



# ALASKA RAILROAD CORPORATION

ENGINEERING SERVICES

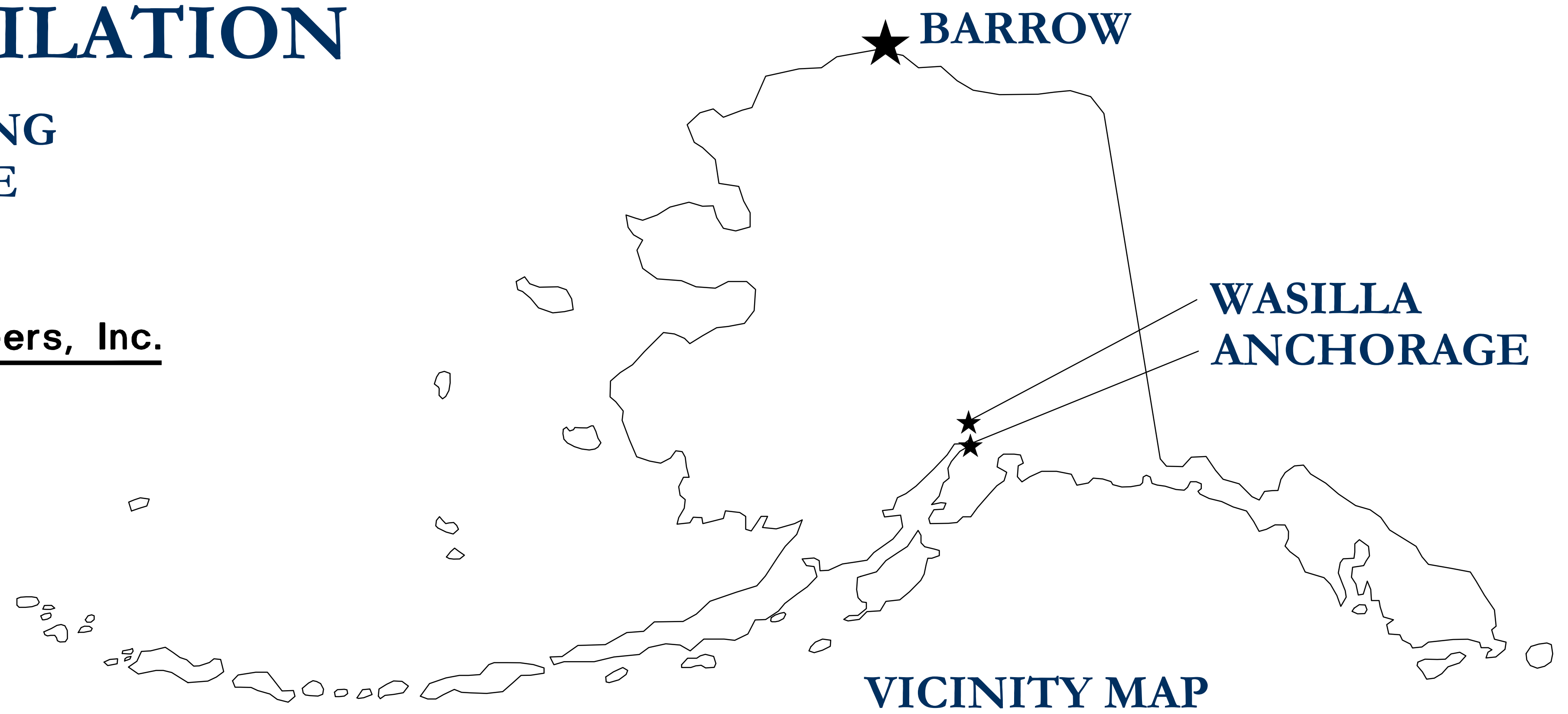
P.O. BOX 107500, ANCHORAGE, ALASKA 99510-7500

## ALL SEASONS CLOTHING COMPANY RETAIL VENTILATION

KENAI SUPPLY BUILDING  
WASILLA SHOPS CIRCLE  
WASILLA, ALASKA

**MBA Consulting Engineers, Inc.**

3812 Spenard Road, Suite 200  
ANCHORAGE, AK 99517



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**VICINITY MAP**

| REV. | DATE    | BY  | REVISION |
|------|---------|-----|----------|
| 0    | 1/11/19 | MBA | BID SET  |
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|--|---|--|
|  | <b>ALASKA RAILROAD CORPORATION</b><br>ENGINEERING SERVICES<br>P.O. BOX 107500, ANCHORAGE, ALASKA 99510-7500 |  |
|  | <b>ALASKA RAILROAD CORPORATION</b><br><b>KENAI SUPPLY BUILDING RENOVATION</b>                               |  |
| <b>TITTLE SHEET</b>  |   | <b>TTS</b>   |
| DESIGNED BY: MBA<br>DRAWN BY: MBA<br>CHECKED BY: MBA<br>APPROVED BY: MBA | SCALE: AS NOTED<br>DATE: 1/11/2019  | AFE NO.:<br>ACAD FILE: 17034_TTS<br>DWG NO.<br><b>1</b> OF <b>12</b> |

| HEATING COIL SCHEDULE |             |      |         |         |      |          |     |           |             |     |        |            |            |                |
|-----------------------|-------------|------|---------|---------|------|----------|-----|-----------|-------------|-----|--------|------------|------------|----------------|
| SYMBOL                | LOCATION    | MBH  | MAX CFM | VEL FPM | GPM  | AIR TEMP |     | FLUID (%) | FLUID TEMP. |     | ΔP AIR | MAX. FLUID | VALVE TYPE | RELATED SYSTEM |
|                       |             |      |         |         |      | IN       | OUT |           | IN          | OUT |        |            |            |                |
| (E)HC-1               | HALL 114    | 7.8  | --      | 500 MAX | 0.8  | --       | 70  | WATER     | 190         | 170 | 0.15"  | 2.0'       | 2-WAY      | HRV-1          |
| HC-2                  | GARAGE 107  | 229  | 6,100   | 500 MAX | 16.9 | 20       | 55  | 50% PG    | 180         | 160 | 0.15"  | 2.0'       | 3-WAY      | AHU-1          |
| HC-3                  | RETAIL 101  | 63.4 | 3,450   | 500 MAX | 6.3  | 55       | 72  | WATER     | 190         | 170 | 0.15"  | 2.0'       | 2-WAY      | REHEAT COIL    |
| HC-4                  | STORAGE 216 | 10.7 | 1,280   | 500 MAX | 2.4  | 55       | 72  | WATER     | 190         | 170 | 0.15"  | 2.0'       | 2-WAY      | REHEAT COIL    |
| HC-5                  | STORAGE 216 | 19.5 | 1,370   | 500 MAX | 2.5  | 55       | 72  | WATER     | 190         | 170 | 0.15"  | 2.0'       | 2-WAY      | REHEAT COIL    |

| FAN SCHEDULE |            |       |      |     |       |          |       |      |     |                   |   |  |  |
|--------------|------------|-------|------|-----|-------|----------|-------|------|-----|-------------------|---|--|--|
| SYMBOL       | LOCATION   | CFM   | S.P. |     | RPM   | O.V. FPM | TYPE  |      | USE | MOTOR HP/VOLTS/PH | DESIGN BASIS PRODUCT  |  |  |
|              |            |       | TOT  | EXT |       |          | SIZE  | WHL  |     |                   |   |  |  |
| AHU-1        | GARAGE 107 | 6,100 | 2.9  | 1.0 | 1,706 | 1,307    | 22.25 | PLEN | S/A | 7.5/208/3         | TRANE MODEL CSAA012UA, MIXING BOX W/ FILTER, HEATING COIL, COOLING COIL, S/A FAN SECTION, 30" H PERFORATED PLENUM, FACTORY VFD, UC600 CONTROL, LCD, ENTHALPY CONTROL, MIN O/A 3,390 CFM |  |  |
| RF-1         | ROOF       | 6,100 | 0.5  | --  | 515   | --       | --    | --   | E/A | 1-1/2 /208/3      | GREENHECK GB 300-VGD-15, VFD, 0-10VDC INPUT, ROOF FAN   |  |  |

| ROOF HOOD SCHEDULE |         |         |       |                     |                  |              |                      |      |           |
|--------------------|---------|---------|-------|---------------------|------------------|--------------|----------------------|------|-----------|
| SYMBOL             | SERVICE | AIR CFM | SP IN | THROAT AREA IN x IN | CURB CAP IN x IN | VELOCITY FPM | DESIGN BASIS PRODUCT |      |           |
|                    |         |         |       |                     |                  |              |                      | RH-1 | AHU-1 O/A |

| GAS FIRED HEATING UNIT SCHEDULE |                        |      |     |      |       |     |            |                   |   |
|---------------------------------|------------------------|------|-----|------|-------|-----|------------|-------------------|---|
| SYMBOL                          | TYPE                   | FUEL | MBH |      | CFM   | RPM | TOTAL AMPS | MOTOR HP/VOLTS/PH | DESIGN BASIS PRODUCT  |
|                                 |                        |      | IN  | OUT  |       |     |            |                   |   |
| GUH-1                           | HORIZONTAL UNIT HEATER | GAS  | 100 | 80.5 | 1,900 | --  | 2.1        | 1/8 /120/1        | LENNOX MODEL LP24-100S, HORIZONTAL DISCHARGE, PROPELLER UNIT HEATER |

| COOLING COIL SCHEDULE |                         |                |     |         |      |         |                |       |             |                      |
|-----------------------|-------------------------|----------------|-----|---------|------|---------|----------------|-------|-------------|----------------------|
| SYMBOL                | LOCATION RELATED SYSTEM | TOTAL SENSIBLE | CFM | VEL FPM | TYPE | EAT LAT | LIQUID SUCTION | FLUID | PRESS. DROP | DESIGN BASIS PRODUCT |
|                       |                         |                |     |         |      |         |                |       |             |                      |

| CONDENSING UNIT SCHEDULE |      |         |     |     |              |            |         |                     |                      |      |
|--------------------------|------|---------|-----|-----|--------------|------------|---------|---------------------|----------------------|------|
| SYMBOL                   | TONS | ARI NET | EDB | LDB | UNIT CONFIG. | FLUID IEER | MCA MFS | ELECTRICAL VOLTS/PH | DESIGN BASIS PRODUCT |      |
|                          |      |         |     |     |              |            |         |                     |                      | CU-1 |

| FAN SOUND POWER SCHEDULE |      |                       |     |     |     |    |    |    |    |      |                       |     |     |     |    |    |    |    |
|--------------------------|------|-----------------------|-----|-----|-----|----|----|----|----|------|-----------------------|-----|-----|-----|----|----|----|----|
| SYSTEM                   | FAN  | OCTAVE BAND FREQUENCY |     |     |     |    |    |    |    | FAN  | OCTAVE BAND FREQUENCY |     |     |     |    |    |    |    |
|                          |      | 1                     | 2   | 3   | 4   | 5  | 6  | 7  | 8  |      | 1                     | 2   | 3   | 4   | 5  | 6  | 7  | 8  |
|                          |      | 63                    | 125 | 250 | 500 | 1K | 2K | 4K | 8K |      | 63                    | 125 | 250 | 500 | 1K | 2K | 4K | 8K |
| AHU-1                    | SF-1 | 74                    | 74  | 70  | 77  | 70 | 69 | 66 | 53 | RF-1 | 78                    | 81  | 73  | 63  | 60 | 57 | 50 | 46 |

| BOILER SCHEDULE |                  |           |      |               |                  |       |          |                      |  |
|-----------------|------------------|-----------|------|---------------|------------------|-------|----------|----------------------|--|
| SYMBOL          | TYPE             | FLUID (%) | FUEL | AGA INPUT MBH | GROSS OUTPUT MBH | MOTOR |          | DESIGN BASIS PRODUCT |  |
|                 |                  |           |      |               |                  | HP    | VOLTS/PH |                      |  |
| (E) B-1         | CAST IRON BOILER | H2O       | GAS  | 305           | 247              | --    | 120/1    | WEIL MCLAIN PFG-06   |  |
| (E) B-2         | CAST IRON BOILER | H2O       | GAS  | 305           | 247              | --    | 120/1    | WEIL MCLAIN PFG-06   |  |

| HEAT EXCHANGER SCHEDULES |     |       |        |      |      |           |     |            |     |             |          |  |
|--------------------------|-----|-------|--------|------|------|-----------|-----|------------|-----|-------------|----------|--|
| SYMBOL                   | MBH | FLUID |        | GPM  |      | HOT TEMP. |     | COLD TEMP. |     | PRESS. DROP |          | DESIGN BASIS PRODUCT                             |
|                          |     | HOT   | COLD   | HOT  | COLD | IN        | OUT | IN         | OUT | HOT         | COLD     |  |
| HX-1                     | 229 | H 20  | 50% PG | 15.6 | 16.9 | 190       | 160 | 150        | 180 | 0.53 PSI    | 0.76 PSI | TACO MODEL TB80x90, TYPE: BRAZE PLATE, 1-1/4"NPT |

| TANK SCHEDULE |                      |          |                      |             |       |  |
|---------------|----------------------|----------|----------------------|-------------|-------|--|
| SYMBOL        | FUNCTION             | MEDIUM   | TOTAL VOLUME GALLONS | MATERIALS   | LABEL | DESIGN BASIS PRODUCT   |
|               |                      |          |                      |             |       |  |
| (E)AS-2       | AIR SEPARATOR        | WATER    | ---                  | BRASS       | ---   | 1-1/2" SPIROVENT MODEL VJR150, COPPER COALESCING MEDIUM, BRASS BODY, AUTO AIR VENT, 4.5 LBS      |
| AS-3          | AIR & DIRT SEPARATOR | 50% P.G. | ---                  | BRASS       | ---   | 1-1/2" SPIROVENT VDR-150FT, COPPER COALESCING MEDIUM, BRASS BODY, AUTO AIR VENT, 9.0 LBS         |
| (E)ET-1       | HYDRONIC EXPANSION   | WATER    | 6.0                  | STEEL/BUTYL | ---   | FLEXCON MODEL HXT-60, ACCEPTANCE VOLUME = 3.0  |
| (E)ET-2       | HYDRONIC EXPANSION   | WATER    | 6.0                  | STEEL/BUTYL | ---   | FLEXCON MODEL HXT-60, ACCEPTANCE VOLUME = 3.0  |
| ET-4          | HYDRONIC EXPANSION   | 50% P.G. | 6.0                  | STEEL/BUTYL | ---   | FLEXCON MODEL HXT-60, ACCEPTANCE VOLUME = 3.0  |
| GT-1          | GLYCOL MIX TANK      | 50% P.G. | 6.6                  | ---         | ---   | AXIOM MODEL MF200, POLYETHYLENE CONTAINER, PRV, DIAPHRAGM PUMP, LOW LEVEL ALARM, 50 W, 120 V, 1ø |

| PUMP SCHEDULE |           |                      |        |       |      |          |              |   |  |
|---------------|-----------|----------------------|--------|-------|------|----------|--------------|---|--|
| SYMBOL        | LOCATION  | SERVICE              | FLUID  |       | GPM  | HEAD FT. | RPM          | MOTOR HP/VOLTS/PH                                       | DESIGN BASIS PRODUCT   |
|               |           |                      | TYPE   | TEMP. |      |          |              |   |  |
| (E)PMP-1      | MECH ROOM | BUILDING HEAT        | WATER  | 190   | 10.2 | --       | 1/3 /120/1   | GRUNDFOS UPS40-40/4 3 SPEED                             |  |
| (E)PMP-2      | MECH ROOM | UH-1 TO 3, HC-1      | WATER  | 190   | 4.8  | --       | 1/20 /120/1  | TACO HEC-2, FLOW CHECK, EC MOTOR CONSTANT POWER CONTROL |  |
| (D)PMP-3      | MECH ROOM | UH-6A                | WATER  | 190   | --   | --       | 1/20 /115/1  | TACO HEC-2, FLOW CHECK, EC MOTOR CONSTANT POWER CONTROL |  |
| PMP-4         | MECH ROOM | BUILDING VENTILATION | WATER  | 190   | 26.8 | 22       | --           | 0.68 /120/1   | TACO VR15, EC MOTOR, LEAD / LAG, 0-10VDC IN/OUT, PRESSURE CONTROL  |
| PMP-5         | MECH ROOM | HC-2                 | 50% PG | 180   | 16.9 | 19       | 1100<br>4400 | 2.5A /115/1   | TACO VR3452-FC1A01, ECM, 0-10VDC INPUT, PRESSURE CONTROL, LEAD/LAG |

| AIR OUTLET SCHEDULE |           |          |              |     |  |          |
|---------------------|-----------|----------|--------------|-----|--|----------|
| SYMBOL              | UNIT SIZE | SCFM     | FINISH       | USE | DESIGN BASIS PRODUCT   |          |
|                     |           |          |              |     | (A)  | SEE PLAN |
| (B)                 | SEE PLAN  | SEE PLAN | WHITE POWDER | R/A | PRICE MODEL 630L, ALUMINUM, 3/4" BLADE SPACING, 35 DEGREE DEFLECTION, DUCT MOUNT   |          |
| (C)                 | SEE PLAN  | SEE PLAN | WHITE POWDER | S/A | PRICE MODEL 620, DOUBLE DEFLECTION, 3/4" BLADE SPACING, FRONT BLADES PARALLEL TO LONG DIMENSION, WALL OR DUCT MOUNT AS SHOWN |          |

| LEGEND & ABBREVIATIONS |                                     |        |
|------------------------|-------------------------------------|--------|
| ABBR.                  | EXPLANATION                         | SYMBOL |
| AAV                    | AUTOMATIC AIR VENT                  | □      |
| AFF                    | ABOVE FINISHED FLOOR                | —      |
| BDD                    | BACKDRAFT DAMPER                    | —      |
| BD                     | BALANCING DAMPER                    | —      |
|                        | BALANCING/ISOLATION VALVE           | —      |
|                        | BALL VALVE                          | —      |
| CFM                    | CUBIC FEET/MINUTE                   | —      |
| CO                     | CLEANOUT                            | —      |
| CV                     | CHECK VALVE                         | —      |
| CW                     | COLD WATER                          | —      |
| (D)                    | DEMOLISH                            | —      |
| (E)                    | EXISTING                            | —      |
| E/A                    | EXHAUST AIR                         | —      |
| FCO                    | FLOOR CLEANOUT                      | —      |
| FDC                    | FIRE DEPARTMENT CONNECTION          | —      |
| FD                     | FLOOR DRAIN                         | —      |
|                        | FLEXIBLE DUCT                       | —      |
| GS                     | GLYCOL SUPPLY                       | —GS—   |
| GR                     | GLYCOL RETURN                       | —GR—   |
| HB                     | HOSE BIBB                           | —      |
| HC                     | HEATING COIL                        | —      |
| HW                     | HOT WATER                           | —      |
| HWC                    | HOT WATER CIRCULATION               | —      |
| HWR                    | HEATING WATER RETURN                | —HWR—  |
| HWS                    | HEATING WATER SUPPLY                | —HWS—  |
| MOD                    | MOTOR OPERATED DAMPER               | —      |
| MOV                    | 2-WAY MOTOR OPERATED VALVE          | —      |
| MOV                    | 3-WAY MOTOR OPERATED VALVE          | —      |
| NIC                    | NOT IN CONTRACT                     | —      |
| O/A                    | OUTSIDE AIR                         | —      |
|                        | PIPE ANCHOR                         | —      |
|                        | PIPE GUIDE                          | —      |
| POC                    | POINT OF CONNECTION                 | —      |
|                        | PRESSURE GAGE                       | —      |
| PRV                    | PRESSURE RELIEF VALVE               | —      |
| R/A                    | RETURN AIR, RELIEF AIR              | —      |
| RV                     | RELIEF VALVE                        | —      |
|                        | RETURN AIR SLOT                     | —      |
|                        | RETURN/EXHAUST AIR REG. OR GRILLE   | —      |
| S                      | SANITARY SOIL                       | —      |
| S/A                    | SUPPLY AIR                          | —      |
|                        | STRAINER WITH DRAIN VALVE           | —      |
| SL                     | ACOUSTICALLY LINED DUCT             | —      |
|                        | STATIC PRESSURE SENSOR              | —      |
|                        | SUPPLY AIR SLOT W/FLEX DUCT         | —      |
|                        | SUPPLY AIR REG. GRILLE, OR DIFFUSER | —      |
| TW                     | TEMPERED WATER                      | —TW—   |
|                        | THERMALLY INSULATED DUCT OR PIPE    | —      |
|                        | THERMOMETER                         | —      |
| T'STAT                 | THERMOSTAT                          | —      |
| T'STAT                 | RETURN AIR THERMOSTAT               | —      |
|                        | UNION                               | —      |
| V                      | VENT                                | —      |
| VTR                    | VENT THRU ROOF                      | —      |
| WCO                    | WALL CLEANOUT                       | —      |
| W                      | WASTE                               | —      |

THIS IS A STANDARD LEGEND, SOME SYMBOLS SHOWN ON LEGEND ARE NOT NECESSARILY ON THE DRAWING.

**ALASKA RAILROAD CORPORATION**  
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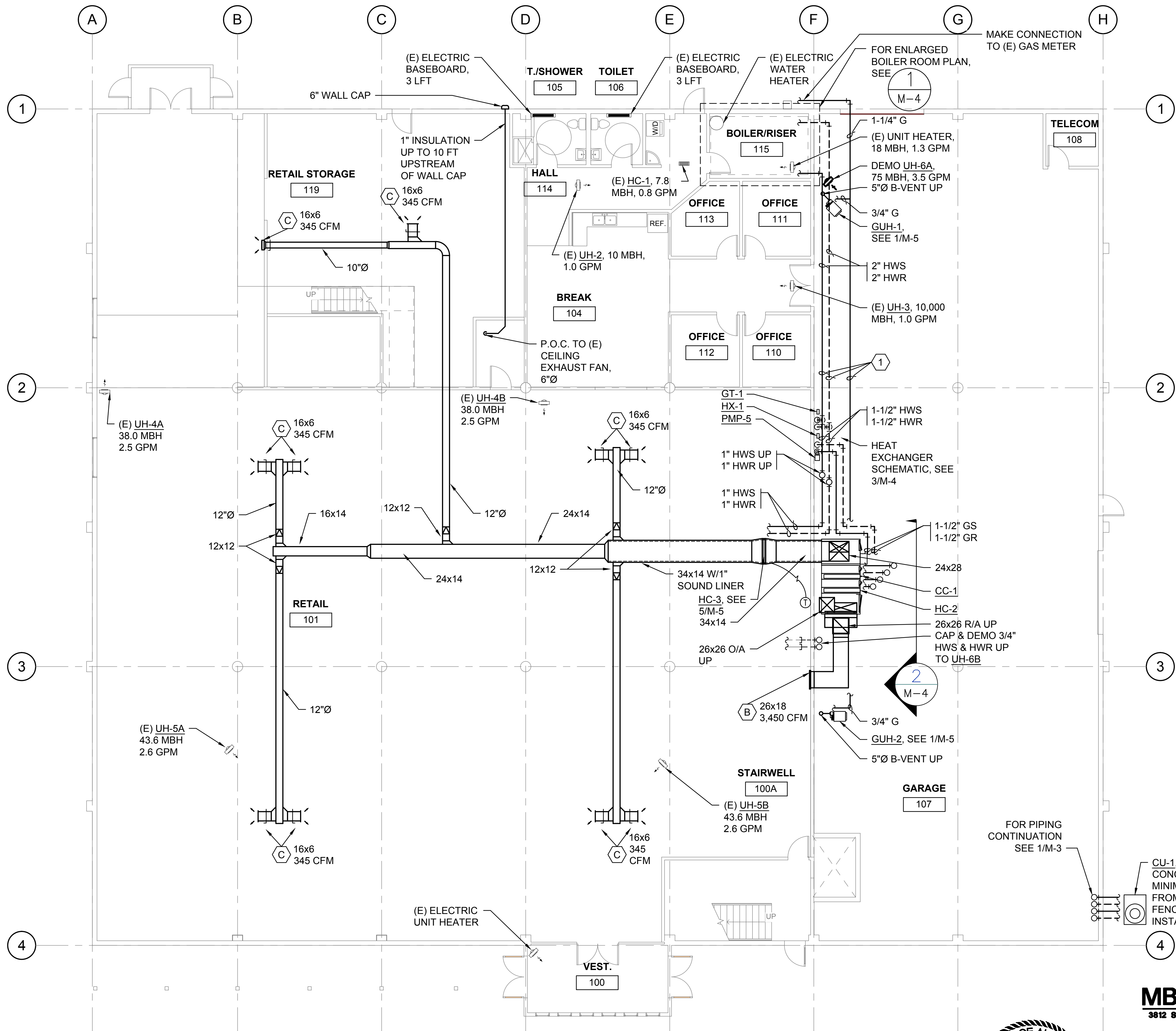
PROJECT: **ALASKA RAILROAD CORPORATION KENAI SUPPLY BUILDING RENOVATION**

TITLE: **MECHANICAL LEGEND & SCHEDULES**

DESIGNED BY: MSM  
DRAWN BY: MSM  
CHECKED BY: SCH  
APPROVED BY: MSM

SCALE: AS NOTED  
DATE: 1/11/2019

AFE NO.:  
ACAD FILE: 17034-M-1  
DWG NO.: **2** OF **12**



**SHEET NOTES:**

- 1 HEATING AND GAS LINES SHOWN DIAGRAMMATICALLY FOR CLARITY. ROUTE LINES ON WALL.
2. ROUTE NEW DUCTWORK IN RETAIL EXPOSED, UNDER CEILING GRID.
3. FIELD VERIFY SPRINKLER HEAD AND SECURITY CAMERA LOCATIONS. ADJUST DUCT ROUTING TO AVOID OBSTRUCTIONS.

**LEVEL 1 - HVAC PLAN**  
 1/8"=1'-0"



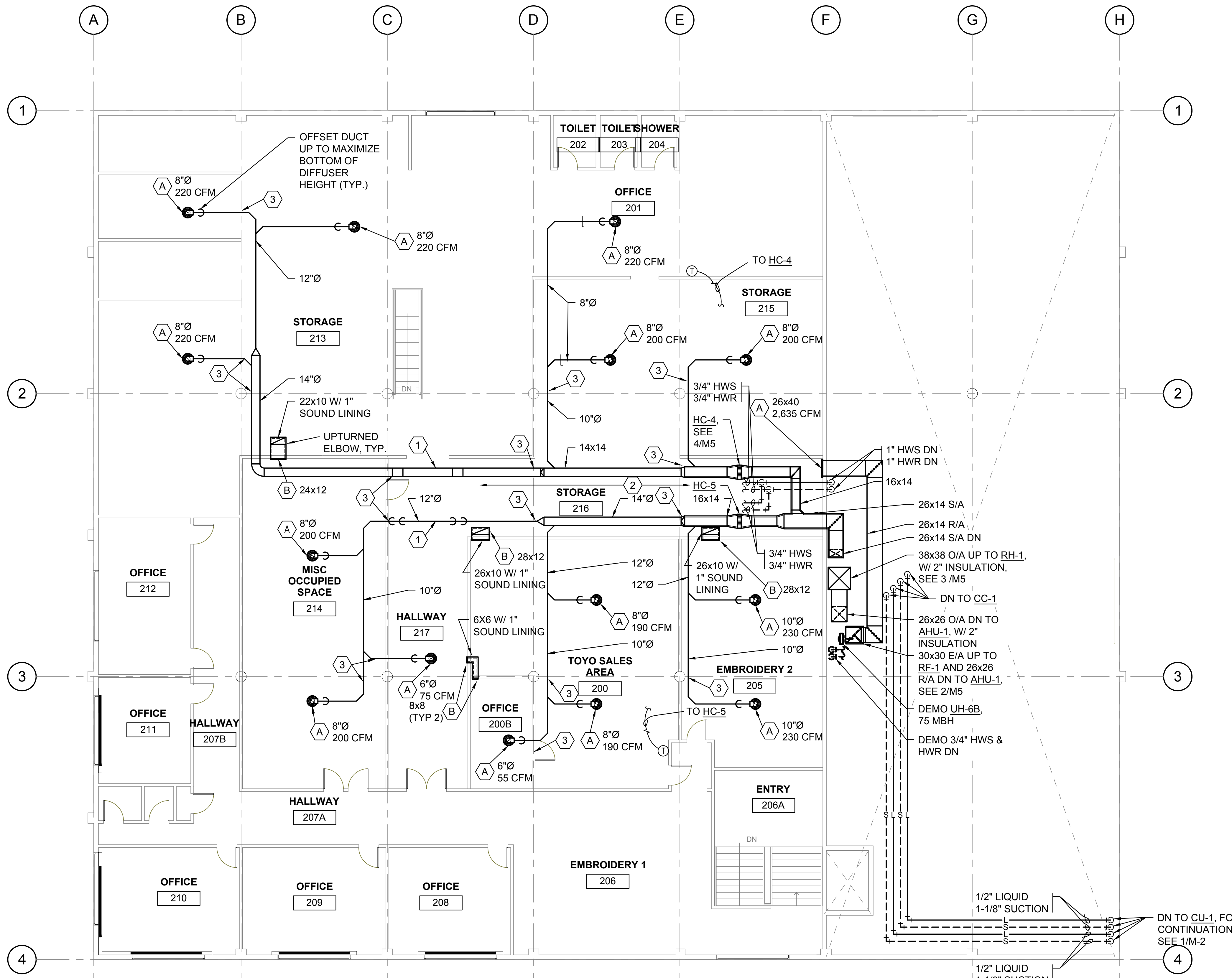
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| <b>ALASKA RAILROAD CORPORATION</b><br><b>KENAI SUPPLY BUILDING RENOVATION</b> |                                    |
| <b>FIRST FLOOR HVAC PLAN</b>  |                                    |
| DESIGNED BY: MSM<br>DRAWN BY: MSM<br>CHECKED BY: SCH<br>APPROVED BY: MSM      | SCALE: AS NOTED<br>DATE: 1/11/2019 |
| AFE NO.:<br>ACAD FILE:17034-M1<br>DWG NO.                                     | <b>M-2</b><br>3 OF 12              |

**SHEET NOTES:**

- 1 OFFSET DUCTWORK OVER LIGHTS RUNNING DOWN HALLWAY 217.
- 2 RELOCATE SPRINKLER HEADS AND BRANCHES IN STORAGE 216 AS REQUIRED TO RUN DUCT MAINS.
- 3 OFFSET UNDER BEAM, THIS LOCATION.
- 4 DUCTWORK SHALL BE ROUTED TIGHT TO BEAMS. BOTTOM OF DUCT SHALL REMAIN HIGHER THAN 7'-6" PER IBC.
- 5 RECONFIGURE SPRINKLER BRANCH LINES AND HEADS AS REQUIRED TO ACCOMMODATE HVAC SYSTEM.



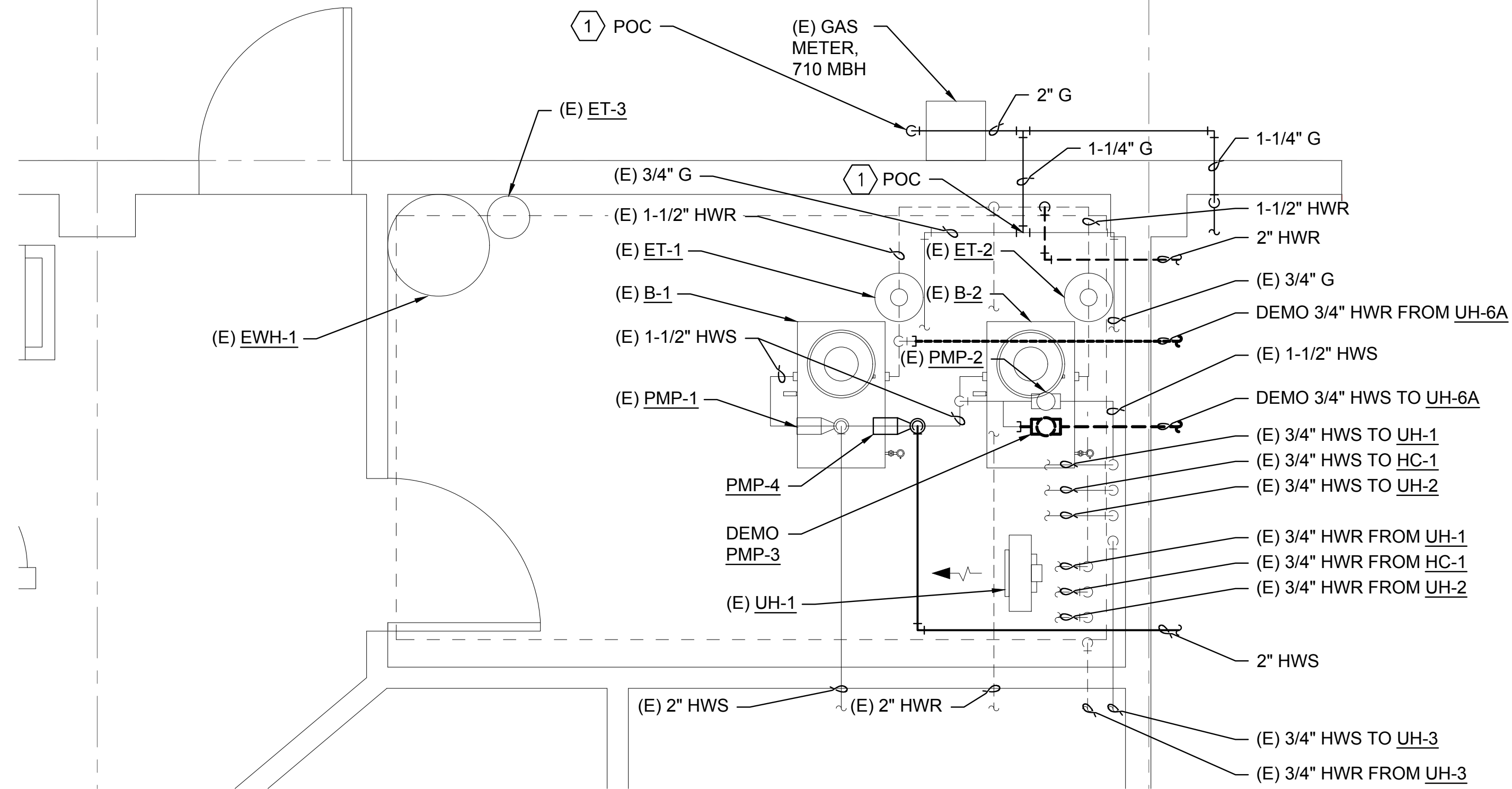
**LEVEL 2 - HVAC PLAN**  
 1  
 M-3 1/8"=1'-0"



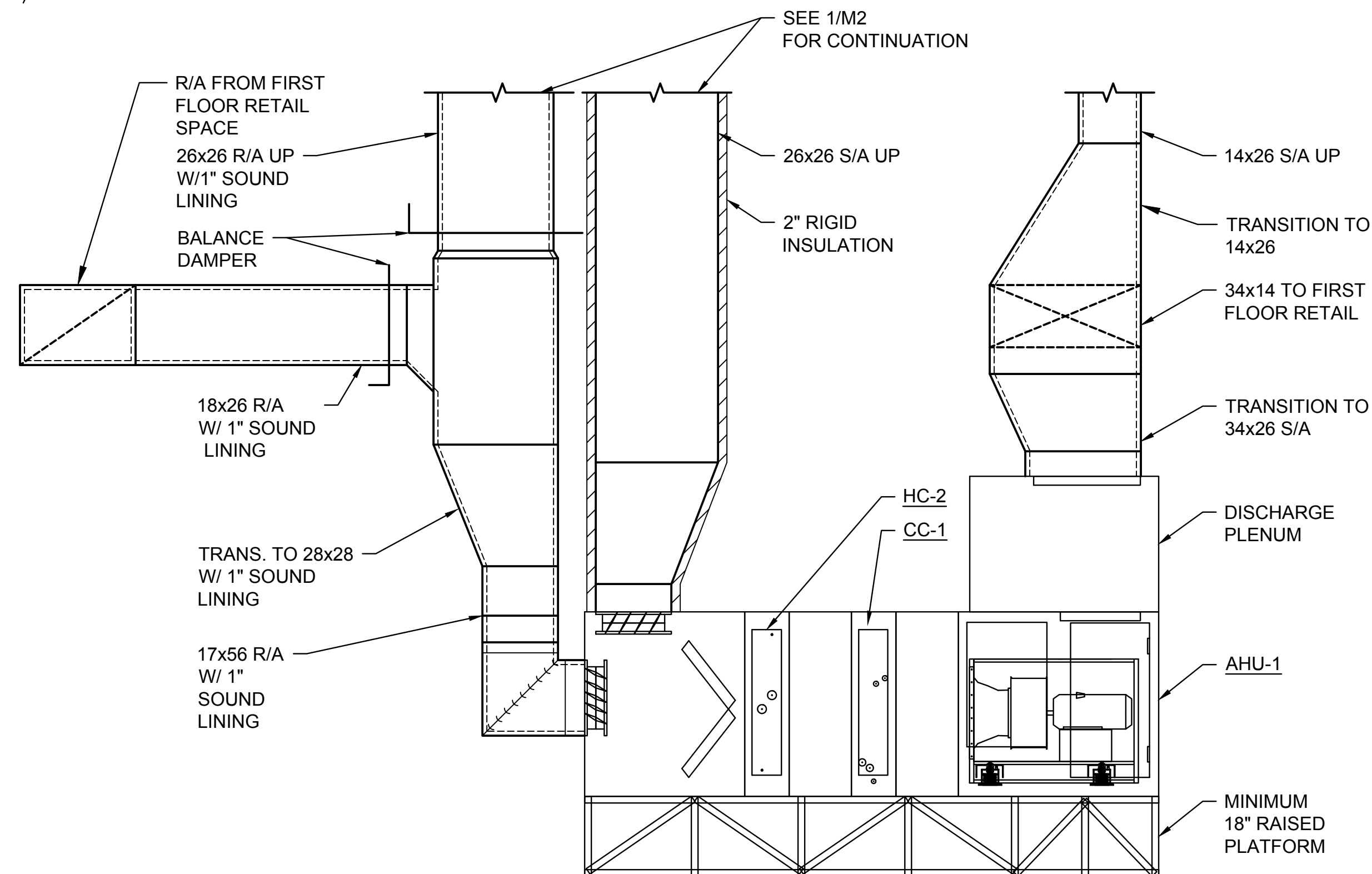
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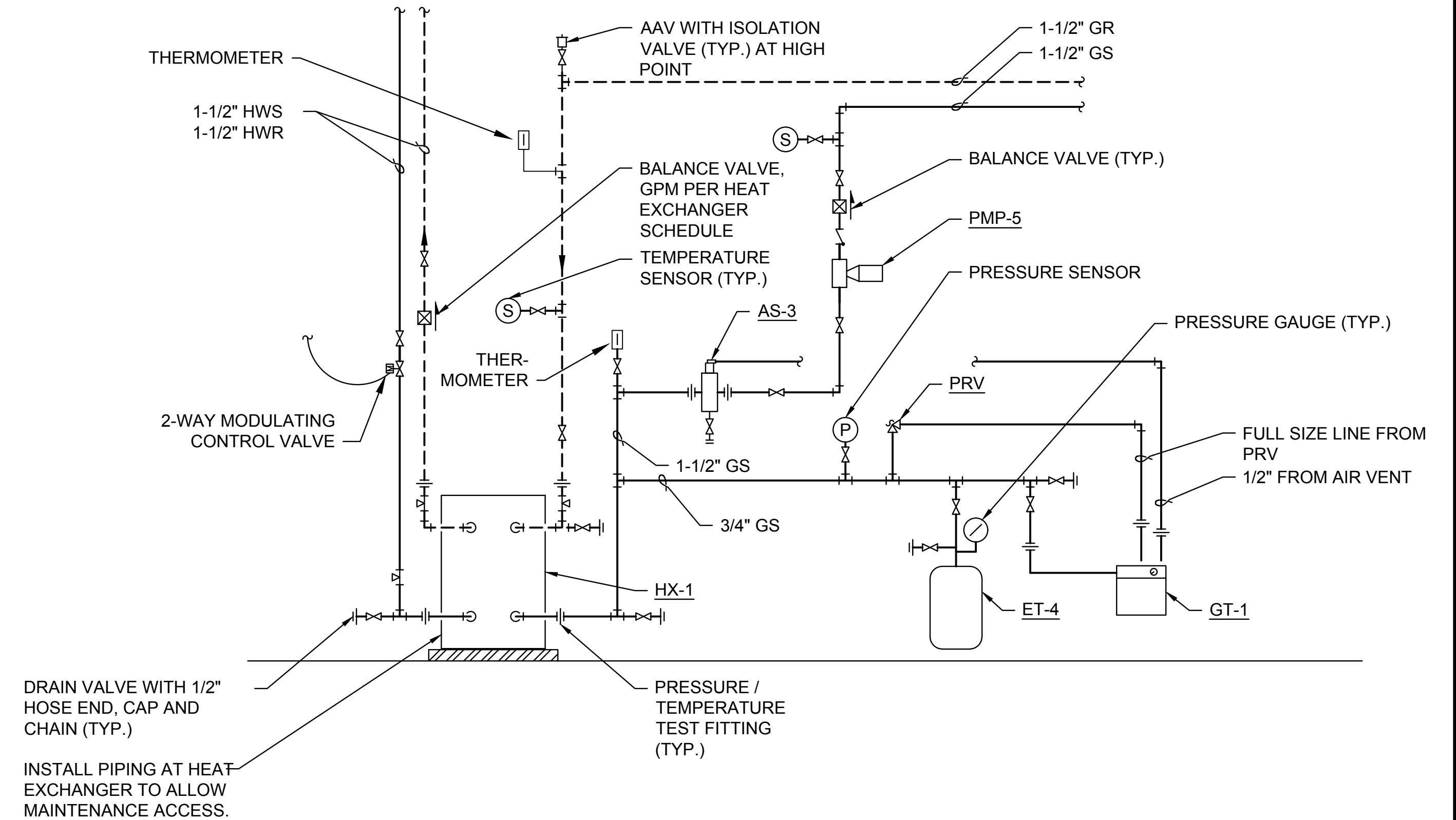
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| <b>ALASKA RAILROAD CORPORATION</b><br><b>KENAI SUPPLY BUILDING RENOVATION</b>                                   |  |
| <b>SECOND FLOOR</b><br><b>HVAC PLAN</b>   |  |
| DESIGNED BY: MSM<br>DRAWN BY: MSM<br>CHECKED BY: SCH<br>APPROVED BY: MSM  | SCALE: AS NOTED<br>DATE: 1/11/2019                                   |
| <b>M-3</b>  | AFE NO.:<br>ACAD FILE: 17034-M1<br>DWG NO.:<br><b>4</b> OF <b>12</b> |



**1 BOILER ROOM PLAN**  
M-4 1/2"=1'-0"



**2 AHU-1 ELEVATION**  
M-4 1/2"=1'-0"



**3 HEAT EXCHANGER SCHEMATIC**  
M-4 NTS

**SHEET NOTES:**

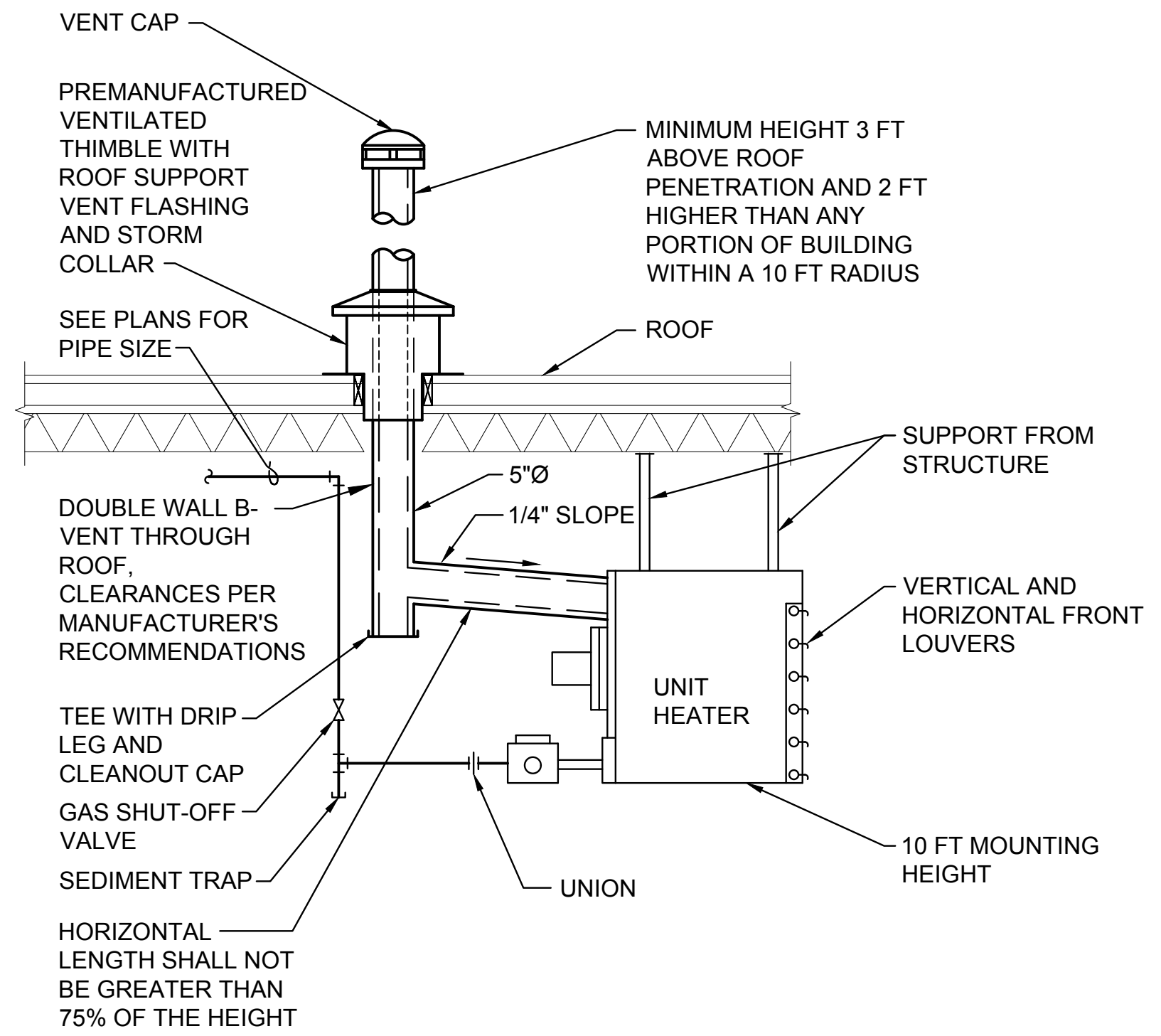
- 1 DEMOLISH EXISTING GAS LINE TO MECHANICAL ROOM, PROVIDE NEW GAS LINE TO METER.

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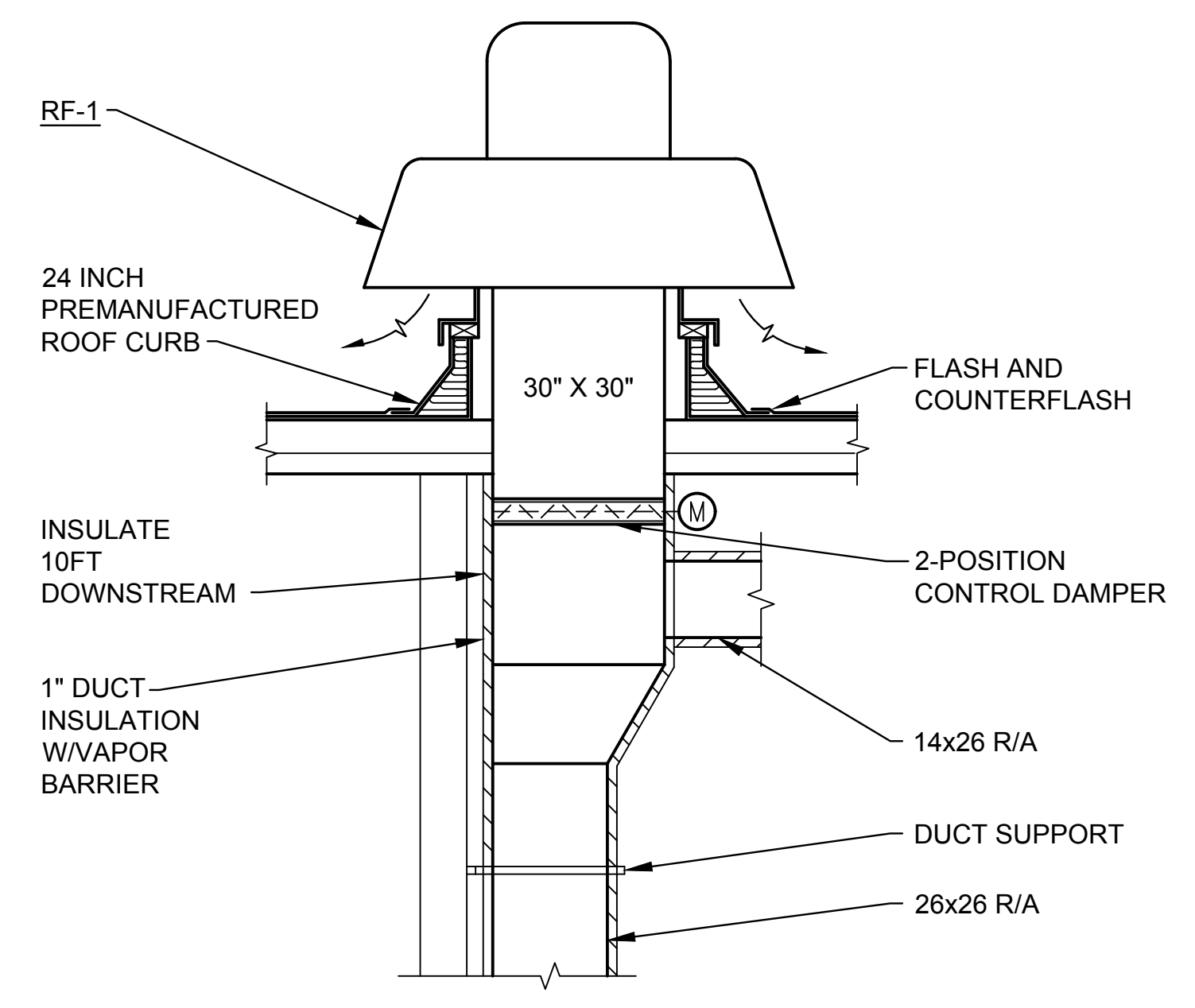
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|  |                 |  |                  |
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| PROJECT: <b>ALASKA RAILROAD CORPORATION<br/>KENAI SUPPLY BUILDING RENOVATION</b> |                 | TITLE: <b>BOILER DEMOLITION &amp; REMODEL<br/>PIPING SCHEMATIC</b>   |                  |
| DESIGNED BY: MSM   | DRAWN BY: MSM   | CHECKED BY: SCH  | APPROVED BY: MSM |
| SCALE: AS NOTED  | DATE: 1/11/2019 | <div style="display: flex; align-items: center;"> <div style="font-size: 2em; font-weight: bold; margin-right: 10px;">M-4</div> <div> <p>AFE NO.:</p> <p>ACAD FILE: 17034-M-4</p> <p>DWG NO. <b>5</b> OF <b>12</b></p> </div> </div> |                  |
| REV.   | DATE            |  |                  |

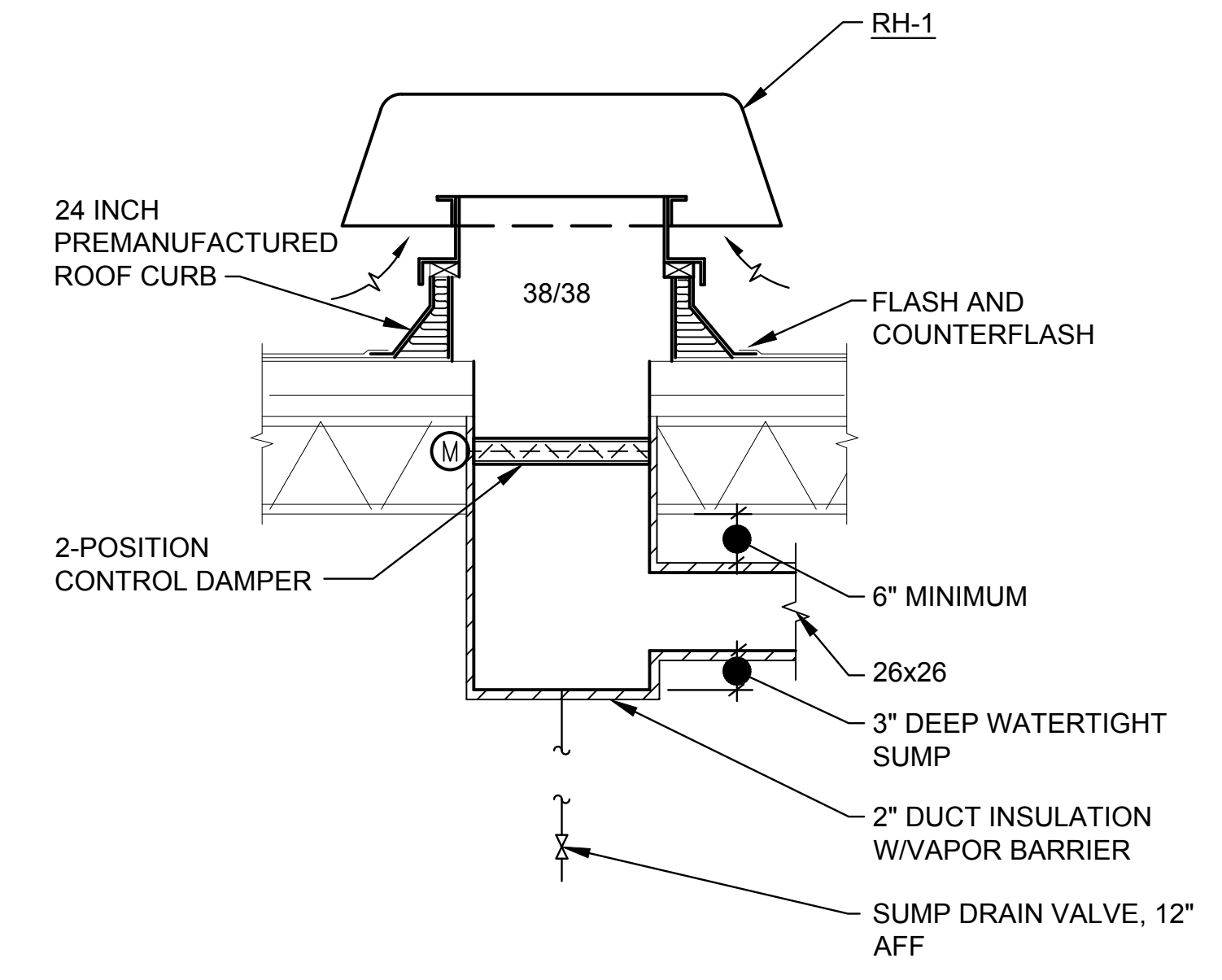




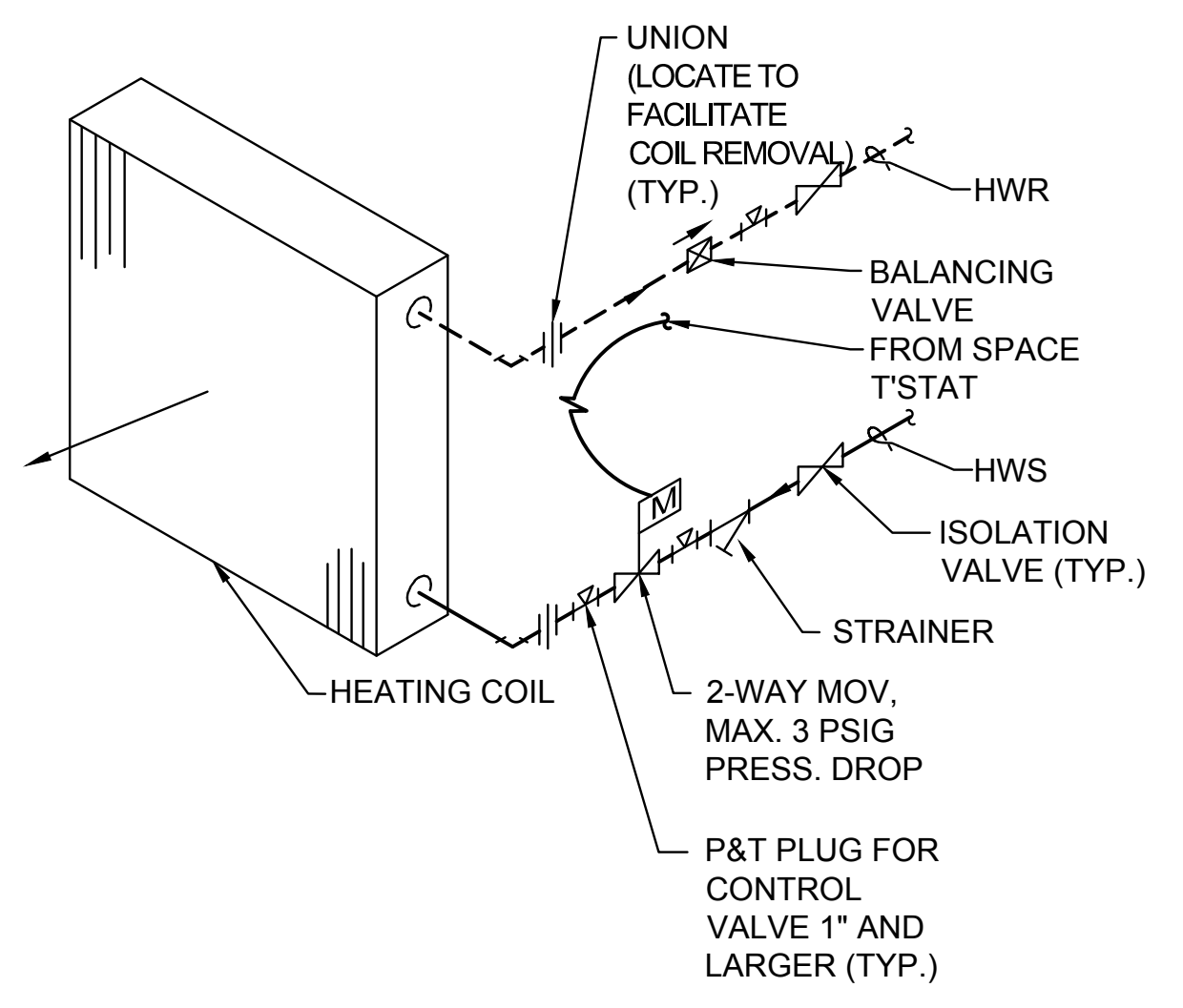
**1 GAS FIRED UNIT HEATER DETAIL**  
M-5 NTS



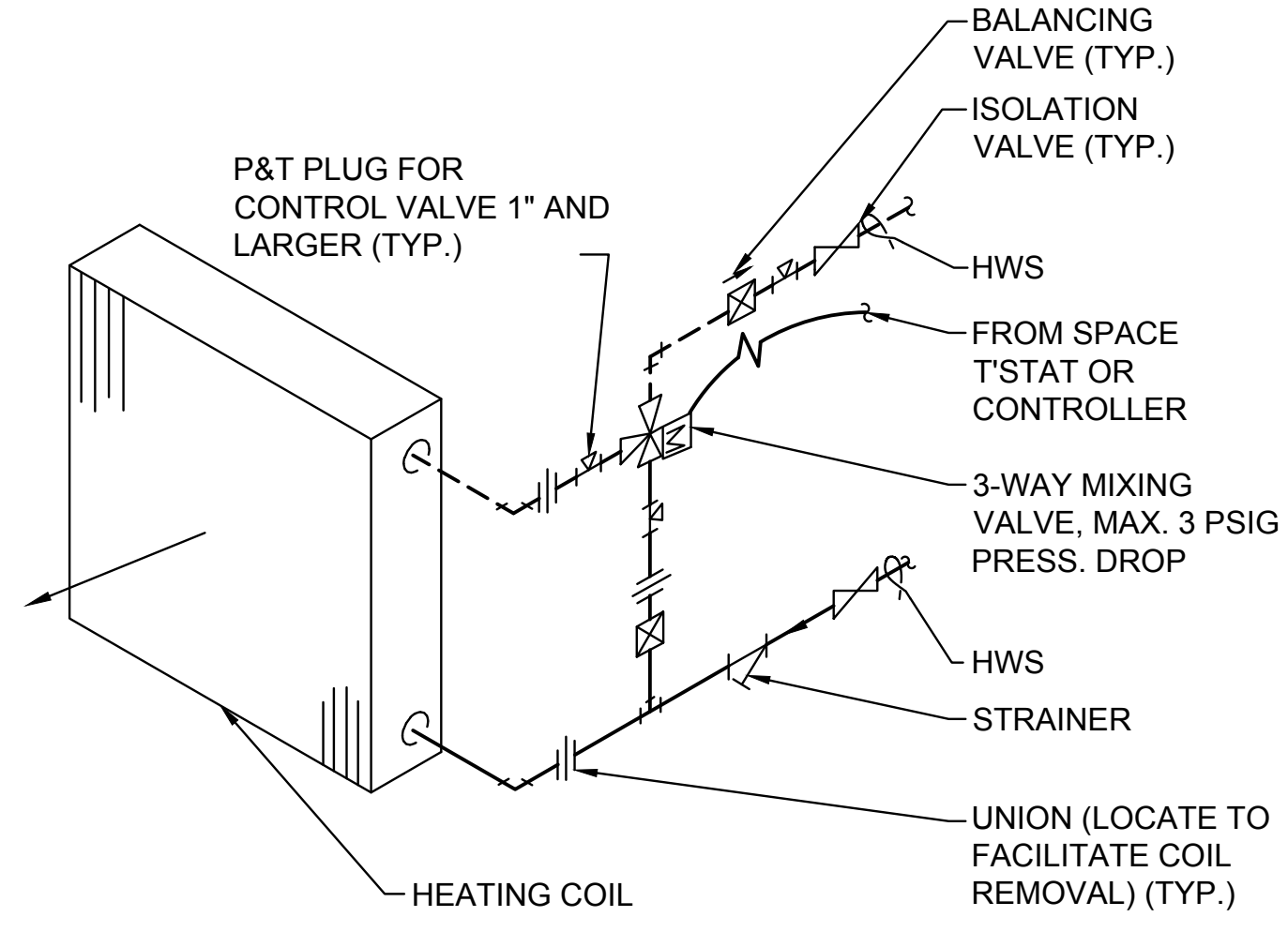
**2 RELIEF FAN DETAIL**  
M-5 NTS



**3 ROOF HOOD DETAIL**  
M-5 NTS



**4 2-WAY HEATING COIL DETAIL**  
M-5 NTS



**5 3-WAY HEATING COIL DETAIL**  
M-5 NTS



**MBA Consulting Engineers, Inc.**  
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| REV. | DATE    | BY  | REVISION |
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| <b>ALASKA RAILROAD CORPORATION</b><br>ENGINEERING SERVICES<br>P.O. BOX 107500, ANCHORAGE, ALASKA 99510-7500 |  |
| <b>ALASKA RAILROAD CORPORATION</b><br><b>KENAI SUPPLY BUILDING RENOVATION</b>                               |  |
| <b>DETAILS</b>  |  |
| DESIGNED BY: <u>MSM</u><br>DRAWN BY: <u>MSM</u><br>CHECKED BY: <u>SCH</u><br>APPROVED BY: <u>MSM</u>        | SCALE: AS NOTED<br>DATE: 1/11/2019                               |
| <b>M-5</b>  | AFE NO.:<br>ACAD FILE:17034-M-5<br>DWG NO. <b>6</b> OF <b>12</b> |

DIVISION 15 - MECHANICAL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Work consists of providing labor, products, and in performing all operations required for the complete operating installation of all mechanical systems as shown and specified, in strict accordance with specifications, applicable drawings, terms, and conditions of the contract and all applicable codes and ordinances governing installation of the various mechanical systems. Correlate all work fully with the work of other crafts. Provide all systems complete and in proper operating order.

1.2 REGULATORY REQUIREMENTS

A. Comply with all applicable local, state, and national codes, ordinances and regulations in existence at bid date affecting materials and methods of installation of the mechanical systems. Follow recommended practices as set down by ASME, SMACNA, International Building Code, International Mechanical Code, Uniform Plumbing Code, International Fire Code, National Electrical Code, AGA, and OSHA as they apply to this project except in cases where statutes govern.

1.3 MANUFACTURER'S WARRANTIES

A. In the event of equipment or component failure, it is the Contractor's responsibility to repair or replace such defective equipment or components and bear all associated costs. The Contractor shall pursue Manufacturer's written implied warranties to the extent necessary to obtain replacement equipment or components prior to any other action being initiated.

1.4 ELECTRICAL WORK

A. All wiring shall be in accordance with NEC, State and Local Codes.

1.5 TESTS AND INSPECTIONS

A. Schedule, obtain, and pay all fees and/or services required by local authorities and by these specifications, to test the mechanical systems as specified.

B. Deficiencies: Immediately correct all deficiencies, which are evidenced during the tests and repeat tests until system is approved. Do not cover or conceal piping, equipment, or other portions of the mechanical installations until satisfactory tests are made and approved.

C. Completion: Upon completion of the mechanical installation, demonstrate to the contracting agency's satisfaction that the systems have been installed in a satisfactory manner in accordance with the plans, specifications, and applicable codes. Demonstrate dynamic operation of all systems. Show that all controls are operable and are properly adjusted in accordance with the requirements of the final systems balance, that all systems are properly balanced, that all equipment operates properly, that filters and strainers are clean, and that all components of all systems are installed and adjusted for proper operation.

1.6 PROJECT/SITE CONDITIONS

A. Install work in locations shown on drawings, unless prevented by project conditions.  
 B. Provide information showing proposed rearrangement of work to meet project conditions, including changes to work specified in other sections or interference with site conditions not in the contract. Obtain permission of Owner before proceeding.

1.7 SUBMITTALS

A. Submittal review is for general design and arrangement only and does not relieve the contractor from any requirements of contract documents. Provision of a complete and satisfactory working installation is the sole responsibility of the contractor.  
 B. Submittals shall be made in accordance with Division 1 requirements.

1.8 OPERATION AND MAINTENANCE MANUALS

A. Provide Operation and Maintenance (O&M) Manuals for training of and future reference by, Owner's personnel in operation and maintenance of systems and related equipment. Bind each manual in a hard-backed, loose-leaf, three-ring binder. Use 8-1/2" x 11" white paper.  
 B. Submittal of O&M Manuals shall be made in accordance with Division 1 requirements.

1.9 SEISMIC RESTRAINT

A. Contractor shall submit structural calculations and structurally engineered shop drawings for seismic restraint of all new mechanical components and equipment, including ductwork and piping. Calculations to be performed in accordance with the requirements of Chapter 16 of the 2012 International Building Code and are to be stamped by a registered professional structural engineer licensed in the State of Alaska.  
 B. Seismic Restraint design to be based on Seismic Occupancy Category II and Seismic Design Category D.

PART 2 - PRODUCTS

2.1 SUPPORTS AND ANCHORS

2.1.1 PIPE HANGERS AND SUPPORTS

A. Hangers for pipe sizes 1/2 to 1-1/2 inch: Adjustable swivel, loop hanger.  
 B. Hangers for pipe sizes 2 to 4 inches: Adjustable, swivel.  
 C. Michigan Hanger Co. Model No. 100 for steel and plastic and Model #101 for copper pipe.  
 D. Piping support spacing per Uniform Plumbing Code.  
 E. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work. Place a hanger within 12 inches of each horizontal elbow. Use hangers with 1-1/2 inch minimum vertical adjustments.

2.1.2 HANGER RODS

A. Steel hanger rods: Threaded both ends, threaded one end, or continuous threaded.

2.1.3 SLEEVES

A. Sleeves for piping and ductwork through non-fire rated floors, beams, walls, footings, and potentially wet floors: Form with steel pipe or 18 gauge galvanized steel. Extend sleeves through floors one inch above finished floor level. Caulk sleeves full depth and provide floor plate. Where piping or ductwork penetrates ceiling or wall, close off space between pipe or duct and adjacent work with fire-stopping insulation and caulk seal airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration. Fire stopping insulation: Glass fiber type, non-combustible. Caulk: Acrylic sealant.  
 B. Sleeves for pipes through fire rated and fire resistive floors and walls, and fireproofing: Prefabricated fire rated sleeves including seals, UL listed.  
 C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.  
 D. Install chrome-plated steel escutcheons at finished surfaces.

2.1.4 DUCTWORK HANGERS AND SUPPORTS

A. Ducts 24 inches and less: Provide with one inch x 18 gauge straps fastened to ductwork and to building construction. Space not more than eight feet on center.  
 B. Ducts 25 inches through 42 inches: Provide mild steel rods fastened to angle iron stiffeners with nuts and to building construction with appropriate inserts, flanges, or clamps. Space not more than eight feet on center.  
 C. Ducts over 42 inches: Fasten hanger rods to angle stiffeners not more than four feet on center.  
 D. Recommended methods of fastening bracing to ductwork, include riveting, bolting, and tack welding.

2.2 MECHANICAL IDENTIFICATION

2.2.1 EQUIPMENT

A. Plastic Nameplates: Laminated three-layer plastic with engraved white letters on dark contrasting background color.

2.2.2 VALVES AND PUMPS

A. Plastic Tags: Laminated three-layer plastic with engraved white letters on dark contrasting background color. Tag size minimum of 1-1/2 inch diameter.  
 B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

2.2.3 PIPING

A. Stencils: With clean cut symbols and letters indicating flow direction arrow and fluid being conveyed.  
 B. Stencil Paint: Semi-gloss enamel, colors conforming to ASME A13.1.  
 C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering, and indicating flow direction arrow and fluid being conveyed. Brandystrap-on, Seton or approved.  
 D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Brandystrap-on, Craftmark, Seton or approved.  
 E. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape of not less than 6 inch wide by 4 mil thick, manufactured for direct burial service.

2.2.4 DUCTWORK

A. Identify ductwork with plastic nameplates or stenciled painting. Identify as to air handling unit number, and area served.

2.2.5 VALVE CHART AND SCHEDULE

A. Provide valve chart and schedule in aluminum frame with clear plastic shield. Install at location as directed.

2.3 PIPING INSULATION

2.3.1 INSULATION

A. Acceptable Manufacturers: Armstrong, Certainteed, Manville, Knauf, Pittsburgh Corning.  
 B. Glass fiber insulation: ASTM C547, "K" value of 0.24 at 75 degrees F, noncombustible, minimum service temperature -20, maximum service temperature 300 degrees F, maximum moisture absorption 0.20 percent by volume, vapor retarder jacket composed of white Kraft paper and aluminum foil laminate. Flame spread/smoke developed rating of 25/50 or less in accordance with UL 723.  
 C. Duct liner, Certainteed Toughgard Type 150 or equal.

2.3.2 HOT PIPING REQUIREMENTS

A. Insulation and Jacket.  
 1. On piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation at such locations. Insulate flanges and unions at equipment when fluid temperatures exceeds 140 degrees F. Insulate fittings, joints, and valves with same insulation and thickness as scheduled. Staples may be used to seal jackets.  
 2. Cover insulation on fittings with pre-molded PVC fittings covers.  
 3. Indoor, exposed applications: Size for finish paint application.  
 B. Insulate heating water or glycol supply and return lines thru 2 inches with 1 inch thick glass fiber insulation, and lines over 2 inches with 1-1/2 inch insulation.  
 C. Insulate all domestic hot water lines with 1/2 inch thick glass fiber insulation.

2.3.4 SPECIAL INSULATION REQUIREMENTS

A. Insulate refrigeration suction line with 1 inch Armaflex or equal.

2.3.5 DUCT INSULATION REQUIREMENTS

A. Insulate outside air ductwork with 2 inch of rigid glass fiber insulation, k = .24 at 75 degrees F, 450 degrees F service temperature, 0.02 perm vapor transmission, 5 percent water vapor sorption.  
 B. Insulate interior concealed supply air duct with 1-1/2 inches FSK faced flexible duct wrap, k = .24 at 75 degrees F, 250 degrees F service temperature, .02 perm vapor transmission, 5 percent water vapor sorption.  
 C. Insulate exhaust air ductwork with 1 inch rigid FSK faced glass fiber insulation, k = .24 at 75 degrees F, 450 degrees F service temperature .02 perm vapor transmission, 5 percent water vapor sorption.

2.4 SPRINKLER SYSTEM

A. Provide system design, materials, tools, equipment, supervision, labor, and transportation to complete the work and obtain specified performance.  
 B. Provide a complete wet type sprinkler system.  
 C. Coordinate and resolve details to achieve compatibility between the sprinkler system and other building elements.  
 D. Provide system to IBC and NFPA 13 requirements.  
 E. Interface system with building fire and smoke alarm system.  
 F. Conceal piping, except in mechanical spaces and unfinished spaces.  
 G. All materials shall bear UL or FM label or marking.  
 H. Coordinate sprinkler system piping and head locations with ceiling types, light fixtures, air diffusers, ducts, and structural members.  
 I. Center heads in two directions in ceiling tiles.

2.5 PLUMBING AND HYDRONIC PIPING

2.5.1 MATERIALS

A. Heating Glycol Piping, Above Grade.  
 1. Steel Pipe: ASTM A53, Schedule 40, black. Fittings: ASTM B16.3, malleable iron or ASTM A234, forged steel welding type fittings. Joints: AWS D1.1, welded.  
 2. Copper Tubing: ASTM B88, Type L, hard drawn. Fittings: ANSI/ASME B16.18 cast brass or ASME B16.22 solder wrought copper. Joints: ASTM B32, solder, Engelhard "Silvabrite 100" or other approved lead-free solder. Compatible with glycol.  
 3. Cross Linked Polyethylene Barrier Tubing: ASTM F876 and F877, DIN Standard 4726 oxygen diffusion barrier, rated at 100 PSI @ 180 degrees F, Uponer hePEX, Viega ViegaPEX, Zurn ZurnPEX or approved equal.

G. Natural Gas Piping, Buried Beyond 5 feet of Building.

1. Polyethylene Pipe: ASTM D2513, SDR 11.5. Fittings: ASTM D2683 or ASTM D2513 socket type. Joints: Fusion welded.

H. Natural Gas Piping, Above Ground

1. Steel Pipe: ASTM A53 Schedule 40 black. Fittings: ASME B16.3, malleable iron, or ASTM A234, forged steel welding type. Joints: NFPA 54, threaded or welded to ASME B31.1, ASME B31.2, ASME B31.9 and ASME Sec. 1. Gas pressure of 2 lbs. or more to be welded fittings and welded joints only.

2.5.2 FLANGES, UNIONS, AND COUPLINGS

A. Pipe size 2 inches and under: Piping: bronze unions for copper pipe, soldered joints.

B. Dielectric connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.5.3 VALVES

A. Select valves of the best quality and type suited for the specific service and piping system used. Minimum working pressure rating 125 psig steam or 150 psig W.O.G. Ball valves are to be used in lieu of gate valves for shut-off and isolation service.  
 B. Ball valves: Up to and including 3 inches: Bronze or stainless steel body, 400 psi W.O.G. - 150 S.W.P., standard port, stainless steel or bronze ball, Teflon seats, and stuffing box ring, lever handle, solder or threaded ends. Seat material to be compatible with fluid handled.

2.6 REFRIGERATION PIPING

2.6.1 MATERIALS

A. Copper Tubing: ASTM B280, Type ACR hard drawn or annealed.  
 1. Fittings: ASME B16.22 wrought copper.  
 2. Joints: Braze AWS A5.8 Bcup silver/phosphorous/copper alloy with melting range 1190 to 1480 degrees F.

B. Copper Tubing to 7/8-inch OD: ASTM B88, Type K, annealed.  
 1. Fittings: ASME B16.26 cast copper.  
 2. Joints: Flared.  
 C. Pre-charged line sets.

SEE M-7 FOR CONTINUATION



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| <p>PROJECT: <b>ALASKA RAILROAD CORPORATION KENAI SUPPLY BUILDING RENOVATION</b></p> |                 |                   |                       |
| <p>TITLE: <b>MECHANICAL SPECIFICATIONS</b></p>                                      |                 |                   |                       |
| DESIGNED BY: MSM  | SCALE: AS NOTED | <p><b>M-6</b></p> | AFE NO.:              |
| DRAWN BY: MSM   | DATE: 1/11/2019 |                   | DWG NO.:              |
| CHECKED BY: SCH   |                 |                   | <b>7</b> OF <b>12</b> |
| APPROVED BY: MSM  |                 |                   |                       |

SEE M-6 FOR CONTINUATION

2.7 PIPING EXECUTION

2.7.1 INSTALLATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside of pipe, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- C. Install in accordance with manufacturer's instructions.
- E. Provide non-conducting dielectric connections wherever jointing dissimilar metals. Install to NACE RP-01-69.
- F. Route piping in orderly manner and maintain gradient.
- G. Sleeve pipe passing through partitions, walls, and floors.
- H. Install piping to conserve building space and not interfere with use of space.
- I. Group piping whenever practical at common elevations.
- I. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- K. Install valves with stems upright or horizontal, not inverted.
- L. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.
- M. Provide clearance for installation of insulation and access to valves and fittings. Provide access doors where valves and fittings are not exposed.
- N. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- O. Prepare unfinished pipe, fittings, supports, and accessories for finished painting.
- P. Use gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.

2.7.2 TESTING

- A. Heating Water and Glycol Piping Systems
  - 1. Test all water piping hydrostatically at 100 psig or 150% of working pressure, whichever is greater, for a period of four hours. Observe piping during this period and repair all leaks.

2. Air Test.

- a. In general, air testing is not acceptable. In the event of conditions that would subject the pipe to freezing, however, an equivalent air pressure test may be used after obtaining approval from the Contracting Agency.
- b. Make the air test by attaching an air compressor testing apparatus to any suitable opening, and after closing all other inlets and outlets to the system, force air into the system until there is uniform gauge pressure of 100 pounds per square inch, or 150% of working pressure, but not more than 150 psig. The air pressure shall be held without introduction of additional air for a period of at least eight hours. Locate all leaks by applying soap solution to all joints. Repair all leaks.
- 3. Provide certification that testing has been accomplished. Testing certification to be included in operation and maintenance manuals.

B. Natural Gas

- 1. Test all gas piping before connection to gas source. Do not enclose or conceal any untested portion of the gas system.
- 2. Test all piping in accordance with Chapter 4 of the International Fuel Gas Code.
- 3. Obtain a certificate of final inspection from the Administrative Authority and include in operation and maintenance manuals.

2.8 DUCTWORK

2.8.1 DEFINITIONS

- A. Duct sizes: Inside clear dimensions.

2.8.2 MATERIALS

- A. General: Non-combustible or conforming to requirements for Class 1 air duct materials or UL 181.
- B. Steel ducts: ASTM A525 galvanized steel sheet, lock forming quality, having zinc coating of 1.25 oz per square foot for each side in conformance with ASTM A90.
- C. Insulated flexible ducts: UL 181, Class 1, flexible duct wrapped with flexible glass fiber insulation, enclosed by seamless metallized film vapor barrier, rated to 6 inches WG positive and 1 inch WG negative pressure and a maximum velocity of 4000 fpm.
- D. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials, liquid used alone or with tape, or heavy mastic.
- E. Hanger rod: Steel, galvanized, threaded both ends, threaded one end, or continuously threaded.
- F. Balancing dampers: Fabricated with duro dyne specline series regulators. Provide concealed type regulator set for inaccessible damper locations.

2.8.3 DUCTWORK INSTALLATION

- A. Fabricate and support in accordance with SMACNA duct construction standards and ASHRAE handbooks, except as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressure indicated.
- B. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees, convergence downstream shall not exceed 45 degrees.
- C. Use double nuts and lock washers on threaded rod supports.

2.8.4 DUCTWORK APPLICATION SCHEDULE

|                     |          |
|---------------------|----------|
| Air System          | Material |
| Low Pressure Supply | Steel    |
| Exhaust             | Steel    |

2.9 TEMPERATURE CONTROLS

- A. Provide electric/electronic temperature controls for all equipment and systems specified including but not limited to the following.
  - 1: Pump PMP-4: Pump shall run continuously, manual on-off switch, set pump to variable differential pressure control mode.
  - 2: Gas Fired Unit Heaters GUH-1, GUH-2: On call for heat from wall mounted thermostat (adjustable) burner and fan shall operate.
  - 3: Heat Exchanger HX-1: 2-Way hot side valve shall modulate to maintain cold side setpoint of 180 degrees F (adjustable).
  - 4: Reheat Coils HC-3, HC-4, HC-5: Space thermostat shall modulate three-way or two-way valve as indicated on plans to maintain setpoint of 72 degrees F (adjustable).

5: Air Handling Unit AHU-1:

- A. Time Schedule: Start and stop fan to meet occupancy schedule. Provide status and start/stop. Failure to start signals alarm.
- B. Safety Devices:
  - a. Freeze Protection: Stop fan and close outside air damper and modulate heating coil in full heat position if temperature after supply fan is 45 degrees F; signal alarm.
  - b. Smoke Detection: Shuts off power to VFD and closes outside air and exhaust dampers when smoke is detected; signal alarm.
  - c. System Shutdown: When the system is shut down, the outside and exhaust dampers will close, the return air dampers will open and the heating coil valve is closed.
- C. Minimum Outside Air: When supply fan is on, the outside air dampers open to provide minimum outside air volume for ventilation.
  - a. Occupied Mode Minimum outside air, see drawing schedule.
  - b. CO<sub>2</sub> Sensor located in return air duct to override outside air damper minimum position open or closed to maintain less than 1000 ppm.
- D. Mixed Air Temperature (Occupied Mode):
  - a. When the fan is off, the outside air and exhaust dampers are closed and the return dampers are open.
  - b. When the supply fan is on, outside and return dampers modulate to maintain 55 degrees F. mixed air temperature.
- E. Supply Air Temperature:
  - a. Heating Mode HC-1: When supply fan is on, PMP-5 modulates to maintain 55 degrees F. supply air temperature.
  - b. Cooling Mode CC-1: When supply fan is on, discharge air setpoint shall be maintained by modulating the economizer or staging the DX cooling system as required to maintain 55 degrees F. supply air temperature.
- 6: Relief Fan RF-1: When relief fan is on the damper is open, relief fan VFD modulates to maintain + .03" (adjustable) building static pressure relative to outdoors. Relief fan shall be enabled when AHU-1 is enabled.

- 7: Condensing Unit CU-1: Unit enabled to run when outside air temperature exceeds 55 degrees F. (Adjustable). The unit shall operate subject to its own internal operating and safety controls to maintain supply air temperature of 55 degrees F.

- B. Provide necessary hardware, software, wiring, conduit and terminal unit controls for a complete and functional control system.
- C. Manufacturer shall be company specializing in manufacturing products required for system control with minimum five years experience.
- D. Installer: Company specializing in applying the work with minimum five years experience.

2.10 TESTING, ADJUSTING AND BALANCING

2.10.1 EXAMINATION

- A. Before commencing work, verify that systems are complete and operable. Ensure the following:
  - 1. Equipment is operable and in a safe and normal condition.
  - 2. Temperature control systems are installed complete and operable.
  - 3. Proper thermal overload protection is in place for electrical equipment.
  - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
  - 5. Duct systems are clean of debris.
  - 6. Correct fan rotation.
  - 7. Coil fins have been cleaned and combed.
  - 8. Access doors are closed and duct end caps are in place.
  - 9. Air outlets are installed and connected.
  - 10. Duct system leakage has been minimized.
  - 11. Hydronic systems have been flushed, filled, and vented.
  - 12. Correct pump rotation.
  - 13. Proper strainer baskets are clean and in place.
  - 14. Service and balance valves are open.
- B. Report any defects or deficiencies noted during performance of services to Architect/Engineer.
- C. Promptly report abnormal conditions in mechanical systems or conditions which prevent system balance.
- D. If, for design reasons, system cannot be properly balanced, report as soon as observed.

- E. Beginning of work means acceptance of existing conditions.

2.10.2 PREPARATION

- A. Provide instruments required for testing, adjusting, and balancing operations.
- B. Provide additional balancing devices as required.

2.10.3 INSTALLATION TOLERANCES

- A. Adjust air handling systems to plus or minus 5 percent for supply systems and plus or minus 10 percent for return and exhaust systems from figures indicated.
- B. Adjust hydronic systems to plus or minus 10 percent of design.

2.10.4 ADJUSTING

- A. Recorded data shall represent actually measured, or observed condition.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

2.10.5 AIR SYSTEM PROCEDURE

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

- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.
- L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.
- M. Check multi-zone units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.

2.10.6 WATER SYSTEM PROCEDURE

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



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**ALASKA RAILROAD CORPORATION**  
**KENAI SUPPLY BUILDING RENOVATION**

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TITLE:






















**MECHANICAL SPECIFICATIONS**

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| DESIGNED BY: <u>MSM</u> | SCALE: AS NOTED | M-7 | AFE NO.:           |
| DRAWN BY: <u>MSM</u>    | DATE: 1/11/2019 |     | ACAD FILE:17034-M7 |
| CHECKED BY: <u>SCH</u>  |                 |     | DWG NO.            |
| APPROVED BY: <u>MSM</u> |                 |     | 8 OF 12            |



### POWER LEGEND

|   |                                      |
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|    | ELECTRICAL POWER PANEL               |
|    | ELECTRICAL DISTRIBUTION PANEL        |
|    | ELECTRICAL LIGHTING PANEL            |
|    | PANELBOARD CABINET FLUSH MOUNT       |
|    | PANELBOARD CABINET SURFACE MOUNT     |
|    | SWITCHBOARD NEW                      |
|    | SWITCHBOARD EXISTING                 |
|    | METER                                |
|    | CONTROLLER/DISCONNECT                |
|    | UNFUSED DISCONNECT                   |
|    | FUSED DISCONNECT                     |
|    | VARIABLE FREQUENCY DRIVE             |
|    | CONTROLLER                           |
|    | CONTACTOR                            |
|    | MOTOR SINGLE PHASE                   |
|    | MOTOR SINGLE PHASE : X = HORSE POWER |
|    | MOTOR 3PH                            |
|    | MOTOR 3PH : X = HORSE POWER          |
|   | GENERATOR POWER                      |
|  | TRANSFORMER                          |
|  | THERMAL SWITCH                       |

### ABBREVIATIONS

[E] EXISTING TO REMAIN

| <b>PANEL: MDP [E]</b>           |                               |                |  |          |           |  |         |     |                           |
|---------------------------------|-------------------------------|----------------|--|----------|-----------|--|---------|-----|---------------------------|
| PROJECT: ARRC KENAI SUPPLY BLDG |                               |                | MOUNTING MAINS   |          |           | OPTIONS  |         |     |                           |
| LOCATION: ROOM 107              |                               |                | <input checked="" type="checkbox"/> SURFACE <input type="checkbox"/> LUGS        |          |           | <input type="checkbox"/> FEEDTHRU <input type="checkbox"/> SHUNT TRIP <input type="checkbox"/> ISO GND BAR                   |         |     |                           |
|                                 |                               |                | <input checked="" type="checkbox"/> FLUSH <input checked="" type="checkbox"/> CB |          |           | <input type="checkbox"/> SUBFEED LUG <input type="checkbox"/> SUBFEED BRKR <input checked="" type="checkbox"/> SOLID NEUTRAL |         |     |                           |
| VOLTAGE: 208Y/120 VOLT          |                               | 3 PHASE 4 WIRE |  |          | 800 A MCB |  | 10k AIC |     |                           |
| NOTE                            | CIRCUIT DESCRIPTION           | KVA            | AMP  | P        | CKT       | AMP  | P       | KVA | CIRCUIT DESCRIPTION       |
|                                 | PANEL SS JDA36250 250 AMP     |                | 250  | 3        | 1         | 2  |         |     | PANEL RS1 FA36100 100 AMP |
|                                 |                               |                |  |          | 3         | 4  |         |     |                           |
|                                 |                               |                |  |          | 5         | 6  |         |     |                           |
|                                 | PANEL BR FA32100 100 AMP      |                | 100  | 3        | 7         | 8  |         |     | PANEL RS2 FA36100 100 AMP |
|                                 |                               |                |  |          | 9         | 10   |         |     |                           |
|                                 |                               |                |  |          | 11        | 12   |         |     |                           |
| 1                               | <b>PANEL S NORTH 2 (SN 2)</b> | <b>37.1</b>    | <b>200</b>   | <b>3</b> | 13        | 14   |         |     | PANEL SN FA36100 100 AMP  |
|                                 |                               |                |  |          | 15        | 16   |         |     |                           |
|                                 |                               |                |  |          | 17        | 18   |         |     |                           |
|                                 | SPACE                         |                |  |          | 19        | 20   |         |     | SPACE                     |
|                                 | SPACE                         |                |  |          | 21        | 22   |         |     | SPACE                     |
|                                 | SPACE                         |                |  |          | 23        | 24   |         |     | SPACE                     |
|                                 | SPACE                         |                |  |          | 25        | 26   |         |     | SPACE                     |
|                                 | SPACE                         |                |  |          | 27        | 28   |         |     | SPACE                     |
|                                 | SPACE                         |                |  |          | 29        | 30   |         |     | MAIN                      |
|                                 | SPACE                         |                |  |          | 31        | 32   |         |     | MAIN                      |
|                                 | SPACE                         |                |  |          | 33        | 34   |         |     | MAIN                      |
|                                 | SPACE                         |                |  |          | 35        | 36   |         |     | MAIN                      |
|                                 | SPACE                         |                |  |          | 37        | 38   |         |     | MAIN                      |
|                                 | SPACE                         |                |  |          | 39        | 40   |         |     | MAIN                      |
|                                 | SPACE                         |                |  |          | 41        | 42   |         |     | MAIN                      |
| <b>CONNECTED LOAD:</b>          |                               | 37.1 KVA       |  | 103.0 A  |           | <b>NOTE:</b>   |         |     |                           |
| <b>DEMAND LOAD:</b>             |                               | 37.1 KVA       |  | 103.0 A  |           | 1. PROVIDE NEW CIRCUIT BREAKER TO FEED NEW PANEL   |         |     |                           |
| DATE:                           |                               |                |  |          |           |  |         |     |                           |
| REV:                            |                               |                |  |          |           |  |         |     |                           |

| <b>PANEL: SN2 (NEW)</b>         |                     |                |  |         |           |  |         |     |                     |
|---------------------------------|---------------------|----------------|--|---------|-----------|--|---------|-----|---------------------|
| PROJECT: ARRC KENAI SUPPLY BLDG |                     |                | MOUNTING MAINS   |         |           | OPTIONS  |         |     |                     |
| LOCATION: ROOM 107              |                     |                | <input checked="" type="checkbox"/> SURFACE <input type="checkbox"/> LUGS        |         |           | <input type="checkbox"/> FEEDTHRU <input type="checkbox"/> SHUNT TRIP <input type="checkbox"/> ISO GND BAR                   |         |     |                     |
|                                 |                     |                | <input checked="" type="checkbox"/> FLUSH <input checked="" type="checkbox"/> CB |         |           | <input type="checkbox"/> SUBFEED LUG <input type="checkbox"/> SUBFEED BRKR <input checked="" type="checkbox"/> SOLID NEUTRAL |         |     |                     |
| VOLTAGE: 208Y/120 VOLT          |                     | 3 PHASE 4 WIRE |  |         | 200 A MLO |  | 10k AIC |     |                     |
| NOTE                            | CIRCUIT DESCRIPTION | KVA            | AMP  | P       | CKT       | AMP  | P       | KVA | CIRCUIT DESCRIPTION |
|                                 | AHU-1 (7.5 HP)      | 8.8            | 50   | 3       | 1         | 2  |         | 0.5 | GUH-1 (1/8 HP)      |
|                                 |                     |                |  |         | 3         | 4  |         | 0.5 | GUH-2 (1/8 HP)      |
|                                 |                     |                |  |         | 5         | 6  |         | 0.5 | GT-1 (50W)          |
|                                 |                     |                |  |         | 7         | 8  |         | 0.3 | PMP-5               |
|                                 | CU-1 (MCA 55)       | 19.8           | 70   | 3       | 9         | 10   |         |     | SPACE               |
|                                 |                     |                |  |         | 11        | 12   |         |     | SPACE               |
|                                 |                     |                |  |         | 13        | 14   |         |     | SPACE               |
|                                 | RF-1 (1.5 HP)       | 2.4            | 15   | 3       | 15        | 16   |         |     | SPACE               |
|                                 |                     |                |  |         | 17        | 18   |         |     | SPACE               |
|                                 | SPACE               |                |  |         | 19        | 20   |         |     | SPACE               |
|                                 | SPACE               |                |  |         | 21        | 22   |         |     | SPACE               |
|                                 | SPACE               |                |  |         | 23        | 24   |         |     | SPACE               |
|                                 | SPACE               |                |  |         | 25        | 26   |         |     | SPACE               |
|                                 | SPACE               |                |  |         | 27        | 28   |         |     | SPACE               |
|                                 | SPACE               |                |  |         | 29        | 30   |         |     | SPACE               |
|                                 | SPACE               |                |  |         | 31        | 32   |         |     | SPACE               |
|                                 | SPACE               |                |  |         | 33        | 34   |         |     | SPACE               |
|                                 | SPACE               |                |  |         | 35        | 36   |         |     | SPACE               |
|                                 | SPACE               |                |  |         | 37        | 38   |         |     | SPACE               |
|                                 | SPACE               |                |  |         | 39        | 40   |         |     | SPACE               |
|                                 | SPACE               |                |  |         | 41        | 42   |         |     | SPACE               |
| <b>CONNECTED LOAD:</b>          |                     | 32.7 KVA       |  | 90.7 A  |           | <b>NOTE:</b>   |         |     |                     |
| <b>DEMAND LOAD:</b>             |                     | 37.1 KVA       |  | 103.1 A |           |  |         |     |                     |
| DATE:                           |                     |                |  |         |           |  |         |     |                     |
| REV:                            |                     |                |  |         |           |  |         |     |                     |

#### NEC 220.87 Service Load Calc (addition to an existing service)

### KENAI SUPPLY WASILLA

**Existing Load**

Maximum Demand 42.00 kW (1-year history as reported by the utility)

Power Factor 0.90 Estimated

Feeder Load 46.67 kVA Connected Load

Demand Factor 125% NEC 220.87(2)

Calculated Load 58.33 kVA Demand Load                    162 Amps

**New Load**

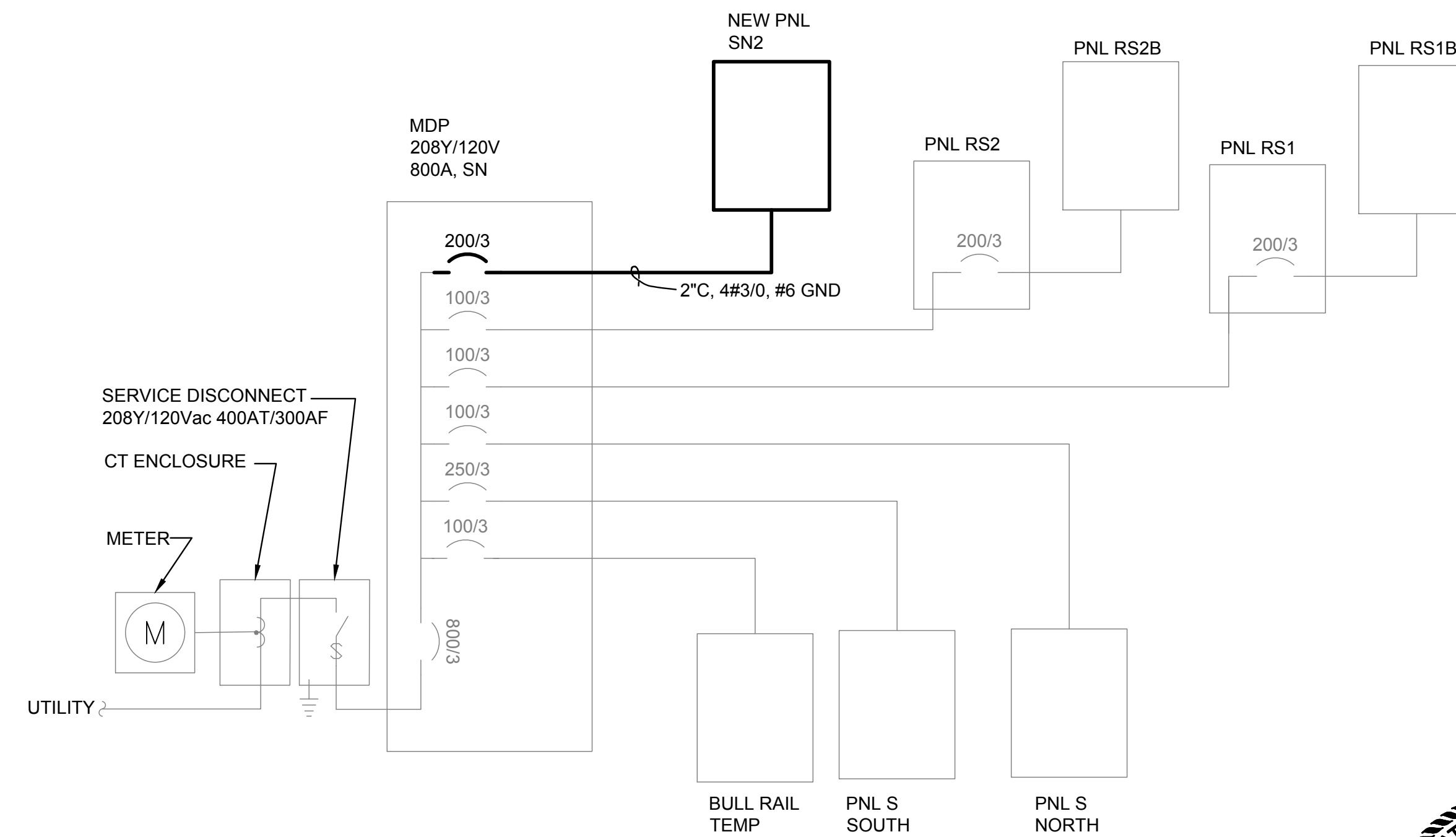
Voltage 208 3 Phase

| PANEL Loads    | kVA        | NEC Factor | NEC kVA     |
|----------------|------------|------------|-------------|
| PANEL SN2      | 32.20      |            | 37.10       |
| Misc Total     | 32.20      |            | 37.10       |
| New Load Total | 32.20 kVA  |            | 37.10 kVA   |
|                | 89.38 Amps |            | 102.98 Amps |

**Total New Load Summary**

|                           | Connected Load   | NEC Load         |
|---------------------------|------------------|------------------|
| Existing Load             | 46.67 kVA        | 58.33 kVA        |
| New Load                  | 32.20 kVA        | 37.10 kVA        |
| <b>Total Service Load</b> | <b>78.87 kVA</b> | <b>95.43 kVA</b> |
|                           | 219 Amps         | 265 Amps         |

|                       |                    |           |         |
|-----------------------|--------------------|-----------|---------|
| Existing Service Size | 300 Amps           | 208 Volts | 3 Phase |
| Will Provide          | 12% Spare Capacity |           |         |



**1**  
E-1  
POWER ONE-LINE DIAGRAM  
NTS



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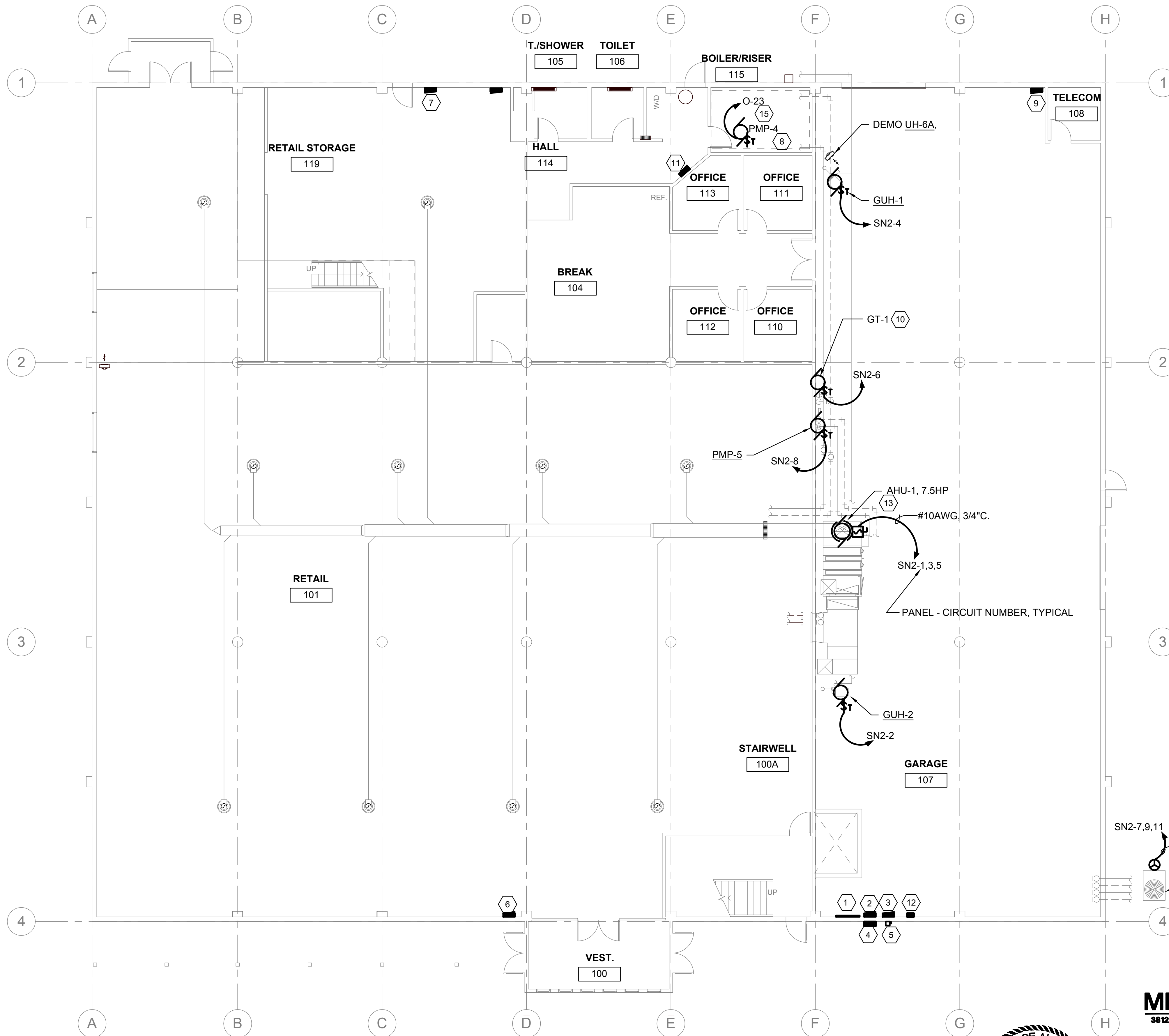
|   |         |     |         |
|---|---------|-----|---------|
| 0 | 1/11/19 | MBA | BID SET |
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|   |         |     |         |

**ALASKA RAILROAD CORPORATION**  
ENGINEERING SERVICES  
P.O. BOX 107500, ANCHORAGE, ALASKA 99510-7500

**ALASKA RAILROAD CORPORATION**  
**KENAI SUPPLY BUILDING RENOVATION**

**LEGEND, SCHEDULES AND POWER ONE-LINE**

|                  |                 |            |                     |
|------------------|-----------------|------------|---------------------|
| DESIGNED BY: EWC | SCALE: AS NOTED | <b>E-1</b> | AFC NO.:            |
| DRAWN BY: SNS    | DATE: 1/11/2019 |            | ACAD FILE: 17034-M1 |
| CHECKED BY: EWC  |                 | 9          | DWG NO.:            |
| APPROVED BY: EWC |                 |            | 12                  |



**SHEET NOTES:**

- 1 TELEPHONE SERVICE ENTRANCE
- 2 PANEL SHOP NORTH (SN)
- 3 MDP
- 4 CT ENCLOSURE
- 5 SERVICE DISCONNECT
- 6 PANEL RS1
- 7 PANEL RS2
- 8 DEMOLISH PMP-3 SEE SHEET M-4.
- 9 PANEL SHOP SOUTH (SS)
- 10 CONNECT GT-1 TO CIRCUIT INDICATED IN PANEL SN2.
- 11 PANEL O
- 12 NEW PANEL SN2
- 13 VFD FURNISHED WITH AHU-1
- 14 SINGLE POINT EQUIPMENT CONNECTION. PROVIDE CONDUIT FOR CONTROL WIRES (INSTALLED BY MECHANICAL) FROM CU-1 TO AHU-1.
- 15 CONNECT PMP-4 TO SPARE 20A/1P CIRCUIT BREAKER IN PANEL O.

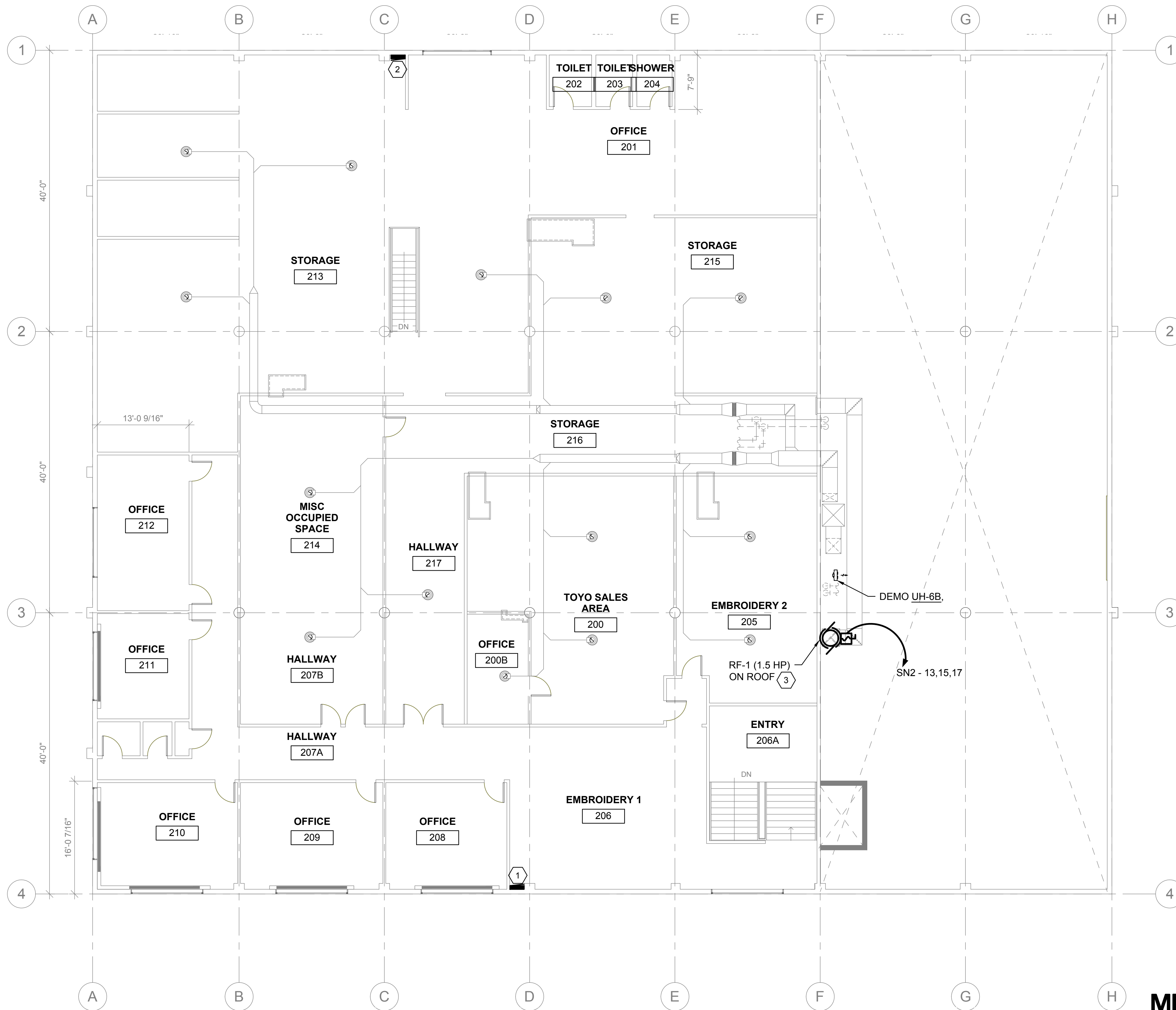
**1 LEVEL 1 - ELECTRICAL PLAN**  
E-2 1/8"=1'-0"



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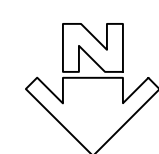
| REV. | DATE    | BY  | REVISION |
|------|---------|-----|----------|
| 0    | 1/11/19 | MBA | BID SET  |
|      |         |     |          |
|      |         |     |          |
|      |         |     |          |

|  |                 |
|--|-----------------|
| <br>ALASKA RAILROAD CORPORATION<br>ENGINEERING SERVICES<br>P.O. BOX 107500, ANCHORAGE, ALASKA 99510-7500 |                 |
| <b>ALASKA RAILROAD CORPORATION</b><br><b>KENAI SUPPLY BUILDING RENOVATION</b>                            |                 |
| <b>FIRST FLOOR</b><br><b>ELECTRICAL PLAN</b>   |                 |
| DESIGNED BY: EWC   | SCALE: AS NOTED |
| DRAWN BY: SNS  | DATE: 1/11/2019 |
| CHECKED BY: EWC  | <b>E-2</b>      |
| APPROVED BY: EWC   |                 |
| AFE NO.: ACAD FILE:17034-M1<br>DWG NO. <b>10</b> OF <b>12</b>  |                 |

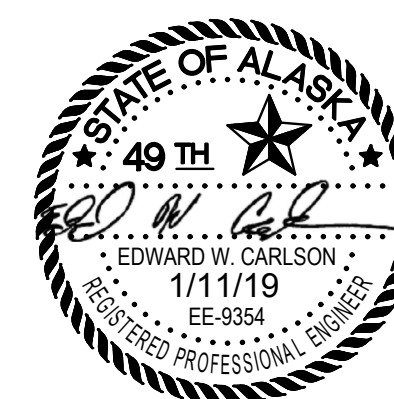
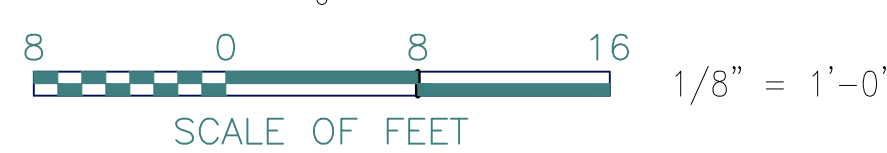


**SHEET NOTES:**

- ① PANEL RS1B
- ② PANEL RS2B
- ③ CONNECT TO VFD FURNISHED WITH EF-1. PROVIDE CONDUIT FOR CONTROL WIRES (INSTALLED BY MECHANICAL) FROM EF-1 TO AHU-1.




**1**  
E-3 **LEVEL 2 - ELECTRICAL PLAN**  
1/8"=1'-0"



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| REV. | DATE    | BY  | REVISION |
|------|---------|-----|----------|
| 0    | 1/11/19 | MBA | BID SET  |
|      |         |     |          |
|      |         |     |          |
|      |         |     |          |

|   |  |
|---|--|
|  <b>ALASKA RAILROAD CORPORATION</b><br>ENGINEERING SERVICES<br>P.O. BOX 107500, ANCHORAGE, ALASKA 99510-7500 |  |
| <b>ALASKA RAILROAD CORPORATION</b><br><b>KENAI SUPPLY BUILDING RENOVATION</b>   |  |
| <b>SECOND FLOOR</b><br><b>ELECTRICAL PLAN</b>   |  |
| DESIGNED BY: EWC<br>DRAWN BY: SNS<br>CHECKED BY: EWC<br>APPROVED BY: EWC  | SCALE: AS NOTED<br>DATE: 1/11/2019                                   |
| <b>E-3</b>  | AFE NO.:<br>ACAD FILE: 17034-M1<br>DWG NO.<br><b>11</b> OF <b>12</b> |

PART 1 - GENERAL

1.1 SCOPE

- A. PROVIDE COMPLETE ELECTRICAL SYSTEMS AS SHOWN ON DRAWINGS AND SPECIFIED. FURNISH ALL LABOR, EQUIPMENT, APPLIANCES, MATERIALS, AND PERFORM OPERATIONS REQUIRED FOR COMPLETE INSTALLATION IN ACCORDANCE WITH ALL SECTIONS OF SPECIFICATIONS, DRAWINGS, CODES, AND CONDITIONS OF CONTRACT.

1.2 CODES, STANDARDS, FEES, PERMITS

- A. COMPLY WITH LATEST EDITION OF THE NATIONAL ELECTRICAL CODE, NATIONAL ELECTRICAL SAFETY CODE, LOCAL CODES, AMENDMENTS, ORDINANCES AND REQUIREMENTS OF UTILITY COMPANIES' FURNISHING SERVICES TO INSTALLATION. COMPLY WITH NEMA, UL, ANSI, ICEA AND OTHER INDUSTRY STANDARDS. COMPLY WITH REQUIREMENTS OF IBC, IMC, UPC, AND OTHER APPLICABLE CODES.
- B. SECURE AND PAY FOR ALL INSPECTIONS, FEES, PERMITS, ETC., REQUIRED BY LOCAL AND STATE AGENCIES.

1.3 DRAWINGS

- A. ELECTRICAL DRAWINGS ARE DIAGRAMMATIC AND DO NOT SHOW ALL FEATURES OF WORK. INSTALL ELECTRICAL ITEMS TO PROVIDE SYMMETRICAL APPEARANCE. DO NOT SCALE DRAWINGS. REVIEW OTHER DRAWINGS AND ADJUST WORK TO CONFORM TO CONDITIONS SHOWN. VERIFY FIELD CONDITIONS. IMMEDIATELY CONTACT THE OWNER'S REPRESENTATIVE FOR CLARIFICATION OF QUESTIONABLE, OBSCURE ITEMS, OR APPARENT CONFLICTS. THE OWNER'S REPRESENTATIVE'S DECISION IS FINAL FOR ALL CLARIFICATIONS REQUESTED. EXTRA COST RESULTING FROM A CONDITION WHERE CLARIFICATION WAS NOT REQUESTED: MADE AT NO INCREASE IN CONTRACT AMOUNT UNLESS EXTRA COST IS APPROVED IN WRITING.

1.4 WORKMANSHIP

- A. CONSIDERED AS IMPORTANT AS ELECTRICAL AND MECHANICAL EFFICIENCY AND SUBJECT TO APPROVAL. EMPLOY WORKMEN SKILLED IN TRADE AND FAMILIAR WITH PARTICULAR TECHNIQUES APPLICABLE TO VARIOUS SECTIONS OF WORK. INSTALL IN ACCORDANCE WITH NECA "STANDARD PRACTICES FOR GOOD WORKMANSHIP IN ELECTRICAL CONTRACTING."

1.5 COORDINATION

- A. COORDINATE WITH OTHER TRADES FOR PROPER INSTALLATION AND TIMELY EXECUTION. ANY CHANGES NECESSITATED BY FAILURE TO PROPERLY COORDINATE WORK: MADE AT NO INCREASE IN CONTRACT AMOUNT.
- B. VERIFY INFORMATION SHOWN ON PLANS WITH EQUIPMENT ITEMS ACTUALLY FURNISHED WHERE EQUIPMENT IS FURNISHED OR INSTALLED BY OTHERS. NOTIFY OWNER'S REPRESENTATIVE OF ANY CONFLICTS.

1.6 REMODEL WORK

- A. EXISTING CONDITIONS NOTED ON THE DRAWINGS WERE PREPARED FROM PREVIOUS CONSTRUCTION DRAWINGS. VISIT SITE, VERIFY EXISTING CONDITIONS AND ALLOW ADEQUATE MONIES TO COVER ADDITIONAL WORK REQUIRED AS A RESULT OF AS-BUILT CONDITIONS. ASSUME THAT THE AS-BUILT INFORMATION DOES NOT INDICATE EXACT CONDUIT ROUTING OR CIRCUITING. INCLUDE NECESSARY WORK TO PROVIDE CIRCUIT CONTINUITY TO EXISTING CIRCUITS THAT MAY BE AFFECTED BY NEW WORK. CUT BACK EXISTING WORK BEING REMOVED OR ABANDONED BEYOND FINISHED SURFACES TO ALLOW REPAIR AND REFINISHING. ASSUME CONDITION OF WIRING IS SUITABLE FOR RECONNECTING.
- B. NOTIFY OWNER'S REPRESENTATIVE OF ANY FIELD CONDITIONS WHERE CONTRACTOR CANNOT REUSE EXISTING MATERIAL OR EQUIPMENT BECAUSE OF DETERIORATED CONDITIONS. ALSO NOTIFY OWNER'S REPRESENTATIVE OF ANY EXISTING CONDITIONS WHICH MAY BE CONSIDERED UNSAFE OR IN NEED OF REPAIR.

1.7 SUBMITTALS

- A. SUBMITTAL REVIEW IS FOR GENERAL DESIGN AND ARRANGEMENT ONLY AND DOES NOT RELIEVE THE CONTRACTOR FROM ANY REQUIREMENTS OF CONTRACT DOCUMENTS. PROVISION OF A COMPLETE AND SATISFACTORY WORKING INSTALLATION IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

1.8 PROJECT COMPLETION

- A. THOROUGHLY CLEAN INSIDE AND OUT ALL FIXTURES AND EQUIPMENT. CLEAN PREMISES OF CONSTRUCTION DEBRIS. CALL FOR FINAL CONSTRUCTION OBSERVATION. CONDUCT OPERATING TEST FOR APPROVAL. DEMONSTRATE INSTALLATION TO OPERATE SATISFACTORILY IN ACCORDANCE WITH REQUIREMENTS OF CONTRACT DOCUMENTS. PROVIDE PERSONNEL TO ASSIST ENGINEER IN REMOVAL AND REPLACEMENT OF EQUIPMENT FOR OBSERVATION PURPOSES.
- B. SHOULD ANY PORTION OF INSTALLATION FAIL, REPAIR OR REPLACE ITEMS UNTIL ITEMS CAN BE DEMONSTRATED TO COMPLY.
- C. FIRE ALARM AND EMERGENCY SYSTEMS MUST BE OPERATIONAL PRIOR TO OCCUPANCY.
- D. SUBMIT A LETTER CERTIFYING COMPLETION OF PROJECT IN ACCORDANCE WITH PLANS AND SPECIFICATIONS. TURN OVER RECORD DRAWINGS TO OWNER.

1.9 GUARANTEE

- A. GUARANTEE ALL MATERIAL TO BE NEW, ALL WORK TO BE FREE FROM DEFECTS IN MATERIAL AND WORKMANSHIP FOR ONE YEAR FROM DATE OF FINAL ACCEPTANCE. REPAIR OR REPLACE ANY WORK OR MATERIAL DEEMED DEFECTIVE DURING THE GUARANTEE PERIOD AT NO COST TO THE OWNER.

PART 2 - PRODUCTS

2.1 RACEWAYS

- A. GALVANIZED RIGID STEEL CONDUIT OR INTERMEDIATE METAL CONDUIT: USE IN DAMP OR WET LOCATIONS, UNDERGROUND, IN CONCRETE OR CMU, WHERE SUBJECT TO PHYSICAL DAMAGE, FOR SERVICE CONDUCTORS AND PANELBOARD FEEDERS.
- B. ELECTRICAL METALLIC TUBING: USE IN ALL OTHER AREAS UNLESS OTHERWISE INDICATED. PROVIDE RAIN/TIGHT/CONCRETE-TIGHT COMPRESSION FITTINGS.
- C. FLEXIBLE METALLIC CONDUIT: USE FOR FINAL CONNECTIONS TO FIXTURES AND EQUIPMENT TO ISOLATE VIBRATION OR ALLOW RELOCATION. PROVIDE FLEXIBLE WATERTIGHT CONDUIT IN DAMP OR WET LOCATIONS (PUMPS, KITCHEN EQUIPMENT, ETC.). WHERE USED OUTDOORS, USE LIQUIDTIGHT FLEXIBLE CONDUIT RATED FOR -60 DEGREES F AND LISTED FOR DIRECT BURY.
- D. NO CONDUIT ALLOWED EMBEDDED IN SPRAY-APPLIED FIREPROOFING OR BETWEEN STRUCTURAL STEEL MEMBERS AND GYPSUM WALL BOARD.
- E. UNLESS NOTED, INSTALL RACEWAYS CONCEALED EXCEPT AT SURFACE CABINETS, MOTOR AND EQUIPMENT CONNECTIONS, AND IN UTILITY ROOMS. LOCATE RACEWAYS TO NOT ENDANGER STRENGTH OF STRUCTURAL MEMBERS, AND SIX INCHES MINIMUM FROM PARALLEL RUNS OF HEAT PIPING. DO NOT INSTALL RACEWAYS IN OR THROUGH STRUCTURAL MEMBERS UNLESS SPECIFICALLY APPROVED. CROSS EXPANSION JOINTS WITH EXPANSION FITTINGS AND BONDING CONDUCTOR.
- F. PROVIDE PULL WIRE IN RACEWAYS INSTALLED BUT LEFT EMPTY.
- G. WATERPROOF ALL ROOF AND EXTERIOR WALL PENETRATIONS AS APPROVED.

2.2 WIRE AND CABLE

- A. INSTALL ALL CONDUCTORS IN APPROVED RACEWAY SYSTEMS. TYPE MC CABLE MAY BE USED WITHIN THE LIMITS OF THE NEC UNLESS OTHERWISE NOTED ON DRAWINGS. ALL CONDUCTOR SIZES BASED ON COPPER, #12 AWG MINIMUM EXCEPT CONTROL WIRING MAY BE #14.
- B. MINIMUM INSULATION RATING: 75 DEGREES C, 600 VOLT. IN LIGHTING FIXTURE CHANNELS, HIGH TEMPERATURE AREAS: 90 DEGREES C, 600 VOLT.
- C. 120 VOLT BRANCH CIRCUIT LENGTHS FROM PANEL TO FIRST OUTLET EXCEEDING 75': NO. 10 AWG MINIMUM.
- D. INCREASE CONDUCTOR SIZES TO #10 AWG OR USE 90 DEGREES C-RATED INSULATION TO OFFSET DERATING FACTOR, WHEN MORE THAN THREE 20 AMP CONDUCTORS ARE INSTALLED IN SINGLE RACEWAY.
- E. CABLE FOR FIRE ALARM SYSTEMS AND OTHER SPECIAL INSTALLATIONS: AS DESCRIBED UNDER OTHER SECTIONS OF SPECIFICATIONS, NOTED ON DRAWINGS, OR RECOMMENDED BY MANUFACTURER.
- F. COLOR CODE 120/208 VOLT SYSTEMS: BLACK, RED, BLUE AND WHITE. CODE SOUND AND SIGNAL SYSTEMS WIRING AND ANY SPECIAL EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S DIAGRAMS OR RECOMMENDATIONS.
- G. INSTALL NO THERMOPLASTIC INSULATED CONDUCTORS WHEN TEMPERATURE IS BELOW 20 DEGREES F.
- H. CONNECTIONS:
  - 1. #6 AND LARGER: SOLDERLESS LUGS.
  - 2. #8 AND SMALLER: INSULATED WIRE NUT CONNECTOR, IDEAL "WINGNUT" HARD SHELL.
- I. LOW VOLTAGE, SPECIAL PURPOSE, COAXIAL CABLES, ETC.: INSTALL AND TERMINATE PER MANUFACTURER'S RECOMMENDATIONS.

2.3 BOXES

- A. WHERE CONDUIT SYSTEMS OR MC CABLE IS USED, PROVIDE GALVANIZED OR CADMIUM PLATED, ONE PIECE PRESSED OR WELDED STEEL WITH DEVICE FINISH RING AND GANG COVER. FOUR INCH SQUARE OR OCTAGONAL, 1-1/2" DEEP MINIMUM SIZE. PROVIDE STEEL SQUARE CORNER MASONRY BOXES AND FINISH RINGS IN MASONRY, CONCRETE OR CONCRETE BLOCK WALLS.
- B. THROUGH WALL BOXES NOT PERMITTED. PROVIDE SIX INCH MINIMUM NIPPLE BETWEEN OUTLETS SHOWN BACK-TO-BACK ON COMMON WALLS. MINIMUM 24" SEPARATION IN FIRE-RATED WALLS AND PENETRATIONS. SET FLUSH WITH WALL OR CEILING FINISH. PROVIDE ISOLATION BARRIER BETWEEN DISSIMILAR VOLTAGES IN SAME OUTLET AND WHERE LINE-TO-LINE VOLTAGE EXCEEDS 300 VOLTS.
- C. VERIFY LOCATION OF ALL OUTLETS. UNLESS NOTED, MOUNT OUTLETS AS FOLLOWS, FINISHED FLOOR TO CENTERLINE OF OUTLET:

|   |       |
|---|-------|
| WALL SWITCHES, PUBLIC TELEPHONE OUTLETS           | 4'-0" |
| CONVENIENCE OUTLETS, INDIVIDUAL TELEPHONE OUTLETS | 1'-6" |
| WEATHERPROOF OUTLETS                              | 2'-6" |
- D. PROVIDE ADDITIONAL PULL BOXES AS REQUIRED TO AVOID EXCESS PULLING TENSIONS AND TO FACILITATE WORK.

2.4 PANELBOARDS AND OVERCURRENT PROTECTION

- A. SQUARE D TYPE NQOD SERIES. SIMILAR EQUIPMENT BY OTHER MANUFACTURERS ACCEPTABLE. SIEMENS EQUIPMENT IS NOT ACCEPTABLE. SAME MANUFACTURER AND KEYED ALIKE THROUGHOUT PROJECT. FACTORY ASSEMBLED PANELS WITH THERMAL MAGNETIC BRANCH BREAKERS, MAIN LUGS OR CIRCUIT BREAKER, ETC., AS SHOWN. PROVIDE DEAD FRONT CONSTRUCTION, FLUSH OR SURFACE MOUNTED AS SHOWN, 20" WIDE, 5-3/4" DEEP UNLESS OTHERWISE INDICATED. PROVIDE DOORS WITH CONCEALED HINGES, FLUSH KEYED HANDLES. PROVIDE TYPED CIRCUIT DIRECTORIES ON DOOR IN FRAME WITH PROTECTIVE PLASTIC COVERING. DIRECTORY TO INCLUDE CIRCUIT NUMBER, CIRCUIT USE, ETC. SEE DRAWINGS FOR ADDITIONAL REQUIREMENTS. MOUNT TOP OF CABINET AT 6'-6" UNLESS NOTED.

- B. PROVIDE CIRCUIT BREAKERS OF THERMAL MAGNETIC TYPE, QUICK-MAKE, QUICK-BREAK WITH A MINIMUM OF 10,000 AIC RATING AT 120/208 VOLT. MEET NEMA STANDARD AB1. PROVIDE HIGH INTERRUPTING CAPACITY AND NON-FUSE TYPE CURRENT LIMITING CIRCUIT BREAKERS WHERE SHOWN. PROVIDE MULTI-POLE BREAKERS WITH INTERNAL COMMON TRIP.
- C. PROVIDE "SWITCHING RATED" CIRCUIT BREAKERS FOR ALL LIGHTING CIRCUITS CONTROLLED AT THE PANELBOARD. PROVIDE CIRCUIT BREAKERS DESIGNATED "GFI" EQUIPPED WITH INTEGRAL CLASS A GROUND FAULT CIRCUIT INTERRUPTER SET TO TRIP ON GROUND FAULT OF SIX MILLIAMPS OR GREATER.

2.5 WIRING DEVICES

- A. DUPLEX RECEPTACLES: 20 AMP, 125 VOLT, NEMA TYPE 5-20R, MEET FEDERAL SPECIFICATION W-C-596F TESTS. COLOR TO MATCH EXISTING. PROVIDE OUTLETS DESIGNATED GFI WITH INTEGRAL CLASS A GROUND FAULT CIRCUIT INTERRUPTER UL 943-LISTED.
- B. SPECIAL OUTLETS: CAPACITY, VOLTAGE AND NEMA CONFIGURATION NOTED, SAME QUALITY AS DUPLEX RECEPTACLES.
- C. SWITCHES: 20 AMP, 120/277 VOLT, MEET FEDERAL SPECIFICATION W-S-896E, UL #20, SELF-GROUNDING. COLOR AS DIRECTED.
- D. DEVICE PLATES: UL LISTED, ONE PIECE FLUSH PLATES STAINLESS STEEL. USE GALVANIZED PLATES FOR EXPOSED WIRING, GASKETED POLYCARBONATE SELF-CLOSING WEATHERPROOF PLATES OUTDOORS, U.L. LISTED FOR WET LOCATIONS WHILE IN USE.

2.6 MOTORS CONNECTIONS

- A. UNLESS OTHERWISE INDICATED, HEATING, VENTILATING AND PLUMBING EQUIPMENT MOTORS AND CONTROLS ARE FURNISHED, SET IN PLACE, AND WIRED IN ACCORDANCE WITH THE FOLLOWING SCHEDULE: (COORDINATE ALL WORK WITH MECHANICAL.)

| ITEM  | FURNISHED BY | SET IN PLACE BY | WIRED POWER | WIRED CONTROL |
|---|--------------|-----------------|-------------|---------------|
| EQUIPMENT MOTORS  | MC           | MC              | EC          | MC            |
| MAGNETIC MOTOR STARTERS:  |              |                 |             |               |
| a)AUTOMATICALLY CONTROLLED WITH OR WITHOUT HOA SWITCHES   | EC           | EC              | EC          | MC            |
| b)MANUALLY CONTROLLED   | EC           | EC              | EC          | EC            |
| c)IN PACKAGED EQUIPMENT   | MC           | MC              | EC          | MC            |
| DISCONNECT SWITCHES, MANUAL MOTOR STARTERS, THERMAL OVERLOAD SWITCHES   | EC           | EC              | EC          | --            |
| CONTROL RELAYS, TRANSFORMERS, TIME CLOCKS, THERMOSTATS, VALVES, FLOAT CONTROLS, DAMPER MOTORS, EP AND PE SWITCHES, OTHER MISCELLANEOUS CONTROLS | MC           | MC              | MC          | MC            |

- B. APPLIANCE AND MISCELLANEOUS EQUIPMENT CONNECTIONS.
  - 1. PROVIDE AND MAKE ALL FINAL ELECTRICAL CONNECTIONS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND SHOP DRAWINGS FOR EQUIPMENT FURNISHED BY OTHERS. PROVIDE FLEXIBLE CONDUIT; TYPE SO OR ST RUBBER CORDS WITH GROUNDING CONDUCTOR; PIGTAILS, KELLEMS, CAPS, ETC., AS REQUIRED FOR AN OPERATING SYSTEM.
  - 2. PROVIDE OUTLETS AT LOCATIONS TO CONVENIENTLY SERVE EQUIPMENT. PROVIDE RECEPTACLES AS REQUIRED TO MATCH CORD CAPS ON EQUIPMENT FURNISHED. PROVIDE DIRECT WIRING OR RECEPTACLES FOR FINAL CONNECTION TO EQUIPMENT AS REQUIRED FOR PARTICULAR EQUIPMENT FURNISHED.

2.7 MOTOR STARTER AND DISCONNECTS

- A. PROVIDE EACH MOTOR WITH DISCONNECTING MEANS AND WITH SUITABLE CONTROLLER OR OTHER DEVICE AS REQUIRED, COMPLETE WITH MANUAL OR AUTOMATIC CONTROL OF STANDARD NEMA SIZES.

- B. PROVIDE ACROSS-THE-LINE COMBINATION STARTER-DISCONNECT MAGNETIC STARTERS WITH AMBIENT COMPENSATED THERMAL OVERLOAD PROTECTION SET AT 115% MEASURED FULL LOAD CURRENT IN EACH UNGROUNDED PHASE WITH MAINTENANCE-FREE, DOUBLE BREAK, SOLID SILVER ALLOY CONTACTS.
- C. ARRANGE CONTROL CIRCUITS FOR MANUAL, AUTO AND OTHER SIGNAL INPUTS FROM MECHANICAL CONTROL PANELS, AND ARRANGE CONTROL POWER TO DE-ENERGIZE CONTROL CIRCUITS WHENEVER OPERATING POWER SUPPLY TO PARTICULAR EQUIPMENT IS DISCONNECTED.
- D. PROVIDE HORSEPOWER RATED MANUAL MOTOR STARTING SWITCH WITH THERMAL OVERLOAD PROTECTION FOR EACH SINGLE PHASE MOTOR. SIZE HEATERS FOR 115% MEASURED FULL LOAD CURRENT.
- E. WHERE SHOWN, PROVIDE FUSED SWITCH TYPE COMBINATION STARTERS FOR ALL THREE PHASE MOTORS RATED 7.0 FULL LOAD AMPERES AND BELOW. SIZE FUSES FOR APPROXIMATELY 115% OF MOTOR FULL LOAD CURRENT. PROVIDE NON-FUSED SWITCH TYPE FOR ALL THREE PHASE MOTORS RATED ABOVE 7.0 FULL LOAD AMPERES.
- F. DISCONNECTS: HEAVY DUTY SAFETY SWITCHES, CIRCUIT BREAKERS OR MANUAL MOTOR STARTING SWITCHES.

2.8 GROUNDING

- A. GROUND ALL ELECTRICAL DEVICES, MOTORS, METALLIC PIPING, DUCTWORK, METAL FRAMING, ETC., IN ACCORDANCE WITH N.E.C. ARTICLE 250.
- B. PROVIDE SEPARATE GREEN GROUNDING CONDUCTOR IN ALL FEEDERS, BRANCH CIRCUITS, AND EQUIPMENT CORDS.

PART 3 - EXECUTION

3.1 GENERAL

- A. INSTALL ALL MATERIAL AND EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, INSTRUCTIONS AND INSTALLATION DRAWINGS, UNLESS OTHERWISE INDICATED AND IN ACCORDANCE WITH NECA'S "STANDARD PRACTICES FOR GOOD WORKMANSHIP IN ELECTRICAL CONTRACTING".
- B. SEAL PENETRATIONS WITH UL-LISTED FIREPROOFING MATERIALS TO MAINTAIN FIREPROOFING INTEGRITY AND WATERTIGHTNESS.
- C. SEAL AIRTIGHT ALL PENETRATIONS THROUGH SMOKE PARTITIONING, FAN PLENUMS, DUCTWORK, AND VAPOR BARRIERS.
- D. REPLACE OR REPAIR ANY SPRAY-APPLIED FIREPROOFING OR INSULATION DAMAGED BY INSTALLATION OF ELECTRICAL EQUIPMENT.
- E. REPAIR ALL DAMAGE TO FINISHED SURFACES WHERE CAUSED BY INSTALLATION OF ELECTRICAL EQUIPMENT.
- F. PROVIDE PROPER IDENTIFICATION FOR PANELS, SWITCHES, OR ANY ITEM OF ELECTRICAL EQUIPMENT USED AS A CONTROL DEVICE OR DISCONNECTING MEANS FOR ANY EQUIPMENT. IDENTIFY BOXES CONTAINING EMERGENCY CIRCUITS PER N.E.C. ARTICLE 700-9.
- G. PROVIDE UPDATED TYPED PANEL SCHEDULES.

3.2 SUPPORTS

- A. SUPPORT RACEWAYS ON APPROVED TYPES OF WALL BRACKETS, CEILING TRAPEZE HANGERS OR MALLEABLE IRON STRAPS. PLUMBERS PERFORATED STRAP NOT PERMITTED AS MEANS OF SUPPORT.
- B. DO NOT SUSPEND RACEWAYS OR EQUIPMENT FROM CEILING TIE WIRE OR T-BAR, FROM STEAM, WATER OR OTHER PIPING OR DUCTWORK, BUT SUPPORT INDEPENDENTLY.
- C. ANCHOR EQUIPMENT TO THE BUILDING STRUCTURE TO RESIST SEISMIC DESIGN CATEGORY D EARTHQUAKE FORCES. PROVIDE ADEQUATE BACKING AT STRUCTURAL ATTACHMENT POINTS TO ACCEPT THE FORCES INVOLVED.
- D. SECURE BOXES, WALL BRACKETS, CABINETS AND HANGERS BY MEANS OF TOGGLE BOLTS IN HOLLOW MASONRY AND GYPBOARD; PRESET INSERTS OR EXPANSION BOLTS IN SOLID MASONRY AND CONCRETE; MACHINE SCREWS, BOLTS OR WELDING ON METAL SURFACES; AND WOOD SCREWS IN WOOD CONSTRUCTION.

3.3 AS-BUILT DRAWINGS

- A. KEEP CLEAN SET OF PRINTS AT JOB SITE AND RECORD ALL ELECTRICAL CHANGES THAT OCCURRED DURING CONSTRUCTION. FAILURE TO DO SO MAY DELAY PAYMENT.
- B. AT END OF CONSTRUCTION, PROVIDE ONE COMPLETE SET OF DRAWINGS INDICATING ALL FIELD CHANGES FOR RECORD PURPOSES TO THE OWNER'S REPRESENTATIVE.

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| ALASKA RAILROAD CORPORATION<br>ENGINEERING SERVICES<br>P.O. BOX 107500, ANCHORAGE, ALASKA 99510-7500 |                    |                                    |
| PROJECT: ALASKA RAILROAD CORPORATION<br>KENAI SUPPLY BUILDING RENOVATION                             |                    |                                    |
| TITLE: ELECTRICAL SPECIFICATIONS   |                    |                                    |
| DESIGNED BY:   | EWC                | SCALE: AS NOTED<br>DATE: 1/11/2019 |
| DRAWN BY:  | SNS                |                                    |
| CHECKED BY:  | EWC                |                                    |
| APPROVED BY:   | EWC                |                                    |
| AFE NO.:   | ACAD FILE:17034-E4 |                                    |
| DWG NO.:   | 12 OF 12           |                                    |

| REV. | DATE    | BY  | REVISION |
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