Purchasing Division
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Addendum 2
Solicitation 21-AA19
Hartley Nature Center Building and Parking Additions

This addendum serves to notify all bidders of the changes to the solicitation as identified in the attached documents.

Please acknowledge receipt of this Addendum by checking the acknowledgment box within the www.bidexpress.com solicitation. Failure to acknowledge the addendum may render your bid non-responsive.

Posted: **May 6, 2021**

PERFORMANCE
DRIVEN DESIGN.
LHBcorp.com

ADDENDUM NO. 02, May 6, 2021

RE: Hartley Nature Center Building Addition

LHB Project No.: 190961

TO: All Plan Holders

FROM: LHB, Inc.

This Addendum forms a part of the Contract Documents and modifies the original Bidding Documents dated April 2, 2021 and Addendum No. 01, dated April 30, 2021. Acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject the Bidder to disqualification.

This Addendum consists of 03 pages and the following attachment (s):

- 09 6723
- 09 9300
- 23 2013
- 23 5400
- 23 8219
- 26 0944
- 28 3100
- C205
- A711
- E500
- E701

QUESTIONS AND ANSWERS

Q1: Rm finish show's rm 123 and 124 to have act ceilings, the ceiling plan shows gyp which one do they want?
A1: Ceilings to be Gypsum Board. Updated Room Finish schedule in this Addendum.

Q2: Is the new siding getting finished?
A2: Siding to be stained to match existing. Specification section inserted.

Q3: Please clarify existing vendor types of systems for both the fire alarm and security.
A3: Refer to revised Security drawings and Fire Alarm spec.

Q4: Division #9 calls out for sec. 09 8430 Sound Absorbing wall & ceiling units. The section is not listed. Does this apply to the project?
A4: Section 09 8430 will be deleted from the Specification.

Q5: Section 09 5100 calls out for 15/16" grid and Material Finish calls out for DXFL?
A5: Section 09 5100 will be removed. Refer to Section 09 5113 for grid information.

Q6: Section 09 5113 2.10 Metal edge molding and trim. States for circular penetrations of the ceiling. Does this apply to this project?
A6: All ceiling penetrations should receive a finished edge.

Q7: Which scope is carrying the permanent parking signs (salvage and new)?
A7: The earthwork and civil scope.

Q8: To what extents does note 4 on plan page C204 apply? Is the intent to verify existing depth of the watermain just in areas where design finish grade is lower than existing finish grade?

A8: That is correct. Verify existing depth of watermain in areas where design grade is lower than existing grade.

Q9: Is this job going to be subject to any tree clearing date restrictions?
A9: It will be the responsibility of the contractor to adhere to all permit requirements, which may include but is not limited to, the wetland permit special conditions for the determination of the northern long-eared bat hibernacula and roost trees and subsequent tree clearing dates. According to readily available information from the US Fish and Wildlife Natural Heritage Inventory database, no bat hibernacula or roost tree locations are documented at this site.

Q10: For those bidding on "Gardner Builders" scope items, please clarify how bids should be submitted and who they should be submitted to.
A10: All bids going to Gardner Builders directly can be submitted through the Building Connected invite or email to duluthestimating@gardner-builders.com

Q11: For those bidding on "Gardner Builders" scope items, please clarify if bid bonds are required.
A11: Bid Bonds are required only for the sealed bid packages. No performance or payment bonds will be required for the scope items bid to Gardner Builders. These will be held through Gardner Builders.

Q12: If bid bonds are required for "Gardner Builders" scope items, should the bonds be submitted with the bid or do they specifically have go through Bid Express or to purchasing@duluthmn.gov regardless of how/where the bid is submitted?
A12: Refer to Addendum 01.

Q13: For bid scope 9F Resinous Flooring 09 6723, only the flake is specified, the coating system (manufacturer and product line) that the flake would be broadcast into is not specified. Please clarify.
A13: Refer to revised 09 6723 in this Addendum.

Q14: Sheets X000 Quality Control and X001 Standard Notes are not included in the set?
A14: Remove reference to X000 and X001, they are not a part of the set.

Q15: Will an Exterior Painting specification section be issued and added to the painting scope?
A15: Exterior staining Specification section is added with this Addendum.

Q16: What is the existing Wood Door Veneer?
A16: Existing doors appear to be cherry veneer.

GENERAL - None

CHANGES TO SPECIFICATIONS
2-1. Remove Section 09 8430 in its entirety.
2-2. Remove Section 09 5100 in its entirety.
2-3. Replace Section 09 6723 in its entirety.
2-4. Add Section 09 9300 in its entirety.
2-5. Replace Section 23 2013 in its entirety.
2-6. Replace Section 23 5400 in its entirety.
2-7. Replace Section 8219 in its entirety.
2-8. Replace Section 26 0944 in its entirety.
2-9. Replace Section 28 3100 in its entirety.

PRODUCT APPROVALS

No materials or equipment will be allowed to be used unless it either 1) meets specified criteria and/or manufacturer or 2) has received prior approval as documented in an addendum. This includes all equipment furnished by subcontractors.

Section / Paragraph No.	Specified Product	Proposed Substitution / Model
08 1416/2.01.A	Wood Veneer Doors	Eggers Industries, Graham Wood Doors, Marshfield Door Systems
06 8316/2.01.A	Fiberglass Reinforced Plastic	Glasteel
09 5113	Acoustic Ceiling Baffles	Golterman & Sabo, aCappella Verse - baffles

CHANGES TO DRAWINGS

2-10. Replace Sheet C205 in its entirety.
2-11. Replace Sheet A711 in its entirety.
2-12. Replace Sheet E500 in its entirety.
2-13. Replace Sheet E701 in its entirety.

END OF ADDENDUM NO. 02

SECTION 09 6723

RESINOUS FLOORING AND WALL SYSTEMS (REVISED ADDENDUM NO. 02)

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resinous Systems of the Following Types:
   1. Decorative Mosaic Epoxy Flooring.
   2. Epoxy Cove Base.

1.02 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete.

1.03 REFERENCES

A. ASTM International (ASTM):
   1. ASTM C29 / C29M - Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate.
   2. ASTM C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
   3. ASTM C128 - Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.
   4. ASTM C307 - Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacings.
   5. ASTM C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.
   6. ASTM C413 - Standard Test Method for Absorption of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
   7. ASTM C566 - Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying.
   8. ASTM C570 - Standard Specification for Oil- and Resin-Base Caulking Compound for Building Construction.
   9. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
   10. ASTM C580 - Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
   11. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
   12. ASTM D257 - Standard Test Methods for DC Resistance or Conductance of Insulating Materials.
   13. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
   14. ASTM D471 - Standard Test Method for Rubber Property - Effect of Liquids.
   15. ASTM D522 - Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings.
   16. ASTM D570 - Standard Test Method for Water Absorption of Plastics.
   17. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
   18. ASTM D628 - Standard Specification for Asbestos Tubular Sleeving.
   19. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
   20. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
   21. ASTM D648 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
   22. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics.
   23. ASTM D696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between minus 22 to 86 degrees F (minus 30 and 30 degrees C) with a Vitreous Silica Dilatometer.

24. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
25. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
26. ASTM D1475 - Standard Test Method For Density of Liquid Coatings, Inks, and Related Products.
27. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
28. ASTM D2134 - Standard Test Method for Determining the Hardness of Organic Coatings with a Sward-Type Hardness Rocker.
29. ASTM D2196 - Standard Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational Viscometer.
30. ASTM D2240 - Standard Test Method for Rubber Property-Durometer Hardness.
31. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
32. ASTM D2369 - Standard Test Method for Volatile Content of Coatings.
33. ASTM D2370 - Standard Test Method for Tensile Properties of Organic Coatings.
34. ASTM D2393 - Test Method for Viscosity of Epoxy Resins and Related Components.
35. ASTM D2697 - Standard Test Method for Volume Nonvolatile Matter in Clear or Pigmented Coatings.
36. ASTM D2794 - Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
37. ASTM D3278 - Standard Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus.
38. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.
39. ASTM D4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
40. ASTM D4226 - Standard Test Methods for Impact Resistance of Rigid Poly(Vinyl Chloride) (PVC) Building Products.
41. ASTM D4366 - Standard Test Methods for Hardness of Organic Coatings by Pendulum Damping Tests
42. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
43. ASTM D5441 - Standard Test Method for Analysis of Methyl Tert-Butyl Ether (MTBE) by Gas Chromatography.
44. ASTM D7234 - Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
45. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
46. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
47. ASTM F3010 - Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Coverings
48. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
49. ASTM G154 - Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials.
50. ASTM G155 - Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.

B. National Floor Safety Institute (NFSI):
    1. ANSI/NFSI B101.1 - Test Method for Measuring Wet SCOF of Common Hard-Surface Floor Materials.

1.04 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data:
   1. Manufacturer's data sheets on each product to be used, including properties, VOC content, wet static coefficient of friction, compressive strength, tensile strength, elongation and similar properties.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Typical installation methods.

C. Verification Samples: Two representative units of each system, including color and texture.

D. Shop Drawings: Include details of materials, construction and finish. Include relationship with adjacent construction.

E. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.

F. Manufacturer's Project References: Submit manufacturer's list of successfully completed resinous flooring system projects, including project name and location, name of architect, and type and quantity of flooring systems furnished.

G. Applicator's Project References: Submit applicator's list of successfully completed resinous flooring system projects, including project name and location, name of architect, and type and quantity of flooring systems applied.

H. Care and Maintenance Instructions: Submit manufacturer's care and maintenance instructions, including cleaning instructions.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.

B. Applicator's Qualifications:
   1. Applicator regularly engaged, for a minimum of 5 years, in application of resinous flooring systems of similar type to that specified.
   2. Employ persons trained for application of resinous flooring systems.

C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

D. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect's review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
   1. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
   2. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
   3. Retain mock-up during construction as a standard for comparison with completed work.
   4. Do not alter or remove mock-up until work is completed or removal is authorized.

1.06 PRE-INSTALLATION CONFERENCE

A. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Delivery Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name, manufacturer, and batch number.

B. Storage and Handling Requirements:
   1. Store and handle materials in accordance with manufacturer's instructions.
   2. Keep materials in manufacturer's original, unopened containers and packaging until application.

3. Store materials in clean, dry area indoors between 65 and 80 degrees F (18 and 27 degrees C).
4. Store materials out of direct sunlight.
5. Keep materials from freezing.
6. Protect materials during storage, handling, and application to prevent contamination or damage.

1.08 PROJECT CONDITIONS

A. Apply flooring system under the following ambient conditions:
   1. Ambient and Concrete Floor Temperatures: Between 65 and 85 degrees F (18 and 29 degrees C).
   2. Material Temperature: Between 65 and 85 degrees F (18 and 29 degrees C).
   3. Relative Humidity: Maximum 80 percent.
   4. Dew Point: Floor temperature more than 5 degrees over dew point.

B. Do not apply flooring system under ambient conditions outside manufacturer's limits.

1.09 WARRANTY

A. Submit manufacturer's standard warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers
   1. Decorative Mosaic Epoxy Coating.
      a. Sherwin Williams, General Polymers (800) 524-5979.
      b. Florock Polymer Flooring, www.florock.net, (773)376-7132.

B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.02 DECORATIVE FLAKE

A. Match colors from Custom Mix by Torginol Inc. (800)558-7596.
   1. Refer to the Room Finish Schedule on the Drawings for type FF.1, FF.2 and Base FFB.1 and FFB.2.

B. Decorative Flake: Water-based resin material, inorganic minerals, additives, integrally pigmented.
   1. Shape: Random.
   2. Size: 1/4
   3. Surface Texture: Smooth.
   4. Color: As Scheduled.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine concrete surfaces to receive resinous system. Verify concrete is structurally sound.

B. Do not begin preparation or installation until satisfactory moisture test results are achieved. Provide manufacturer's recommended moisture vapor control coating if required.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Protection of In-Place Conditions: Protect adjacent surfaces and adjoining walls from contact with resinous system materials.

C. Surface Preparation:
   1. Prepare concrete surface in accordance with manufacturer’s instructions.
   2. Remove dirt, dust, debris, oil, grease, curing agents, bond breakers, paint, coatings, sealers, silicones, and other surface contaminants which could adversely affect application of resinous system.

3. Steel shot blast concrete to a minimum surface profile of ICRI 310.2R, CSP 5.
4. Key-cut termination points with 1/4-inch (6-mm) by 1/4-inch (6-mm) cut.
5. Patch depressions, divots, and cracks in concrete in accordance with manufacturer's instructions.
6. Mechanically remove loose, delaminated, and damaged concrete and repair in accordance with manufacturer's instructions.
7. Joints: Fill joints in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install resinous system in accordance with manufacturer's instructions and approved submittals at locations indicated on the Drawings.

B. Ensure concrete is dry, clean, and prepared in accordance with manufacturer's instructions.

C. Allow concrete to cure a minimum of 7 days before applying resinous system.

D. Mixing:
1. Mix material components together in accordance with manufacturer's instructions.
2. Mix only enough material that can be applied within working time.
3. Add and mix colorants with materials in accordance with manufacturer's instructions to achieve uniform color.

E. Apply resinous system materials to obtain consistent mil thickness and smooth, uniform appearance and texture.

F. Overlay: Apply overlay in accordance with manufacturer's instructions. Apply overlay to prepared concrete surface.

G. Traction Aggregate: Broadcast traction aggregate in accordance with manufacturer's instructions. Broadcast traction aggregate into wet overlay.

H. Cove:
1. Apply cove primer and cove in accordance with manufacturer's instructions at locations indicated on the Drawings.
2. Apply cove to height and shape as indicated on the Drawings.
3. Apply cove to create seamless, smooth transition between flooring and walls.

I. Seal Coat:
1. Apply seal coat in accordance with manufacturer's instructions.
2. Apply seal coat over traction aggregate.

3.04 FIELD QUALITY CONTROL

A. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.

B. Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01.

3.05 CLEANING AND PROTECTION

A. Allow resinous system to dry in accordance with manufacturer's instructions before opening to traffic.

B. Allow resinous system to dry a minimum of 1 week before cleaning by mechanical means.

C. Protect completed resinous system from damage during construction.

END OF SECTION

SECTION 09 9300

STAINING AND TRANSPARENT FINISHING (ISSUED ADDENDUM NO. 02)

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of stains.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 REFERENCE STANDARDS

A. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category.

C. Samples: Submit two samples, illustrating selected colors and sheens for each system with specified coats cascaded. Submit on actual wood substrate to be finished, ____by____ inch in size.

D. Certification: By manufacturer that stains and transparent finishes comply with VOC limits specified.

E. Maintenance Data: Submit data including product technical data sheets, safety data sheets (SDS), care and cleaning instructions, and touch-up procedures.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 3 years experience and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of stain or transparent finish, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Stain and Transparent Finish Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by manufacturer of stains and transparent finishes.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Stains:
   1. Behr Process Corporation: www.behr.com/#sle.
   2. PPG Paints Flood Exterior Stains: www.flood.com/#sle.
   3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 STAINS AND TRANSPARENT FINISHES - GENERAL

A. Finishes:
   1. Provide finishes capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   3. Supply each finish material in quantity required to complete entire project's work from a single production run.
   4. Do not reduce, thin, or dilute finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 01 6116.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: To be selected from manufacturer's full range of available colors.
   1. Selection to be made by Architect after award of contract. Color to match existing.

2.03 EXTERIOR STAIN AND TRANSPARENT FINISH SYSTEMS

A. Finish on Wood:
   1. Stain: Exterior Solid Stain for Wood, Water Based; MPI #16.
      a. Products:
         1) Behr Premium Solid Color Waterproofing Stain.
         2) PPG Paints Flood Pro Series Solid Color Stain, FLD 820 Series.
         3) Sherwin-Williams WoodScapes Acrylic Solid Color Stain. (MPI #16)
         4) Substitutions: Section 01 6000 - Product Requirements.

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of finished surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of stains and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's written instructions.

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

D. Sand wood surfaces lightly between coats to achieve required finish.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Reinstall items removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

END OF SECTION

SECTION 23 20 13
HYDRONIC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe and pipe fittings for:

1. Heating water piping system.
2. Radiant heating piping system.
3. Equipment drains and overflows.
4. Unions, flanges and couplings.

1.2 RELATED SECTIONS

A. Section 23 05 00 – Common Work Results for HVAC Equipment.

B. Section 23 05 29 - Hangers and Supports for HVAC Piping, Ductwork and Equipment.

C. Section 23 05 53 – Identification for HVAC Piping, Ductwork and Equipment.

D. Section 23 07 19 – HVAC Piping Insulation.

E. Section 23 05 16 – Expansion Fittings and Loops for HVAC Piping.

F. Section 23 25 31 - Water Treatment for Heating Systems.

G. Section 23 20 19 - Hydronic Specialties.

1.3 REFERENCES

A. ASME - Boiler and Pressure Vessel Codes, SEC 9 - Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators.

B. ASME B31.9 - Building Services Piping.

C. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.

D. ASTM B88 - Seamless Copper Water Tube.

E. ASTM F876 - Crosslinked Polyethylene (PEX) Tubing.

F. AWS D1.1 - Structural Welding Code.

1.4 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Use grooved mechanical couplings and fasteners only in accessible locations.

C. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

D. Use non-conducting dielectric connections whenever jointing dissimilar metals.

E. Provide pipe hangers and supports in accordance with Section 23 05 29.

1.5 SUBMITTALS

A. Submit under provisions of Section 23 05 00.

B. Product Data: Include data on pipe materials, pipe fittings, and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

C. Infloor Tubing Layout: Manufacturer is to design and submit a tubing layout, materials, capacity calculations with gpm/wpd/btu data, and installation details for the infloor zones. Mechanical contractor is to coordinate installation with floor/concrete contractor.

D. Welders Certificate: Include welders certification of compliance with ASME SEC 9.

E. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

1.6 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 23 05 00.

B. Record actual routing of piping.

1.7 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 23 05 00.

B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.8 QUALIFICATIONS

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

B. Installer: Company specializing in performing the work of this section with minimum ten years documented experience.

C. Welders: Certify in accordance with ASME SEC 9 and AWS D1.1.

1.9 REGULATORY REQUIREMENTS

A. Conform to ASME B31.9 code for installation of piping system.

B. Welding Materials and Procedures: Conform to ASME SEC 9 and applicable state labor regulations.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of welders.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 23 05 00.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.1 HEATING WATER PIPING, ABOVE GROUND

A. Steel Pipe: ASTM A53, Schedule 40, black.

1. Fittings: Malleable iron or forged steel welding type fittings.
2. Joints: Threaded or welded or grooved.

B. Copper Tubing: ASTM B88, Type L, hard drawn.

1. Fittings: Cast brass, or solder wrought copper.
2. Joints: Solder, lead free, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F. Grooved. Expanded end methods that thins the wall thickness is not acceptable.

2.2 RADIANT HEATING PIPING [ADDENDUM 2]

A. Polyethylene Pipe Pex-A with O2 Barrier or PE-RT: ASTM F876 and ASTM F877, cross-linked polyethylene, 100 psig operating pressure at 180 degrees F.

1. Fittings: Brass and copper.
2. Joints: Mechanical compression fittings.
3. Manufacturers:
   a. Watts RadiantPEX Plus.
   b. Roth XPERT-S5.
   c. Heatlink.
   d. Substitutions: Refer to Section 23 05 00.
4. Stainless steel manifold with isolation valves, air vents, stop valve on each supply circuit and balancing valve on each return circuit.

2.3 EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tubing: ASTM B88, Type L, hard drawn.

1. Fittings: Cast brass, or solder wrought copper or grooved ends.
2. Joints: Solder, lead free, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F or grooved. Expanded end methods that thins the wall thickness is not acceptable.

2.4 UNIONS, FLANGES, AND COUPLINGS (CONNECTIONS TO EQUIPMENT)

A. Unions for Pipe 2 inches and Under:

1. Ferrous Piping: 150 psig malleable iron, threaded.
2. Copper Pipe: Bronze, soldered joints.

B. Flanges for Pipe Over 2 inches:

1. Ferrous Piping: 150 psig forged steel, slip-on.
2. Copper Piping: Bronze.
3. Gaskets: 1/16 inch thick preformed neoprene.

C. Grooved and Shouldered Pipe End Couplings:

1. Manufacturers:
    a. Anvil Gruvlok.
    b. Grinnel.
    c. Victaulic.
    d. Substitutions: Refer to Section 15010.
2. Housing Clamps: Malleable iron clamps to engage and lock and provide rigidity use a rigid design coupling. For areas designed to permit some angular deflection, contraction, and expansion, use flexible style couplings; steel bolts, nuts, and washers; galvanized for galvanized pipe.
3. Sealing Gasket: C-shape elastomer composition for operating temperature range from -30 degrees F to 230 degrees F., 30% propylene glycol, and Ph of 12.
4. Performance:
    a. Pipe Size Range: ¾" to 6", 8" and up.
    b. Max working pressure: 750 psig, 400 psig.
5. Accessories: Steel bolts, nuts, and washers.

D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, or Victaulic Clearflow dielectric waterway, water impervious isolation barrier.

PART 3 EXECUTION

3.1 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.

D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

E. After completion, fill, clean, and treat systems. Refer to Section 23 25 31.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install piping to ASME B31.9.

C. Route piping in orderly manner, parallel to building structure, and maintain gradient.

D. Install piping to conserve building space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Sleeve pipe passing through partitions, walls and floors.

G. Slope piping and arrange to drain at low points.

H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Provide expansion loops where shown on Drawings. Anchor pipe with U-bolt or iron bar clamps secured to building structure. Provide guides to maintain position and alignment of piping. Where space does not allow space for expansion loop, provide expansion joints.

I. Install runouts from mains and risers with swing joints of sufficient length to absorb vertical expansion or contraction of risers and horizontal expansion or contraction of mains.

J. Provide access where valves and fittings are concealed.

K. Slope piping and arrange systems to drain at low points. Provide manual drain at low points and bottom of risers.

L. Use eccentric reducers to maintain top of pipe level.

M. Use non-conducting dielectric connections whenever jointing dissimilar metals.

N. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

O. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting.

P. Install control valves. Run piping full size to valve, use concentric increasers at valves outlets and eccentric reducers at inlets.

3.3 TESTING OF PIPING SYSTEMS

A. Test under hydrostatic pressure of 100 psig or 1-1/2 times normal operating pressure, whichever is greater, for a period of four hours.

B. Apply tests to all piping and equipment which a part of these systems, including tanks, pumps, and valves, except for items that might be damaged because of excessive pressures.

C. Start systems following a procedure that will remove all air.

END OF SECTION

SECTION 23 54 00
ENERGY RECOVERY VENTILATORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Energy recovery unit.

B. Controls.

1.2 RELATED SECTIONS

A. Section 23 05 13 – Common Motor Requirements for HVAC Equipment.

B. Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment.

C. Section 23 07 13 - Ductwork Insulation.

D. Section 25 35 00 – Integrated Automation Instrumentation and Terminal Devices for HVAC.

1.3 REFERENCES

A. ASHRAE 52 - Method of Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter.

B. ASHRAE 90A - Energy Conservation in New Building Design.

C. NEMA MG 1 - Motors and Generators.

1.4 SUBMITTALS FOR REVIEW

A. Section 23 05 00 - Submittals: Procedures for submittals.

B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

C. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

D. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 23 05 00 - Procedures for submittals.

B. Project Record Documents: Record actual locations of components and 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 manufacturers warranty and ensure forms have been filled out in Owners name and registered with manufacturer.

1.6 QUALITY ASSURANCE

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

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

1.7 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.8 WARRANTY

A. Section 23 05 00 - Warranties.

1.9 EXTRA MATERIALS

A. Provide two sets of filters for each heat recovery unit.

PART 2 PRODUCTS

2.1 ENERGY RECOVERY VENTILATOR

A. Manufacturer:

1. Venmar.
2. RenewAire.
3. Greenheck *[Addnedum 2]*
4. Substitution: None.

B. Energy Recovery Ventilator (ERV) shall be a packaged unit and shall transfer both heat and humidity using static plate core technology and have a single point electrical connection. Unit to be equipped with built-in bypass dampers and controls to allow for economizer and frost control.

C. Quality Assurance:

1. Unit shall be Listed under UL 1812 Standard for Ducted Air to Air Heat Exchangers. (Note that a few low volume product or product configurations are not UL Listed.)
2. The ERV core shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of ten years from the date of purchase. The balance-of-unit shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of one year from the date of purchase.

D. Energy Transfer:

1. The ERV shall be capable of transferring both sensible and latent energy between airstreams. Latent energy transfer shall be accomplished by direct water vapor transfer from one air stream to the other, without exposing transfer media in succeeding cycles directly to the exhaust air and then to the fresh air.

E. Frost Control:

1. Temperature initiated at 23^0 time based. Exhaust fan will be circulated and supply fan is off.

F. Positive Airstream Separation:

1. Water vapor transfer shall be through molecular transport by hydroscopic resin and shall not be accomplished by “porous plate” mechanisms. Exhaust and fresh airstreams shall travel at all times in separate passages, and airstreams shall not mix.

G. Construction:

1. The energy recovery component shall be of fixed-plate cross-flow construction, with no moving parts.
2. The unit case shall be constructed of G90 galvanized, 20-gauge steel, with lapped corners and zinc plated screw fasteners.
3. Access doors shall provide easy access to blowers, ERV cores, and filters. Doors shall have an airtight compression seal using closed cell foam gaskets.
4. Case walls and doors shall be insulated with 1 inch, 4 pound density, foil/scrim faced, high-density fiberglass board insulation, providing a cleanable surface and eliminating the possibility of exposing the fresh air to glass fibers.
5. The ERV cores shall be protected by a MERV-13 rated, 2" nominal, pleated, disposable filter in both airstreams.
6. Unit shall have single-point power connection and a single-point 24 VAC contactor control connection. (Except Inverter Ready units that have terminal connections for an independent inverter for each air stream.)
7. Blower motors shall be EPACT compliant for energy efficiency and be thermally protected or supplied with external starters.
8. Blowers shall be quiet running, forward curve or backward incline type and be EC motor direct drive.
9. transformer/relay package to supply a 24VAC power source.
10. Provide factory installed filter monitors for each airstream.
11. Provide throwaway-type air filters for each airstream.

H. Installation:

1. Provide rubber or spring type isolators appropriately sized for corner weights of the specific unit.
2. Provide flexible duct connections at unit duct flanges.

I. Controls:

1. Provide the premium controls package. Controls package to include the following points/features:
   a. Modbus, BACnet MS/TP or BACnet TCP/IP
   b. Enable/Disable of unit
   c. Filter alarm for both sets of filters
   d. Bypass controls
   e. Control isolation dampers
   f. Supply fan modulation, ECM
   g. Supply fan status
   h. Exhaust fan modulation, ECM
   i. Exhaust fan status
   j. Smoke detection
   k. Demand control ventilation

l. IAQ control ventilation using VOC
m. Microprocessor controller
n. Supply air temperature
o. Exhaust air temperature
p. Exhaust airflow rate
q. Outside air temperature
r. Outside air humidity
s. Outside airflow rate
t. Unit supply air temperature
u. Heating enable
v. Heating staged/modulation
w. Cooling staged/modulation

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that floors are ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available.

3.2 INSTALLATION

A. Install in accordance with NFPA 90B.

B. Provide condensate drains from energy recovery ventilator and pipe to floor drain.

C. Provide stand and neoprene isolation pad for ERV.

D. Sequence:

1. BAS to monitor ERV. Refer to 25 95 00.

END OF SECTION

SECTION 23 82 19
FAN COIL UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fan-coil units.

1.2 RELATED SECTIONS

A. Section 23 05 00 – Common Work Results for HVAC Equipment.

B. Section 23 05 13 – Common Motor Requirements for HVAC Equipment.

C. Section 23 20 13 - Hydronic Piping.

D. Section 23 20 19 - Hydronic Specialties.

E. Section 25 95 00 – Integrated Automation Control Sequence for HVAC.

1.3 REFERENCES

A. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS FOR REVIEW

A. Section 23 05 00 - Submittals: Procedures for submittals.

B. Product Data: Provide typical catalog of information including arrangements.

C. Shop Drawings:

1. Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations.
2. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.
3. Indicate mechanical and electrical service locations and requirements.

D. Manufacturer's Instructions: Indicate installation instructions and recommendations.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 23 05 00 - Project Closeout.

B. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owners name and registered with manufacturer.

1.6 QUALITY ASSURANCE

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

1.7 REGULATORY REQUIREMENTS

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

1.8 WARRANTY

A. Section 23 05 00 - Warranties.

1.9 EXTRA MATERIALS

A. Section 23 05 00 - Project Closeout.

B. Provide one extra set of filters for each unit.

PART 2 PRODUCTS

2.1 FAN-COIL UNITS

A. Manufacturer:

1. Daikin.
2. Enviro-Tec.
3. International Environmental.
4. Trane.
5. Carrier *[Addendum 2]*
6. Substitutions: None.

B. Coils: Evenly spaced aluminum fins mechanically bonded to copper tubes, designed for 200 psi and 220 degrees F. Provide drain pan under cooling coil, easily removable for cleaning, with drain connection.

C. Cabinet: 0.0598 inch steel with exposed corners and edges rounded, easily removed panels, glass fiber insulation;

D. Finish: Factory apply baked enamel on visible surfaces of enclosure or cabinet.

E. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.

F. Motor: Tap wound multiple speed permanent split capacitor with sleeve bearings, resiliently mounted.

G. Controls: Field-installed by controls contractor.

H. Filter: Easily removed 1 inch thick glass fiber throw-away type, located to filter air before coil.

I. Heating Capacity: As scheduled.

J. Cooling Capacity: As scheduled.

K. Electrical: Provide unit with integral starter/disconnect.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install equipment exposed to finished areas after walls and ceiling are finished and painted. Avoid damage.

C. Protection: Provide finished cabinet units with protective covers during balance of construction.

D. Fan-Coil Units: Install as indicated

E. Hydronic Coils: Provide with shut-off valve on supply and lockshield balancing valve on return piping. Provide with vent, if not easily accessible, extend vent to exterior surface of cabinet for easy servicing. Provide float operated automatic air vents with stop valve.

F. Connect drain pan to condensate drain. Route condensate to drainage plumbing fixture as noted on the drawings.

3.2 CLEANING

A. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

B. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

C. Install new filters.

END OF SECTION

SECTION 26 09 44

DIGITAL LIGHTING CONTROL EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.

1.2 SUMMARY

A. Provide digital lighting management system including network manager, room controllers, relays and controls for control of all interior and exterior lighting.

B. Provide lighting control (relay) panels for control of exterior lighting. All exterior lighting circuits are controlled by a relay panel to energy management system interface.

C. Provide control devices including, but not limited to:

1. Digital On/Off Room controller (not shown on plans, refer to detail sheets).
2. Digital On/Off/0-10 Volt Dimming Room controller.
3. Photo sensors.
4. Digital Ceiling mounted occupancy sensors.
5. Momentary contact switches or low voltage wall stations.
6. Low voltage dimmer switches and/or low voltage digital switches.
7. Graphical “touchscreen” preset stations.

1.3 REFERENCES

A. Division 25: Integrated Automation

B. Section 26 01 00: Common Work Results for Electrical

C. Section 26 01 20: Testing and Adjustments to Electrical Systems

D. Section 26 05 33: Raceways, Fitting and Boxes

E. Section 26 51 13: Lighting

F. Section 26 27 26: Wiring Devices

G. Federal Communications Commission

H. Underwriters Laboratories

I. 2002 National Electric Code.

J. International Building Code with Minnesota State Amendments

K. NFPA 101 - Life Safety

L. Applicable Energy Codes

1.4 SYSTEM DESCRIPTION

A. Provide a complete lighting control system as described herein and as shown on the plans.

B. Provide a digital low voltage lighting management system with software and relays and associated low voltage switches.

C. System shall include, but not be limited to:

1. Digital network manager
2. Digital on/off room controllers
3. Digital input/output interface
4. BAS interface module
5. Peripheral devices
6. Remote access connection modem

D. Where system is controlling LED luminaires provide digital on/off/0-10 volt dimming room controllers.

1.5 SUBMITTALS

A. Submit shop drawings and descriptive data in accordance with Section 26 01 05: "Submittals Closeout Training and Spare Parts".

B. Provide a complete shop drawing package of the system.

C. Provide clearly legible shop drawings.

D. Submit shop drawings in a neatly bound comb or three ring binder with protective covers. Indicate on the front cover the date submitted, project name, specification section number, electrical contractor's name, address, telephone number and the submitting equipment supplier's address and telephone number. Allow enough clear area on the title sheet for shop drawing review stamps.

E. Submit original drawings for each floor plan produced by the supplier/manufacturer. Submitting reproductions of the Contract Documents is not acceptable. Drawings are to show locations of all devices and include updated sequence of operation.

F. Submit a material list showing quantity, manufacturer, type and description of each item being furnished.

G. Indicate short circuit current rating of all equipment.

H. Submit original prints of the manufacturer product sheets with complete technical data for each item being provided. Circle, arrow or provide other permanent marking on each data sheet to clearly indicate the specific product included in the submittal. Remove or crosshatch out any product on the data sheets not applicable to the project or not being submitted for review.

I. Submit wiring diagrams for all components including but not limited to, software network manager, relays, low voltage switches, occupancy sensors and daylighting controls.

J. Submit a one line diagram of the system configuration proposed if it differs from the system that is shown and described on the drawings.

K. Submit physical drawings of components.

L. Shop drawings not containing all the information listed above will be rejected without review.

1.6 QUALITY ASSURANCE

A. Factory pretest and burn-in all components and assemblies are to be prior to installation.

B. Qualification of the Manufacturer: Minimum of three years experience in the manufacture of lighting control equipment and components.

C. Provide all assemblies in compliance with FCC emissions standards specified in Part 15 Subpart J for Class A application.

D. All applicable products must be UL/CUL listed.

1.1 SYSTEM OPERATION – DIGITAL LIGHTING MANAGEMENT SYSTEM

A. Refer to Sequence Of Operation on the drawings.

B. Normal operation

1. All zones of control are to be controlled by master switches.
2. The programming of the system is performed in each room, area and relay panel. Memory is to be retained in the event of a power failure.
3. The system is to be capable of providing the following functions:
   a. Multiple zoning of different areas required for both switching and time controls.
   b. Timed on/off sweeps with off warning mode.
   c. Master switch override within each building zone and building entrances.
   d. low voltage dimming switches and/or digital switches control for classroom lighting.
   e. Automatic photo sensor control/timer control of exterior lighting and day lighting zones.
4. Occupancy Sensors. Occupancy sensor inputs are to be wired directly to the soft switch inputs of the lighting control panels, or room controllers without the need for power packs.
5. Toggle switches and Momentary Contact switches. Switches wired to the soft inputs of the lighting control panels will also be used to provide manual overrides from a central location.
6. Sweep off schedule. Provide scheduling of any relay or group of relays to automatically turn off at predetermined times of the day or night. Scheduling will be determined by the Owner.
7. Daylight sensors. Provide daylight sensor input to the lighting control equipment that automatically varies the lighting in the room or rooms. All adjustments to the levels, rate, delay, etc., must be performed at the lighting control panel through software, and not at the remote sensor.

C. Life Safety Operation

1. All life safety relays shall fail closed, and must revert to the closed state upon loss of normal utility power, regardless of the status of the life safety relay prior to the power outage. The relays shall remain in the closed state until normal power is restored, regardless of any inputs that may be "requesting" that the relay open.
2. After any utility power outage (momentary or long duration), all normal relays shall revert back to whatever state they were in prior to the normal power outage.

D. Power Supply – Battery backup

1. Provide sufficient battery backup of the lighting control system to ride through generator starting times and other power interruptions. Provide 5 minutes minimum for all panels and equipment on the entire Lighting Control System.

PART 2 - PRODUCTS

2.1 DIGITAL LIGHTING MANAGEMENT (DLM) SYSTEM

A. Acceptable manufacturers:

a. WattStopper Inc.

b. N. Light

c. ILC – Intelligent Lighting Controls

d. Hubbell Lighting Controls

B. General System Description

1. The Digital Lighting Management System will consist of digital network manager, room controllers, relays, low voltage switches, occupancy sensors and/or photo sensors, as well as their associated wiring. All components shall be supplied by the same manufacturer.

2. The room controllers will be mounted in the ceilings directly above the room switches as shown on the drawings.

3. Low voltage switches will be mounted in the spaces as shown on the drawings. Low voltage wiring from the switches and sensors to the relay panel will be CLASS 2 or CLASS 2P (plenum rated) as required by the National Electrical Code and local standards. Each low voltage wire will be labeled with the channel letter (A-P) at each switch or sensor. Use only properly color coded, stranded #20 AWG (or larger) wire as indicated on the drawings. All relays and switches are to be tested after installation to confirm proper operation and the loads recorded on the directory card in each panel.

4. Interface lighting control panels with digital lighting management system.

C. Hardware Features

1. Digital Network Manager

a. Provide Digital Network Manager capable of, but not limited to; global control, monitoring, adjustment and scheduling of networked lighting control components and lighting control panels.

b. Communicate with lighting control network and BAS via BACnet.

c. Web based browser interface with scalable security and remote log in.

2. Digital On/Off Room controllers relays will be UL listed and consist of the following:

a. Input/output voltage: 120/277VAC, 50/60Hz.

b. Maximum 20A combined load per room controller, each relay rated for:

1) Ballast or incandescent: 20A

2) Motor load: 1 HP

c. Class 2 output to DLM local network: 24NDC, 150mA across 3 RJ45 ports.

d. Maximum current: 600mA, category 5e cable, up to 1,000 feet, maximum of 4 room controllers, controlling up to 8 loads, up to 24 communicating devices.

e. Operating conditions: for indoor use only; 32-104^{0}F (0-40^{0}C); 5-95% RH, non-condensing.

f. Provide Room Controllers as necessary to accomplish switching indicated on plans.

3. Digital On/Off/0-10 Volt Dimming Room Controller
    a. Provide digital room controllers with on/off/01- volt dimming capabilities for control of LED lighting.
    b. Provide digital on/off/0-10 volt dimming room controllers to support energy saving manual-50% on, and dimming control strategies.
    c. The digital on/off/0-10 volt dimming room controller will be UL listed and comprise of the following:
    d. Input/output voltage: 120/230/277VAC, 50/60 Hz.
    e. Load ratings per relay and per room controller:
        1) Ballast: 20A @ 120/277 VAC
        2) Incandescent: 20A @ 120 VAC
        3) Motor load: 1 Hp @ 120 VAC
    f. Class 2 dimming control signal: 1-10 VDC, sinking or sourcing (automatic adjustment based on load).
    g. Class 2 output to DLM local network: 24 VDC, up to 250 MA across 4 RJ45 ports.
    h. DLM local network parameters with LMRC-210 Series Room Controllers; network may include up to 4 LMRC-100 Series and/or LMPL-101 Room Controllers:
        1) Maximum current: 800 mA
        2) Category 5e cable, up to 1,000 feet; 300 feet maximum between communication devices
        3) Up to 64 loads
        4) Up to 48 communicating devices
    i. Operating conditions: for indoor use only; 32-158^{0}F (0-70^{0}C); 4-95% RH, non-condensing.
    j. Provide Room Controllers as necessary to accomplish switching indicated on plans.
4. Photo Sensors
    a. Provide Photo Sensors capable of direct integration to digital lighting network.
    b. The sensor shall be a self-contained control device that detects changes in light levels. The sensor shall adjust the light levels by raising or lowering the light level, by controlling fixture 0 to 10 volt dimming ballast or controlling a 50% to 100% stepped level dimming ballast or provide ON/OFF switching of the fixture circuit with either a power pack or relay in the control panel. Coordinate with light fixture and lighting control schedules as to type of control to be provided.
    c. The sensor shall be either a closed loop device that measures both the daylight contribution and the controlled electric light contribution or an open loop device that measures just the daylight contribution. Type of device will be determined by the application.
    d. The sensor shall be a low voltage device, powered by 24 VDC or 24 VAC voltage supplied by a power pack.
    e. The sensor shall have a linear response with greater than 1% accuracy over the sensed range.

f. The sensor shall have a control range of 10-100 foot-candles.

g. To ensure quality and reliability, sensor shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.

h. Sensor styles for indoor and skylight/atrium installations to be ceiling mounted or as required and as shown on drawings. Verify sensor mounting location(s) with Architect prior to installation.

i. Outdoor sensors shall be weatherproof and located as shown on drawings. Exterior lights shall be controlled by a combination sensor and time clock. The photo sensor shall provide the ON function at dusk and the time clock shall control specific circuit(s) OFF functions during dark hours.

j. Provide dual zone sensors where indicated.

5. Digital Ceiling Mounted Occupancy Sensors

   a. Provide occupancy sensor capable of direct integration to digital lighting network.

   b. Solid state, operates at 5VDC supplied by the room controller.

   c. Load Ratings: 20 amps fluorescent, 20 amps HID and 13 amps incandescent loads.

   d. Integral isolated Form C relay rated at 0.5 amp @24VDC.

   e. High impact, injection molded plastic housing.

   f. Mounting hardware designed for the particular application: wall, ceiling, corner surface, wall switch retrofit, etc.

   g. Immune to RFI and EMI.

   h. Adjustable time delay (8 minutes to 30 minutes).

   i. Adjustable sensitivity.

   j. LED activity indicators.

   k. Operating temperature: $+32^0$F to $+104^0$F at 5% to 95% non-condensing humidity.

   l. UL Listed.

   m. 5 year replacement warranty.

6. Low Voltage Dimmer Switches

   a. Provide dimmer switch capable of direct integration to digital lighting network.

   b. Provide dimmer with LED dim indicator. Dim to indicate power to switch. Bright to indicate load or scene is active.

   c. Provide Specification Grade 0-10 volt dimmer switch. Provide (1) dimmer switch for each dimmer switch shown on plans.

   d. Where shown provide four (4) button dimmer switches with dedicated on/off/up/down buttons. Label each button accordingly.

   e. Provide matched Specification Grade plates of materials and color as specified in Section 26.

7. Low Voltage Momentary Contact Switches/Plates

a. Provide Specification Grade standard three position center off momentary contact toggle switches as shown on the plans for overriding the relays.

b. Connect such that up is on and down is off.

c. Provide matched Specification Grade plates of materials and color as specified in Section 26 27 26.

8. Low Voltage Wall Stations

a. Provide low voltage wall stations as shown and described on the drawings.

b. Provide matching devices for:

1) Single on/off

2) Dual on/off

3) Quad on/off

c. All devices are to be recessed into two (2) gang outlet boxes.

d. All devices are to have a minimum of two (2) RJ-45 ports.

e. Devices shall be ivory/white/almond/gray to match wiring devices specified in Section 26 27 26.

9. Graphical "touchscreen" Preset Stations

a. Provide full-color "touchscreen" not less than 3.5" (diagonal).

b. Touchscreen to be software configurable to provide not less than (16) scene selections.

c. Interface touchscreen directly with digital lighting control system.

2.2 DIGITAL LIGHTING MANAGEMENT SYSTEM NETWORK

A. General System Description

1. Provide a digital network manager that provides global control of the room controllers described in the previous article.

2. Software Feature

a. The network manager will be UL listed and consist of the following:

1) Operating voltage: 15VDC from 120VAC plug-in power supply (included) or auxiliary enclosure.

2) Plastic housing, mounting via integral DIN rail slot or screw down tabs on housing.

3) RJ45 Ethernet port for TCP/IP (LAN) connection, green link status LED.

4) Embedded power PC platform @ 524 Mhz.

5) QNX real time operating system.

6) RS485 network, BACnet MS/TP twisted pair, baud rate 9600, 19200, 38400 or 76800 selectable

i) LMSM-3E: three segment networks

ii) LMSM-6E: add NB-ROUTERs as needed for up to 300 rooms

7) Segment network parameters:

i) LM-MSTP wire rated for BACnet MS/TP (RS485)

ii) Linear topology; 4000 feet maximum per segment

iii) Up to 40 local networks or panels per segment

8) Status LEDs for power and normal operation.

9) Operating conditions: for indoor use only; 32-122^{0}F (0-50^{0}C); 5-90% RH, non-condensing.

2.3 DIGITAL INPUT/OUTPUT INTERFACE

A. General System Description:

1. Provide input/output interface device for integration of third party devices.
2. The digital input/output interface will be UL listed and consists of the following:
   a. Input/output voltage: 24VDC from DLM network
   b. Maximum current consumption: 20mA
   c. DLN local network connection: 2 RJ45 ports
   d. Removable terminal block for connections to isolated relay output and third party inputs
   e. Isolated relay rating:
      1) 24VDC/VAC, 1A, SPDT
      2) Normally open (N/O), normally closed (N/C) and common outputs
   f. Input ratings:
      1) Input max. sink/source current: 1-5 mA
      2) Logic input signal voltage High: >18 VDC
      3) Logic input signal voltage Low: <2 VDC
   g. Operating conditions; for indoor use only; 32-131^{0}F (0-55^{0}C).

2.4 CONDUCTORS AND CABLES

A. Power wiring to supply side of remote-control power sources: Not smaller than No. 12 AWG, complying with Division 26.

B. Classes 2 and 3 Control Cable: Multi-conductor shielded cable with stranded copper conductors not smaller than No. 18 AWG, complying with Division 26.

C. Class 1 Control Cable: Multi-conductor cable with stranded copper conductors not smaller than No. 14 AWG, complying with Division 26.

D. Cat 5E unshielded, twisted-pair cable for control and signal transmission conductors, complying with Division 26 Section "Voice and Data Cabling".

PART 3 - EXECUTION

3.1 PRE-INSTALLATION MEETING AND SERVICES

A. Contractor to arrange a pre-installation meeting with Owner/Engineer and lighting control manufacturer prior to start of lighting control system installation. The Contractor shall schedule the pre-installation site visit, after receipt of the approved shop drawings, to review the following:

1. Confirm the location and mounting of all digital devices, with special attention to placement of occupancy sensors, daylighting sensors and room controllers.
2. Review the specifications for low voltage control wiring and termination.
3. Discuss the functionally and configuration of all products, including sequences of operation, per design requirements.
4. Discuss requirements for integration with other trades.

B. Coordination with Owner's IT Network Infrastructure:

1. The Contractor will required to coordinate with the Owner's Representative to secure all require network connections to the Owner's IT network infrastructure.
    a. The Contractor will provide to the Owner's Representative all network infrastructure requirements of the networked lighting control system.
    b. The Contractor shall provide to the Manufacturer's Representative all necessary contacts pertaining to the Owner's IT infrastructure, to ensure that the system is properly connected and started up.

C. Contractor to install all devices and wiring in a professional manner. All line voltage connections to be tagged to indicate circuit and switched legs.

D. **Where projects require phased occupation; programming will be required at each phase of occupation. Refer to Division 0 and 1 of the specifications for phasing requirements**.

E. Contactor to install all room/area devices using manufacturer's factory-tested Cat 5e cable with pre-terminated RJ-45 connectors. If pre-terminated cables are required due to length of run, the Contractor is responsible for testing each field-terminated cable following installation, and shall supply the Engineer and lighting controls manufacturer with test results. Contractor to install any room to room network devices using manufacturer-supplied LM-MSTP network wire. Network wire substitutions not permitted and may result in loss of product warranty per DLM SEGMENT NETWORK section of specification. Low voltage wiring topology must comply with manufacturer's specification. Contractor shall route network wiring as shown in submittal drawings as closely as possible, and shall document final wiring location, routing and topology on as built drawings.

F. Install the work of this Section in accordance with manufacturers printed instruction unless otherwise indicated. Before start up, Contractor is required to test all devices to ensure proper communication.

G. Install and program software with initial settings of adjustable values. Make backup copies of software and user-supplied values. Provide current license for software.

H. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two (2) years.

I. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two (2) years from date of Substantial Completion. Upgrading software is to include operating system and new or revised licenses for using software.

J. Upgrade Notice: Provide the owner with at least 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

3.2 INSTALLATION

A. Install all Equipment in accordance with manufacturers recommendations. Provide complete system as indicated on the drawings. Make all necessary wiring connections to internal/external control devices.

B. Locate DLM network manager and BAS interface adjacent to panelboard as indicated on the drawings.

C. Install room controller and low voltage switches as indicated on the floor plans and detail sheets.

D. Label all low voltage switch wires and corresponding room controller to identify which relay(s) and switch(es) control associated rooms.

E. Stub ¾" empty EMT conduit from each switch outlet box to accessible ceiling. Provide an insulating bushing on end of conduit.

F. Comply with Section 26 for conduit installation. Minimum size conduit will be ¾ inch.

3.3 WIRING INSTALLATION

A. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

B. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

C. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 OCCUPANCY SENSOR INSTALLATION

A. Where occupancy sensors are indicated on the plans or specified herein, provide all components, power packs, mounting hardware, brackets, wiring and terminations required to provide on/off control of the light fixtures in the space served by the occupancy sensors.

B. Provide occupancy sensors with sufficient coverage to ensure positive detection of activity from any location within the room or space. Provide additional occupancy sensors than those shown on the plans if required or recommended by the manufacturer to ensure proper coverage of the entire space.

C. Provide the proper type of occupancy sensor based on the type of space, use, and size of the room. The following chart indicates the proper type of occupancy sensor based on typical use spaces. Refer to the plans for specific types and applications.

Type of space	Dual Technology (DT)	Ultrasonic (US)	Passive Infrared (PIR)
Public Restrooms		√	
Stairwells		√	
Corridors		√	
Conference Rooms		√	
Classrooms	√		

Hard Offices		√	
Open Office Areas			√
Work Rooms	√		
Vestibules			√
Adverse environments			√

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems".

B. Identify each wire and associated termination point on the terminal blocks. Provide a permanent labeling method. Provide identification based on the final identification/number system coordinated with the Owner. Provide as-built relay schedule in the cabinet and in the project O & M Manuals.

C. Create a directory to indicate loads served by each relay; incorporate Owner's final room designations. Obtain approval before installing. Use a PC to create directory; handwritten directories are unacceptable.

D. Lighting Control Panel Nameplates: Label each panel with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems".

3.6 SYSTEM START-UP

A. The Electrical Contractor will provide both the manufacturer and the Electrical Engineer with three (3) weeks written notice of the system start-up and adjustment date. All vendors are required to have programming technicians available with three (3) weeks' notice. Some projects have phased occupation and/or substantial completion dates. Programming will be required at each phase of occupancy.

B. Upon completion of the system start-up, the factory authorized technician will provide the proper training to the Owners personnel on the adjustment and maintenance of the system.

C. Upon completion of installation by the installer, including completion of all required varication and documentation required by the manufacturer, the system will be started up and programmed by an authorized representative of the manufacturer.

1. Perform low voltage network cable testing prior to system start up. Provide test results to the Engineer.

D. System start-up and programming is to include:

1. Verifying operation communication to all system devices.
2. Programming the network devices into functional control zones to meet the required sequence of operation.
3. Programming and verifying all sequence of operations.
4. Customization of Owner's software interfaces and applications.
5. Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings. Adjust time delay so that controls area remains lighted while occupied.

E. Initial start-up and programming is to occur on site. Programming will be required at:

1. Each substantial completion

2. Six months after occupancy

3. At the 11 month warranty walk-thru

F. Provide programming remotely over the internet as necessary.

G. Provide written or computer generated documentation on the configuration of the system including room by room description including:

1. Sensor parameters, time delays, sensitivities and daylighting setpoints.

2. Sequence of operation (e.g. manual ON, auto OFF, etc.)

3. Load parameters (e.g. blink warning, etc.)

3.7 DEMONSTRATION AND TRAINING

A. Engage a factory authorized service representative to train Owner's maintenance personnel to adjust, operate and maintain lighting control devices. Refer to Division 01 Section "Demonstration and Training".

B. Provide the Owner with hands on instruction on the use and maintenance of the systems in two (2) 4 hour sessions. The Contractor is required to digitally video record all of the training sessions.

C. In addition to the above hour requirements, the Electrical Contractor is required to include four (4) additional hours of training to be used after six month of occupancy. These additional hours can be used at the Owners discretion for any or all of the system included.

3.8 TESTING

A. Test the operation and function of each room controller/relay. Record the results of the test and provide as part of the as-built drawings.

B. Perform the following field tests and inspections and prepare test reports:

1. After installing all switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.

2. Operational Test: Verify actuation of each sensor and adjust time delays.

C. Remove and replace lighting control devices where test results indicate they do not comply with specified requirements.

3.9 FINAL CHECKOUT AND ACCEPTANCE

A. Demonstrate the operation and use of the system to the Architect/Engineer and to the Owner's representative(s).

B. Verify the following before scheduling the system demonstration:

1. System installation is complete.

2. System is fully operational.

C. Verify the following before requesting final approval:

1. Owner training is complete.

2. As-built documentation is complete and turned over to the Engineer.

D. Provide a letter to the Owner certifying that the installation is complete, fully operational and successfully tested.

E. Close-Out Documentation:

1. System Documentations:

   a. Submit software database file with desired device labels and notes completed.

2. Owner Training

   a. Provisions for onsite training for Owner and designated attendees to be included in submittal package.

F. Final acceptance of the system will be given upon completion of all of the above requirements

3.10 COMMISSIONING

A. System shall be completely commissioned by factory trained and authorized service personnel. This commission process must be completed prior to Owner's commissioning agent performing commission. Coordinate commissioning of products specified in this section with commissioning requirements for low voltage programmable lighting control systems specified in Section 26 09 23 "Lighting Control Devices".

B. Factory commissioning shall consist of three (3) visits:

1. Pre-Wire Inspection: During this visit the factory representative shall define conduit, wire and confirm device location requirements.

2. Start-Up of System: During this visit factory personnel will confirm conduit wire requirements and provide calibration for all lighting control devices to include but not limited to day light sensors, occupancy sensors and lighting control panels. Device calibration will be provided for each space. This visit shall be coordinated with the Architect/Engineer.

3. Commissioning Trip: This trip will consist of demonstrating to the Engineer of Record the complete and functional lighting control system as defined in this section. Where needed, correct malfunctioning units at site, then re-test to demonstrate compliance otherwise remove and replace with new units, and proceed with re-testing. Testing and re-testing at no cost to Owner.

3.11 COMMISSIONING SUPPORT SERVICES

A. On this project, a commissioning agent will be hired to verify the installation and programming of all building system, which includes the lighting control system. Manufacturer should include an extra day of technician's time to review the functionality and settings of the lighting control hardware with the commissioning agent, including reviewing submittal drawings and ensuring that instructions on how to configure each device are readily available. Manufacturer is NOT responsible for helping the commissioning agent inspect the individual devices. It will be the commissioning agent's responsibility to create and complete any forms required for the commissioning process, although the manufacturer or contractor may offer spreadsheets and/or printouts to assist the agent with this task.

B. The commissioning agent is required to work with the electrical contractor during installation of the lighting control hardware to become familiar with the specific products. The agent may also accompany the manufacturer's technicians during their start-up work to better understand the process of testing, calibration and configuration of the products. However, the Contractor and manufacturer will ensure that interfacing with the agent does not prevent them from completing the requirements outlined in the contract documents.

3.12 MANUALS

A. Submit complete operating and maintenance manuals in the format required by 26.01.05 to include:

1. "As built" set of complete wiring diagrams, details and floor plans indicating all of the devices. The Contractor will be responsible for documenting installed location of all networked devices, including networked luminaires. This includes responsibility to provide as-built plan drawing showing device address barcodes corresponding to locations of installed equipment.
2. Data sheets required to operate the equipment and system.
3. Data sheets required for testing, repair, trouble shooting and recommended maintenance intervals.
4. Provide a replacement parts list and name and address where available.
5. Provide a copy of the digitally recorded training sessions.

B. “As installed” Bill of Materials to include catalog cuts of all components of the lighting control system.

3.13 MAINTENANCE AND SPARE PARTS

A. Provide spare relays in quantities indicated on the Lighting Control Panel schedules.

B. Provide new parts, upgrades, and/or replacements available for minimum of five (5) years available to the owner.

C. Provide free telephone technical support.

3.14 WARRANTY

A. The Contractor and successful vendor is to provide a complete parts and labor warranty for the system, commencing on the date of final acceptance and continuing for a period of five (5) years, except for network manager provide one (1) year warranty. Provide all materials and labor required to correct any system malfunction or failure (determined not to be the result of negligence, abuse or misuse) at no charge to the Owner during this time period.

3.15 ADJUSTING

A. Adjustments: When requested at 11 months from date of Substantial Completion, provide onsite assistance in adjusting all sensors to suit actual occupied conditions. This visit to project will need to occur during other-than-normal occupancy hours.

1. For occupancy sensors, verify operation at outer limits of detector range. Set time delay to suit Owners operations.
2. For daylighting controls, adjust set points and dead band controls to suit owners operations.

END OF SECTION

SECTION 28 31 00

FIRE ALARM SYSTEM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.

1.2 SUMMARY

A. New Fire Alarm System – interconnect new FACP to existing and new devices as required.

B. Interface to HVAC Systems

C. Interface to Automatic Closing and Self-Closing devices

D. Interface to Fire Protection System

1.3 REFERENCES

A. Section 26 01 00: General Provisions – Electrical.

B. Section 26 01 00: General Provisions – Electrical.

C. Section 28 01 00: Common Work Results for Electronic Safety and Security

D. Section 28 01 05: Submittals, Closeout Documents, Training and Spare Parts

E. Section 28 01 50: Testing and Fire Alarm Systems

F. Section 26 05 29: Supporting Devices

G. This section is subject to all of the applicable provisions of the above indicated sections.

1.4 SYSTEM DESCRIPTION

A. Provide a new, voice capable, intelligent addressable fire alarm system for a complete operational system, including, but not limited to the following components: Main control panel as required to support the new and existing devices, communications cards, initiating loop cards, indicating zone cards, power supplies and backup batteries. Update panel to reflect the revised installation; remote intelligent detectors; interfaces to HVAC fans, combination smoke/fire dampers and sprinkler systems; audible and visual indicating devices; monitor and control modules; communication devices; raceway system, boxes, wiring, grounding and the associated labor, programming, setup and testing.

B. Note that the existing system is a Simplex 4004 Hardwired system and all existing initiating device zones shall be interfaced into the new addressable fire alarm system via Zone Addressable Modules (existing devices remain as zoned/hardwired and all new are addressable). Similarly, the existing notification appliance zones will need to be extended to the new panel for control. Devices are not shown on the electrical drawings and the selected contractor shall interface at no additional cost after the bid.

1.5 SYSTEM OPERATION

A. Provide all labor, materials, testing and programming required to provide a complete operating fire alarm system in both the existing building and new addition/remodeled areas.

1.6 SUBMITTALS

A. For general requirements see Section 26 01 00 and 28 01 00.

B. Submit qualifications of the system installer as specified in this section.

C. Submit a complete shop drawing package of the proposed system.

D. Provide clearly legible shop drawings.

E. Submit shop drawings in a neatly bound comb or three ring binder with protective covers. Indicate on the front cover the date submitted, project name, specification section number, electrical contractor's name, address, telephone number and the submitting equipment supplier's address and telephone number. Allow enough clear area on the title sheet for shop drawing review stamps.

F. Submit 1/8" scale reproducible sepia floor plans showing all rooms, stairways, corridors, horizontal exits, controlled HVAC units, sprinkler flow and control valves, and all fire alarm system components. The drawings shall include exact wire counts and types, and point address information for each device. Single line for walls may be used.

G. Submit the following riser/wiring/connection diagrams:

1. Single line riser drawing indicating all system components and the vertical wiring necessary to connect the components. Indicate conduit sizes and wire counts and a legend indicating the type of wiring.

2. Functional block diagram showing initiating device wiring, loop communications wiring, annunciator wiring, power supply wiring, indicating device wiring, power supply wiring, battery wiring, communications/modem wiring, etc. It is not necessary to show every initiating and indicating device on the riser diagram, but illustrate the wiring and connection of each type of device on each addressable loop. Indicate on the diagram the quantity of devices on each loop and the maximum allowable quantity of devices on each loop (to determine the number of spare addresses for future expansion).

3. Wiring diagrams showing wiring and terminations between HVAC fan units and the fire alarm system.

4. Wiring diagrams showing wiring and terminations between combination fire/smoke dampers and the fire alarm system.

5. Wiring diagrams showing wiring and terminations between self closing and automatically closing devices and the fire alarm system.

6. Wiring diagrams showing wiring and terminations between sprinkler system flow switches, valve position switches, dry pipe low pressure monitoring switches, etc., and the fire alarm system.

7. Branch circuit wiring to the main control panel, sub-panels, and other devices in the system requiring 120 volt power.

H. Submit original drawings produced by the supplier/manufacturer. Submitting reproductions of the Contract Documents is not acceptable.

I. Submit a material list showing quantity, manufacturer, type and description of each item being furnished. Indicate in a separate list, the quantity and description of all spare parts to be turned over to the Owner at the end of the project.

J. Submit original prints of the manufacturer product sheets with complete technical data for each item being provided. Circle, arrow or provide other permanent marking on each data sheet to clearly indicate the specific product included in the submittal. Remove or crosshatch out any product on the data sheets not applicable to the project or not being submitted for review.

K. Submit physical and schematic drawings of special and custom components or hardware.

L. Submit power supply sizing and battery sizing calculations showing total fire alarm system power draw in the supervisory and alarm conditions.

M. Submit complete description of system operating sequence.

N. Submit voltage drop calculations for indicating devices.

O. Submit complete mounting details and instructions for all equipment to be installed.

P. Submit complete description of system operating sequence.

Q. Shop drawings not containing all the information listed above will be rejected without review.

1.7 QUALITY ASSURANCE

A. Provide complete engineering, technical and support services to properly complete the project as designed by system manufacturer and supplier to match existing system and operation.

B. Provide the following, prepared by the manufacturer and supplier:

1. Certification of project and drawings.
2. Project management as required by Engineer and Owner.
3. Complete project testing and training to Engineers and Owners satisfaction.
4. Underwriters Laboratories (U.L.) Certification.
5. Service personnel to be NICET Level II Certified.
6. Maintained inventory levels to provide service parts as required by the specification.

C. Provide fire alarm and detection systems conforming to the requirements of the latest edition of the following National Fire Protection Association (NFPA) publications including all amendments to these publications:

1. 13: Standard for the Installation of Sprinkler Systems.
2. 70: National Electrical Code, including Article 760.
3. 71: Protective Signaling Systems.
4. 72: National Fire Alarm Code.
5. 101: Life Safety Code.

D. Construct and install all fire alarm and fire detection equipment in accordance with the following publications:

1. Underwriters Laboratories Inc. (UL):
   a. 38 Manually Activated Signaling Boxes for Use with Fire Protection Signaling Systems.
   b. 268 and 268A Smoke Detectors for Fire Protective Signaling Systems.
   c. 346 Waterflow Indicators for Fire Protective Signaling Systems.
   d. 464 Audible Signal Appliances.
   e. 864 Control Units for Fire Protective Signaling Systems.
   f. 1481 Power Supplies for Fire Protective Signaling Systems.
   g. 1971 Visual Signaling Appliances for the Hearing Impaired.

2. Americans with Disabilities Act.
3. International Fire Code (IFC).
4. International Mechanical Code (UMC).
5. International Building Code (IBC).
6. State Building Code
7. Minnesota Amendments to the IBC, IMC and IFC.
8. Local (City) Codes

E. Provide components that are listed and cross listed as a product of a single fire alarm system manufacturer by Underwriter's Laboratory, Inc. (U.L.) and bear the "U.L." label. Provide control equipment listed under U.L. category UOJZ as a single control unit.

F. Qualifications of the Installer:

1. Before commencing work, submit data showing that the contractor/subcontractor has successfully installed fire alarm systems of the same type and design as specified. Include the names, locations, and the contact name and telephone number of at least six (6) such installations completed by the installer. Specify type and design for each system and furnish documentation that the system has performed satisfactorily for the preceding eighteen (18) months.
2. Provide evidence of completion of the required manufacturers' training and experience by the contractor or have NICET Level II (or higher), Certified Fire Alarm or Special Hazard Associate Engineering Technician(s), as applicable, in their employ.
3. Installed system to be certified by Underwriter's Laboratories for a period of five (5) years. The system must be covered by a maintenance contract, during this five (5) year term, by a U.L. certified service company. Installing contractor/subcontractor to furnish proof of qualification and listing to perform this service.
4. Experience of Installer: Accomplish installation by a Contractor with a minimum of five years experience in the installation of the specified fire alarm system. Any proposed installer who cannot show evidence of such qualifications will be rejected.

G. Manufacturer's Representative

1. Provide the services of a representative or technician licensed in the State of Minnesota from the manufacturer of the system, or a factory trained technician of the manufacturer of the system, experienced in the installation and operation of the type of system provided. Supervise installation, software documentation, adjustment, preliminary testing, final testing and certification of the system. Provide the required instruction to the Owner's personnel in the system operation, maintenance and programming.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Equipment supplied by manufacturers as listed herein are considered approved for bidding on this project. Where specific models are referred to, the intent is to establish a minimum level of features and performance and to match the existing system and operation.

2.2 MAIN CONTROL PANEL

A. The existing fire alarm control panel is a Simplex 4004 FACP. The new panel shall be a Simplex 4007ES or approved equal unit with associated voice control unit accessories.

B. The new panel shall have a UDACT compatible with the existing phone and IP monitoring service.

2.3 STANDBY BATTERIES

A. Provide additional standby batteries as required in accordance with the requirements of NFPA 72 that are appropriately sized to operate the fire alarm system for a minimum of twenty-four (24) hours and then operating all indicating units for at least five (5) minutes after the 24 hours, **plus an additional 10% spare capacity.**

B. Provide battery charger sized to fully charge all standby batteries within eight (8) hours after a full discharge cycle.

C. Provide maintenance-free, sealed gel cell or sealed lead-acid batteries. Batteries which vent gases are not acceptable.

D. Mount batteries inside the main control panel enclosure on the bottom. Separate battery enclosures are not acceptable.

E. Provide monitoring of batteries, charger and associated wiring from the main control panel.

F. Provide a voltmeter and ammeter to indicate battery voltage and charging current through the front LCD display on the fire alarm control panel.

2.4 MANUAL STATIONS

A. Provide manual pull stations to match existing manufacture.

1. Single action type (non-break glass type).
2. Die cast aluminum construction with baked red enamel finish.
3. Semi flush mounted to recessed backbox.
4. Pull lever locks in the protruding position when actuated.
5. Key lock switch for resetting handle and for testing purposes.
6. Fully enclosed silver plated contacts configured as normally open or normally closed.
7. UL listed.

B. Provide vandalproof shield over each manual pull station, to sound a local alarm when the shield is raised. Refer to "Vandal Equipment" specified elsewhere in this section.

C. Provide manual station with addressable communications module or provide addressable communications module immediately adjacent to manual station.

D. Provide unique address assignment for each detector, either through DIP switches located in the communication module or assigned by the main control panel.

2.5 VANDAL EQUIPMENT

A. Provide manual pull station vandal shields to match existing.

1. Provide a UL listed clear polycarbonate hinged shield with integral peizo alarm to sound a local alarm when the shield is raised. Provide batteries for each.

a. Safety Technology International #1100/#6600 Series or pre-approved equal.

B. Wire guards

1. Provide heavy gauge (16 Ga. minimum), white steel guard for smoke or heat detectors where indicated on the drawing or specified herein.

   a. Shaw Perkins model SDG, Pro-Tec model 2000 series or pre-approved equal.

2. Provide manufacturer-approved wire guards for horns, strobes and horn/strobe units where indicated on the drawings or specified herein.

3. Provide wire guards over horn/strobe units in the gymnasium.

C. Clear Plastic Guard.

1. Provide clear plastic cover guard where indicated on the drawing or specified herein.

D. Vandalproof enclosures

1. Where vandalproof equipment enclosures are noted in this specification and on the plans, provide enclosures with the following specifications:

   a. Heavy duty sheet metal with piano hinge

   b. Minimum ¼" thick clear lexan faceplate.

   c. BEST/SCHLAGE lock, keyed to the Owner's master.

   d. Secured to the wall with approved anchoring hardware.

   e. Verify color with Owner.

2.6 INTELLIGENT AUTOMATIC PHOTOELECTRONIC SMOKE DETECTORS

A. Provide automatic photoelectronic smoke sensors with the following specifications and to match existing manufacture:

1. Utilizes light scattering principle from an internal infrared LED light source and reports the percent obscuration to the main control panel.

2. Factory set threshold at a nominal 1.5% light obscuration per foot (set via the main control panel)

3. Operates +14 to +120 degree F temperature, 10% to 93% humidity range.

4. Operates on single twisted pair cable.

5. Self-compensating drift compensation for maximum stability (set via the main control panel).

6. Integral red LED visible to the eye from below the detector to indicate an alarm condition and to indicate the polling pulse from the main control panel.

7. Mounts to base by twist locking motion.

8. U.L. 268 listed.

B. Provide detector base with addressable communications module.

C. Provide unique address assignment for each detector, either through DIP switches located in the communication module or assigned by the main control panel.

2.7 INTELLIGENT AUTOMATIC HEAT DETECTORS

A. Provide automatic heat detectors with the following specifications and to match existing manufacture:

1. Utilizes a combination of fixed temperature and rate of rise compensation (temperature exceeds 15 degree per minute rise, set via the main control panel).
2. Operates at +14 to +122 degree F temperature, with relative humidity less than 93%.
3. Integral red LED visible to the eye from below the detector to indicate an alarm condition and to indicate the polling pulse from the main control panel.
4. Mounts to base by twist locking motion.
5. U.L. 521 listed.

B. Provide detector base with addressable communications module.

C. Provide ordinary rated (135 degree F) detectors in normal spaces. Provide intermediate rated (175 degree F) in unconditioned spaces such as boiler rooms or other areas with a high ambient temperature.

D. Provide unique address assignment for each detector, either through DIP switches located in the communication module or assigned by the main control panel.

2.8 INTELLIGENT PHOTOELECTRONIC DUCT SMOKE DETECTORS

A. Provide automatic photoelectronic duct smoke sensors with the following specifications and to match existing manufacture:

1. Utilizes light scattering principle from an internal infrared LED light source and reports the percent obscuration to the main control panel.
2. Factory set threshold at a nominal 1.5% light obscuration per foot (set via main control panel)
3. Self-compensating drift compensation for maximum stability (set via main control panel).
4. Operates at air velocities from 300-4000 ft/min, +32 to +120 degree F operating temperature, 10%-93% humidity range.
5. Operates on single twisted pair cable.
6. Smoke chamber blocks particles larger than 200 microns.
7. Integral red LED visible to the eye from outside the detector housing to indicate an alarm condition and to indicate the polling pulse from the main control panel.
8. Mounts to housing/base by twist locking motion.
9. U.L. 268 listed.

B. Provide detector base with addressable communications module.

C. Provide unique address assignment for each detector, either through DIP switches located in the communication module or assigned by the main control panel.

D. Provide HVAC duct-mounted housing and sampling tubes of the proper length to sample the entire width of the HVAC duct. Provide additional duct smoke detectors as required for ducts wider than the longest sampling tube recommended by the fire alarm manufacturer.

E. Provide addressable control module and associated relay rated at 10 amps for connection to HVAC unit starter circuit for fan motor shutdown. Provide unique address assignment for each control module, either through DIP switches located in the control module or assigned by the main control panel.

F. Provide addressable control module and associated relay for connection to combination smoke/fire dampers. Provide unique address assignment for each control module, either through DIP switches located in the control module or assigned by the main control panel.

G. Provide remote test station for each duct detector in a readily accessible location near the unit. Provide engraved label on remote test station denoting the location, HVAC unit number, "RETURN", damper location, etc. as required to identify the detector's location and function.

2.9 COMBINATION FIRE/SMOKE DAMPERS

A. Provided by Mechanical Contractor. Verify damper type and locations with Mechanical Contractor.

B. Unless noted otherwise, provide intelligent duct detector located upstream of damper.

C. Provide addressable control module at each damper to allow the main control panel to actuate each damper independently.

D. Provide unique address assignment for each damper, either through DIP switches located in the control module or assigned by the main control panel.

E. Provide power wiring from fire alarm system through the control module to the damper's associated DDC (damper control).

2.10 AUTOMATIC SPRINKLER WATERFLOW SWITCHES

A. Provided by Mechanical Contractor.

B. Provide addressable communications module for each waterflow switch to communicate alarm and trouble signals to the main control panel.

C. Provide unique address assignment for each waterflow switch, either through DIP switches located in the communication module or assigned by the main control panel.

2.11 AUTOMATIC SPRINKLER VALVE POSITION (TAMPER) SWITCHES

A. Provided by Mechanical Contactor

B. Provide addressable communications module for each valve position switch to communicate trouble and supervisory signals to the main control panel.

C. Provide unique address assignment for each valve position switch, either through DIP switches located in the communication module or assigned by the main control panel.

2.12 SPEAKER NOTIFICATION APPLIANCES

A. Appliances shall comply with UL 1480 and shall be listed and labeled by an NRTL.

B. Communication transducers multi-tapped 1/4W to 2 W, with moisture-resistant, sealed compression driver.

C. Sensitivity: 87 – 96 dBA on-axis at 10' or higher if required for vendor-supplied layout drawings.

D. Frequency response: 400-4000 Hz for tonal signaling and 125- 12,000 Hz for general signaling.

E. Matching Transformers: Tap range matched to acoustical environment of speaker location.

F. Mounting Faceplate: Factory finished, white.

2.13 ALARM INDICATING STROBES

A. Provide alarm indicating strobes with the following specifications:

1. Semi-flush mounting to 4-inch square electrical box

2. 24 VDC operation powered from the main control panel.
3. In rooms larger than 1600 square feet
    a. Minimum 120 candela when measured on axis
    b. Rated for wall mount applications per UL 1971 at a minimum of 110 candela effective intensity.
4. Non-assembly rooms and corridors
    a. Minimum 75 candela when measured on axis
    b. Rated for wall mount applications per UL 1971 at a minimum of 15 candela effective intensity.
5. One to three flashes per second with a one (1) hertz synchronous flash pattern in accordance with ADA.
6. White with red “Alert” lettering. Vandal-proof polycarbonate lens.
7. Supervised wiring
8. U.L. 1971 listed, ADA compliant

2.14 ALARM INDICATING SPEAKER/STROBE UNIT

A. Provide speaker/strobe units with the following specifications:

1. Temporal sounding pattern of ½ to 1 sec ON, followed by ½ to 1 second OFF for three cycles, followed by a 1½ to 2 second OFF period for no less that 180 seconds.
2. Semi-flush mounting to 4-inch square electrical box
3. 24 VDC operation powered from the main control panel.
4. A minimum 90 dB output at 10 feet on axis.
5. Strobe light with the specifications of the strobe unit specified elsewhere in this section.
6. White with red “Alert” lettering. Vandal-proof polycarbonate lens.
7. Supervised wiring
8. U.L. 1971 listed , ADA compliant

2.15 SYSTEM WIRE AND CABLE

A. Provide all conductors and cables in conformance with the National Electrical Code Section 760-30.

B. Size all initiating and indicating circuit wiring as recommended by the system manufacturer. Provide minimum 14 AWG size for indicating and control circuits, and 18 AWG for initiating circuits.

C. Provide shielded cable to minimize RFI if recommended by the manufacturer.

D. Provide maximum individual circuit voltage drop of 15% at the most distant device; or less if necessary to meet the manufacturer’s operating voltage range for all devices.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide a complete and fully operational fire alarm and detection system as described herein and as shown on the drawings.

B. Provide a two wire Class B, low voltage, power limited, ADA compliant, addressable, closed circuit, electrically supervised, non-coded, temporal sounding type system as described in NFPA 72.

C. Provide individual alarm and trouble indication for each initiating device.

D. Provide supervisory signal indication for the sprinkler valve position switches (provided by others). Provide separate and unique monitoring of each valve position switch.

E. Provide supervision of the following circuits and devices:

1. Each individual initiating device and associated wiring
2. Each individual indicating device and associated wiring
3. Fire pump and fire pump wiring status.
4. Standby battery voltage.
5. Battery wiring.
6. Power supply voltage
7. CPU operation
8. Communications/Modem
9. Error Memory
10. Software Configuration
11. Hardware Configuration
12. Remote sub-panels, power supplies and associated wiring between the sub-panel and the main control panel.

F. Provide a clear distinction (at the main control panel and remote annunciators) between the alarm notification signal and the trouble notification signal.

G. Provide automatic HVAC system shut down for air handling units that move an air volume in excess of 2000 cfm. Provide duct detectors in the return ducts, and addressable control modules at each motor starter.

H. Install and wire all equipment in accordance with this specification, project drawings and shop drawings.

I. Provide all wiring, conduit, junction boxes and outlet boxes required for the system, including terminations to initiating, indicating and control devices furnished by others.

J. Install all wiring in concealed conduit in new construction. Provide surface raceway and boxes in finished areas of existing construction. Reuse existing conduit and boxes wherever possible.

K. Paint all junction boxes red and label “Fire Alarm”.

L. Provide plain English description of the location of each initiating device (zone). Coordinate wording of each device with the Owner.

M. Provide a laminated floor plan showing all device locations, addresses and plain-English description of the location. Mount the plan adjacent to the annunciator panel in the building Engineer's office.

N. Provide color coded wiring throughout. Test all wiring for opens, shorts and grounds before system startup.

O. Terminate all fire alarm wiring at terminal strips at the main control panel and all annunciator panels. Identify each cable with a number corresponding to a wiring diagram to be submitted in the O&M manuals. Neatly arrange of cabling around the sides of the cabinets to facilitate servicing of equipment and modules.

P. Provide the required system programming. Coordinate with the Owner all plain English address points, alarm verification presets, passwords, communication dialer protocol information, etc.

Q. Coordinate the installation of the fire alarm system with mechanical contractor. Verify locations of sprinkler waterflow switches and valve position switch locations with mechanical contractor. Provide wiring and make terminations to sprinkler waterflow devices and valve position switches being installed by mechanical contractor.

R. Coordinate the installation of the fire alarm system with mechanical contractor. Verify locations of smoke damper and EP switch locations with mechanical contractor. Provide wiring and make terminations to EP switches being installed by mechanical contractor.

S. Provide and install power to magnetic door holders, including wiring and connections through the associated smoke detector. Wire existing magnetic door holder wiring through the associated smoke detector base for automatic closure if the smoke detector senses smoke.

T. Mount end-of-line resistors in separate junction box located near the last device in the circuit or in last device. Clearly and permanently label "EOL RESISTOR" at each junction box cover plates and/or devices containing EOL resistors.

U. Provide one 3/4 inch conduit and telephone cable from main fire alarm control panel to the telephone terminal board for tie-in to remote monitoring company. Verify location with Owner.

V. Provide and connect wiring from the duct smoke detector control modules to associated motor controllers.

W. Install smoke detectors after the site is free from abnormal dust and dirt conditions, or provide manufacturer-approved protective cover over the device until the site is clean.

X. Provide permanent labels for controls and indicators.

Y. Provide Form C relays where required to control line voltage equipment.

Z. Mount fire alarm devices to electrical boxes.

AA. Locate automatic detectors a minimum of 36 inches away from supply air diffusers.

3.2 PLENUM CABLE INSTALLATION

A. Plenum rated conductors are to be installed above accessible, suspended ceilings. Provide conduit for all exposed areas or above any gyp board or otherwise inaccessible ceilings. Where provided utilize cable trays. Do not utilize cable trays provided for voice/data cabling.

B. Provide bushings on all conduit drops to outlet boxes for devices installed in walls.

C. Route all cables to avoid access panels on equipment and in ceiling.

D. Support all cable at 5' intervals using "J" hooks. Fasten "J" hooks to building structure. Adhere to the manufacturer's maximum fill for the cable support hardware. Bundle cables to eliminate sagging between "J" hooks. Install "J" hooks to eliminate sagging on ceilings, ducts, pipes, etc.

E. Install cables without violating the minimum bend radius recommended by the cable manufacturer.

F. Maintain at least a 12" spacing from fluorescent light fixtures and other EMI/RFI noise sources.

G. No splices are allowed in individual runs of cables. If splices are required due to the construction schedule then splices are to be made within junction boxes. Notify engineer for inspection of junction boxes prior to installation of ceiling tiles.

H. Maintain conductor shields at each connection point and tie to ground. Conductor shields are to be continuous throughout the entire run of cable.

I. Provide test results indicating continuity of conductor shields. Replace all cables where shields have become nicked or cut.

J. Terminate all conductors in flush outlet boxes behind devices. Provide stress relief. Provide grommets where cables enter HVAC equipment.

K. Provide red plenum cable for fire alarm systems.

3.3 TESTS AND ADJUSTMENTS

A. Upon completion of the installation phase, test and adjust the system to insure proper operation.

B. Test all operational features of the system at this time.

C. Where required, make appropriate correction(s) and adjustments.

D. Make an inspection of the fire alarm system with the manufacturer's representative of the fire alarm equipment, including those components necessary to the direct operation of the system such as manual stations, thermal detectors, smoke detectors, flow switches and controls, whether or not manufactured by the manufacturer. The inspection to comprise examination and certification of such equipment for the following:

1. The system functions properly;
2. The type of equipment installed is that designated by the Engineer's specifications;
3. Equipment of the manufacturer has been installed in accordance with the manufacturer's recommendation and that all signaling devices of whatever manufacturer have been operated or tested to verify their operation: The supervisory wiring of those items of equipment connected to a supervised circuit is operating and that the regulations, if any, concerning such supervisory wiring, have been met to the satisfaction of inspecting officials.

E. Inspection Certification: Upon completion of the inspection and when all of the above conditions have been complied with, the manufacturer is to issue to the Engineer:

1. A copy of the inspecting technician's report showing location of each device and certifying the test results of each device.
2. A certificate of verification confirming that the inspection has been completed and accepted by the authority having jurisdiction and showing the conditions upon which such inspection and certification have been rendered.

F. Owners Instruction: The manufacturer to provide the services of a competent alarm system technician for the period of two working days, at a time convenient to the Owner, to instruct the staff in the operation and maintenance of the system.

G. Provide a letter to the Owner and Fire Marshal certifying that the installed system is UL certified.

3.4 AS-BUILT DOCUMENTATION

A. Provide to the Engineer two (2) complete as-built manuals assembled in loose-leaf binders containing the following:

1. As-built system functional block diagrams.
2. Corrected copies of approved shop drawings
3. As-built system wiring diagram.
4. List indicating each device, location, address, label, etc.
5. Final operating sequence (step by step) for the system as tested and accepted by the Fire Marshal.
6. **Hard copy printout of the complete fire alarm operating program, and a CD-ROM disk with programming software as written and customized for this project.**
7. System operation manuals.
8. System maintenance manuals.
9. Name, address and phone number of the responsible service organization.

3.5 FINAL CHECKOUT AND ACCEPTANCE

A. Demonstrate the operation and use of the system to the Architect/Engineer, to the Owner's representative(s) and the Fire Marshal.

B. Verify the following before scheduling the system demonstration:

1. System installation is complete.
2. System is fully operational.

C. Verify the following before requesting final approval:

1. Owner training is complete.
2. As-built documentation is complete and turned over to the Engineer.

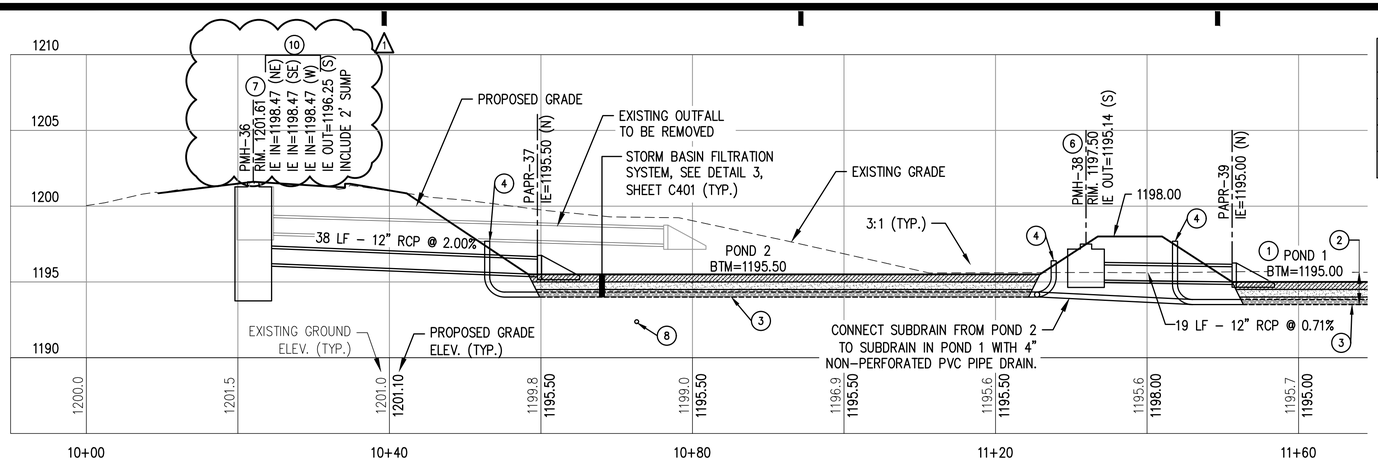
D. Provide a letter to the Owner certifying that the installation is complete, fully operational and successfully tested.

E. Final acceptance of the system will be given upon completion of all of the above requirements.

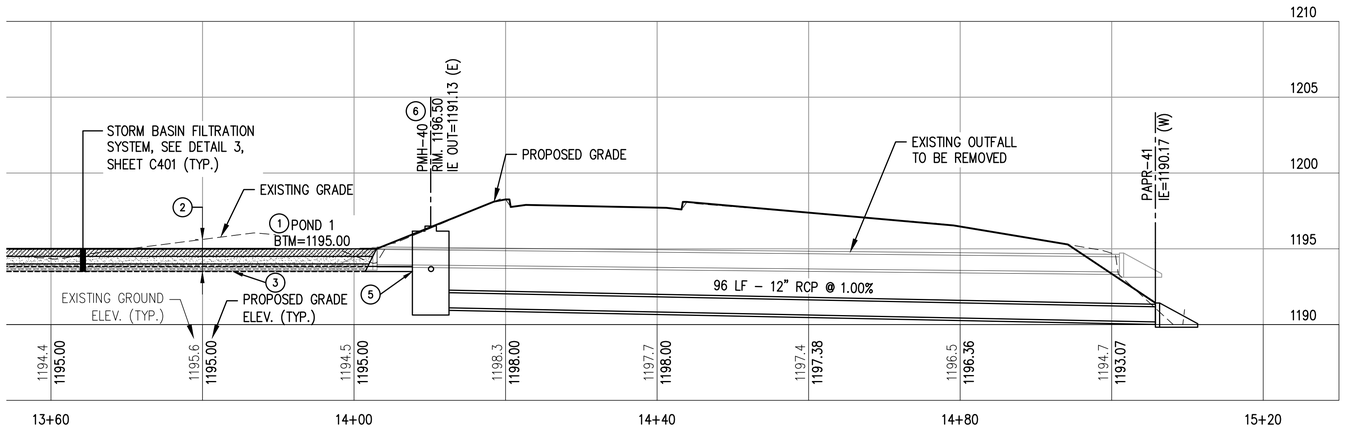
3.6 SYSTEM GUARANTEE

A. Provide a complete parts and labor warranty for the system, commencing on the date of final acceptance and continuing for a period of one (1) year. Provide all materials and labor required to correct any system malfunction or failure (determined not to be the result of negligence, abuse or misuse) at no charge to the Owner during this time period.

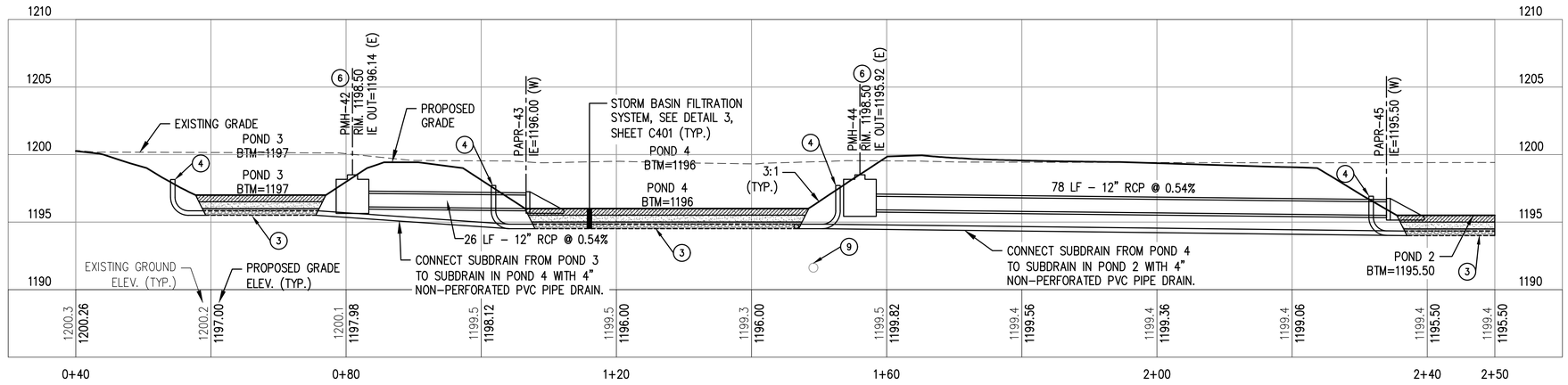
END OF SECTION



HARTLEY ROAD TO STORMWATER POND 1



STORMWATER POND 1 TO OUTFALL



STORMWATER POND 3 TO STORMWATER POND 2

STORM BASIN STORAGE DATA

	POND 1	POND 2	POND 3	POND 4
POND BTM EL/AREA	1195.00/4,022 SF	1195.50/3,746 SF	1197.00/214 SF	1196.00/643 SF
OVERFLOW EL/AREA	1196.50/7,630 SF	1197.50/5,228 SF	1198.50/541 SF	1198.50/1,712 SF
POND VOLUME	8,770 CU FT	8,942 CU FT	556 CU FT	2,880 CU FT

TOTAL PROPOSED POND VOLUME	21,148 CU FT
NEW IMPERVIOUS SURFACE	21,083 SF (0.48 AC)
EXISTING IMPERVIOUS SURFACE TO PONDS	43,560 SF (1.00 AC)

KEY NOTES:

1. THE RECONSTRUCTED STORMWATER POND (POND 1) IS REPLACING AN INFILTRATION BASIN THAT HAS BECOME NONFUNCTIONAL.
2. EXCAVATE INPLACE BASIN TO GRADES AND DEPTHS SHOWN AND REMOVE INPLACE BASIN SUBBASE.
3. CONSTRUCT BASIN SUBDRAIN SYSTEM. SEE DETAIL 3, SHEET C401 (TYP.)
4. CLEANOUT ASSEMBLY. SEE DETAIL 2, SHEET C401 (TYP.)
5. CONNECT SUBDRAIN TO STRUCTURE.
6. M-11 CASTING PER MNDOT STD. PLATE 4143.
7. STRM-1 CASTING
8. VERIFY DEPTH OF EXISTING ELECTRICAL SERVICE. ADJUST AS NECESSARY TO PROVIDE 36" MIN. COVER OR TO MEET UTILITY PROVIDER'S REQUIREMENTS, WHICHEVER IS GREATER.
9. VERIFY DEPTH OF EXISTING 8" HDPE WATERLINE. IF COVER OVER PIPE FROM PROPOSED GRADE IS LESS THAN 7.5', PROVIDE INSULATION OVER EXISTING PIPE IN CUT AREA PER CITY DETAIL W-13 ON SHEET C410.
10. EXISTING 12" RCP. EXISTING STORM PIPE INFORMATION BASED ON HISTORIC DESIGN PLANS. CONFIRM INFORMATION IN THE FIELD.

LHB
PERFORMANCE DRIVEN DESIGN.
LHBcorp.com
21 W. Superior St., Ste. 500 | Duluth, MN 55802 | 218.727.8446

CLIENT:
CITY OF DULUTH

411 West 1st Street
Duluth, MN 55802

THIS SQUARE APPEARS 1/2" x 1/2" ON FULL SIZE SHEETS.

NO	DATE	ISSUED FOR
	04/20/2021	CD SUBMITTAL

NO	DATE	REVISION
1	05/06/2021	ADDENDUM 02

I HEREBY CERTIFY that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

SIGNATURE: Megan Goplin

TYPED OR PRINTED NAME: MEGAN GOPLIN

DATE: 04/20/2021 REG. NO.: 53018

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PROJECT NAME:
HARTLEY NATURE CENTER BUILDING ADDITION

3001 WOODLAND AVENUE
DULUTH, MN 55803

DRAWING TITLE:
STORM PROFILES

FILE: ..\magopli\ACCDocs\LHB\190961 Hartley Addition\Project Files\Civil_LA\Cv19
DRAWN BY: MAG
CHECKED BY: -
PROJ. NO: agopli
DRAWING NO: **C205**

MATERIALS LIST

Flooring

CPT. 1	Carpet 1
Mfr:	Interface
Prod:	Step It Up
Style #:	1473802500
Color:	106333 Ebony
Size:	50cmx50cm
Installation:	Monolithic
CPT. 2	Carpet 2
Mfr:	Interface
Prod:	Step It Up
Style #:	1473802500
Color:	106338 Azure
Size:	50cmx50cm
Installation:	Monolithic
FF.1	Flake Flooring 1
Mfr:	Torginol
Prod:	Flake
Color Mix:	F1560 Mint Green 85%
	F9990 Slime 5%
	F2200 Primary Yellow 10%
Flake Size:	1/4"
FF.2	Flake Flooring 2
Mfr:	Torginol
Prod:	Flake (Cannoli FB-130)
Color Mix:	F1425 Ivory 30%
	F1770 Salmon 10%
	F1780 Scone 30%
	F1820 White 30%
Flake Size:	1/4"
TR.1	Trackoff flooring
Mfr:	Interface
Prod:	Step Repeat
Style #:	1388402500
Color:	104913 Dark Brown
Size:	50cmx50cm
Installation:	Monolithic

Base

FFB.1	Flake Floor Base 1
Mfr:	Torginol
Prod:	Flake
Color Mix:	F1560 Mint Green 85%
	F9990 Slime 5%
	F2200 Primary Yellow 10%
Flake Size:	1/4"
Size:	coved base 4" H
FFB.2	Flake Floor Base 2
Mfr:	Torginol
Prod:	Flake (Cannoli FB-130)
Color Mix:	F1425 Ivory 30%
	F1770 Salmon 10%
	F1780 Scone 30%
	F1820 White 30%
Flake Size:	1/4"
Size:	coved base 4" H
RB. 1	Resilient Base 1
Mfr:	Tarkett
Prod:	Recess Cove Base RWDC
Color:	178 Ironstone (Metallic)
Size:	4.25"
WB. 1	Wood Base 1
Prod:	Match Existing Wood Base
Species:	Oak
Finish:	Match Existing Wood Base
Size:	Match Existing Wood Base

Walls

PT. 1	Paint 1 (light warm grey)
Mfr:	Sherwin Williams
Color:	Worldly Gray SW7043
PT. 2	Paint 2 (deep blue)
Mfr:	Sherwin Williams
Color:	Dark Night SW6237
PT . 3	Paint 3 (yellow-green)
Mfr:	Sherwin Williams
Color:	Frolic SW6703
PT. 4	Paint 4 (bright teal)
Mfr:	Sherwin Williams
Color:	Amalfi SW6783
PT. 5	Paint 5 (orange)
Mfr:	Sherwin Williams
Color:	Yarrow SW6669
PT. 6	Paint 6 (tan)
Mfr:	Sherwin Williams
Color:	Soft Fawn SW9097
SWF. 1	Stone Wall Finish 1
Mfr:	Champlain Stone
Prod:	Building Stones Thin Veneer
Cut:	Mosaic
Thickness:	3/4" - 1 1/4"
Color:	American Granite
Grout:	TEC Light Pewter 927
WT.1	Wall Tile 1
Rep:	Tile x Design | Jennifer Christopher
Prod:	Citi Tile
Color:	Super White
Finish:	Gloss
Size:	4"x16"
Installation:	Horizontal 1/3 offset
Grout:	TEC Fern 990
WF.1	Window Film 1
Mfr:	Takeform
Prod:	Amplify/Clarity
Finish:	Clear
Roll Size:	61"
Opacity:	75% Opacity
Artwork:	Owl and Bunny
WG.1	Wall Graphic 1
Mfr:	Takeform
Prod:	Amplify/Traffic
Application:	Self Adhesive
Size:	2'-3" w x 3'-9" h
Artwork:	Fox and Squirrel
BB.1	Bulletin Board Wall Finish 1
Mfr:	Forbo
Prod:	Bulletin Board
Color:	Baby Lettuce 2213
Size:	48" wide
Trim:	Fry reglet wallcovering edge
WD.1	Wood Wainscot wall finish 1
Prod:	match existing wood wall finish
Species:	match existing wood wall finish
Finish:	match existing wood wall finish
Size:	match existing wood wall finish

Ceilings

ABC. 1	Acoustical Baffle Ceiling 1
Mfr:	MDC
Prod:	Zintra Individual Standard Baffles
Color:	Ecru
Size:	See Reflected Ceiling Plan
Height and Thickness:	5.5" x 1/2"
Installation:	Grommet and Cable
ACT. 1	Acoustical Ceiling Tile 1
Mfr:	USG
Prod:	Frost High-LR
Color:	white
Size:	24"x24"x 3/4" thick
Edge:	Shadowline Bevel
Grid:	Donn DXLF
PTC.1	Painted Ceilings 1
Mfr:	Sherwin Williams
Color:	Extra White
Finish:	Flat

Misc

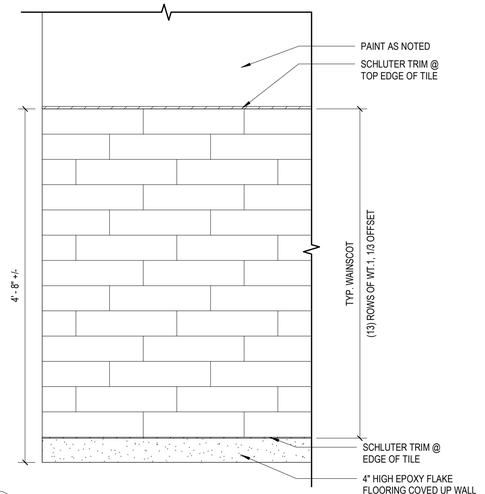
PLAM.1	Plastic Laminate 1
Location:	Cabinet Faces
Mfr:	Formica
Prod:	8840-58
Color:	Natural Ribbonwood
Finish:	Matte
PLAM.2	Plastic Laminate 2
Location:	Countertops unless noted otherwise
Mfr:	Formica
Prod:	9685-58
Color:	Black Recycled Kraft
Finish:	Matte
SS.1	Solid Surface 1
Location:	Countertops at Break Room and at Lavatory Locations, Window Sills.
Mfr:	Corian
Color:	Domino Terrazzo
WS.1	Exterior Wood Stain
Mfr:	Sherwin-Williams
Color:	Match Existing

ROOM FINISH SCHEDULE

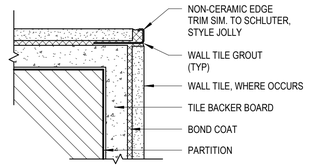
RM NUMBER	RM NAME	FLOOR	BASE	WALLS				CEILING	COMMENTS
				NORTH	EAST	SOUTH	WEST	FINISH	
100	VESTIBULE	EX	EX	EX	EX	EX	EX	EX	
103	CLASSROOM 1	EX	EX	EX	EX	EX/WD.1	EX	EX/PTC.1	
110	OFFICE	CPT.1	EX	PT.1	PT.1	PT.1	PT.2	EX	
110A	OFFICE	CPT.2	RB.1	PT.1	PT.1	PT.1	PT.1	EX	
110B	OFFICE	CPT.1	EX	PT.1	PT.1	PT.1	PT.1	EX	
110C	OFFICE	CPT.1	RB.1	PT.1	PT.1	PT.1	PT.1	ACT.1	
110D	CLOSET	CPT.1	EX	EX	EX	EX	EX	EX	
110E	WAITING	CPT.2	RB.1	PT.1	PT.1	PT.1	PT.4	EX	
110F	RENTAL	CPT.1	RB.1	PT.1	PT.1	PT.2	PT.1	ACT.1	
111	STORAGE	EX	EX	EX	EX	EX/PT.1	EX/PT.1	EX	
112	WOMEN	EX	EX	EX	EX	EX	EX	EX	
113	MEN	EX	EX	EX	EX	EX	EX	EX	
114	WASH	EX	EX	EX	EX	EX	EX	EX	
115	HALL	EX	EX	WD.1/PT.1	WD.1/PT.1	EX	EX	EX	
119	CIRCULATION	CPT.2	RB.1	PT.1	PT.1	PT.1	PT.1	PTC.1	
119A	CLOSET	CPT.2	RB.1	PT.1	PT.1	PT.1	PT.1	PTC.1	
120	VESTIBULE	TR.1	RB.1	PT.1	PT.1	PT.1	PT.1/WF.1	ACT.1	WF.1 AT VESTIBULE GLAZING REFER TO 3/A411
121	LOBBY	FF.1	RB.1	PT.1/PT.3/SWF.1/WF.2	PT.1/WF.1	PT.1/PT.6	-	ABC.1/PTC.1	WF.1 AT CONFERENCE ROOM GLAZING REFER TO 2/A411
122	WASH	FF.1	FFB.1	WT.1/PT.1	WT.1/PT.1	WT.1/PT.4	WT.1/PT.1	PTC.1	
123	BOYS	FF.1	FFB.1	WT.1/PT.4	WT.1/PT.1	WT.1/PT.1	WT.1/PT.4	PTC.1	
124	GIRLS	FF.1	FFB.1	WT.1/PT.4	WT.1/PT.4	WT.1/PT.1	WT.1/PT.1	PTC.1	
125	HALL	FF.1	RB.1	PT.1	PT.1/PT.4/PT.5	PT.1	PT.1/PT.3/PT.4/WD.1/WG.1/PT.5	PTC.1/PT.3	WG.1 AT CLASSROOM LITTLE DOORS, HALLWAY SIDE ONLY...
126	CLASSROOM 5	FF.2/CPT.2	RB.1	BB.1/PT.1/PT.3	PT.1/PT.3/PT.4	PT.1	PT.1	PTC.1/PT.3	FRY REGLET WALLCOVERING FINISH TRIM AT BB.1
127	STORAGE	CPT.2	RB.1	PT.1	PT.1	PT.1	PT.1	PTC.1	
128	TOILET	FF.2	FFB.2	WT.1/PT.4	WT.1/PT.4	WT.1/PT.4	WT.1/PT.4	ACT.1	
129	CLASSROOM 6	FF.2/CPT.2	RB.1	PT.1	PT.1/PT.3/PT.4	BB.1/PT.1/PT.3	PT.1	PTC.1/PT.3	FRY REGLET WALLCOVERING FINISH TRIM AT BB.1
130	VESTIBULE	TR.1	RB.1	PT.1	PT.1	PT.1	PT.1	ACT.1	
130A	CLOSET	TR.1	RB.1	PT.1	PT.1	PT.1	PT.1	PTC.1	
131	LAUNDRY	CONC	RB.1	PT.1	PT.1	PT.1	PT.1	PTC.1	
132	WELLNESS	CPT.1	RB.1	PT.1	PT.1	PT.1	PT.2	PTC.1	
133	TOILET	FF.1	FFB.1	WT.1/PT.4	WT.1/PT.4	WT.1/PT.4	WT.1/PT.4	PTC.1	
134	STORAGE	CONC	RB.1	PT.1	PT.1	PT.1	PT.1	PTC.1	
135	STAFF BREAK	FF.1/CPT.1	RB.1	PT.1	PT.1	PT.1	PT.1/PT.2	PTC.1	
136	CONF	CPT.1	RB.1	PT.1	PT.1	PT.1	PT.2	PTC.1	
200	MECHANICAL MEZZANINE			PT.1	PT.1	PT.1	PT.1	-	
201	MEZZ STAIR	EX	EX	PT.1	PT.1	PT.1	PT.1	EX	

FINISH NOTES:

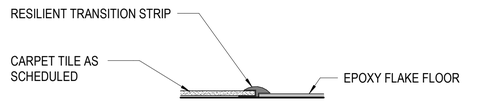
1) RESILIENT MATERIALS SHALL ALL BE TARKETT COLOR 178 IRONSTONE (METALLIC).
2) HOLLOW METAL FRAMES SHALL BE PAINTED TO MATCH ADJACENT WALL SURFACE.



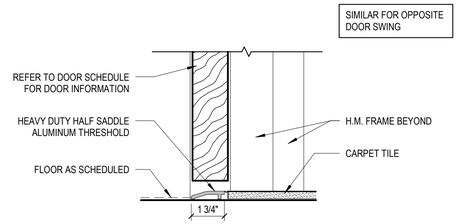
3 WALL TILE DETAIL
1" = 1'-0"



2 FINISH DETAIL - TILE CORNERS
6" = 1'-0"



4 FLOORING TRANSITION - CARPET & FLAKE FLOOR
3" = 1'-0"



1 FLOORING TRANSITION - FLOORING & CONC
3" = 1'-0"

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isola design

CLIENT:
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Duluth, MN 55802

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NO	DATE	ISSUED FOR
	04/20/2021	CD SUBMITTAL

NO	DATE	REVISION
1	05/06/2021	ADDENDUM #2

I HEREBY CERTIFY that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Architect under the laws of the State of Minnesota.

Signature:
Typed or Printed Name: BRANDEE NESS LIAN
Date: 04/20/2021 Reg. No.: 42589

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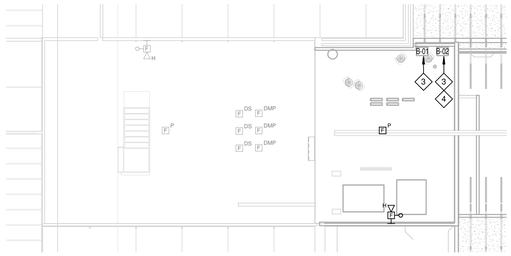
PROJECT NAME:
HARTLEY NATURE CENTER
BUILDING ADDITION

3001 WOODLAND AVENUE
DULUTH, MN 55803

DRAWING TITLE:
MATERIALS LIST & FINISH SCHEDULE

DRAWN BY: ZAR
CHECKED BY: JU
PROJ. NO: 190961
DRAWING NO: A711

BIM 360://190961 Hartley Addition/190961 Hartley Addition A20 Central.rvt
5/6/2021 2:21:08 PM



2 ELECTRONIC SAFETY AND SECURITY PLAN - MEZZANINE
1/8" = 1'-0"

1 ELECTRONIC SAFETY AND SECURITY PLAN - LEVEL 1
1/8" = 1'-0"

BIM 360://190961 Hartley Addition/190961 Hartley Addition E20 Central.rvt
5/6/2021 8:46:20 AM

GENERAL NOTES:

A. EXTEND THE EXISTING FIRE ALARM SYSTEM TO ALL NEW DEVICES SHOWN.

B. MOUNT NEW FIRE ALARM DEVICES SHOWN ON EXISTING WALLS UTILIZING SURFACE RACEWAY AND BOXES. PAINT RACEWAY TO MATCH EXISTING SURFACES.

C. PROVIDE FIRE ALARM WIRING CONCEALED IN CONDUIT.

D. PROVIDE SECURITY SYSTEM WIRING CONCEALED IN CONDUIT.

E. PROVIDE PLENUM RATED CABLE FOR FIRE ALARM SYSTEM. REFER TO SPECIFICATIONS FOR WIRING REQUIREMENTS.

F. ALL SECURITY DEVICES ARE TO BE WIRED AS A SINGLE PONT TO THE EXISTING SECURITY PANEL. ALL FINAL CONNECTIONS AT THE PANEL WILL BE BY DIVISION 28. ALL OTHER CABLING, DEVICES AND CONNECTIONS ARE BY DIVISION 26.

G. CATEGORY 6A CABLING FOR CCTV SURVEILLANCE SYSTEM CAMERA LOCATIONS WILL BE FURNISHED AND INSTALLED BY DIVISION 27. CAMERAS, MOUNTING HARDWARE, AND INSTALLATION ARE BY OWNER.

KEY NOTES:

1. CONNECT NEW FIRE ALARM DEVICES SHOWN ON PLAN TO EXISTING FIRE ALARM SYSTEM. PROVIDE COMPONENTS AS REQUIRED FOR FULLY OPERATIONAL FIRE ALARM SYSTEM.
2. CONNECT NEW SECURITY & ACCESS CONTROL DEVICES SHOWN ON PLAN TO EXISTING SECURITY & ACCESS CONTROL SYSTEM. EXISTING SECURITY & ACCESS CONTROL SYSTEM VENDOR IS ADVANTAGE SYSTEMS GROUP. PROVIDE COMPONENTS AS REQUIRED FOR FULLY OPERATIONAL SECURITY & ACCESS CONTROL SYSTEM.
3. PROVIDE CONNECTION FROM BOILER STATUS AUX. CONTACT TO EXISTING SECURITY SYSTEM FOR MONITORING OF BOILER STATUS. COORDINATE WITH BOILER INSTALLER AND OWNER. PROVIDE CABLING AND CONNECTIONS AS REQUIRED.
4. WORK ASSOCIATED WITH BOILER 'B-02' IS UNDER BID ALTERNATE 1, NO WORK UNDER BASE BID.

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Duluth, MN 55802

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NO	DATE	ISSUED FOR
	04/20/2021	CD SUBMITTAL

NO	DATE	REVISION
1	05/06/2021	ADDENDUM 02

I HEREBY CERTIFY that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Signature:
Typed or Printed Name: RYAN J. LINDAHL
Date: 04/20/21 Reg. No.: 46731

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PROJECT NAME:
HARTLEY NATURE CENTER BUILDING ADDITION

3001 WOODLAND AVENUE
DULUTH, MN 55803

DRAWING TITLE:
ELECTRONIC SAFETY AND SECURITY PLAN

DRAWN BY: WW
CHECKED BY: RL
PROJ. NO: R19-3743.000
DRAWING NO: **E500**

LIGHT FIXTURE SCHEDULE

LTR TYPE	FIXTURE TYPE	MOUNTING	LAMP TYPE	VOLTAGE/ BALLAST	FIXTURE DESCRIPTION	MANUFACTURER/ CATALOG SERIES	NOTES
A	2'X2' LENSED TROFFER	RECESSED IN GRID	LED 2000 LUMENS 3500K	120-277V ELECTRONIC 0-10 DIMMING DRIVER	0.156 ACRYLIC LENS, PATTERN #A19, REGRESSED ALUMINUM DOOR, PAINTED AFTER FABRICATION, ENCLOSED SPRING LOADED LATCHES	LITHONIA GTL SERIES H.E. WILLIAMS SO SERIES COLUMBIA LJT SERIES METALUX GR SERIES DAY-BRITE T SERIES	
C2	4 INCH WIDE X 2 FOOT LINEAR - INTERIOR	RECESSED IN GYP. CEILING	LED 1,200 LUMENS 3500K	120-277 VOLT 0-10V DIMMING DRIVER	EXTRUDED ALUMINUM HOUSING, FLUSH SATIN LENSES. FINISH SELECTED BY ARCHITECT.	MARK SL4 SERIES NEORAY S124 SERIES PINNACLE EV4 SERIES METALUMEN RM4 SERIES AXIS BEAM 4 SERIES FOCAL POINT SEEM4 SERIES	
C4	4 INCH WIDE X 4 FOOT LINEAR - INTERIOR	RECESSED IN GYP. CEILING	LED 2,400 LUMENS 3500K	120-277 VOLT 0-10V DIMMING DRIVER	EXTRUDED ALUMINUM HOUSING, FLUSH SATIN LENSES. FINISH SELECTED BY ARCHITECT.	MARK SL4 SERIES NEORAY S124 SERIES PINNACLE EV4 SERIES METALUMEN RM4 SERIES AXIS BEAM 4 SERIES FOCAL POINT SEEM4 SERIES	
E	EXIT SIGN WITH BATTERY SINGLE FACE	UNIVERSAL	LED	120-277 VOLT	GREEN STENCIL, BRUSHED ALUMINUM FACE, BLACK DIE CAST HOUSING, NI-CAD BATTERY, SELF DIAGNOSTICS.	LITHONIA LES SERIES EXITRONIX 400U SERIES CHORIDE 55 SERIES DUAL-LITE SES SERIES COOPER SURELITES CX SERIES	
E1	EXIT SIGN WITH BATTERY DOUBLE FACE	UNIVERSAL	LED	120-277 VOLT	GREEN STENCIL, BRUSHED ALUMINUM FACE, BLACK DIE CAST HOUSING, NI-CAD BATTERY, SELF DIAGNOSTICS.	LITHONIA LES SERIES EXITRONIX 400U SERIES CHORIDE 55 SERIES DUAL-LITE SES SERIES COOPER SURELITES CX SERIES	
EM	EMERGENCY BATTERY PACK	SURFACE WALL	(2) 1.5W LED	120-277 VOLT	WHITE THERMAL PLASTIC HOUSING, NI-CAD BATTERY, SELF DIAGNOSTICS	LITHONIA ELM2LED SERIES COOPER SURELITES LEM2 SERIES LIGHTALARMS GR SERIES DUAL-LITE EV SERIES EMERGI-LITE PR SERIES	
J4	2 INCH WIDE X 4 FOOT LINEAR DIRECT/INDIRECT - INTERIOR	AIR CRAFT CABLE	LED 3,200 LUMENS-DOWN 1,600 LUMENS-UP 3500K	120-277 VOLT 0-10V DIMMING DRIVER	EXTRUDED ALUMINUM HOUSING, FLUSH SATIN LENS. CONTROL UP/DOWN SEPERATELY. FINISH SELECTED BY ARCHITECT. DUAL CIRCUIT.	MARK SL2 SERIES NEORAY S122 SERIES PINNACLE EV2 SERIES METALUMEN RM2 SERIES AXIS BEAM 2 SERIES FOCAL POINT SEEM2 SERIES	
J4L	2 INCH WIDE X 4 FOOT LINEAR DIRECT/INDIRECT - INTERIOR	AIR CRAFT CABLE	LED 1,600 LUMENS-DOWN 800 LUMENS-UP 3500K	120-277 VOLT 0-10V DIMMING DRIVER	EXTRUDED ALUMINUM HOUSING, FLUSH SATIN LENS. CONTROL UP/DOWN SEPERATELY. FINISH SELECTED BY ARCHITECT. BATWING DISTRIBUTION INDIRECT COMPONENT. DUAL CIRCUIT.	MARK SL2 SERIES NEORAY S122 SERIES PINNACLE EV2 SERIES METALUMEN RM2 SERIES AXIS BEAM 2 SERIES FOCAL POINT SEEM2 SERIES	
J8	2 INCH WIDE X 8 FOOT LINEAR DIRECT/INDIRECT - INTERIOR	AIR CRAFT CABLE	LED 6,400 LUMENS-DOWN 3,200 LUMENS-UP 3500K	120-277 VOLT 0-10V DIMMING DRIVER	EXTRUDED ALUMINUM HOUSING, FLUSH SATIN LENS. CONTROL UP/DOWN SEPERATELY. FINISH SELECTED BY ARCHITECT. DUAL CIRCUIT.	MARK SL2 SERIES NEORAY S122 SERIES PINNACLE EV2 SERIES METALUMEN RM2 SERIES AXIS BEAM 2 SERIES FOCAL POINT SEEM2 SERIES	
J8L	2 INCH WIDE X 8 FOOT LINEAR DIRECT/INDIRECT - INTERIOR	AIR CRAFT CABLE	LED 3,200 LUMENS-DOWN 1,600 LUMENS-UP 3500K	120-277 VOLT 0-10V DIMMING DRIVER	EXTRUDED ALUMINUM HOUSING, FLUSH SATIN LENS. CONTROL UP/DOWN SEPERATELY. FINISH SELECTED BY ARCHITECT. BATWING DISTRIBUTION INDIRECT COMPONENT. DUAL CIRCUIT.	MARK SL2 SERIES NEORAY S122 SERIES PINNACLE EV2 SERIES METALUMEN RM2 SERIES AXIS BEAM 2 SERIES FOCAL POINT SEEM2 SERIES	
J9	2 INCH WIDE X 9 FOOT LINEAR DIRECT/INDIRECT - INTERIOR	AIR CRAFT CABLE	LED 3,600 LUMENS-DOWN 3,600 LUMENS-UP 3500K	120-277 VOLT 0-10V DIMMING DRIVER	EXTRUDED ALUMINUM HOUSING, FLUSH SATIN LENS. CONTROL UP/DOWN SEPERATELY. FINISH SELECTED BY ARCHITECT. DUAL CIRCUIT.	MARK SL2 SERIES NEORAY S122 SERIES PINNACLE EV2 SERIES METALUMEN RM2 SERIES AXIS BEAM 2 SERIES FOCAL POINT SEEM2 SERIES	
L2	2 INCH WIDE X 2 FOOT LINEAR - INTERIOR	RECESSED IN GYP. CEILING	LED 1,200 LUMENS 3500K	120-277 VOLT 0-10V DIMMING DRIVER	EXTRUDED ALUMINUM HOUSING, FLUSH SATIN LENSES. FINISH SELECTED BY ARCHITECT.	MARK SL2 SERIES NEORAY S122 SERIES PINNACLE EV2 SERIES METALUMEN RM2 SERIES AXIS BEAM 2 SERIES FOCAL POINT SEEM2 SERIES	
L4	2 INCH WIDE X 4 FOOT LINEAR - INTERIOR	RECESSED IN GYP. CEILING	LED 1,600 LUMENS 3500K	120-277 VOLT 0-10V DIMMING DRIVER	EXTRUDED ALUMINUM HOUSING, FLUSH SATIN LENSES. FINISH SELECTED BY ARCHITECT.	MARK SL2 SERIES NEORAY S122 SERIES PINNACLE EV2 SERIES METALUMEN RM2 SERIES AXIS BEAM 2 SERIES FOCAL POINT SEEM2 SERIES	
L4H	2 INCH WIDE X 4 FOOT LINEAR - INTERIOR	RECESSED IN GYP. CEILING	LED 3,200 LUMENS 3500K	120-277 VOLT 0-10V DIMMING DRIVER	EXTRUDED ALUMINUM HOUSING, FLUSH SATIN LENSES. FINISH SELECTED BY ARCHITECT.	MARK SL2 SERIES NEORAY S122 SERIES PINNACLE EV2 SERIES METALUMEN RM2 SERIES AXIS BEAM 2 SERIES FOCAL POINT SEEM2 SERIES	
L4G	2 INCH WIDE X 4 FOOT LINEAR - INTERIOR	RECESSED IN GRID	LED 3,200 LUMENS 3500K	120-277 VOLT 0-10V DIMMING DRIVER	EXTRUDED ALUMINUM HOUSING, FLUSH SATIN LENSES. FINISH SELECTED BY ARCHITECT.	MARK SL2 SERIES NEORAY S122 SERIES PINNACLE EV2 SERIES METALUMEN RM2 SERIES AXIS BEAM 2 SERIES FOCAL POINT SEEM2 SERIES	
L8	2 INCH WIDE X 8 FOOT LINEAR - INTERIOR	RECESSED IN GYP. CEILING	LED 3,200 LUMENS 3500K	120-277 VOLT 0-10V DIMMING DRIVER	EXTRUDED ALUMINUM HOUSING, FLUSH SATIN LENSES. FINISH SELECTED BY ARCHITECT.	MARK SL2 SERIES NEORAY S122 SERIES PINNACLE EV2 SERIES METALUMEN RM2 SERIES AXIS BEAM 2 SERIES FOCAL POINT SEEM2 SERIES	
L8G	2 INCH WIDE X 8 FOOT LINEAR - INTERIOR	RECESSED IN GRID. CEILING	LED 3,200 LUMENS 3500K	120-277 VOLT 0-10V DIMMING DRIVER	EXTRUDED ALUMINUM HOUSING, FLUSH SATIN LENSES. FINISH SELECTED BY ARCHITECT.	MARK SL2 SERIES NEORAY S122 SERIES PINNACLE EV2 SERIES METALUMEN RM2 SERIES AXIS BEAM 2 SERIES FOCAL POINT SEEM2 SERIES	
L8H	2 INCH WIDE X 8 FOOT LINEAR - INTERIOR	RECESSED IN GYP. CEILING	LED 6,400 LUMENS 3500K	120-277 VOLT 0-10V DIMMING DRIVER	EXTRUDED ALUMINUM HOUSING, FLUSH SATIN LENSES. FINISH SELECTED BY ARCHITECT.	MARK SL2 SERIES NEORAY S122 SERIES PINNACLE EV2 SERIES METALUMEN RM2 SERIES AXIS BEAM 2 SERIES FOCAL POINT SEEM2 SERIES	

LIGHT FIXTURE SCHEDULE

L9	2 INCH WIDE X 9 FOOT LINEAR - INTERIOR	RECESSED IN GYP. CEILING	LED 3,600 LUMENS 3500K	120-277 VOLT 0-10V DIMMING DRIVER	EXTRUDED ALUMINUM HOUSING, FLUSH SATIN LENSES. FINISH SELECTED BY ARCHITECT.	MARK SL2 SERIES NEORAY S122 SERIES PINNACLE EV2 SERIES METALUMEN RM2 SERIES AXIS BEAM 2 SERIES FOCAL POINT SEEM2 SERIES	
L14	2 INCH WIDE X 14 FOOT LINEAR WALL GRAZER	REGRESSED IN GYP. CEILING, MOUNTED TO GYP. WALL.	LED 8,000 LUMENS 3500K	120-277 VOLT 0-10V DIMMING DRIVER	EXTRUDED ALUMINUM HOUSING. FINISH SELECTED BY ARCHITECT. WALL WASH	AXIS GPRLED (GRAZE PERFEKT) SERIES OR APPROVED EQUAL	
M4	4 FOOT STRIP LIGHT	AIR CRAFT CABLE SUSPENDED	LED 4000 LUMENS 3500K	120-277V ELECTRONIC DRIVER	RIGID BODY HOUSING, DIFFUSE WHITE LENS	LITHONIA ZL1D SERIES WILLIAMS LLMS SERIES METALUX SNLED SERIES COLUMBIA MPS SERIES MERCURY LSV SERIES	
P	8 FOOT DIAMETER X 16" HIGH ACCOUSTICAL RING LIGHT.	SUSPENDED	LED 8,000 LUMENS-DOWN 4,000 LUMENS-UP 3500K	120-277 VOLT 0-10V DIMMING DRIVER	ACCOSTICAL RING LIGHT. FABRIC(S), CANOPY, DIFFUSER, LENS AND FINISH(ES) SELECTED BY ARCHITECT.	LIGHT ART ACOUSTIC RING SERIES OR APPROVED EQUAL	1
U2	2 FOOT UNDER CABINET LIGHT	SURFACE TO UNDERSIDE OF UPPER CABINET	LED 1,200 LUMENS 3500K	120V ELECTRONIC DRIVER	ALUMINUM HOUSING, DIFFUSE ACRYLIC LENS. PROVIDE OVERALL LENGHT AS SHOWN. PROVIDE ALL REQUIRED MOUNTING COMPONENTS. FINISH SELECTED BY ARCHITECT.	KENALL AUC SERIES WAC BA-ACLED SERIES JUNO UPLED SERIES MERCURY LUCS SERIES COLUMBIA CUC SERIES	
W	WALL MOUNT CUTOFF TRAPEZOID FORWARD THROW	SURFACE SEE PLANS FOR MOUNTING HEIGHT	LED 4000 LUMENS MATCH EXISTING EXTERIOR LIGHTING COLOR TEMPERATURE	120-277V ELECTRONIC DRIVER	DIE CAST ALUMINUM HOUSING AND DOOR FRAME WITH SILICONE GASKETED TEMPERED GLASS LENS, FORWARD THROW DISTRIBUTION, WET LOCATION LISTED, FUSED. FINISH SELECTED BY ARCHITECT	LITHONIA WST-LED SERIES COOPER McGRAW IST SERIES H.E. WILLIAMS WPTZ SERIES GARDCO 101L SERIES SPAULDING TRP SERIES	
AA	AREA LIGHT	25' TALL, 4" SQUARE POLE ,GRAPHITE FINISH	LED 15,000 LUMENS MATCH EXISTING SITE LIGHTING COLOR TEMPERATURE	120-277V ELECTRONIC DRIVER	DIE CAST ALUMINUM HOUSING AND DOOR FRAME WITH SILICONE GASKETED TEMPERED GLASS LENS, TYPE III (3) DISTRIBUTION WET LOCATION LISTED, FUSED. GRAPHITE FINISH. PROVIDE WITH 50% DIMMED OUTPUT AT MIDNIGHT (CONTROL OPTION AD-012 FOR KIM ALT1 SERIES)	KIM LIGHTING ALT1 SERIES OR APPROVED EQUAL	
BB	WALKWAY LIGHT	12' TALL, 4" SQUARE POLE, GRAPHITE FINISH	LED 5000 LUMENS MATCH EXISTING SITE LIGHTING COLOR TEMPERATURE	120-277V ELECTRONIC DRIVER	DIE CAST ALUMINUM HOUSING AND DOOR FRAME WITH SILICONE GASKETED TEMPERED GLASS LENS, TYPE II (2) DISTRIBUTION WET LOCATION LISTED, FUSED. GRAPHITE FINISH	KIM LIGHTING ALT1 SERIES OR APPROVED EQUAL	

LIGHT FIXTURE SCHEDULE GENERAL NOTES

A. EQUAL LUMINAIRES MUST BE PRE-APPROVED.
B. PROVIDE NECCESSARY MOUNTING HARDWARE AND ACCESSORIES FOR ALL LUMINAIRES.
C. REFER TO LIGHTING PLAN KEYNOTES 3 AND 12 FOR LIGHT FIXTURES WITH BATTERY BACKUP.

LIGHT FIXTURE SCHEDULE NOTES

1. PROVIDE A CONTRACTOR ALLOWANCE FOR THIS FIXTURE OF $12,500.00. THIS ALLOWANCE INCLUDES PURCHASE OF FIXTURE ONLY. INSTALLATION, HANDLING, AND FREIGHT IS NOT INCLUDED IN THIS ALLOWANCE.

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NO	DATE	REVISION
1	05/06/2021	ADDENDUM 02

I HEREBY CERTIFY that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Signature:
Typed or Printed Name: RYAN J. LINDAHL
Date: 04/20/21 Reg. No.: 46731

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PROJECT NAME:
HARTLEY NATURE CENTER BUILDING ADDITION

3001 WOODLAND AVENUE
DULUTH, MN 55803

DRAWING TITLE:
ELECTRICAL SCHEDULES

DRAWN BY: WW
CHECKED BY: RL
PROJ. NO: R19-3743.000
DRAWING NO: **E701**

BIM 360://19096 I Hartley Addition/19096 I Hartley Addition E20 Central.rvt
5/6/2021 10:05:22 AM