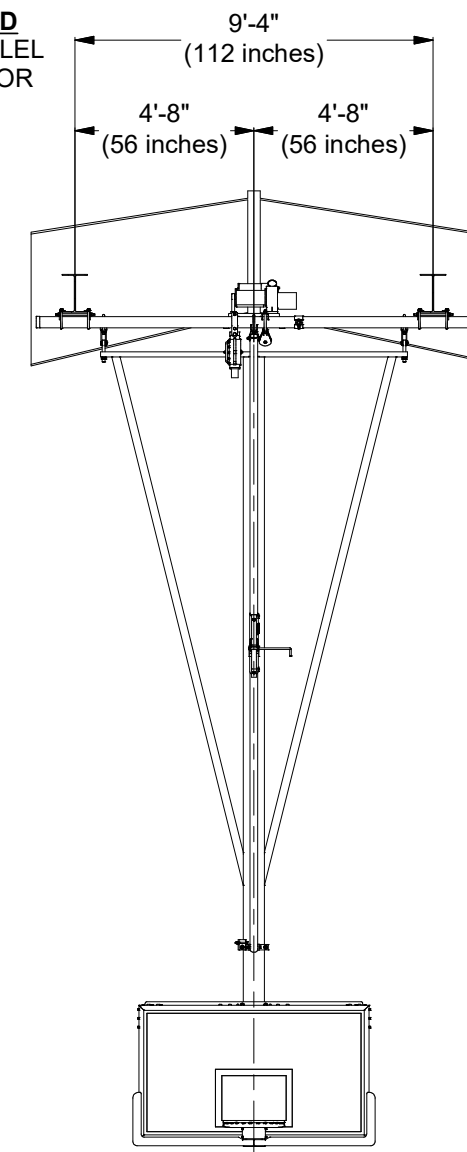
The alternatives scenario loads can be utilized in the same way; the mast vs pulley, a non-centered situation, static vs dynamic, folded or down position, or any other combination of series and height scenarios.



ALTERNATE
S.B.O. MAY BE IN LINE
WITH MAIN FRAME SLOPE



PREFERRED
S.B.O. PARALLEL
TO THE FLOOR

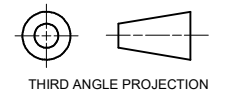


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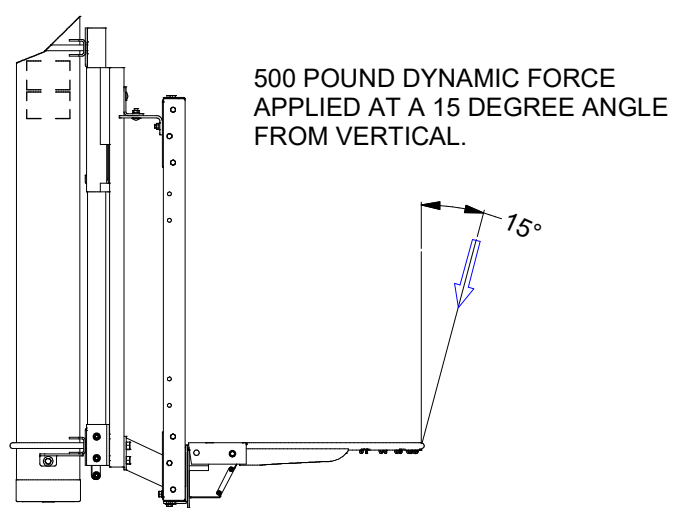
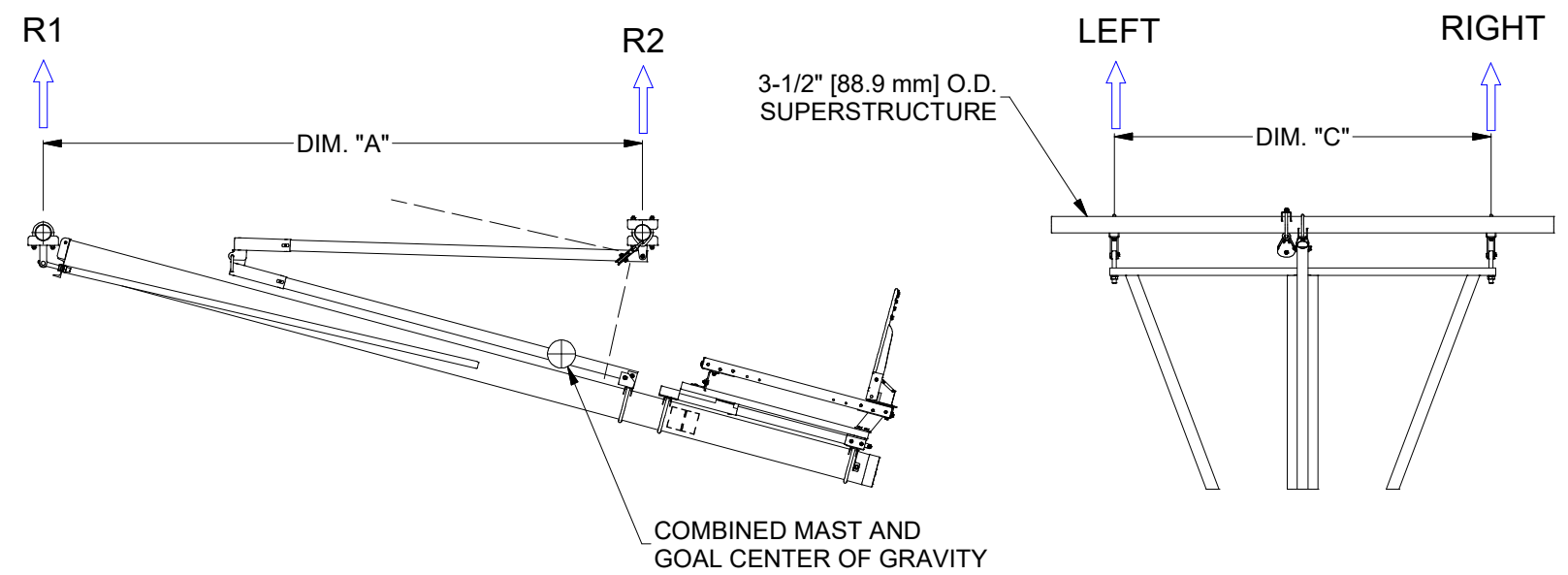
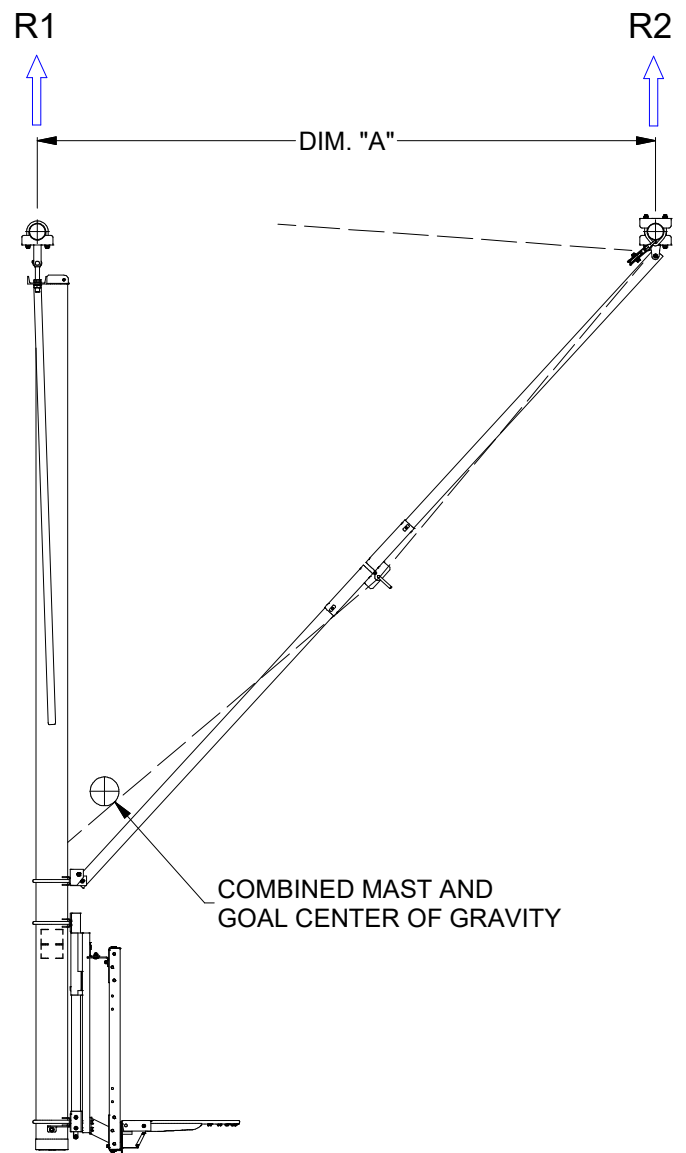
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REV	DATE	BY
3107 DIMENSIONS FOR LOADS		
FILE #		
SHEET 17 OF 20		



NOTE: DYNAMIC FORCES ARE ESTIMATED RESULTANTS OF FORCES APPLIED BY A 300 POUND PLAYER EXECUTING A SLAM DUNK AND HANGING FROM THE RIM.

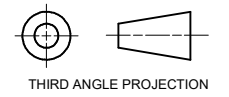
TRUSS HEIGHT (FT)	31 Ft - 0 In		ABOVE FINISHED FLOOR		THE COMBINED LOADS REPRESENT THE TOTAL INSTALLATION LOADS AND ARE COMPRISED OF THE BACKSTOP ONLY LOADS PLUS THE SUPERSTRUCTURE AND ACCESSORIES LOADS											
DIMENSION "A"	15' - 9"															
DIMENSION "C"	7' - 10"															
STATIC REACTION LOADS Version 8.1																
BACKSTOP UNIT ONLY							SUPERSTRUCTURE AND ACCESSORIES			COMBINED LOADS						
DOWN POSITION							FOLDED POSITION			DOWN POSITION			FOLDED POSITION			
	TOTAL	LEFT	RIGHT	TOTAL	LEFT	RIGHT	TOTAL	LEFT	RIGHT	TOTAL	LEFT	RIGHT	TOTAL	LEFT	RIGHT	
R1 (Lbs)	648	324	324	140	70	70	240	120	120	888	444	444	380	190	190	
R2 (Lbs)	97	48	48	604	302	302	240	120	120	337	168	168	844	422	422	
HOIST CABLE PULL (Lbs)	0			625												
TOTAL LOADS INCLUDING STATIC & DYNAMIC																
DOWN POSITION							FOLDED POSITION			SUPERSTRUCTURE AND ACCESSORIES			COMBINED LOADS			
	TOTAL	LEFT	RIGHT	TOTAL	LEFT	RIGHT	TOTAL	LEFT	RIGHT	TOTAL	LEFT	RIGHT	TOTAL	LEFT	RIGHT	
R1 (Lbs)	880	440	440				240	120	120	1120	560	560				
R2 (Lbs)	347	174	174				240	120	120	587	294	294				
STATIC WEIGHTS & CG																
DOWN POSITION							FOLDED POSITION			SUPERSTRUCTURE AND ACCESSORIES						
	WEIGHT (Lbs)	"X" DIM (in)	"Y" DIM (in)	"X" DIM (in)	"Y" DIM (in)		WEIGHT (Lbs)	"X" DIM (in)	"Y" DIM (in)							
COMBINED MAST, GOAL, & BACKBOARD	690	9.43	164.35	161.19	33.43		STRUCTURE AND ACCESSORIES	480	94.47	1.75						
MAST SIDE BRACE	28	67.43	114.00	52.13	-2.88											
SUPPORT SIDE BRACE	27	127.15	70.50	56.06	-3.44											
TOTAL	744															

ORDER NUMBER
PROJECT NAME
DEALER NAME
DEALER ORDER NUMBER
QUOTE #
DRAWN BY: YEAGER DATE: 7/29/2020
APPROVED BY: DATE:



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NOTE: Gared Holdings, LLC (Performance Sports Systems & Gared Sports) assumes no responsibility for the design integrity of the building structure.

MODEL 3106 OR MODEL 3107

REV	DATE	BY
-----	------	----

LOAD CALCULATION

FILE #



Gared Holdings, LLC
9200 East 146th Street, Suite A
Noblesville, Indiana 46060
317-774-9840

August 26,2020

Subject: Overhead Support Structure

Performance Sports Systems is committed to the safety and reliability of all equipment we supply. In the interest of safety and reliability, we design our connecting clamps to the highest standards, test them in house, and continually review their performance. We understand the needs of our customers and dealers to have these same clamps tested by independent labs to validate our findings and provide unbiased and documented results. In order to address those needs we have hired an independent laboratory with multiple accreditations to test the clamps used in our overhead structure. The testing performed validates, and confirms, the structural integrity of clamps we offer.

These results are as follows (see next page for clamp illustration):

- Beam Clamp assemblies exhibited failure at loads exceeding 24,850 lbs.
- Extended Swing Hanger assemblies exhibited failure at loads exceeding 16,850 lbs.
- Swing Hanger assemblies, Travel Hinge assemblies, and Swing Hinge assemblies exhibited failure at loads exceeding 14,450 lbs.
- Purlin Attachment assemblies exhibited failure at loads exceeding 11,750 lbs.
- Mast Hinge assemblies exhibited failure at loads exceeding 10,850 lbs.
- Travel Ring assemblies exhibited failure at loads exceeding 10,050 lbs.
- Swivel Beam Clamp assemblies exhibited failure at loads exceeding 7,550 lbs.

Specific failure loads of specific part numbers are available upon request.

Upon request these loads can be applied to calculate safety factors in our assemblies of 50:1 for structural frame hangers, and 60:1 for structure support fittings during the design process.

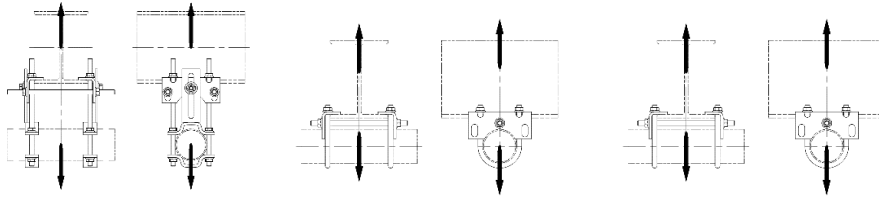
Sincerely,

A handwritten signature in black ink, appearing to read "Matt Phelps", is written over a light blue horizontal line.

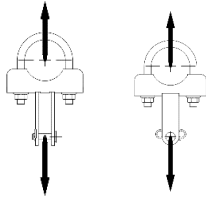
Matt Phelps

Mechanical Engineer, New Product Development
Gared Holdings LLC
9200 E 146th Street Ste. A
Noblesville, IN 46060
mphelps@garedholdings.com

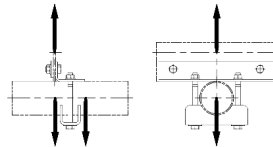
Beam Clamp Assemblies:



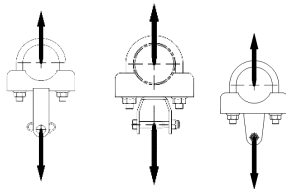
Extended Swing Hanger assemblies:



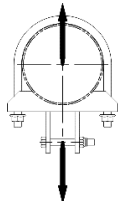
Purlin Attachment assembly:



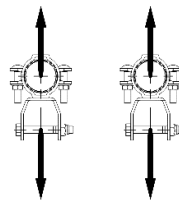
Swing Hanger assemblies, Travel Hinge assemblies, and Swing Hinge assemblies:



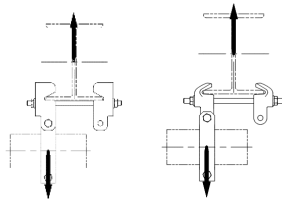
Mast Hinge assembly:



Travel Ring assembly:



Swivel Beam Clamp assemblies:



KEY NOTES:

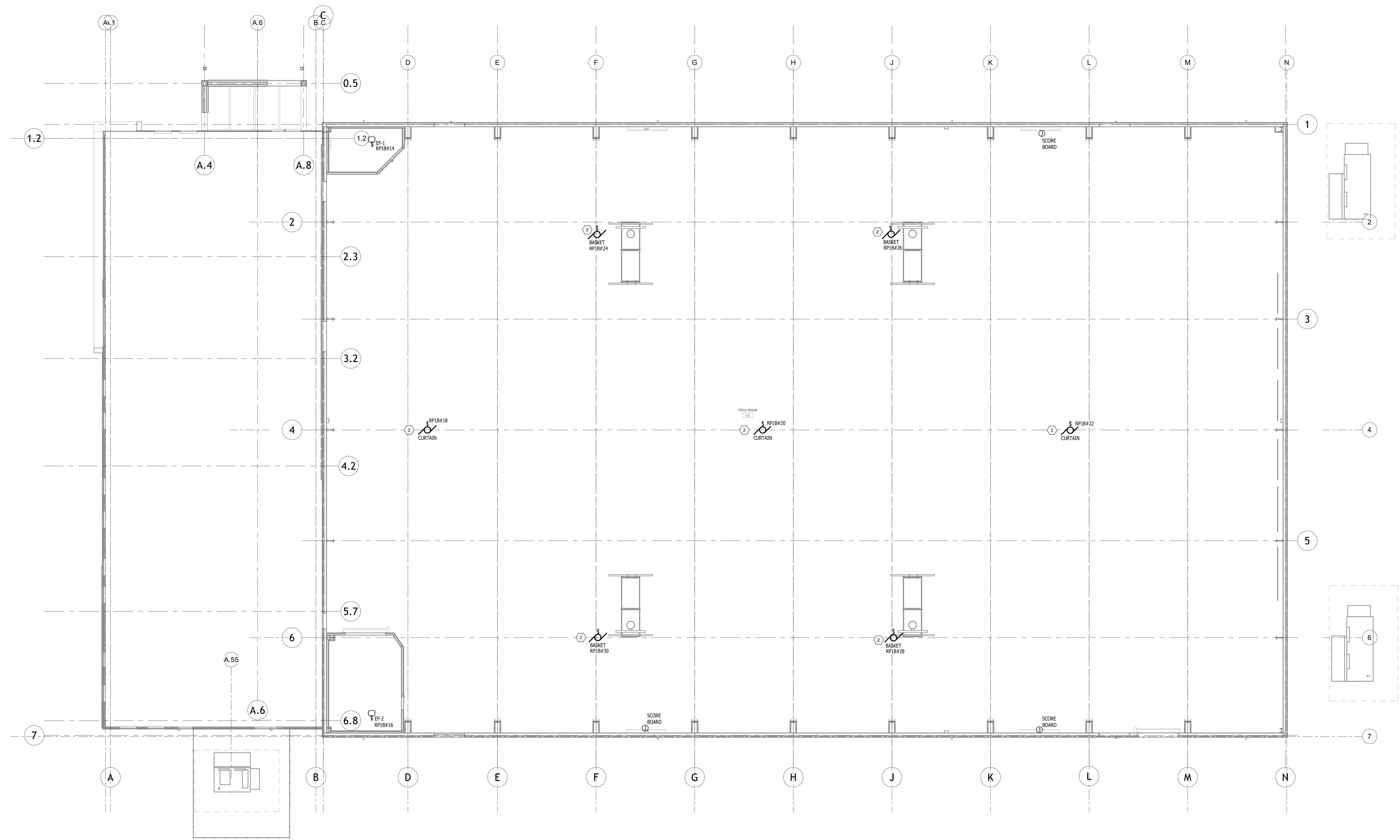
2 MOTOR RATED DISCONNECT SWITCH FOR CEILING EQUIPMENT. COORDINATE RATING WITH EQUIPMENT SELECTION AND MANUFACTURER REQUIREMENTS.

THE COLLABORATIVE

MEP CONSULTING ENGINEER



491 E. WRIGHT AVE.
SHEPHERD, MI 48883
(PH) 989-567-1100
info@KTSEngineeringGroup.com
KTS PROJECT NO. 24-0219



PROJECT TITLE
OSCODA AREA SCHOOLS

NEW COMMUNITY CENTER

3550 E River Rd
Oscoda, MI 48750

12/18/2024 CD / BID

TC JOB NO. 107167
OWNER JOB NO.

SHEET TITLE
ELECTRICAL CLERESTORY PLAN - POWER

SHEET NO.
E1.02

RFI detail

#18 Substitution Request - Dynamic Sport Construction



Status	<input type="checkbox"/> Open <input checked="" type="checkbox"/> Closed
Created on	Feb 10, 2025 by Matt Moser (WOLGAST CORPORATION)
RFI type	Default RFI workflow
Ball in court	Matt Moser (WOLGAST CORPORATION)
Answered	Feb 13, 2025 by Dustin DeWitt (The Collaborative)

Question

Would Dynamic Sports Construction be considered for the Oscoda Community Center?

Official response

Dustin DeWitt (The Collaborative): Submittal Rejected, Please see specs for suitable alternatives.

By *Dustin DeWitt* (The Collaborative) - Feb 13, 2025, 1:19 PM EST

References and Attachments**Files (4)**

- [DynaForce 8mm Substitution Request.pdf](#)
- [DynaForce Track Substitution Request.pdf](#)
- [OSSTAX Substitution Request.pdf](#)
- [TeamPlay M Substitution Request.pdf](#)

Impact

Cost impact -

Schedule impact -

Other attributes

Priority Normal

Discipline	-
Category	-
Location	-
Location details	-
External id	-
Co-reviewer(s)	
Spec Section	-
Construction Phase	Pre-Bid

Activities	By	At
<p>Christie Huver changed the status from Open Answered to Closed</p> <p>Official response: Dustin DeWitt (The Collaborative): Submittal Rejected, Please see specs for suitable alternatives. changed the watchers to Patrick Fritz (WOLGAST CORPORATION), Clinton Clark (WOLGAST CORPORATION), Matt Moser (WOLGAST CORPORATION)</p>	Christie Huver	Feb 13, 2025, 1:20 PM EST
<p>Christie Huver changed the status from Open In Review to Open Answered set Ball in court to Matt Moser (WOLGAST CORPORATION)</p>	Christie Huver	Feb 13, 2025, 1:19 PM EST
<p>Allison Schrecongost response was submitted by Christie Huver: Per Dustin's response</p>	Christie Huver	Feb 13, 2025, 1:19 PM EST
<p>Dustin DeWitt added a response: Submittal Rejected, Please see specs for suitable alternatives.</p>	Dustin DeWitt	Feb 11, 2025, 10:24 AM EST
<p>Matt Moser added a reference to a File TeamPlay M Substitution Request.pdf</p>	Matt Moser	Feb 10, 2025, 4:20 PM EST
<p>Matt Moser added a reference to a File OSSTAX Substitution Request.pdf</p>	Matt Moser	Feb 10, 2025, 4:20 PM EST
<p>Matt Moser added a reference to a File DynaForce Track Substitution Request.pdf</p>	Matt Moser	Feb 10, 2025, 4:20 PM EST
<p>Matt Moser added a reference to a File DynaForce 8mm Substitution Request.pdf</p>	Matt Moser	Feb 10, 2025, 4:20 PM EST
<p>Matt Moser (WOLGAST CORPORATION) created this RFI in Open In Review status and set Ball in court to Allison Schrecongost, Dustin DeWitt (The Collaborative).</p>	Matt Moser	Feb 10, 2025, 4:20 PM EST

CSI Form 1.5C

SUBSTITUTION REQUEST (During the Bid Period)

Project: Oscado Area Schools 2024 Bond Program Substitution Request Number:

BP 2 Community Center

From: Dynamic Sports Construction, Inc.

To: Wolgast Corporation

Date: 2/7/2025

A/E Project Number: 107253

Re: Substitution Request

Contract For: Resilient Athletic Flooring

Specification Title: Resilient Athletic Flooring

Description: Mondo Advance 8mm

Section: 096566 Page: 3

Article/Paragraph: 2.1 B 6

Proposed Substitution: DynaForce® 8mm

Manufacturer: Dynamic Sports Construction, Inc. Address: 4338 W Highway 82, Gainesville, TX 76240 Phone: 512-260-6722

Trade Name: Dynamic Sports Construction, Inc. Model No.: 8mm

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
Same warranty will be furnished for proposed substitution as for specified product.
Same maintenance service and source of replacement parts, as applicable, is available.
Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
Proposed substitution does not affect dimensions and functional clearances.
Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted by: Corey Wolessensky

Signed by: Corey Wolessensky

Firm: Dynamic Sports Construction, Inc.

Address: 4338 W Highway 82, Gainesville, TX 76240

Telephone: 512-260-6722

A/E's REVIEW AND ACTION

- Substitution approved - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
Substitution approved as noted - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
Substitution rejected - Use specified materials.
Substitution Request received too late - Use specified materials.

Signed by:

Date:

Supporting Data Attached: Drawings Product Data Samples Tests Reports side by side

DYNAFORCE® INDOOR FLOORING SYSTEM



ENERGY STARTS WITH THE ATHLETE
DYNAFORCE® RAISES IT TO A HIGHER LEVEL



You'll find DynaForce® at hundreds of universities, schools & recreational facilities nationwide.



A hybrid system that merges the best attributes of sheet and poured systems so *any* athlete can excel. Best+Best=DynaForce®.

The beauty of this system isn't just its amazing looks. DynaForce® is about superior performance, safety and flexibility.

From basketball, & volleyball, to pickleball. PE to aerobics, soccer to football drills and more, DynaForce® delivers:

- **Greater customization.** You choose more or less padding, more or less resilience.
- **Superior energy return** for higher performance competition.
- **Greater tensile strength** for superior static & rolling load characteristics – think banquet tables, bleacher loads, fitness equipment.
- **Seamless, non-porous surface** enhances performance, durability and sanitation.

- **Easy, cost-efficient updating through refinishing** – no expensive removal or replacement.
- **Durability** – 15+ year life span!
- **Ideal shock absorption** for high performance *and* safety.

Reduced joint stress and fatigue, fewer injuries, greater player confidence, better quality training & competition, greater comfort

- **Long-term aesthetic appeal** – special finish, 8+ colors, customization.
- **Flexibility** – works in conjunction with our indoor track & other multi-purpose products.
- **Environmental stewardship** – DynaForce is recyclable, eligible for 6+ LEED points and installed with our Zero Mercury product formulations.

Dynamic: Pertaining to energy or power in motion; involving or causing energy, motion, action or change: opposite to static.

DYNAFORCE® INDOOR FLOORING SYSTEM



DYNAFORCE®: CONTAINED ENERGY THAT WILL PERFORM INTO THE NEXT DECADE AND BEYOND

DYNAFORCE®

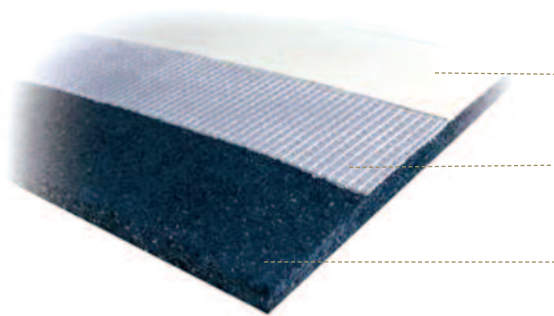
We customize each system to your needs. Choose...

- Your system thickness, from 6 mm to 16 mm, for desired performance.
- The surface texture and wear layer you need, from tennis to track.
- The right warranty for your investment.
- Customized color, logo and layout choices.



Made in
the USA

DynaForce® delivers unmatched durability through its incredibly strong top layer that will not separate over time. And it can be refinished without costly removal or replacement.



Seamless, self leveling 2 mm polyurethane wear layer performs like wood, with optimum slide and slip resistance and resilience. The next generation in polyurethane technology, DynaForce's resin is low maintenance, durable, anti-bacterial, impervious and virtually indestructible.

Optional fiberglass reinforcing layer for greater dimensional strength.

Dual-Durometer technology combines special polyurethane layer with technologically advanced base-mat underlay for greater durability and resistant wear. The result: a more predictable floor surface with superior deformation recovery and even distribution of point loads.

Bring on the sports, aerobics, equipment, banquets, street shoes...

- Low life-cycle cost due to ease of refinishing – no removal or replacement necessary.
- Available in a range of shock absorption levels, DynaForce's special recycled rubber pad delivers better, more consistent shock absorption and is eligible for LEED points.
- Specifically designed comfort layer returns maximum dimensional memory and load capacity.
- Special UV-cured polyurethane finish.

The Dynamic Story:

We are a premiere, full-service contractor specializing *only* in high performance and multipurpose flooring solutions. An American company, we take pride in delivering products made entirely in the USA in an **ISO 9001-2000 certified facility**.

We also take pride in our team. We employ the most experienced installation technicians in the industry to install 100+ indoor sports floors and running tracks annually. *No subcontractors*. And we manufacture, sell and install directly to you, the customer. We believe this is the best way to deliver a better product, plus it allows us to deliver *unmatched value pricing!* We're led by people who've been champions of this business for 15+ years.



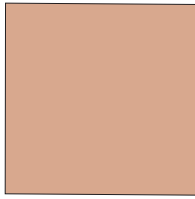
Environmental stewardship is at the core of the Dynamic philosophy. We create recyclable products from locally sourced materials, re-using existing and rapidly re-newable resources. Our VOC compliant sustainable systems are eligible for LEED points, installed with zero-mercury product formulations and are less chemically demanding.

Dynamic: Pertaining to energy or power in motion; involving or causing energy, motion, action or change: opposite to static.

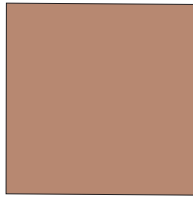
DYNAMIC COLOR OPTIONS



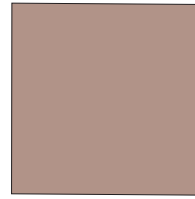
TOP COATING PRODUCTS



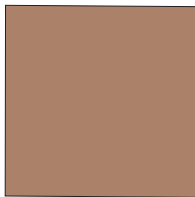
**Sahara
Tan**



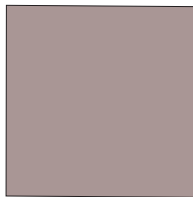
**Latte
Brown**



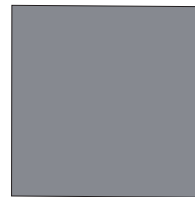
**Vintage
Bronze**



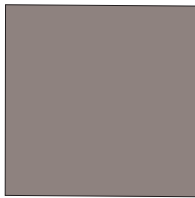
**Toasted
Almond**



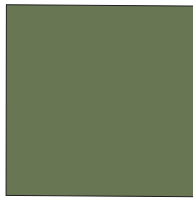
Lava



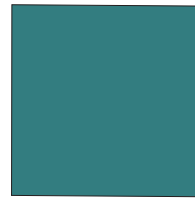
**Sterling
Silver**



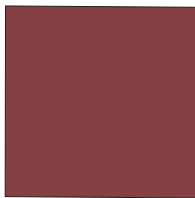
Fossil



**Sea
Green**



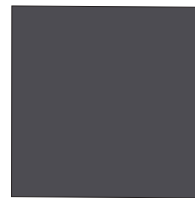
**Teal
Blue**



**Burnt
Red**



**Ocean
Blue**



**Anchor
Gray**

LINE PAINTS



White



Grey



Brown



Yellow



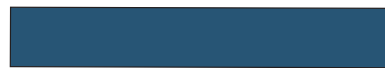
Orange



Red



Purple



Blue



Green



Black

This chart is representative of standard colors. Actual colors may vary.
Custom color matches are available and subject to a set-up charge with minimum quantities.

Dynamic: Pertaining to energy or power in motion; involving or causing energy, motion, action or change: opposite to static.



DynaForce® - Adrian College – Adrian, MI



DynaForce® - Doyle Recreation Center – Sturgis, MI



DynaForce® - Big Bear Arena – Sault Ste. Marie, MI



DynaForce® - Caledonia Schools Rec Center – Caledonia, MI

Appendix A

PHYSICAL PROPERTIES COMPARISON -		
DynaForce 8mm Vs Mondo Advance 8mm		
Test Analysis	DynaForce 8mm	Mondo Advance 8mm
Hardness Shore (ASTM/D2240)	80 Shore A	Shore A 78 +/- 5
Length of rolls	Top layer seamless	12-15 meters long 6' width
	Base layer 5' wide and 80' long	42' 7"
Total Thickness	8mm	8mm
Coefficient of Friction	.4 to .7	>0.60
Tensile Strength, psi	Min 1400	≥330
Elongation %	min 300%	≥230
Adhesive VOC	See VOC Certification	50g/l or less
Recovery in 72 hours	>90%	90-95%
Static Load Limit	≥ 0.004	<0.009
Ball Rebound (DIN 18032-2)	>98%	No value given
Critical Radiant Flux /Flamibility	Class 1 not Flammable (Din 519610)	Class 1
Made in the USA	yes	No
Warranty	As Per specification	As Per Specifications

**DynaForce®
Hybrid Athletic Flooring System**

PART 1 – GENERAL

DESCRIPTION

The DynaForce® hybrid athletic flooring system as manufactured and installed by Dynamic Sports Construction, Inc. is a cast in place, two-component polyurethane elastomer, installed over a pre-fabricated, recycled rubber resilient compounded underlayment, specially formulated for multi-purpose, and athletic flooring applications.

WORKING CONDITIONS

The building shall be dry, closed in, lighted and permanently heated. The slab shall be dry and the existing synthetic floor shall be sufficiently adhered to the substrate showing no signs of moisture related delamination. The temperature maintained at a minimum of 65 degrees F and relative humidity at a maximum of 50% for 48 hours prior to, during and 48 hours after installation. The entire floor area shall be closed to all traffic during the installation process.

WARRANTY

The DynaForce® synthetic flooring system is warranted against defects in materials and workmanship for a period of two (2) year and against excessive wear for a period of ten (10) years from the date of installation. The warranty excludes damage or defects caused by improper construction or design of the sub-floor, by subsequent deterioration of the sub-floor, moisture migration, hydrostatic pressure, neglect, lack of maintenance, vandalism, abuse or acts of god.

PART 2 – PRODUCTS

Subject to compliance with the requirements, products that may be incorporated into the work include but are not limited to the following:

DynaForce® synthetic flooring system by Dynamic Sports Construction, Inc., or pre-approved equal.

Polyurethane resin shall meet the following physical properties:

A. The polyurethane must exhibit the following minimum characteristics:

- | | | |
|----|-------------------------|--------|
| 1. | Consistency | Liquid |
| 2. | Non-Volatile Percentage | 100% |

3. Shore Hardness (DIN 53505) 80 Shore A (+/-5)
4. Tensile Strength (DIN (53517) min.1100 psi
5. Elongation at Break (DIN 53504) 150%
6. Tear Strength 28 N/mm²
7. Inflammability of Top Layer (DIN 51960) Class 1-Not Flammable

B. The pre-fabricated underlayment shall meet the following physical properties:

1. Density (ASTM D-297) .45pcf
2. Tensile Strength (ASTM D-412) 88%
3. Elongation (ASTM D-412) 97%
4. Compressibility (ASTMF-36A)
 - At 50 psi 20% Compression...87% of recovery
 - At 100 psi 91% recovery
 - At 200 psi 91% recovery
 - (25% deflection, 22 hours at 158 degrees F)
5. Die Tear PPI (ASTM-624) 30 ppi
6. Thickness 6mm (the wear layer shall be 2mm and complete system thickness 8mm)
7. Flexibility (ASTM F-147) 0-1
8. Compression Set B (ASTM D-395) 26% of recovery at 25% deflection (158 degrees F/22 hrs.)

C. The Floor System shall meet the following performance properties:

1. Compression Set (DIN) 1.9%
2. Ball Bounce (DIN 18032) >98%
3. Coefficient of Friction (DIN 18032).56 DRY
.44 WET
4. Shock Absorption DIN 18032 (force reduction) minimum of 20%
5. Impact Resistance 2 Kgm/cm²
6. Inflammability (DIN 51960) Class I
7. Resistance Rolling Load (DIN 18032) No Damage
8. Rebound Resistance (DIN 53512) 29%
9. Wear Resistance- 1000 cycles <.4 grams loss
10. Moisture Absorption
 - a. Surface 0%
 - b. Base Mat 20.8%
11. Heat Resistance .098 m2K/W
(Unaffected from -20F to 135F)
12. Thickness – 8mm

D. DynaForce® Base-Mat Adhesive

Two-component polyurethane adhesive applied at a rate of 750 mg/m(2) (0.15 lb/sf)

E. DynaForce® Base-Mat

Pre-fabricated underlayment made of recycled rubber granules bound with MDI polyurethane binder with a constant thickness of 6mm. **No liquid applied base layers will be acceptable.**

- F. DynaForce® Sealer
A two-component, thixotropic polyurethane sealer applied at a rate of 600 g/M(2) (0.12 lb./sf).
- F. DynaForce® Resin
Pigmented, two-component polyurethane wear layer shall be applied at a rate of 1350 g/M(2) (0.278 lb./sf @ 1mm thickness). The wear layer shall be self-leveling and result in a total thickness of 2mm (.556/lb./sf total).
- G. DynaForce® Finish Coating and Line Paint
Shall be a three-component, pigmented, water based polyurethane finish coating and line paint.

PART 3 – EXECUTION

PREPARATION

The existing concrete slab shall be inspected and found to be acceptable to receive the DynaForce® flooring system. No presence of moisture related problems should be found (moisture levels in the substrate must be at or below 5%, 75%rH or 3lbs/1000sf when tested with a calcium chloride test at all locations tested). There shall be no sealers or curing compounds, or any other bond prohibiting substances. It shall be the responsibility of the General Contractor to ensure that the tolerance of the concrete substrate is within 1/8" in 10' prior to commencement of the floor surface installation.

Base-Mat

Thoroughly mix the DynaForce® base-mat adhesive, and apply directly to the existing flooring with a notched trowel at a rate of 0.15 lbs./sf. Roll base-mat into fresh adhesive. Do not allow compression fit at any seams. Roll all base-mat applications with a 100 lb. Linoleum roller. Continue to repeat rolling process as necessary to ensure adhesive transfer.

Seal Coat

Thoroughly mix the DynaForce® sealer. Apply to the base-mat with a flat, steel trowel. Allow sealer to fully cure before applying resilient, wear layer.

Resilient Wear Layer

Thoroughly mix the DynaForce® resin. Apply resin at a rate of (1350g/m(2) per 1mm thickness with a Swedish knife or metered rake. Mixed material shall be applied wet-to-wet to ensure a seamless surface. Sand any imperfections and tack clean floor prior to the application of matte finish. Finished thickness of wear layer shall average 2mm.

Matte Finish

Mix pigmented WATERBORNE DynaForce® Polyurethane Finish Coating – neither solvent based coatings nor hybrid coatings (coatings which contain both water and a solvent such as butyl acetate, xylene, etc.) are permissible and the VOC content of all finish coating and game line paints must be less than 20g/l VOC content. Apply with airless sprayer, or roller at a rate of 0.03lbs/sf. Color to be selected from manufacturer's standard range.

QUALITY ASSURANCE

Installer/ manufacturer of flooring system shall have a minimum of ten years experience in the application of polyurethane surfacing for athletic, interior applications, and in manufacturing two-component polyurethane. **Manufacturer of polyurethane elastomer shall be ISO-9001 and 14001 certified to establish a standard of quality for manufacturing. Provide documentation with the bid. Products must contain ZERO mercury. Components must ALL be less than 20g/l VOC content.**

The Installer shall have installed a minimum of fifty (50) zero mercury, cast in place, two-component polyurethane elastomer sports floors with a resilient base-mat within the last 12 months.

Contractors wishing to be considered as "equal" must provide documentation for their products prior to the bid opening. No substitutions shall be allowed post bid. Information shall include the following:

- A. Test reports from an independent laboratory stating that the proposed product complies with the VOC emission requirements for indoor flooring as established by CA Specification 01350, meets the physical properties listed above, and contains zero mercury.

A list of ten references meeting the above criteria that includes project name, contact person, and phone number.

Dynamic Sports Construction, Inc.
301 Sonny Drive
Leander, TX 78641
800-517-0015
512-260-9118 fax



COMPLIANCE TESTED by berkeley analytical

VOC Emission Test Certificate

Product Name: DynaForce

Product Sample Information		Certificate Information	
Company:	Dynamic Sports Construction, Inc	Certificate No:	181019-01
Company Website:	www.dynamicsportsconstruction.com	Certified By:	 Raja S. Tannous, Laboratory Director
Product Type:	Flooring (all types)	Date:	October 19, 2018
Date Produced:	9/26/2018		

Reference Standard: California Department of Public Health CDPH/EHLB/Standard Method Version 1.2, 2017 (Emission testing method for CA Specification 01350)

Acceptance Criteria and Results Demonstrating Compliance of Product Sample to Referenced Standard:

Exposure Scenario ¹	Individual VOCs of Concern ²		Formaldehyde ³		TVOC ⁴
	Criterion	Compliant?	Criterion	Compliant?	
School Classroom	≤½ Chronic REL	YES	≤9.0 µg/m ³	YES	> 0.5 - 4.9 mg/m ³
Private Office	≤½ Chronic REL	YES	≤9.0 µg/m ³	YES	> 0.5 - 4.9 mg/m ³

Product Coverage⁵: Not applicable

1. Exposure scenarios & product quantities for classroom & office are defined in Tables 4-2 – 4-5 (CDPH Std. Mtd. V1.2-2017)
2. Maximum allowable concentrations of individual target VOCs are specified in Table 4-1 (*ibid.*)
3. Maximum allowable formaldehyde concentration is ≤9 µg/m³, effective Jan 1, 2012; previous limit was ≤16.5 µg/m³ (*ibid.*)
4. Informative only; predicted TVOC Range in three categories, i.e., ≤0.5 mg/m³, >0.5 – 4.9 mg/m³, and ≥5.0 mg/m³
5. Informative and applicable only to tests of wet-applied products; grams of sample applied per square meter of substrate

Standards & Codes Recognizing CDPH Standard Method V1.2 (partial list)

- USGBC LEED Version 4, BD&C, ID&C
- The WELL Building Standard
- ANSI/GBI 01, Green Building Assessment Protocol
- Green Guide for Healthcare V2.2

Narrative: Dynamic Sports Construction, Inc selected a sample representative of its DynaForce, a polyurethane resilient rubber athletic flooring product and submitted it on 9/27/2018 for testing. Berkeley Analytical measured and evaluated the emissions of VOCs from this sample following CDPH/EHLB/Standard Method V1.2-2017. The results of the test are presented in Berkeley Analytical report, 649-002-01A-Oct1918.

Berkeley Analytical is an independent, third-party laboratory specializing in the analysis of organic chemicals emitted by and contained in building products, finishes, furniture, and consumer products. We are an ISO/IEC 17025 accredited laboratory (IAS, [TL-383](#)); all standards used in performing this test are in Berkeley Analytical's scope of accreditation.

DISCLAIMER: THIS CERTIFICATE OF COMPLIANCE AFFIRMS THAT: 1) A SAMPLE OF THE LISTED PRODUCT WAS TESTED ACCORDING TO THE REFERENCED STANDARD; 2) THE MEASURED VOC EMISSIONS FROM THE SAMPLE WERE EVALUATED FOR THE DEFINED EXPOSURE SCENARIO(S); AND 3) THE RESULTS MEET THE ACCEPTANCE CRITERIA OF THE REFERENCED STANDARD(S). BERKELEY ANALYTICAL IS NOT RESPONSIBLE FOR ANY CLAIMS REGARDING A PRODUCT OR PRODUCTS ENTERED INTO COMMERCE THAT MAY BE BASED ON THIS TEST. BERKELEY ANALYTICAL PROVIDES THIS CERTIFICATE OF COMPLIANCE "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PURPOSE.

CSI Form 1.5C

SUBSTITUTION REQUEST (During the Bid Period)

Project: Oscado Area Schools 2024 Bond Program Substitution Request Number:

BP 2 Community Center

From: Dynamic Sports Construction, Inc.

To: Wolgast Corporation

Date: 2/7/2025

A/E Project Number: 107253

Re: Substitution Request

Contract For: Resilient Athletic Flooring

Specification Title: Resilient Athletic Flooring

Description: Mondo Super X 720 10.5mm

Section: 096566 Page: 3

Article/Paragraph: 2.1 5 A5

Proposed Substitution: OSSTSPORT OSSTRAX

Manufacturer: Ecore Athletic Address: 715 Fountain Ave, Lancaster, PA 17601 Phone: 512-260-6722

Trade Name: Ecore Athletic Model No.: 23.3

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
Same warranty will be furnished for proposed substitution as for specified product.
Same maintenance service and source of replacement parts, as applicable, is available.
Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
Proposed substitution does not affect dimensions and functional clearances.
Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted by: Corey Wolesensky

Signed by: Corey Wolesensky

Firm: Dynamic Sports Construction, Inc.

Address: 4338 W Highway 82, Gainesville, TX 76240

Telephone: 512-260-6722

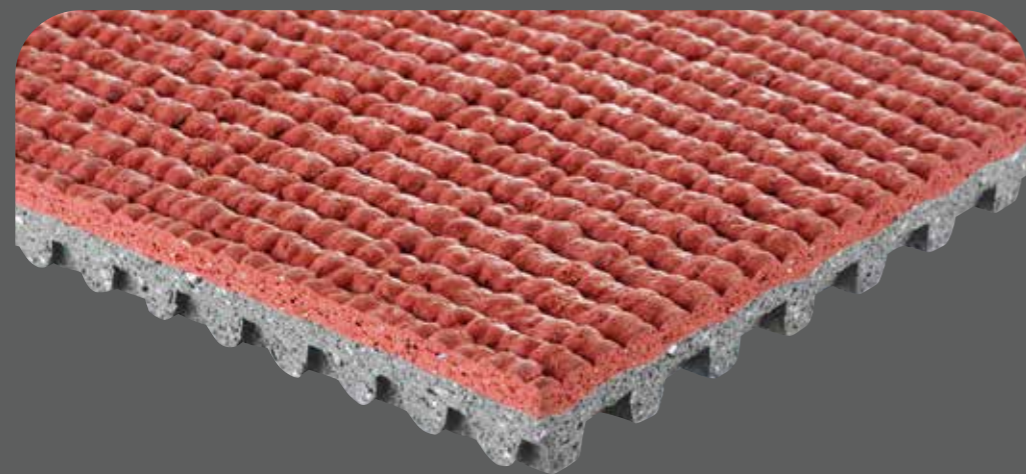
A/E's REVIEW AND ACTION

- Substitution approved - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
Substitution approved as noted - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
Substitution rejected - Use specified materials.
Substitution Request received too late - Use specified materials.

Signed by:

Date:

Supporting Data Attached: Drawings Product Data Samples Tests Reports side by side



SPIKE RESISTANT ATHLETIC TRACK SURFACE

OSSTRAX

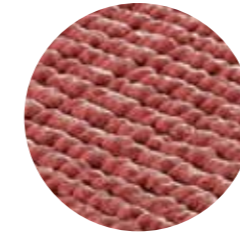
- MOLDED AND VULCANIZED RUBBER LAYER
- RESISTANCE TO SPIKE
- RESISTANCE TO UV
- VERTICAL DEFORMATION <2.0mm
- WA CERTIFIED SURFACE PRODUCT (13mm)
- FOR OUTDOOR AND INDOOR USE.
- GREENGUARD GOLD CERTIFICATION
- CONFORM TO EN14877 STANDARD



DURABILITY • SAFE • PERFORMANCE



CO-VULCANIZED MULTILAYER



SURFACE LAYER

OSSTRAX has Rock granule texture surface. This texture is suitable for athletics activities and also has high performance in spike resistance.



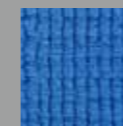
BASE LAYER

Waffle bottom layer gives the stable support for the surface and also has better performance in shock absorption than other similar product in the market.

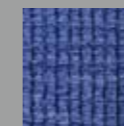
COLOR RANGE



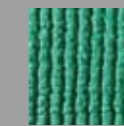
PX-10
Red



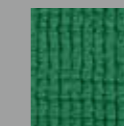
PX-23
Sky blue



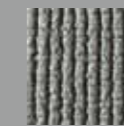
PX-28
Navy blue



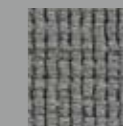
PX-30
Light green



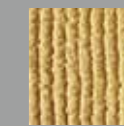
PX-33
Lake green



PX-40
Light grey



PX-42
Deep grey

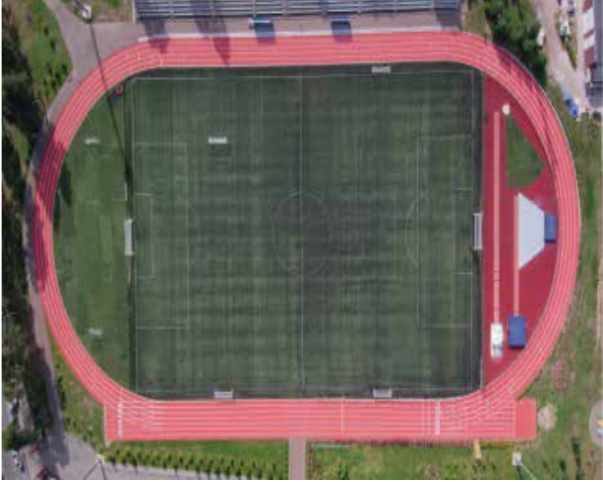


PX-50
Yellow

SPECIFICATION

THICKNESS	8mm, 10mm, 13mm	
ROLL WIDTH	100cm to 140cm	3'3.4" to 4'7"
ROLL LENGTH	6M to 15M	19'8" to 49'2.6"





OSSTRAX PERFORMANCE

DURABLE . FAST. CLIMATE NEUTRAL



OUTSTANDING DURABILITY
 Vulcanized rubber makes a strong material even stronger

EMBOSSSED TEXTURE SURFACES
 Granule-free, uniform texture

EASY TO MAINTAIN
 Non-porous surface
 No coating, no granules fall



Appendix A

PHYSICAL PROPERTIES COMPARISON		
OSSTRAX Vs. Mondo Super X Performance		
Test Analysis	OSSTRAX 10mm	Mondo Super X 10mm
Hardness Shore (ASTM/D2240)	53/35 Shore A	55/40 Shore A
Length of rolls	3'4" to 4'7" Wide by 19'8" to 49'2.6" long	3' Wide by 49'2' long
Total Thickness	10mm	10.5mm
Tensile Strength (DIN 53504)	≥120psi	>75 psi
Elongation at Break	≥210%	≥100%
Critical Radiant Flux	Compliant	.45W/cm2
V.O.C. Compliance	Yes	Yes
Color Stability	Good	Good
Shock Absorption	28% +/- 3	No Value Given

1. Manufacturer

KING ARTHUR INDUSTRIES CO., LTD.

No.512, Chioufen Rd, Luntze Tsun, Yung-Ching Hsaing, ChangHua Hsien, Taiwan

TEL: +886-4-8223131 FAX: +886-4-8229956, E-mail: info@osst-surfaces.com

2. Product name

OSSTRAX

2.1 Product description

2.1.a Prefabricated synthetic athletic track surface vulcanized in two layers construction consists of EPDM, Mineral fillers, stabilizing agents, color pigments, none permeable, textured wear resistant surface layer and waffle like shock absorbing layer bonded by vulcanization.

2.1.b Color : 8 standard colors (see catalogue) .

2.1.c Thickness : 8mm, 10mm, 13mm (WA certified track surface)

2.1.d Finish : Track embossing.

2.1.e Dimensions : in Roll : Width. 100cm to 140cm (3' 4" to 4'7.")
Length 6M to 15M (19'8" to 49'2.6")

2.2. Product properties

Test items	Test Methods	Requirements	Thickness		
			8mm	10mm	13mm
Elongation at break	ASTM D412	≥40%	≥210%	≥210%	≥210%
Tensile Strength	ASTM D412	≥75psi	≥120psi	≥120psi	≥120psi
Hardness of wear layer	ASTM D2240	**	53±5	53±5	53±5
Hardness of backing	ASTM D2240	**	35±5	35±5	35±5
Abrasion resistance (H18,1KG,1000cycles)	ASTMD3389	≤2.0g	≤1.5g	≤1.5g	≤1.5g
Resistance of Chemicals	ASTMF925	≤Slight Change	No change	No change	No change
Color Heat stability	ASTMF1514	≤8.0△E	0.61	0.61	0.61
Color Light stability	ASTMF1515	≤8.0△E	1.74	1.74	1.74
Shock Absorption	ASTM F2569	>10%	23(±3)	28±3	38(±3)
Vertical deformation	ASTM F2157	<3.5mm	1.3(±0.3)	1.4(±0.3)	1.7(±0.3)
Friction (Dry)	ASTM E303	80~110	≥105	≥105	≥105
Spike resistance -Tensile strength - Elongation	EN14810	Not differ more than 20%	**	**	≤20%△Tr% ≤20%△Eb%
World Athletics certified surface	WA	Compliant	**	**	Certified
REACH SVHC items	REACH	Compliant	Compliant		
GREENGUARD Certification	GREENGUARD	Compliant	Compliant		
GREENGUARD Gold	GREENGUARD	Compliant	Compliant		
Critical Radiant Flux	ASTM E648	≥0.1w/cm2	Compliant		
Sum of 18 PAHs (Polycyclic Aromatic Hydrocarbons)	Af PS GS 2014:01	Not detected	Not detected		

Results obtained from manufacturing controls can vary between production lots and don't constitute representations or warranties as to any particular product lot. KING ARTHUR COMPANY keeps the right to modify the characteristics of the products anytime.

3. Adhesive

Adhesive: Two component polyurethane-epoxy glue.

***Please contact the glue manufacturer for product recommendation based on project location.**

4. Delivery and Storage

- 4.1 The general contractor shall provide a secure, clean and dry storage location, which is protected from exposure to harmful weather conditions at 65 to 104 degrees F (18 to 40 degrees °C).
- 4.2 Store sports flooring rolls in original wrappings, and label intact until time of installation.
- 4.3 Keep the rolls are well positioned in an upright position with pallet, and don't stack anything on top includes stack rolls on top of each other.

5. References

5.1 Association(s)

WA (World Athletics)

5.2 ASTM International (ASTM)

ASTM D412: Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.
ASTM D2240: Standard Test Method for Rubber Property (Durometer Hardness).
ASTM D3389: Standard Test Method for Coated Fabrics Abrasion Resistance (Rotary Platform Abrader).
ASTM F925: Standard Test Method for Resistance to Chemicals of Resilient Flooring.
ASTM F1514: Standard Test method for Measuring Heat Stability of Resilient Flooring by Color Change.
ASTM F1515: Standard Test Method for Measuring Light Stability of Resilient Flooring by Color Change.
ASTM F2772: Standard Specification for Athletic Performance Properties of Indoor Sports Floor Systems.
ASTM F2157: Standard Specification for Synthetic Surfaced Running Tracks
ASTM F2117: Standard Test Method for Vertical Rebound Characteristics of Sports Surface
ASTM E303: Standard Test Method for Measuring Surface Frictional Properties
ASTM F2569: Standard Test Method for Evaluating the Force Reduction Properties of Surfaces for Athletic
ASTM E648: Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

5.3 European Committee for Standardization (EN)

EN 13036-4: Road and airfield surface characteristics. Test methods -the pendulum test for friction.
EN 14808: Surfaces for sports areas. Determination of shock absorption.
EN 14809: Surfaces for sports areas. Determination of vertical deformation.
EN 12235: Surfaces for sports areas - Determination of vertical ball behavior

5.4 GREENGUARD Environmental Institute (GEI)

GREENGUARD Certification: Compliant with stringent emission levels for over 360 VOCs, plus a limit on the total of all chemical emissions combined (TVOC).
GREENGUARD Gold Certification: Compliant with safety factors to account for sensitive individuals (such as children and the elderly) and ensure that a product is acceptable for use in environments such as schools and healthcare facilities.

5.5 REACH:

Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH), establishing European Chemicals Agency.

5.6 SVHC:

Candidate List of substances of very high concern for Authorization (published in accordance with Article 59(10) of the REACH Regulation)

CSI Form 1.5C

SUBSTITUTION REQUEST (During the Bid Period)

Project: Oscado Area Schools 2024 Bond Program Substitution Request Number:

BP 2 Community Center

From: Dynamic Sports Construction, Inc.

To: Wolgast Corporation

Date: 2/7/2025

A/E Project Number: 107253

Re: Substitution Request

Contract For: Resilient Athletic Flooring

Specification Title: Resilient Athletic Flooring

Description: Mondo Super X 720 10.5mm

Section: 096566 Page: 3

Article/Paragraph: 2.1 A5

Proposed Substitution: DynaForce® 11mm

Manufacturer: Dynamic Sports Construction, Inc. Address: 4338 W Highway 82, Gainesville, TX 76240

Phone: 512-260-6722

Trade Name: Dynamic Sports Construction, Inc.

Model No.: 11mm

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
Same warranty will be furnished for proposed substitution as for specified product.
Same maintenance service and source of replacement parts, as applicable, is available.
Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
Proposed substitution does not affect dimensions and functional clearances.
Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted by: Corey Wolessensky

Signed by: Corey Wolessensky

Firm: Dynamic Sports Construction, Inc.

Address: 4338 W Highway 82, Gainesville, TX 76240

Telephone: 512-260-6722

A/E's REVIEW AND ACTION

- Substitution approved - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
Substitution approved as noted - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
Substitution rejected - Use specified materials.
Substitution Request received too late - Use specified materials.

Signed by:

Date:

Supporting Data Attached: Drawings Product Data Samples Tests Reports

DYNAFORCE® INDOOR FLOORING SYSTEM



ENERGY STARTS WITH THE ATHLETE
DYNAFORCE® RAISES IT TO A HIGHER LEVEL



You'll find DynaForce® at hundreds of universities, schools & recreational facilities nationwide.

A hybrid system that merges the best attributes of sheet and poured systems so *any* athlete can excel. Best+Best=DynaForce®.

The beauty of this system isn't just its amazing looks. DynaForce® is about superior performance, safety and flexibility.

From basketball, & volleyball, to pickleball. PE to aerobics, soccer to football drills and more, DynaForce® delivers:

- **Greater customization.** You choose more or less padding, more or less resilience.
- **Superior energy return** for higher performance competition.
- **Greater tensile strength** for superior static & rolling load characteristics – think banquet tables, bleacher loads, fitness equipment.
- **Seamless, non-porous surface** enhances performance, durability and sanitation.

- **Easy, cost-efficient updating through refinishing** – no expensive removal or replacement.
- **Durability** – 15+ year life span!
- **Ideal shock absorption** for high performance *and* safety.

Reduced joint stress and fatigue, fewer injuries, greater player confidence, better quality training & competition, greater comfort

- **Long-term aesthetic appeal** – special finish, 8+ colors, customization.
- **Flexibility** – works in conjunction with our indoor track & other multi-purpose products.
- **Environmental stewardship** – DynaForce is recyclable, eligible for 6+ LEED points and installed with our Zero Mercury product formulations.

Dynamic: Pertaining to energy or power in motion; involving or causing energy, motion, action or change: opposite to static.

DYNAFORCE® INDOOR FLOORING SYSTEM



DYNAFORCE®: CONTAINED ENERGY THAT WILL PERFORM INTO THE NEXT DECADE AND BEYOND

DYNAFORCE®

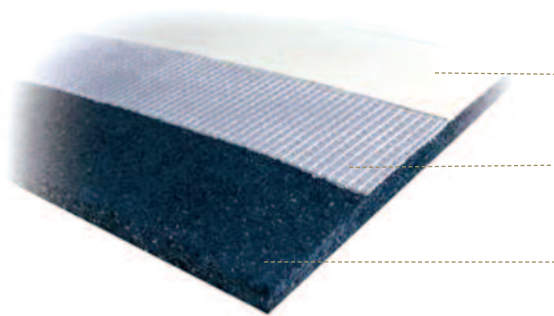
We customize each system to your needs. Choose...

- Your system thickness, from 6 mm to 16 mm, for desired performance.
- The surface texture and wear layer you need, from tennis to track.
- The right warranty for your investment.
- Customized color, logo and layout choices.



Made in
the USA

DynaForce® delivers unmatched durability through its incredibly strong top layer that will not separate over time. And it can be refinished without costly removal or replacement.



Seamless, self leveling 2 mm polyurethane wear layer performs like wood, with optimum slide and slip resistance and resilience. The next generation in polyurethane technology, DynaForce's resin is low maintenance, durable, anti-bacterial, impervious and virtually indestructible.

Optional fiberglass reinforcing layer for greater dimensional strength.

Dual-Durometer technology combines special polyurethane layer with technologically advanced base-mat underlay for greater durability and resistant wear. The result: a more predictable floor surface with superior deformation recovery and even distribution of point loads.

Bring on the sports, aerobics, equipment, banquets, street shoes...

- Low life-cycle cost due to ease of refinishing – no removal or replacement necessary.
- Available in a range of shock absorption levels, DynaForce's special recycled rubber pad delivers better, more consistent shock absorption and is eligible for LEED points.
- Specifically designed comfort layer returns maximum dimensional memory and load capacity.
- Special UV-cured polyurethane finish.

The Dynamic Story:

We are a premiere, full-service contractor specializing *only* in high performance and multipurpose flooring solutions. An American company, we take pride in delivering products made entirely in the USA in an **ISO 9001-2000 certified facility**.

We also take pride in our team. We employ the most experienced installation technicians in the industry to install 100+ indoor sports floors and running tracks annually. *No subcontractors*. And we manufacture, sell and install directly to you, the customer. We believe this is the best way to deliver a better product, plus it allows us to deliver *unmatched value pricing!* We're led by people who've been champions of this business for 15+ years.



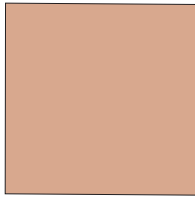
Environmental stewardship is at the core of the Dynamic philosophy. We create recyclable products from locally sourced materials, re-using existing and rapidly re-newable resources. Our VOC compliant sustainable systems are eligible for LEED points, installed with zero-mercury product formulations and are less chemically demanding.

Dynamic: Pertaining to energy or power in motion; involving or causing energy, motion, action or change: opposite to static.

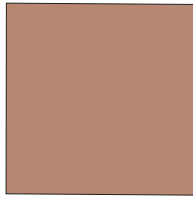
DYNAMIC COLOR OPTIONS



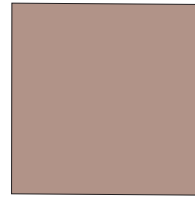
TOP COATING PRODUCTS



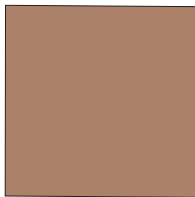
**Sahara
Tan**



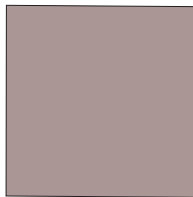
**Latte
Brown**



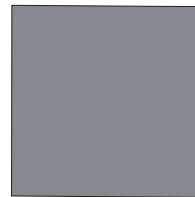
**Vintage
Bronze**



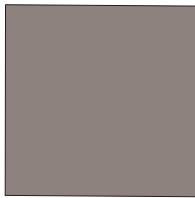
**Toasted
Almond**



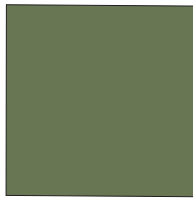
Lava



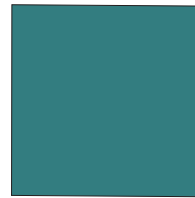
**Sterling
Silver**



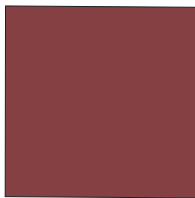
Fossil



**Sea
Green**



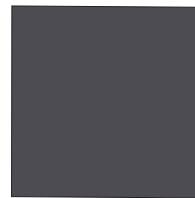
**Teal
Blue**



**Burnt
Red**



**Ocean
Blue**



**Anchor
Gray**

LINE PAINTS



White



Grey



Brown



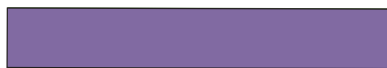
Yellow



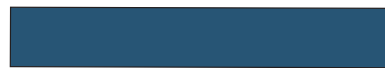
Orange



Red



Purple



Blue



Green



Black

This chart is representative of standard colors. Actual colors may vary.
Custom color matches are available and subject to a set-up charge with minimum quantities.

Dynamic: Pertaining to energy or power in motion; involving or causing energy, motion, action or change: opposite to static.



DynaForce® - Adrian College – Adrian, MI



DynaForce® - Doyle Recreation Center – Sturgis, MI



DynaForce® - Big Bear Arena – Sault Ste. Marie, MI



DynaForce® - Caledonia Schools Rec Center – Caledonia, MI

**DynaForce® 11mm
Fluid Applied Athletic Flooring System**

PART 1 – GENERAL

DESCRIPTION

The DynaForce® fluid applied athletic flooring system as manufactured and installed by Dynamic Sports Construction, Inc. is a cast in place, two-component polyurethane elastomer, installed over a pre-fabricated, recycled rubber resilient compounded underlayment, specially formulated for multi-purpose, and athletic flooring applications.

WORKING CONDITIONS

The building shall be dry, closed in, lighted and permanently heated. The slab shall be dry and the existing synthetic floor shall be sufficiently adhered to the substrate showing no signs of moisture related delamination. The temperature maintained at a minimum of 65 degrees F and relative humidity at a maximum of 50% for 48 hours prior to, during and 48 hours after installation. The entire floor area shall be closed to all traffic during the installation process.

WARRANTY

The DynaForce® fluid applied athletic flooring system is warranted against material manufacturing defects for a period of ten (10) years from the date of installation. The warranty excludes damage or defects caused by improper construction or design of the sub-floor, by subsequent deterioration of the sub-floor, moisture migration, hydrostatic pressure, neglect, lack of maintenance, vandalism, abuse or acts of god.

PART 2 – PRODUCTS

Subject to compliance with the requirements, products that may be incorporated into the work include but are not limited to the following:

DynaForce® Fluid Applied Athletic Flooring system by Dynamic Sports Construction, Inc., or pre-approved equal.

Polyurethane resin shall meet the following physical properties:

A. The polyurethane must exhibit the following minimum characteristics:

- | | | |
|----|-------------------------|-------------------|
| 1. | Consistency | Liquid |
| 2. | Non-Volatile Percentage | 100% |
| 3. | Shore Hardness | 80 Shore A (+/-5) |

4.	Tensile Strength	min.1100 psi
5.	Elongation at Break	150%
6.	Tear Strength	28 N/mm ²
7.	Inflammability of Top Layer	Class 1-Not Flammable

B. The pre-fabricated underlayment shall meet the following physical properties:

1.	Density	.45pcf
2.	Tensile Strength	88%
3.	Elongation	97%
4.	Compressibility	
	At 50 psi	20% Compression...87% of recovery
	At 100 psi	91% recovery
	At 200 psi	91% recovery
	(25% deflection, 22 hours at 158 degrees F)	
5.	Die Tear PPI	30 ppi
6.	Thickness	9mm (the wear layer shall be 2mm and complete system thickness 11mm)
7.	Flexibility	0-1
8.	Compression Set B	26% of recovery at 25% deflection (158 degrees F/22 hrs.)

C. The Floor System shall meet the following performance properties:

1.	Vertical Deformation	1.9%
2.	Ball Bounce	>98%
3.	Coefficient of Friction	.56 DRY .44 WET
4.	Shock Absorption (force reduction)	minimum of 28%
5.	Impact Resistance	2 Kgm/cm ²
6.	Inflammability	Class I
7.	Resistance Rolling Load	No Damage
8.	Rebound Resistance	29%
9.	Wear Resistance- 1000 cycles	<.4 grams loss
10.	Moisture Absorption	a. Surface 0% b. Base Mat 20.8%
11.	Heat Resistance	.098 m2K/W (Unaffected from -20F to 135F)
12.	Thickness	11mm

D. DynaForce® Base-Mat Adhesive
Two-component polyurethane adhesive applied at a rate of 750 mg/m(2) (0.15 lb/sf)

E. DynaForce® Base-Mat
Pre-fabricated underlayment made of recycled rubber granules bound with MDI polyurethane binder with a constant thickness of 9mm. **No liquid applied base layers will be acceptable.**

- F. DynaForce® Sealer
A two-component, thixotropic polyurethane sealer applied at a rate of 600 g/M(2) (0.12 lb./sf).
- F. DynaForce® Resin
Pigmented, two-component polyurethane wear layer shall be applied at a rate of 1350 g/M(2) (0.278 lb./sf @ 1mm thickness). The wear layer shall be self-leveling and result in a total thickness of 2mm (.556/lb./sf total).
- G. DynaForce® Finish Coating and Line Paint
Shall be a three-component, pigmented, water based polyurethane finish coating and line paint.

PART 3 – EXECUTION

PREPARATION

The existing concrete slab shall be inspected and found to be acceptable to receive the DynaForce® flooring system. No presence of moisture related problems should be found (moisture levels in the substrate must be at or below 5%, 75%rH or 3lbs/1000sf when tested with a calcium chloride test at all locations tested). There shall be no sealers or curing compounds, or any other bond prohibiting substances.

Base-Mat

Thoroughly mix the DynaForce® base-mat adhesive, and apply directly to the existing flooring with a notched trowel at a rate of 0.15 lbs./sf. Roll base-mat into fresh adhesive. Do not allow compression fit at any seams. Roll all base-mat applications with a 100 lb. Linoleum roller. Continue to repeat rolling process as necessary to ensure adhesive transfer.

Seal Coat

Thoroughly mix the DynaForce® sealer. Apply to the base-mat with a flat, steel trowel. Allow sealer to fully cure before applying resilient, wear layer.

Resilient Wear Layer

Thoroughly mix the DynaForce® resin. Apply resin at a rate of (1350g/m(2) per 1mm thickness with a Swedish knife or metered rake. Mixed material shall be applied wet-to-wet to ensure a seamless surface. Sand any imperfections and tack clean floor prior to the application of matte finish. Finished thickness of wear layer shall average 2mm.

Matte Finish

Mix pigmented WATERBORNE DynaForce® Polyurethane Finish Coating – neither solvent based coatings nor hybrid coatings (coatings which contain both water and a solvent such as butyl acetate, xylene, etc.) are

permissible and the VOC content of all finish coating and game line paints must be less than 20g/l VOC content. Apply with airless sprayer, or roller at a rate of 0.03lbs/sf. Color to be selected from manufacturer's standard range.

QUALITY ASSURANCE

Installer/ manufacturer of flooring system shall have a minimum of ten years experience in the application of polyurethane surfacing for athletic, interior applications, and in manufacturing two-component polyurethane. **Manufacturer of polyurethane elastomer shall be ISO-9001 and 14001 certified to establish a standard of quality for manufacturing. Provide documentation with the bid. Products must contain ZERO mercury. Components must ALL be less than 20g/l VOC content.**

The Installer shall have installed a minimum of fifty (50) zero mercury, cast in place, two-component polyurethane elastomer sports floors with a resilient base-mat within the last 12 months.

Contractors wishing to be considered as "equal" must provide documentation for their products prior to the bid opening. No substitutions shall be allowed post bid. Information shall include the following:

- A. Test reports from an independent laboratory stating that the proposed product complies with the VOC emission requirements for indoor flooring as established by CA Specification 01350, meets the physical properties listed above, and contains zero mercury.

Dynamic Sports Construction, Inc.
301 Sonny Drive
Leander, TX 78641
800-517-0015
512-260-9118 fax



COMPLIANCE TESTED by berkeley analytical

VOC Emission Test Certificate

Product Name: DynaForce

Product Sample Information		Certificate Information	
Company:	Dynamic Sports Construction, Inc	Certificate No:	181019-01
Company Website:	www.dynamicsportsconstruction.com	Certified By:	 Raja S. Tannous, Laboratory Director
Product Type:	Flooring (all types)	Date:	October 19, 2018
Date Produced:	9/26/2018		

Reference Standard: California Department of Public Health CDPH/EHLB/Standard Method Version 1.2, 2017 (Emission testing method for CA Specification 01350)

Acceptance Criteria and Results Demonstrating Compliance of Product Sample to Referenced Standard:

Exposure Scenario ¹	Individual VOCs of Concern ²		Formaldehyde ³		TVOC ⁴
	Criterion	Compliant?	Criterion	Compliant?	
School Classroom	≤½ Chronic REL	YES	≤9.0 µg/m ³	YES	> 0.5 - 4.9 mg/m ³
Private Office	≤½ Chronic REL	YES	≤9.0 µg/m ³	YES	> 0.5 - 4.9 mg/m ³

Product Coverage⁵: Not applicable

1. Exposure scenarios & product quantities for classroom & office are defined in Tables 4-2 – 4-5 (CDPH Std. Mtd. V1.2-2017)
2. Maximum allowable concentrations of individual target VOCs are specified in Table 4-1 (*ibid.*)
3. Maximum allowable formaldehyde concentration is ≤9 µg/m³, effective Jan 1, 2012; previous limit was ≤16.5 µg/m³ (*ibid.*)
4. Informative only; predicted TVOC Range in three categories, i.e., ≤0.5 mg/m³, >0.5 – 4.9 mg/m³, and ≥5.0 mg/m³
5. Informative and applicable only to tests of wet-applied products; grams of sample applied per square meter of substrate

Standards & Codes Recognizing CDPH Standard Method V1.2 (partial list)

- USGBC LEED Version 4, BD&C, ID&C
- The WELL Building Standard
- ANSI/GBI 01, Green Building Assessment Protocol
- Green Guide for Healthcare V2.2

Narrative: Dynamic Sports Construction, Inc selected a sample representative of its DynaForce, a polyurethane resilient rubber athletic flooring product and submitted it on 9/27/2018 for testing. Berkeley Analytical measured and evaluated the emissions of VOCs from this sample following CDPH/EHLB/Standard Method V1.2-2017. The results of the test are presented in Berkeley Analytical report, 649-002-01A-Oct1918.

Berkeley Analytical is an independent, third-party laboratory specializing in the analysis of organic chemicals emitted by and contained in building products, finishes, furniture, and consumer products. We are an ISO/IEC 17025 accredited laboratory (IAS, [TL-383](#)); all standards used in performing this test are in Berkeley Analytical's scope of accreditation.

DISCLAIMER: THIS CERTIFICATE OF COMPLIANCE AFFIRMS THAT: 1) A SAMPLE OF THE LISTED PRODUCT WAS TESTED ACCORDING TO THE REFERENCED STANDARD; 2) THE MEASURED VOC EMISSIONS FROM THE SAMPLE WERE EVALUATED FOR THE DEFINED EXPOSURE SCENARIO(S); AND 3) THE RESULTS MEET THE ACCEPTANCE CRITERIA OF THE REFERENCED STANDARD(S). BERKELEY ANALYTICAL IS NOT RESPONSIBLE FOR ANY CLAIMS REGARDING A PRODUCT OR PRODUCTS ENTERED INTO COMMERCE THAT MAY BE BASED ON THIS TEST. BERKELEY ANALYTICAL PROVIDES THIS CERTIFICATE OF COMPLIANCE "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PURPOSE.

CSI Form 1.5C

SUBSTITUTION REQUEST (During the Bid Period)

Project: Oscado Area Schools 2024 Bond Program Substitution Request Number:

BP 2 Community Center

From: Dynamic Sports Construction, Inc.

To: Wolgast Corporation

Date: 2/7/2025

A/E Project Number: 107253

Re: Substitution Request

Contract For: Resilient Athletic Flooring

Specification Title: Resilient Athletic Flooring

Description: Mondo Advance 8mm

Section: 096566 Page: 3

Article/Paragraph: 2.1A B 6

Proposed Substitution: OSSTSPORT Team Play M 8mm

Manufacturer: Ecore Athletic Address: 715 Fountain Ave, Lancaster, PA 17601 Phone: 512-260-6722

Trade Name: Ecore Athletic Model No.: 23.3

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
Same warranty will be furnished for proposed substitution as for specified product.
Same maintenance service and source of replacement parts, as applicable, is available.
Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
Proposed substitution does not affect dimensions and functional clearances.
Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted by: Corey Wolesensky

Signed by: Corey Wolesensky

Firm: Dynamic Sports Construction, Inc.

Address: 4338 W Highway 82, Gainesville, TX 76240

Telephone: 512-260-6722

A/E's REVIEW AND ACTION

- Substitution approved - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
Substitution approved as noted - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
Substitution rejected - Use specified materials.
Substitution Request received too late - Use specified materials.

Signed by:

Date:

Supporting Data Attached: Drawings Product Data Samples Tests Reports side by side



DYNAMIC SPORTS CONSTRUCTION, INC. LINE BY LINE PRODUCT COMPARISON

Standards	TeamPlay-M	Mondo Advance	
Thickness	8mm	8mm	
Elongation at Break	≥300%	≥200%	
Tensile Strength	≥300 psi	≥500 psi	
Abrasion Resistance	≤0.5g	≤0.4g	
Critical Radiant Flux	Compliant	Compliant	
Resistance to Chemicals	Compliant	Compliant	
Heat Resistance	Compliant	Compliant	
Light Resistance	Compliant	Compliant	
GREENGUARD Certification	Compliant	Compliant	
GREENGUARD Gold	Compliant	Compliant	



INDOOR MULTIPURPOSE ATHLETIC SURFACE

TeamPlay-M

- MOLDED AND VULCANIZED RUBBER LAYER
- BALL REBOUND >98%
- RESISTANCE TO IMPACT
- VERTICAL DEFORMATION <2.0mm
- GREAT ELASTICITY
- MULTIPURPOSE SURFACE FOR INDOOR SPORTS
- EXCELLENT ABRASION RESISTANCE
- GREENGUARD GOLD CERTIFICATION
- NATURAL MARBLING COLOR SURFACE



VERSATILE • DURABLE • EASY TO MAINTAIN



CO-VULCANIZED MULTILAYER



SURFACE LAYER

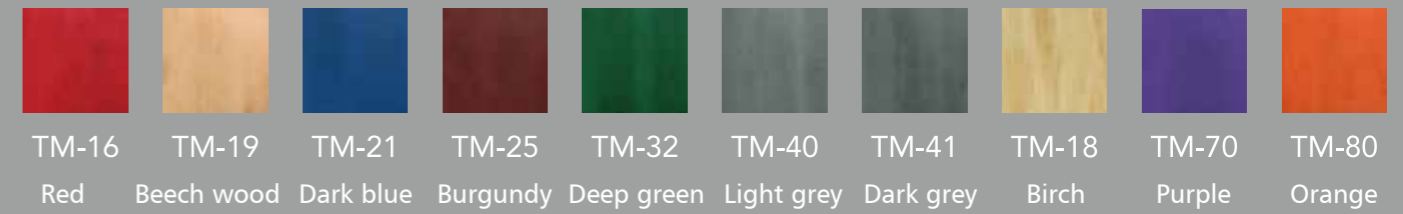
Smooth & marbling like finish surface.
Vulcanized rubber surface.
Easy to maintain.
Excellent abrasion resistance.



BASE LAYER

Vulcanized rubber base layer.
Flexible support structure.

COLOR RANGE



SPECIFICATION

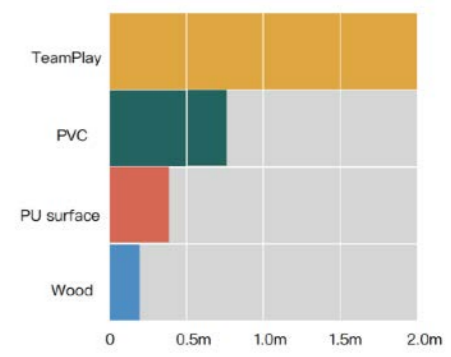
THICKNESS	6mm, 8mm, 10mm	
ROLL WIDTH	122cm	48"
ROLL LENGTH	6M to 15M	19'8" to 49'2.6"





OUTSTANDING DURABILITY
 Vulcanized rubber with extra thick wear layer makes an excellent resistance to abrasion

WEAR LAYER THICKNESS



TeamPlay-M

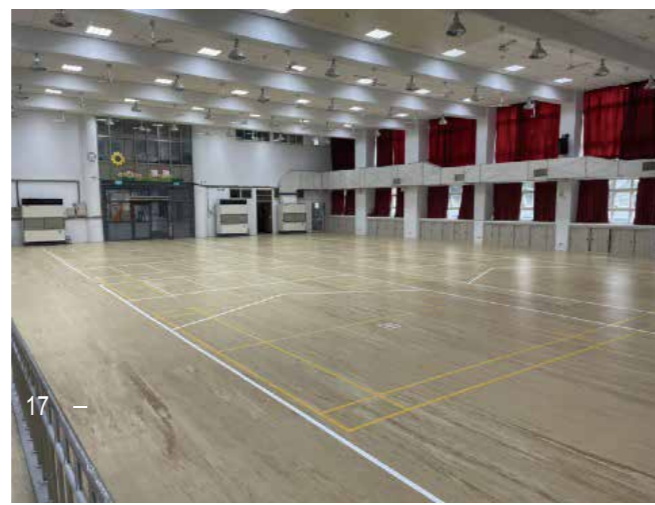
DURABLE. ELASTIC . COMFORTABLE

PERFORMANCE



EASY TO MAINTAIN
 Flat and non-porous surface

MARBLE LOOK SURFACE
 Natural marbled pattern



1. Manufacturer

KING ARTHUR INDUSTRIES CO., LTD.

No.512, Chioufen Rd, Luntze Tsun, Yung-Ching Hsaing, ChangHua Hsien, Taiwan

TEL: +886-4-8223131 FAX: +886-4-8229956, E-mail: info@osst-surfaces.com

2. Product name:

TeamPlay- Marble

2.1 Product description

2.1.a Prefabricated sport surface vulcanized in two layers construction consists of EPDM, natural rubber, mineral fillers, stabilizing agents, color pigments, none permeable, textured wear resistant surface layer and shock absorbing layer bonded by vulcanization.

2.1.b Color : 10 standard colors (see catalogue)

2.1.c Thickness: 6mm, 8mm,10mm

2.1.d Finish : smooth surface with marble color.

2.1.e Dimensions: in Roll : Width. 100cm to 125cm (3' 4" to 4'1.2")

Length 6M to 15M (19'8" to 49'2.6")

2.2 Product properties

Test items	Test Methods	Requirements	Thickness		
			6mm	8mm	10mm
Force reduction	ASTM F2772	>10%	10%±3	12%±3	15%±3
Vertical deformation	ASTM F2772	<3.5mm	0.4mm±0.2	0.5mm±0.2	0.6mm±0.2
Slip/Skid Resistance (Dry)	ASTM F2772	80~110	>90	>90	>90
Ball Rebound	ASTM F2772	>90%	>96%	>96%	>96%
Elongation at break	ASTM D412	≥70%	≥300%	≥300%	≥300%
Tensile Strength	ASTM D412	≥75psi	≥300 psi	≥300 psi	≥300 psi
Hardness of full layer	ASTM D2240	**	62±3	62±3	62±3
Abrasion resistance (H18,1000g,1000cycles)	ASTM D3389	≤1g	≤0.5g	≤0.5g	≤0.5g
Fungi resistance	ASTM G21-15	Under Level1	Level 0	Level 0	Level 0
Resistance of Chemicals	ASTM F925	No change	Compliant	Compliant	Compliant
Color Heat stability	ASTM F1514	≤8.0ΔE	0.61	0.61	0.61
Color Light stability	ASTM F1515	≤8.0ΔE	1.86	1.86	1.86
Critical Radiant Flux	ASTM E648	≥0.1w/cm2	Compliant	Compliant	Compliant
Resistance to impact	EN1517	no cracking	No damage	No damage	No damage
Resistance to indentation	EN1516	≤0.5 mm	<0.4mm	<0.4mm	<0.4mm
Resistance to a rolling load	EN1569	≤0.5 mm	<0.3mm	<0.3mm	<0.3mm
GREENGUARD Certification	GREENGUARD	Compliant	Compliant	Compliant	Compliant
GREENGUARD Gold	GREENGUARD	Compliant	Compliant	Compliant	Compliant
REACH SVHC items	REACH	Compliant	Compliant	Compliant	Compliant

Results obtained from manufacturing controls can vary between production lots and don't constitute representations or warranties as to any particular product lot. KING ARTHUR COMPANY keeps the right to modify the characteristics of the products anytime.

3 · Adhesive

Adhesive: Two component polyurethane glue.

***Please contact the glue manufacturer for product recommendation based on project location.**

4. Delivery and Storage

4.1 The general contractor shall provide a secure, clean and dry storage location, which is protected from exposure to harmful weather conditions at 65 to 104 degrees F (18 to 40 degrees °C).

4.2 Store sports flooring rolls in original wrappings, and label intact until time of installation.

4.3 Keep the rolls are well positioned in an upright position with pallet, and don't stack anything on top includes stack rolls on top of each other.

5. References

5.1 Association(s)

ASTM International (ASTM)

5.2 ASTM International (ASTM)

ASTM D412: Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.

ASTM D2240: Standard Test Method for Rubber Property (Durometer Hardness).

ASTM D3389: Standard Test Method for Coated Fabrics Abrasion Resistance (Rotary Platform Abrader).

ASTM F925: Standard Test Method for Resistance to Chemicals of Resilient Flooring.

ASTM F2772: Standard Specification for Athletic Performance Properties of Indoor Sports Floor Systems.

ASTM F2157: Standard Specification for Synthetic Surfaced Running Tracks

ASTM F2117: Standard Test Method for Vertical Rebound Characteristics of Sports Surface

ASTM E303: Standard Test Method for Measuring Surface Frictional Properties

ASTM F2569: Standard Test Method for Evaluating the Force Reduction Properties of Surfaces for Athletic

ASTM E648: Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant

ASTM F1514: Standard Test method for Measuring Heat Stability of Resilient Flooring by Color Change.

ASTM F1515: Standard Test Method for Measuring Light Stability of Resilient Flooring by Color Change.

5.3 European Committee for Standardization (EN)

EN 13036-4: Road and airfield surface characteristics. Test methods -the pendulum test for friction.

EN 14808: Surfaces for sports areas. Determination of shock absorption.

EN 14809: Surfaces for sports areas. Determination of vertical deformation.

EN 12235: Surfaces for sports areas - Determination of vertical ball behavior

EN 1517: Surfaces for sports areas. Determination of Resistance to impact.

EN 1516: Surfaces for sports areas. Determination of Resistance to indentation.

EN 1569: Surfaces for sports areas. Determination of Resistance to a rolling load.

5.4 GREENGUARD Environmental Institute (GEI)

GREENGUARD Certification: Compliant with stringent emission levels for over 360 VOCs, plus a limit on the total of all chemical emissions combined (TVOC).

GREENGUARD Gold Certification: Compliant with safety factors to account for sensitive individuals (such as children and the elderly) and ensure that a product is acceptable for use in environments such as schools and healthcare facilities.

5.5 REACH:

Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH), establishing European Chemicals Agency.

5.6 SVHC:

Candidate List of substances of very high concern for Authorization (published in accordance with Article 59(10) of the REACH Regulation)

RFI detail

#19 Substitution Request RTUs & Duct in the gym



Status	Closed
Created on	Feb 10, 2025 by Matt Moser (WOLGAST CORPORATION)
RFI type	Default RFI workflow
Ball in court	Matt Moser (WOLGAST CORPORATION)
Answered	Feb 13, 2025 by Dustin DeWitt (The Collaborative)

Question

Could, Captive Air, Paragon & Modine be a substitute for the Aeon systems.

Cannot find a manufacturer for the bathroom stalls.

Could Prihoda be a substitute for the fabric duct in the gym.

Official response

Dustin DeWitt (The Collaborative): Rejected, please submit proper forms and documentation for substitution requests. See spec sections for acceptable manufactures. See SECTION 102113.19 - SOLID PLASTIC TOILET COMPARTMENTS 2.1 for Bathroom stall partitions.

By *Dustin DeWitt* (The Collaborative) - Feb 13, 2025, 1:16 PM EST

Impact

Cost impact -

Schedule impact -






Other attributes

Priority Normal

Discipline -

Category -

Location	-
Location details	-
External id	-
Co-reviewer(s)	
Spec Section	-
Construction Phase	Pre-Bid

Activities	By	At
<p>Christie Huver changed the status from  Open Answered to  Closed</p> <p>Official response: Dustin DeWitt (The Collaborative): Rejected, please submit proper forms and documentation for substitution requests. See spec sections for acceptable manufactures. See SECTION 102113.19 - SOLID PLASTIC TOILET COMPARTMENTS 2.1 for Bathroom stall partitions.</p> <p>changed the watchers to Patrick Fritz (WOLGAST CORPORATION), Clinton Clark (WOLGAST CORPORATION), Matt Moser (WOLGAST CORPORATION)</p>	Christie Huver	Feb 13, 2025, 1:17 PM EST
<p>Christie Huver changed the status from  Open In Review to  Open Answered set Ball in court to Matt Moser (WOLGAST CORPORATION)</p>	Christie Huver	Feb 13, 2025, 1:16 PM EST
<p>Allison Schrecongost response was submitted by Christie Huver: Per Dustin's response</p>	Christie Huver	Feb 13, 2025, 1:16 PM EST
<p>Dustin DeWitt added a response: Rejected, please submit proper forms and documentation for substitution requests. See spec sections for acceptable manufactures. See SECTION 102113.19 - SOLID PLASTIC TOILET COMPARTMENTS 2.1 for Bathroom stall partitions.</p>	Dustin DeWitt	Feb 11, 2025, 10:49 AM EST
<p>Matt Moser (WOLGAST CORPORATION) created this RFI in  Open In Review status and set Ball in court to Allison Schrecongost, Dustin DeWitt (The Collaborative).</p>	Matt Moser	Feb 10, 2025, 4:26 PM EST

RFI detail

#20 Support Steel



Status	Closed
Created on	Feb 11, 2025 by Matt Moser (WOLGAST CORPORATION)
RFI type	Default RFI workflow
Ball in court	Matt Moser (WOLGAST CORPORATION)
Answered	Feb 13, 2025 by Dustin DeWitt (The Collaborative)

Question

Please clarify support steel requirements for scoreboards as shown on A4.00.

Please clarify support steel requirements for overhead volleyball equipment.

Official response

Dustin DeWitt (The Collaborative): Scoreboard: Assume a dead load of 200 lbs per unit. Provide miscellaneous framing between wall girts for anchorage. Sub-framing between girts shall be by the PEMB supplier (similar to a framed opening).

Volleyball: Locations per A7.22, provide PEMB secondary framing at the primary attachment point of 1250 lbs and brace attachment point of 500 lbs, final dimensions and layout shall be coordinated with the supplier.

By **Dustin DeWitt** (The Collaborative) - Feb 13, 2025, 1:11 PM EST

References and Attachments

Files (1)

- [A4.00--Building Sections.pdf](#)

Impact

Cost impact -

Schedule impact -

Other attributes

Priority Normal

Discipline -

Category -

Location -

Location details -

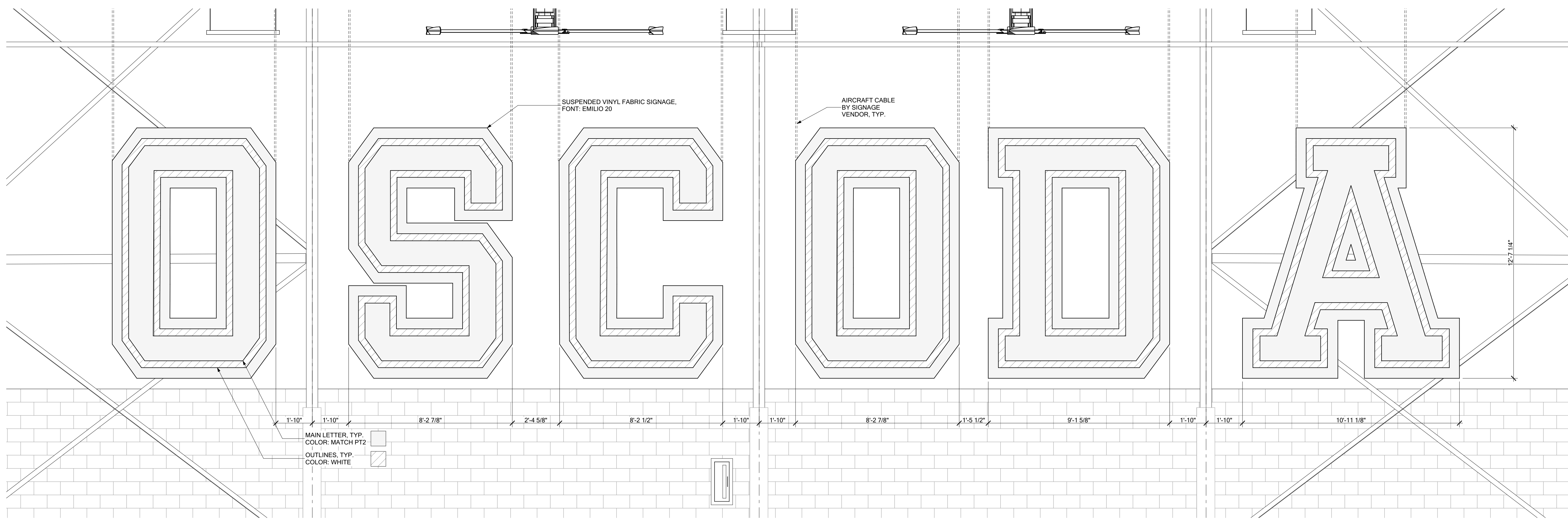
External id -

Co-reviewer(s)

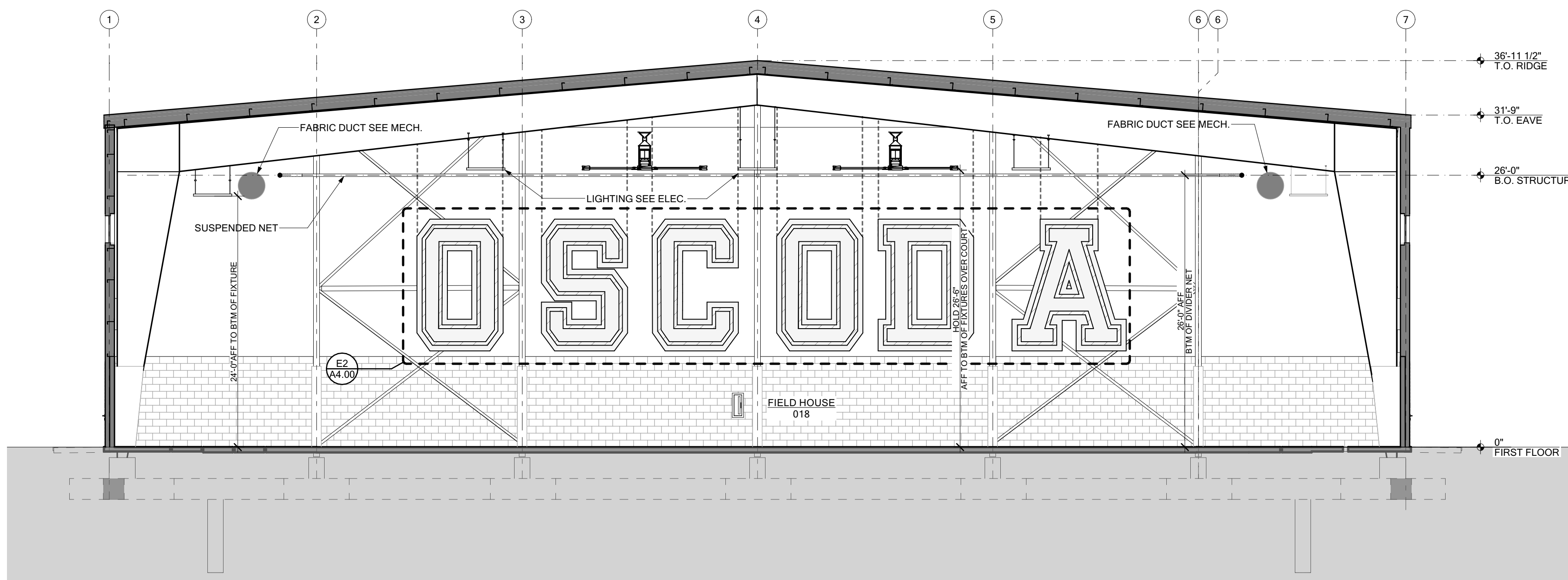
Spec Section -

Construction Phase Pre-Bid

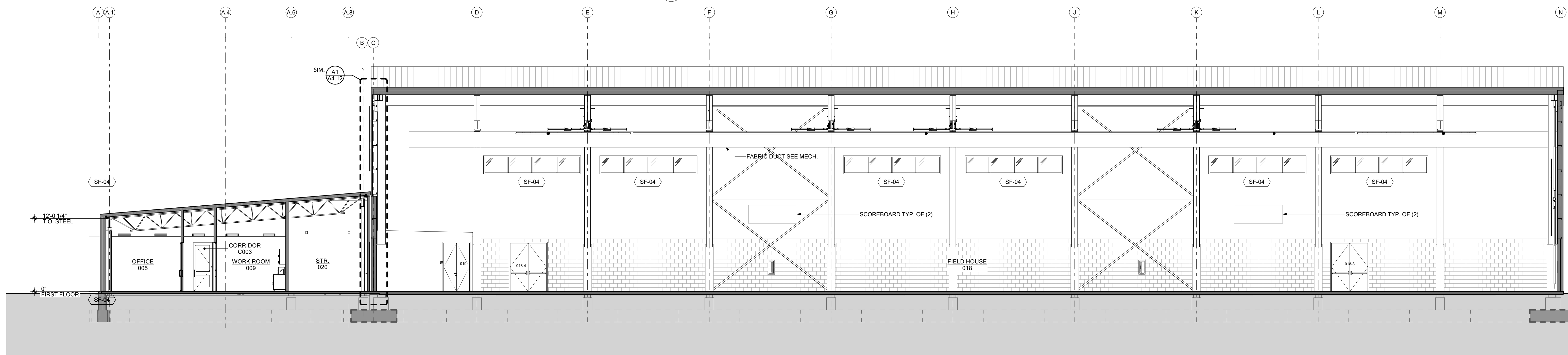
Activities	By	At
<p>Christie Huver changed the status from Open Answered to Closed</p> <p>Official response: Dustin DeWitt (The Collaborative): Scoreboard: Assume a dead load of 200 lbs per unit. Provide miscellaneous framing between wall girts for anchorage. Sub-framing between girts shall be by the PEMB supplier (similar to a framed opening).</p> <p>Volleyball: Locations per A7.22, provide PEMB secondary framing at the primary attachment point of 1250 lbs and brace attachment point of 500 lbs, final dimensions and layout shall be coordinated with the supplier.</p> <p>changed the watchers to Patrick Fritz (WOLGAST CORPORATION), Clinton Clark (WOLGAST CORPORATION), Matt Moser (WOLGAST CORPORATION)</p>	Christie Huver	Feb 13, 2025, 1:11 PM EST
<p>Christie Huver changed the status from Open In Review to Open Answered set Ball in court to Matt Moser (WOLGAST CORPORATION)</p>	Christie Huver	Feb 13, 2025, 1:11 PM EST
<p>Allison Schrecongost response was submitted by Christie Huver: Per Dustin's reponse</p>	Christie Huver	Feb 13, 2025, 1:11 PM EST
<p>Dustin DeWitt added a response: Scoreboard: Assume a dead load of 200 lbs per unit. Provide miscellaneous framing between wall girts for anchorage. Sub-framing between girts shall be by the PEMB supplier (similar to a framed opening). Volleyball: Locations per A7.22, provide PEMB secondary framing at the primary attachment point of 1250 lbs and brace attachment point of 500 lbs, final dimensions and layout shall be coordinated with the supplier.</p>	Dustin DeWitt	Feb 11, 2025, 12:41 PM EST
<p>Matt Moser added a reference to a File A4.00--Building Sections.pdf</p>	Matt Moser	Feb 11, 2025, 9:00 AM EST
<p>Matt Moser (WOLGAST CORPORATION) created this RFI in Open In Review status and set Ball in court to Allison Schrecongost, Dustin DeWitt (The Collaborative).</p>	Matt Moser	Feb 11, 2025, 9:00 AM EST



E2 ENLARGED SIGNAGE ELEVATION
SCALE: 3/8" = 1'-0"



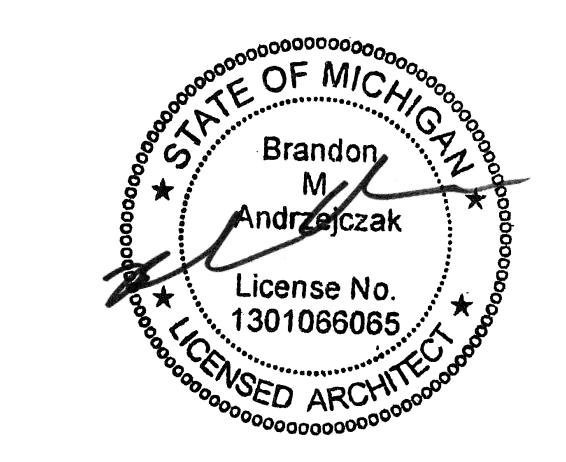
C1 SOUTH TRANSVERSE BUILDING SECTION
SCALE: 1/8" = 1'-0"



A1 EAST LONGITUDINAL BUILDING SECTION
SCALE: 1/8" = 1'-0"

KEYNOTES:
(NOTE: NOT ALL NUMBERS ARE USED)

BAR-01	VAPOR-RETARDING AIR BARRIER SYSTEM
BAR-02	VAPOR-PERMEABLE AIR BARRIER SYSTEM
BAR-03	VAPOR-PERMEABLE WATER-RESISTIVE BARRIER
BAR-04	BARRIER TRANSITION SHEET
BAR-05	APPLIED DAMPPROOFING
CLG-01	CEILING
CLG-02	SEE REFLECTED CEILING PLANS A7 00 SERIES SHEETS
CMF-01	COLD-FORMED METAL FRAMING
CMF-02	COLD-FORMED DEFLECTION TRACK
CMF-03	COLD-FORMED CLIP ANGLE
CMF-04	COLD-FORMED BOX HEADER
CON-01	CONCRETE
CON-02	CAST-IN-PLACE CONCRETE
CON-03	UNDERSLAB VAPOR RETARDER
CON-04	EXPANSION JOINT FILLER
CON-05	PRECAST CONCRETE PLANK
CON-06	PRECAST CONCRETE PANEL
CWF-01	CURTAIN WALL FRAMING SYSTEM
CWF-02	CURTAIN WALL ANCHOR CLIP
DEK-01	METAL DECKING
DEK-02	STEEL DECKING
DEK-03	STEEL ACOUSTICAL DECKING
FLR-01	FLOORING
FLR-02	CARPET
FST-01	FIRE STOPPING, SEALANTS, AND RESISTIVE MATERIALS
FST-02	FIRESTOPPING
FST-03	FIRE SEALANT
FST-04	SPRAY-APPLIED FIRE-RESISTIVE MATERIAL
FST-05	INTUMESCENT COATING
GLA-01	GLAZING
GLA-02	MONOLITHIC GLAZING
GLA-03	INSULATED GLAZING UNIT
GYP-01	GYP-SUM BOARD ASSEMBLIES
GYP-02	GYP-SUM BOARD
GYP-03	GLASS MAT-FACED GYP-SUM BOARD
GYP-04	CONTROL JOINT
GYP-05	CORNER BEAD
GYP-06	J-BEAD
GYP-07	F-REVEAL
GYP-08	U-REVEAL
GYP-09	Z-REVEAL
GYP-10	CEMENT BACKER BOARD
HMD-01	HOLLOW METAL DOORS AND FRAMES
HMD-02	HOLLOW METAL DOOR FRAME
HMD-03	HOLLOW METAL WINDOW OPENING
HMD-04	HOLLOW METAL DOOR
INS-01	INSULATION
INS-02	RIGID INSULATION BOARD
INS-03	SPRINKLER INSULATION
INS-04	THERMAL BATT INSULATION
INS-05	ACOUSTICAL BATT INSULATION
JNT-01	JOINT SEALANTS
JNT-02	JOINT SEALANT
JNT-03	BACKER ROD
JNT-04	ACOUSTICAL SEALANT
JNT-05	PREFORMED JOINT SEAL
JNT-06	BUILDING EXPANSION JOINT ASSEMBLY
JST-01	STEEL JOISTS
JST-02	STEEL JOIST
JST-03	STEEL JOIST GIRDER
JST-04	BEARING PLATE
JST-05	JOIST SUBSTITUTE
MAS-01	MASONRY (GENERAL)
MAS-02	BRICK MASONRY
MAS-03	CONCRETE MASONRY UNIT
MAS-04	DECORATIVE CMU VENEER
MAS-05	FLASHING
MAS-06	VENEER ANCHOR
MAS-07	MASONRY WEEP, 24" O.C.
MAS-08	PRESSURE EQUALIZATION VENT, 24" O.C.
MAS-09	CAVITY DRAINAGE MATERIAL
MAS-10	GROUT
MAS-11	PREFORMED MASONRY CONTROL JOINT
MAS-12	LINTEL
MAS-13	SOLID CONCRETE MASONRY UNIT
MAS-14	CMU BOND BEAM
MAS-15	CMU FLASHING PAN
MAS-16	FLASHING TERMINATION BAR
MPL-01	METAL PANELS
MPL-02	ARCHITECTURAL METAL PANEL
MPL-03	METAL COMPOSITE MATERIAL PANEL
MPL-04	FLASHING TO MATCH METAL PANEL
MPL-05	METAL SOFFIT PANEL
NSF-01	NON-STRUCTURAL METAL FRAMING (3/8" UNO)
NSF-02	NON-STRUCTURAL DEFLECTION TRACK
NSF-03	HAT CHANNEL FURRING (1 1/2" UNO)
NSF-04	RESILIENT CHANNEL FURRING
NSF-05	Z-FURRING
NSF-06	NON-STRUCTURAL CLIP ANGLE
NSF-07	SHAFT WALL FRAMING
NSF-08	J-TRACK
NSF-09	FRAMING TRACK
OHD-01	OVERHEAD DOORS
OHD-02	OVERHEAD COILING INSULATED DOOR
OHD-03	OVERHEAD COILING SHUTTER
PMB-01	PRE ENGINEERED METAL BUILDING
PMB-02	METAL WALL PANEL
PMB-03	METAL BUILDING FRAME
PMB-04	GIRT
PMB-05	PURLIN
PMB-06	EAVE / RAKE FRAMING
PMB-07	TRIM
RFG-01	ROOFING
RFG-02	SINGLE-PLY MEMBRANE ROOFING
RFG-03	ROOF MEMBRANE FLASHING
RFG-04	ROOFING INSULATION
RFG-05	TAPERED ROOFING INSULATION
RFG-06	ROOFING VAPOR RETARDER
RFG-07	TERMINATION BAR
RFG-08	PREFORMED PIPE BOOT
RFG-09	STANDING-SEAM METAL ROOFING
RFG-10	STANDING-SEAM ROOF FLASHING
RFG-11	ROOFING UNDERLAYMENT
RFG-12	CONTINUOUS ICE & WATER SHIELD
RNF-01	REINFORCING STEEL
RNF-02	REINFORCING BAR
RNF-03	WELDED WIRE MESH
SFR-01	STOREFRONT FRAMING
SFR-02	STOREFRONT FRAMING SYSTEM
SFR-03	COMPENSATING HEAD RECEPTOR
SFR-04	EXTRUDED SILL FLASHING
SFR-05	STOREFRONT ENTRANCE
SFR-06	BRAKE METAL TRIM TO MATCH FRAMING
SFR-07	PREFINISHED FLASHING TO MATCH FRAMING
SHD-01	WINDOW SHADES
SHD-02	ROLLING WINDOW SHADE
SHG-01	SHEATHING
SHG-02	FIBERGLASS MAT GYP-SUM SHEATHING
SHG-03	PLYWOOD SHEATHING (3/4" FRT UNO)
SHG-04	NAIL BASE SHEATHING (3/8" TOTAL THICKNESS UNO)
SHM-01	SHEET METAL FABRICATIONS
SHM-02	GUTTER
SHM-03	DOWNSPOUT
SHM-04	GRAVEL STOP
SHM-05	CORNING
SHM-06	SHEET METAL FLASHING
SHM-07	Drip EDGE
SHM-08	COUNTERFLASHING
SSU-01	SOLID SURFACE
SSU-02	SOLID SURFACE MATERIAL, SEE FINISH SCHEDULE
STL-01	STRUCTURAL STEEL
STL-02	STEEL COLUMN
STL-03	STEEL BEAM
STL-04	STEEL PLATE
STL-05	STEEL ANGLE
STL-06	STEEL CHANNEL
STL-07	STEEL WIDE FLANGE BEAM
STL-08	STEEL RECTANGULAR TUBE
STL-09	STEEL ROUND TUBE
STN-01	STONE MASONRY
STN-02	STONE VENEER MASONRY
STN-03	STONE WALL CAP
WFN-01	WOOD FINISH CARPENTRY
WFN-02	WOOD TRIM
WFN-03	WOOD VENEER TRIM PANEL
WFN-04	WOOD BASE
WFN-05	WOOD FINISH FLOORING
WDF-01	ROUGH WOOD FRAMING (FRT UNO)
WDF-02	WOOD BLOCKING
WDF-03	WOOD FRAMING (2X4 UNO)
WDF-04	WOOD FURRING
WIN-01	WINDOWS
WIN-02	WINDOW



PROJECT TITLE
OSCODA AREA SCHOOLS

NEW COMMUNITY CENTER
3550 E River Rd,
Oscoda, MI, 48750

12/18/2024 CD/BD
10/11/2024 DESIGN DEVELOPMENT
08/16/2024 SCHEMATIC DESIGN

TC JOB NO. 107253
OWNER JOB NO. #Client Project No.

SHEET TITLE
BUILDING SECTIONS