

November 24, 2021

Aedis Architects  
387 S. First St., Suite 300  
San Jose, CA 95113

**Subject:** Meadow Heights Elementary School HVAC Replacement  
San Mateo - Foster City School District  
Aedis Project No. 2021005.05  
DSA Application #01-119554

### **ADDENDUM NO. 1**

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CHANGES AND/OR CLARIFICATIONS OF THE DRAWINGS AND SPECIFICATIONS ARE AS FOLLOWS:

#### **SPECIFICATIONS**

ITEM NO. 1.1:      TABLE OF CONTENTS

Add:            07 31 13 ASPHALT SHINGLES  
Add:            08 91 19 FIXED LOUVER  
Add:            09 72 00 WALL COVERING  
Add:            31 10 00 SITE CLEARING  
Add:            31 23 00 EXCAVATION AND FILL  
Add:            31 23 16 TRENCHING  
Add:            33 11 16 SITE WATER UTILITIY DISTRIUTION PIPING  
Add:            33 13 00 DISINFECTION OF WATER DISTRIBUTION  
Add:            33 40 00 STORM DRAINAGE UTILITIES  
Add:            33 49 13 STORM DRAINAGE MANHOLES, FRAMES & COVERS  
Delete:        09 72 60 TACKABLE WALL COVERING

ITEM NO. 1.2:      SECTION 07 31 13 - ASPHALT SHINGLES

Add:            The specification in its entirety per 07 31 13 Asphalt Shingles.

ITEM NO. 1.3:      SECTION 08 91 19 - FIXED LOUVER

Add:            The specification in its entirety per 08 91 19 Fixed Louver.

ITEM NO. 1.4:      SECTION 09 72 00 - WALL COVERING

Add:            The specification in its entirety per 09 72 00 Wall Covering.

ITEM NO. 1.5:      SECTION 09 72 60 - TACKABLE WALL COVERING

**ADDENDUM NO. 1**

11/24/2021

Meadow Heights Elementary School HVAC Replacement  
San Mateo – Foster City School District  
Aedis Project No. 2021005.04

Delete: The specification in its entirety.

ITEM NO. 1.6: SECTION 23 05 00 - HEATING AND VENTILATING AIR CONDITIONING

Revise: Part 2.1 per 23 05 00 Heating and Ventilating Air Conditioning.

ITEM NO. 1.7: SECTION 23 09 23 - DIRECT DIGITAL CONTROL SYSTEM

Revise: Part 3.7 part B per 23 09 23 Direct Digital Control System.

ITEM NO. 1.8: SECTION 31 10 00 SITE CLEARING

Add: The specification in its entirety per 31 10 00 Site Clearing.

ITEM NO. 1.9: SECTION 31 23 00 EXCAVATION AND FILL

Add: The specification in its entirety per 31 23 00 Excavation and Fill.

ITEM NO. 1.10: SECTION 32 13 26 - TRENCHING

Add: The specification in its entirety per 32 13 26 Trenching.

ITEM NO. 1.11: SECTION 32 31 13 - CHAIN LINK FENCES AND GATES

Add: 2.4 SWING GATES D. Hardware  
Item 5.: Panic Hardware: CD 990AX-L-WH-6280 SNB with Gate closer/Hinge:  
Sure, Close Pivot: SM AT90W”  
Item 6.: Locinox 3DM 180 Degree 3-way adjustable ornamental hinge for 20’ gate.

ITEM NO. 1.12: SECTION 33 11 16 SITE WATER UTILITIY DISTRIUTION PIPING

Add: The specification in its entirety per 33 11 16 Site water Utility Distribution Piping

ITEM NO. 1.13: SECTION 33 13 00 DISINFECTION OF WATER DISTRIBUTION

Add: The specification in its entirety per 33 13 00 Disinfection of water Distribution

ITEM NO. 1.14: SECTION 33 40 00 STORM DRAINAGE UTILITIES

Add: The specification in its entirety per 33 40 00 Storm Drainage Utilities

ITEM NO. 1.15: SECTION 33 49 13 STORM DRAINAGE MANHOLE, FRAMES & COVERS

Add: The specification in its entirety per 33 49 13 Storm Drainage Manhole, Frames & Covers

**ADDENDUM NO. 1**

11/24/2021

Meadow Heights Elementary School HVAC Replacement  
San Mateo – Foster City School District  
Aedis Project No. 2021005.04

**DRAWINGS****CIVIL**

ITEM NO. 1.16:     DRAWING SHEET C1.1 – DEMOLITION SITE PLAN

Add:            New Sheet in its entirety per AD1-C1.1

ITEM NO. 1.17:     DRAWING SHEET C2.1 – GRADING AND DRAINAGE PLAN

Add:            New Sheet in its entirety per AD1-2.1

ITEM NO. 1.18:     DRAWING SHEET C3.1 – UNDERGROUND UTILITIES PLAN

Add:            New Sheet in its entirety per AD1-C3.1

ITEM NO. 1.19:     DRAWING SHEET C4.1 – DETAILS

Add:            New Sheet in its entirety per AD1-C4.1

ITEM NO. 1.20:     DRAWING SHEET C4.2 – DETAILS

Add:            New Sheet in its entirety per AD1-C4.2

**ARCHITECTURAL**

ITEM NO. 1.21:     DRAWING SHEET T1 – TITLE SHEET

Revise:          General Notes 7 to read as “ALL EXISTING FINISHES OR MATERIALS DAMAGED OR DEMOLISHED DUE TO NEW CONSTRUCTION SHALL BE RESTORED TO THEIR ORIGINAL STATE, INCLUDING BUT NOT LIMITED TO REINSTALLING OR REPLACING EXISTING CHAINLINK FENCING AS REQUIRED AND RESTRIPIING PAVING IN KIND. S.E.D. FOR TRENCH ROUTING. VERIFY IN FIELD AND SEE ARCHITECTURAL SITE PLAN FOR STRIPING AT EXISTING PAVING.”

ITEM NO. 1.22:     DRAWING SHEET A1.02 – SITE PLAN

Add:            Trenching area to New Site Plan 1/A1.02 and Graphic Key per AD1-A1.02

Revise:          Enlarged New Site Plan 2/A1.02 per AD1-A1.02

Revise:          Enlarged Demolition Site Plan 3/A1.02 per AD1-A1.02

Revise:          Electrical Enclosure Enlarged Layout 4/A1.02 per AD1-A1.02

Add:            General sheet Notes #G per AD1-A1.02

Add:            Keynotes #17, #18, #19, #20 & #21 per AD1-A1.02

**ADDENDUM NO. 1**

11/24/2021

Meadow Heights Elementary School HVAC Replacement  
San Mateo – Foster City School District  
Aedis Project No. 2021005.04

**ITEM NO. 1.23: DRAWING SHEET A2.01 – DEMOLITION FLOOR PLAN – BLDGS 1, 2, 3 & 4**

Revise: Demolition Keynote 1 per AD1-A2.01  
Add: General Sheet Note #J per AD1-A2.01  
Add: Demolition prep keynote #9 at Demolition Floor Plan 1/A2.01 per AD1-A2.01  
Add: Partial ceiling demolition keynote #10 at Demolition Floor Plans 2/A2.01, 3/A2.01, and 4/A2.01 per AD1-A2.01

**ITEM NO. 1.24: DRAWING SHEET A3.01 – NEW FLOOR PLANS – BLDGS 1, 2, 3 & 4**

Add: Door tags 3ab, 9ab & 15ab per AD1-A3.01  
Revise: New Floor Plan Keynote #9 per AD1-A3.01  
Add: New Floor Plan Keynote #11 per AD1-A3.01  
Add: Patch & paint gyp.bd ceiling per AD1-A3.01

**ITEM NO. 1.25: DRAWING SHEET A5.01 – SITE ROOF PLAN**

Add: Exhaust fans at building per AD1-A5.01  
Revise: Roof Plan Keynote 2 per AD1-A5.01  
Add: Roof Plan Keynote 3 per AD1-A5.01

**ITEM NO. 1.26: DRAWING SHEET A8.10 – EXTERIOR DETAILS**

Add: Detail 20 per attached AD1-A8.10  
Revise: Detail 9 per attached AD1-A8.10

**ITEM NO. 1.27: DRAWING SHEET A9.10 – INTERIOR DETAILS, WALL TYPES, & INTERIOR ELEVATIONS**

Revise: Details 1 & 3 per AD1-A9.10A  
Revise: Details 6 per AD1-A9.10B

**ITEM NO. 1.28: DRAWING SHEET A11.01 – FINISH & OPENING SCHEDULES, LEGEND & DETAILS**

Add: Doors 3ab, 9ab & 15ab to Door Schedule per AD1-A11.01  
Add: Door Schedule Comments per AD1-A11.01  
Add: Door Type B per AD1-A11.01

**STRUCTURAL****ITEM NO. 1.29: DRAWING SHEET S5.02 – TYPICAL CONCRETE DETAILS**

Delete: Detail 4 per AD1-S5.02  
Revise: Detail 5 per AD1-S5.02

**ADDENDUM NO. 1**

11/24/2021

Meadow Heights Elementary School HVAC Replacement  
San Mateo – Foster City School District  
Aedis Project No. 2021005.04

**MECHANICAL****ITEM NO. 1.30: DRAWING SHEET MP0.02 – SCHEDULES – MECHANICAL & PLUMBING**

Revise: Classroom Split System per AD1-MP0.02

Add: Roof Exhaust Fans Schedule per AD1-MP0.02.

**ITEM NO. 1.31: DRAWING SHEET MP2.03 – FLOOR PLAN – NEW – BLDGS 1, 2, 3, & 4 – MECHANICAL & PLUMBING**

Add: Dimensions per AD1-MP2.03.

Revise: General Notes #4 & #6 per AD1-MP2.03.

**ITEM NO. 1.32: DRAWING SHEET MP 2.04 – FLOOR PLAN – NEW – BLDGS 1, 2, 3, 4 – MECHANICAL & PLUMBING**

Add: New sheet in its entirety per AD1-MP2.04

**ITEM NO. 1.33: DRAWING SHEET MP6.01 – DETAILS – MECHANICAL & PLUMBING**

Revise: Detail 3 per AD1-MP6.01a

Revise: Detail 4 per AD1-MP6.01b

Revise: Detail 14 per AD1-MP6.01c

Add: Detail 16 per AD1-MP6.01d

**ELECTRICAL****ITEM NO. 1.34: DRAWING SHEET E3.1 – ELECTRICAL NEW FLOOR PLANS – BLDGS. 1, 2, 3 & 4**

Revise: Circuit homeruns for circulation pumps and outlets in Bldg. 2 per AD1-E3.1.

Add: General Note #6 per AD1-E3.1.

Add: Sheet Note #19 per AD1-E3.1

Add: Power for exhaust fan per AD1-E3.1

Add: Solar Conduit stub ups at each wing per AD1-E3.1

Add: Power plan per AD1-E3.1

**ITEM NO. 1.35: DRAWING SHEET E4.2 – NEW SINGLE LINE DIAGRAM**

Revise: Spare circuit breakers at main switchboard per AD1-E4.2

Revise: Switchboard to be OFCI per AD1-E4.2

**ITEM NO. 1.36: DRAWING SHEET E4.3 – PANEL SCHEDULES**

Add: Existing Panel B and Panel B-2 to the schedule per AD1-E4.3

Revise: Panel schedules per AD1-E4.3

**ADDENDUM NO. 1**

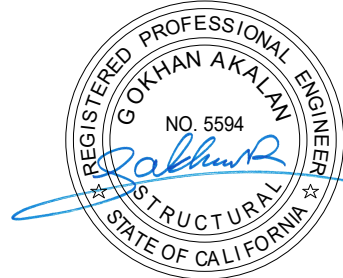
11/24/2021

Meadow Heights Elementary School HVAC Replacement  
San Mateo – Foster City School District  
Aedis Project No. 2021005.04



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Aedis Architects  
Thang Do, Principal



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Structural, BASE Design  
Gokhan Akalan



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Electrical, American Consulting Engineers Electrical  
Sammy Fernandez



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Mechanical, Cypress Engineering Group  
Metin Serttunc

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Division of the State Architect

**Attachments:**

Specifications:

07 31 13 Asphalt Shingles (12 pages)  
08 91 19 Fixed Louver (5 pages)  
09 72 00 Wall Coverings (6 pages)  
23 05 55 Heating Ventilating Air Conditioning (12 pages)  
23 09 23 Direct Digital Control (20 pages)  
31 10 00 Site Clearing (2 pages)  
31 23 00 Excavation and Fill (2 pages)  
31 23 16 Trenching (5 pages)  
33 11 16 Site Water Utility Distribution Piping (6 pages)  
33 13 00 Disinfection of Water Distribution (4 pages)  
33 40 00 Storm Drainage Utilities (6 pages)  
33 49 00 Storm Drainage Manholes, Frames & Covers (4 pages)

Drawings:

**CIVIL**

SHEET AD1-C1.1  
SHEET AD1-C2.1  
SHEET AD1-C3.1  
SHEET AD1-C4.1  
SHEET AD1-C4.2

**ARCHITECTURAL:**

SHEET AD1-A1.02  
SHEET AD1-A2.01  
SHEET AD1-3.01  
SHEET AD1-5.01  
SHEET AD1-8.10  
SHEET AD1-9.10A  
SHEET AD1-9.10B  
SHEET AD1-A11.01

**STRUCTURAL:**

SHEET AD1-S5.02

**MECHANICAL:**

SHEET AD1-MP0.02  
SHEET AD1-MP2.03  
SHEET AD1-MP2.04  
SHEET AD1-MP6.01a  
SHEET AD1-MP6.01b  
SHEET AD1-MP6.01c  
SHEET AD1-MP6.01d

**ELECTRICAL:**

SHEET AD1-E3.1  
SHEET AD1-E4.2  
SHEET AD1-E4.3

## SECTION 073113 - ASPHALT SHINGLES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Glass-fiber-reinforced asphalt shingles.
  - 2. Underlayment materials.

#### 1.2 DEFINITIONS

- A. Roofing Terminology: See ASTM D1079 for definitions of terms related to roofing Work in this Section.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
  - 1. Asphalt shingles.
  - 2. Underlayment materials.
  - 3. Asphalt roofing cement.
  - 4. Elastomeric flashing sealant.
- B. Shop Drawings: For metal flashing and trim.
- C. Samples for Initial Selection:
  - 1. For each type of asphalt shingle indicated.
  - 2. For each type of accessory involving color selection.
- D. Samples for Verification: For the following products, in sizes indicated:
  - 1. Asphalt Shingles: Full size.
  - 2. Ridge and Hip Cap Shingles: Full size.
  - 3. Ridge Vent: 12-inch- (305-mm-) long Sample.
  - 4. Exposed Valley Lining: 12 inches (305 mm) square.

MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT  
San Mateo-Foster City School District  
Project No 2021005.04

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each type of asphalt shingle and underlayment product indicated, for tests performed by manufacturer and witnessed by a qualified testing agency.
- C. Research Reports: For synthetic underlayment, from ICC-ES, indicating that product is suitable for intended use under applicable building codes.
- D. Sample Warranty: For manufacturer's materials warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For asphalt shingles to include in maintenance manuals.
- B. Materials warranties.
- C. Roofing Installer's warranty.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized installer who is trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing materials in a dry, well-ventilated location protected from weather, sunlight, and moisture in accordance with manufacturer's written instructions.
- B. Store underlayment rolls on end, on pallets or other raised surfaces. Do not double-stack rolls.
- C. Protect unused roofing materials from weather, sunlight, and moisture when left overnight or when roofing Work is not in progress.
- D. Handle, store, and place roofing materials in a manner to prevent damage to roof deck or structural supporting members.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Proceed with installation only when existing and forecasted weather conditions permit product installation and related Work to be performed in accordance with manufacturer's written instructions and warranty requirements.

1. Install self-adhering, polymer-modified bitumen sheet underlayment within the range of ambient and substrate temperatures recommended in writing by manufacturer.

#### 1.10 WARRANTY

- A. Materials Warranty: Manufacturer agrees to repair or replace asphalt shingles that fail within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Manufacturing defects.
  2. Materials Warranty Period: 40 years from date of Substantial Completion, prorated, with first 20 years nonprorated.
  3. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds of up to 110 mph (49 m/s) 130 mph (58 m/s) for 15 years from date of Substantial Completion.
  4. Algae-Resistance Warranty Period: Asphalt shingles will not discolor for 10 years from date of Substantial Completion.
  5. Workmanship Warranty Period: 20 years from date of Substantial Completion.
- B. Roofing Installer's Warranty: On warranty form at end of this Section, signed by Installer, in which Installer agrees to repair or replace components of asphalt shingle roofing that fail in materials or workmanship within specified warranty period.
  1. Warranty Period: Five years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 SOURCE LIMITATIONS

- A. Obtain each type of product from single source from single manufacturer.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. Exterior Fire-Test Exposure: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance in accordance with ASTM E108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.
- B. Wind Resistance: Provide asphalt shingles that comply with requirements of ASTM D3161/D3161M, Class F, and with ASTM D7158/D7158M, Class H.
- C. Energy Performance, ENERGY STAR: Provide asphalt shingles that are listed on the DOE's "ENERGY STAR Roof Product List" for steep-slope roof products.

MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT  
San Mateo-Foster City School District  
Project No 2021005.04

2.3 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

- A. Laminated-Strip Asphalt Shingles: ASTM D3462/D3462M, laminated, multi-ply overlay construction; glass-fiber reinforced, mineral-granule surfaced, and self-sealing.
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. CertainTeed; Landmark.
  - 2. Butt Edge: Straight cut.
  - 3. Strip Size: Manufacturer's standard.
  - 4. Algae Resistance: Granules resist algae discoloration.
  - 5. Color and Blends: As selected by Architect from manufacturer's full range.
- B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

2.4 UNDERLAYMENT MATERIALS

- A. Organic Felt: Asphalt-saturated organic felts, nonperforated and complying with the following:
  - 1. ASTM D4869/D4869M: Type II.
- B. Synthetic Underlayment: UV-resistant polypropylene, polyolefin, or polyethylene polymer fabric with surface coatings or treatments to improve traction underfoot and abrasion resistance; evaluated and documented to be suitable for use as a roof underlayment under applicable codes by a testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. CertainTeed; Diamond Deck
- C. Self-Adhering, Polymer-Modified Bitumen Sheet: ASTM D1970/D1970M, minimum **40-mil- (1.0-mm-)** thick sheet; glass-fiber-mat-reinforced, polymer-modified asphalt; with slip-resistant top surface and release backing; cold applied.
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. CertainTeed; WinterGuard
  - 2. Top Surface: Textured polymer film.
- D. Granular-Surfaced Valley Lining: ASTM D3909/D3909M, mineral-granular-surfaced, glass-felt-based, asphalt roll roofing; **36 inches (914 mm)** wide.

2.5 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D4586/D4586M Type II, asbestos free.

- B. Elastomeric Flashing Sealant: ASTM C920, Type S, Grade NS, one-part, non-sag, elastomeric polymer sealant; of class and use classifications required to seal joints and remain watertight; recommended in writing by manufacturer for installation of flashing systems.
- C. Roofing Nails: ASTM F1667, aluminum, stainless steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum **0.120-inch- (3-mm-)** diameter, sharp-pointed, with a **3/8- to 7/16-inch- (10- to 11-mm-)** diameter flat head and of sufficient length to penetrate **3/4 inch (19 mm)** into solid wood decking or extend at least **1/8 inch (3 mm)** through sheathing less than **3/4 inch (19 mm)** thick.
  - 1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
- D. Underlayment Nails: Aluminum, stainless steel, or hot-dip galvanized-steel wire nails with low-profile metal or plastic caps, **1-inch- (25-mm-)** minimum diameter.
  - 1. Provide with minimum **0.0134-inch- (0.34-mm-)** thick metal cap, **0.010-inch- (0.25-mm-)** thick power-driven metal cap, or **0.035-inch- (0.89-mm-)** thick plastic cap; and with minimum **0.083-inch- (2.11-mm-)** thick ring shank or **0.091-inch- (2.31-mm-)** thick smooth shank of length to penetrate at least **3/4 inch (19 mm)** into roof sheathing or to penetrate through roof sheathing less than **3/4 inch (19 mm)** thick.

## 2.6 METAL FLASHING AND TRIM

- A. Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
  - 1. Sheet Metal: Stainless steel.
- B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item unless otherwise specified in this Section or indicated on Drawings.
  - 1. Apron Flashings: Fabricate with lower flange a minimum of **4 inches (102 mm)** over and **4 inches (102 mm)** beyond each side of downslope asphalt shingles and **6 inches (152 mm)** up the vertical surface.
  - 2. Step Flashings: Fabricate with a headlap of **2 inches (51 mm)** and a minimum extension of **4 inches (102 mm)** over the underlying asphalt shingle and up the vertical surface.
  - 3. Counterflashings: Fabricate to cover **4 inches (102 mm)** of base flashing measured vertically; and in lengths required so that no step exceeds **8 inches (203 mm)** and overall length is no more than **10 feet (3 m)**.
    - a. Provide metal reglets for installation.
  - 4. Open-Valley Flashings: Fabricate from metal sheet not less than **24 inches (610 mm)** wide in lengths not exceeding **10 feet (3 m)**, with **1-inch- (25-mm-)** high, inverted-V

profile water diverter at center of valley and equal flange widths of not less than 11 inches (279 mm).

- a. Hem flange edges for fastening with metal cleats.
  - b. Add stiffening ribs in flashings to promote drainage.
5. Drip Edges: Fabricate in lengths not exceeding 10 feet (3 m) with minimum 2-inch (51-mm) roof-deck flange and 1-1/2-inch (38-mm) fascia flange with 3/8-inch (10-mm) drip at lower edge.
  6. Vent-Pipe Flashings: ASTM B749, Type L51121, at least 1/16 inch (1.6 mm) thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof, and extending at least 4 inches (102 mm) from pipe onto roof.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
  2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored and that provisions have been made for flashings and penetrations through asphalt shingles.
  3. Verify that vent stacks and other penetrations through roofing are installed and securely fastened.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION OF UNDERLAYMENT MATERIALS

- A. Comply with asphalt shingle and underlayment manufacturers' written installation instructions and with recommendations in NRCA's "The NRCA Roofing Manual: Steep-Slope Roof Systems" applicable to products and applications indicated unless more stringent requirements are specified in this Section or indicated on Drawings.
- B. Asphalt-Saturated Felt: Install on roof deck parallel with and starting at eaves and fasten with underlayment nails.
  1. Single-Layer Installation:

- a. Lap sides a minimum of [2 inches (51 mm)] [4 inches (102 mm)] over underlying course.
    - b. Lap ends a minimum of 4 inches (102 mm).
    - c. Stagger end laps between succeeding courses at least 72 inches (1829 mm).
  2. Double-Layer Installation:
    - a. Install a 19-inch- (483-mm-) wide starter course at eaves and completely cover with a 36-inch- (914-mm-) wide second course.
    - b. Install succeeding 36-inch- (914-mm-) wide courses lapping previous courses 19 inches (483 mm) in shingle fashion.
    - c. Lap ends a minimum of 4 inches (102 mm). Stagger end laps between succeeding courses at least 72 inches (1829 mm).
    - d. Apply a continuous layer of asphalt roofing cement over starter course and on felt surface to be concealed by succeeding courses as each felt course is installed. Apply at locations indicated on Drawings.
  3. Install felt underlayment on roof deck not covered by self-adhering, polymer-modified bitumen sheet unless otherwise specified in this Section or indicated on Drawings.
    - a. Lap sides of felt over self-adhering sheet not less than 4 inches (102 mm) in direction that sheds water.
    - b. Lap ends of felt not less than 6 inches (152 mm) over self-adhering sheet.
  4. Install fasteners in a grid pattern of 12 inches (305 mm) between side laps with 6-inch (152-mm) spacing at side and end laps.
  5. Terminate felt extended up not less than 4 inches (102 mm) against sidewalls, curbs, chimneys, and other roof projections.
- C. Synthetic Underlayment:
1. Install on roof deck parallel with and starting at the eaves.
    - a. Lap sides and ends as recommended in writing by manufacturer, but not less than 4 inches (102 mm) for side laps and 6 inches (152 mm) for end laps.
    - b. Stagger end laps between succeeding courses at interval recommended in writing by manufacturer, but not less than 72 inches (1829 mm).
    - c. Fasten with underlayment nails in accordance with manufacturer's written instructions.
    - d. Cover underlayment within period recommended in writing by manufacturer.
  2. Install in single layer on roofs sloped at 4:12 and greater.
  3. Install in double layer on roofs sloped at less than 4:12.
  4. Install synthetic underlayment on roof deck not covered by self-adhering, polymer-modified bitumen sheet unless otherwise specified in this Section or indicated on Drawings.
    - a. Lap sides of underlayment over self-adhering sheet not less than 4 inches (102 mm) in direction to shed water.

MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT  
San Mateo-Foster City School District  
Project No 2021005.04

- b. Lap ends of underlayment not less than 6 inches (152 mm) over self-adhering sheet.
  5. Install fasteners in a grid pattern of 12 inches (305 mm) between side laps with 6-inch (152-mm) spacing at side and end laps.
  6. Terminate synthetic underlayment extended up not less than 4 inches (102 mm) against sidewalls, curbs, chimneys, and other roof projections.
- D. Granular-Surfaced, Concealed Valley Lining: For woven valleys. Comply with recommendations in NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."
  1. Lap roof-deck underlayment over valley lining at least 6 inches (152 mm).
  2. Install a 36-inch- (914-mm-) wide strip of granular-surfaced valley lining, with granular-surface face up, centered in valley and fastened to roof deck.
  3. Lap ends of strips at least 12 inches (305 mm) in direction to shed water, and seal with asphalt roofing cement.
  4. Fasten to roof deck.
- E. Metal-Flashed, Open-Valley Underlayment: Install two layers of minimum 36-inch- (914-mm-) wide underlayment centered in valley.
  1. Use same underlayment as installed on field of roof.
  2. Stagger end laps between layers at least 72 inches (1829 mm).
  3. Lap ends of each layer at least 12 inches (305 mm) in direction that sheds water, and seal with asphalt roofing cement.
  4. Fasten each layer to roof deck with underlayment nails located as far from valley center as possible and only to extent necessary to hold underlayment in place until installation of valley flashing.
  5. Lap roof-deck underlayment over first layer of valley underlayment at least 6 inches (152 mm).
- F. Granular-Surfaced, Open-Valley Lining: Before installing valley lining, install 36-inch- (914-mm-) wide felt underlayment centered in valley. Fasten to roof deck with underlayment nails.
  1. Lap roof-deck felt underlayment over valley felt underlayment at least 6 inches (152 mm).
  2. Install an 18-inch- (457-mm-) wide strip of valley lining centered in valley, with granular-surface face down.
  3. Install a second 36-inch- (914-mm-) wide strip of valley lining centered in valley, with granular-surface face up.
  4. Lap ends of each strip at least 12 inches (305 mm) in direction to shed water, and seal with asphalt roofing cement.
  5. Stagger end laps between succeeding strips at least 72 inches (1829 mm).
  6. Fasten each strip to roof deck.

3.3 INSTALLATION OF METAL FLASHING AND TRIM

- A. Install metal flashings and trim to comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
  - 1. Install metal flashings in accordance with recommendations in NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."
  - 2. Bed flanges of metal flashings using asphalt roofing cement or elastomeric flashing sealant.
- B. Apron Flashings: Extend lower flange over and beyond each side of downslope asphalt shingles and up the vertical surface.
- C. Step Flashings: Install with a headlap of 2 inches (51 mm) and extend over underlying shingle and up the vertical face.
  - 1. Install with lower edge of flashing just upslope of, and concealed by, butt of overlying shingle.
  - 2. Fasten to roof deck only.
- D. Cricket and Backer Flashings: Install against roof-penetrating elements extending concealed flange beneath upslope asphalt shingles and beyond each side.
- E. Counterflashings: Coordinate with installation of base flashing and fit tightly to base flashing. Lap joints a minimum of 4 inches (102 mm) secured in a waterproof manner.
  - 1. Install in reglets or receivers.
- F. Open-Valley Flashings: Install centered in valleys, lapping ends at least 8 inches (203 mm) in direction that sheds water. Fasten upper end of each length to roof deck beneath overlap.
  - 1. Secure hemmed flange edges into metal cleats spaced 24 inches (610 mm) apart and fastened to roof deck.
  - 2. Adhere minimum 9-inch- (229-mm-) wide strips of self-adhering, polymer-modified bitumen sheet to metal flanges and to underlying self-adhering sheet, polymer-modified bitumen sheet.
    - a. Place strips parallel to and over flanges so that they will be just concealed by installed shingles.
  - 3. Provide a closure at the end of the inverted-V profile of the valley metal to minimize water and ice infiltration.
- G. Rake Drip Edges: Install over underlayment materials and fasten to roof deck.
- H. Eave Drip Edges: Install below underlayment materials and fasten to roof deck.
- I. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

### 3.4 INSTALLATION OF ASPHALT SHINGLES

- A. Install asphalt shingles in accordance with manufacturer's written instructions and recommendations in NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."
- B. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip at least **7 inches (178 mm)** wide with self-sealing strip face up at roof edge.
  - 1. Extend asphalt shingles **1/2 inch (13 mm)** over fasciae at eaves and rakes.
  - 2. Install starter strip along rake edge.
- C. Install first and remaining courses of laminated asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- D. Install first and remaining courses of three-tab-strip asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- E. Fasten asphalt shingle strips with a minimum of four roofing nails, but not less than the number indicated in manufacturer's written instructions for roof slope and design wind speed indicated on Drawings and for warranty requirements specified in this Section.
  - 1. Locate fasteners in accordance with manufacturer's written instructions.
  - 2. Where roof slope exceeds 18:12, hand seal self-sealing asphalt shingles to improve the shingles' positive bond by applying asphalt roofing cement spots between course overlaps after nailing the upper course.
  - 3. Where roof slope is less than 4:12, hand seal self-sealing asphalt shingles to improve the shingles' positive bond by applying asphalt roofing cement spots between course overlaps after nailing the upper course.
  - 4. When ambient temperature during installation is below **50 deg F (10 deg C)**, hand seal self-sealing asphalt shingles by applying asphalt roofing cement spots between course overlaps after nailing the upper course.
- F. Open Valleys: Cut and fit asphalt shingles at open valleys, trimming upper concealed corners of shingle strips.
  - 1. Maintain uniform width of exposed open valley from highest to lowest point.
  - 2. Extend shingle a minimum of **4 inches (102 mm)** over valley metal.
  - 3. Set valley edge of asphalt shingles in a **3-inch- (76-mm-)** wide bed of asphalt roofing cement.
  - 4. Do not nail asphalt shingles to metal open-valley flashings.
- G. Ridge Vents: Install continuous ridge vents over asphalt shingles in accordance with manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.
- H. Hip and Ridge Shingles: Maintain same exposure of cap shingles as roofing-shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds.

MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT  
San Mateo-Foster City School District  
Project No. 2021005.04

1. Fasten with roofing nails of sufficient length to penetrate sheathing.
2. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

3.5 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS **<Insert name>** of **<Insert address>**, herein called the "Roofing Installer," has performed roofing and associated work ("the work") on the following project:
1. Owner: **<Insert name of Owner>**.
  2. Owner Address: **<Insert address>**.
  3. Building Name/Type: **<Insert information>**.
  4. Building Address: **<Insert address>**.
  5. Area of the Work: **<Insert information>**.
  6. Acceptance Date: **<Insert date>**.
  7. Warranty Period: **<Insert time>**.
  8. Expiration Date: **<Insert date>**.
- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant the work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that, during Warranty Period, Roofing Installer will, at Roofing Installer's own cost and expense, make or cause to be made such repairs to or replacements of the work as are necessary to correct faulty and defective work and as are necessary to maintain the work in a watertight condition.
- D. This Warranty is made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to the work and other parts of the building, and to building contents, caused by:
    - a. Lightning;
    - b. Peak gust wind speed exceeding **<Insert wind speed> mph (m/s)**;
    - c. Fire;
    - d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
    - e. Faulty construction of copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
    - f. Vapor condensation on bottom of roofing; and
    - g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
  2. When the work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.

MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT  
San Mateo-Foster City School District  
Project No 2021005.04

3. Roofing Installer is responsible for damage to the work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of the work.
4. During Warranty Period, if Owner allows alteration of the work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of the alterations, but only to the extent the alterations affect the work covered by this Warranty. If Owner engages Roofing Installer to perform the alterations, Warranty shall not become null and void unless Roofing Installer, before starting the alterations, notified Owner in writing, showing reasonable cause for claim, that the alterations would likely damage or deteriorate the work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a use or service more severe than originally specified, this Warranty shall become null and void on date of the change, but only to the extent the change affects the work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect the work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on the work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of the work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this **<Insert day>** day of **<Insert month>**, **<Insert year>**.

1. Authorized Signature: **<Insert signature>**.
2. Name: **<Insert name>**.
3. Title: **<Insert title>**.

END OF SECTION 073113

## SECTION 089119 - FIXED LOUVERS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Fixed louvers.

#### 1.3 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Horizontal Louver: Louver with horizontal blades (i.e., the axis of the blades are horizontal).
- C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
  - 1. Show weep paths, gaskets, flashings, sealants, and other means of preventing water intrusion.
  - 2. Show mullion profiles and locations.
- C. Samples: For each type of metal finish required.

MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT  
San Mateo-Foster City School District  
Project No. 2021005.04

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranties: For manufacturer's special warranties.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 WARRANTY

- A. Manufacturer's Warranty: 1 year Standard Product Warranty.
- B. Special Finish Warranty: Manufacturer agrees to repair or replace components on which finishes fail in materials or workmanship within specified warranty period.
  - 1. Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain fixed and operable louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

- A. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.
  - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- B. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2 - 089119 FIXED LOUVERS

## 2.3 FIXED EXTRUDED-ALUMINUM LOUVERS

### A. Horizontal Thin-Line Nondrainable-Blade Louver:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Greenheck Fan Corporation; ESJ-155
  - b. Or approved equal
2. Louver Depth: 1 ½ inches.
3. Blade Profile and Thickness: J style, heavy gauge aluminum, 0.056 in. nominal wall thickness, positioned at 30.5 degree angles on approximately 1 7/8 inch centers.
4. Frame Nominal Thickness: 0.063 in for frames
5. Finish: AAMA 2605
  - a. Color selected by Architect from manufacturer's full range of colors.
6. Louver Performance Ratings:
  - a. Free Area: 6.99 ft<sup>2</sup>
  - b. Free Area Percentage: 45.6%
7. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

### B. Horizontal Nondrainable-Blade Louver:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Greenheck Fan Corporation. ESJ-401
  - b. Or approved equal
2. Louver Depth: 4 inches (100 mm).
3. Blade Profile and Thickness: J style, heavy gauge aluminum, 0.081 in. nominal wall thickness, positioned at 37 degree and 45 degree angles on approximately 4 inch centers.
4. Frame Nominal Thickness: 0.081 in for frames.
5. Finish: AAMA 2605
  - a. Color selected by Architect from manufacturer's full range of colors.
6. Louver Performance Ratings:
  - a. Free Area: 8.44 ft<sup>2</sup>
  - b. Free Area Percentage: 53%
7. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

## 2.4 MATERIALS

- A. Aluminum Extrusions: **ASTM B221** (**ASTM B221M**), Alloy 6063-T5, T-52, or T6.

MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT  
San Mateo-Foster City School District  
Project No. 2021005.04

- B. Aluminum Sheet: **ASTM B209 (ASTM B209M)**, Alloy 3003 or 5005, with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Fasteners: Use types and sizes to suit unit installation conditions.
  - 1. Use tamper-resistant screws for exposed fasteners unless otherwise indicated.
  - 2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
  - 3. For color-finished louvers, use fasteners with heads that match color of louvers.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

## 2.5 FABRICATION

- A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
- C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
  - 1. Frame Type: Channel unless otherwise indicated.
- D. Include supports, anchorages, and accessories required for complete assembly.

## 2.6 ALUMINUM FINISHES

- A. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT  
San Mateo-Foster City School District  
Project No. 2021005.04

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

- A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

- A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Restore louvers damaged during installation and construction, so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
  - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089119

## SECTION 097200 - WALL COVERINGS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Vinyl wall covering.

#### 1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data on physical characteristics, durability, fade resistance, and fire-test-response characteristics.

- B. Shop Drawings: Show location and extent of each wall-covering type. Indicate pattern placement seams and termination points.

- C. Samples: For each type of wall covering and for each color, pattern, texture, and finish specified, full width by 36 inches (914 mm) long in size.

1. Wall-Covering Sample: From same production run to be used for the Work

- a. Show complete pattern repeat.
- b. Mark top and face of fabric.

- D. Product Schedule: For wall coverings. Use same designations indicated on Drawings.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each wall covering, for tests performed by a qualified testing agency.

- B. Certificate of Compliance: Submit manufacturer's certification that wall covering furnished meets or exceeds the architect's specification requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wall coverings to include in maintenance manuals.

1.6 WARRANTY

- A. Furnish a written warranty against defects in material or workmanship for five (5) years from the date of shipment.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for occupants after Project completion during the remainder of the construction period.
- B. Lighting: Do not install wall covering until lighting that matches conditions intended for occupants after Project completion is provided on the surfaces to receive wall covering.
- C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.
- D. Areas where wallcovering will be installed shall have a constant minimum temperature of not less than 60 degrees for at least seven days prior to and throughout installation period and for seven days thereafter.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver vinyl wallcovering and adhesive to the job site in unbroken or undamaged containers and clearly marked with the supplier's identification label.
- B. Store vinyl wallcoverings in a flat position to avoid damage to roll ends.
- C. Store materials in a clean, dry storage area with temperature maintained above 55 degrees with normal humidity.
- D. Do not cross stack material.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates in accordance with test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    - a. Flame-Spread Index: 25 or less.
    - b. Smoke-Developed Index: 50 or less.
  - 2. UL Label: All products shall be UL labeled assuring complete compliance with all specifications and requirements through continuous inspection by UL inspectors.
- B. Fire Detection Characteristics: The vinyl wallcovering shall contain the Early Warning Effect formulation which provides early warning to potential fire conditions. The vinyl wallcovering shall contain thermoparticulating ingredients which, when heated to approximately 300 °F, emit a colorless, odorless vapor that activates ionization smoke detectors when installed according to manufacturer's specifications.
  - 1. Evidence of the Early Warning Effect shall be based on the ASTM E603 standard guide for room fire experiments.

### 2.2 VINYL WALL COVERING

- A. Subject to compliance with requirements, provide the following:
  - 1. Koroseal
  - 2. Or approved equal
- B. Description: Provide vinyl products in rolls from same production run and complying with the following:
  - 1. FS CCC-W-408A and Wallcovering Association's W-101D for Type III, Heavy Duty.
- C. Width: 54 inches (1372 mm).
- D. Repeat: Random.
- E. Mildew Resistance: Rating of zero or 1 when tested in accordance with ASTM G21.
- F. Features:

MEADOW HEIGHT ELEMENTARY SCHOOL HVAC REPLACEMENT  
San Mateo-Foster City School District  
Project No. 2021005.04

1. Stain-Resistant Coating: Manufacturer's standard coating
2. Antimicrobial.
3. Water-based inks.
4. Heavy-metals free.
5. Halogenated-fire-retardant free.

G. Colors, Textures, and Patterns: As selected by Architect from manufacturer's full range.

## 2.3 ACCESSORIES

- A. Adhesive: Mildew-resistant, nonstaining adhesive, for use with specific wall covering and substrate application indicated and as recommended in writing by wall-covering manufacturer.
- B. Primer/Sealer: Mildew resistant, complying with requirements in Section 099123 "Interior Painting" and recommended in writing by primer/sealer and wall-covering manufacturers for intended substrate.
- C. Seam Tape: As recommended in writing by wall-covering manufacturer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation surfaces being true in plane and vertical and horizontal alignment, maximum moisture content, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, and mildew.
- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
  1. Wall surfaces shall be free from defects and imperfections that could show through the finished covered surface.
  2. Sand-finished plaster shall be smoothed, cinder or cement blocks shall be plastered, or otherwise rendered smooth, and old wallcoverings shall be removed.

MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT  
San Mateo-Foster City School District  
Project No. 2021005.04

3. For new drywall construction, manufacturer's recommended primer should be used before application of wallcovering for ease of future removal when redecorating.
  4. Glossy surfaces shall either be sanded to dull surface, or a coat of manufacturer's recommended primer applied prior to installation of wallcovering.
  5. If there is any evidence of mildew, it must be removed, and the wall surface treated to inhibit further mildew growth.
  6. All painted surfaces should be evaluated for the possibility of pigment bleed-through. If there is any possibility, a coat of sealer, recommended by the manufacturer, should be applied before application of the wallcovering.
  7. Do not install vinyl wallcovering over oil-based wood stains as a bleed-through may occur.
  8. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
- D. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- E. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

### 3.3 INSTALLATION OF WALL COVERING

- A. Wallcovering shall be installed by experienced workers and contractors in strict accordance with the manufacturer's printed instructions using vinyl wallcovering adhesive recommended by the manufacturer (WHEAT PASTE SHALL NOT BE USED). It is absolutely imperative that installer read the manufacturer's instruction sheet in each roll before installing the vinyl wallcovering. Permanent building light shall be available for installation.
- B. Installer, before cutting, shall examine pattern and color and determine that they are the correct pattern and color as specified.
- C. Installer shall install each roll in sequence starting with largest roll number and each strip in same sequence as cut from roll. If pattern is not random, examine for repeat design. Some patterns should be lined up, matched or reversed for best results. If necessary, trim selvage deep enough to assure color uniformity.
- D. After application of three strips, an inspection should be made and if there are any variations in color or pattern which are felt to be excessive, the wallcovering distributor or manufacturer's representative should be notified for his inspection before any further wallcovering is installed.
- E. Always bring material six (6) inches around inside and outside corners being sure to fit into corners to avoid bridging or spanning.
- F. The wallcovering should be smoothed to the hanging surface with a stiff bristled sweep brush or a flexible broad-knife to eliminate air bubbles. Avoid burnishing the face of the material.

MEADOW HEIGHT ELEMENTARY SCHOOL HVAC REPLACEMENT  
San Mateo-Foster City School District  
Project No. 2021005.04

- G. Remove excess adhesive along finished seam immediately after each wallcovering strip is applied. Use of clean, warm water, a natural sponge, and clean towels are recommended for this use. It is very important to change water often to maintain cleanliness.

3.4 CLEANING

- A. Remove excess adhesive at seams, perimeter edges, and adjacent surfaces.
- B. Use cleaning methods recommended in writing by wall-covering manufacturer.
- C. Replace strips that cannot be cleaned.
- D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 097200

**SECTION 23 05 00 – HEATING, VENTILATING, AIR CONDITIONING**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01, and Division 23 Sections apply to this Section.

**1.2 SCOPE OF WORK**

- A. Provide labor, materials, equipment, and services to furnish and install complete mechanical systems which shall include, but not limited to equipment, ductwork, piping, accessories, insulation, and supports.

**1.3 SUBMITTALS**

- A. Submit for review, within fifteen (15) days after signing Contract, the required number of copies of a complete list of materials proposed for use. This list includes:
  - 1. Split System Heat Pumps.
  - 2. Ductwork.
  - 3. Duct Insulation and Lining.
  - 4. Dampers and Duct Accessories.
  - 5. Filters.
  - 6. Diffusers, Registers, and Grilles.
  - 7. Refrigerant Piping.
  - 8. Mechanical Supports.
  - 9. Shop Drawings:
  - 10. Power, signal, and control wiring diagrams including detailed wiring diagrams that clearly differentiate between manufacturer-installed and field-installed wiring.
  - 11. Qualification Data:
    - a. Certificate from VRF system manufacturer certifying that installer has successfully completed prerequisite training administered by manufacturer for proper installation of systems, including but not limited to, equipment, piping, controls, and accessories indicated and furnished for installation.
- B. No substitute materials or equipment shall be installed without the written approval of the Architect.
- C. No increase in the contract price will be considered to accommodate the use of alternative equipment, including revisions required by other trades.

## MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT

San Mateo-Foster City School District

Project No. 2021005.04

- D. Submit test reports on all systems tested. Tests required by Authorities Having Jurisdiction over the work shall be submitted on appropriate forms to the satisfaction of such authorities.

### 1.4 QUALITY ASSURANCE

#### A. Manufacturer Qualifications:

1. Nationally recognized manufacturer of VRF HVAC systems and products.
2. Shipped VRF HVAC systems with similar requirements to those indicated for a continuous period of five (5) years.

#### B. Installer Qualifications:

1. Each employee shall be certified by manufacturer for proper installation of systems, including, but not limited to, equipment, piping, controls, and accessories indicated and furnished for installation.
2. Installer certification shall be valid and current for duration of Project.
3. Installer shall have demonstrated past experience with products being installed for period within five (5) consecutive years before time of bid.

### 1.5 WARRANTY

- A. The units shall be covered by the manufacturer's standard limited warranty for a period of 12 months from date of installation. If during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer.
- B. The units shall carry an extended manufacturer's parts and compressor warranty for a period of 10 years from date of installation. The following steps shall be taken by the contractor to ensure systems are eligible for extended warranty.
  1. System is designed and submitted using the approved application tool.
  2. System installed by a contractor who has successfully completed the OEM factory training class.
  3. Upon completion of installation and prior to final commissioning, contractor shall provide revised piping layout reflecting actual installation conditions to VRF manufacturer.
  4. Provide a verified and submitted commissioning report to Owner, VRF manufacturer and contractor.
- C. The contractor shall provide labor warranty as specified in the general conditions for this project.

## **PART 2 – PRODUCTS**

### **2.1 HVAC EQUIPMENT**

- A. Furnish and install all equipment in accordance with Drawings, manufacturer's recommendations, and all applicable codes. Split system heat pumps regardless of location shall be provided by a sole source. Acceptable manufacturers:
  - 1. Heat Pump, Indoor Unit:
    - a. Samsung (Basis of Design), see drawings for model number.
    - b. Daikin – model number at classroom, FXTQ54TAVJUA
    - c. Mitsubishi – model number at classroom, TPVFYP054
  - 2. Heat Pump, Outdoor Unit:
    - a. Samsung (Basis of Design), see drawings for model number.
    - b. Daikin – model number at classroom, RXTQ60TAVJUA.
    - c. Mitsubishi – model number at classroom, TUMYP060.

### **2.2 FILTERS**

- A. Filters shall be 2”-thick of size and number required for equipment and selected for 300 FPM velocity.
- B. Filters shall be throwaway type, Class 2 UL listed.
- C. Filters shall be minimum MERV 13 based on ASHRAE Standard 52.2 test method.

### **2.3 DUCTWORK**

- A. Comply with latest edition of SMACNA HVAC Duct Construction Standards, Metal and Flexible for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Comply with NFPA 90A when ducts traverse through smoke zones.
- B. Comply with UL 181 and California Energy Code Section 120.4 requirements for air distribution ducts and plenums.
- C. Ducts shall be minimum 24 gauge thickness. Ducts shall be constructed for 2500 FPM maximum velocity and static pressure classes as follows:
  - 3. Supply Ducts: +3 inch w.g.
  - 4. Return Ducts: - 2 inch w.g.
  - 5. Exhaust Ducts: -2 inch w.g.
- D. Longitudinal seams: Groove and Pittsburgh lock seams and slip joints shall be used.
- E. Duct Connections: Ductmate industries “Ductmate 35” and “Ductmate 45”. Ductmate “Spiralmate” for round duct. Ductmate “Ovalmate” for oval duct.

## MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT

San Mateo-Foster City School District

Project No. 2021005.04

- F. Duct sealing shall be DP 1010 water based duct sealant and SMACNA approved foil-backed pressure sensitive tape or Hardcast, Two Part II Duct Sealing System: DT-5400 tape with RTA-50 sealant.
- G. Flexible ducts shall be UL 181 and Class I air duct in compliance with SMACNA HVAC Duct Construction Standards, Metal and Flexible, and NFPA 90A and 90B.
- H. Flexible ducts shall be two-ply vinyl film supported by helically wound spring-steel wire, R4.2 fiberglass insulation, exterior reinforced laminated vapor barrier film. Duct shall be rated for +2 inch w.g., -1 inch w.g., 4000 FPM maximum velocity, and -10°F to +160°F. Flame Spread less than 25, Smoke Developed less than 50.

### 2.4 DUCT INSULATION AND LINING

- A. All duct insulation and lining shall comply with California Energy Code Section 120.4 requirements for air distribution ducts and plenums.
- B. Insulation shall conform to NFPA 90A and 90B, and UL 181, Class I. Insulation shall have Flame Spread not over 25 and Smoke Developed of not over 50.
- C. Wherever external duct insulation is specified and internal acoustic treatment of equivalent insulating effect is also required by the Drawings or Specification for the same location, the external insulation may be omitted.
- D. Acceptable Manufacturers: Johns Manville, Owens Corning or approved equal.
- E. Acoustic Duct Liner: 1" thick, R4.2 in directly conditioned space and 2" thick, R8.0 in unconditioned space or outdoors. Owens Corning Quiet R, or approved equal.
- F. Duct Insulation: 3" thick, R8.3 in unconditioned space and 1 1/2" thick, R4.2 for indirectly conditioned space. Owens Corning SoftR Ductwrap FRK, or approved equal.
- G. Duct Insulation Outdoor: 2" thick rigid board fiberglass, R8.7 with 0.016 inch thick sheet Aluminum jacket.

### 2.5 REGISTERS, DIFFUSERS AND GRILLES

- A. Acceptable manufacturers: Titus, Krueger.
- B. Registers, diffusers, and grilles shall be as indicated on Drawings. Drawings and schedules indicate specific requirements of air inlets and air outlets. Other manufacturers' products with equal quality, appearance, finish, and performance characteristics may be considered.
- C. Registers shall have adjustable air pattern for setting in field to match field conditions. Redirect air pattern when required.
- D. Refer to Architectural Drawings and Specifications for reflected ceiling plans, elevations, wall and ceiling type and construction. Coordinate frame and border types to accommodate the wall or ceiling specified or shown on the Architectural Drawings.
- E. Registers, diffusers, and grilles in fire-rated ceilings or walls shall be all-steel construction.

## **2.6 DAMPERS AND DUCT ACCESSORIES**

- A. Acceptable manufacturers:
  - 1. Dampers: Ruskin, Air Balance Inc, Pottorff, or approved equal.
  - 2. Actuators: Belimo, Honweywell, or approved equal.
  - 3. Turning vanes: Ductmate industries, Duro Dyne, or approved equal.
  - 4. Flexible connectors: Duro Dyne, Ventafabrics, or approved equal.
  - 5. Duct access doors: Ductmate industries, Ward industries, or approved equal.
  - 6. Backdraft dampers: Ruskin, Greenheck, Air Balance Inc, or approved equal.
- B. Provide volume dampers as specified or shown on the Drawings for proper balancing and distribution of air. Provide single blade dampers in ducts 24 inches in width or less, or 12 inches in height or less. Provide multiple blade, opposed blade design, dampers for all other duct sizes. Coordinate with the balancing contractor and provide additional dampers required for proper air balance.
- C. Dampers shall be galvanized steel construction and shall be minimum 2 gauges thicker than duct gauge. Damper shall be pivoted to turn easily, provided with operating handles and locking devices mounted on the outside of the duct in an accessible location. Dampers shall be reinforced for rigidity.
- D. Damper actuators for control dampers shall be modulating, 24V power supply, 0-10V DC control input, weatherproof construction.
- E. Turning vanes shall comply with SMACNA HVAC Duct Construction Standards, Metal and Flexible for vanes and vane runners. Vane runners shall automatically align vanes.
- F. Manufactured Turning Vanes: Fabricate 1 1/2" wide, double vane, curved blades of galvanized steel construction set to 3/4" o.c. Support with bars perpendicular to blades set 2" o.c. and set into vane runners suitable for duct mounting.
- G. Flexible duct connectors shall be flame retardant fabrics, coatings, and adhesives complying with UL 181, Class I. Where exposed to weather, fabric shall be double coated with weatherproof, synthetic rubber resistant to UV rays.
- H. Duct access doors shall be airtight and suitable for duct pressure class, constructed of galvanized steel with insulation fill as integral part of appropriate thickness. Include cam latches, sash locks, and hinges such that doors can easily be opened without tools. Seal around frame with neoprene or foam rubber.
- I. Backdraft dampers shall be multi blade, parallel action gravity balanced, or adjustable counter-balance weighted dampers. Dampers shall have center pivoted blades of maximum 6" width, with sealed edges, assembled in rattle free manner with 90-degree stop. Provide with adjustment device to permit setting for varying differential static pressure.

## MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT

San Mateo-Foster City School District

Project No. 2021005.04

### 2.7 REFRIGERANT PIPING

- A. Refrigerant line kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed. Factory insulated lines with flared fittings at both ends. Mueller Streamline Co., JMF Company, or approved equal.
- B. Refrigerant pipe insulation shall be minimum 1" thick flexible closed cell elastomeric foam complying with ASTM C543 with UV retardant, and resistant to mold and mildew. Outdoor piping shall have insulation covered with .016 inch thick aluminum jacket.
- C. Refrigerant pipe insulation shall meet requirements of California Energy Code Section 120.3.

### 2.8 HANGERS AND SUPPORTS

- A. Subject to compliance with requirements, provide products by one of the following manufacturers or other approved equal:
  - 1. B-Line.
  - 2. Mason West.
  - 3. Unistrut.
  - 4. Power Strut.
  - 5. Hilti.
- B. Qualify welding processes and operators according to ASME Boiler and Pressure Vessel Code. Comply with AWS D1.1 procedures for field welding.
- C. Duct attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

### 2.9 SLEEVES

- A. Construct sleeves for pipes passing through walls, floors, partitions, hung or furred ceilings, etc. of minimum 18 gage galvanized steel, flanges on each side of wall, partition, hung or furred ceiling, etc.
- B. Provide standard weight galvanized steel pipe sleeves with welded anchor flanges at foundation walls and reinforced concrete or masonry walls.
- C. Provide 20 gage galvanized sheet metal sleeves for round ductwork passing through masonry or concrete construction. Rectangular ductwork shall be provided with framed openings through floor and wall construction.
- D. Install escutcheons at exposed piping through floors, ceilings, walls and partitions in finished areas, within cabinets and millwork, and piping through all fire-rated separations.

### 2.10 CONTROLS

- E. Furnish and install programmable thermostats where indicated. Coordinate exact locations with Architect.

- F. If indicated on Drawings, provide thermostats by specified manufacturer.
- G. Thermostats shall comply with latest edition of California Energy Code for demand responsive capabilities and occupancy monitoring if required.
- H. Mount thermostats 48 inches above finished floor.
- I. Control wiring shall be installed per manufacturer's instructions and wiring diagrams. Wiring in walls and exposed spaces shall be in conduit and in accordance with Division 26. Wiring above ceiling shall be plenum rated cable complying with NFPA 70.

## **2.11 PAINTING**

- A. See Division 09 for painting.
- B. Prime and paint diffuser boot and duct interiors where visible through grilles with a matte black finish.
- C. Prime and paint exposed ductwork, supports, and registers where required by the Architect.
- D. Prime and paint louver or grille interiors where required by the Architect.

## **PART 3 – EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas and conditions for compliance with requirements for installation clearances, tolerances and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 EQUIPMENT INSTALLATION**

- A. Equipment shall be installed level, on curbs or supports as required and/or indicated on Drawings and in accordance with manufacturer's instructions and recommendations.
- B. Equipment shall be installed in locations shown and as complete assemblies with adequate service clearances for access and maintenance as required by codes and equipment installation manuals.

### **3.3 DUCTWORK INSTALLATION**

- A. All ductwork gauges, joints, bracing, reinforcing, and other details shall be in accordance with latest edition of SMACNA manuals unless otherwise specified.
- B. Duct dimensions are net, inside, clear dimensions. For internally lined ducts, add lining thickness to determine metal duct dimensions.
- C. Provide minimum 24-gauge sheet metal construction for ducts. Construct ducts with NFPA 90A gauges when traversing smoke zones.

## MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT

San Mateo-Foster City School District

Project No. 2021005.04

- D. Construct ducts of galvanized sheet metal, except where otherwise indicated or specified.
- E. Construct all ductwork to dimensions indicated, straight and smooth on the inside with neatly finished joints lapped in direction of travel.
- F. Fabricate changes in direction, both horizontal and vertical, to permit easy airflow.
- G. At exposed duct penetrations of walls, floors and ceilings, provide sheet metal angle type escutcheons fastened to the duct only.
- H. Duct Openings: Provide openings where required to accommodate thermometers, smoke detectors, controllers, wiring, conduit, tubing, etc. insert through air-tight rubber grommets.
- I. Provide pitot tube openings where required for testing of systems. Include threaded metal cap, spring loaded cap or threaded plug to eliminate any air leakage. Coordinate locations of openings with balancing contractor.
- J. Install ductwork to clear all obstructions, preserve headroom, and keep openings clear. Install exposed ducts as high as possible. Coordinate with other trades to maintain minimum 7'-6" clearance above finished floor, unless otherwise indicated.
- K. Install ducts unless otherwise indicated, vertically or horizontally and parallel and perpendicular to building lines; avoid diagonal runs.
- L. Coordinate layout with suspended ceiling, lighting layouts, and similar finished work.
- M. Install dampers in branch duct for all air inlets and outlets at accessible location. Dampers shall be capable of adjustments and of being locked into position.
- N. Use radius elbows in rectangular ductwork unless otherwise indicated. Centerline radius shall be a minimum 150 percent of duct width. Where space does not permit duct radius, install square elbow with turning vanes.
- O. Ends of ducts shall turn over 3/4" for airtight connections between ducts and grilles. The ducts and grilles shall have separate sets of screws. Register frames and ends of ducts shall be properly placed before finishing is begun.
- P. All ducts shall be supported per SMACNA HVAC Duct Construction Standards. Supports and seismic bracing shall be in accordance with OSHPD Preapproval of Manufacturer's Certification OPM-0043-13 and OPM-0052-13, and the California Building Code.
- Q. Ducts exposed to weather shall be completely waterproof with outdoor vapor barrier mastic over tape at all joints and seams. Slope entire top of duct down towards sides and coordinate duct slope with roof slope. Arrange standing seam, joints, and flanges to prevent accumulation, ponding or pooling of water.
- R. Seal joints and seams of ductwork airtight to SMACNA seal classifications.
- S. Protect all ductwork and interiors of ducts shall be clean and free from foreign materials until building is enclosed.

- T. All ductwork and sealing shall comply with California Energy Code Section 120.4 requirements for Air Distribution System Ducts and Plenums.

### **3.4 FLEXIBLE DUCTWORK INSTALLATION**

- A. Flexible ductwork shall be installed with no runs of more than 5'-0" in length and shall be used only at register connections.
- B. Flexible duct shall be installed in fully extended condition, free of sags and kinks, using only minimum length required to make connection. Bends greater than 90° are not allowed.
- C. Flexible duct shall be full size of branch. Any change in size to match terminal connection shall be made at terminal. Connect to duct collars, terminal unit connections and air inlets and outlets per manufacturer's instructions.
- D. All connections shall be sealed with high pressure duct sealer and secured with 3/8" nylon straps around inside liner of flexible duct.
- E. Flexible ducts shall be supported at or near mid-length with 2" wide, 28 gauge steel hanger collar attached to the structure with an approved duct hanger. Installation shall minimize sharp radius turns or offsets.

### **3.5 DUCT INSULATION AND LINING INSTALLATION**

- A. Concealed ductwork shall be insulated with fiberglass ductwrap.
- B. Provide acoustic lining where indicated on Drawings.
- C. All supply and return ductwork shall be insulated, or acoustically lined on the inside when ductwork is exposed.
- D. Exhaust duct need not be insulated. Outside air duct indoors need not be insulated. Outside air duct installed outdoors shall be insulated.

### **3.6 DUCT ACCESSORIES INSTALLATION**

- A. Flexible connections shall be installed on inlet and outlet duct connections of fans, air conditioning units, furnaces, and all other HVAC equipment. Fabric shall be of weight and strength for service required, properly fitted to render connection airtight. Fabric of sufficient width to provide minimum 4" between connected items.
- B. Install backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated. Install backdraft dampers at roof hoods or louvers connected to ductwork.
- C. Install duct access doors to allow for inspecting, adjusting, and maintaining accessories and terminal units. Access doors shall be large enough for maintenance.

### **3.7 REGISTERS, DIFFUSERS, AND GRILLES INSTALLATION**

- A. Locations indicated on the Architectural Drawings shall take precedence. For lay-in ceiling panels, locate in the center of the panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- B. Install with airtight connection to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.
- C. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.
- D. Install diffusers, registers, and grilles level and plumb, according to manufacturer's written instructions.
- E. All visible interior surfaces of registers, diffusers, and grilles shall be painted flat black.
- F. All visible exterior surfaces of registers, diffusers, and grilles shall be factory off-white finish as standard. Where required by Architect, provide in a color as selected by Architect or provide prime-painted for field painting.

### **3.8 REFRIGERANT PIPING INSTALLATION**

- A. Refrigerant pipe installation shall comply with latest editions of ASHRAE 15 and ASME B31.5.
- B. Install piping in accordance with manufacturer's instructions and good practices.
- C. Install piping adjacent to unit to allow access to unit for service and maintenance.
- D. Where required, provide or install additional refrigerant charge per equipment manufacturer's requirements. After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
- E. Install piping as short and direct as possible, with a minimum number of joints and fittings.
- F. Route piping in orderly manner, parallel to building structure, and maintain gradient. Group piping whenever practical at common elevations and locations. Install piping to conserve space and avoid interference with use of space.
- G. Slope piping one percent in direction of oil return. Provide suction traps at base of suction risers where required.
- H. Piping shall be cut accurately to measurements established at job site and worked into place without springing or forcing, allowing for proper head room.
- I. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- J. Install sleeves for piping and tubing penetrations of walls, ceilings, and floors. Install escutcheons for piping and tubing penetrations of walls, ceilings, and floors.

- K. Install insulation without and gaps or cracks and use contact adhesive recommended by manufacturer at joints and connections.
- L. When the thickness of insulation is reduced, for example at support hangers, reinforce the reduced thickness with additional insulation.
- M. Seal longitudinal seams and end joints of insulation with manufacturer's recommended adhesive to eliminate openings in insulation. Installation to maintain a continuous vapor barrier.
- N. Where metal jackets are indicated for insulation, install with 2 inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless steel bands 12 inches on center at end joints.

### **3.9 HANGERS AND SUPPORTS INSTALLATION**

- A. All equipment, plenums, registers, ductwork, and piping shall be securely anchored to building structure and seismically braced as required by the Drawings and Specifications. Comply with OSHPD Preapproval of Manufacturer's Certification OPM-0043-13 and OPM-0052-13, and the California Building Code.
- B. Comply with SMACNA HVAC Duct Construction Standards – Metal and Flexible for hanger rod or sheet metal strap sizes and spacing for duct supports.
- C. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- D. Install lateral bracing with pipe hangers and supports to prevent swaying.
- E. Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- F. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- G. Install hangers and supports to provide indicated pipe slopes.
- H. Adjust hangers to distribute loads equally on attachments.
- I. Trim excess length of continuous-thread hanger and support rods to 1 1/2 inches.
- J. Perform all welding in accordance with standards of the American Welding Society. Clean surfaces of loose scale, rust, paint or other foreign matter and properly align before welding. Use wire brush on welds after welding.

### **3.10 TESTING**

- A. Comply with more stringent of system manufacturer's requirements and requirement indicated herein.

## MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT

San Mateo-Foster City School District

Project No. 2021005.04

- B. Provide the Architect with certified copies of the test results in written format. At a minimum include the date of the test, witnesses present, sections tested, length of tests, starting and final pressures.
- C. After completion of refrigerant piping installation, pressurize piping systems to a test pressure of not less than 600 psig using dry nitrogen.
- D. Successful testing shall maintain the test pressure for a continuous and uninterrupted period of 24 hours.
- E. After completion of pressure testing evacuate piping systems using a vacuum pump with a check valve. Maintain test pressure per manufacturer's requirements for a continuous and uninterrupted period of one (1) hour.
- F. Prepare and submit test reports to the Architect for project record.
- G. Charge the refrigerant piping system following system manufacturer's written instructions. Total refrigerant charge shall be recorded and permanently displayed at the system's outdoor unit.

### **3.11 ADJUSTING**

- A. Adjust equipment and components to function smoothly, and lubricate as recommended by manufacturer.
- B. Adjust initial temperature setpoints. Adjust initial airflow settings and discharge airflow patterns.
- C. Set field adjustable switches and circuit breaker trip ranges according to manufacturer's written instructions.

### **3.12 FIELD QUALITY CONTROL**

- A. Engage a factory authorized service representative to inspect field assembled components and equipment installation, including piping and electrical connections. Provide a written report of inspection to the Architect.
- B. Engage a factory authorized service representative to perform startup service. Complete installation and startup checks according to manufacturer's written instructions. Provide completed startup sheets for each piece of equipment to the Architect.

### **3.13 TRAINING AND O&MS**

- A. Refer to Section 23 00 00 Mechanical General Requirements and Division 01 for Training requirements, Operating and Maintenance Manuals, and other Closeout procedures.

**END OF SECTION**

**SECTION 23 09 23 – DIRECT DIGITAL CONTROL SYSTEM FOR HVAC**

**PART 1 – GENERAL**

**1.1 WORK INCLUDED**

- A. Furnish a Delta Controls BACnet Energy Management System (EMS) as specified herein to tie into and match the San Mateo-Foster City School District (SMFCSD) current Energy Management System Standard. The operator's workstation, all building controllers, application controllers, and all input/output devices shall communicate using the protocols and network standards as defined by ANSI/ASHRAE Standard 135-2008, BACnet. In other words, all workstations and controllers, including unitary controllers, shall be native BACnet devices. No gateways shall be used for communication to controllers installed under this section. Gateways may be used for communication to existing systems or to systems installed under other sections.
- B. The control system shall be as shown and consist of a high-speed, peer-to-peer network of DDC controllers and operator workstation(s) residing and communicating on a BACnet IP (Internet Protocol) network. The operator workstation(s) shall be a personal computer (PC) with a color monitor, mouse, keyboard, and printer. The PC will allow a user to interface with the network via multi-tasking dynamic color graphics. Each mechanical system, building floor plan, and control device will be depicted by point-and-click graphics. A modem shall be provided for remote access to the network.
- C. Systems using gateways to route proprietary devices and objects to BACnet are not acceptable.
- D. For Local Area Network installations provide access to the control system via the Internet. The owner shall provide a connection to the Internet via high-speed cable modem, ADSL, ISDN, T1 or through the facility ISP. The owner shall pay for all monthly Internet access fees and connection charges.
- E. System Object Capacity. The system size shall be expandable to at least twice the number of input/output objects required for this project. Additional controllers (along with associated devices and wiring) shall be all that is necessary to achieve this capacity requirement. The Operator Workstations installed for this project shall not require any hardware additions or software revisions in order to expand the system.
- F. Provide all necessary BACnet-compliant hardware and software to meet the system's functional specifications. Provide Protocol Implementation Conformance Statement (PICS) for Windows-based control software and every controller in system, including unitary controllers. All controller devices must be BTL tested and listed by the official BACnet Testing Laboratory, having the BTL approval mark issued.
- G. All devices in this facility location shall be accessible from a single graphical user interface.
- H. Prepare individual hardware layouts, interconnection drawings, and software configuration from project design data.

## MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT

San Mateo-Foster City School District

Project No. 2021005.04

- I. Design, provide, and install all equipment cabinets, panels, data communication network cables needed, and all associated hardware.
- J. Furnish and install the required software to produce a complete and operational native BACnet EMS as specified herein.
- K. Provide complete manufacturer's specifications for all items that are supplied. Include vendor name of every item supplied.
- L. Provide supervisory specialists, including a dedicated project manager, and technicians throughout the duration of the project to assist in all phases of EMS system installation, startup, and commissioning.
- M. Provide a comprehensive operator and technician training program as described herein.
- N. Provide as-built documentation, operator's terminal software, diagrams, and all other associated project operational documentation (such as technical manuals) on approved media, the sum total of which accurately represents the final system.

### 1.2 SYSTEM DESCRIPTION

- A. A distributed logic control system complete with all software and hardware functions shall be provided and installed. System shall be completely based on ANSI/ASHRAE Standard 135-2008, BACnet and achieved listing under the BACnet Testing Laboratories BACnet - Advanced Workstation Software (B-AWS). This system is to control all mechanical equipment, including all unitary equipment such as heat pumps, fan-coils, AC units, and any other listed equipment using native BACnet-compliant components. Non-BACnet-compliant or proprietary equipment or systems (including gateways) shall not be acceptable and are specifically prohibited.
- B. Building controllers shall include complete energy management software, including scheduling building control strategies with optimum start and logging routines. All energy management software and firmware shall be resident in field hardware and shall not be dependent on the operator's terminal. Operator's terminal software is to be used for access to field-based energy management functions only. Provide zone-by-zone direct digital logic control of space temperature, scheduling, runtime accumulation, equipment alarm reporting, and override timers for after-hours usage.
- C. All application controllers for every terminal unit (HP, UV, etc.), air handler, all central plant equipment, and any other piece of controlled equipment shall be fully programmable. Application controllers shall be mounted next to controlled equipment and communicate with building controller through BACnet LAN.
- D. System Architecture:

MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT  
San Mateo-Foster City School District  
Project No. 2021005.04

1. EMS Contractor shall utilize Owner's IT WAN for connection from BACnet Server to all Global Controllers furnished and installed as part of this project. Connection shall be by way of BACnet/IP as defined in Addendum A (Annex J) of the ANSI/ASHRAE Standard for BACnet. Connection between all Integration Level Global Controllers, the BACnet Server and any client work stations (PC's or Lap Tops) shall be high-speed, peer-to-peer Ethernet as per Standard IEEE802.3. Owner shall furnish and maintain IT WAN infrastructure.
2. EMS Contractor shall provide and install a dedicated MS/TP LAN extending from all Global Controller's to distributed field level controller BACnet devices.
3. Distributed field level controllers are responsible for directly controlling and monitoring HVAC and Electrical system points throughout the facility.
4. The BACnet Server hosts system configurations, programming databases and stores all trendlog data. The Server maintains all backup files for system configuration and programming located on Global Controller's and field level controllers and is capable of directly uploading or downloading information from the controllers.

**1.3 APPROVED MANUFACTURERS AND CONTRACTORS**

- A. Approved Control Manufacturers:
  1. Delta Controls; no substitution.
- B. Approved Control System Contractors:
  1. The bidder's company shall have a minimum of 10 years of experience with installing Delta Controls systems.
  2. The bidder's company shall have a minimum of 2 years of experience installing Delta Controls on educational campuses.

**1.4 QUALITY ASSURANCE**

- A. The Contractor shall be regularly engaged in the manufacturing, installation and maintenance of EMS systems and shall have demonstrated technical expertise and experience in the manufacture, installation and maintenance of EMS systems similar in size and complexity to this project.
- B. The EMS system shall be designed, installed, commissioned, and serviced by manufacturer-authorized and trained personnel. System provider shall have an in-place support facility within 50 miles of the site with technical staff, spare parts inventory and necessary test and diagnostic equipment.
- C. To provide the level of support and response required by the Owner, the Energy Management System Contractor shall have a fully staffed service department with the following minimum personnel and service offerings:
  1. Minimum of 1 (one) Dedicated Support Technician located at a fixed location with access to a network for remote access to the site.
  2. Minimum of 1 (one) Dedicated Service Dispatcher to route calls and prioritize service response.

## MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT

San Mateo-Foster City School District

Project No. 2021005.04

3. Minimum of 5 (five) Dedicated Field Service Technicians. To ensure that there are personnel available to respond to service requests in a timely manner, these technicians are to be dedicated to service and not used on construction projects.
  4. Maintain a 24/7 Service Call Center staffed by live operators enabling immediate response to Owner's critical emergency EMS concerns.
- D. The EMS Contractor shall provide an on-site, experienced project manager for this work who is responsible for direct supervision of the installation, start up and commissioning of the EMS system.
- E. EMS Contractor shall have a proven record of successful native BACnet installations and maintenance of equivalent native BACnet systems for a minimum period of 5 years utilizing the same native BACnet manufacturer's product line that the Contractor proposes to use on this project.
- F. Materials and equipment shall be manufacturer's latest standard design that complies with the specification requirements.
- G. All BAS peer-to-peer network controllers, central system controllers and local user displays shall be UL Listed under Standard UL 916, category PAZX.
- H. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.
- I. All products used in this installation shall be new, currently under manufacture, and shall be applied in standard off the shelf products. This installation shall not be used as a test site for any new products unless explicitly approved by the Engineer in writing. Spare parts shall be available for at least 5 years after completion of this contract.

### 1.5 REFERENCE STANDARDS

- A. The latest edition of the following standards and codes in effect and amended as of supplier's proposal date, and any applicable subsections thereof, shall govern design and selection of equipment and material supplied:
1. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
  2. ANSI/ASHRAE Standard 135-2008, BACnet.
  3. Uniform Building Code (UBC), including local amendments.
  4. UL 916 Underwriters Laboratories Standard for Energy Management Equipment. Canada and the US.
  5. National Electrical Code (NEC).
  6. FCC Part 15, Subpart J, Class A.
  7. EMC Directive 89/336/EEC (European CE Mark).
  8. UL-864 UUKL listing for Smoke Controls for any equipment used in smoke control sequences.

- B. City, county, state, and federal regulations and codes in effect as of contract date.
- C. Except as otherwise indicated, the system supplier shall secure and pay for all permits, inspections, and certifications required for his work, and arrange for necessary approvals by the governing authorities.

## **1.6 SUBMITTALS**

- A. Drawings:
  - 1. The system supplier shall submit engineered drawings, control sequence, and bill of materials for approval.
  - 2. Drawings shall be submitted in the following standard sizes: 11" x 17" (ANSI B).
- B. System Documentation - Include the following in submittal package:
  - 1. System configuration diagrams in simplified block format.
  - 2. All input/output object listings and an alarm point summary listing.
  - 3. Electrical drawings that show all system internal and external connection points, terminal block layouts, and terminal identification.
  - 4. Complete bill of materials, valve schedule and damper schedule.
  - 5. Manufacturer's instructions and drawings for installation, maintenance, and operation of all purchased items.
  - 6. Overall system operation and maintenance instructions—including preventive maintenance and troubleshooting instructions.
  - 7. For all system elements—operator's workstation(s), building controller(s), application controllers, routers, and repeaters—provide BACnet Protocol Implementation Conformance Statements (PICS) as per ANSI/ASHRAE Standard 135-2001.
  - 8. Provide complete description and documentation of any proprietary (non-BACnet) services and/or objects used in the system.
  - 9. A list of all functions available and a sample of function block programming that shall be part of delivered system.

## **1.7 WARRANTY**

- A. Warranty shall cover all costs for parts, labor, associated travel, and expenses for a period of one (1) year from completion of system acceptance.
- B. Extended Warranty – Years 2 to 5. For Characterized Control Valves (CCV), Globe Valves, Butterfly Valves, associated Valve Actuators and Damper Actuators, provide like kind replacement components for any defective material identified and returned in Years 2 to 5 from the date of system acceptance.
- C. Hardware and software personnel supporting this warranty agreement shall provide on-site or off-site service in a timely manner after failure notification to the vendor.

- D. This warranty shall apply equally to both hardware and software. This warranty shall apply equally to both hardware and software.

## **1.8 RELATED WORK IN OTHER SECTIONS**

- A. Refer to Division 0 and Division 1 for related contractual requirements.
- B. Refer to Section 23 00 00 for General Mechanical Provisions.
- C. Refer to Section 26 00 00 for General Electrical Provisions.

## **PART 2 – PRODUCTS**

### **2.1 CONTROL PROGRAMMING SOFTWARE**

- A. All DDC programming throughout the EMS network shall adhere to the following standards:
  - 1. Programming on all controllers must be completely operator definable and modifiable and must use a single common programming language for all control devices. Use of pre-canned, factory burned-in DDC programming on controllers is not acceptable and is grounds for rejection of EMS system.
  - 2. Programming shall be developed in an object-oriented graphical programming environment. Line by line code programming is specifically prohibited and is not acceptable.
  - 3. Programming must accommodate all written sequences of operations.
  - 4. Programming shall be modifiable from any server PC, operator console PC and/or portable laptop PC workstation without requiring the burning of new chips or having to directly access the local controller. Software shall accommodate the downloading of programming via established network Ethernet or modem connections.
  - 5. Programming must support the use of virtual software points in the same manner as all physical points are supported.
  - 6. All programming points, virtual or real, for any specific device in the entire EMS network shall be accessible to all other network devices at any given time, regardless of physical location.
  - 7. All programming shall adhere to the BACnet protocols for Standard Command Priorities.
  - 8. Programming software must include a pre-developed cohesive PID (proportional-integral-derivative) algorithm whereby a user can adjust gain and anti-windup coefficients accordingly to effectively accomplish advanced sequence of operation requirements.

### **2.2 BUILDING (GLOBAL) CONTROLLER**

- A. General Requirements:

MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT  
San Mateo-Foster City School District  
Project No. 2021005.04

1. BACnet Conformance:
  - a. Building Controller shall be approved by the BTL as meeting the BACnet Building Controller requirements.
  - b. Please refer to section 22.2, BACnet Functional Groups, in the BACnet standard, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.
2. Building controller shall be of scalable design such that the number of trunks and protocols may be selected to fit the specific requirements of a given project.
3. The controller shall be capable of panel-mounted on DIN rail and/or mounting screws.
4. The controller shall be capable of providing global control strategies for the system based on information from any objects in the system, regardless if the object is directly monitored by the building controller module or by another controller.
5. The controller shall be capable of running up to six independent control strategies simultaneously. The modification of one control strategy does not interrupt the function or runtime others.
6. The software program implementing the DDC strategies shall be completely flexible and user-definable. All software tools necessary for programming shall be provided as part of project software. Any systems utilizing factory pre-programmed global strategies that cannot be modified by field personnel on-site, using a WAN or downloaded through remote communications are not acceptable. Changing global strategies using firmware changes is also unacceptable.
7. Programming shall be object-oriented using control function blocks, and support DDC functions, All flowcharts shall be generated and automatically downloaded to controller. Programming tool shall be supplied and be resident on workstation. The same tool shall be used for all controllers.
8. Programming tool shall provide means to graphically view inputs and outputs to each program block in real-time as program is executing. This function may be performed using the operator's workstation or field computer.
9. Controller shall have 6000 Analog Values and 6000 Binary Values
10. Controller IP configuration can be done via a direct USB connect with a operator's workstation or field computer.
11. Controller shall have at a minimum a Quad Core 996Ghz processor to ensure fast processing speeds.
12. Global control algorithms and automated control functions shall execute using a 64-bit processor.
13. Controller shall have a minimum of 1 GB of DDR3 SDRAM on a 533Mhz bus to ensure high speed data recording, large data storage capacity and reliability.

14. Controller shall support two on-board EIA-485 ports capable of supporting various EIA-485 protocols including but not limited to BACnet MS/TP and Modbus.
  - a. Ports are capable of supporting various EIA-485 protocols including but not limited to BACnet MS/TP and Modbus.
15. Controller shall support two gigabit speed Ethernet (10/100/1000) ports.
  - a. Ports are capable of supporting various Ethernet protocols including but not limited to BACnet IP, FOX, and Modbus.
16. All ports shall be capable of having protocol(s) assigned to utilize the port's physical connection
17. The controller shall have at a minimum four onboard inputs, two universal inputs and two binary inputs.
18. Schedules:
  - a. Building controller modules shall provide normal seven-day scheduling, holiday scheduling and event scheduling.
  - b. Each building controller shall support a minimum of 480 BACnet Schedule Objects and 480 BACnet Calendar Objects.
19. Logging Capabilities:
  - a. Each building controller shall log as minimum 1920 objects at 15 min intervals. Any object in the system (real or calculated) may be logged. Sample time interval shall be adjustable at the operator's workstation.
  - b. Logs may be viewed both on-site or off-site using WAN or remote communication.
  - c. Building controller shall periodically upload trended data to networked operator's workstation for long-term archiving if desired.
  - d. Archived data stored in database format shall be available for use in third-party spreadsheet or database programs.
20. Alarm Generation:
  - a. Alarms may be generated within the system for any object change of value or state (either real or calculated). This includes things such as analog object value changes, binary object state changes, and various controller communication failures.
  - b. Each alarm may be dialed out as noted elsewhere.
  - c. Alarm log shall be provided for alarm viewing. Log may be viewed on-site at the operator's terminal or off-site using remote communications.
  - d. Controller must be able to handle up to 1920 alarm setups stored as BACnet event enrollment objects, with system destination and actions individually configurable.
21. Demand Limiting:

MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT  
San Mateo-Foster City School District  
Project No. 2021005.04

- a. Demand limiting of energy shall be a built-in, user-configurable function. Each controller module shall support shedding of up to 1200 loads using a minimum of two types of shed programs.
  - b. Load shedding programs in building controller modules shall operate as defined in section 2.1.J of this specification.
- 22. Tenant Activity Logging:
  - a. Tenant Activity logging shall be supported by building controller module. Each independent module shall support a minimum of 480 zones.
  - b. Tenant Activity logging shall function as defined in section 2.1.K of this specification.
- B. BACnet MS/TP:
  - 1. BACnet MS/TP LAN must be software-configurable from 9.6 to 115.4Kbps:
    - a. Each BACnet MS/TP LAN shall support 64 BACnet devices at a minimum
    - b. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.
- C. BACnet IP:
  - 1. The building controller shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internetwork, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the LAN.
  - 2. Must support interoperability on WANs and CANs and function as a BACnet Broadcast Management Device (BBMD).
  - 3. Each controller shall support at a minimum 128 BBMD entries.
  - 4. BBMD management architecture shall support 3000 subnets at a minimum.
  - 5. Shall support BACnet Network Address Translation.
  - 6. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.
- D. Expansion ports:
  - 1. Controller shall support two expansion ports.
    - a. Combining the two on-board EIA-458 ports with fully loaded expansion ports the controller shall support 6 EIA-485 trunks simultaneously.
  - 2. Expansion cards that mate to the expansion ports shall include:
    - a. Dual port EIA-485 card.
- E. Power Supply:
  - 1. Input for power shall accept between 17–30VAC, 47–63Hz.

2. Optional rechargeable battery for shutdown of controller including storage of all data in flash memory.
  3. On-board capacitor will ensure continuous operation of real-time clocks for minimum of 14 days.
- F. Controller shall be in compliance with the following:
1. UL 916 for open energy management.
  2. FCC Class B.
  3. ROHS.
  4. IEC 60703.
  5. C-Tick Listed.
- G. Controller shall operate in the following environmental conditions:
1. -4 to 149 °F (-20 to 65 °C) without optional battery, or 32 to 122 °F (0 to 50 °C) with optional battery.
  2. 0 to 95% RH, non-condensing.

## **2.3 AUXILIARY CONTROL DEVICES**

- A. Temperature Sensors:
1. All temperature sensors to be solid-state electronic, interchangeable with housing appropriate for application. Wall sensors to be installed as indicated on drawings. Mount 48 inches above finished floor. Duct sensors to be installed such that the sensing element is in the main air stream. Immersion sensors to be installed in wells provided by control contractor, but installed by mechanical contractor. Immersion wells shall be filled with thermal compound before installation of immersion sensors. Outside air sensors shall be installed away from exhaust or relief vents, not in an outside air intake, and in a location that is in the shade most of the day.
- B. Intelligent Room Sensor with Touch Screen:
1. Hardware:
    - a. Room sensor shall include:
      - 1) Backlit touch screen LCD digital display.
      - 2) Temperature sensor.
      - 3) Programmable Status Light indicator.
      - 4) CO2 Sensor (as scheduled on prints).
    - b. Temperature sensor shall be a Uni-Cuve Type II thermistor with an accuracy of +/- 0.36 °F (0.2 °C) at calibration point over the range of 32-158 °F or better.s

MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT  
San Mateo-Foster City School District  
Project No. 2021005.04

- c. The intelligent room sensor's Smart Light shall have a minimum of four colors (Blue, Red, Amber and Green) that will cast a glow onto the wall below the sensor to be used as visual indicator to the occupants of the condition of the system. The color and on/off state of smart light shall be fully programmable.
  - d. CO2 Sensor shall have an accuracy of +/- 30 ppm over the range of 0-5000 ppm or better.
  - e. CO2 sensor shall utilize Automatic Baseline Correction to maintain sensor calibration without need for manual calibration.
  - f. The user shall interact with the smart sensor using a touch screen, with no buttons allowed.
  - g. The intelligent room sensor shall have provisions for a tamper proof installation requiring tools to be removed from the wall.
  - h. The touch screen shall have a surface hardness of Mohs 7 or greater to prevent being easily scratched.
  - i. Controller shall function as room control unit and allow occupant to raise and lower setpoint, and activate terminal unit for override use—all within limits as programmed by building operator.
2. Display Content:
- a. The intelligent room sensor shall simultaneously display room setpoint, room temperature, and outside temperature at each controller.
  - b. The intelligent room sensor shall have the ability to add or remove from the display time-of-day, and indoor air temp to customize the view for the customer.
  - c. The intelligent room sensor must have the capability to show temperatures in degrees Fahrenheit or degrees Centigrade.
  - d. A communication loss or improper communications wiring shall be displayed on the LCD screen to aid in trouble shooting.
  - e. Information about the version of firmware shall be displayable on the LCD screen.
  - f. A cleaning mode will be provided to allow for the touch screen to be cleaned without inadvertently making changes to system parameters.
  - g. The intelligent room sensor shall have the ability to display the status of a lighting zone status and control the on/off state of the zone from the touch screen using a tenant accessible display page.
  - h. The intelligent room sensor shall have the ability to display the status of a window zone (e.g. blinds) and control the on/off state of the zone from the touch screen using a tenant accessible display page.
  - i. After Hours Override shall:
    - 1) Override time may be set and viewed in 30 minute increments.

## MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT

San Mateo-Foster City School District

Project No. 2021005.04

- 2) Override time countdown shall be automatic, but may be reset to zero by occupant from the sensor.
    - 3) Time remaining shall be displayed.
    - 4) Display shall show the word "OFF" in unoccupied mode unless a function button is pressed.
  3. Other Modes:
    - a. The intelligent room sensor shall also allow service technician access to hidden functions for advanced system configuration. This functionality shall be accessed protected with a configurable pin number.
    - b. Field service mode shall allow access to common parameters as dictated by the application's sequence of operations. The parameters shall be viewed and set from the intelligent room sensor with no computer or other field service tool needed.
    - c. Balance mode shall, if intelligent room sensor is connected to VAV controller, allow a VAV box to be balanced and all air flow parameters viewed. The balancing parameters shall be viewed and set from the intelligent room sensor with no computer or other field service tool needed.
  4. Intelligent Room Sensor shall be in compliance of the following:
    - a. UL Standard for Safety 916
    - b. FCC Part 15.107 & 109, Class B, CFR47-15
    - c. EMC Directive 89/336/EEC (European CE Mark).
- C. Wall Sensor:
1. Standard wall sensor shall use solid-state sensor identical to intelligent room sensor and shall be packaged in aesthetically pleasing enclosure. Sensor shall provide override function, warmer/cooler lever for set point adjustment and port for plug-in of Field Service Tool for field adjustments. Override time shall be stored in controller and be adjustable on a zone-by-zone basis. Adjustment range for warmer/cooler lever shall also be stored in EEPROM on controller. All programmable variables shall be available to field service tool through wall sensor port.

### **2.4 ELECTRONIC ACTUATORS AND VALVES:**

- A. Quality Assurance for Actuators and Valves:
1. UL Listed Standard 873 and C.S.A. Class 4813 02 certified.
  2. NEMA 2 rated enclosures for inside mounting, provide with weather shield for outside mounting.
  3. Five-year manufacturer's warranty. Two-year unconditional and three-year product defect from date of installation.
- B. Execution Details for Actuators and Valves:

MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT  
San Mateo-Foster City School District  
Project No. 2021005.04

1. VAV box damper and reheat valve actuation in addition to Fan Coil primary valve actuation shall be floating type or analog (2–10 VDC, 4–20 mA).
  2. Primary valve control on Air Handling Units shall be analog (2–10 VDC, 4–20 mA).
- C. Actuators for damper and control valves 0.5–6 inches shall be electric unless otherwise specified, provide actuators as follows:
1. UL Listed Standard 873 and Canadian Standards Association Class 481302 shall certify actuators.
  2. NEMA 2 rated actuator enclosures for inside mounting. Use additional weather shield to protect actuator when mounted outside.
  3. Five-year manufacturer's warranty. Two-year unconditional and three-year product defect from date of installation.
  4. Mechanical spring shall be provided when specified. Capacitors or other non-mechanical forms of fail-safe are not acceptable.
  5. Position indicator device shall be installed and made visible to the exposed side of the actuator. For damper short shaft mounting, a separate indicator shall be provided to the exposed side of the actuator.
  6. Overload Protection: Actuators shall provide protection against actuator burnout by using an internal current limiting circuit or digital motor rotation sensing circuit. Circuit shall insure that actuators cannot burn out due to stalled damper or mechanical and electrical paralleling. End switches to deactivate the actuator at the end of rotation are acceptable only for butterfly valve actuators.
  7. A pushbutton gearbox release shall be provided for all non-spring actuators.
  8. Modulating actuators shall be 24 VAC and consume 10 VA power or less.
  9. Conduit connectors are required when specified and when code requires it.
- D. Damper Actuators:
1. Economizer actuators shall utilize analog control 2–10 VDC; floating control is not acceptable.
  2. Electric damper actuators (including VAV box actuators) shall be direct shaft-mounted and use a V-bolt and toothed V-clamp causing a cold weld effect for positive gripping. Single bolt or set-screw type fasteners are not acceptable.
  3. One (1) electronic actuator shall be direct shaft-mounted per damper section. No connecting rods or jackshafts shall be needed. Small outside air and return air economizer dampers may be mechanically linked together if one (1) actuator has sufficient torque to drive both and damper drive shafts are both horizontal installed.
  4. Multi-section dampers with electric actuators shall be arranged so that each damper section operates individually. One (1) electronic actuator shall be direct shaft-mounted per damper section. See below execution section for more installation details.

## MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT

San Mateo-Foster City School District

Project No. 2021005.04

5. Actuator mounting for damper and valve arrangements shall comply with the following:
  - a. Damper actuators: Shall not be installed in the air stream.
  - b. A weather shield shall be used if actuators are located outside. For damper actuators, use clear plastic enclosure.
  - c. Damper or valve actuator ambient temperature shall not exceed 122 degrees F through any combination of medium temperature or surrounding air. Appropriate air gaps, thermal isolation washers or spacers, standoff legs, or insulation shall be provided as necessary.
  - d. Actuator cords or conduit shall incorporate a drip leg if condensation is possible. Water shall not be allowed to contact actuator or internal parts. Location of conduits in temperatures dropping below dew point shall be avoided to prevent water from condensing in conduit and running into actuator.
  - e. Damper mounting arrangements shall comply to the following:
    - 1) The ventilation subcontractor shall furnish and install damper channel supports and sheet metal collars.
    - 2) No jack shafting of damper sections shall be allowed.
    - 3) Multi-section dampers shall be arranged so that each damper section operates individually. One (1) electronic actuator shall be direct shaft mounted per section.
  - f. Size damper sections based on actuator manufacturer's specific recommendations for face velocity, differential pressure and damper type. In general:
    - 1) Damper section shall not exceed 24 ft-sq. with face velocity >1500 FPM.
    - 2) Damper section shall not exceed 18 ft-sq. with face velocity > 2500 FPM.
    - 3) Damper section shall not exceed 13 ft-sq. with face velocity > 3000 FPM.
  - g. Multiple section dampers of two or more shall be arranged to allow actuators to be direct shaft mounted on the outside of the duct.
  - h. Multiple section dampers of three or more sections wide shall be arranged with a 3-sided vertical channel (8 inches wide by 6 inches deep) within the duct or fan housing and between adjacent damper sections. Vertical channel shall be anchored at the top and bottom to the fan housing or building structure for support. The sides of each damper frame shall be connected to the channels. Holes in the channel shall allow damper drive blade shafts to pass through channel for direct shaft-mounting of actuators. Open side of channel shall be faced downstream of the airflow, except for exhaust air dampers.

- i. Multiple section dampers to be mounted flush within a wall or housing opening shall receive either vertical channel supports as described above or sheet metal standout collars. Sheet metal collars (12-inch minimum) shall bring each damper section out of the wall to allow direct shaft-mounting of the actuator on the side of the collar.

## **2.5 ENCLOSURES**

- A. All controllers, power supplies and relays shall be mounted in enclosures.
- B. Enclosures may be NEMA 1 when located in a clean, dry, indoor environment. Indoor enclosures shall be NEMA 12 when installed in other than a clean environment. Outdoor enclosures must be either NEMA 3R or NEMA 4.
- C. All temperature control panels shall be fabricated in a UL-listed panel shop. Field assembled temperature control panels are not allowed.

## **PART 3 – EXECUTION**

### **3.1 EXAMINATION**

- A. The project plans shall be thoroughly examined for control device and equipment locations. Any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started
- B. The Contractor shall inspect the site to verify that equipment may be installed as shown. Any discrepancies, conflicts, or omissions shall be reported to the Engineer for resolution before rough-in work is started
- C. The Contractor shall examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequate — or if any discrepancies occur between the plans and the Contractor's work, and the plans and the work of others — the Contractor shall report these discrepancies to the Engineer and shall obtain written instructions for any changes necessary to accommodate the Contractor's work with the work of others. Any changes in the work covered by this specification made necessary by the failure or neglect of the Contractor to report such discrepancies shall be made by — and at the expense of — this Contractor.

### **3.2 PROTECTION**

- A. The Contractor shall protect all work and material from damage by its work or employees, and shall be liable for all damage thus caused
- B. The Contractor shall be responsible for its work and equipment until finally inspected, tested, and accepted. The Contractor shall protect any material that is not immediately installed. The Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects

### **3.3 INSTALLATION (GENERAL)**

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

- B. Provide all miscellaneous devices, hardware, software, interconnections, installation, and programming required to ensure a complete operating system in accordance with the sequences of operation and point schedules.

### **3.4 LOCATION AND INSTALLATION OF COMPONENTS**

- A. Locate and install components for easy accessibility; in general, mount 48 inches above floor with minimum three (3) feet of clear access space in front of units. Obtain approval on locations from owner's representative prior to installation.
- B. All instruments, switches, transmitters, etc., shall be suitably wired and mounted to protect them from vibration, moisture, and high or low temperatures.
- C. Identify all equipment and panels. Provide permanently mounted tags for all panels.
- D. Provide stainless steel or brass thermowells suitable for respective application and for installation under other sections, and sized to suit pipe diameter without restricting flow.

### **3.5 INTERLOCKING AND CONTROL WIRING**

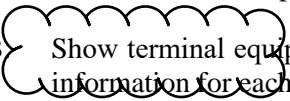
- A. Provide all interlock and control wiring associated with the EMS system. All wiring shall be installed neatly and professionally, in accordance with all national, state and local electrical codes.
- B. Provide wiring as required by functions as specified and as recommended by equipment manufacturers, to serve specified control functions. Provide shielded low capacitance wire for all communications trunks.
- C. Control wiring shall not be installed in power circuit raceways. Magnetic starters and disconnect switches shall not be used as junction boxes. Provide auxiliary junction boxes as required. Coordinate location and arrangement of all control equipment with the owner's representative prior to rough-in.
- D. Provide auxiliary pilot duty relays on motor starters as required for control function.
- E. Provide power for all control components from nearest electrical control panel or as indicated on the electrical drawings; coordinate with electrical contractor.
- F. All control wiring in mechanical, electrical, telephone and boiler rooms to be installed in raceways. Exposed control wiring shall also be installed in raceways. All other control wiring to be installed without conduit neatly and inconspicuously per local code requirements.

### **3.6 DDC OBJECT TYPE SUMMARY**

- A. Provide all database generation.
- B. Displays

1. System displays shall show all analog and binary object types within the system. They shall be logically laid out for easy use by the owner. Provide outside air temperature indication on all system displays.
- C. Run Time Totalization
  1. At a minimum, run time totalization shall be incorporated for each monitored supply fan, return fan, exhaust fan, hot water and chilled water pumps. Warning limits for each point shall be entered for alarm and or maintenance purposes.
- D. Trendlog
  1. All binary and analog object types (including zones) shall have the capability to be automatically trended.
- E. Alarm
  1. All analog inputs (High/Low Limits) and selected binary input alarm points shall be prioritized and routed (locally or remotely) with alarm message per owner's requirements.
- F. Database Save
  1. Provide backup database for all standalone application controllers on disk.

### **3.7 OPERATOR INTERFACE**

- A. Standard Graphics. Provide graphics for all mechanical systems and floor plans of the building. Point/object information on the graphic displays shall dynamically update. Show on each graphic all input and output points/objects for the system. Also show relevant calculated points/objects such as setpoints
- B.  Show terminal equipment information on a “graphic” summary table. Provide dynamic information for each point/object show
- C. The Contractor shall provide all the labor necessary to install, initialize, start up, and troubleshoot all Operator Workstation software and their functions as described in this section. This includes any operating system software, the Operator Workstation database, and any third-party software installation and integration required for successful operation of the operator interface.

### **3.8 SYSTEM CHECKOUT AND TESTING**

- A. Prepare and start logic control system under provisions of this section.
- B. Start up and commission systems. Allow sufficient time for startup and commissioning prior to placing control systems in permanent operation.
- C. Provide the capability for off-site monitoring at control contractor's local or main office. At a minimum, off-site facility shall be capable of system diagnostics and software download. Owner shall provide phone line for this service for one (1) year or as specified.

## MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT

San Mateo-Foster City School District

Project No. 2021005.04

- D. Furnish all labor and test apparatus required to calibrate and prepare for service of all instruments, controls, and accessory equipment furnished under this specification.
- E. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
- F. Enable the control systems and verify calibration of all input devices individually. Perform calibration procedures per manufacturers' recommendations.
- G. Verify that all binary output devices (relays, solenoid valves, two position actuators and control valves, magnetic starters, etc.) operate properly and that the normal positions are correct.
- H. Verify that all analog output devices (I/Ps, actuators, etc.) are functional, that start and span are correct, and that direction and normal positions are correct. The Contractor shall check all control valves and automatic dampers to ensure proper action and closure. The Contractor shall make any necessary adjustments to valve stem and damper blade travel.
- I. Verify that the system operation adheres to the Sequences of Operation. Simulate and observe all modes of operation by overriding and varying inputs and schedules. Tune all DDC loops and optimum Start/Stop routines.

### 3.9 TRAINING

- A. Provide application engineer to instruct owner in operation of systems and equipment.
- B. Provide system operator's training to include (but not be limited to) such items as the following: modification of data displays, alarm and status descriptors, requesting data, execution of commands and request of logs. Provide this training to a minimum of three persons.
- C. Provide on-site training, in three sessions, each a minimum of 8 hours as part of this contract. Each session shall be coordinated with the building owner.
  - 1. Provide first training session before occupancy, once all systems are functioning and tested.
  - 2. Provide second training 4-5 months after occupancy.
  - 3. Provide final training 11 months after occupancy. This training should focus on answering questions about controls system. Collect questions at least two (2) weeks before training and tailor training materials to address these questions.
- D. Train the designated staff of Owner's Representative and Owner to enable Day-to-day Operators to:
  - 1. Proficiently operate the system.
  - 2. Understand control system architecture and configuration.
  - 3. Understand DDC system components.

MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT  
San Mateo-Foster City School District  
Project No. 2021005.04

4. Understand system operation, including DDC system control and optimizing routines.
  5. Operate the workstation and peripherals.
  6. Log on and off the system.
  7. Access graphics, point/object reports, and logs.
  8. Adjust and change system setpoints, time schedules, and holiday schedules.
  9. Recognize malfunctions of the system by observation of the printed copy and graphical visual signals.
  10. Understand system drawings, and Operation and Maintenance manual.
  11. Understand the job layout and location of control components.
  12. Access data from DDC controllers and ASC.
  13. Operate portable operator's terminals.
- E. Train the designated staff of Owner's Representative and Owner to enable Advanced Operators to:
1. Make and change graphics on the workstation
  2. Create, delete, and modify alarms, including annunciation and routing of these
  3. Create, delete, and modify point/object trend logs, and graph or print these
  4. Create, delete, and modify reports
  5. Add, remove, and modify system's physical points/objects
  6. Create, modify, and delete programming
  7. Add panels when required
  8. Add Operator Workstation stations
  9. Create, delete, and modify system displays — both graphical and otherwise
  10. Perform DDC system field checkout procedures
  11. Perform DDC controller unit operation and maintenance procedures
  12. Perform workstation and peripheral operation and maintenance procedures
  13. Perform DDC system diagnostic procedures
  14. Configure hardware including PC boards, switches, communication, and I/O points/objects
  15. Maintain, calibrate, troubleshoot, diagnose, and repair hardware
  16. Adjust, calibrate, and replace system components
- F. The instructor(s) shall be factory-trained instructors experienced in presenting this material.

**3.10 DEMONSTRATION**

- A. Demonstrate complete operating system to owner's representative.
- B. Provide certificate stating that control system has been tested and adjusted for proper operation.

**END OF SECTION**

SECTION 31 10 00 - SITE CLEARING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes removal of surface debris; removal of paving, curbs, sidewalks; removal of trees, shrubs, and other plant life; removal of underground storage tanks; and removal of abandoned utilities.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 PREPARATION

- A. Verify that existing plant life designated to remain is tagged or identified.
- B. Removed materials are to be removed from the site and disposed of in a lawful manner.

3.2 PROTECTION

- A. Locate, identify, and protect utilities from damage that are to remain.
- B. Protect trees, plant growth, and features designated to remain.
- C. Protect benchmarks, survey control points, and existing structures from damage or displacement.

3.3 CLEARING

- A. Clear areas required for access to site and execution of Work.
- B. Remove trees and shrubs indicated and in a manner specified on the drawings or in these specifications. Remove tree and shrub root bulbs in their entirety and to a

maximum root diameter of one inch.

#### 3.4 REMOVAL

- A. Remove debris, rock, and extracted plant life from site to the limits indicated on the drawings.
- B. Remove paving, curbs, and concrete from the site to the limits indicated on the drawings.
- C. Neatly saw cut edges at limits indicated for all pavement, curbs, and walkways to be removed.
- D. Excavate and remove any underground storage tanks and associated plumbing piping, as indicated on the drawings.

#### 3.5 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, relandscaped, or regraded, without mixing with foreign materials for use in finish grading.
- B. Stockpile on site and protect from erosion.
- C. Remove excess topsoil not intended for reuse, from site.

END OF SECTION

SECTION 31 23 00 - EXCAVATION AND FILL

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes excavating for building foundations, roads, parking areas, site grading, slabs-on-grade, landscaping areas, and for site structures.
- B. Related Sections:
  - 1. Section 31 23 16.13 - Trenching.

1.2 REFERENCES

- A. The project Soils Report and any supplements to the Soils Report.
- B. Local utility standards when working within 24 inches of the respective utility lines.

PART 2 PRODUCTS

- A. Bio-Retention Soils
  - 1. Permeable Class II Aggregate Base or crushed drain rock.
  - 2. Planting soil is 60% sand, 40% compost mix allowing 5"/hour percolation.

PART 3 EXECUTION

3.1 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.

3.2 EXCAVATING

- A. Underpin adjacent structures which may be damaged by excavating work.
- B. Excavate subsoil to accommodate building foundations, slabs-on-grade, paving and site structures.

MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT  
San Mateo-Foster City School District  
Project No. 2021005.04

- C. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity; perform compaction in accordance with Section 31 23 23.13 and 31 23 16.13.
- D. Slope banks with machine to angle of repose or less until shored.
- E. Do not interfere with 45 degree bearing splay of foundations.
- F. Grade top perimeter of excavating to prevent surface water from draining into excavation.
- G. Hand trim excavation. Remove loose matter.
- H. Remove lumped subsoil, boulders, and rock in accordance with the provisions of the Soils Report and any supplements to the Soils Report.
- I. Notify Architect/Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume Work.
- J. Correct areas over excavated with backfill and compact replacement as specified for authorized excavation.
- K. Remove excess excavated material from site.

3.3 FIELD QUALITY CONTROL

- A. The project Soils Engineer shall provide testing and inspection services.

3.4 PROTECTION

- A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.
- B. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

END OF SECTION

## SECTION 312316 – TRENCHING

### PART 1 GENERAL

#### 1.1 SUMMARY

- A. Section includes excavating trenches for utilities from outside building to final connection point or public right-of-way or utility; compacted fill from top of utility bedding to subgrade elevations; and backfilling and compaction.
- B. Related Sections:
  - 1. Section 03 30 00 – Cast-in-Place Concrete.

#### 1.2 DEFINITIONS

- A. Utility: Any buried pipe, duct, conduit, or cable.

#### 1.3 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

#### 1.4 COORDINATION

- A. Section 01 06 00 - Regulatory Requirements.
- B. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.
- C. Verify elevations of existing facilities prior to placing new Work.

### PART 2 PRODUCTS

#### 2.1 FILL MATERIALS

- A. Fill and Structural Fill shall be: As specified in the project Soils Report and any supplements to the Soils Report.

#### 2.2 ACCESSORIES

- A. Filter Fabric: Non-biodegradable, woven as manufactured by TC Mirafi, Tenax Corp., Tensar Earth Technologies, Inc. or equal.

## PART 3 EXECUTION

### 3.1 LINES AND GRADES

#### A. Grades

1. Pipes shall be laid true to the lines and grades indicated.
2. The grade alignment of the pipe shall be maintained by the use of a string line parallel with the grade line and vertically above the centerline of the pipe. This line shall be established on level batter boards at intervals of not more than 25 feet. Batter boards shall span the trench and be rigidly anchored to substantial posts driven into the ground on each side of the trench. Three adjacent batter boards must be set before laying pipe to provide a check on the grades and line. Elevation and position of the string line shall be determined from the elevation and position of offset points or stakes located along the pipe route. Pipe shall not be laid using side lines for line or grade.
3. As an alternative means of establishing alignment and grade, a "Laser-Beam" instrument may be utilized with a competent operator.

#### B. Location of Pipe Lines:

1. The location and approximate depths of the proposed pipe lines are shown on the Drawings.
2. An underground locate service shall be enlisted to discover the location of existing utilities regardless if they are shown on the drawings.
3. The Architect/Engineer reserves the right to make changes in lines, grades, and depths of pipe lines and manholes when such changes are necessary.

### 3.2 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Protect plant life, lawns, and other features remaining as a portion of final landscaping.
- C. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- D. Maintain and protect above and below grade utilities which are to remain.
- E. Cut out soft areas of subgrade not capable of compaction in place. Backfill and compact to density equal to or greater than requirements for subsequent backfill material.

### 3.3 EXCAVATING

- A. Excavate subsoil required for utilities.

MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT  
San Mateo-Foster City School District  
Project No. 2021005.04

- B. Cut trenches sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work.
- C. Do not interfere with 45 degree bearing splay of foundations.
- D. Hand trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.
- E. Remove lumped subsoil, boulders, and rock as directed by the Soils Engineer or other inspector.
- F. Correct over excavated areas with backfill and compact replacement as specified for authorized excavation.
- G. Stockpile excavated material on site. Remove excess material not being used from site.

### 3.4 TRENCHING

- A. Excavations:
  - 1. Excavation shall be dug so that the pipe can be laid and jointed properly. The trench shall be made so that the pipe can be laid to the alignment and depth as shown on the Drawings, and it shall be excavated only so far in advance of pipe laying as permitted by the Architect/Engineer. The excavation shall not be more than two feet wider at the bottom than the outside diameter of the pipe or structure. If there is no interference with construction, or adjacent property, and if soil permits, the Contractor at his own expense shall be permitted to slope the side walls of the excavation starting at a point two (2) feet above the top of pipe.
  - 2. The trench shall be excavated to the depth required so as to provide a uniform and continuous bearing and support for the pipe on bedding material at every point between joints, except where pipe slings or other lifting tackle are withdrawn.
  - 3. Excavation Below Grade:
    - 1) Where excavation indicates that the subsurface materials at the bottom of the trench are in a loose or soft state, the Contractor shall be advised to excavate to a depth where suitable material is encountered, as directed by the Architect/Engineer.
    - 2) Where the bottom of the trench has been excavated by mistake to a greater depth than required, the Contractor shall refill this area using approved material. No additional compensation shall be given to the Contractor. Refilling with earth to bring the bottom of the trench to the proper grade will not be permitted.
  - 4. Excavation within 24 inches of existing utilities shall be governed by specifications of the Owner of the respective utility. The Contractor shall obtain these specifications and follow the same at no extra cost.
  - 5. Excavation and shoring shall adhere to the requirements and safety standards set

by OSHA.

- B. Trenching in Advance of Pipe Laying: The trench for the pipe lines shall not be opened for a distance of more than 200 feet at any one time, unless authorized by the Architect/Engineer. At no time will the Contractor be permitted to leave more than 50 feet of trench open at the end of a working day. Adequate protection of open trench shall be provided by the Contractor and the Contractor shall be responsible therefore.

### 3.5 SHEETING AND BRACING

- A. General:
  - 1. Sheeting and bracing of all excavations shall conform to the latest statutes of the State of California governing safety of workers in the construction industry. When necessary, in the opinion of the Contractor, adequate sheeting and bracing shall be installed to prevent ground movement that may cause damage or settlement to adjacent structures, pipelines and utilities. Any damage due to settlement because of failure to use sheeting or because of inadequate bracing, or through negligence or fault of the Contractor in any other manner, shall be repaired at the Contractor's expense.
  - 2. Sides of trenches in unsuitable, loose or soft material, five feet or more in depth, shall be shored, sheeted, braced, sloped, or otherwise supported by means of sufficient strength to protect employees working within them.
- B. Sheeting Requirements:
  - 3. Where excavations are made with vertical sides which require supporting, the sheeting and bracing shall be of sufficient strength to sustain the sides of the excavations and to prevent movement which could in any way injure the Work, or adjacent structures, or diminish the working space sufficiently to delay the Work. Special precautions shall be taken where there is additional pressure due to the presence of other structures.
  - 4. It shall be the Contractor's responsibility to select sheeting and bracing of sufficient dimensions and strength and type to adequately support the sides of trenches and excavations.
  - 5. Sheeting and bracing shall be removed before the completion of the Work.

### 3.6 BACKFILLING

- A. Backfill trenches to contours and elevations shown on the drawings.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, or spongy subgrade surfaces.
- C. Fill materials shall be as specified in the Soils Report and any supplements to the Soils Report.

MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT  
San Mateo-Foster City School District  
Project No. 2021005.04

- D. Employ a placement method that does not disturb or damage utilities in trench. Jetting of backfill materials to achieve compaction shall not be permitted.
- E. Maintain optimum moisture content of fill materials to attain required compaction density.
- F. Remove surplus fill materials from site.

3.7 TOLERANCES

- A. Section 01 40 00 - Quality Requirements.
- B. Top Surface of Backfilling Under Paved Areas: Plus or minus 0.05 feet from required elevations.
- C. Top Surface of General Backfilling: Plus or minus 1/10 feet from required elevations.

3.8 FIELD QUALITY CONTROL

- A. Compaction testing will be performed by the project Soils Engineer.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.

3.9 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 - Execution and Closeout Requirements.
- B. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION

SECTION 33 11 16 - SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes pipe and fittings for site water line including domestic water line, fire water line, and valves and fire hydrants.
- B. Related Sections:
  - 1. Section 31 23 00 - Excavation and Fill.
  - 2. Section 31 23 16.13 - Trenching.

1.2 REFERENCES

- A. ASME B16.18 (American Society of Mechanical Engineers) - Cast Copper Alloy Solder Joint Pressure Fittings.
- B. ASME B16.22 (American Society of Mechanical Engineers) - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- C. ASTM B88 - Seamless Copper Water Tube.
- D. ASTM D1785 - Poly (VinylChloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120.
- E. ASTM D2241 - Poly (VinylChloride) (PVC) Plastic Pipe(SDR-PR).
- F. ASTM D2466 - Poly (VinylChloride) (PVC) Plastic Pipe Fittings, Schedule 80.
- G. ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
- H. ASTM D3139 - Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.
- I. ASTM D3035 - Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.
- J. AWS A5.8 (American Welding Society) - Brazing Filler Metal.
- K. AWWA C104 (American Water Works Association) - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
- L. AWWA C105(American Water Works Association) - Polyethylene Encasement for Ductile Iron Piping for Water and Other liquids.
- M. AWWA C111 (American Water Works Association) - Rubber- Gasket Joints for Ductile Iron and Grey-Iron Pressure Pipe and Fittings.

## MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT

San Mateo-Foster City School District

Project No. 2021005.04

- N. AWWA C151 (American Water Works Association) - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
- O. AWWA C500 (American Water Works Association) - Gate Valves, 3 through 48 in NPS, for Water and Sewage Systems.
- P. AWWA C502 (American Water Works Association) - Dry Barrel Fire Hydrants.
- Q. AWWA C504 (American Water Works Association) - Rubber Seated Butterfly Valves.
- R. AWWA C508 (American Water Works Association) - Swing-Check Valves for Waterworks Service, 2 in through 24 in NPS.
- S. AWWA C509 (American Water Works Association) - Resilient Seated Gate Valves 3 in through 12 in NPS, for Water and Sewage Systems.
- T. AWWA C600 (American Water Works Association) - Installation of Ductile-Iron Water Mains and Appurtenances.
- U. AWWA C606 (American Water Works Association) - Grooved and Shouldered Type Joints.
- V. AWWA C900 (American Water Works Association) - Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 inch through 12 inch, for Water.
- W. AWWA C901 (American Water Works Association) - Polyethylene (PE) Pressure Pipe, Tubing, and Fittings, 1/2 inch through 3 inch, for Water
- X. UL 246 (Underwriters Laboratories, Inc.) - Hydrants for Fire - Protection Service.

### 1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

### 1.4 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements.
- B.
- C. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.
- D. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

- E. Operation and Maintenance Data: Operation and Maintenance Data: Procedures for submittals.

## 1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with the local water supply utility and local fire department.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Deliver and store valves in shipping containers with labeling in place.

## PART 2 PRODUCTS

### 2.1 WATER PIPE

- A. Ductile Iron Pipe: AWWA C151:
  - 1. Fittings: Ductile iron, standard thickness.
  - 2. Joints: AWWA C111, rubber gasket with rods.
- B. Copper Tubing: ASTM B88, Type K, annealed:
  - 1. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.
  - 2. Joints: Compression connection or AWS A5.8, BCuP silver braze.
- C. PVC Pipe: ASTM D1785, Schedule 80, ASTM D2241, SDR-26 for 160 psig pressure rating, SDR-41 for 100 psig rating, SDR-21 for 200 psig rating:
  - 1. Fittings: ASTM D2466, PVC.
  - 2. Joints: ASTM D2855, solvent weld.
  - 3. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Water Service" in large letters.
- D. PVC Pipe: AWWA C900 Class 150:
  - 1. Fittings: AWWA C111, cast iron.
  - 2. Joints: ASTM D3139 compression gasket ring.
  - 3. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Water Service" in large letters.
- E. Polyethylene Pipe: AWWA C901, ASTM D3035, for 160 psig pressure rating:
  - 1. Fittings: AWWA C901, molded or fabricated.
  - 2. Joints: Compression.
  - 3. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Water Service" in large letters.

### 2.2 GATE VALVES - UP TO 3 INCHES

## MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT

San Mateo-Foster City School District

Project No. 2021005.04

- A. Brass or Bronze body, non-rising stem, inside screw, single wedge or disc, IPS ends, with control rod, extension box, and valve key.

### 2.3 GATE VALVES - 3 INCHES AND OVER

- A. AWWA C500, Iron body, bronze trim, non-rising stem with square nut, single wedge, flanged or mechanical joint ends, control rod, extension box, and valve key.

### 2.4 SWING CHECK VALVES - FROM 2 INCHES TO 24 INCHES

- A. AWWA C508, iron body, bronze trim, 45 degree swing disc, renewable disc and seat, flanged ends.

### 2.5 BUTTERFLY VALVES - FROM 2 INCHES TO 24 INCHES

- A. AWWA C504, iron body, bronze disc, resilient replaceable seat, water or lug ends, infinite position lever handle.

### 2.6 FLEXIBLE EXPANSION JOINTS:

- A. Flexible ball joints shall be installed in the locations indicated on the drawings and shall be manufactured of ductile iron conforming to the material properties of ANSI/AWWA C153/A21.53. Flexible joints shall provide protection for shear, bending, and axial expansion. Each flexible ball joint shall be pressure tested against its own restraint to a minimum of 350 psi. MEGALUG joint restraint shall be provided with each mechanical joint connection. All pressure containing parts shall be lined with a minimum of 15 mils of fusion bonded epoxy, conforming to the applicable requirements of ANSI/AWWA C213 and shall be tested with a 1500 volt spark test conforming to stated specification. All flexible ball joints shall be FLEX-TEND DOUBLE BALL, as manufactured by EBAA Iron, Inc., or approved equal.

### 2.7 HYDRANT

- A. Hydrant: Type as required by utility company and local fire department.

### 2.8 BEDDING AND COVER MATERIALS

- A. Bedding: Shall be sand or gravel.
- B. Cover: Shall be sand or gravel.

### 2.9 ACCESSORIES

- A. Concrete for Thrust Restraints: Concrete type specified in Section 32 13 13.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination.
- B. Verify that building service connection and municipal utility water main size, location, and invert are as indicated.

### 3.2 PREPARATION

- A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare pipe connections to equipment with flanges or unions.

### 3.3 BEDDING

- A. Excavate pipe trench in accordance with Section 31 23 16.13 for Work of this Section.
- B. Form and place concrete for pipe thrust restraints at any change of pipe direction. Place concrete to permit full access to pipe and pipe accessories. Provide square footage of thrust restraining bearing on subsoil, as required by AWWA Standards.
- C. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches compacted depth; compact to 95 percent relative compaction.
- D. Backfill around sides and to top of pipe with cover fill, tamp in place and compact to 95 percent relative compaction.
- E. Maintain optimum moisture content of fill material to attain required compaction density.

### 3.4 INSTALLATION - PIPE

- A. Install and test all plumbing piping systems in strict accordance with the California Plumbing Code.
- B. Install in accordance with manufacturer's instructions.
- C. Maintain separation of water main from sewer piping in accordance with the provisions of the Uniform Plumbing Code and local health codes.
- D. Install pipe to indicated elevation to within tolerance of 2 inches.
- E. Route pipe in straight line.
- F. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- G. Install access fittings to permit disinfection of water system performed under Section 33 31 00.
- H. Form and place concrete for thrust restraints at each elbow or change of direction of pipe

main.

- I. Establish elevations of buried piping to ensure not less than 2 feet of cover.
- J. Install trace wire continuous over top of pipe. buried 6 inches above pipe line.
- K. Backfill trench in accordance with Section 31 23 16.13.

### 3.5 INSTALLATION - VALVES AND HYDRANTS

- A. Set valves on solid bearing.
- B. Center and plumb valve box over valve. Set box cover flush with finished grade.
- C. Set hydrants plumb; locate pumper nozzle perpendicular to and facing roadway.
- D. Set hydrants to grade, with nozzles at least 20 inches above ground.

### 3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Flush and disinfect system in accordance with Section 33 31 00.

### 3.7 SERVICE CONNECTIONS

- A. Provide water service to utility company requirements with reduced pressure backflow preventer and water meter with by-pass valves as required by local utility company.

### 3.8 FIELD QUALITY CONTROL

- A. Division 22 – Plumbing: Testing and inspection services
- B. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

END OF SECTION

SECTION 33 13 00 - DISINFECTION OF WATER DISTRIBUTION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes disinfection of potable water distribution system; and testing and reporting results.
- B. Related Sections:
  - 1. Section 33 11 16 – Site Water Utility Distribution Piping.

1.2 REFERENCES

- A. AWWA (American Waterworks Association) B300 - Standard for Hypochlorites.
- B. AWWA (American Waterworks Association) B301 - Standard for Liquid Chlorine.
- C. AWWA (American Waterworks Association) B302 - Standard for Ammonium Sulfate.
- D. AWWA (American Waterworks Association) B303 - Standard for Sodium Chlorite.
- E. AWWA (American Waterworks Association) C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
- F. AWWA (American Waterworks Association) C651 - Standards for Disinfecting Water Mains.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures.
- B. Test Reports: Indicate results comparative to specified requirements.
- C. Procedures, Chemicals, and Treatment Levels: Submit procedures, proposed chemicals, and treatment levels for review.
- D. Certificate: Certify that cleanliness of water distribution system meets or exceeds specified requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents:
- C. Disinfection Report:

# MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT

San Mateo-Foster City School District

Project No. 2021005.04

1. Type and form of disinfectant used.
2. Date and time of disinfectant injection start and time of completion.
3. Test locations.
  4. Name of person collecting samples.
  5. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
  6. Date and time of flushing start and completion.
  7. Disinfectant residual after flushing in ppm for each outlet tested.

## D. Bacteriological Report:

1. Date issued, project name, and testing laboratory name, address, and telephone number.
2. Time and date of water sample collection.
3. Name of person collecting samples.
4. Test locations.
5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
6. Coliform bacteria test results for each outlet tested.
7. Certification that water conforms, or fails to conform, to bacterial standards of local municipality.

## 1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with AWWA C651.
- B. Maintain one copy of each document on site.
- C. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this section with minimum three (3) years documented experience.
- D. Testing Firm: Company specializing in testing and examining potable water systems, certified and approved by the State of California.
- E. Submit bacteriologist's signature and authority associated with testing.

## PART 2 PRODUCTS

### 2.1 DISINFECTION CHEMICALS

- A. Chemicals: As directed by local municipality.

## PART 3 EXECUTION

### 3.1 EXAMINATION

MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT  
San Mateo-Foster City School District  
Project No. 2021005.04

- A. Section 01 30 00 - Administrative Requirements: Coordination.
- B. Verify that piping system has been cleaned, inspected, and pressure tested.
- C. Perform scheduling and disinfecting activity with start-up, water pressure testing, adjusting and balancing, demonstration procedures, including coordination with related systems.

3.2 EXECUTION

- A. Provide and attach required equipment to perform the Work of this section.
- B. Introduce treatment into piping system.
- C. Maintain disinfectant in system for 24 hours.
- D. Flush, circulate, and clean until required cleanliness is achieved; use municipal or domestic water.
- E. Replace permanent system devices removed for disinfection.
- F. Pressure test system to 200 psi. Repair leaks and re-test.
  - 1. After completion of the pipeline installation, including backfill, but prior to final connection to the existing system, conduct, in the presence of the Architect/Engineer, concurrent hydrostatic pressure and leakage tests in accordance with AWWA C600.
  - 2. Provide all equipment required to perform the leakage and hydrostatic pressure tests.
  - 3. The test pressure shall be not less than 200 psi or 50 psi in excess of maximum static pressure, whichever is greater.
  - 4. The hydrostatic test shall be at least a two-hour duration.
  - 5. No pipeline installation will be approved if the pressure varies by more than 5 psi during the duration of the hydrostatic pressure test.
  - 6. Before applying the test pressure, air shall be expelled completely from the section of piping under test. Corporation cocks shall be installed so that the air can be expelled as the pipeline is being filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the tests, the corporation cocks shall be removed and plugged.
  - 7. Slowly bring the piping to the test pressure and allow the system to stabilize prior to conducting the leakage test. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure.
  - 8. All exposed piping, fittings, valves, hydrants, and joints shall be examined carefully during the hydrostatic pressure test. Any damage or defective pipe, fittings, valves, hydrants, or joints that are discovered following the pressure test shall be repaired or replaced with sound material at no cost to the Owner, and test shall be repeated to the satisfaction of the Architect/Engineer.

# MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT

San Mateo-Foster City School District

Project No. 2021005.04

9. No pipeline installation will be approved if the leakage is greater than that determined by the following formula:

$$L = \frac{SD\sqrt{P}}{133,200}$$

L = the allowable, in gallons per hour

S = the length of pipe tested, in inches

D = the nominal diameter of the pipe, in inches

p = the average test pressure during the leakage test, in pounds per square inch (gauge)

- G. If leakage exceeds the rate as determined in Paragraph 9 above, locate the source and make repairs as necessary to the satisfaction of the Architect/Engineer.

## 3.3 FIELD QUALITY CONTROL

A. Section 01 45 00 - Quality Control.

B. Disinfection, Flushing, and Sampling:

1. Disinfect the pipeline installation in accordance with AWWA C651, except that liquid chlorine shall not be used.
2. Upon completion of the retention period required for disinfection, flush the pipeline until the chlorine concentration of water leaving the pipeline is no higher than that generally prevailing in the existing system or is acceptable for domestic use.
3. Dispose of the chlorinated water in conformance with all Federal, State and Municipal laws, ordinances, rules, and regulations. If there is any possibility that the chlorinated discharge will cause damage to the environment, then a neutralizing chemical shall be applied to the chlorinated water to neutralize thoroughly the chlorine residual remaining in the water.
4. After final flushing and before the pipeline is connected to the existing system, or placed in service, the Contractor shall employ an approved independent testing laboratory to sample, test and certify the water for conformance with the purity standards of the local municipality, the United States Environmental Protection Agency, and the Federal Clean Water Act Health Standards. The Architect/Engineer shall be furnished with a copy of such certification by the testing laboratory, and no installation will be approved without such certification.

END OF SECTION

SECTION 33 40 00 - STORM DRAINAGE UTILITIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes gravity site storm sewerage drainage piping, fittings and accessories, and bedding; bio-retention facilities connection of drainage system to municipal sewers and on-site points of connection; and catch basins, area drains, and cleanouts.
- B. Related Sections:
  - 1. Section 31 23 00 - Excavation.
  - 2. Section 31 23 16.13 - Trenching.
  - 3. Section 33 49 13 - Storm Drainage Manholes, Frames, and Covers.

1.2 REFERENCES

- A. AASHTO M36 (American Association of State Highway and Transportation Officials) - Metallic (Zinc or Aluminum) Coated Corrugated Steel Culverts and Underdrains.
- B. ASTM A74 - Cast Iron Soil Pipe and Fittings.
- C. ASTM C14 - Concrete Sewer, Storm Drain, and Culvert Pipe.
- D. ASTM C76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- E. ASTM C425 - Compression Joints for Vitrified Clay Pipe and Fittings.
- F. ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
- G. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- H. ASTM D2729 - Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- I. ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
- J. ASTM D3033 - Type PSP Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- K. ASTM D3034 - Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- L. ASTM D7613 - Polypropylene Liner.

# MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT

San Mateo-Foster City School District

Project No. 2021005.04

M. Class II Permeable Materials – To meet the requirements of Caltrans Standard Specification 68-1.025.

N. ASTM D6707 – Mirafi Filter Fabric.

## 1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data indicating pipe, pipe accessories, and fittings.

C. Manufacturer's Installation Instructions: Submit special procedures required to install Products specified.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

## 1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements.

B. Project Record Documents:

1. Accurately record actual locations of pipe runs, connections, catch basins, cleanouts, and invert elevations.
2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

C. Operation and Maintenance Data: Procedures for submittals.

## 1.5 COORDINATION

A. Section 01 50 00 - Temporary Facilities and Controls.

B. Coordinate the Work with termination of storm sewer connection outside building, trenching, connection to foundation drainage system, municipal sewer utility service, and on-site points of connection.

## PART 2 PRODUCTS

### 2.1 MATERIALS

A. Sewer Pipe Materials:

1. Cast Iron Pipe: ASTM A74, Service type, inside nominal diameter of 4 to 12 inches, bell and spigot end.

## 2 - 3 40 00 STORM DRAINAGE UTILITIES

MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT  
San Mateo-Foster City School District  
Project No. 2021005.04

2. Cast Iron Pipe Joint Device: ASTM C564, rubber gasket joint devices.
  3. Concrete Pipe: ASTM C14, Class 3; unreinforced; inside nominal diameter of 10 inches, bell and spigot end joints.
  4. Concrete Pipe Joint Devices: ASTM C443, rubber compression gasket joint.
  5. Reinforced Concrete Pipe: ASTM C76, Class III or IV; inside nominal diameter of 12 to 60 inches, bell and spigot end joints.
  6. Reinforced Concrete Pipe Joint Device: ASTM C443, rubber compression gasket joint.
  7. Plastic Pipe: ASTM D2751, SDR 26, Acrylonitrile-Butadiene-Styrene (ABS) material; inside nominal diameter of 4 to 24 inches, bell and spigot style solvent sealed joint end.
  8. Plastic Pipe: ASTM D3034, Type PSM, Poly(Vinyl Chloride) (PVC) SDR-26 material; inside nominal diameter of 4 to 24 inches, bell and spigot style rubber ring sealed gasket joint.
  9. Corrugated Steel Pipe: AASHTO M36; nominal diameter of 12 to 60 inches, end joints; helical lock seam; coated inside and out with 0.050 inch thick bituminous coating.
  10. Corrugated Steel Pipe Coupling Bands: Galvanized steel, 0.052 inches thick x 10 inches wide; connected with two neoprene "O" ring gaskets and two galvanized steel bolts.
  11. Perforated Plastic Pipe: ASTM D3034, PVC with perforations.
- B. Liner:
1. 30 mil polypropylene liner.

## 2.2 ACCESSORIES

- A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.
- B. Grout: Specified in Section 03 30 00.

## 2.3 CATCH BASINS AND PLANT AREA DRAINS

- A. NEW - As specified on the drawings.
- B. EXISTING – Adjust as specified on the drawings. For inlets in pedestrian areas,

MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT  
San Mateo-Foster City School District  
Project No. 2021005.04

ensure grates are ADA compliant. Replace non-compliant grates as necessary.

2.4 CLEANOUTS

- A. As specified on the drawings.

2.5 BEDDING AND COVER MATERIALS

- A. Bedding: Fill as specified by pipe manufacturer and approved by Soils Engineer.
- B. Cover: Fill as specified in the project Soils Report and any supplements to the Soils Report.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.

3.2 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with bedding material.
- B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

3.3 BEDDING

- A. Excavate pipe trench in accordance with Section 31 23 16.13 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.
- B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches compacted depth.
- C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

- A. Install and test all plumbing piping systems in strict accordance with the California Plumbing Code.

4 - 3 40 00 STORM DRAINAGE UTILITIES

- B. Install in accordance with manufacturer's instructions.
- C. Install pipe, fittings, and accessories in accordance with ASTM D2321. Seal joints watertight.
- D. Lay pipe to slope gradients noted on drawings with maximum variation from true slope of 1/8 inch in 10 feet.
- E. Perforated pipe shall be installed with perforations down.
- F. Install trench fill at sides and over top of pipe. Provide top cover to minimum compacted thickness of 12 inches, compact to 95 percent.
- G. Refer to Section 31 23 23.13 for backfilling and compacting requirements. Do not displace or damage pipe when compacting.
- H. Refer to Section 33 49 13 for manhole requirements.

### 3.5 INSTALLATION - CATCH BASINS AND CLEANOUTS

- A. Set precast structures so that they firmly and fully bear on 6" crushed stone bedding.
- B. Form bottom of excavation clean and smooth to correct elevation.
- C. Form and place Cast-In-Place Concrete base pad, with provision for storm sewer pipe end sections.
- D. Level top surface of base pad; sleeve concrete shaft sections to receive storm sewer pipe sections.
- E. Establish elevations and pipe inverts for inlets and outlets as indicated.
- F. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

### 3.6 INSTALLATION – BIO-RETENTION FACILITIES

- A. Form bottom of excavation smooth to correct elevation.
- B. Install welded seam 30 mil polypropylene liner in basin bottom.
- C. Install Class II permeable material minimum 2" under perforated pipe.
- D. Install remainder of Class II permeable material.
- E. Install Mirafi Filber Fabric over permeable materials.
- F. Install top soil.

3.7 FIELD QUALITY CONTROL

- A. Division 22 – Plumbing: Testing and inspection services.
- B. Request inspection prior to and immediately after placing aggregate cover over pipe.
- C. Compaction testing will be performed in accordance with ASTM D1557.
- D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to owner.

3.8 INSTALLATION, FLUSHING & CLEANING

- A. All new pipe installed and existing pipe connected to shall be flushed, cleaned and videoed for at least 200 feet downstream, or to the next downstream inlet or manhole, whichever is farther, of last point of connection to ensure clean and functioning system.

3.9 PROTECTION OF FINISHED WORK

- A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.
  - 1. Take care not to damage or displace installed pipe and joints during construction of pipe supports, backfilling, testing, and other operations.
  - 2. Where pipe is damaged or displaced, take remedial measures as directed by the Architect/Engineer including, but not limited to, retesting of joints, relaying pipe or replacing pipe. Provide remedial measures at no additional cost to the Owner.

END OF SECTION

SECTION 33 49 13 - STORM DRAINAGE MANHOLES, FRAMES, AND COVERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Modular precast concrete manhole sections with tongue-and-groove joints, covers, anchorage, and accessories.
- B. Related Sections:
  - 1. Section 31 23 00 - Excavation and Fill.

1.2 REFERENCES

- A. ACI (American Concrete Institute) 318 - Building Code Requirements for Reinforced Concrete.
- B. ASTM A48 - Gray Iron Castings.
- C. ASTM A536 - Ductile Iron Castings.
- D. ASTM C39 - Test Method for Compressive Strength of cylindrical Concrete Specimens.
- E. ASTM C478 - Precast Reinforced Concrete Manhole Sections.
- F. ASTM C923 - Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.

1.3 DESIGN REQUIREMENTS

- A. Equivalent strength shall be based on structural design of reinforced concrete as outlined in ACI 318.
- B. Design of lifting devices for precast structures shall conform to ASTM C 913.
- C. Design of joints for precast structures shall conform to ASTM C 913.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate manhole locations, elevations, piping, and sizes and elevations of penetrations.
- C. Product Data: Submit manhole covers, component construction, features, configuration,

and dimensions.

#### 1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with local municipality Public Work's standard.
- B. Maintain one copy of each document on site.

#### 1.6 DELIVERY, STORAGE AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Comply with precast concrete manufacturer's instructions for unloading, storing and moving precast manholes and drainage structures.
- C. Store precast concrete manholes and drainage structures to prevent damage to the Owner's property or other public or private property, and any property so damaged shall be repaired at the Contractor's expense.
- D. Clearly mark each precast structure by indentation or waterproof paint to indicate the date of manufacture, manufacturer and identifying symbols and/or numbers shown on the Contract Drawings to indicate its intended use.

### PART 2 PRODUCTS

#### 2.1 MANHOLES, FRAMES, AND COVERS

- A. As specified by the local municipality.

#### 2.2 COMPONENTS

- A. As specified by the local municipality.

#### 2.3 CONFIGURATION

- A. As specified by the local municipality.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and Project Conditions.
- B. Verify items provided by other sections of Work are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into Work.

- D. Verify excavation for manholes is correct.

### 3.2 PREPARATION

- A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.
- B. Do not install structures under site conditions known to result in loads heavier than that for which the structure was designed.
- C. Inspect precast concrete structures immediately prior to placement in the excavation to verify that they are internally clean and free from damage. Remove damaged units from the construction site and replaced, at no additional cost to the Owner.

### 3.3 INSTALLATION

- A. Excavation and Backfill:
  - 1. Excavate for manholes and drainage structures in accordance with Section 31 23 00 in the location and to depth shown. Provide clearance around the sidewalls of the structure as required for construction.
  - 2. If groundwater is encountered, prevent accumulation of water in excavations. Place manholes or drainage structures in a dry trench.
  - 3. Where the possibility exists of a watertight structure becoming buoyant in a flooded excavation, take necessary steps to avoid flotation of the structure.
- B. Place base pad, trowel top surface level.
- C. Place manhole sections plumb and level, trim to correct elevations, anchor to base pad.
- D. Backfill excavations for manholes and drainage structures in accordance with Section 31 23 00.
- E. Form and place manhole cylinder plumb and level, to correct dimensions and elevations.
- F. Cut and fit for pipe.
- G. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as required.
- H. Set cover frames and covers level without tipping, to correct elevations.
- I. Coordinate with other sections of Work to provide correct size, shape, and location.

### 3.4 PRECAST CONCRETE MANHOLE AND DRAINAGE STRUCTURE INSTALLATION

- A. To ensure safety, lift precast structures at the lifting points designated by the manufacturer.

## MEADOW HEIGHTS ELEMENTARY SCHOOL HVAC REPLACEMENT

San Mateo-Foster City School District

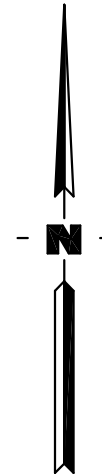
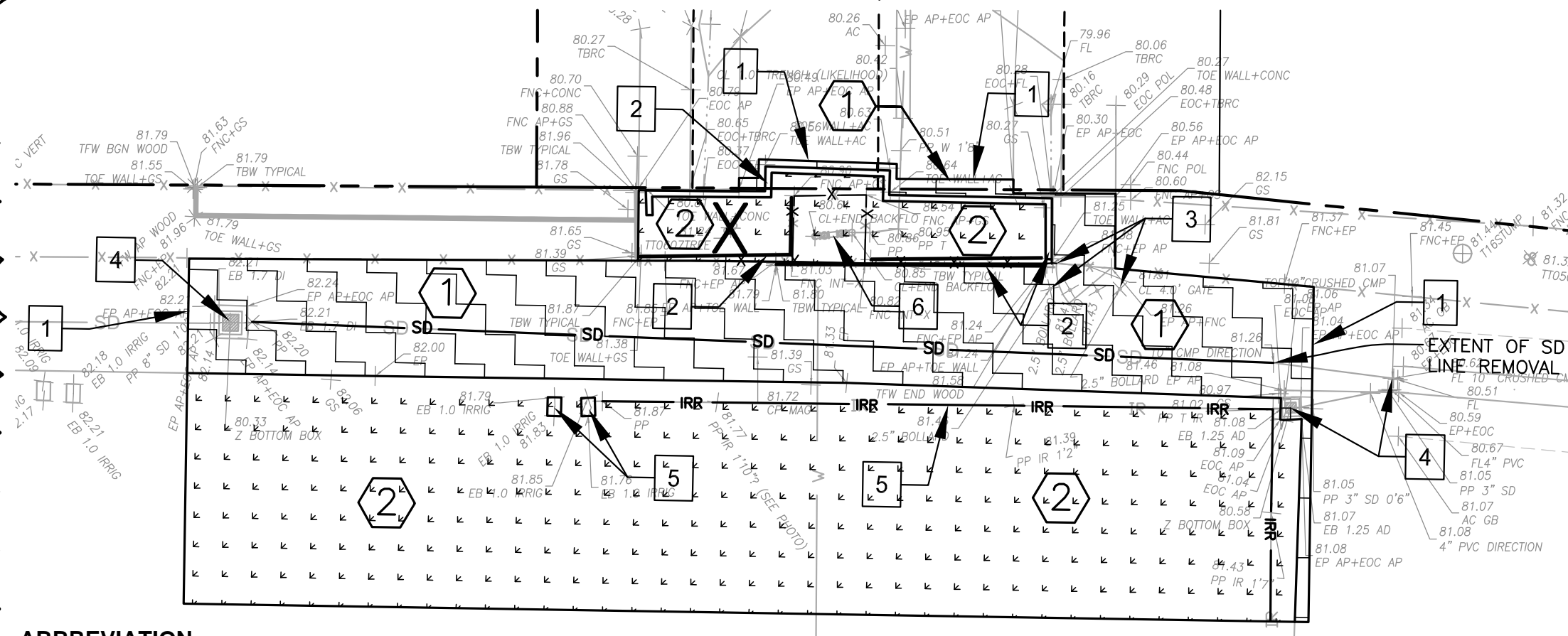
Project No. 2021005.04

- B. When lowering manholes and drainage structures into the excavations and joining pipe to the units, take precautions to ensure that the interior of the pipeline and structure remains clean.
- C. Set precast structures so that they firmly and fully bear on 6" crushed stone bedding, compacted in accordance with the provisions of Sections 31 23 00 and 31 23 23.13, or on other support system shown on the Contract Drawings.
- D. Assemble multi-section structures by lowering each section into the excavation. Lower, set level, and firmly position the base section before placing additional sections.
- E. Ensure joint integrity by removing all foreign materials from joint surfaces and verifying that sealing materials are placed properly. Avoid misalignment by using guide devices affixed to the lower section.
- F. Joint sealing materials may be installed at the site or at the manufacturer's plant.
- G. Verify that manholes and drainage structures installed satisfy required alignment and grade.
- H. Remove knockouts or cut structure to receive piping so as not to create openings more than that required to receive pipe. Fill annular space with mortar.
- I. Cut pipe to finish flush with interior of structure.
- J. Shape inverts through manhole as shown on the Contract Drawings.

### 3.5 FIELD QUALITY CONTROL

- A. Section 01 45 00 - Quality Control: Testing and inspection services.
- B. Field tests will be used to evaluate and approve cast-in-place concrete in accordance with Section 03 30 00.
- C. Vertical Adjustment of Existing Manhole and Drainage Structures:
  - 1. Where required, adjust the top elevation of existing manholes and drainage structures to suit finished grades shown on the Contract Drawings.
  - 2. Reset existing frames, grates and covers, carefully removed, cleaned of all mortar fragments, to the required elevation in accordance with the requirements specified for installation of castings.
  - 3. Remove the concrete so as not to damage the existing vertical reinforcing bars when removal of an existing concrete wall is required. The vertical bars shall be cleaned of all concrete and bent into the new concrete top slab or spliced to required vertical reinforcement, as shown on the Contract Drawings.
  - 4. Clean and apply sand-cement bonding compound on all existing concrete surfaces to receive cast-in-place concrete. Sand-cement bonding compound and its application shall be in accordance with Section 03 30 00.
  - 5.

END OF SECTION



( IN FEET )  
1 inch = 10 ft.  
GRAPHIC SCALE

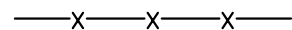
#### ABBREVIATION

AC ASPHALT CONCRETE  
AB AGGREGATE BASE  
BFP BACK FLOW PREVENTOR  
INV INVERT  
ME MATCH EXISTING ELEVATION  
SD STORM DRAIN

#### LEGEND

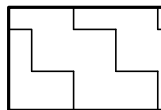


TREE TO BE REMOVED  
REMOVE ALL ROOTS



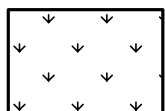
FENCE/GATES/FOUNDATIONS TO BE REMOVED

1

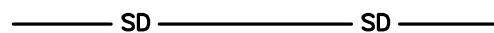


ASPHALT PAVING & AGGREGATE BASE ROCK TO  
BE REMOVED, REMOVE HEADER BOARD TYP.

2



SHRUBS AND/OR LANDSCAPING TO BE REMOVED. GRUB  
OUT ALL VEGETATION/REMOVE BARK OR WOOD CHIPS.  
REMOVE PLANTER BOXES. REMOVE ANY IRRIGATION LINES  
OR VALVES & RELOCATE PER DISTRICT DIRECTION.



STORM SEWER LINES AND STRUCTURES TO BE REMOVED



IRRIGATION LINES AND VALVE BOXES TO BE REMOVED  
(SALVAGE COPPER & RETURN TO DISTRICT), S.L.D.

- 1 SAWCUT ASPHALT OR REMOVE  
CONCRETE TO NEAREST CONTROL JOINT
- 2 REMOVE WOOD PLANTER BOXES &  
HEADER BOARD
- 3 FENCE & BOLLARDS TO REMAIN
- 4 STORM LINES, DRAIN INLET, SDMH, SDCO  
TO REMAIN
- 5 REMOVE IRRIGATION LINES, VALVES & BOXES.  
RELOCATE AS DIRECTED BY DISTRICT
- 6 REMOVE BACKFLOW PREVENTOR



## DEMOLITION PLAN

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San Jose, CA., 95113

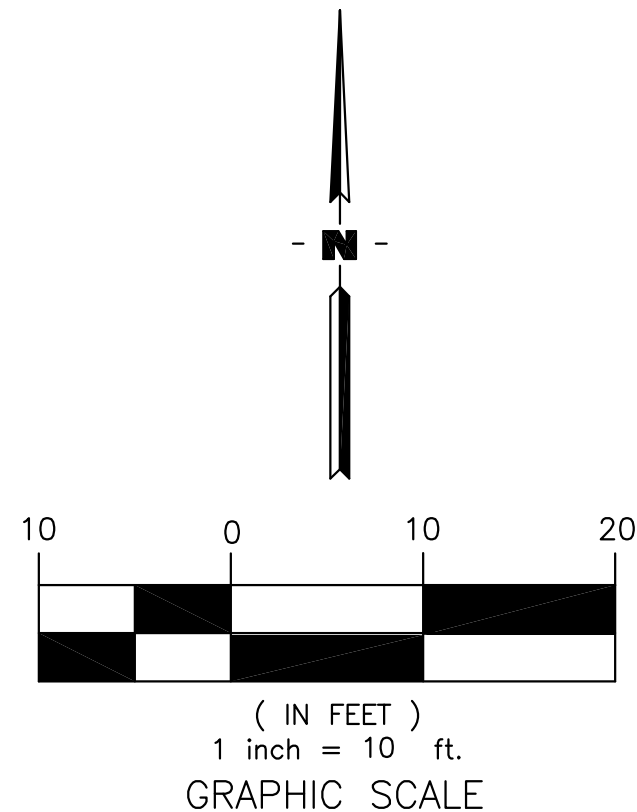
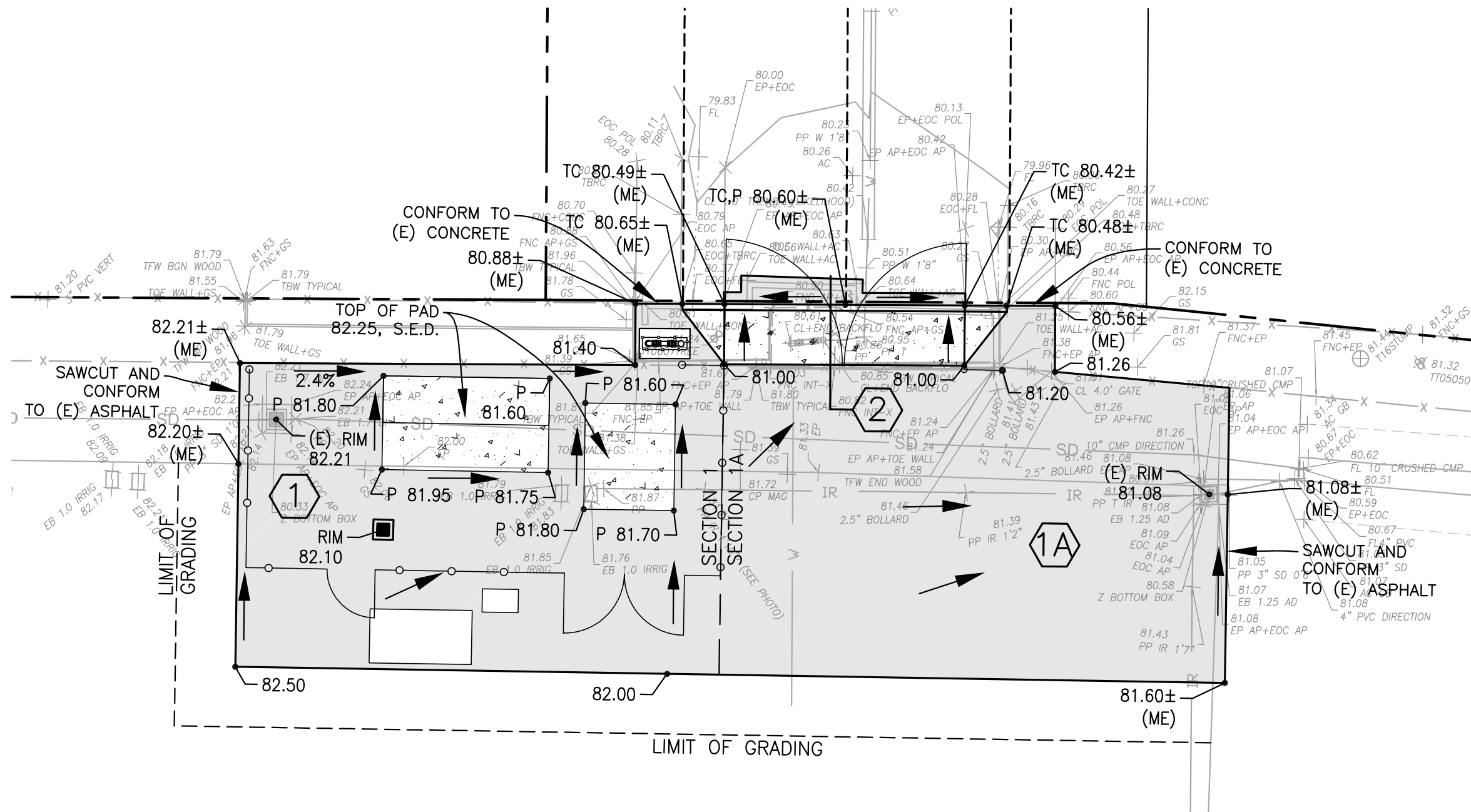
tel: (408) 300 - 5160  
fax: (408) 300 - 5121

MEADOW HEIGHTS ELEMENTARY SCHOOL  
- HVAC REPLACEMENT

SAN MATEO-FOSTER CITY SCHOOL DISTRICT

FILE NO.: 41-26  
APPL NO.: 01-119554  
JOB NO.: 2021005.04  
DATE: 11/24/2021

SHEET  
**AD1-C1.1**



GRADING & DRAINAGE PLAN
SCALE: 1"=10'

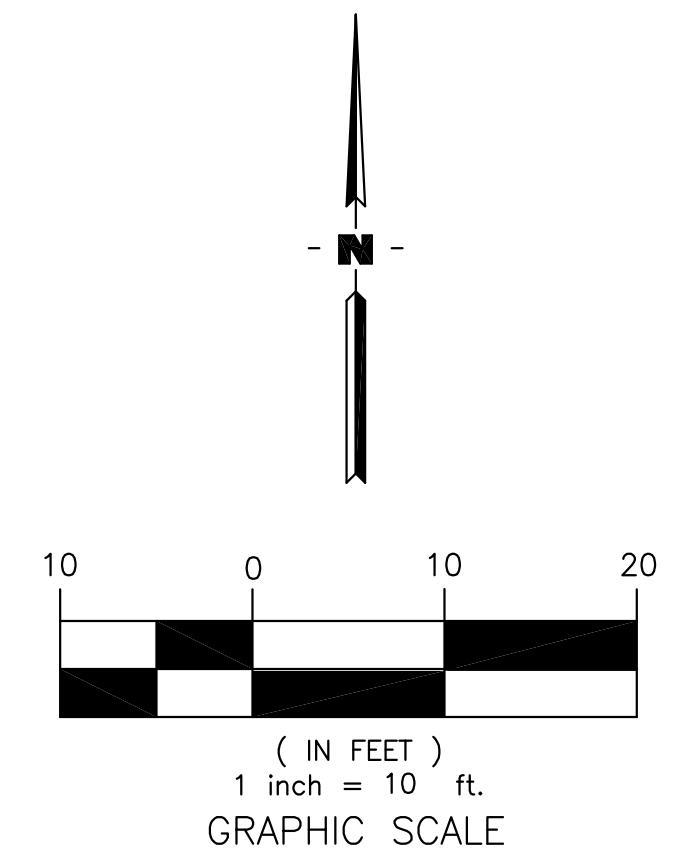
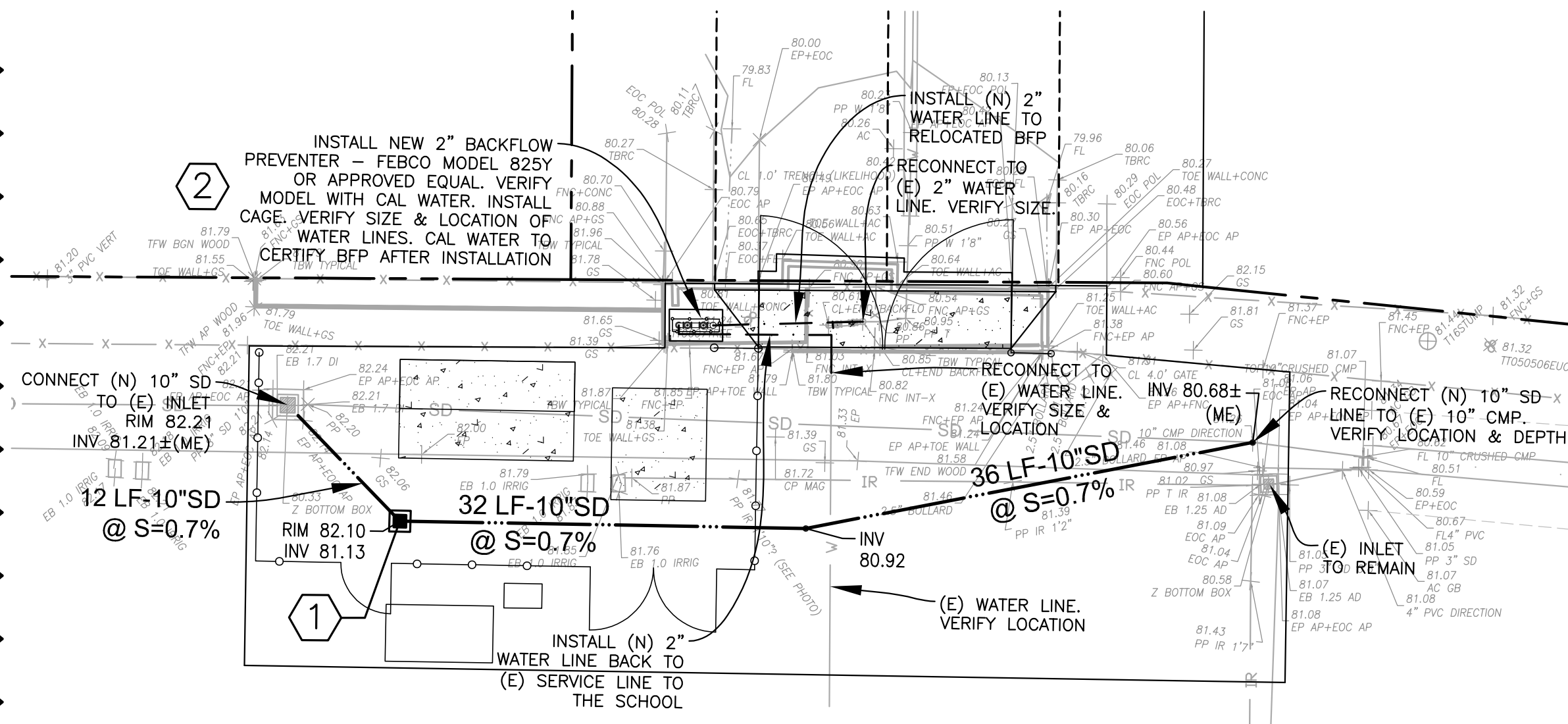
LEGEND

- 1A ASPHALT PAVING, SEE DETAIL 1A/AD1-C4.1
1 ASPHALT PAVING, SEE DETAIL 1/AD1-C4.1
2 DRIVEWAY, SEE DETAIL 2/AD1-C4.1

GRADING & DRAINAGE PLAN



Table with project information including aedis architects logo, project name (MEADOW HEIGHTS ELEMENTARY SCHOOL - HVAC REPLACEMENT), file number (41-26), sheet number (AD1-C2.1), and contact information for San Jose, CA.



## UNDERGROUND UTILITIES PLAN

SCALE: 1"=10'

### LEGEND

- ① 12" STORM INLET, SEE DETAIL 3/AD1-C4.1
- ② REDUCED PRESSURE BACKFLOW PREVENTER, SEE DETAIL 4/AD1-C4.2

### NOTE

CONTRACTOR IS ADVISED TO VERIFY ALL INVERT ELEVATIONS AT POINTS OF CONNECTION TO EXISTING UTILITIES PRIOR TO CONSTRUCTION OF, OR EXCAVATION FOR, ALL NEW UTILITIES. IF A CONFLICT IS DETERMINED, THE ENGINEER SHALL BE NOTIFIED FOR DETERMINATION OF REMEDY. – SEE UNDERGROUND NOTES.

A

## UNDERGROUND UTILITIES PLAN



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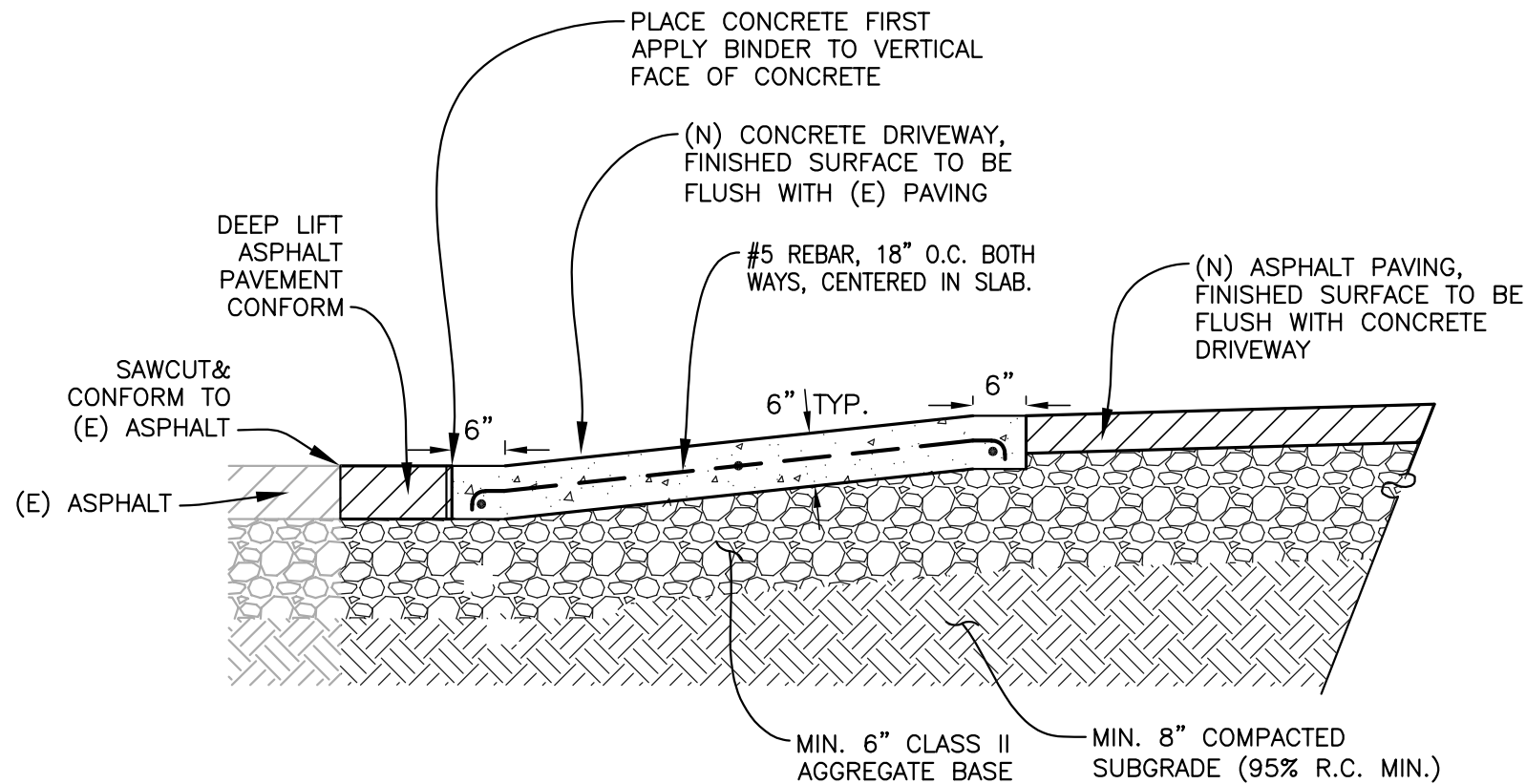
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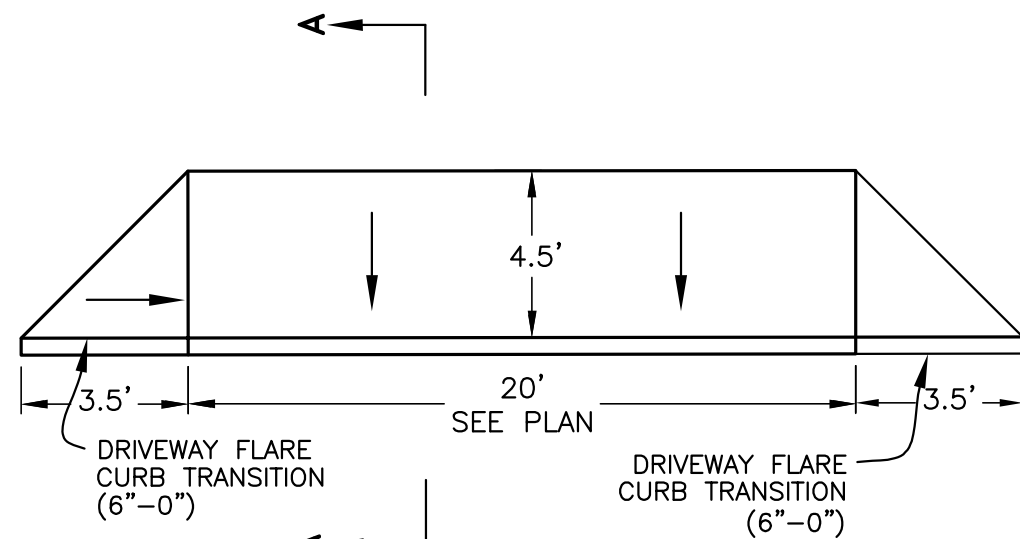
MEADOW HEIGHTS ELEMENTARY SCHOOL  
- HVAC REPLACEMENT  
SAN MATEO-FOSTER CITY SCHOOL DISTRICT

FILE NO.: 41-26  
APPL NO.: 01-119554  
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DATE: 11/24/2021

SHEET  
**AD1-C3.1**



**SECTION A-A VIEW**

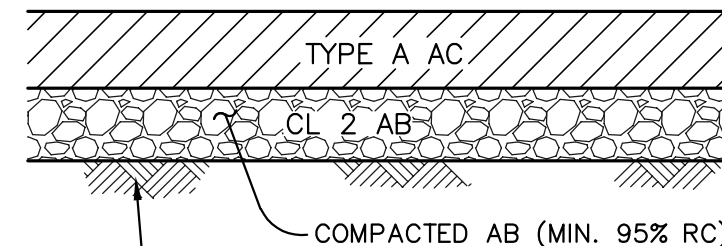


**PLAN VIEW**

**2 DRIVEWAY DETAIL**

NOT TO SCALE

SECTION	TYPE A AC	CL 2 BASE
1A FIRE LANE	3.5"	12.0"
1 PEDESTRIAN	3.0"	6.0"



MIN. 8" COMPACTED  
SUBGRADE AT MIN. 95% R.C.

NOT TO SCALE

**1 1A AC PAVEMENT SECTION**

JENSEN PRECAST (PHONE: 800-843-9569)  
12" DROP INLET MODEL 1212-HDI WITH  
ADJUSTABLE FRAME AND GRATE.  
LABEL INLET "NO DUMPING FLOWS TO BAY"

**3 STORM INLET**



**DETAILS**

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fax: (408) 300 - 5121

MEADOW HEIGHTS ELEMENTARY SCHOOL  
- HVAC REPLACEMENT  
SAN MATEO-FOSTER CITY SCHOOL DISTRICT

FILE NO.: 41-26  
APPL NO.: 01-119554  
JOB NO.: 2021005.04  
DATE: 11/24/2021

SHEET  
**AD1-C4.1**



- NOT TO SCALE

## 4

# REDUCED PRESSURE BACKFLOW PREVENTER



## DETAILS

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**AD1-C4.2**

GENERAL SHEET NOTES

- A BUILDINGS ARE UNSPRINKLERED, TYPE V-B CONSTRUCTION UNLESS OTHERWISE NOTED
- B NO DEMOLITION SHALL BEGIN UNTIL PLANS INCLUDING THE DEMOLITION WORK HAVE BEEN APPROVED BY DSA
- C CONTRACTOR SHALL MAINTAIN FIRE LANE ACCESS THROUGHOUT PROJECT.
- D DO NOT INTERRUPT EXISTING UTILITY SERVICES SERVING OCCUPIED OR USED FACILITIES, EXCEPT WHEN AUTHORIZED IN WRITING BY AND COORDINATED WITH THE OWNER.
- E PROTECT EXISTING & NEW STRUCTURES, UTILITIES, SIDEWALKS, PAVEMENTS, TREES AND SHRUBS FROM DAMAGE DURING CONSTRUCTION
- F REFER TO ELECTRICAL AND MECHANICAL DRAWINGS FOR EXTENT OF ELECTRICAL AND MECHANICAL WORK
- G ALL EXISTING FINISHES OR MATERIALS DAMAGED OR DEMOLISHED DUE TO NEW CONSTRUCTION SHALL BE RESTORED TO THEIR ORIGINAL STATE, INCLUDING BUT NOT LIMITED TO REINSTALLING OR REPLACING EXISTING CHAINLINK FENCING AS REQUIRED AND RESTRIPIING PAVING IN KIND, S.E.D. FOR TRENCH ROUTING. SEE ARCHITECTURAL SITE PLAN FOR STRIPING AT EXISTING PAVING

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San Jose, CA 95113  
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PROJECT

MEADOW HEIGHTS  
ELEMENTARY  
SCHOOL - HVAC  
REPLACEMENT

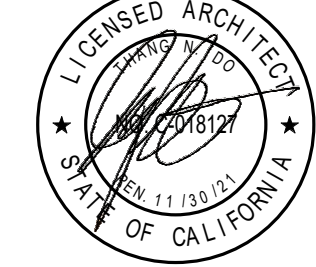
SAN MATEO-FOSTER CITY  
SCHOOL DISTRICT

CONSULTANT

SITE PLAN KEYNOTES

- 1 (E) ASPHALT TO REMAIN.
- 2 (E) CHAINLINK GATE TO REMAIN.
- 3 (E) POLE AND FOOTING TO BE REMOVED.
- 4 (E) TURF TO BE REMOVED, RECONFIGURE (E) IRRIGATION. SEE NEW ENLARGED SITE PLAN FOR MORE INFORMATION. DO NOT OVERCUT.
- 5 ASPHALT. SEE DETAIL 9/A8.10 FOR ASSEMBLY.
- 6 (E) CHAINLINK BATTING ENCLOSURE TO REMAIN.
- 7 10'W DOUBLE GATE. SEE DETAIL 3/A8.10.
- 8 4'W GATE. SEE DETAIL 2/A8.10.
- 9 CHAINLINK ENCLOSURE. SEE DETAIL 4/A8.10.
- 10 ELECTRICAL EQUIPMENT, S.E.D.
- 11 REMOVE (E) ELECTRICAL EQUIPMENT AND CONCRETE PAD COMPLETELY, S.E.D. PATCH ASPHALT FLUSH TO ADJACENT. SEE DETAIL 9/A8.10 SIM.
- 12 (E) FENCING, POLES, AND FOOTING TO BE REMOVED.
- 13 REMOVE (E) ASPHALT PAVING.
- 14 20'W DOUBLE GATE. SEE DETAIL 3/A8.10.
- 15 AT (E) 12'H CHAINLINK FENCING TO REMAIN ADJACENT REMOVED CHAINLINK, PREP (E) CHAINLINK FOR RECONNECTION.
- 16 CONFORM NEW AND EXISTING ASPHALT FLUSH.
- 17 12" STORM INLET S.C.D.
- 18 CONCRETE DRIVEWAY S.C.D.
- 19 REMOVE (E) WOOD PLANTER BOXES & HEADER BOARD
- 20 TRANSFORMER, S.E.D.
- 21 ELECTRICAL BOX, S.E.D.

STAMP



STATE

DSA FILE NUMBER 41-26  
APPL # 01-119554

REVISIONS

No.	Description	Date
1	Addendum 1	11/17/2021

MILESTONES

DD	
90% CD	
DSA SUB	06/02/2021
BACKCHECK	09/22/2021

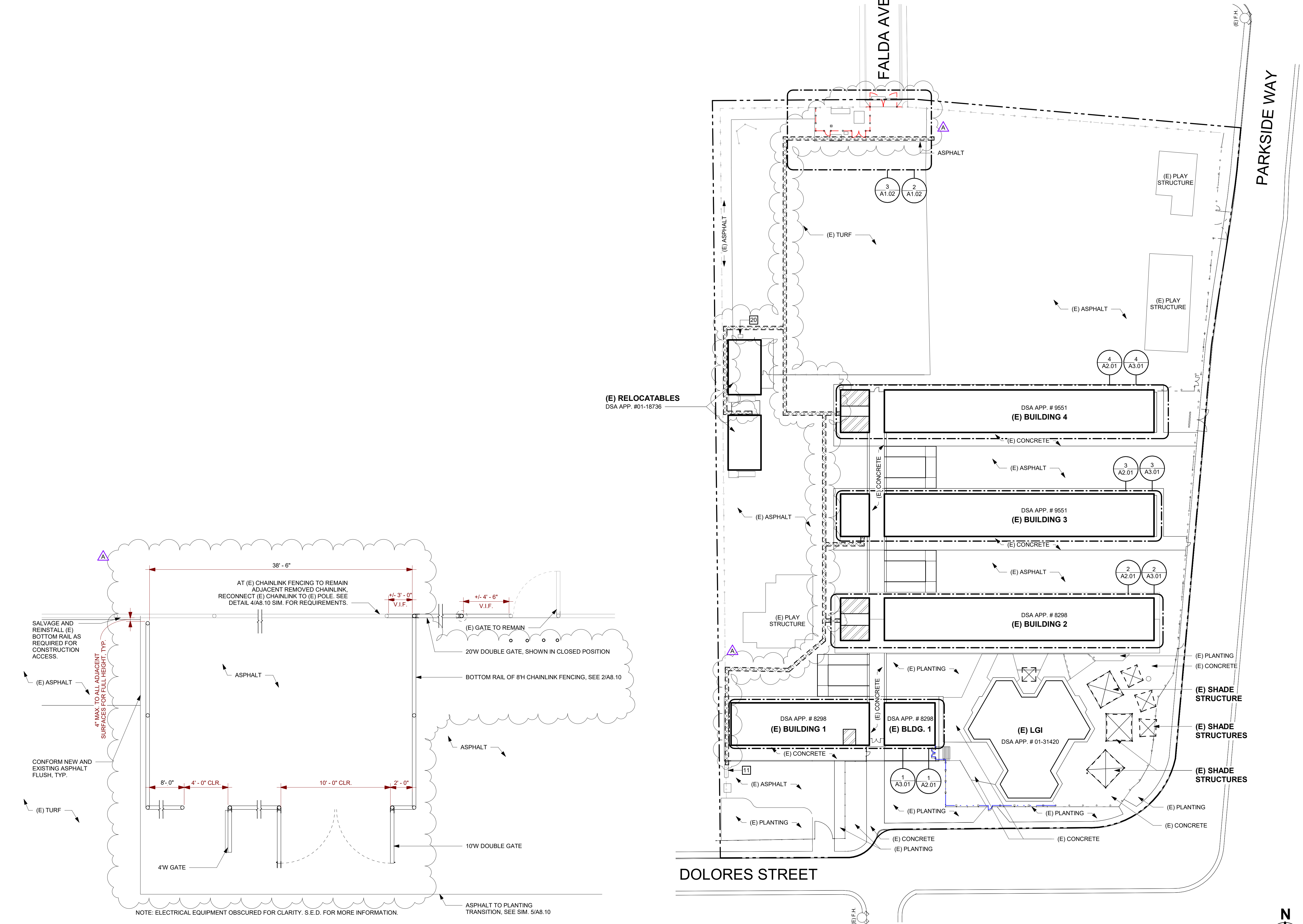
SHEET

SITE PLAN

DATE 11/24/2021

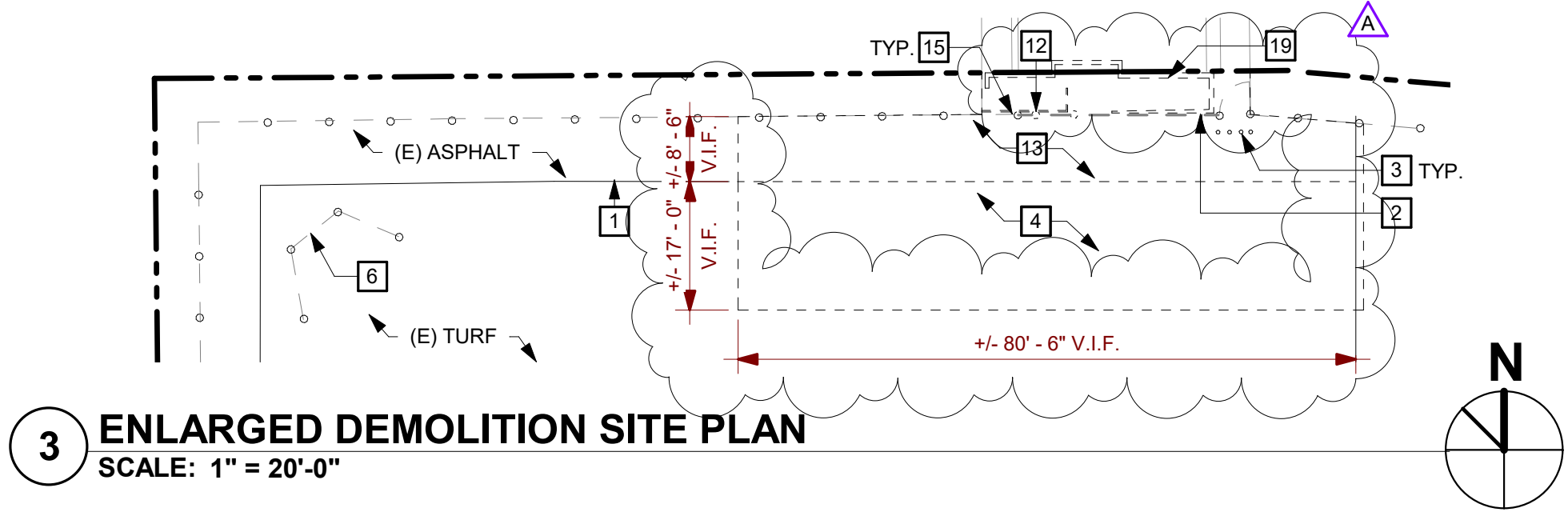
JOB # 2021005.04

SHEET # AD1-  
A1.02

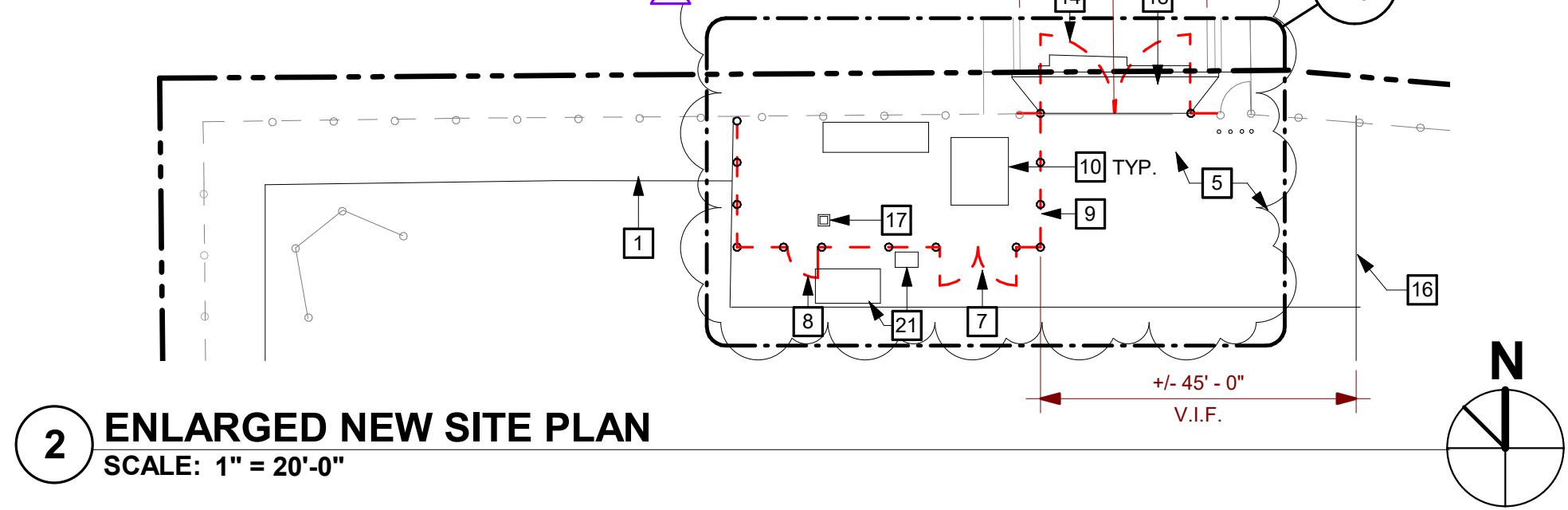


4 ELECTRICAL ENCLOSURE ENLARGED LAYOUT  
SCALE: 1/4" = 1'-0"

1 NEW SITE PLAN  
SCALE: 1/32" = 1'-0"



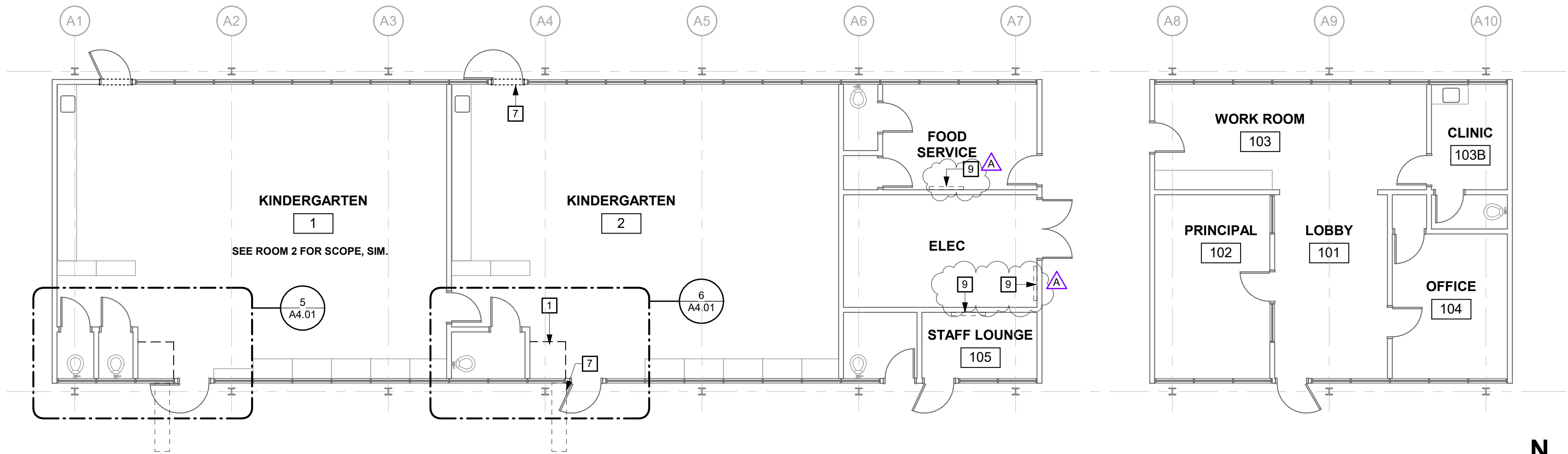
3 ENLARGED DEMOLITION SITE PLAN  
SCALE: 1" = 20'-0"



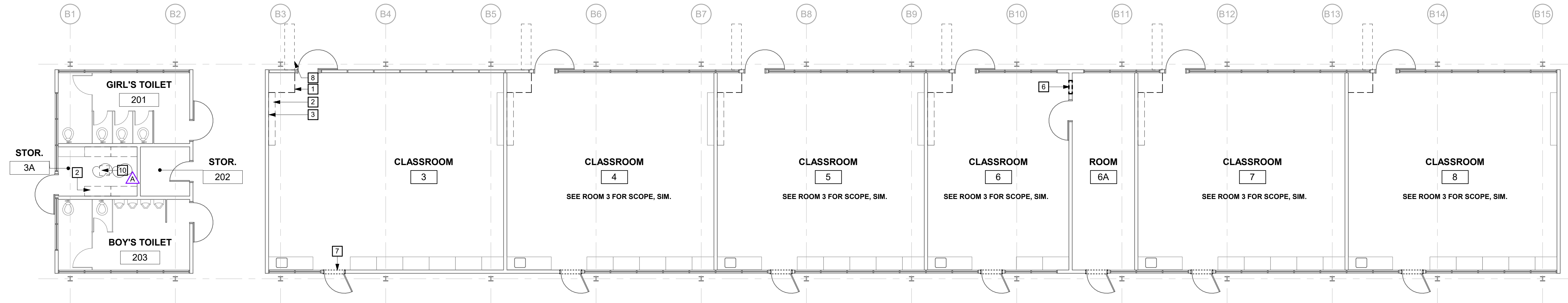
2 ENLARGED NEW SITE PLAN  
SCALE: 1" = 20'-0"

GRAPHIC KEY

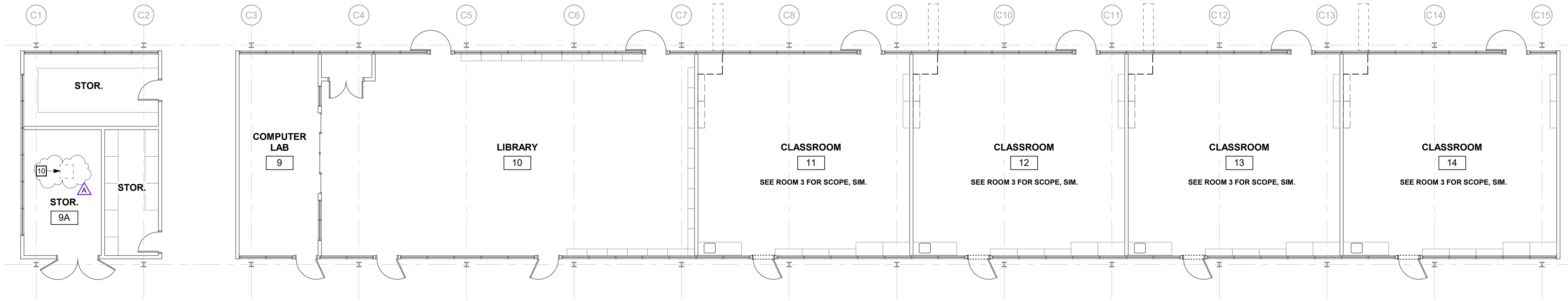
- EXISTING TOILET ROOMS
- EXISTING CONSTRUCTION TO REMAIN
- EXISTING COVERED STRUCTURE
- TRENCH FOR ELECTRICAL WORK, S.E.D., 8/35.01 & DETAILS ON SHEET A8.10
- PROPERTY LINE
- (E) CHAINLINK FENCE
- (N) CHAINLINK FENCE
- EXISTING FIRE HYDRANT
- (E) F.H.



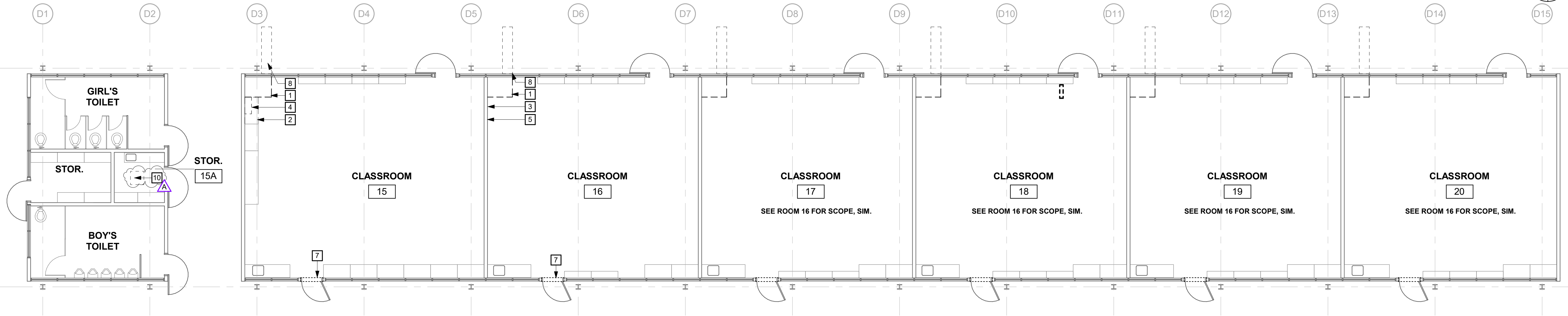
1 DEMOLITION FLOOR PLAN - BLDG 1  
SCALE: 1/8" = 1'-0"



2 DEMOLITION FLOOR PLAN - BLDG 2  
SCALE: 1/8" = 1'-0"



3 DEMOLITION FLOOR PLAN - BLDG 3  
SCALE: 1/8" = 1'-0"



4 DEMOLITION FLOOR PLAN - BLDG 4  
SCALE: 1/8" = 1'-0"

## GENERAL SHEET NOTES

- A ROOM NAMES OR NUMBERS MAY NOT BE CONSISTENT BETWEEN DEMOLITION AND NEW FLOOR PLANS.
- B REFER TO MECHANICAL AND ELECTRICAL DRAWINGS FOR EXTENT OF MECHANICAL AND ELECTRICAL DEMOLITION WORK.
- C VERIFY LIMITS OF DEMOLITION WITH SCOPE OF NEW WORK PRIOR TO COMMENCING WORK.
- D ALL ITEMS SHOWN DASHED ARE TO BE DEMOLISHED UNLESS OTHERWISE NOTED ON PLANS.
- E REMOVE ALL MISCELLANEOUS TRIM, CASEWORK, EQUIPMENT, CONDUIT, BASES, AND OTHER SURFACE MOUNTED ITEMS WHETHER SHOWN OR NOT, AS REQUIRED TO FACILITATE SCOPE OF WORK. REMOVE AND CAP ALL OUTLETS, SWITCHES, WIRES, THERMOSTATS, ETC. TO THEIR SOURCE AS REQUIRED. SEE MECHANICAL AND ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION AND SCOPE OF WORK.
- F REMOVE ADJACENT FINISHES AS REQUIRED TO FACILITATE SCOPE OF WORK. PATCH BACK IN KIND.
- G EXISTING EQUIPMENT INDICATED TO BE RELOCATED PER NEW PLAN IS TO BE STORED AND PROTECTED DURING CONSTRUCTION.
- H NO DEMOLITION SHALL BEGIN UNTIL PLANS INCLUDING THE DEMOLITION WORK HAVE BEEN APPROVED BY DSA.
- I DIMENSIONS FOR EXISTING BUILDING ARE APPROXIMATE. CONTRACTOR TO FIELD VERIFY PRIOR TO START OF CONSTRUCTION.
- J REFER TO "HVAC AND POWER UPGRADE PROJECT HAZARDOUS MATERIALS SURVEY REPORT." CONTRACTOR TO ABATE AREAS AFFECTED BY SCOPE OF WORK. REMOVE AND DISPOSE OF MATERIALS PER REPORT RECOMMENDATIONS.

## DEMOLITION FLOOR PLAN KEYNOTES

- 1 REMOVE (E) MECHANICAL UNIT, METAL ENCLOSURE, T-BAR AND GYP SOFFIT, S.M.D.
- 2 SALVAGE (E) CABINET AND TURN OVER TO DISTRICT
- 3 SALVAGE (E) 4x8 TACK PANEL AND TURN OVER TO DISTRICT
- 4 REMOVE (E) MECHANICAL EQUIPMENT, S.M.D.
- 5 RECONFIGURE (E) WIREMOLD. SHORTEN CONFIGURATION TIGHT TO NEW ENCLOSURE AND PROVIDE END CAP. SEE NEW FLOOR PLAN FOR MORE INFORMATION.
- 6 CUT AND PREP OPENING FOR MECHANICAL WORK, S.M.D.
- 7 REMOVE (E) WINDOW GLAZING ABOVE AND PREP FOR NEW WORK, S.M.D.
- 8 REMOVE PAVING AND PREP FOR NEW WORK, S.M.D.
- 9 PREP FOR NEW WORK, S.M.D.
- 10 REMOVE PARTIAL GYP. BD CEILING FOR FUTURE EXHAUST FAN, S.M.D.

## GRAPHIC KEY

### WALL TYPES:

- EXISTING WALL TO REMAIN.
- EXISTING STOREFRONT OR WINDOW TO REMAIN.

## BUILDING KEY

- 6 5 4 3 2 1 LGI

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### PROJECT

MEADOW HEIGHTS  
ELEMENTARY  
SCHOOL - HVAC  
REPLACEMENT

SAN MATEO-FOSTER CITY  
SCHOOL DISTRICT

CONSULTANT

### STAMP



### STATE

DSA FILE NUMBER 41-26  
APPL # 01-119554

### REVISIONS

No.	Description	Date
1	Addendum 1	11/24/2021

### MILESTONES

DD	
90% CD	
DSA SUB	06/02/2021
BACKCHECK	09/22/2021

### SHEET

DEMOLITION  
FLOOR PLAN -  
BLDGS 1,2,3, & 4

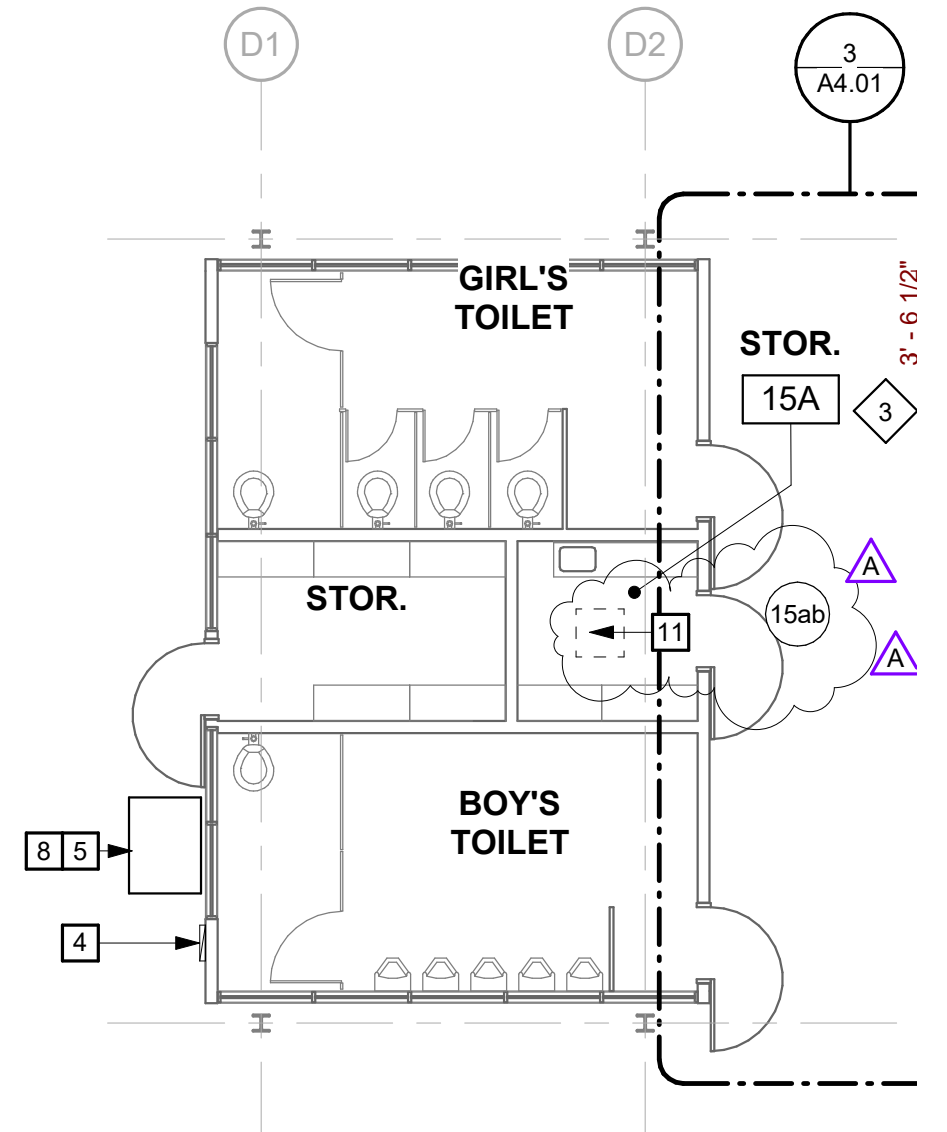
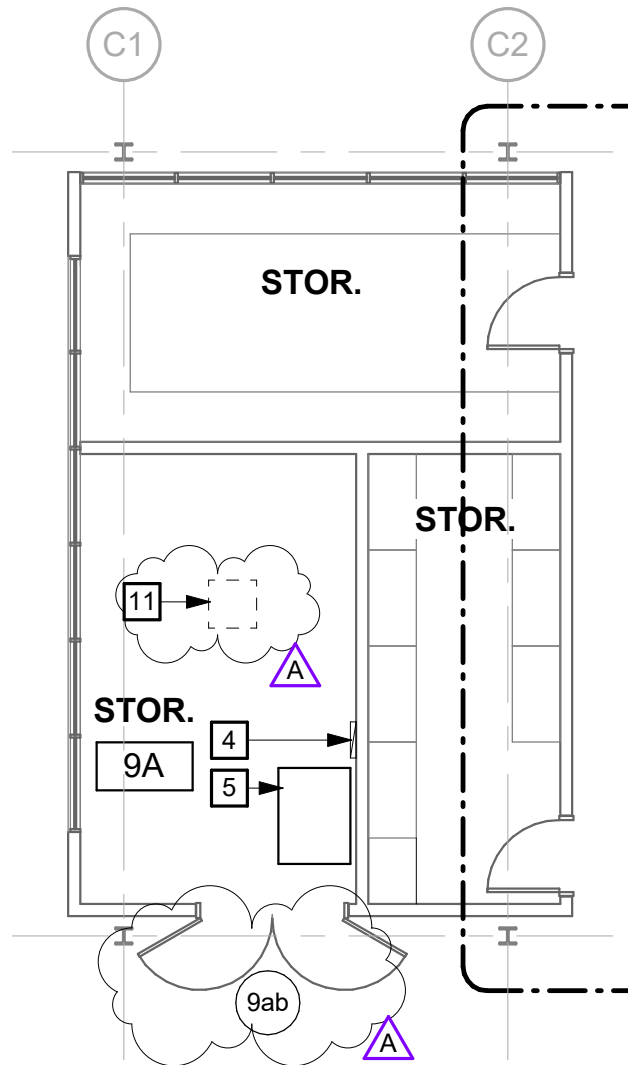
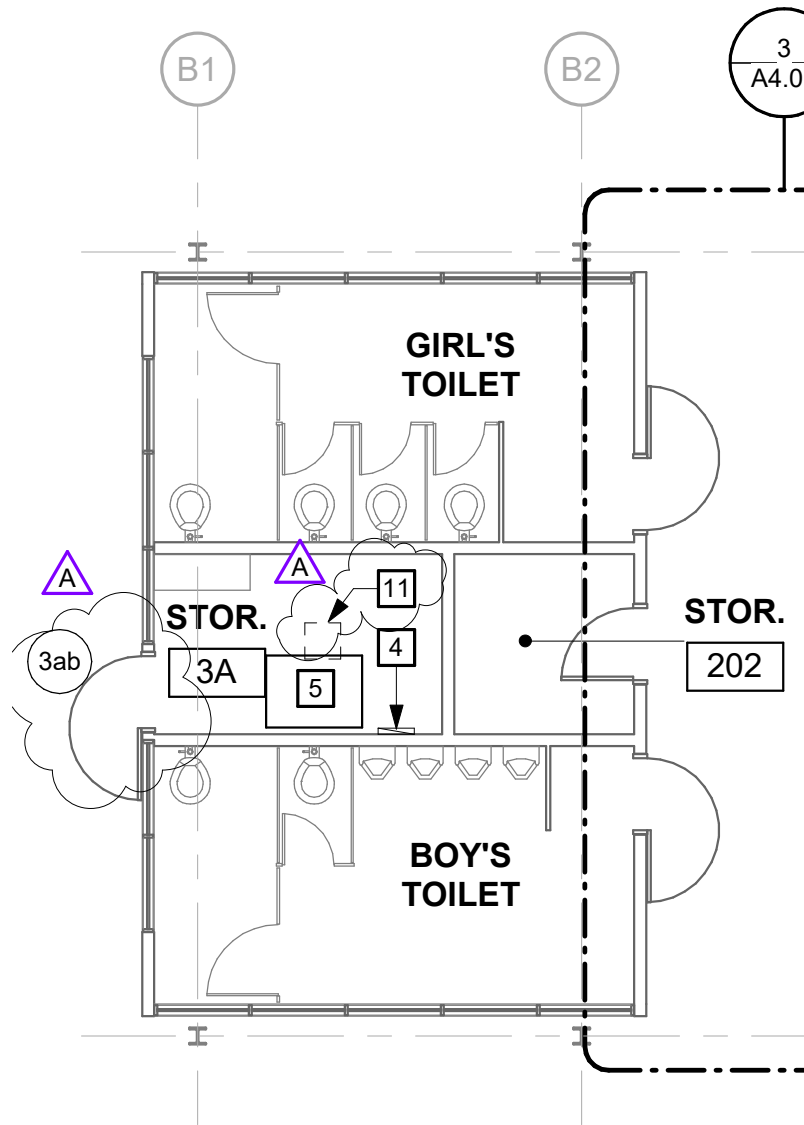
### DATE

11/24/2021

JOB # 2021005.04

### SHEET #

AD1-  
A2.01



**2 NEW FLOOR PLAN - BLDG 2**  
SCALE: 1/8" = 1'-0"

**3 NEW FLOOR PLAN - BLDG 3**  
SCALE: 1/8" = 1'-0"

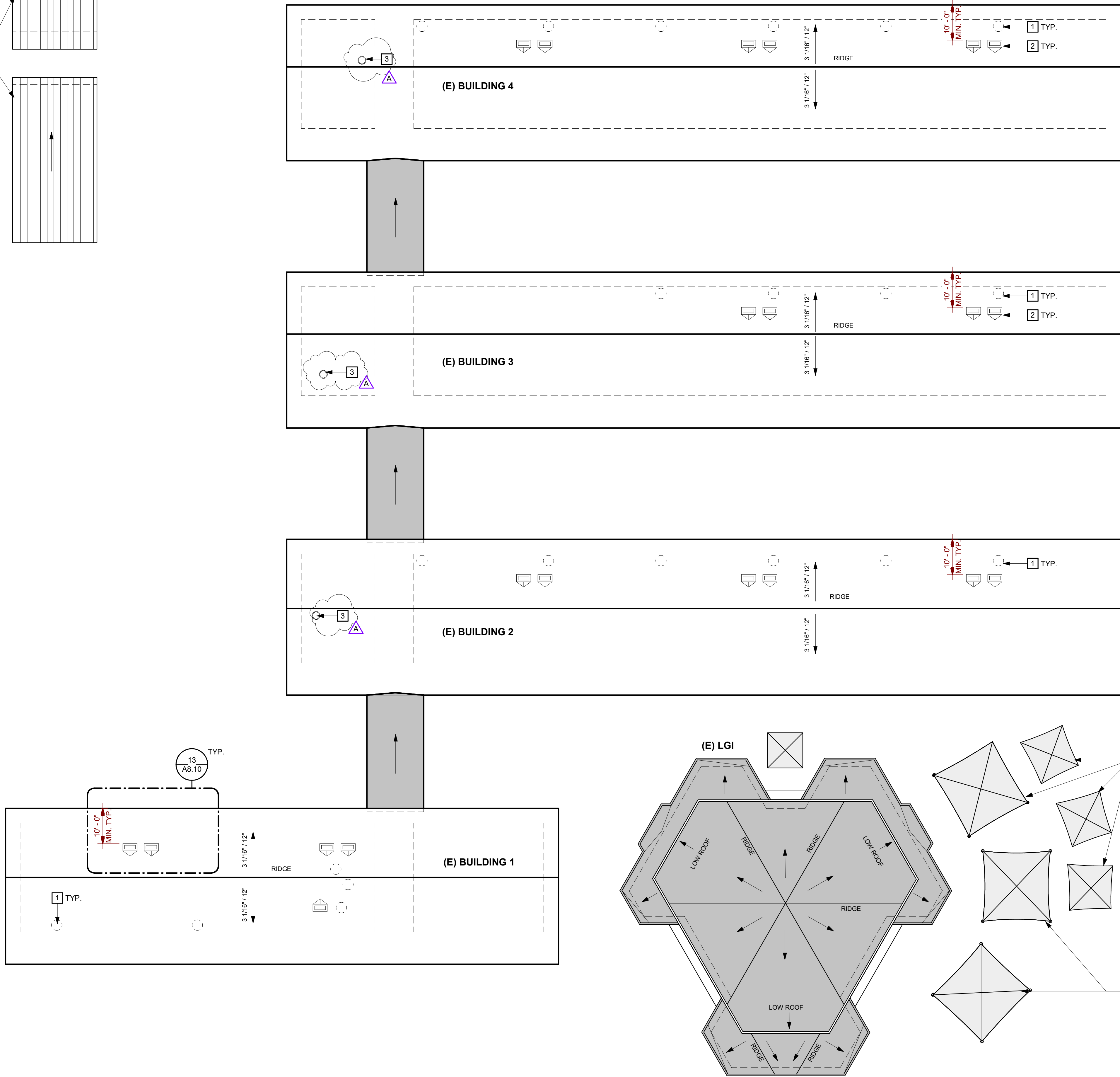
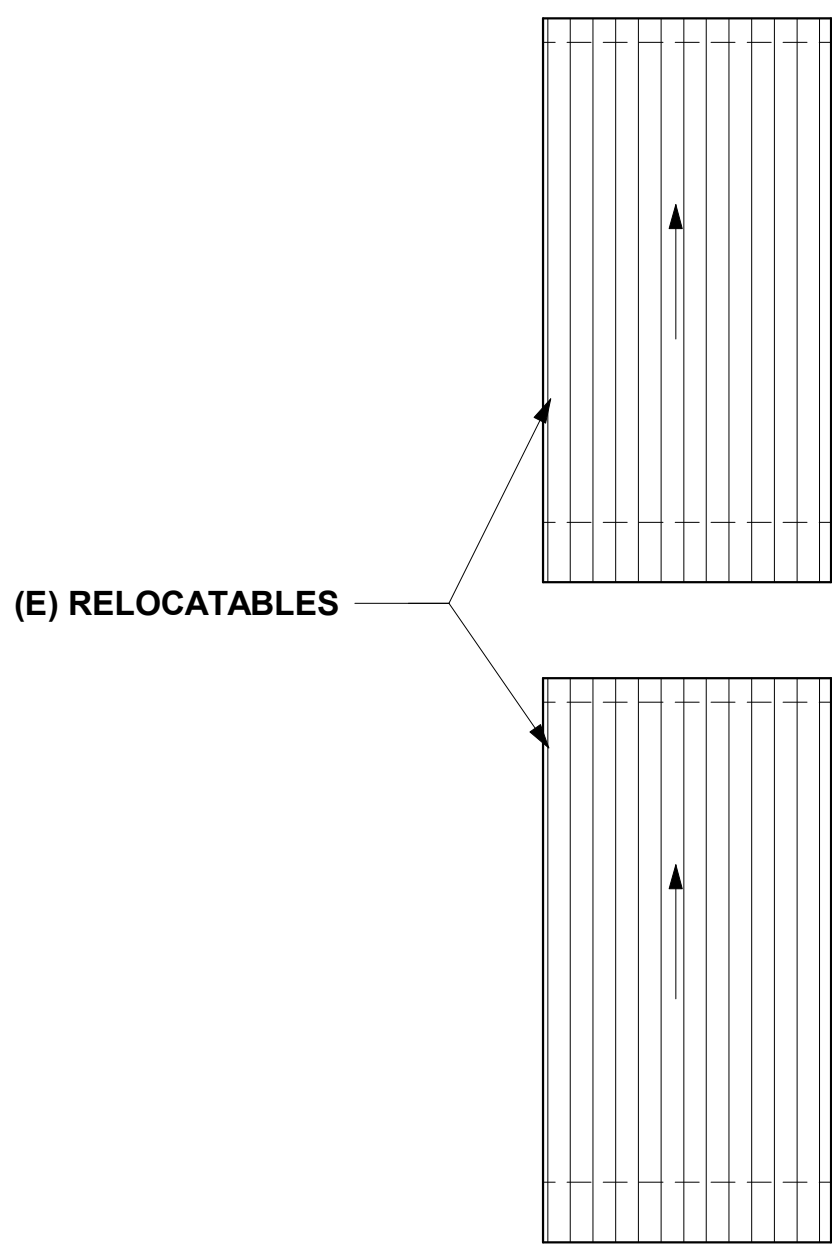
**4 NEW FLOOR PLAN - BLDG 4**  
SCALE: 1/8" = 1'-0"

## NEW FLOOR PLAN KEYNOTES

- 7 PATCH OPENING FROM TO MECHANICAL WORK, CHASE AND SEE DETAIL 07/10/19.
- 8 LOCATE EQUIPMENT PLACEMENT OUTSIDE OF ADJACENT 180-DEGREE DOOR SWING.
- 9 REFER TO 7/A4.01 FOR TYPICAL REFLECTED CEILING PLAN, REMOVE AND REINSTALL (E) ACOUSTICAL CEILING TILES ABOVE AS REQUIRED FOR CONSTRUCTION ACCESS INCLUDING BUT NOT LIMITED TO ELECTRICAL ROUTING, MECHANICAL DUCTWORK ANCHORAGE, BLOCKING FOR ROOFTOP PLATFORMS. DO NOT ALTER SUSPENDED A.C.T. GRID.
- 10 PATCH PAVING AT DRY WELL. SEE 6/A8.10 AND S.M.D.
- 11 PATCH AND PAINT GYP. BD. CEILING ADJACENT EXHAUST FAN. S.M.D.



<b>aedis</b> architects		MEADOW HEIGHTS ELEMENTARY SCHOOL - HVAC REPLACEMENT	
		SAN MATEO-FOSTER CITY SCHOOL DISTRICT	
387 S. 1st Street, Suite 300 San Jose, CA., 95113		FILE NO.: 41-26 APPL NO.: 01-119554	SHEET <b>AD1-A3.01</b>
tel: (408) 300 - 5160 fax: (408) 300 - 5121		JOB NO. 2021005.04 DATE 11/24/2021	



**1 SITE ROOF PLAN**  
SCALE: 1/16" = 1'-0"

**GENERAL SHEET NOTES**

- A REFER TO MECHANICAL AND ELECTRICAL DRAWINGS FOR EXTENT OF MECHANICAL AND ELECTRICAL WORK.
- B SIZE OF MECHANICAL EQUIPMENT PADS ARE FOR REFERENCE ONLY. THE CONTRACTOR SHALL VERIFY REQUIRED PAD DIMENSION WITH EQUIPMENT MANUFACTURER.

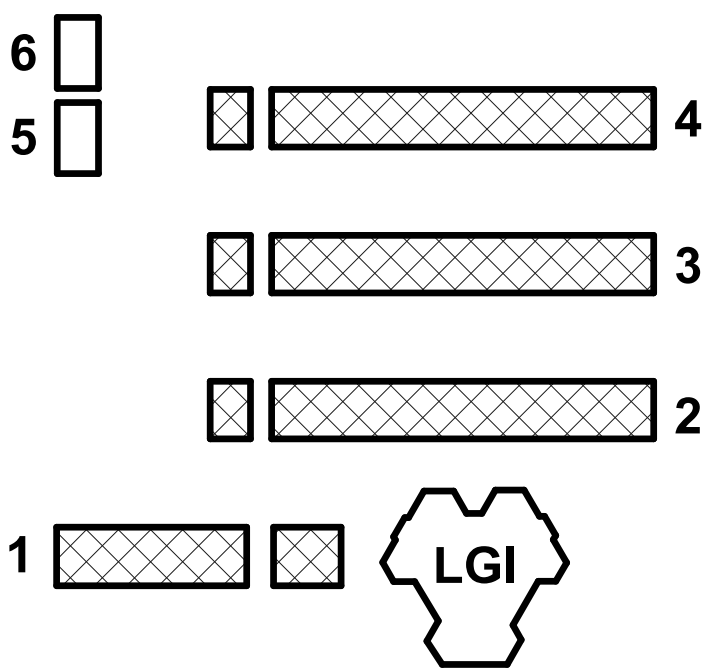
**ROOF PLAN KEYNOTES**

- 1 PATCH (E) PENETRATION AT REMOVED FLUE AND COMBUSTION AIR INTAKE AND PATCH (N) PENETRATIONS. S.M.D. AND SEE DETAIL 17/A8.10
- 2 MECHANICAL UNIT ON PLATFORM WITH CRICKET. S.M.D. AND SEE DETAIL 10/A8.10. REMOVE (E) ROOFING TO SUBSTRATE FOR CONSTRUCTION ACCESS.
- 3 EXHAUST FAN SEE 10/A8.10 SIM. S.M.D. REMOVE (E) ROOFING TO SUBSTRATE AND PREP OPENING AS REQUIRED FOR NEW WORK.

**GRAPHIC KEY**

- (E) ASPHALT SHINGLE, CLASS C MINIMUM
- (E) STANDING SEAM, CLASS C MINIMUM
- (E) FABRIC SHADE STRUCTURE
- (E) SINGLE PLY ROOFING, CLASS C MINIMUM
- OUTLINE OF WALL BELOW.

**BUILDING KEY**



**PROJECT**

**MEADOW HEIGHTS  
ELEMENTARY  
SCHOOL - HVAC  
REPLACEMENT**

**SAN MATEO-FOSTER CITY  
SCHOOL DISTRICT**

CONSULTANT

**STAMP**



**STATE**

DSA FILE NUMBER **41-26**  
APPL # **01-119554**

**REVISIONS**

No.	Description	Date
1	Addendum 1	11/17/2021

**MILESTONES**

DD  
90% CD  
DSA SUB 06/02/2021  
BACKCHECK 09/22/2021

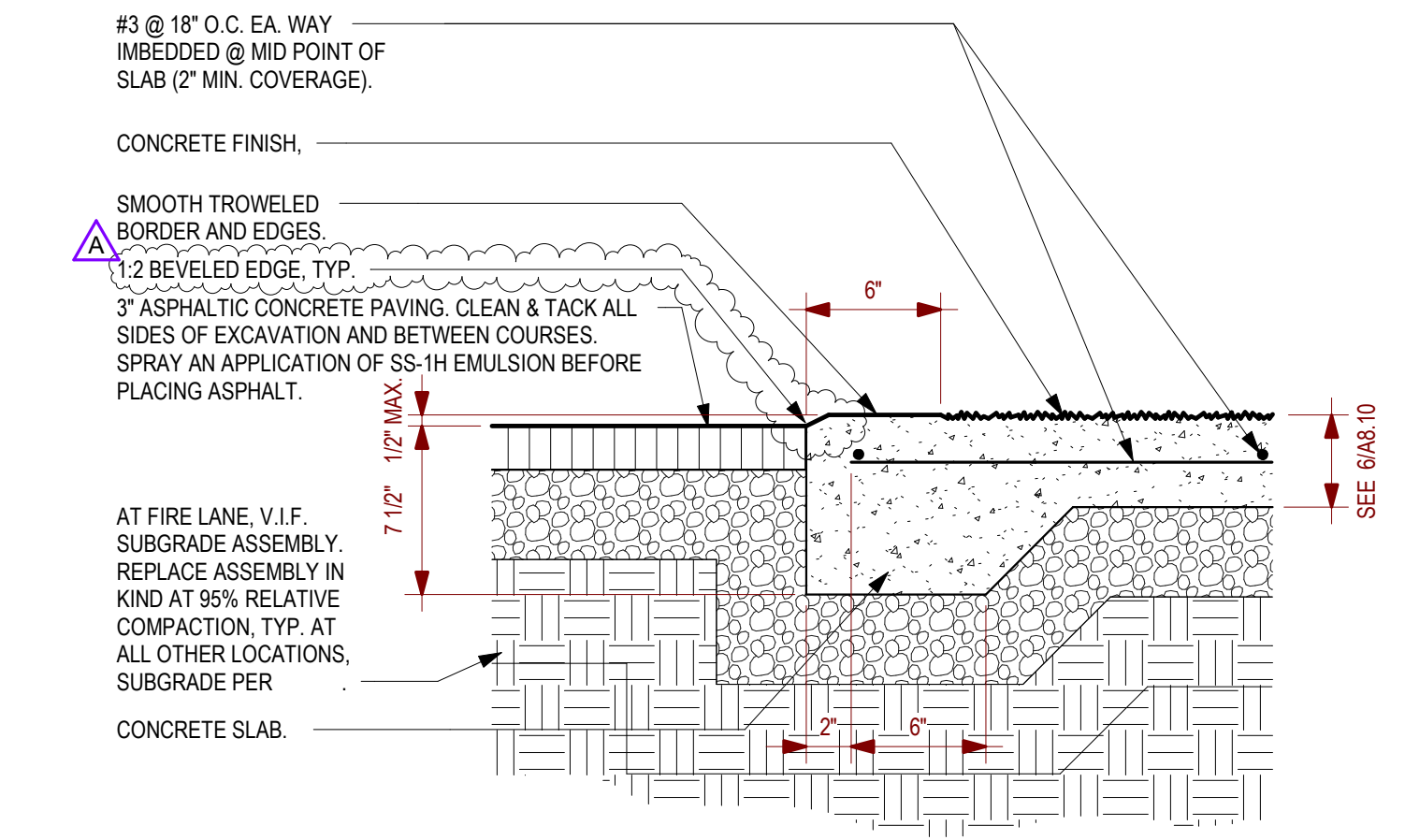
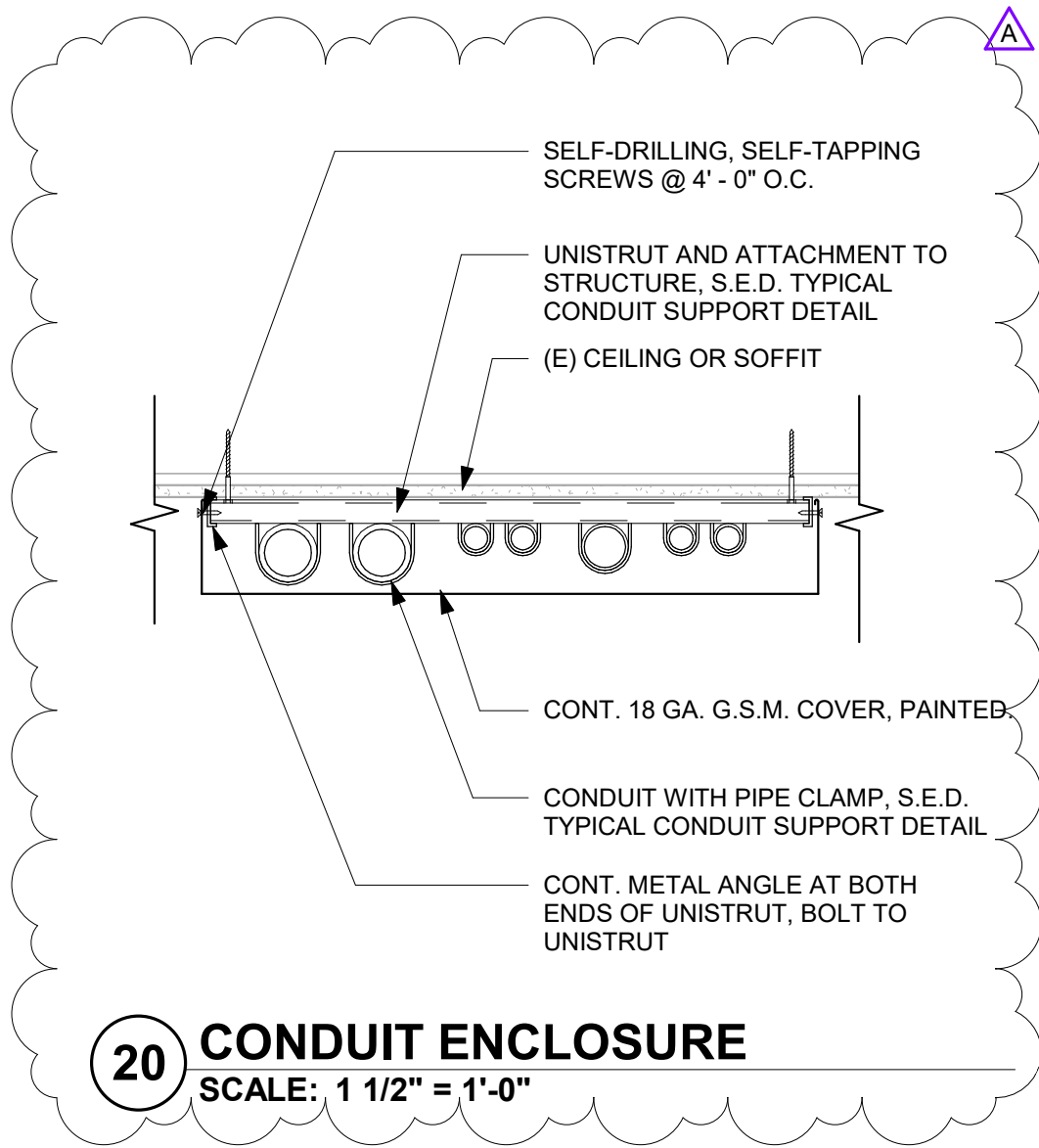
**SHEET**


**SITE ROOF PLAN**

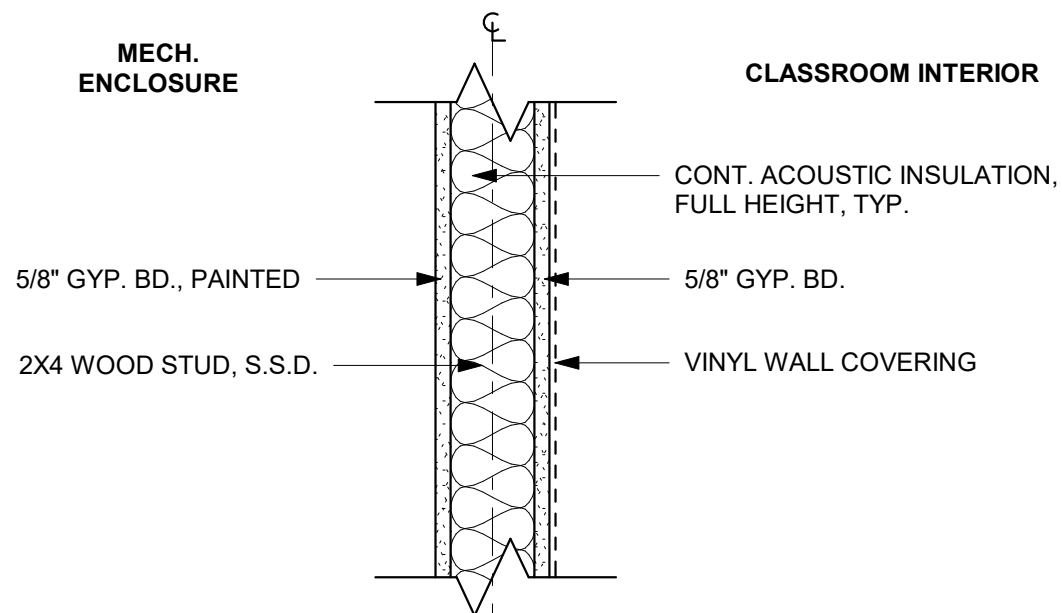
DATE 11/24/2021

JOB # 2021005.04

SHEET # AD1-  
**A5.01**

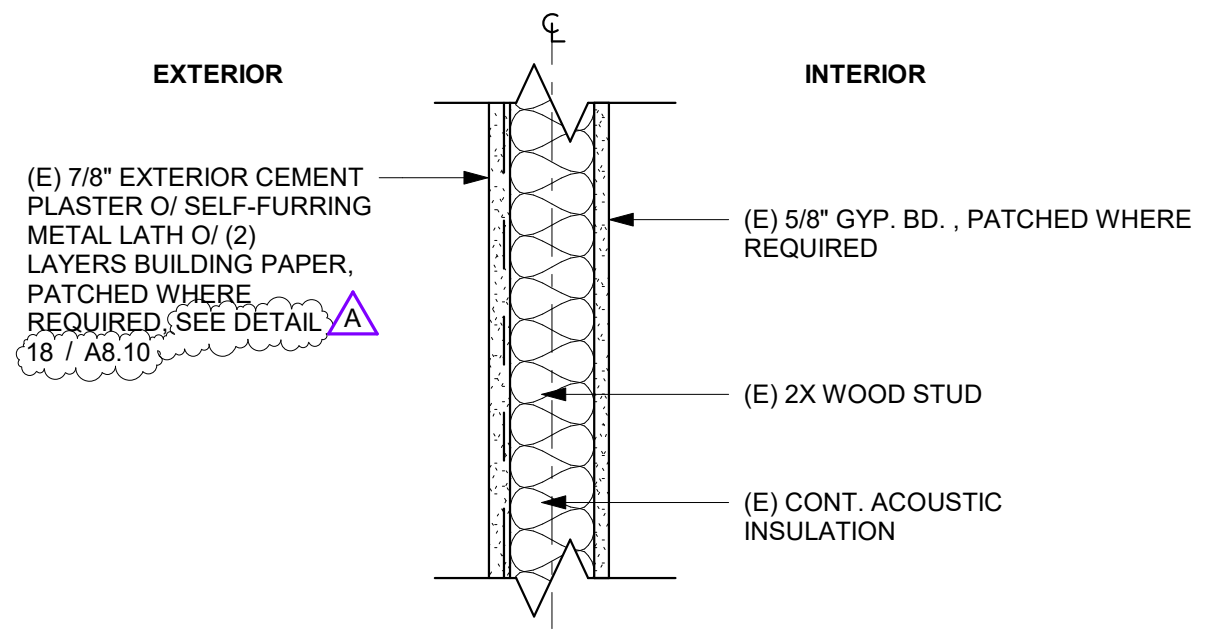


<div></div> <div>387 S. 1st Street, Suite 300 San Jose, CA., 95113</div> <div>tel: (408) 300 - 5160 fax: (408) 300 - 5121</div>		MEADOW HEIGHTS ELEMENTARY SCHOOL - HVAC REPLACEMENT	
		SAN MATEO-FOSTER CITY SCHOOL DISTRICT	
		FILE NO.: 41-26	SHEET  <b>AD1-A8.10</b>
		APPL NO.: 01-119554	
		JOB NO. 2021005.04	
DATE 11/24/2021			



**NOTE:**  
SEE DETAIL 6/A9.10 FOR TYPICAL SOUND TREATED NONRATED WALL.

**1** **WALL TYPE 1**  
SCALE: 1 1/2" = 1'-0"



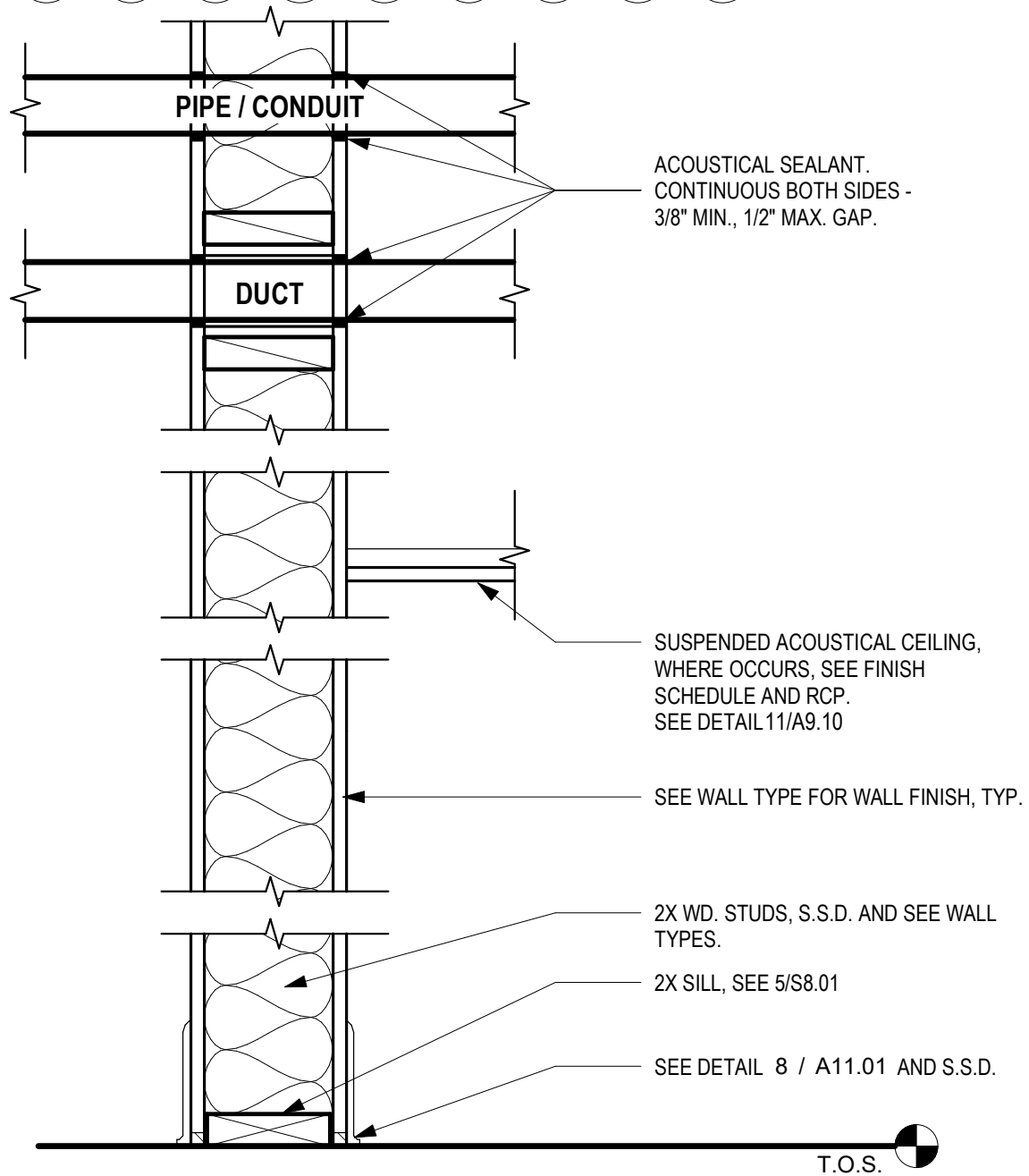
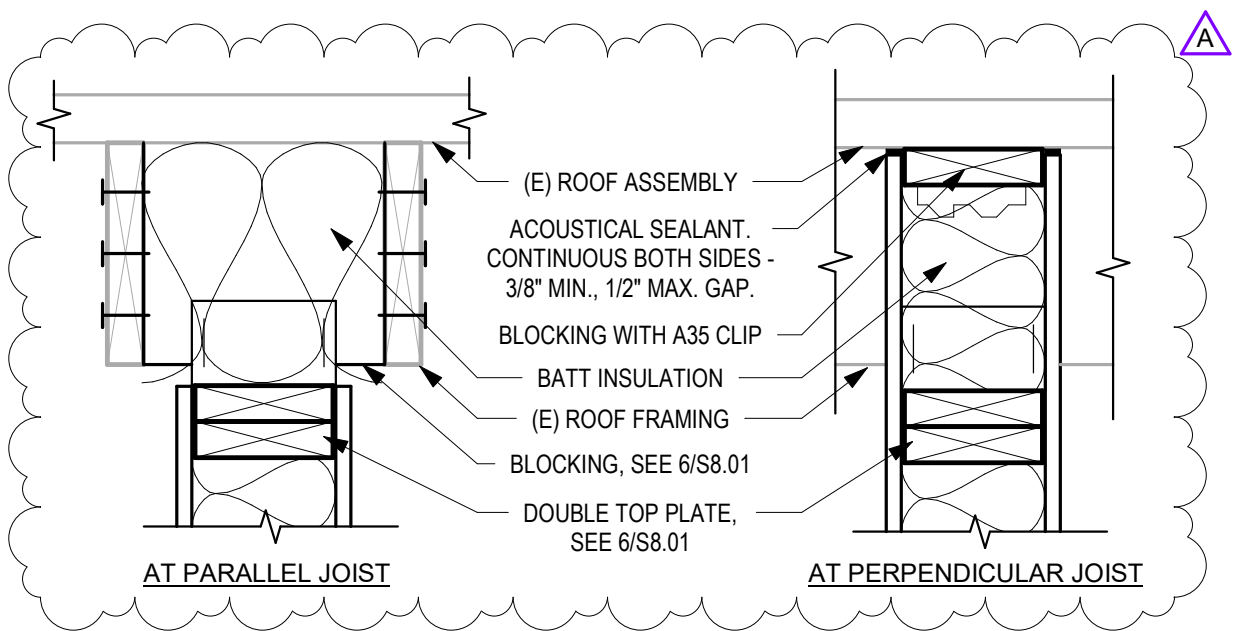
**ADDITIONAL WALL TYPES**

3A - ONE LAYER 1/2" PLYWOOD IN LIEU OF GYP. BD. AT INTERIOR SIDE

**3** **(E) WALL TYPE 3**  
SCALE: 1 1/2" = 1'-0"



		MEADOW HEIGHTS ELEMENTARY SCHOOL - HVAC REPLACEMENT	
		SAN MATEO-FOSTER CITY SCHOOL DISTRICT	
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	APPL NO.: 01-119554		
	JOB NO. 2021005.04		
	DATE 11/24/2021		



**NOTES:**

- FOR RECESSED ACCESSORIES OR CABINETS, PROVIDE BLOCKING, GYPSUM BOARD AND ACOUSTICAL SEALANT SIMILAR TO DETAIL AT DUCT.

**6**

**TYPICAL SOUND TREATED NONRATED WALL**

**SCALE: 1 1/2" = 1'-0"**



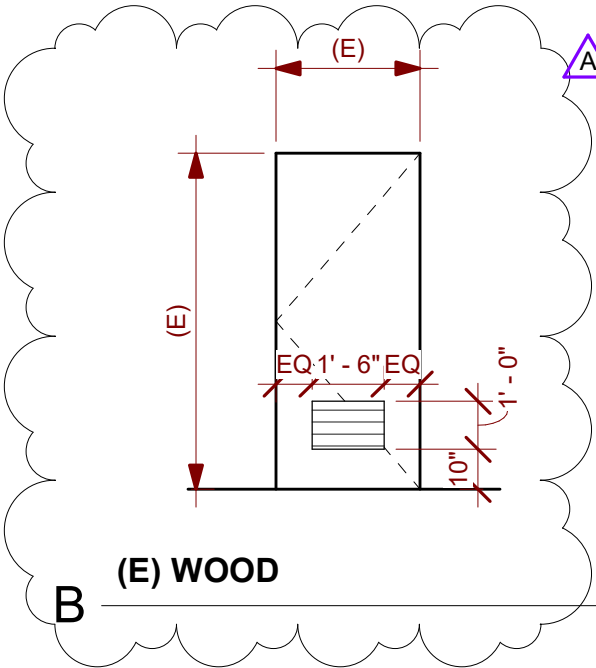
		MEADOW HEIGHTS ELEMENTARY SCHOOL - HVAC REPLACEMENT	
		SAN MATEO-FOSTER CITY SCHOOL DISTRICT	
387 S. 1st Street, Suite 300 San Jose, CA., 95113		FILE NO.: 41-26	SHEET  <b>AD1-A9.10B</b>
tel: (408) 300 - 5160 fax: (408) 300 - 5121		APPL NO.: 01-119554	
		JOB NO. 2021005.04	
		DATE 11/24/2021	

DOOR SCHEDULE												
DOOR ID	OPENING SIZE		DOOR		FRAME		DETAILS				HARDWARE GROUP	COMMENTS
	WIDTH	HEIGHT	TYPE	FINISH	TYPE	FINISH	HEAD	JAMB-1	JAMB-2	SILL		
1a	2' - 6"	7' - 0"	A	P-2	F1	P-3	11/A11.01	11/A11.01	11/A11.01	4/A11.01	01	
2a	2' - 6"	7' - 0"	A	P-2	F1	P-3	11/A11.01	11/A11.01	11/A11.01	4/A11.01	01	
3a	2' - 6"	7' - 0"	A	P-2	F1	P-3	11/A11.01	11/A11.01	11/A11.01	4/A11.01	01	
3ab	3' - 0"	7' - 0"	B	-	-	-	-	-	-	-	-	1
4a	2' - 6"	7' - 0"	A	P-2	F1	P-3	11/A11.01	11/A11.01	11/A11.01	4/A11.01	01	
5a	2' - 6"	7' - 0"	A	P-2	F1	P-3	11/A11.01	11/A11.01	11/A11.01	4/A11.01	01	
6a	2' - 6"	7' - 0"	A	P-2	F1	P-3	11/A11.01	11/A11.01	11/A11.01	4/A11.01	01	
7a	2' - 6"	7' - 0"	A	P-2	F1	P-3	11/A11.01	11/A11.01	11/A11.01	4/A11.01	01	
8a	2' - 6"	7' - 0"	A	P-2	F1	P-3	11/A11.01	11/A11.01	11/A11.01	4/A11.01	01	
9ab	6' - 0"	7' - 0"	B	-	-	-	-	-	-	-	-	1
11a	2' - 6"	7' - 0"	A	P-2	F1	P-3	11/A11.01	11/A11.01	11/A11.01	4/A11.01	01	
12a	2' - 6"	7' - 0"	A	P-2	F1	P-3	11/A11.01	11/A11.01	11/A11.01	4/A11.01	01	
13a	2' - 6"	7' - 0"	A	P-2	F1	P-3	11/A11.01	11/A11.01	11/A11.01	4/A11.01	01	
14a	2' - 6"	7' - 0"	A	P-2	F1	P-3	11/A11.01	11/A11.01	11/A11.01	4/A11.01	01	
15a	2' - 6"	7' - 0"	A	P-2	F1	P-3	11/A11.01	11/A11.01	11/A11.01	4/A11.01	01	
15ab	3' - 0"	7' - 0"	B	-	-	-	-	-	-	-	-	1
16a	2' - 6"	7' - 0"	A	P-2	F1	P-3	11/A11.01	11/A11.01	11/A11.01	4/A11.01	01	
17a	2' - 6"	7' - 0"	A	P-2	F1	P-3	11/A11.01	11/A11.01	11/A11.01	4/A11.01	01	
18a	2' - 6"	7' - 0"	A	P-2	F1	P-3	11/A11.01	11/A11.01	11/A11.01	4/A11.01	01	
19a	2' - 6"	7' - 0"	A	P-2	F1	P-3	11/A11.01	11/A11.01	11/A11.01	4/A11.01	01	
20a	2' - 6"	7' - 0"	A	P-2	F1	P-3	11/A11.01	11/A11.01	11/A11.01	4/A11.01	01	

A

A

A



(E) WOOD


DOOR TYPES

SCALE: 1/4" = 1'-0"

## DOOR SCHEDULE COMMENTS

1 PROVIDE NEW LOUVER AT EXISTING DOOR. CUT AND PREP AS REQUIRED. PAINT LOUVER TO DOOR.

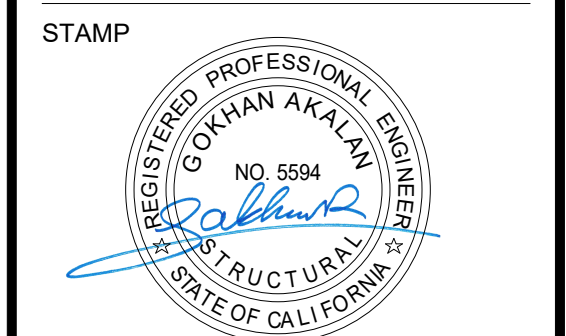


	MEADOW HEIGHTS ELEMENTARY SCHOOL - HVAC REPLACEMENT	
	SAN MATEO-FOSTER CITY SCHOOL DISTRICT	
387 S. 1st Street, Suite 300 San Jose, CA., 95113	FILE NO.: 41-26	SHEET  <b>AD1-A11.01</b>
	APPL NO.: 01-119554	
	JOB NO. 2021005.04	
tel: (408) 300 - 5160 fax: (408) 300 - 5121		DATE 11/24/2021

PROJECT  
MEADOW HEIGHTS  
ELEMENTARY  
SCHOOL - HVAC  
REPLACEMENT

SAN MATEO-FOSTER CITY  
SCHOOL DISTRICT  
CONSULTANT

**BASE  
DESIGN**  
582 MARKET ST. STE. 1402  
SAN FRANCISCO, CA 94104  
Office: (415) 466-2997  
www.BASEdesigninc.com



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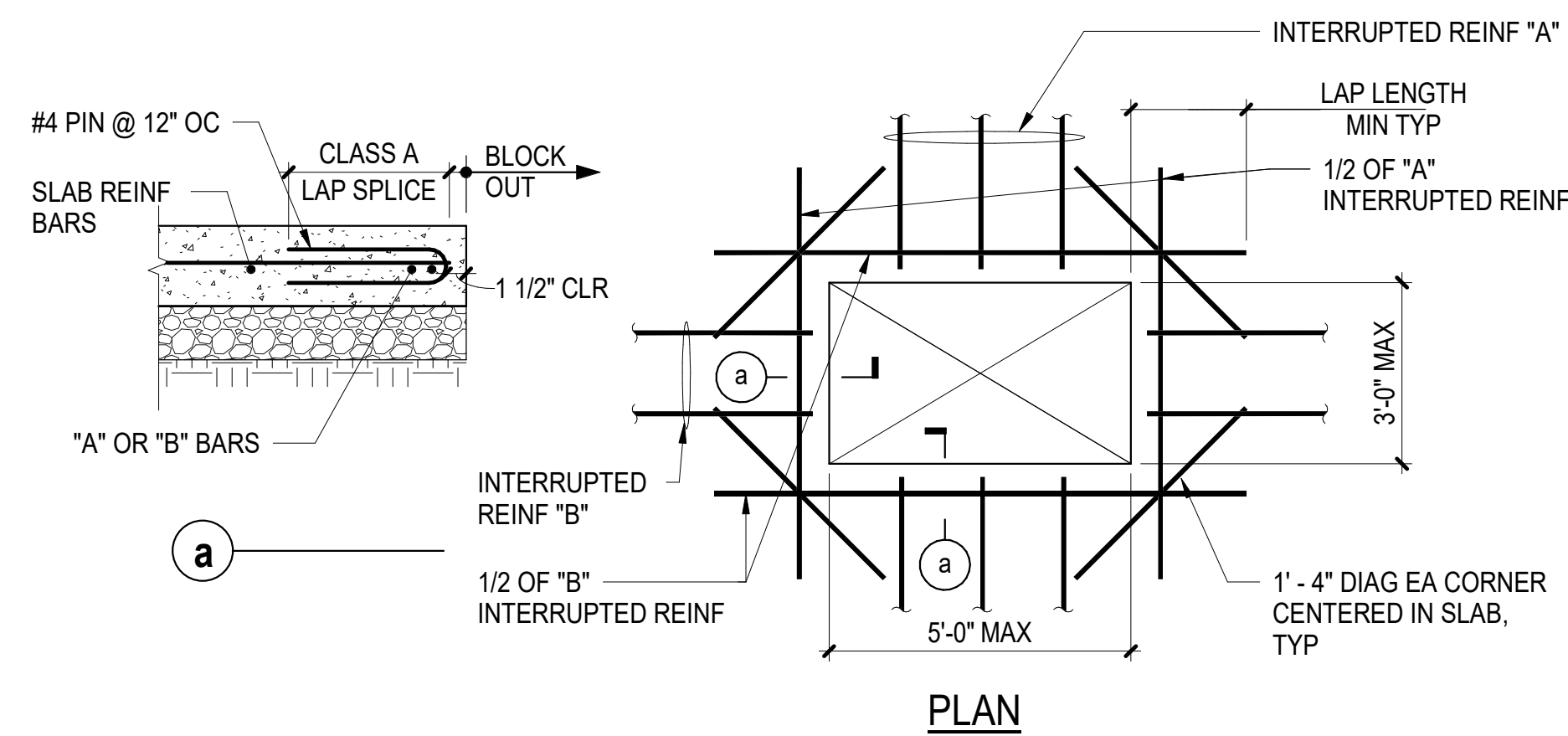
REVISIONS  

No.	Description	Date
1	Addendum 1	11/18/2021

MILESTONES  
DD  
90% CD  
DSA SUB 06/02/2021  
BACKCHECK

SHEET  
**TYPICAL  
CONCRETE  
DETAILS**

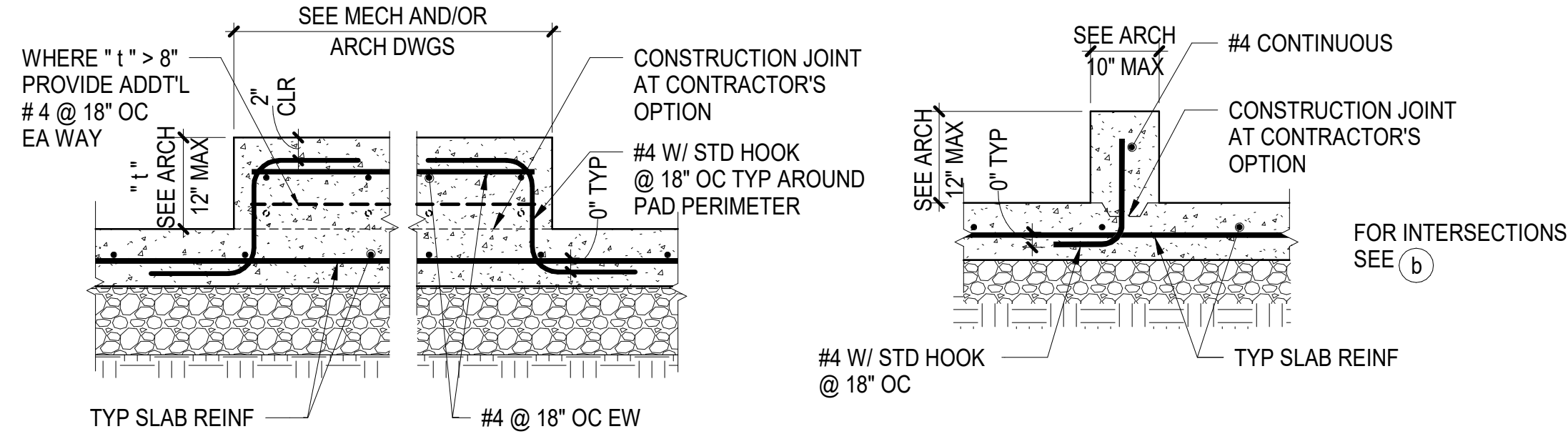
DATE 11/24/2021  
JOB # 2021005.04  
SHEET # AD1-  
AD1-S5.02



- NOTES:
1. OPENING SIZE, LOCATION, AND REINFORCING SHALL BE SUBMITTED AS PART OF THE REINFORCING SHOP DRAWING SUBMITTAL FOR REVIEW AND APPROVAL.
  2. AT EACH SIDE OF THE OPENING, ADD NOT LESS THAN ONE-HALF THE AREA OF REINFORCING THAT IS INTERRUPTED BY THE OPENING. WHERE THE BAR LENGTH PAST THE OPENING IS INTERRUPTED BY AN EDGE OF SLAB, PROVIDE A STANDARD HOOK AT THE DISCONTINUOUS END.
  3. WHERE THE DIAGONAL LENGTH IS INTERRUPTED BY AN EDGE OF SLAB, PROVIDE A STANDARD HOOK.
  4. NOT REQUIRED AT COLUMN LOCATIONS.

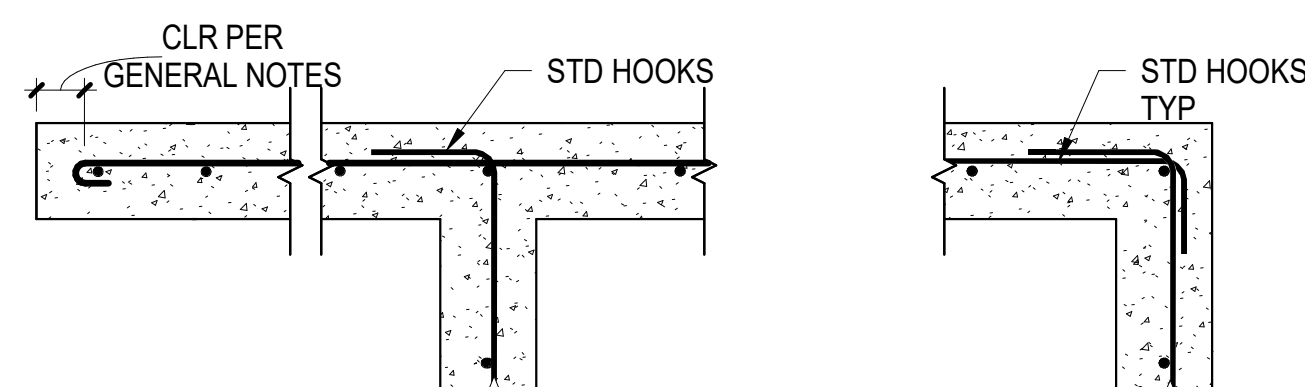
**7 OPENING IN SLAB-ON-GRADE**

NTS



**(b) HOUSEKEEPING PAD AT SLAB-ON-GRADE**

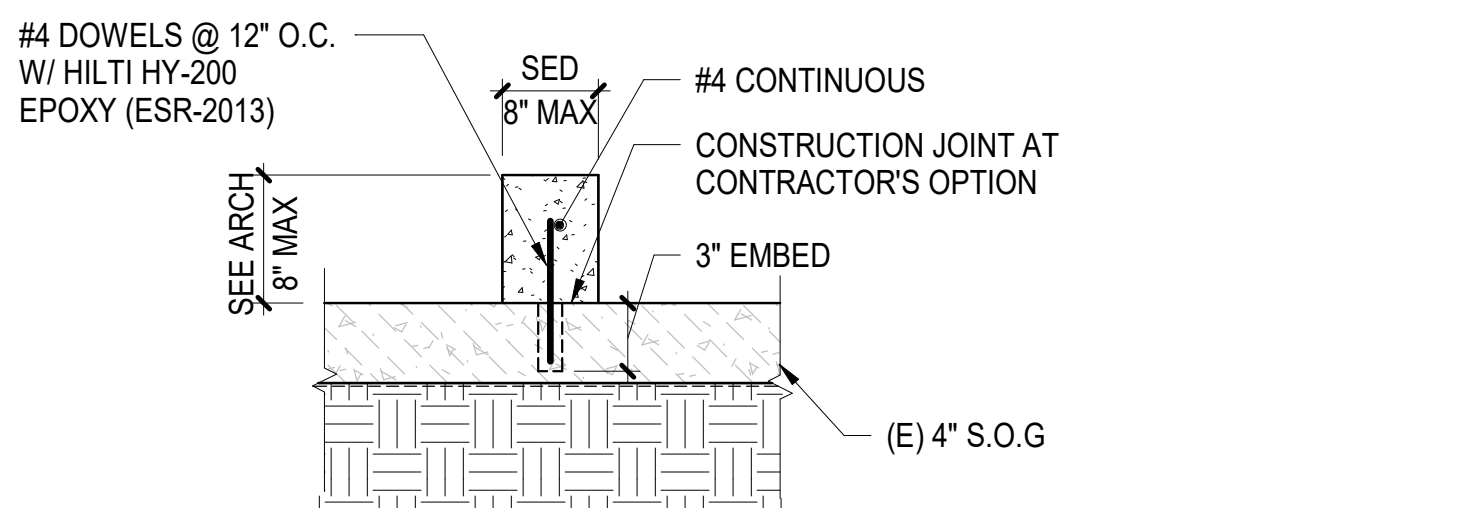
**(a) CURB AT SLAB-ON-GRADE**



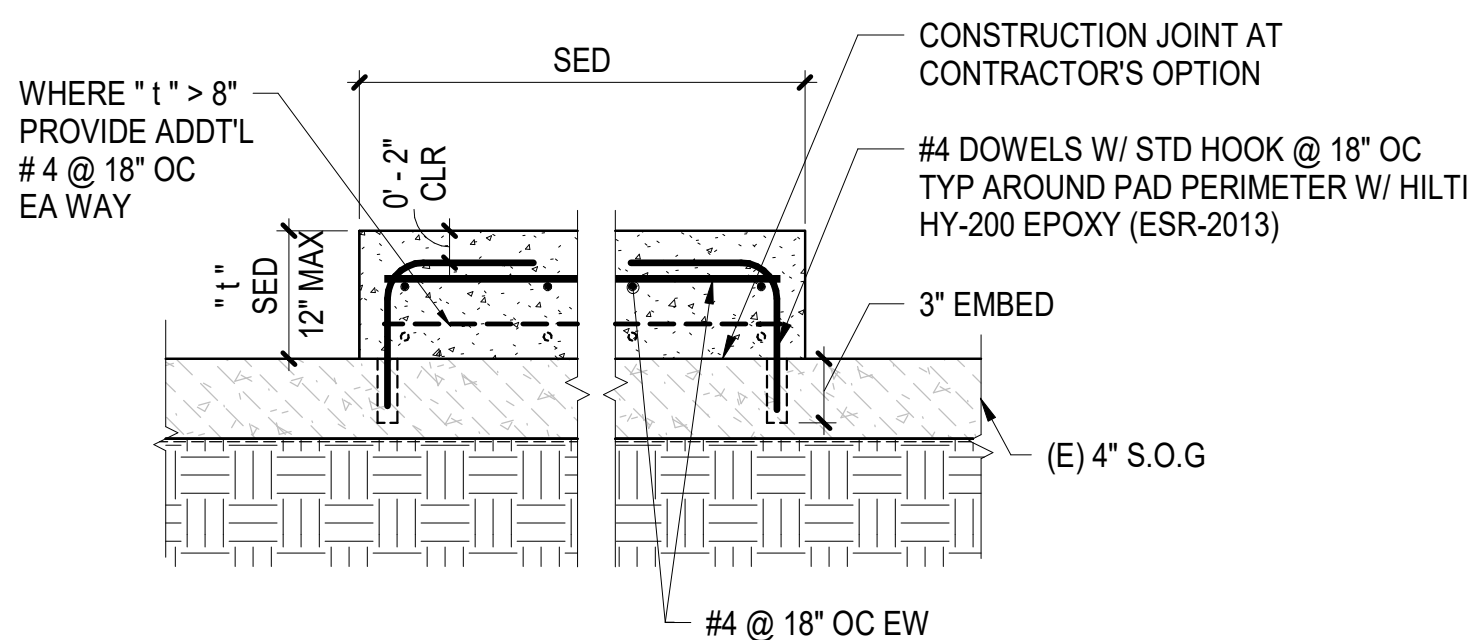
**(c) CONCRETE CURB INTERSECTIONS**

**8 CURBS AND HOUSEKEEPING PADS**

NTS



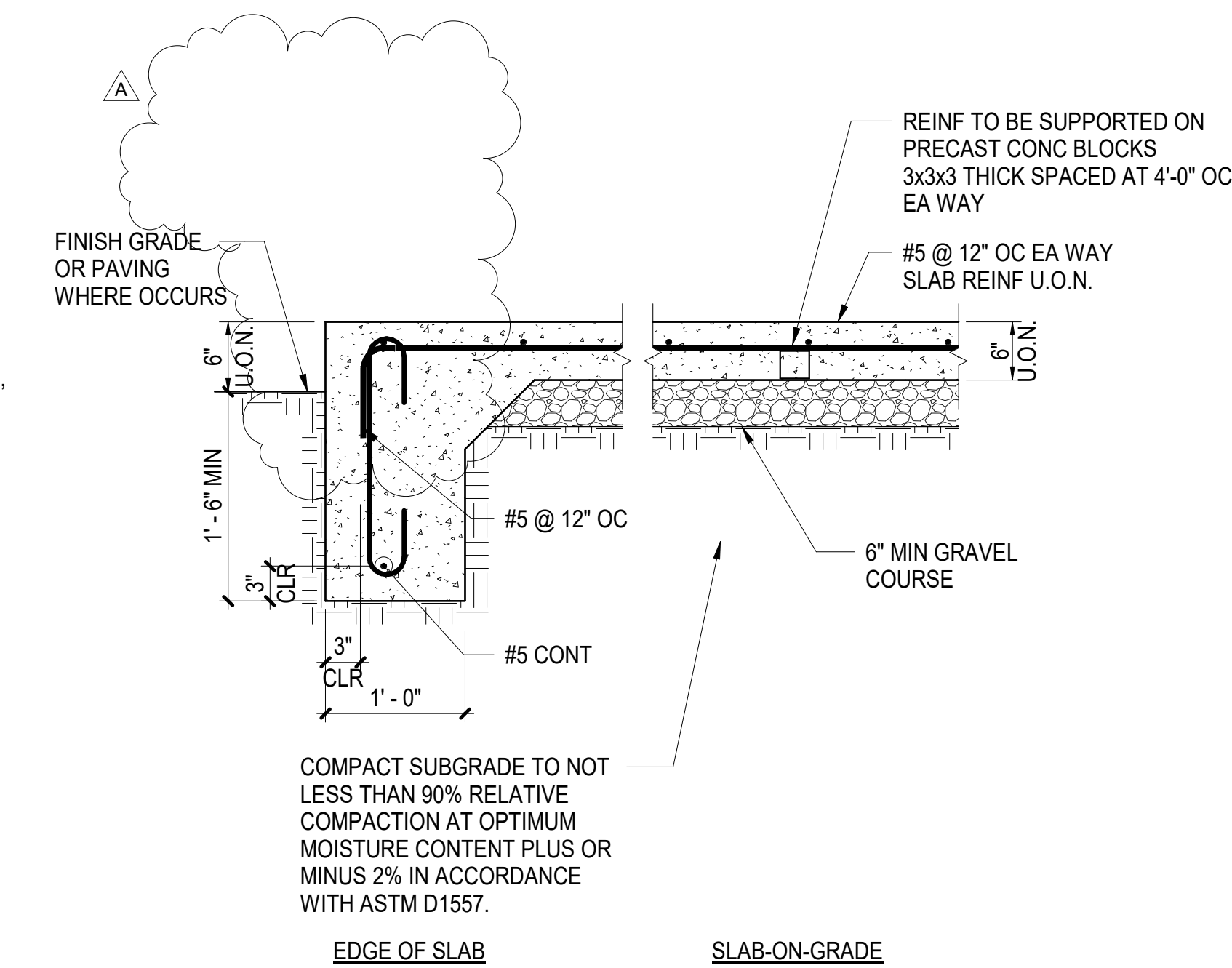
**(B) CURB AT SLAB-ON-GRADE**



**(A) CURB WIDTH > 8"**

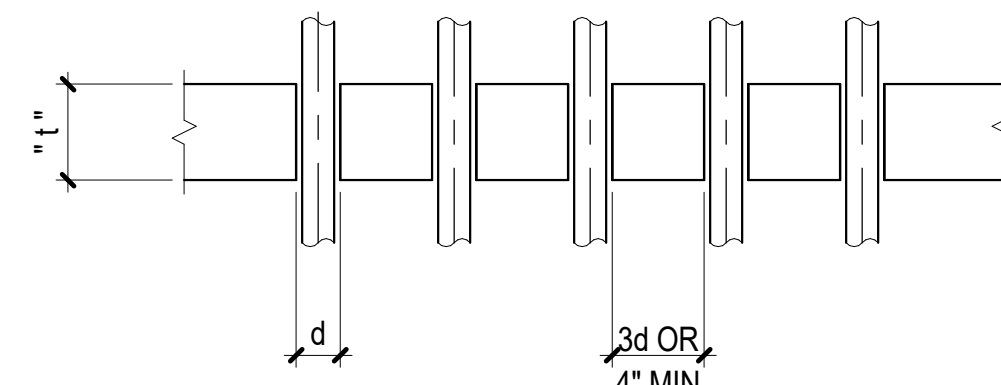
**9 CURBS AND HOUSEKEEPING PADS AT (E) S.O.G**

NTS



**5 SLAB-ON-GRADE DETAIL**

NTS



- NOTES:
1. DO NOT CUT REINFORCING.
  2. IF 4" MINIMUM CLEAR DISTANCE BETWEEN SLEEVES IS NOT POSSIBLE, THIS CONDITION SHALL BE TREATED AS A SLAB OPENING PER DETAIL.
  3. USE OF ALUMINUM CONDUIT IS PROHIBITED.

**6 PIPING & CONDUIT THROUGH SLAB**

NTS

SPLIT SYSTEM AIR CONDITIONERS SCHEDULE														
TAG	MANUFACTURER	MODEL	BUILDING	LOCATION	COOLING TOTAL MBH	HEATING TOTAL MBH	AIRFLOW CFM	REFRIGERANT PIPING		SEER	ELECTRICAL			WEIGHT LBS
								LIQUID	GAS		V / PH	MCA	MOCP	
SSO-1	SAMSUNG	AR24TSFYBWKKCV	BUILDING 1	ROOF	22	24	—	1/4"	5/8"	18	208 / 1	20	30	125
SSI-1	SAMSUNG	AR24TSFYBWKKCV		FOOD SERVICE			657	1/4"	5/8"	—	NOTE 1			30
SSO-2	SAMSUNG	AR09TSFYBWKKCV	BUILDING 1	ROOF	9	11	—	1/4"	3/8"	23.5	208 / 1	12	20	70
SSI-2	SAMSUNG	AR09TSFYBWKKCV		STAFF LOUNGE			371	1/4"	3/8"	—	NOTE 1			25
SSO-3	SAMSUNG	AR24TSFYBWKKCV	BUILDING 1	ROOF	22	NOTE 6	—	1/4"	5/8"	18	208 / 1	20	30	125
SSI-3	SAMSUNG	AR24TSFYBWKKCV		ELECTRICAL ROOM			657	1/4"	5/8"	—	NOTE 1			30

- INDOOR UNITS ARE POWERED BY OUTDOOR UNIT.
- PROVIDE WITH WALL MOUNTING BRACKET.
- PROVIDE WITH SAMSUNG WALL MOUNTED THERMOSTAT.

- PROVIDE WITH BACNET INTERFACE CARD. SEE MP5.01 FOR CONTROLS.
- PROVIDE WITH CONDENSATE PUMP.
- LOCK OUT HEATING.

AIR DISTRIBUTION SCHEDULE						
TAG	MANUFACTURER	MODEL NO.	DESCRIPTION	BORDER TYPE	MOUNTING DETAIL	NOTES
HSS-1	TITUS	S30FL	HIGH SIDEWALL SUPPLY	TYPE 1	2/MP6.01	1, 2, 4
HSR-1	TITUS	350RL	HIGH SIDEWALL RETURN	TYPE 1	12/MP6.01	2, 3
RG-1	TITUS	30RL	RELIEF GRILLE	TYPE 1	12/MP6.01	2, 5

- SET BLADES AT 22.5° DEFLECTION.
- PRIME AND PAINT PER ARCHITECT'S INSTRUCTIONS. REGISTER COLOR SELECTED BY ARCHITECT.
- PROVIDE WITH AIRSAN COMPACT DUCT SILENCER.
- PROVIDE WITH ASD AIR SCOOP DEVICE.
- CONTRACTOR TO FIELD VERIFY (E) DIMENSION PRIOR TO ORDERING.

ROOF EXHAUST FANS SCHEDULE										
TAG	MANUFACTURER	MODEL NO.	AREA SERVED	AIRFLOW CFM	ESP IN. W.G.	FAN RPM	SOUND POWER SONES	MOTOR		WEIGHT LBS
								HP / WATTS	V / PH	
REF-2-1	GREENHECK	G-070-VG	STOR. 202	250	0.25	1479	4.1	1/15	115 / 1	45
REF-3-1	GREENHECK	G-098-VG	STOR. 303	490	0.25	1125	6.0	1/4	115 / 1	45
REF-4-1	GREENHECK	G-070-VG	STOR. 402	250	0.25	1479	4.1	1/15	115 / 1	45

- PROVIDE WITH UL LISTING, FAN MOUNTED SPEED CONTROL, BACKDRAFT DAMPER, BIRDSCREEN, AND ROOF CURB.
- PROVIDE WITH LINE VOLTAGE TSTAT.

CLASSROOM SPLIT SYSTEM HEAT PUMPS SCHEDULE																		
TAG	MANUFACTURER	MODEL	BUILDING	LOCATION	COOLING TOTAL MBH	HEATING TOTAL MBH	AIRFLOW CFM	OUTSIDE AIR CFM	REFRIGERANT PIPING		SEER	HSPF	ELECTRICAL			WEIGHT LBS	MOUNTING DETAIL	NOTES
									LIQUID	GAS			V / PH	MCA	MOCP			
FC-1	SAMSUNG	AM054TNZDCHAA	BLDG 1	CLASSROOM 1	53	61	1150	450	3/8"	3/4"	—	—	208/1	2.6	15	164	1/MP6.01	2, 3, 4, 5, 6, 7, 8
HP-1	SAMSUNG	AM053TXMDCHAA		ROOF	—	—	—	—	3/8"	3/4"	17.5	10	208 / 1	34	50	212	3/MP6.01	1
FC-2	SAMSUNG	AM054TNZDCHAA		CLASSROOM 2	53	61	1150	450	3/8"	3/4"	—	—	208/1	2.6	15	164	1/MP6.01	2, 3, 4, 5, 6, 7, 8
HP-2	SAMSUNG	AM053TXMDCHAA	BLDG 1	ROOF	—	—	—	—	3/8"	3/4"	17.5	10	208 / 1	34	50	212	3/MP6.01	1
FC-3	SAMSUNG	AM054TNZDCHAA		CLASSROOM 3	53	61	1150	450	3/8"	3/4"	—	—	208/1	2.6	15	164	1/MP6.01	2, 3, 4, 5, 6, 7, 8
HP-3	SAMSUNG	AM053TXMDCHAA		ROOF	—	—	—	—	3/8"	3/4"	17.5	10	208 / 1	34	50	212	3/MP6.01	1
FC-4	SAMSUNG	AM054TNZDCHAA	BLDG 2	CLASSROOM 4	53	61	1150	450	3/8"	3/4"	—	—	208/1	2.6	15	164	1/MP6.01	2, 3, 4, 5, 6, 7, 8
HP-4	SAMSUNG	AM053TXMDCHAA		ROOF	—	—	—	—	3/8"	3/4"	17.5	10	208 / 1	34	50	212	3/MP6.01	1
FC-5	SAMSUNG	AM054TNZDCHAA		CLASSROOM 5	53	61	1150	450	3/8"	3/4"	—	—	208/1	2.6	15	164	1/MP6.01	2, 3, 4, 5, 6, 7, 8
HP-5	SAMSUNG	AM053TXMDCHAA	BLDG 2	ROOF	—	—	—	—	3/8"	3/4"	17.5	10	208 / 1	34	50	212	3/MP6.01	1
FC-6	SAMSUNG	AM054TNZDCHAA		CLASSROOM 6	53	61	1150	450	3/8"	3/4"	—	—	208/1	2.6	15	164	1/MP6.01	2, 3, 4, 5, 6, 7, 8
HP-6	SAMSUNG	AM053TXMDCHAA		ROOF	—	—	—	—	3/8"	3/4"	17.5	10	208 / 1	34	50	212	3/MP6.01	1
FC-7	SAMSUNG	AM054TNZDCHAA	BLDG 3	CLASSROOM 7	53	61	1150	450	3/8"	3/4"	—	—	208/1	2.6	15	164	1/MP6.01	2, 3, 4, 5, 6, 7, 8
HP-7	SAMSUNG	AM053TXMDCHAA		ROOF	—	—	—	—	3/8"	3/4"	17.5	10	208 / 1	34	50	212	3/MP6.01	1
FC-8	SAMSUNG	AM054TNZDCHAA		CLASSROOM 8	53	61	1150	450	3/8"	3/4"	—	—	208/1	2.6	15	164	1/MP6.01	2, 3, 4, 5, 6, 7, 8
HP-8	SAMSUNG	AM053TXMDCHAA	BLDG 3	ROOF	—	—	—	—	3/8"	3/4"	17.5	10	208 / 1	34	50	212	3/MP6.01	1
FC-9	SAMSUNG	AM054TNZDCHAA		CLASSROOM 9	53	61	1150	450	3/8"	3/4"	—	—	208/1	2.6	15	164	1/MP6.01	2, 3, 4, 5, 6, 7, 8
HP-9	SAMSUNG	AM053TXMDCHAA		ROOF	—	—	—	—	3/8"	3/4"	17.5	10	208 / 1	34	50	212	3/MP6.01	1
FC-10	SAMSUNG	AM054TNZDCHAA	BLDG 3	CLASSROOM 10	53	61	1150	450	3/8"	3/4"	—	—	208/1	2.6	15	164	1/MP6.01	2, 3, 4, 5, 6, 7, 8
HP-10	SAMSUNG	AM053TXMDCHAA		ROOF	—	—	—	—	3/8"	3/4"	17.5	10	208 / 1	34	50	212	3/MP6.01	1
FC-11	SAMSUNG	AM054TNZDCHAA		CLASSROOM 11	53	61	1150	450	3/8"	3/4"	—	—	208/1	2.6	15	164	1/MP6.01	2, 3, 4, 5, 6, 7, 8
HP-11	SAMSUNG	AM053TXMDCHAA	BLDG 3	ROOF	—	—	—	—	3/8"	3/4"	17.5	10	208 / 1	34	50	212	3/MP6.01	1
FC-12	SAMSUNG	AM054TNZDCHAA		CLASSROOM 12	53	61	1150	450	3/8"	3/4"	—	—	208/1	2.6	15	164	1/MP6.01	2, 3, 4, 5, 6, 7, 8
HP-12	SAMSUNG	AM053TXMDCHAA		ROOF	—	—	—	—	3/8"	3/4"	17.5	10	208 / 1	34	50	212	3/MP6.01	1
FC-13	SAMSUNG	AM054TNZDCHAA	BLDG 4	CLASSROOM 13	53	61	1150	450	3/8"	3/4"	—	—	208/1	2.6	15	164	1/MP6.01	2, 3, 4, 5, 6, 7, 8
HP-13	SAMSUNG	AM053TXMDCHAA		ROOF	—	—	—	—	3/8"	3/4"	17.5	10	208 / 1	34	50	212	3/MP6.01	1
FC-14	SAMSUNG	AM054TNZDCHAA		CLASSROOM 14	53	61	1150	450	3/8"	3/4"	—	—	208/1	2.6	15	164	1/MP6.01	2, 3, 4, 5, 6, 7, 8
HP-14	SAMSUNG	AM053TXMDCHAA	BLDG 4	ROOF	—	—	—	—	3/8"	3/4"	17.5	10	208 / 1	34	50	212	3/MP6.01	1
FC-15	SAMSUNG	AM054TNZDCHAA		CLASSROOM 15	53	61	650	200	3/8"	5/8"	—	—	208/1	2.6	15	164	1/MP6.01	2, 3, 4, 5, 6, 7, 8
HP-15	SAMSUNG	AM053TXMDCHAA		ROOF	—	—	—	—	3/8"	5/8"	17.5	10	208 / 1	34	50	212	3/MP6.01	1
FC-16	SAMSUNG	AM054TNZDCHAA	BLDG 4	CLASSROOM 16	53	61	1150	450	3/8"	3/4"	—	—	208/1	2.6	15	164	1/MP6.01	2, 3, 4, 5, 6, 7, 8
HP-16	SAMSUNG	AM053TXMDCHAA		ROOF	—	—	—	—	3/8"	3/4"	17.5	10	208 / 1	34	50	212	3/MP6.01	1
FC-17	SAMSUNG	AM054TNZDCHAA		CLASSROOM 17	53	61	1150	450	3/8"	3/4"	—	—	208/1	2.6	15	164	1/MP6.01	2, 3, 4, 5, 6, 7, 8
HP-17	SAMSUNG	AM053TXMDCHAA	BLDG 4	ROOF	—	—	—	—	3/8"	3/4"	17.5	10	208 / 1	34	50	212	3/MP6.01	1
FC-18	SAMSUNG	AM054TNZDCHAA		CLASSROOM 18	53	61	1150	450	3/8"	3/4"	—	—	208/1	2.6	15	164	1/MP6.01	2, 3, 4, 5, 6, 7, 8
HP-18	SAMSUNG	AM053TXMDCHAA		ROOF	—	—	—	—	3/8"	3/4"	17.5	10	208 / 1	34	50	212	3/MP6.01	1
FC-19	SAMSUNG	AM054TNZDCHAA	BLDG 4	CLASSROOM 19	53	61	1150	450	3/8"	3/4"	—	—	208/1	2.6	15	164	1/MP6.01	2, 3, 4, 5, 6, 7, 8
HP-19	SAMSUNG	AM053TXMDCHAA		ROOF	—	—	—	—	3/8"	3/4"	17.5	10	208 / 1	34	50	212	3/MP6.01	1
FC-20	SAMSUNG	AM054TNZDCHAA		CLASSROOM 20	53	61	1150	450	3/8"	3/4"	—	—	208/1	2.6	15	164	1/MP6.01	2, 3, 4, 5, 6, 7, 8
HP-20	SAMSUNG	AM053TXMDCHAA	BLDG 4	ROOF	—	—	—	—	3/8"	3/4"	17.5	10	208 / 1	34	50	212	3/MP6.01	1

- SPLIT SYSTEM SHALL BE ABLE TO OPERATE AT 94% HEATING CAPACITY DOWN TO 32°F OUTDOOR AMBIENT TEMPERATURE.
- CFM BASED ON 0.55 ESP.
- PROVIDE WITH SAMSUNG MM-A60UN 24VAC THERMOSTAT ADAPTER AND 24VAC TRANSFORMER.
- PROVIDE WITH DELTA CONTROL THERMOSTAT WITH CO2 SENSOR. SEE MP5.01 FOR CONTROLS.

- PROVIDE WITH CONDENSATE PUMP.
- PROVIDE WITH MERV-13 FILTERS WITH FILTER ACCESS PANEL.
- FAN COIL SHALL BE ADJUSTED TO OPERATE AT CONSTANT SPEED AT INDICATED CFM.
- NOT USED

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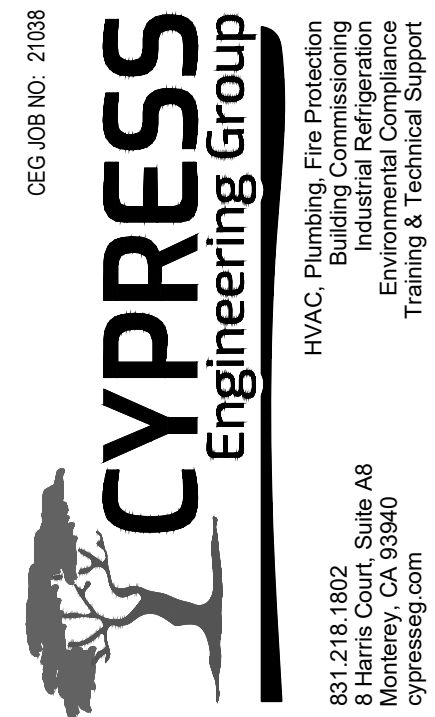
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PROJECT

MEADOW HEIGHTS  
ELEMENTARY  
SCHOOL - HVAC  
REPLACEMENT

SAN MATEO-FOSTER CITY  
SCHOOL DISTRICT

CONSULTANT



STAMP



STATE

DSA FILE NUMBER

41-26

APPL #

01-119554

REVISIONS

No. Description Date

MILESTONES

DD

90% CD

DSA SUB

06/02/2021

BACKCHECK

09/22/2021

SHEET

SCHEDULES-  
MECHANICAL

DATE

11/24/2021

JOB #

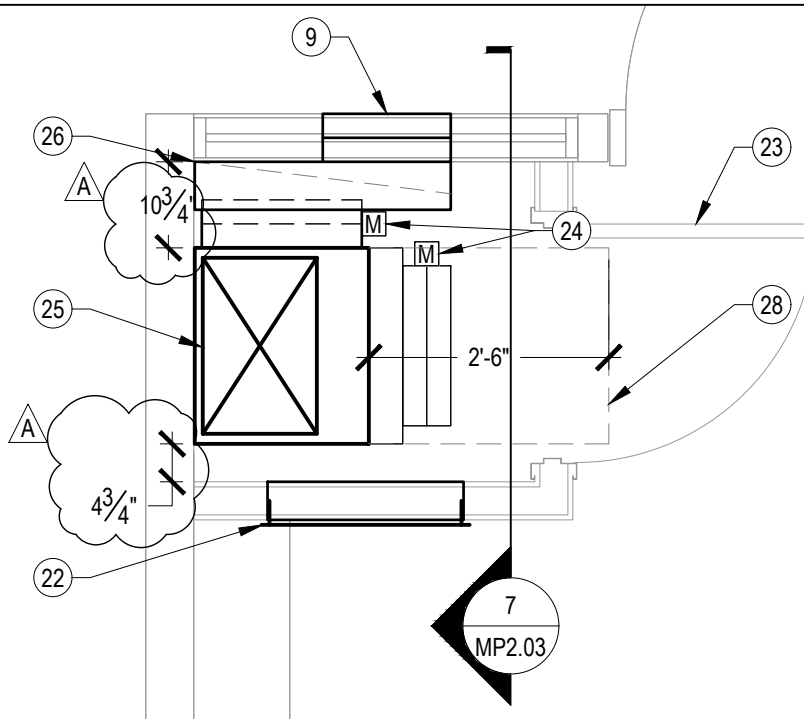
2021005.04

SHEET #

AD1-  
MP0.02

## GENERAL NOTES

1. CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING ALL EXISTING AND NEW BUILDING STRUCTURES, SERVICES AND OWNER'S PROPERTY DURING THE ENTIRE PERIOD OF CONSTRUCTION.
2. COORDINATE THE LOCATIONS OF ROOF/ WALL OPENINGS, PENETRATIONS, DUCTWORK AND ALL MECHANICAL EQUIPMENT WITH RESPECT TO BUILDING STRUCTURE AND OTHER BUILDING SERVICES TO AVOID CONFLICT.
3. FOR CLARITY, ABANDONED CD PIPING AND (E) GAS MAINS ARE NOT SHOWN ON THIS PLAN. SEE MP2.01.
4. PAINT ALL EXPOSED DUCTWORK, SUPPORTS AND REGISTERS TO MATCH ADJACENT. <sup>A</sup>
5. SEE DETAIL 7/MP6.01 FOR PIPE SUPPORT ON ROOF.
6. PAINT CONDENSATE PIPING AT EXTERIOR OF BUILDING TO MATCH ADJACENT. <sup>A</sup>



6  
MP2.03

## FLOOR PLAN - ENCLOSURE

SCALE: NONE

CEG JOB NO: 21038



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Monterey, CA 93940  
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**MEADOW HEIGHTS ELEMENTARY SCHOOL -  
HVAC REPLACEMENT**

**SAN MATEO-FOSTER CITY SCHOOL DISTRICT**

FILE NO.: **41-26**

APPL NO.: **01-119554**

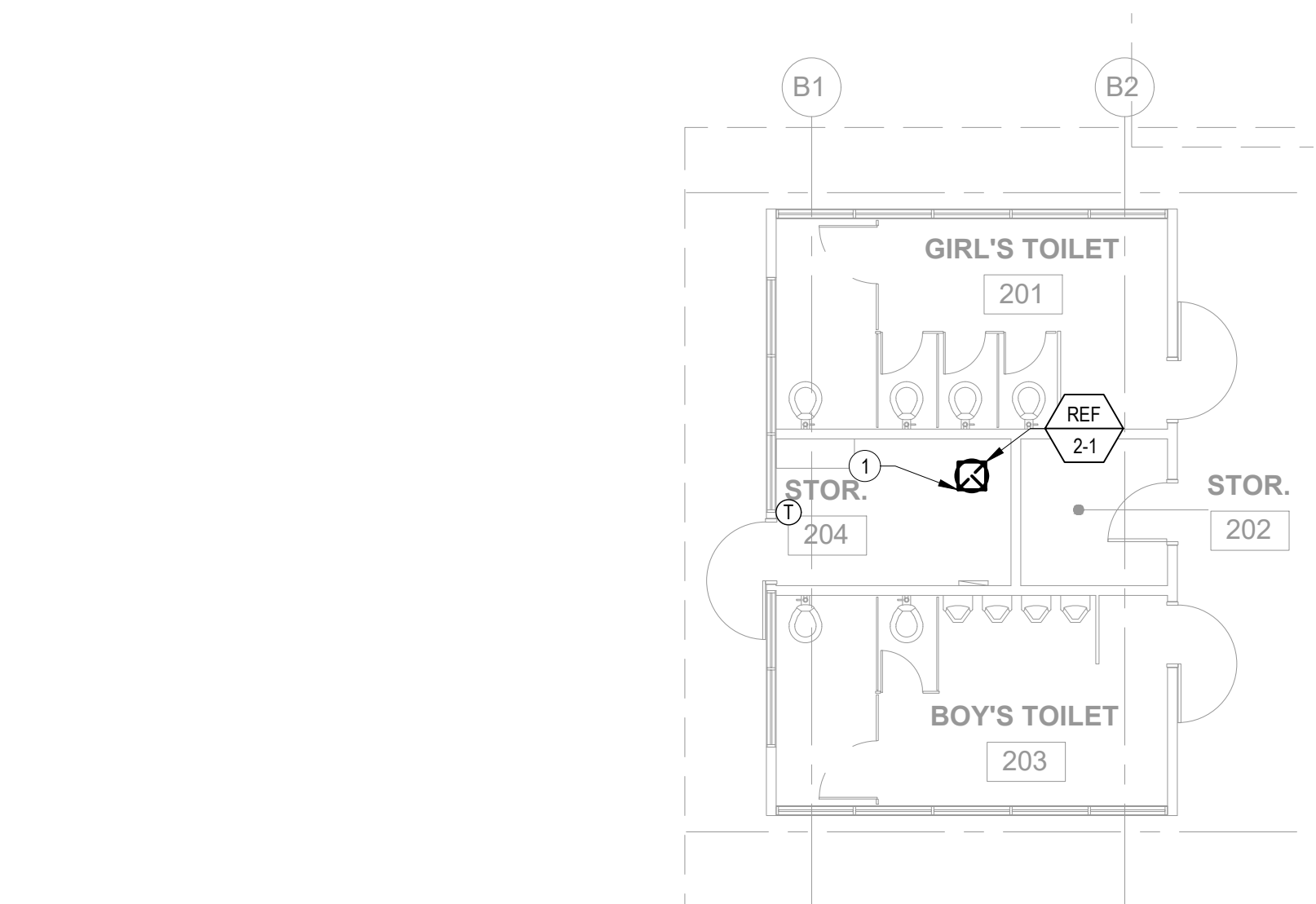
JOB NO.: **2021005.04**

DATE **11/24/2021**

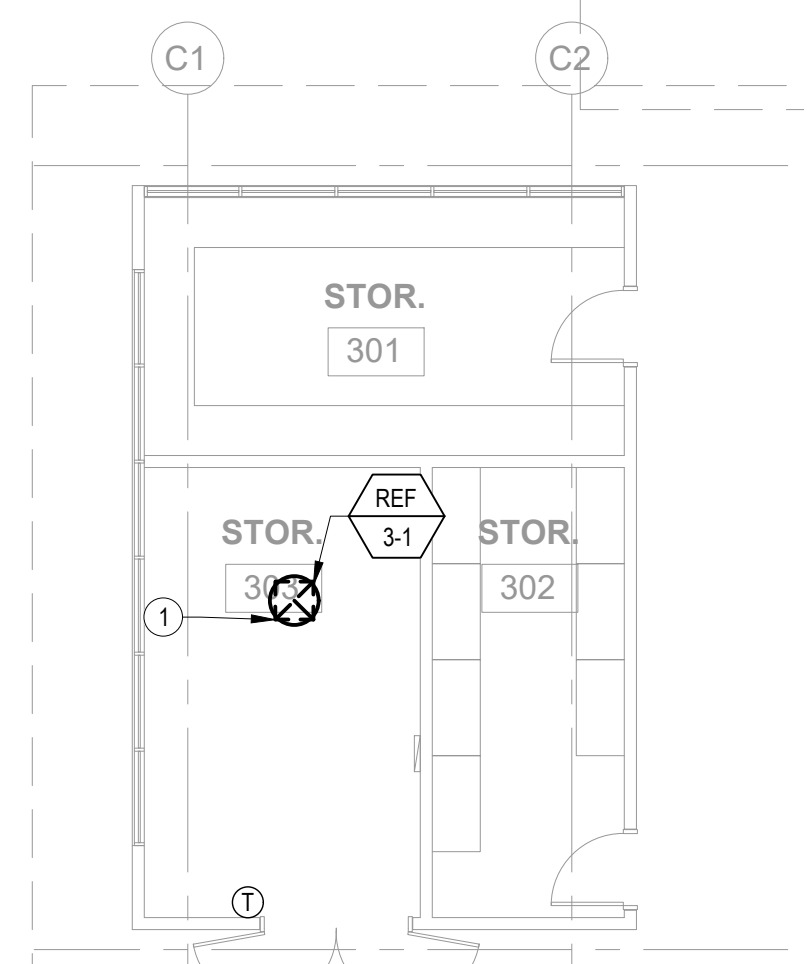
SHEET

REF. SHEET MP2.03

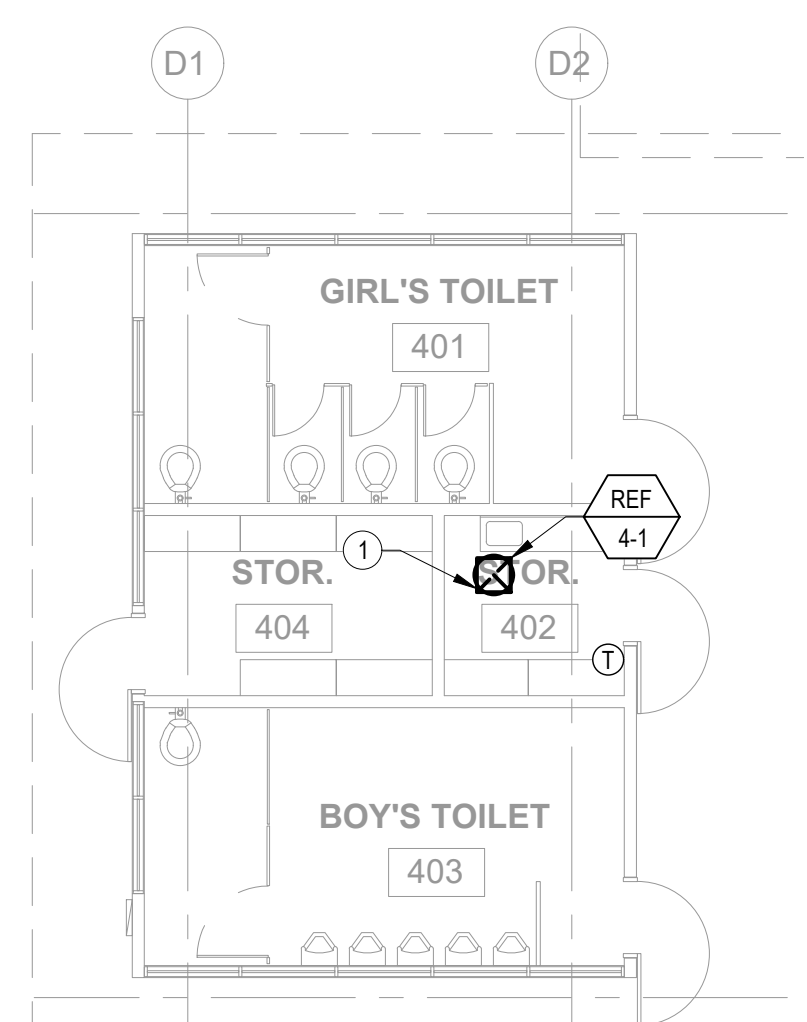
**AD1-MP2.03**



2 PARTIAL FLOOR PLAN - BLDG 2 - NEW - MECHANICAL & PLUMBING  
AD1-MP2.04 SCALE: 1/8" = 1'-0" NORTH



3 PARTIAL FLOOR PLAN - BLDG 3 - NEW - MECHANICAL & PLUMBING  
AD1-MP2.04 SCALE: 1/8" = 1'-0" NORTH



4 PARTIAL FLOOR PLAN - BLDG 4 - NEW - MECHANICAL & PLUMBING  
AD1-MP2.04 SCALE: 1/8" = 1'-0" NORTH

#### GENERAL NOTES

1. CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING ALL EXISTING AND NEW BUILDING STRUCTURES, SERVICES AND OWNER'S PROPERTY DURING THE ENTIRE PERIOD OF CONSTRUCTION.
2. COORDINATE THE LOCATIONS OF ROOF/WALL OPENINGS, PENETRATIONS, DUCTWORK AND ALL MECHANICAL EQUIPMENT WITH RESPECT TO BUILDING STRUCTURE AND OTHER BUILDING SERVICES TO AVOID CONFLICT.
3. FOR CLARITY, ABANDONED CO PIPING AND (E) GAS MAINS ARE NOT SHOWN ON THIS PLAN. SEE MP2.01.
4. PAINT ALL EXPOSED DUCTWORK, SUPPORTS AND REGISTERS TO MATCH ADJACENT.
5. SEE DETAIL 7/MP6.01 FOR PIPE SUPPORT ON ROOF.
6. PAINT CONDENSATE PIPING AT EXTERIOR OF BUILDING TO MATCH ADJACENT.

#### NEW SHEET NOTES

1. INSTALL EXHAUST FAN ON ROOF.

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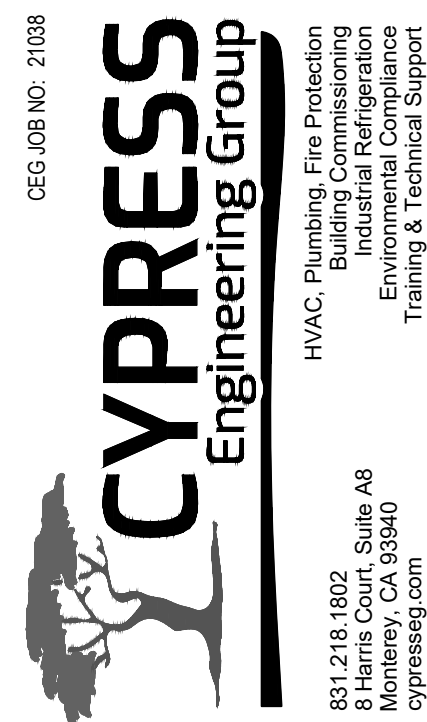
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BACKCHECK	09/22/2021

SHEET

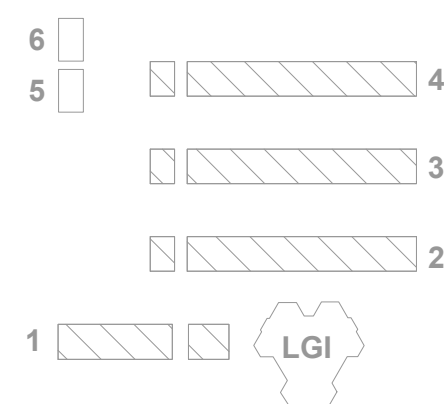
FLOOR PLAN -  
NEW - BLDGS 1, 2,  
3, & 4 -  
MECHANICAL &  
PLUMBING

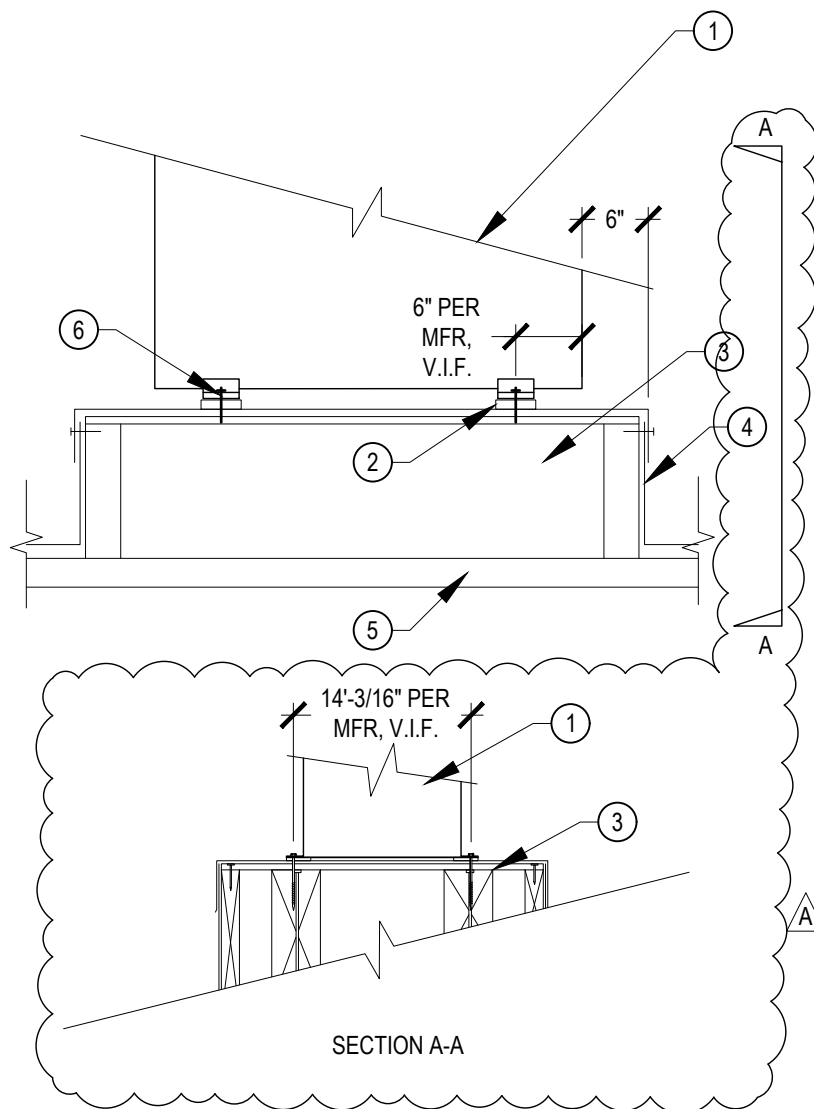
DATE 11/24/2021

JOB # 2021005.04

SHEET # AD1-  
MP2.04

BUILDING KEY





#### DETAIL NOTES:

1. HEAT PUMP. FOR LOCATION, SEE PLANS.
2. 4"x4"x1/4" NEOPRENE PADS SET IN SEALANT. TYP. OF 4. A
3. LEVEL BUILT UP PLATFORM WITH SHEET METAL CAP. SEE 11/S8.01 FOR PLATFORM DETAIL AND ATTACHMENT TO ROOF STRUCTURE. SEE ARCHITECTS DRAWINGS FOR PLATFORM CAP.
4. FOR FLASHING, SEE ARCHITECT'S DRAWINGS.
5. (E) ROOF.
6. 3/8"Ø LAG SCREW THRU MOUNTING HOLE AND ISOLATOR PAD TO PLATFORM. MINIMUM 2" EMBEDMENT. TYP. OF 4.

T.S.

3

SPLIT SYSTEM HEAT PUMP UNIT ON PLATFORM

N.T.S.

CEG JOB NO: 21038



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**MEADOW HEIGHTS ELEMENTARY SCHOOL -  
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**SAN MATEO-FOSTER CITY SCHOOL DISTRICT**

FILE NO.: **41-26**

APPL NO.: **01-119554**

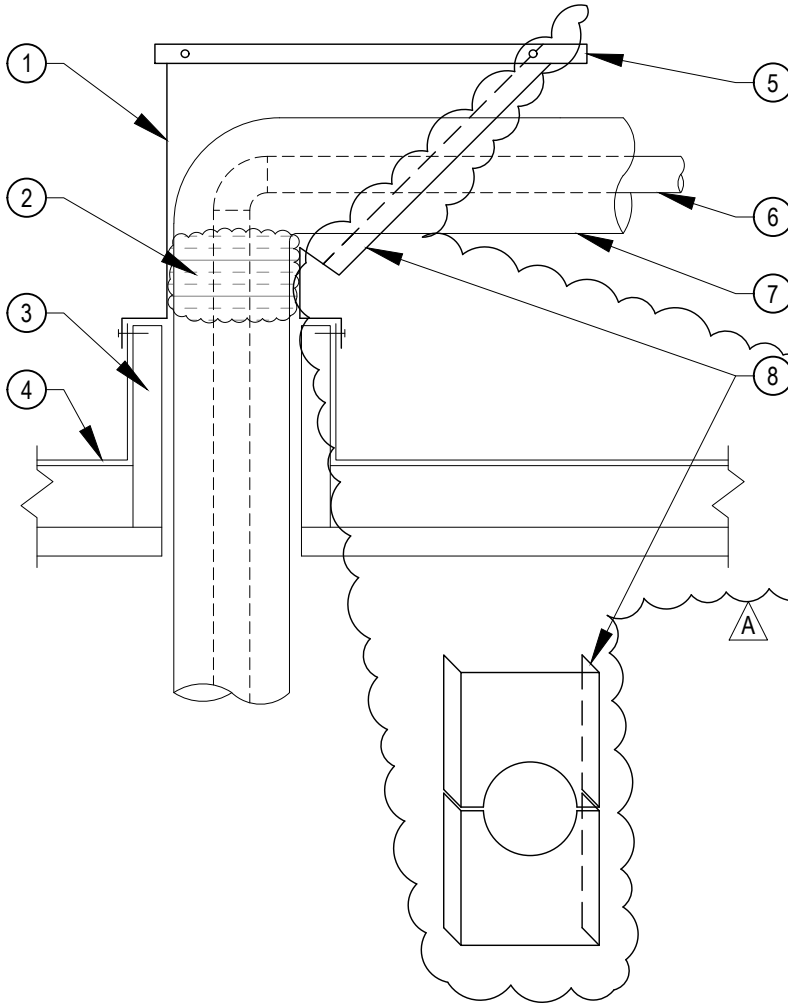
JOB NO.: **2021005.04**

DATE **11/24/2021**

SHEET

REF. SHEET MP6.01

**AD1-MP6.01a**



○ DETAIL NOTES:

1. GALVANIZED SHEET METAL ROOF JACK WITH CAP.
2. FILL OPENING WITH FOAM.
3. ROOF OPENING. SEE STRUCTURAL DRAWING FOR CURB, SEE ARCHITECT'S DRAWINGS FOR FLASHING.
4. ROOFING.
5. REMOVABLE SHEET METAL COVER ATTACHED WITH TWO (2) #8 SELF TAPPING SCREWS EACH SIDE, PAINTED.
6. PIPE.
7. PIPE INSULATION.
8. 2 PIECE 20 GA. GALVANIZED SHEET METAL COVER W/ 1-1/2" FLANGES ATTACHED W/ #12 SMS @4" O.C.

NOTES:

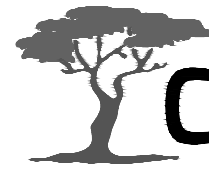
1. EXPOSED PIPING SHALL HAVE ALUMINUM JACKET.

4

PIPING ROOF JACK

N.T.S.

CEG JOB NO: 21038



**CYPRESS**  
Engineering Group

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cypresseg.com

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Industrial Refrigeration  
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**aedis**  
architects

387 S. 1st Street, Suite 300  
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fax: (408) 300 - 5121

**MEADOW HEIGHTS ELEMENTARY SCHOOL -  
HVAC REPLACEMENT**

**SAN MATEO-FOSTER CITY SCHOOL DISTRICT**

FILE NO.: **41-26**

APPL NO.: **01-119554**

JOB NO.: **2021005.04**

DATE **11/24/2021**

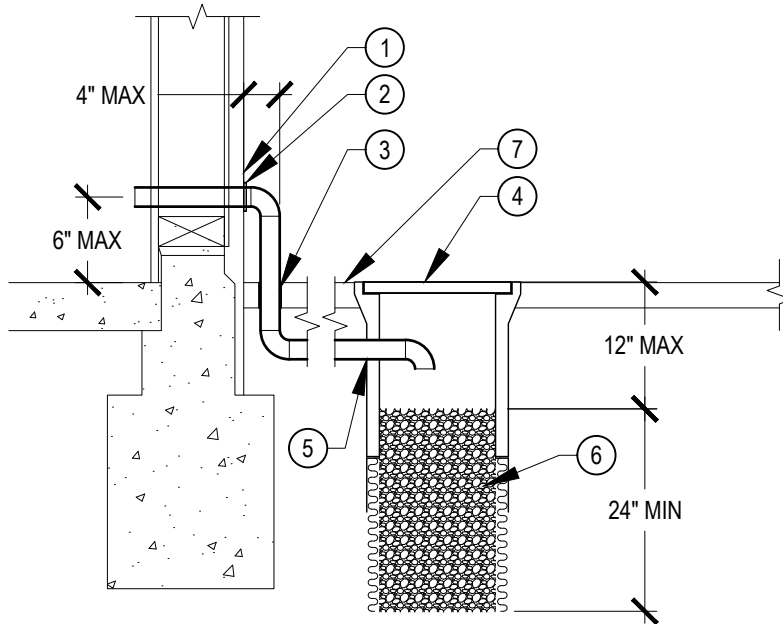
SHEET

REF. SHEET MP6.01

**AD1-MP6.01b**

○ DETAIL NOTES:

1. (E) EXTERIOR WALL.
2. SEAL PENETRATION WATERTIGHT. PROVIDE ESCUTCHEON AT EXTERIOR.
3. DROP PIPE BELOW GRADE.
4. CHRISTY F22 CURB VALVE BOX WITH ADS SNAP ADAPTER AND 18" ADS EXTENSION. WITH F08R REINFORCED CONCRETE LID. FLUSH WITH GRADE.
5. CORE DRILL BOX FOR PIPE TO PASS THROUGH.
6. FILL WITH WASHED PEA GRAVEL. A
7. SEE A8.10 FOR PATCHING.

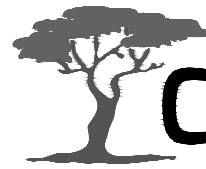


14

CONDENSATE DRYWELL

N.T.S.

CEG JOB NO: 21038



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**MEADOW HEIGHTS ELEMENTARY SCHOOL -  
HVAC REPLACEMENT**

**SAN MATEO-FOSTER CITY SCHOOL DISTRICT**

FILE NO.: **41-26**

APPL NO.: **01-119554**

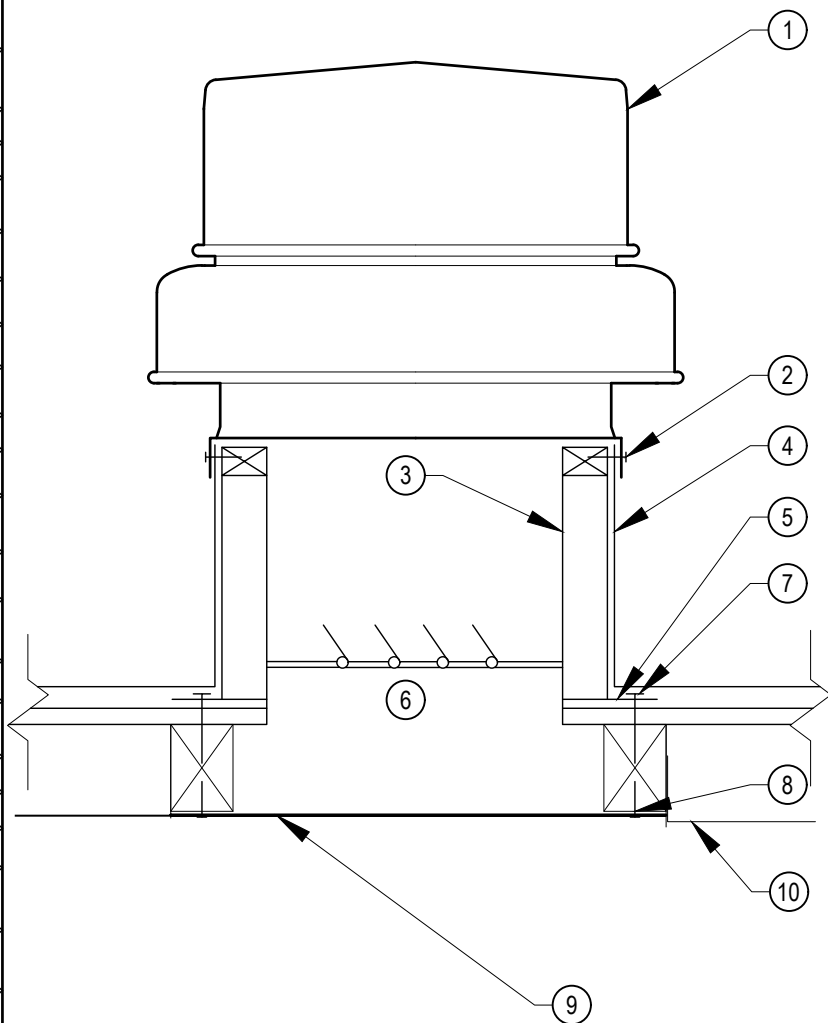
JOB NO.: **2021005.04**

DATE **11/24/2021**

SHEET

REF. SHEET MP6.01

**AD1-MP6.01c**



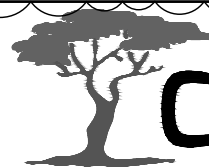
- **DETAIL NOTES:**
1. EXHAUST FAN.
  2. SECURE TO ROOF CURB WITH #12 SELF TAPPING SCREWS AT 12" ON CENTER. MINIMUM 2 PER SIDE.
  3. FACTORY CURB WITH NAILER.
  4. FOR ROOFING AND FLASHING, SEE ARCHITECT'S DRAWINGS.
  5. ROOF DECK.
  6. BACKDRAFT DAMPER.
  7. 3/8"Ø LAG SCREW THRU CURB AND ROOF WITH 3" MINIMUM EMBEDMENT INTO BLOCKING.
  8. 4x BLOCKING. SECURE TO STRUCTURE WITH SIMPSON HU44 HANGERS EACH END.
  9. 1/4" METAL MESH SCREEN, ATTACHED TO FRAMED BLOCKING W/ #8 WOOD SCREWS @ 6" O.C. ALL AROUND.
  10. (E) CEILING.

16

EXHAUST FAN MOUNTING

N.T.S.

CEG JOB NO: 21038



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MEADOW HEIGHTS ELEMENTARY SCHOOL - HVAC REPLACEMENT		
SAN MATEO-FOSTER CITY SCHOOL DISTRICT		
FILE NO.:	41-26	SHEET
APPL NO.:	01-119554	REF. SHEET MP6.01
JOB NO.	2021005.04	<b>AD1-MP6.01d</b>
DATE	11/24/2021	

SHEET # **AD-1**  
**E3.1**



PROJECT

MEADOW HEIGHTS  
ELEMENTARY  
SCHOOL - HVAC  
REPLACEMENT

SAN MATEO-FOSTER CITY  
SCHOOL DISTRICT

CONSULTANT



American Consulting Engineers  
Electrical, Inc.  
1380 The Alameda, Suite 202 408/226-2312  
San Jose, CA 95126 Fax 408/226-2318  
DOB # E02153100

STAMP

STATE

DSA FILE NUMBER

41-26

APPL #

01-119554

REVISIONS

No. Description Date

ADDENDUM 1 11/24/2021

MILESTONES

DD

90% CD

DSA SUB

BACKCHECK

06/02/2021

09/22/2021

SHEET

PANEL  
SCHEDULES

DATE

11/24/2021

JOB #

2021005.04

SHEET #

AD-1  
E4.3

SHEET NOTES:

- 1 PROVIDE SUBFEED CIRCUIT BREAKERS TO RE-FEED EXISTING PANELS.  
SEE SINGLE LINE DIAGRAM FOR ADDITIONAL REQUIREMENTS.

PANEL NAME	AM	FED FROM	XPWR1A					
VOLTAGE	208/120V	MAIN C/B	160					
PHASE	3	BUSING	400 AMP					
WIRE	4	MIN. A/C	10.00					
TYPE	NEMA 1	SUB-FEED C/B	225A-3P					
MOUNTING	SURFACE	FEED THRU LUGS	YES					
CIRCUIT DESCRIPTION	LOAD TYPE (KVA)	CB AMP/P	OKT #	PH #	OKT #	CB AMP/P	LOAD TYPE (KVA)	CIRCUIT DESCRIPTION
	LITG REC MTR NCL						LITG REC MTR NCL	
(N) SPLIT SYSTEM 1 - FOOD SERVICE 40, ROOF		2.08	30A	1	A	2	30A	2.08 (N) SPLIT SYSTEM 3 - ELECTRICAL 39, ROOF
- - - - -		2.08	2P	3	B	4	2P	2.08
(N) SPLIT SYSTEM 2 - STAFF LOUNGE 105, ROOF		1.25	20A	5	C	6	50A	3.74 (N) HEAT PUMP 1 - KINDERGARTEN 1
- - - - -		1.25	2P	7	A	8	2P	3.74
SPARE			20A/1P	9	B	10	50A	3.74 (N) HEAT PUMP 2 - KINDERGARTEN 2
SPARE			20A/1P	11	C	12	2P	3.74
SPARE			20A/1P	13	A	14	15A	0.89 (N) FAN COIL 1 - KINDERGARTEN 1
SPARE			20A/1P	15	B	16	2P	0.89
SPARE			20A/1P	17	C	18	15A	0.89 (N) FAN COIL 2 - KINDERGARTEN 2
SPARE			20A/1P	19	A	20	2P	0.89
SPARE			20A/1P	21	B	22		
SPARE			20A/1P	23	C	24	20A/1P	SPARE
SPARE			20A/1P	25	A	26	20A/1P	SPARE
SPARE			20A/1P	27	B	28	20A/1P	SPARE
SPARE			20A/1P	29	C	30	20A/1P	SPARE
SPARE			20A/1P	31	A	32	20A/1P	SPARE
SPARE			20A/1P	33	B	34	20A/1P	SPARE
SPARE			20A/1P	35	C	36	20A/1P	SPARE
SPARE			20A/1P	37	A	38	20A/1P	SPARE
SPARE			20A/1P	39	B	40	20A/1P	0.36 (N) GFCI REC. MOUNT ON ROOF - BLDG 1 KINDERGARTEN 1,2
SPARE			20A/1P	41	C	42	20A/1P	0.60 (N) MOTOR RATED SWITCH FOR COND. PUMP - BLDG 1
	0 0 0 0 6.7						0 0.4 0.6 22.7	
LOAD SUMMARY	CONNECTED KVA	DEMAND FACTOR	DEMAND KVA	Yes/No				
(LTD) LIGHTING X 125%	0	1.25	0.0	FULL RATED A/C	Y	KVA PHASE A (CONNECTED)	10.9	
(REC) RECEIPTS PER 220.44	0.4	1.00	0.4	SERIES RATED A/C	N	KVA PHASE B (CONNECTED)	9.2	
10KVA X 100% + REMAINDER X 50%	0	0.50	0.0	SPD	N	KVA PHASE C (CONNECTED)	10.2	
(MTR) LARGEST MOTOR X 125%	0.6	1.25	0.6	COPPER BISSING	Y	SUB FEED CONNECTED LOAD		
+ REMAINING MOTORS X 100%	0	1.00	0.0	ALUMINUM BISSING	N	TOTAL DEMAND KVA	30.5	
(NCL) NON CONTINUOUS LOAD X 100%	29.4	1.00	29.4			TOTAL LOAD AMPERES	84.7	

PANEL NAME	DM	FED FROM	XPWR1C
VOLTAGE	208/120V	MAIN C/B	160
PHASE	3	BUSING	400 AMP
WIRE	4	MIN. A/C	10.000
TYPE	NEMA 1	SUB-FEED C/B	225A-3P
MOUNTING	SURFACE	FEED THRU LUGS	YES

CIRCUIT DESCRIPTION	LOAD TYPE (KVA)			CB	OKT #	PH	OKT #	CB	LOAD TYPE (KVA)			CIRCUIT DESCRIPTION
	LITG	REC	MTR						LITG	REC	MTR	
(N) HEAT PUMP 11 - KINDERGARTEN 11			3.74	50A	1	A	2	50A			3.74	(N) HEAT PUMP 13 - KINDERGARTEN 13
- - - - -			3.74	2P	3	B	4	2P			3.74	- - - - -
(N) HEAT PUMP 12 - KINDERGARTEN 12			3.74	50A	5	C	6	50A			3.74	(N) HEAT PUMP 14 - KINDERGARTEN 14
- - - - -			3.74	2P	7	A	8	2P			3.74	- - - - -
(N) FAN COIL 11 - KINDERGARTEN 11			0.89	15A	9	B	10	15A			0.89	(N) FAN COIL 13 - KINDERGARTEN 13
- - - - -			0.89	2P	11	C	12	2P			0.89	- - - - -
(N) FAN COIL 12 - KINDERGARTEN 12			0.89	15A	13	A	14	15A			0.89	(N) FAN COIL 14 - KINDERGARTEN 14
- - - - -			0.89	2P	15	B	16	2P			0.89	- - - - -

SPARE	20A/1P	17	C	18	20A/1P	SPARE
SPARE	20A/1P	19	A	20	20A/1P	SPARE
SPARE	20A/1P	21	B	22	20A/1P	SPARE
SPARE	20A/1P	23	C	24	20A/1P	SPARE
SPARE	20A/1P	25	A	26	20A/1P	SPARE
SPARE	20A/1P	27	B	28	20A/1P	SPARE
SPARE	20A/1P	29	C	30	20A/1P	SPARE
SPARE	20A/1P	31	A	32	20A/1P	SPARE
SPARE	20A/1P	33	B	34	20A/1P	SPARE
SPARE	20A/1P	35	C	36	20A/1P	SPARE
SPARE	20A/1P	37	A	38	20A/1P	SPARE
SPARE	20A/1P	39	B	40	20A/1P	0.72 (N) GFCI REC. MOUNT ON ROOF - BLDG 3
(N) MOTOR RATED SWITCH FOR COND. PUMP - BLDG 3	20A/1P	41	C	42	20A/1P	SPARE

0	0	0.48	16.6	0	0	0.7	0	16.6
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LOAD SUMMARY	CONNECTED KVA	DEMAND FACTOR	DEMAND KVA	Yes/No	
(LTO) LIGHTING X 125%	0	1.25	0.0	FULL RATED A/C	Y
(REC) RECEIPTS PER 220.44	0.7	1.00	0.7	SERIES RATED A/C	N
10KVA X 100% + REMAINDER X 50%	0	0.50	0.0	SPD	N
(MTR) LARGEST MOTOR X 125%	0.5	1.25	0.6	COPPER BUSSING	Y
+ REMAINING MOTORS X 100%	0	1.00	0.0	ALUMINUM BUSSING	N
(NCL) NON CONTINUOUS LOAD X 100%	37.1	1.00	37.1		

KVA PHASE A (CONNECTED)	16.6
KVA PHASE B (CONNECTED)	11.8
KVA PHASE C (CONNECTED)	9.8
SUB FEED CONNECTED LOAD	
TOTAL DEMAND KVA	38.4
TOTAL LOAD AMPERES	106.7

PANEL NAME:	BM	FED FROM:	XPWR1B
VOLTAGE:	208/120V	MAIN C/B:	160
PHASE:	3	BUSING:	400 AMP
WIRE:	4	MIN. A/C:	10.000
TYPE:	NEMA 1	SUB-FEED C/B:	225A-3P
MOUNTING:	SURFACE	FEED THRU LUGS:	YES

CIRCUIT DESCRIPTION	LOAD TYPE (KVA)				CB	OKT #	PH #	OKT #	CB	LOAD TYPE (KVA)				CIRCUIT DESCRIPTION
	LITG	REC	MTR	NCL	AMP/P	#		#	AMP/P	LITG	REC	MTR	NCL	
(N) HEAT PUMP 3 - KINDERGARTEN 3				3.74	50A	2P	1	A	2	50A			3.74	(N) HEAT PUMP 6 - KINDERGARTEN 6
- - - - -				3.74			3	B	4				3.74	- - - - -
(N) HEAT PUMP 4 - KINDERGARTEN 4				3.74	50A	2P	5	C	6	50A			3.74	(N) HEAT PUMP 7 - KINDERGARTEN 7
- - - - -				3.74			7	A	8				3.74	- - - - -
(N) HEAT PUMP 5 - KINDERGARTEN 5				3.74	50A	2P	9	B	10	50A			3.74	(N) HEAT PUMP 8 - KINDERGARTEN 8
- - - - -				3.74			11	C	12				3.74	- - - - -
(N) FAN COIL 3 - KINDERGARTEN 3				0.89	15A	2P	13	A	14	15A			0.89	(N) FAN COIL 6 - KINDERGARTEN 6
- - - - -				0.89			15	B	16				0.89	- - - - -
(N) FAN COIL 4 - KINDERGARTEN 4				0.89	15A	2P	17	C	18	15A			0.89	(N) FAN COIL 7 - KINDERGARTEN 7
- - - - -				0.89			19	A	20				0.89	- - - - -
(N) FAN COIL 5 - KINDERGARTEN 5				0.89	15A	2P	21	B	22	15A			0.89	(N) FAN COIL 8 - KINDERGARTEN 8
- - - - -				0.89			23	C	24				0.89	- - - - -
SPARE					20A/1P	25	A	26	20A/1P					SPARE
SPARE					20A/1P	27	B	28	20A/1P					SPARE
SPARE					20A/1P	29	C	30	20A/1P					SPARE
SPARE					20A/1P	31	A	32	20A/1P					SPARE
SPARE					20A/1P	33	B	34	20A/1P					SPARE
SPARE					20A/1P	35	C	36	20A/1P					SPARE
SPARE					20A/1P	37	A	38	20A/1P					SPARE
SPARE					20A/1P	39	B	40	20A/1P	0.54				(N) GFCI REC. MOUNT ON ROOF - BLDG 2
(N) MOTOR RATED SWITCH FOR COND. PUMP - BLDG 2					20A/1P	41	C	42	20A/1P	0.54				(N) MOTOR RATED SWITCH FOR COND. PUMP - BLDG 2
	0	0	0.72	27.8						0	1.1	0	27.8	

LOAD SUMMARY	CONNECTED KVA	DEMAND FACTOR	DEMAND KVA	Yes/No	
(LTO) LIGHTING X 125%	0	1.25	0.0	FULL RATED A/C	Y
(REC) RECEIPTS PER 220.44	1.1	1.00	1.1	SERIES RATED A/C	N
10KVA X 100% + REMAINDER X 50%	0	0.50	0.0	SPD	N
(MTR) LARGEST MOTOR X 125%	0.7	1.25	0.9	COPPER BISSING	Y
+ REMAINING MOTORS X 100%	0	1.00	0.0	ALUMINUM BISSING	N
(NCL) NON CONTINUOUS LOAD X 100%	55.7	1.00	55.7		

TOTAL DEMAND KVA	57.6
TOTAL LOAD AMPERES	160.1

PANEL NAME:	DM	FED FROM:	XPWR1D						
VOLTAGE:	208/120V	MAIN C/B:	MILO						
PHASE:	3	BUSING:	500 AMP						
WIRE:	4	MIN. A/C:	10.000						
TYPE:	NEMA 1	SUB-FEED C/B:	225A-3P						
MOUNTING:	SURFACE	FEED THRU LUGS:	YES						
CIRCUIT DESCRIPTION	LOAD TYPE (KVA)	CB	OKT #	PH #	OKT #	CB	LOAD TYPE (KVA)	CIRCUIT DESCRIPTION	
	LITG REC MTR NCL	AMP/P	#	#	AMP/P	LITG REC MTR NCL			
(N) HEAT PUMP 15 - KINDERGARTEN 15		3.74	50A	1	A	2	50A	(N) HEAT PUMP 18 - KINDERGARTEN 18	
- - - - -		3.74	20P	3	B	4	20P	- - - - -	
(N) HEAT PUMP 16 - KINDERGARTEN 16		3.74	50A	5	C	6	50A	(N) HEAT PUMP 19 - KINDERGARTEN 19	
- - - - -		3.74	20P	7	A	8	20P	- - - - -	
(N) HEAT PUMP 17 - KINDERGARTEN 17		3.74	50A	9	B	10	50A	(N) HEAT PUMP 20 - KINDERGARTEN 20	
- - - - -		3.74	20P	11	C	12	20P	- - - - -	
(N) FAN COIL 15 - KINDERGARTEN 15		0.89	15A	13	A	14	15A	(N) FAN COIL 18 - KINDERGARTEN 18	
- - - - -		0.89	20P	15	B	16	20P	- - - - -	
(N) FAN COIL 16 - KINDERGARTEN 16		0.89	15A	17	C	18	15A	(N) FAN COIL 19 - KINDERGARTEN 19	
- - - - -		0.89	20P	19	A	20	20P	- - - - -	
(N) FAN COIL 17 - KINDERGARTEN 17		0.89	15A	21	B	22	15A	(N) FAN COIL 20 - KINDERGARTEN 20	
- - - - -		0.89	20P	23	C	24	20P	- - - - -	
SPARE			20A/1P	25	A	26	20A/1P	SPARE	
SPARE			20A/1P	27	B	28	20A/1P	SPARE	
SPARE			20A/1P	29	C	30	20A/1P	SPARE	
SPARE			20A/1P	31	A	32	20A/1P	SPARE	
SPARE			20A/1P	33	B	34	20A/1P	SPARE	
SPARE			20A/1P	35	C	36	20A/1P	SPARE	
SPARE			20A/1P	37	A	38	20A/1P	SPARE	
SPARE			20A/1P	39	B	40	20A/1P	(N) GFCI REC. MOUNT ON ROOF - BLDG 4	
SPARE			20A/1P	41	C	42	20A/1P	- - - - -	
	0	0	0.72	27.8		0	1.1	0	27.8
LOAD SUMMARY	CONNECTED KVA	DEMAND FACTOR	DEMAND KVA	Yes/No					
(LTO) LIGHTING X 125%	0	1.25	0.0	FULL RATED A/C	Y	KVA PHASE A (CONNECTED)		18.6	
(REC) RECEIPTS PER 220.44	1.1	1.00	1.1	SERIES RATED A/C	N	KVA PHASE B (CONNECTED)		19.1	
10KVA X 100% + REMAINDER X 50%	0	0.50	0.0	SPD	N	KVA PHASE C (CONNECTED)		19.8	
(MTR) LARGEST MOTOR X 125%	0.7	1.25	0.9	COPPER BISSING	Y	SUB FEED CONNECTED LOAD			
+ REMAINING MOTORS X 100%	0	1.00	0.0	ALUMINUM BISSING	N	TOTAL DEMAND KVA		57.6	
(NCL) NON CONTINUOUS LOAD X 100%	55.7	1.00	55.7			TOTAL LOAD AMPERES		160.1	

PANEL NAME:	(E) PANEL B										FED FROM: (E) MAIN SWBD																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
VOLTAGE:	208/120V										MAIN C/B: 225A/3P																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
PHASE:	3										BUSING: 225 AMP																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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