BERNARDON

ARCHITECTURE
INTERIOR DESIGN
LANDSCAPE ARCHITECTURE

ADDENDUM NO. 4

Project Name:	Building Renovation for Haverford Township Free Library
Project No.:	7010.03-22
Date of Issue:	October 17, 2023
Notice 1:	Attach this addendum to the Project Manual for this project. It modifies and becomes part of the Bidding Documents. Work or material not specifically mentioned herein is to be as described in the main body of the Project Manual, and as shown on the drawings.
Table of Contents:	This Addendum includes the following:

A. Written addendum (twelve pages total)
B. Revised drawing sheets **A3.1, I1.0, I1.1, I1.2, Civil Engineering sheets 1, 2, 3, 4, 5, 6, and 7, S0.1, S0.2, S1.0, S1.2, S5.2, S5.11, M1.0, M1.2, M1.3, M1.4, M1.5, M2.0, M2.3, P1.0, P2.0, P2.1, E0.1, E1.3,** and **E2.2**
C. Specification section 003000 *Available Information* and referenced 1977 construction drawings (31 pages)
D. Specification section 004100 – *Bid Form* (9 pages)
E. Specification section 093000 *Tiling* (10 pages)
F. Specification Section 230130.52 – *Existing HVAC Air Distribution System Cleaning* (5 pages)
G. Specification Section 230713 *Duct Insulation* (14 pages)
H. Specification Section 230933 *Building Automation System – Honeywell N4 (Java Based)* (48 pages)
I. Specification section 232113 *Hydronic Piping* (10 pages)
J. Specification section 233113 *Metal Ducts* (10 pages)
K. Photographs of Shelving Units to be Removed (11 pages)

CHANGES TO DRAWINGS

1. On Sheet **A0.0:**
   A. At General Keynote G6.04, at the end of the Keynote add "Minimum blocking area to be 18" x 36", or as required by item being mounted."
   B. At Roof Keynotes R07.01, R07.02 and R07.07, change "Fully Adhered Black 60 mil…" to read "Fully Adhered Black 90 mil.…". All EPDM roofing to be black 90 mil. thick to achieve 30 year warranty.
   C. At Wall Keynote W404.04, at the end of the Keynote add "Minimum opening size to be 48" x 72". Provide temporary shoring as required to make opening stable and self-supporting."

2. On Sheet **A3.1**, at detail 2/A3.1 see clarification of the extent of WT-4 and depth of stone hearth from face of fireplace. The revised sheet is attached as part of this addendum.
3. On Sheets **I1.0, I1.1,** and **I1.2**, add Finish Plan General Note 15 clarifying the use of Tile Base TB-1 at the bottom of Wall Tile WT-1. The revised sheets are attached as part of this addendum.
4. On **Civil Engineering Sheet 1**, revise General Notes 9 and 10 regarding obstructions in the right-of-way and post construction as-built survey. The revised sheet is attached as part of this addendum.
5. On **Civil Engineering Sheet 2** update legend, add note concerning Sanitary Lateral/sump pump line to be replaced and planting bed to be removed. The revised sheet is attached as part of this addendum.
6. On **Civil Engineering Sheet 3** add notes regarding valve box for Fire Line, sanitary sewer lateral and sump pump line and revise General Notes 23 through 27. The revised sheet is attached as part of this addendum.
7. On **Civil Engineering Sheet 4**, add 12" silt sock to all sides of the parking lot perimeter. The revised sheet is attached as part of this addendum.
8. On **Civil Engineering Sheet 5** remove Chain Link Fence detail. The revised sheet is attached as part of this addendum.
9. On **Civil Engineering Sheet 6** revise Parking Lot Paving Section Detail. The revised sheet is attached as part of this addendum.
10. On **Civil Engineering Sheet 7** revise Inlet 2 detail. The revised sheet is attached as part of this addendum.
11. On Sheet **S0.1**, at Drawing Symbols legend, revise symbol for Flexible Moment Connection. The revised sheet is attached as part of this addendum.
12. On Sheet **S0.2**, revise the Table of Mix Design Requirements for Interior Topping Slabs. The revised sheet is attached as part of this addendum.
13. On Sheet **S1.0**, in area of new underpinning, change "(E) SLAB ON GRADE (-11.00')" to read "(E) SLAB ON GRADE (-8.50')". The new Slab On Grade in this area will be at elevation -11.00'. The revised sheet is attached as part of this addendum.
14. On Sheet **S1.2**, at Floor/Roof Construction Schedule, revised Mark S3, changing the WWF requirements. The revised sheet is attached as part of this addendum.
15. On Sheet **S5.2,** add detail A/S5.2, Typical Interior Concrete Stair on Grade Detail. The revised sheet is attached as part of this addendum.
16. On Sheet **S5.11**, add detail K/S5.11, Typical Partially Restrained Moment Connection Detail. The revised sheet is attached as part of this addendum.
17. On Sheet **M1.0**, change location of Front End User Interface Panel from Storage (Room 005) to MDF Closet (Room 008A), and note housekeeping pads in Mechanical (Room 006). The revised sheet is attached as part of this addendum.

18. On Sheet **M1.2**, at Innovation Zone (Room 208), update information on equipment provided by Owner. The revised sheet is attached as part of this addendum.
19. On Sheet **M1.3**, in Mechanical (Room 006) update piping sizes. The revised sheet is attached as part of this addendum.
20. On Sheet **M1.4**, at RAD-1, conceal HWS&R behind wall finishes and modify piping sizes in shaft enclosure. The revised sheet is attached as part of this addendum.
21. On Sheet **M1.5**, at Second Floor Plan – Mechanical Piping, update piping sizes. The revised sheet is attached as part of this addendum.
22. On Sheet **M2.0,** update Pump Schedule, VAV Box Schedule, and Air Handling Unit Schedule. The revised sheet is attached as part of this addendum.
23. On Sheet **M2.3,** update the Hot & Chilled Water Piping Riser Diagram. The revised sheet is attached as part of this addendum.
24. On Sheet **P1.0**, at Existing Stair 3 (Room ST3-0) extend 8" storm to exterior of building to be picked up in Civil Drawings. The revised sheet is attached as part of this addendum.
25. On Sheet **P2.0**, revise circulator pump in the Domestic Water Heater Detail – Gas Fired. The revised sheet is attached as part of this addendum.
26. On Sheet **P2.1**, revise Tag GWH-2 in the Water Heater Schedule. The revised sheet is attached as part of this addendum.
27. On Sheet **E0.1**, to General Notes, add note 35. The revised sheet is attached as part of this addendum.
28. On Sheet **E1.3**, revise Enlarged MDF Closet – Power, Mechanical Room Equipment Layout – Power, and Electrical Keynotes E1. The revised sheet is attached as part of this addendum.
29. On Sheet **E2.2**, update Panel Schedule MP-1. The revised sheet is attached as part of this addendum.

CHANGES TO SPECIFICATIONS

1. 003000 *Available Information*: Add construction drawings from the renovation and addition dated 1977. The revised specification section cover page and drawings are attached as part of this addendum. Modifications are shown in red text.

2. 004100 – *Bid Form:* To UNIT PRICES, General Construction add Unit Prices #G-21, #G-22, #G-23 and #G-24. The revised specification section is attached as part of this addendum.

3. 012750 – *Unit Prices and Quantity Allowances*: to paragraph 3.3 GENERAL CONSTRICTION – SCHEDULE OF UNIT PRICES AND QUANTITY ALLOWANCES add the following:

   "U. UNIT PRICE G-21: REPAIR OF EXISTING CONCRETE SLAB ON GRADE:

1. Description: Provide and install repair of existing concrete slab on metal deck floor. Include removal of existing damaged concrete slab and metal deck down to sound substrate and installation of new concrete, tied into and flush with existing adjacent slab. Include new metal deck weld-anchored to existing metal deck. Materials and thickness to match existing.
2. Unit of Measurement: Each square foot of concrete floor.
3. Quantity Allowance:
   a. Include 200 square feet.

V. UNIT PRICE G-22: REMOVAL OF ADDITIONAL FLOOR TILE AND MASTIC

1. Description: Provide removal of additional existing asbestos-containing floor tile and associated mastics down to sound subfloor surface.
2. Unit of Measurement: Each additional square foot of floor tile and mastic beyond what is documented.
3. Quantity Allowance:
   a. Include 100 square feet.

W. UNIT PRICE G-23: REMOVAL OF ADDITIONAL MATIC ENDS ON FIBERGLASS INSULATED PIPE

1. Description: Provide removal of additional existing asbestos-containing mastic ends on fiberglass insulated pipe.
2. Unit of Measurement: Each linear foot of additional insulated pipe beyond what is documented.
3. Quantity Allowance:
   a. Include 100 linear feet.

X. UNIT PRICE G-24: REMOVAL OF ADDITIONAL EXTERIOR WINDOW CAULKING

1. Description: Provide removal of additional existing asbestos-containing window caulking.
2. Unit of Measurement: Each linear foot of additional window caulking beyond what is documented.
3. Quantity Allowance:

a. Include 100 linear feet."

4. 077323 Ethylene-Propylene-Diene-Monomer (EPDM) Roofing:
   A. At paragraph 1.10.a.2, change "Warranty Period: 20 years…" to read "Warranty Period: 30 years…".
   B. At paragraph A.2 change "60 mil (1.5mm), nominal" to read "90 mil, nominal".

5. 093000 *Tiling:* At paragraph 2.6.A, replace the Water-Cleanable Epoxy Grout specification with an Unsanded Cement Grout specification, and at subparagraph 3.7.A.1, replace "…TCNA F101…" with "…TCNA F102..." The revised specification section is attached as part of this addendum. Modifications are shown in red text.

6. 115116 *Book Depositories*:
   A. At subparagraph 2.1.A.1, change "…Model 1010-TW Double Drop" to read "…Model 910-TW Double Drop."
   B. At subparagraph 2.1.A.2, change "…Model M910" to read "…Manufacturer's book truck designed to accommodate the Book Drop, with depressible and separate compartments for books and recorded media".

7. 230130.52 *Existing HVAC Air Distribution System Cleaning*: On first page, below section title add statement about replacement of ductwork. The revised specification section is attached as part of this addendum.

8. 230713 *Duct Insulation*: There are multiple modifications to this section and modifications are not identified. The revised specification section is attached as part of this addendum.

9. 230933 *Building Automation System – Honeywell N4 (Java Based):* There are multiple modifications and deletions to this section and modifications are not identified. The revised specification section is attached as part of this addendum.

10. 232113 *Hydronic Piping*: There are multiple deletions to this section and modifications are not identified. All references to Glycol treatment are deleted. The revised specification section is attached as part of this addendum.

11. 233113 *Metal Ducts:* There are multiple modifications and deletions to this section and modifications are not identified. The revised specification section is attached as part of this addendum.

RESPONSES (R) TO BIDDER QUESTIONS (Q):

Q1: Can you please tell me how many copies are required to be submitted?

R1: Per Section 00 21 00 *Supplemental Instructions to Bidders*, paragraph 6.A, provide one (1) original and one (1) copy.

Q2: There isn't a unit price for additional asbestos abatement. Should there be?

a. Reference Section 011200-6.1.6.I mentions "If Asbestos is found on site beyond those materials identified for remediation, the abatement will be handled by the General Contractor using their unit costs or as negotiated with the Owner." [sic]

R2: Unit Prices for the removal of tile/mastic, asbestos-containing mastic ends on fiberglass insulated pipe and asbestos-containing window caulking that are in addition to those areas already identified in the documents have been added to 012750 – *Unit Prices and Quantity Allowances* and 001410 – *Bid Form* as part of this addendum. The revised specification section 001410 – *Bid Form* is attached as part of this addendum.

Q3: Please confirm the GC is not responsible for hauling away MEP debris (lighting, plumbing fixtures, piping, etc.).

R3: See response to Question Q24 below.

Q4: Round Ducts & Fittings Fabrication - Spec Section 233113-2.03 requires double wall fabrication for all air conditioning supply ducts, but the plans don't show liner for this ductwork. Please clarify the DW requirements for the SA round ductwork?

R4: Include internal lining only for the large exhaust duct where called out on drawing M1.2. The revised specification section 233113 *Metal Ducts* is attached as part of this addendum.

Q5: Lined Interior Ductwork - Spec Section 233113-2.04A.1 & 2 requires 1" liner on all interior Return & Transfer Air ductwork. The drawings show lined RA ductwork in the mechanical shaft only, and no lined TA shown on the plans. Please clarify the lined ductwork requirements for these systems?

R5: Include internal lining only for the large exhaust duct where called out on drawing M1.2. The revised specification section 233113 *Metal Ducts* is attached as part of this addendum.

Q6: VAVs Supply Trunks Insulation - Do the VAVs rectangular supply trunk ductwork have to be insulated? There is no mention of this in the specs or plans.

R6: All supply ducts are to be insulated. VAV rectangular supplies are considered supply ducts.

Q7: Scheduled Control Valves - Are the scheduled control valves shown on M2.0 a part of the ATC package, or are they to be provided by the Mechanical contractor?

R7: Control valves are to be furnished and installed under the Mechanical Contract.

Q8: On the Water Heater Schedule on drawing P2.1 there is no spec for the tankless water heater alternate.

R8: Tankless water heater alternate for GWH-2 shall be Rinnai Infinity Enviro 32. This pertains to "Add Alternate 4: Add Instantaneous Hot Water Heater" in specification Section 012300 *Alternates*.

Q9: I want to confirm that the heating and chilled water piping systems are to contain a mixture of 30% propylene glycol as indicated in 232113-9 para. 3.08.C.? No glycol feeders are shown on M2.3 so I am questioning that this is required.

R9: There is no glycol in the project, and this statement will be removed from specification. See revisions to Section 232113 *Hydronic Piping* as part of this addendum.

Q10: I have numerous insulators/duct fabricators confused by the duct spec and the duct insulation spec. Please clarify what is to be internally lined. Best guess is only the return air and the transfers get internal liner. (Although the round duct spec on 233113-5 says all round supply air ducts for air conditioning supply is to be double wall.) This definitely requires clarification.

R10: Include internal lining only for the large exhaust duct where called out on drawing M1.2. Specification will be edited for the addendum to clarify. See revisions to Section 233113 *Metal Ducts* as part of this addendum.

Q11: Who cuts the concrete wall for the new louvers on M1.0? GC or MC? Spec 011200-16, para 1.8.A.43. states Prime contractors are only responsible for openings smaller than 10". The multiple contract summary matrix (011200-27) contradicts this as to who does the cutting of any size opening.

R11: In the case of the openings to be cut in the concrete wall, Mechanical Contractor to provide the wall cuts for the louvers so they are responsible for cutting the correct sized opening.

Q12: Temporary heat is to be provided by the GC until permanent equipment can be used. Then in 015000-7 it states temp heat is by the HVAC contractor after structure is enclosed. Please clarify by who and when temporary heating requirements are required.

R12: Temp heat is as per the milestones, by General Contractor through 11/30/24 then by Mechanical Contractor using permanent equipment from 12/1/24 through the end of the project.

Q13: Who provides the flue and combustion air intake for the gas fireplace? MC or GC? The GC fireplace spec 103100 has the flues with the fireplace.
R13: General Contractor should provide everything specified for the fireplace in Section 103100 *Manufactured Fireplace*.

Q14: More information needs to be provided for the Innovation Zone on M1.2 pertaining to the exhaust systems you want. Why are these fans not scheduled and/or shown on the roof plan?
R14: These fans are scheduled on M2.0 and shown on the roof. M1.6 (EF-5 and EF-6).

Q15: Is there duct cleaning required? Spec 230130.52 states to clean all existing to remain ducts but I don't see any.
R15: The scope of work as per demolition drawings is to remove all existing ductwork, so there is no duct cleaning required. We kept these statements in the spec in case of any future value engineering decision to reuse any duct (in which case, it must be cleaned).

Q16: Please advise if the GC is responsible for furnishing and installing all electrified hardware.
R16: General Contractor to provide and install all electrified hardware, including battery powered locks. Electrical Contractor to bring 120V power to either a control box/power supply above the door or to a central location power supply. If power supply is at the door than the General Contractor to run all the low voltage wiring down to the door hardware. If at a central location then there should be a low voltage banana cable that's pulled by the Electrical Contractor from the central location over to the door.

Q17: On TA0.0 there is a responsibility matrix that shows all the security wiring by the EC but has the electric locks by GC. Also for that matrix tile block it states "Elec/SEC/IT Contractor". Are all of the items listed in that column in the EC contract.
R17: Electric locks are to be provided and installed by General Contractor (GC). Security Wiring is to be installed by Electrical Contractor (EC). See also response to preceding question. Regarding the heading in the Responsibility Matrix on Sheet TA0.0, the Electrical, Security (SEC) and Information Technology (IT) work is all by the Electrical Contractor (EC). Note that the work under the heading of AV Contractor will be by a separate contractor to the Owner and will be bid early in the construction process.

Q18: The spec'd book depository manufacturer does not have a 1010-TW (through wall) Double Drop model. The 1010 size is only available in free standing units – not through wall. The spec'd manufacturer is pricing the 910 model. Please confirm this is acceptable.

R18: Apparently the 1010-TW has been discontinued. The 910-TW Double Drop is acceptable. See modifications to Section 115116 *Book Depositories*, as part of this Addendum.

Q19: S1.0 shows new concrete stairs being installed and to reference detail on S5.2. There are no details regarding this stair. Please advise.
R19: An interior stair detail has been added to the Structural drawings. See revised Sheet S5.2 that is part of this Addendum.

Q20: In Addendum 03 it refers to drawings A0.0 and A3.1 but I do not see that they were issued. Please advise.
R20: In the case of A0.0, the change was so minor that a revised sheet was not needed and was not provided in Addendum 3. In the case of A3.1, the revised sheet was not included in Addendum 3. It is now attached to this current addendum.

Q21: Re: Bid Bond Form: The town listed on the 1st page of the Bid Bond for the Owner address and job location should be Havertown, however, Haverford is listed. Will you issue a new bid bond form or is it acceptable to cross out "Haverford" and replace with "Havertown"? Please advise.
R21: Haverford Township is the Owner of the building and project. The address is listed as being in Havertown for the library and the Township administration building. Havertown is located in Haverford Township, PA.

Q22: Who is responsible for testing?
R22: All testing will be paid for by the Owner.

Q23: Is a construction trailer required?
R23: Addendum 1 stated a requirement for the GC to provide a trailer for meetings and a small trailer for the Owner's Rep as part of an Alternate. The project documents state that each contractor can have a small trailer on the library site during a certain window per the milestones if they so choose but a trailer is not required.

Q24: Will there be an allowance for the number of dumpsters; since it is GC responsible?
R24: Dumpsters- Each Prime is responsible for their own dumpsters for demolition. They can have one dumpster per Prime contract in the parking lot during the demolition phase. Coordinate access and location with the General Contractor. After demolition is complete the General Contractor is responsible to provide one dumpster on site for all Prime contractors to use to dump their waste daily. General Contractor is responsible to crush down waste in the dumpster as needed so it can be filled as much as possible. General Contractor is to assume the need to have 50 (fifty) 30 yard dumpsters through substantial

completion. After substantial completion, if there is any waste to complete the punchlist or open work to complete, each Prime contractor is responsible to remove their own waste from the site. General Contractor to provide dumpster tickets as back up for each payment application and keep a tally on the dumpster line item of dumpsters used to date. Provide a unit cost per dumpster if more than 50 dumpsters are needed.

Q25: We are being told by our supplier that 2" lightweight concrete on the concrete deck will crack. Aggregate is 3/4". Please advise if this is to be a gypcrete product?

R25: Gypcrete is not durable enough for intended use of space. Provide 4x4-W2.0xW2.0 WWF and a maximum aggregate size of 3/8 in the topping. See revision to Sheets S0.2 and S1.2 that are part of this Addendum.

Q26: Please confirm bottom of underpinning @ all locations in the lower level is -11.86

R26: Sheet S1.0 incorrectly notes that existing slab on grade is at elevation (-11.00'). The existing slab on grade is actually at Elevation (-8.50'). See revision to Sheet S1.0 as part of this Addendum. Elevation of new slab will be at (-11.00'). Underside of new underpinning is noted in drawings and shall be at a maximum elevation of (-11.86'), based on the original drawings. Underpinning elevations are to be verified in the field. Underpinning at spread footing at F/4 is deeper at (-15.00').

Q27: Sheet TA1.1 – How are the typical power/data necessary behind the displays to be provided? We see there is data/power called out at the displays but I believe the intent is for these boxes to be 18" aff correct not behind the displays. Is there a detail showing power/data needed behind the displays?

R27: The symbols legend on Sheet TA0.0 shows the symbol for Flat Panel Displays and the legend addresses the data and power requirements for each display symbol on the floor plans. Detail 6/TA0.1 shows the back box requirements at Wall Mounted Displays, to be mounted at 60" AFF. On the floor plans receptacles for County and non-County telecom outlets are also often shown on walls with the symbol for Flat Panel Displays. These County and non-County telecom outlets are in addition to the outlets required at the Flat Panel Displays. Electrical drawings also show power receptacle requirements.

Q28: Will any of the existing furniture have to be removed by the General Contractor, and if so, how much?

R28: The Library has prepared the attached eleven (11) photographs that document a quantity of 293 shelving units to be removed and disposed of by the General Contractor and is to be included in the General Contractor's costs. In addition to these shelving units, The General Contractor is to carry an allowance of fifteen thousand dollars ($15,000) for labor and hauling/disposal of other yet to be defined materials and furniture left by the Library in the

building which are not already identified in the documents. General Contractor must get approval from the Owner's Representative prior to spending any of the Allowance.

Q29: Sheet P1.5 – AHU-1 has a new gas line called out on the plans. Is this accurate, as this is a four pipe HW/CW unit?
R29: AHU-1 is located near the bathrooms on the 2nd floor. The gas line should be removed as it has a hot water coil.

Q30: Unless I'm missing it I don't see where the access control panel is to be located on the TA plans. Assuming in the MDF?
R30: Access Control Panel is to be located in the MDF Closet (Room 008A) mounted at 4'-0" AFF, location in room to be determined. Provide one (1) dedicated 20 amp circuit to serve this panel.

Q31: Can the existing parking lot fence remain and be used as a barrier during construction?
R32: The existing parking fence can remain in place as a temporary construction barrier until it needs to be removed to install the new work. The General Contractor is then to provide temporary fencing in its place as needed until the new permanent fence is installed.

Q33: Are there details for the trash enclosure and perimeter fence at the parking lot?
R33: The trash enclosure and perimeter fence and the gates in both are to be of the aluminum fencing specified in detail 4/LP-200, 6' HIGH ALUMINUM SCREEN FENCE AND GATE.

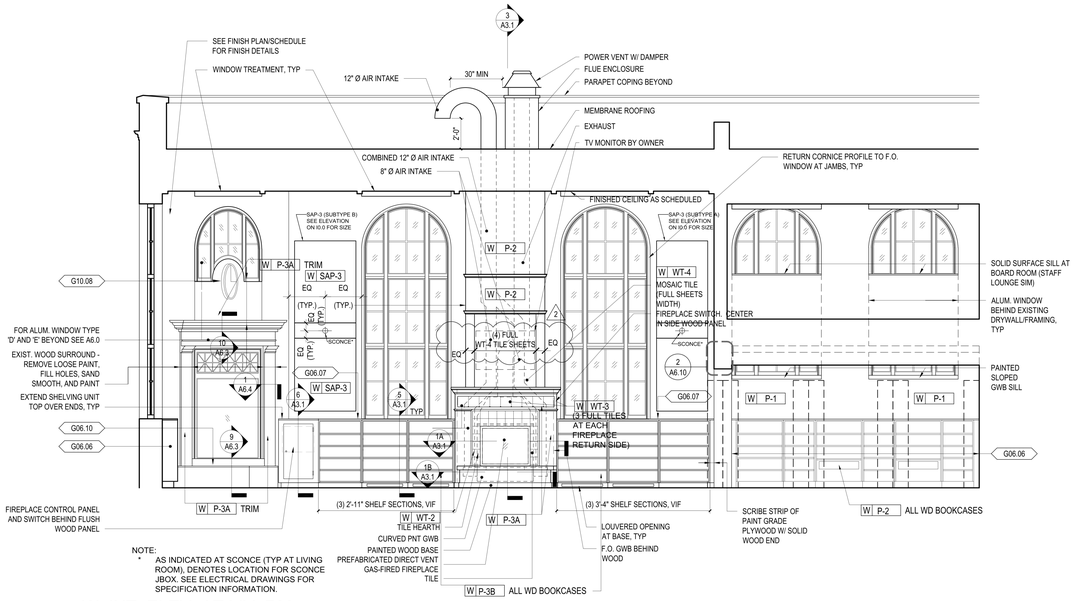
Q34: Confirm piping for RAD-1 will be concealed in wall. Piping is currently shown at exterior glazing.
R34: Attention is drawn to Standard General Note 20 on sheet G0.0 that states that all ductwork, piping, wiring and conduits are to be concealed with new finishes. The piping at RAD-1 is to be concealed behind gypsum wallboard on metal studs. See revision to Sheet M1.4 as part of this Addendum for changes in location of piping at RAD-1.

Q35: Who is responsible for openings for recessed CUH's shown on mechanical plans? MC or GC? Are lintels required?
R35: Unit Heaters in walls are to fit in the existing openings of the former Unit Heaters. Mechanical Contractor is to verify that they submit only units that fit.

Q36: Looking over the fireplace, calls out for a 3" hearth; however, doesn't look like there is a specification in the finish schedule and a dimension provided for the width of it. Let me know if I'm just missing it.

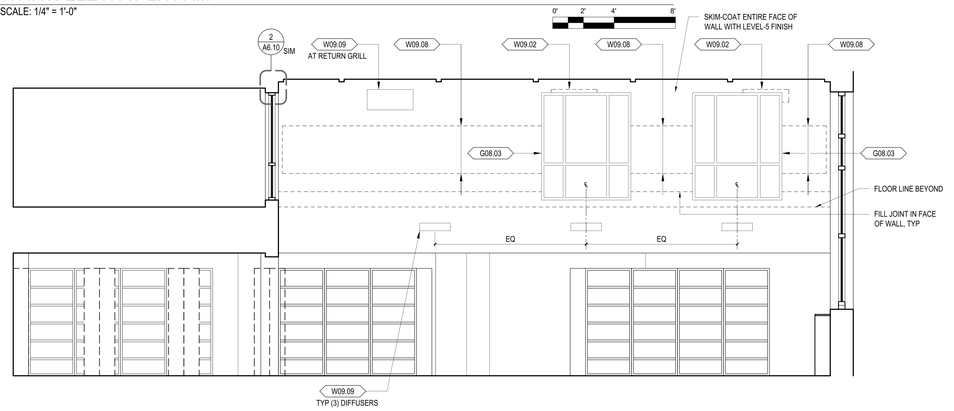
R36: The hearth is noted as 3" thick stone on Sheet A3.1. See Section 044200 *Dimension Stone* for the stone specification. See revised Sheet A3.1 that is part of this Addendum for depth of hearth from face of fireplace.

End of Addendum No. 4



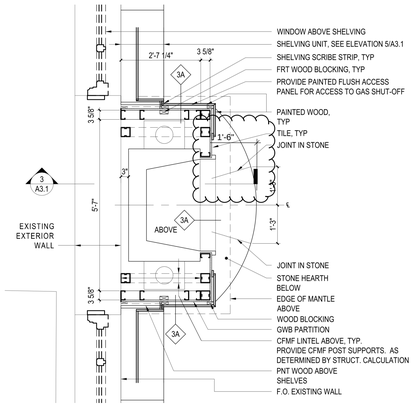
2 / A3.1 W. INT. ELEV. AT LIV. RM

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



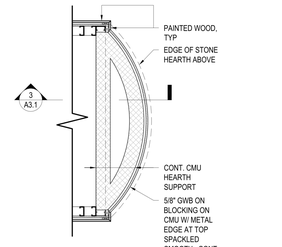
7 / A3.1 E. INT. ELEV. AT LIV. RM

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



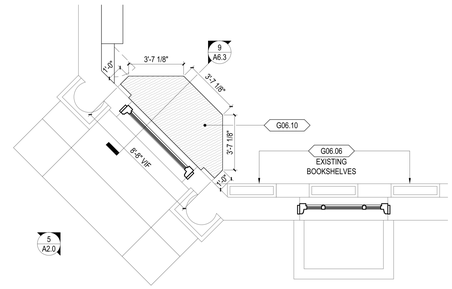
1A / A3.1 ENLARGED PLAN @ FIREPLACE

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



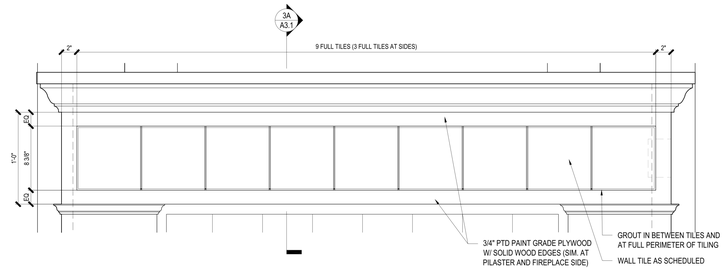
1B / A3.1 ENLARGED PLAN @ FIREPLACE

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



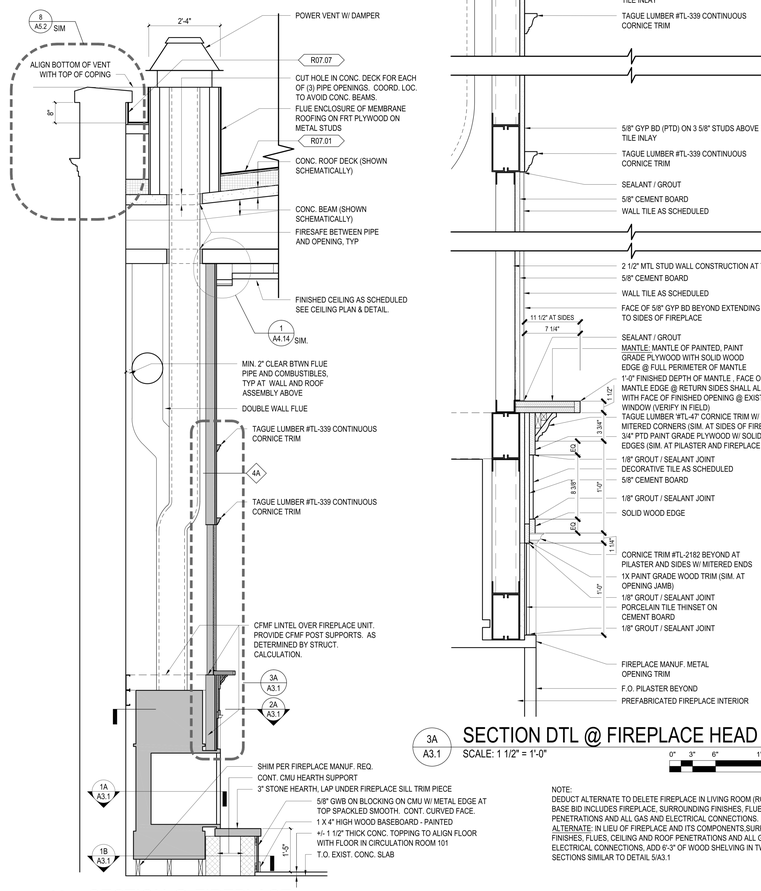
4 / A3.1 ENLARGED PLAN @ CORNER WINDOW

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



2A / A3.1 ELEVATION DTL @ FIREPLACE HEAD

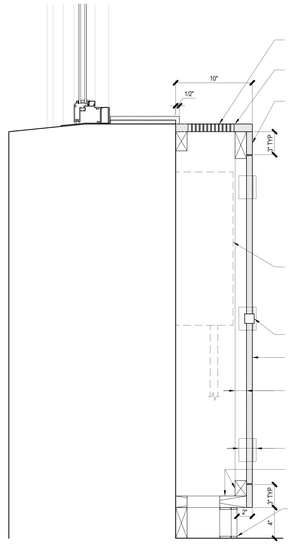
SCALE: 1 1/2" = 1'-0"



3A / A3.1 SECTION DTL @ FIREPLACE HEAD

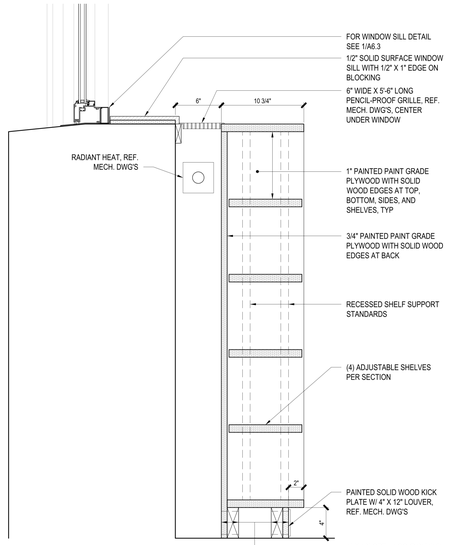
SCALE: 1 1/2" = 1'-0"

NOTE:
DEDUCT ALTERNATE TO DELETE FIREPLACE IN LIVING ROOM (ROOM 115); BASE BID INCLUDES FIREPLACE, SURROUNDING FINISHES, FLUES, PENETRATIONS AND ALL GAS AND ELECTRICAL CONNECTIONS.
ALTERNATE: IN LIEU OF FIREPLACE AND ITS COMPONENTS,SURROUNDING FINISHES, FLUES, CEILING AND ROOF PENETRATIONS AND ALL GAS AND ELECTRICAL CONNECTIONS. ADD 6'-3" OF WOOD SHELVING IN TWO (2) SECTIONS SIMILAR TO DETAIL 5/A3.1



6 / A3.1 SECTION DTL @ FIREPLACE PANEL

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



5 / A3.1 SECTION DTL @ SHELVING UNIT

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

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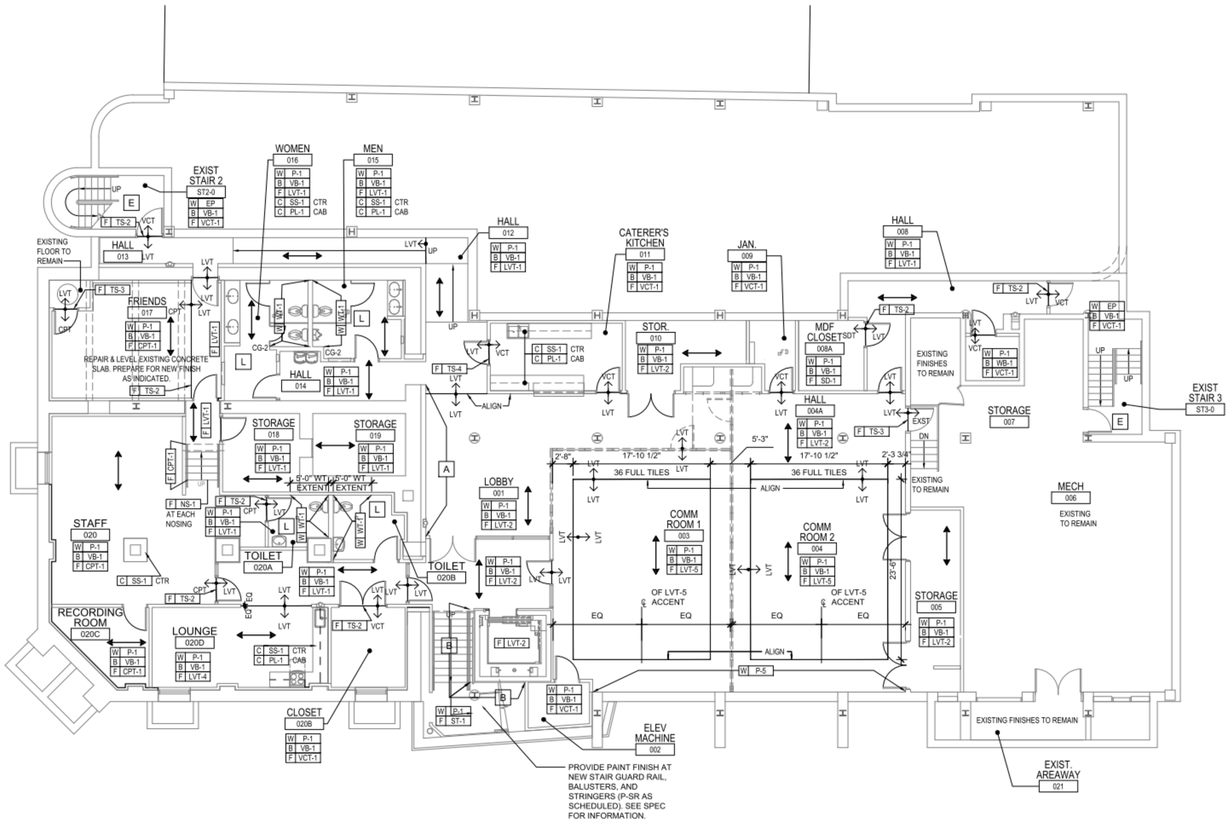
Drawn:	DQ/TH
Reviewed:	ET
Contact:	Eric Trainer
Project Number:	7010.03-22

Sheet Title:

SECTIONS AND DETAILS

Sheet Number:

A3.1



1 / I1.0 LOWER LEVEL FINISH PLAN
SCALE: 1/8" = 1'-0"
0' 4' 8' 16'

FINISH PLAN LEGEND

W X-1	WALL FINISH
B X-1	BASE FINISH
F X-1	FLOOR FINISH
C X-1	CASEWORK FINISH
C X-1 CTR	CASEWORK FINISH
C X-1 CAB	CABINET FINISH
←→	INDICATES START/STOP POINT OF FLOORING FINISHES
←→	PATTERN DIRECTION FOR FLOORING AND WALL FINISHES

FINISH PLAN GENERAL NOTES

1. SEE FINISH SCHEDULE ON I0.00 FOR FINISH INFORMATION AND FLOORING TRANSITION DETAILS.
2. PROVIDE PAINT FINISH AT METAL STRINGERS THROUGHOUT. RAILING AT STAIR ST1-1 SHALL BE CLEAR ANODIZED ALUMINUM FINISH.
3. FLOORING CONTRACTOR SHALL PROVIDE ALL REQUIRED TRANSITION TRIM BETWEEN CHANGES IN FLOOR MATERIAL. SUBMIT SAMPLES FOR DESIGNER'S REVIEW PRIOR TO INSTALLATION.
4. ALL FLOORS SHALL BE PREPARED FOR MATERIAL FLOORING INSTALLATION. PATCH AND LEVEL WITH LATEX COMPOUND APPROVED BY FLOORING MANUFACTURER.
5. FLOORING TRANSITIONS OCCURRING AT DOORWAYS SHALL BE LOCATED UNDER THE CENTER OF THE DOOR WHEN IN CLOSED POSITION, UNLESS NOTED OTHERWISE.
6. ALL GYP BD SHALL BE PAINTED WITH EGGSHELL FINISH, UNLESS NOTED OTHERWISE.
7. AT NEW AND EXISTING HOLLOW METAL DOOR AND WINDOW FRAMES AND AT NEW AND EXISTING WOOD DOORS TO RECEIVE PAINT FINISH, PROVIDE PAINT FINISH TO MATCH ADJACENT PAINT, EXCEPT SEMI-GLOSS FINISH.
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13. AT ALL LOCATIONS WHERE BUILT-IN SHELVING REMOVED, PROVIDE SMOOTH, LEVELED FINISH AT ADJACENT SURFACES.
14. SEE INTERIOR ELEVATIONS FOR WALL TILE EXTENT. △1
15. PROVIDE TILE BASE (TB-1) AT WALLS WHERE WT-1 IS NOTED. PROVIDE SCHEDULED VINYL BASE FOR ALL OTHER WALLS WITHIN TOILET ROOMS.

FINISH PLAN KEY NOTES

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L	PROVIDE TB-1 AT BASE OF WALL TO RECEIVE WALL TILE.

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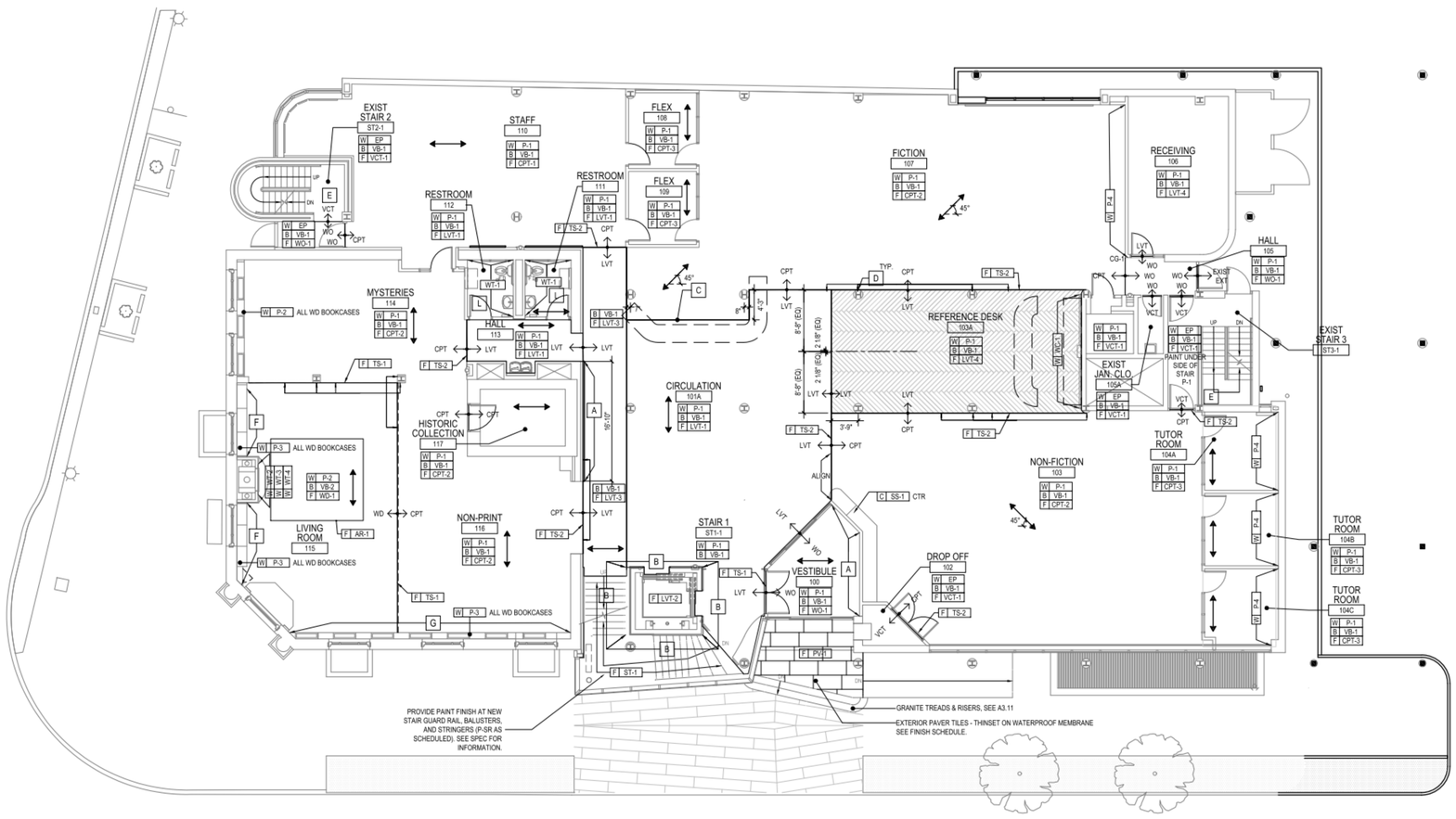
LOWER LEVEL FINISH PLAN

Sheet Number:

I1.0



1 I1.1 FIRST FLOOR FINISH PLAN

SCALE: 1/8" = 1'-0"

0' 4' 8' 16'

FINISH PLAN LEGEND

W X-1	WALL FINISH
B X-1	BASE FINISH
F X-1	FLOOR FINISH
C X-1	CASEWORK FINISH
C X-1 CTR	CASEWORK FINISH
C X-1 CAB	CABINET FINISH
	INDICATES START/STOP POINT OF FLOORING FINISHES
	PATTERN DIRECTION FOR FLOORING AND WALL FINISHES

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Contact: Eric Trainer
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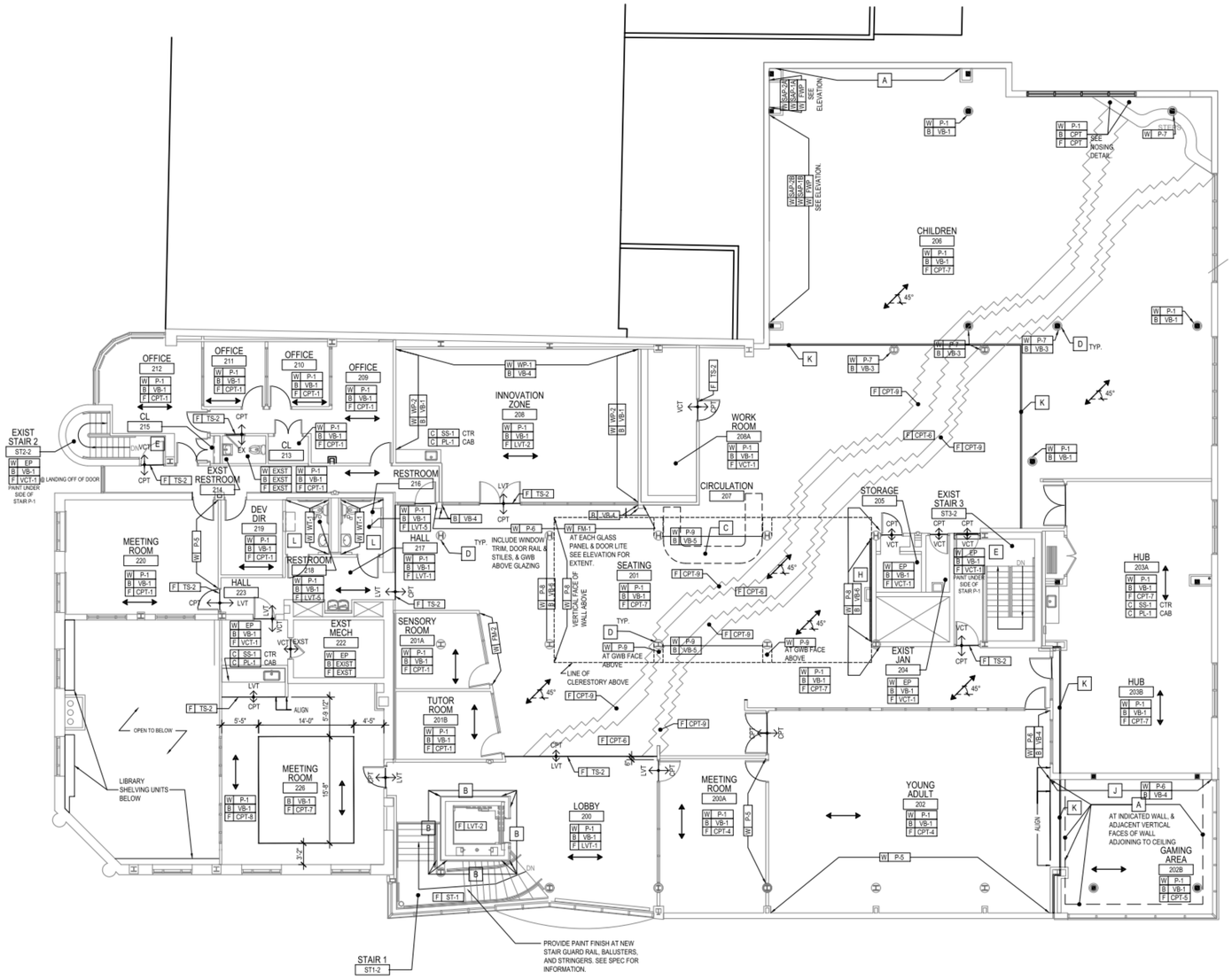
Sheet Title:

FIRST FLOOR FINISH PLAN

Sheet Number:

I1.1



1 I1.2 SECOND FLOOR FINISH PLAN

SCALE: 1/8" = 1'-0"

0' 4' 8' 16'

FINISH PLAN LEGEND

W X-1	WALL FINISH
B X-1	BASE FINISH
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C X-1	CASEWORK FINISH
C X-1 CTR	CASEWORK FINISH
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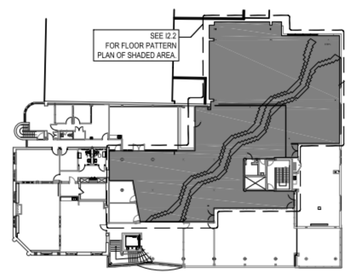
FLOORING PATTERN KEYPLAN



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Reviewed: ET
Contact: Eric Trainer
Project Number: 7010.03-22

Sheet Title:

SECOND FLOOR FINISH PLAN

Sheet Number:

I1.2

IN THE COURT OF COMMON PLEAS OF DELAWARE COUNTY, PENNSYLVANIA
CIVIL ACTION - LAW

IN RE: APPEAL OF THE HAVERFORD TOWNSHIP FREE LIBRARY ASSOCIATION FROM THE DECISION OF OCTOBER 7, 2021 OF THE HAVERFORD TOWNSHIP ZONING HEARING BOARD	:	CIVIL ACTION : : NO. CV-2021-009064

STIPULATION

And Now, this 16th day of December, 2021, the parties in the above-captioned zoning appeal (Haverford Township Free Library Association "Library", Haverford Zoning Hearing Board "ZHB" and Haverford Township "Township") desiring to resolve the issues between them and believing that such resolution is in the best interests of the citizens of Haverford Township agree as follows:

1. The Library will supply two additional book-drop boxes for the return of materials to the Library, at two offsite locations serving distinct areas of Haverford Township to be determined by the Library in areas not currently served by an existing drop box. (It is the hope and intention of the parties that these boxes will alleviate the number of automobile trips to the Library for the purpose of returning materials.)

2. The Library will comply with the stormwater regulations of the Township and will, during the Land Development Process, screen roof top mechanical equipment from street view and from 2nd and 3rd floors of adjacent buildings.

3. The Library will revise its construction plans to pull the outer walls of the proposed new second story back from the property lines of adjacent residential properties, other than party walls, by at least one foot, and verify the design in writing by the architect of record,

(02250424.)

EXHIBIT "A"

and provide the Township codes office with certified, as-built drawings demonstrating the same after completion. The revised construction plans shall be substantially in accordance with the plan attached hereto as **Exhibit "A."**

4. The Township agrees to provide at least 10 additional parking places within 1,000 feet of the Library for 25 years either by purchasing property or by a lease agreement until such a purchase can be accomplished.. This transaction will be completed prior to the issuance of the final Certificate of Occupancy.

5. The Library will develop a system of electronic signage, with sensors for open spaces to advise Library patrons of parking availability on the existing Library property, in accordance with the notes of testimony in the underlying hearings before the zoning hearing board.

6. Upon execution of this Agreement, the pending Zoning Appeal will be marked "Settled, Discontinued and Ended".

7. Notwithstanding paragraph (6) hereinabove, this Honorable Court will maintain jurisdiction of this matter.

8. Subject to compliance with the terms and conditions of this Settlement Stipulation, the Library shall be permitted to construct the proposed addition in accordance with the plan attached hereto as **Exhibit "A"** without the need to obtain any variances or other relief or approvals related to the Library property from the Zoning Hearing Board.

9. All other Township rules and regulations, not embodied in this Zoning Appeal, will remain applicable to this project.

By: _____ David Burman, Township Manager For Haverford Township

By: _____ Phil Goldsmith for the Haverford Library

By: _____ James J. Byrne, Jr., Esq Counsel For Haverford Township

By: _____ Andrew R. Preimuth, Esq Counsel for the Haverford Library

By: _____ Robert Kane For Haverford Township Zoning Hearing Board

By: _____ William Malone, Jr., Esq For Zoning Hearing Board

IN THE COURT OF COMMON PLEAS OF DELAWARE COUNTY, PENNSYLVANIA

CIVIL ACTION - LAW

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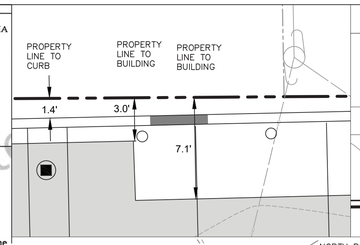
ORDER

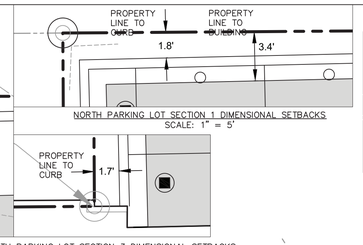
AND NOW, this 29 day of December, 2021, the parties hereto having entered and executed the Stipulation (attached hereto as Exhibit "A"), this Honorable Court hereby approves the settlement of this zoning matter pursuant to the said Stipulation.

BY THE COURT:

Barry C. Dyer J.

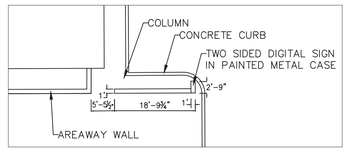


NORTH PARKING LOT DIMENSIONAL SECTION 2 SETBACKS
SCALE: 1" = 5'

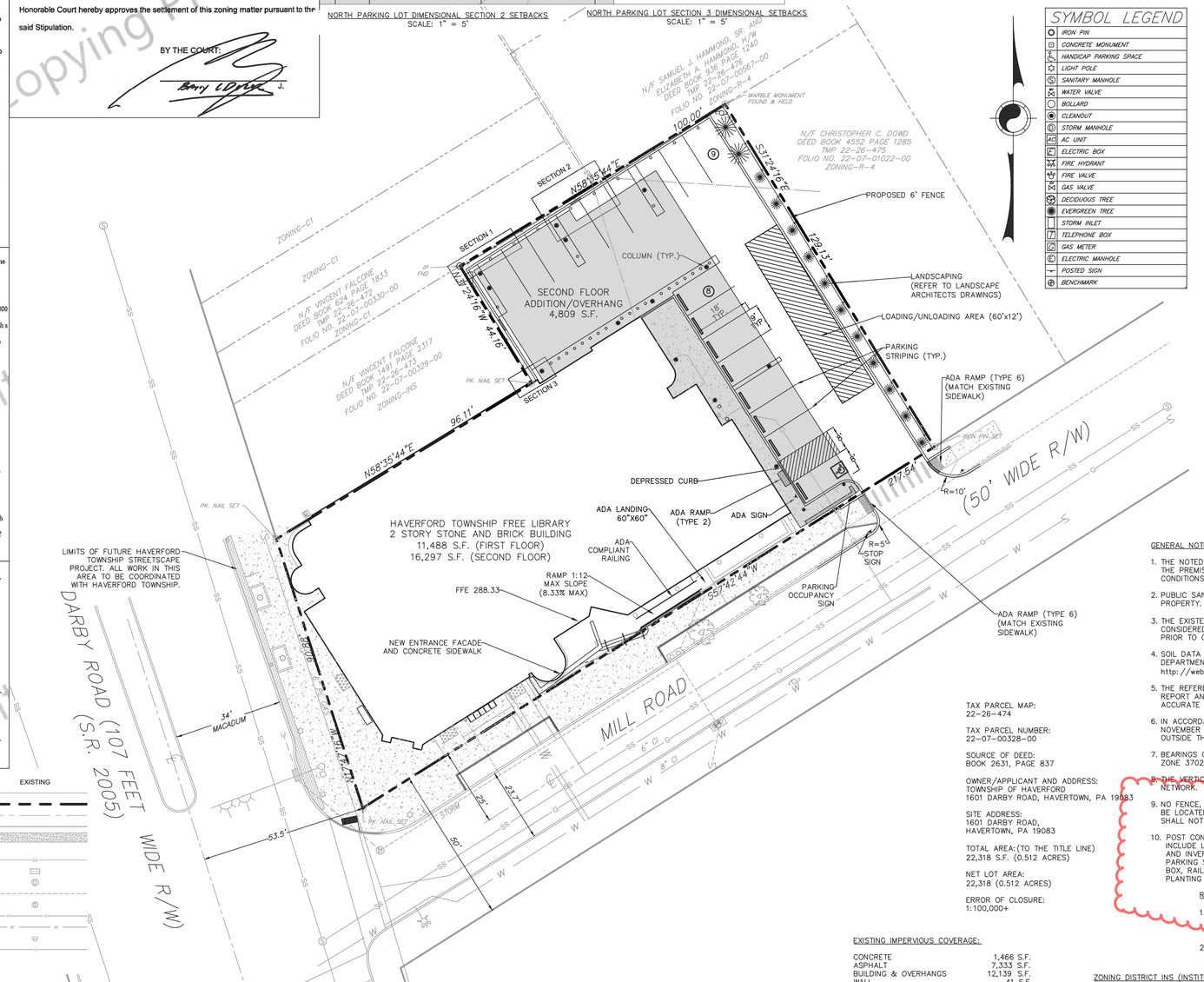


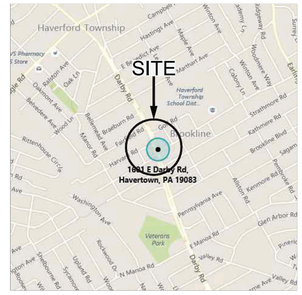
NORTH PARKING LOT SECTION 1 DIMENSIONAL SETBACKS
SCALE: 1" = 5'

NORTH PARKING LOT SECTION 3 DIMENSIONAL SETBACKS
SCALE: 1" = 5'



DIGITAL SIGN DETAIL
N.T.S.





LOCATION MAP
SCALE: 1" = 2,000'

WAIVER GRANTED

160-4(5)(e)3	–	PROPERTY LINES AND NAMES WITHIN 200 FEET OF THE PROPERTY
160-4(5)(e).4	–	STORM SEWER/PUBLIC WATER OWNER AND RESPONSIBLE PARTY FOR MAINTENANCE WITHIN 400' OF THE PROPERTY
78-34		GROUNDWATER RECHARGE
160-5.B(3)[j])	–	WIDENING OF MILL ROAD FROM 23.7 FEET TO 27 FEET.
160-5.B(6)	–	SHADE TREES INSTALLED A MINIMUM OF SIX (6) FEET FROM THE INSIDE EDGE OF THE SIDEWALK.
160-4.A		SUBMISSION OF PRELIMINARY AND FINAL PLANS USING TWO (2) STAGES

NOTES:

1. ENTIRE TRACT AREA = 0.51 ACRES GROSS,
2. EXISTING USE: INSTITUTIONAL.
3. ALL ELECTRIC, TELEPHONE, CABLE TELEVISION AND SIMILAR FACILITIES, BOTH MAIN AND SERVICE LINE SHALL BE PROVIDED BY UNDERGROUND CABLES, INSTALLED IN ACCORDANCE WITH PREVAILING STANDARDS AND PRACTICES OF THE UTILITY AND OTHER COMPANIES PROVIDING SUCH SERVICES.
4. THE AREA BETWEEN THE TITLE LINE FOR PARCEL 22-26-474 AND THE ULTIMATE RIGHT-OF-WAY ALONG MILL ROAD AND DARBY ROAD IS HEREBY OFFERED FOR DEDICATION TO HAVERTOWN TOWNSHIP OR THE GOVERNMENTAL BODY HAVING JURISDICTION AT TIME OF PLAN RECORDATION.
5. ALL CONCRETE MONUMENTS AND IRON PINS SHALL BE SET PRIOR TO PLAN RECODATION.
6. THIS LAND DEVELOPMENT PLAN WAS PREPARED IN ACCORDANCE WITH REQUIREMENTS ESTABLISHED IN THE HAVERFORD TOWNSHIP ZONING ORDINANCE CHAPTER 182, AND THE SUBDIVISION AND LAND DEVELOPMENT ORDINANCE CHAPTER 160.
7. ALL SIGHT DISTANCE OBSTRUCTION (INCLUDING BUT NOT LIMITED TO EMBANKMENTS AND VEGETATION) SHALL BE REMOVED BY THE OWNER TO PROVIDE THE MINIMUM SIGHT DISTANCE BOTH WAYS FOR DRIVER EXITING AND ENTERING THE PROJECT AREA.
8. TOPSOIL SHALL NOT BE REMOVED FROM THE DEVELOPMENT SITE. TOPSOIL SHALL BE STRIPPED, STOCKPILED, AND REDISTRIBUTED ON THE SITE.
9. TREES, STUMPS, OR CONSTRUCTION MATERIALS SHALL BE REMOVED FROM THE PROPERTY.
10. THE MINIMUM DEPTH OF TOPSOIL TO BE SPREAD ON-SITE IS 8"; OR EQUAL TO THE EXISTING DEPTH OF TOPSOIL ENCOUNTERED ON THE SITE, WHICHEVER IS GREATER.
11. IF ANY CHANGES BE MADE TO THE PROPOSED LAYOUT, PLOT PLAN SHOWING THESE CHANGES SHALL BE APPROVED BY THE TOWNSHIP.
12. NO FILL OR EARTH DISTURBANCE SHALL TAKE PLACE IN ALLUVIAL SOILS, WETLANDS, FLOODPLAINS, STREAMS OR PONDS WITHOUT SECURING THE PROPER PERMITS.
13. ALL SHEETS INCLUDED IN THIS SUBDIVISION SUBMISSION ARE TO BE CONSIDERED AS IF RECORDED WITH THE RECORD PLAN.
14. DEVELOPER/FINANCIAL SECURITY AGREEMENTS SHALL BE EXECUTED BETWEEN THE OWNER/DEVELOPER AND THE TOWNSHIP TO GUARANTEE INSTALLATION OF PUBLIC IMPROVEMENTS.
15. INFILTRATION BASIN MAINTENANCE IS THE RESPONSIBILITY OF THE PROPERTY OWNER.
16. THE BMP'S AND STORMWATER MANAGEMENT FACILITIES (AS SHOWN ON THIS PLAN) ARE A PERPETUAL PART OF THE STORMWATER DRAINAGE SYSTEM OF THE TOWNSHIP OF HAVERFORD, AND AS SUCH ARE TO BE PROTECTED AND PRESERVED, IN ACCORDANCE WITH THE APPROVED FINAL PLAN BY THE OWNER(S) ON WHOSE LAND THE STRUCTURE(S) IS (ARE) LOCATED. THE TOWNSHIP OF HAVERFORD AND/OR ITS AGENTS RESERVE THE RIGHT AND PRIVILEGE TO ENTER UPON SUCH LAND FROM TIME TO TIME FOR THE PURPOSE OF INSPECTION OF SAID BMP'S IN ORDER TO DETERMINE THAT THE STRUCTURAL AND DESIGN INTEGRITY ARE BEING MAINTAINED BY THE OWNER(S).
17. THE OWNER(S) IS (ARE) RESPONSIBLE FOR THE INSPECTION AND MAINTENANCE OF STORMWATER MANAGEMENT FACILITIES AND BMP'S.
18. CONSTRUCTION STAKEOUT OF THE BUILDING ADDITION WILL BE COMPLETED USING BERARDON ARCHITECTURAL PLANS.
19. USE ARCHITECTURAL PLANS FOR SURVEYING LAYOUT OF BUILDING INFRASTRUCTURE IMPROVEMENTS.

GENERAL NOTES:

1. THE NOTED SURVEY PLAN REPRESENTS AN ACTUAL FIELD SURVEY PERFORMED ON THE PREMISES ON FEBRUARY 14, 2017 AND NOVEMBER 21, 2022 AND DEPICTS CONDITIONS ON THAT DATE.
2. PUBLIC SANITARY SEWER AND PUBLIC WATER SERVICE WILL BE UTILIZED ON THIS PROPERTY.
3. THE EXISTENCE AND/OR LOCATION OF ALL SUB SURFACE UTILITIES SHALL BE CONSIDERED APPROXIMATE AND MUST BE FIELD VERIFIED BY ALL CONTRACTORS PRIOR TO CONSTRUCTION.
4. SOIL DATA RETRIEVED VIA THE WEB SOIL SURVEY PROVIDED BY THE UNITED STATES DEPARTMENT OF AGRICULTURE AVAILABLE ONLINE AT http://websoilsurvey.nrcs.usda.gov/.
5. THE REFERENCED SURVEY PLAN WAS PREPARED WITHOUT THE BENEFIT OF A TITLE REPORT AND SUBJECT TO ANY FACTS THAT MAY BE DISCLOSED IN A FULL AND ACCURATE TILE REPORT.
6. IN ACCORDANCE WITH FEMA PANEL NUMBER 42045C0106F EFFECTIVE DATE NOVEMBER 18, 2009, PREMISES IS LOCATED IN ZONE X, AREAS DETERMINED TO BE OUTSIDE THE 500 YEAR FLOOD PLAIN.
7. BEARINGS ON THIS PLAN ARE SHOWN IN ACCORDANCE TO PA STATE PLANE SOUTH ZONE 3702.
8. THE VERTICAL DATUM SHOWN ON THIS PLAN IS NAVD 1988 OBTAINED VIA GPS NETWORK.
9. NO FENCE, HEDGE, SHRUBBERY, WALL, PLANTINGS OR OTHER OBSTRUCTION SHALL BE LOCATED WITHIN THE RIGHT-OF-WAY. ADDITIONALLY, SIGHT AT INTERSECTION SHALL NOT BE OBSCURED.
10. POST CONSTRUCTION AS-BUILT SURVEY WILL BE COMPLETED. THIS SURVEY SHALL INCLUDE LOCATION OF ALL UTILITIES, INLET GRATE ELEVATIONS, PIPE SIZES, TYPES, AND INVERTS, STORM MANHOLE, UNDERGROUND BASIN, CURB LINES, COLUMNS, PARKING SPACES, BUILDING LOCATION, ADA RAMP LOCATIONS, VALVES AND VALVE BOX, RAILINGS AND ELEVATIONS, STREET IMPROVEMENTS INCLUDING PLANTERS, PLANTING ISLANDS, AND BIKE RACK.

REFERENCES:

1. A PLAN TITLED "CONSTRUCTION PLAN OF 1601 DARBY ROAD" PREPARED BY MOMENEE INC. DATED NOVEMBER 9, 2017
2. A PLAN TITLED "BOUNDARY & TOPOGRAPHIC SURVEY OF 1601 DARBY ROAD" PREPARED BY MOMENEE INC., DATED FEBRUARY 14, 2017.

TAX PARCEL MAP:
22-26-474

TAX PARCEL NUMBER:
22-07-00328-00

SOURCE OF DEED:
BOOK 2631, PAGE 837

OWNER/APPLICANT AND ADDRESS:
TOWNSHIP OF HAVERFORD
1601 DARBY ROAD, HAVERTOWN, PA 19083

SITE ADDRESS:
1601 DARBY ROAD,
HAVERTOWN, PA 19083

TOTAL AREA:(TO THE TITLE LINE)
22,318 S.F. (0.512 ACRES)

NET LOT AREA:
22,318 (0.512 ACRES)

ERROR OF CLOSURE:
1:100,000+

EXISTING IMPERVIOUS COVERAGE:

CONCRETE	1,466 S.F.
ASPHALT	7,333 S.F.
BUILDING & OVERHANGS	12,139 S.F.
WALL	41 S.F.
CURB	150 S.F.
TOTAL IMP. COVERAGE	21,129 S.F. (94.67%)

PROPOSED IMPERVIOUS COVERAGE:

CONCRETE	1,230 S.F.
ASPHALT	3,216 S.F.
BUILDING & OVERHANGS	16,959 S.F.
WALL	41 S.F.
CURB	150 S.F.
TOTAL IMP. COVERAGE	21,596 S.F. (96.78%)

ZONING DISTRICT INS (INSTITUTIONAL DISTRICT)

	REQUIRED	EXISTING	PROPOSED
LOT AREA	87,120 SF MIN.	22,317 SF*	No Change
WIDTH AT BUILDING	150 FT MIN.	196.11 FT	No Change
FRONT YARD (DARBY)	100 FT MIN.	0.24 FT*	No Change
FRONT YARD (MILL)	100 FT MIN.	0.94 FT*	0.73 FT
SIDE YARD (OPP MILL)	50 FT MIN.	0.0 FT	No Change
REAR YARD (OPP DARBY)	75 FT MIN.	50.43 FT	28.00 FT
BUILDING HEIGHT	35 FT MAX.	<35 FT	<35 FT
BUILDING AREA	20% MAX.	54.39%*	75.99%
IMPERVIOUS SURFACE	40% MAX.	94.67%	96.77%
GROSS FLOOR AREA		31,791 SF	36,736 SF
PARKING	32 EX/38 PR	17 SPACES*	17 SPACES*
RESIDENTIAL BUFFER PLANTING STRIP	5 FT	3.64 FT*	5.1 FT

* ZONING NON-CONFORMITIES APPROVED BY THE COURT OF COMMON PLEAS, DELAWARE COUNTY PA

DESIGN SURVEYOR
KARINS AND ASSOCIATES
C/O CLARK C. CREE
919 CONESTOGA ROAD
SUITE 213
BRYN MAWR, PA 19010

DESIGN ENGINEER
KARINS AND ASSOCIATES
C/O ROBERT M. NEWTON
919 CONESTOGA ROAD
SUITE 213
BRYN MAWR, PA 19010

ARCHITECT
BERNARDEN ARCHITECTURE/
INTERIOR DESIGN/LANDSCAPE
ARCHITECTURE
123 JUSTISON STREET
WILMINGTON, DE 19801

PARKING (EXISTING CONDITIONS)

1 SPACE FOR EACH 1,000 S.F. OF FLOOR AREA
EXISTING FLOOR AREA – 22,772 S.F.
PARKING REQUIRED – 23 SPACES
PARKING PROVIDED – 17 SPACES

PARKING (PROPOSED CONDITIONS)

PROPOSED FLOOR AREA – 27,581 S.F.
PARKING REQUIRED – 28 SPACES
PARKING PROVIDED – 17 SPACED

20 0 10 20 40 80
1 INCH = 20 FT.

COMMONWEALTH OF PENNSYLVANIA:
SS
COUNTY OF DELAWARE:

ON THE _____ DAY OF _____ 2023, BEFORE ME THE SUBSCRIBER, A NOTARY PUBLIC OF THE COMMONWEALTH OF PENNSYLVANIA, RESIDING IN _____, PERSONALLY APPEARED _____ WHO ACKNOWLEDGED THEMSELVES TO BE THE EQUITABLE OWNER OF TAX PARCEL NUMBER: 22-07-00328-00, AND AS SUCH, BEING AUTHORIZED TO DO SO, THEY EXECUTED THE FOREGOING PLAN BY SIGNING THAT THE SAID TTVH, LLC IS THE OWNER OF THE DESIGNATED LAND, THAT ALL NECESSARY APPROVALS OF THE PLAN HAVE BEEN OBTAINED AND IS ENDORSED THEREON, AND THAT IT DESIRES THAT THE FOREGOING PLAN BE RECORDED ACCORDING TO LAW.

WITNESS MY HAND AND NOTORIAL SEAL, THE DAY AND YEAR AFORESAID.

_____ _____
NOTARY PUBLIC MY COMMISSION EXPIRES (SEAL)

I, _____ OWNER OF TAX PARCEL NUMBER: 22-07-00328-00, HAVE LAID OUT UPON MY LAND SITUATE IN THE TOWNSHIP OF HAVERFORD, COUNTY OF DELAWARE, COMMONWEALTH OF PENNSYLVANIA, CERTAIN LOTS AND STREETS ACCORDING TO THE ACCOMPANYING PLAN WHICH IS INTENDED TO BE RECORDED. WITNESS MY HAND AND SEAL THIS _____ DAY OF _____, 2023.

_____

APPROVED BY THE BOARD OF COMMISSIONERS OF THE TOWNSHIP OF HAVERFORD THIS _____ DAY OF _____, 2023.

_____
SECRETARY OF THE BOARD OF SUPERVISORS

RECOMMENDED FOR APPROVAL BY THE HAVERFORD TOWNSHIP PLANNING COMMISSION THIS _____ DAY OF _____, 2023.

_____
CHAIRMAN OF THE PLANNING COMMISSION

REVIEWED BY THE TOWNSHIP ENGINEER: _____

DCPC NO. _____
PROCESSED AND REVIEWED. REPORT PREPARED BY THE DELAWARE COUNTY PLANNING COMMISSION IN ACCORDANCE WITH THE MUNICIPALITIES PLANNING CODE.

CERTIFIED THIS DATE _____

_____
EXECUTIVE DIRECTOR, DELAWARE COUNTY PLANING COMMISSION

RECORDED IN THE OFFICE OF THE RECORDER OF DEEDS, DELAWARE COUNTY, PENNSYLVANIA IN PLAN BOOK: _____ PAGE: _____ ON THE _____ DAY OF _____ 2023.

I HEREBY CERTIFY THAT THIS PLAN REPRESENTS A SURVEY MADE BY ME AND THE MONUMENTS SHOWN THEREON EXIST AS LOCATED, AND THAT ALL DIMENSIONAL AND GEODETIC DETAILS ARE CORRECT.

_____
CLARK CREE, PLS: NO. DATE

I HEREBY CERTIFY THAT TO THE BEST OF MY KNOWLEDGE THE EXISTING CONDITIONS ARE AS SHOWN AND THAT THE PLAN COMPLIES WITH ALL THE REQUIREMENTS OF CHAPTER 121 OF THE CODE OF THE TOWNSHIP OF TREDYFFRIN FOR ALL PROPOSED EARTHMOVING ACTIVITIES AND OTHER WORK AND THAT THE PROPOSED MEASURES WILL MEET THE CURRENT REQUIREMENTS OF TREDYFFRIN TOWNSHIP.

_____
ROBERT M. NEWTON, P.E.

BID DOCUMENTS – JULY 6, 2023 REVISED: SEPTEMBER 20, 2023
BID DOCUMENT ADDENDUM #4 – OCTOBER 11, 2023

REV.	DATE	COMMENTS
3	6/26/2023	TWP. ENG'S REVIEW 6/6/2023
2	6/28/2023	TWP. ENG'S REVIEW 6/9/2023
1	6/7/2023	

RECORD PLAN

FILE NO.: 21-083

MOMENEE, INC.
a Karins Company
ENGINEERING | PLANNING | SURVEYING
919 CONESTOGA ROAD - BRYN MAWR - PA - 19010

MINOR LAND DEVELOPMENT PLAN

1601 DARBY ROAD

HAVERTOWN TOWNSHIP•DELAWARE COUNTY•PENNSYLVANIA

ONE-CALL:	20170390179	APPLICANT
DRAWN BY:	RC	HAVERFORD TOWNSHIP FREE LIBRARY
CHECKED BY:	RMN	1601 DARBY ROAD HAVERTOWN, PA 19083

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
ROBERT M. NEWTON
ENGINEER
No. PE048326
Robert M. Newton

SHEET 1 OF 10
DATE: APRIL 3, 2023
SCALE: 1" = 20'

LEGEND

	PROPOSED	EXISTING
RIGHT OF WAY		
LOT LINES (TITLE LINE)		
ROADWAY CENTERLINE		
CURB		
SIDEWALK		
LIMITS OF DISTURBANCE		
CONTOUR	100	94
CATCH BASIN		
STORM MANHOLE		
STORM SEWER PIPE		
SANITARY MANHOLE		
SANITARY SEWER PIPE		
WATER LINE		
FIRE HYDRANT		
GAS		
FIBER OPTIC		

Serial Number: 20170390179
CALL BEFORE YOU DIG!
PENNSYLVANIA LAW REQUIRES 3 WORKING DAYS NOTICE FOR CONSTRUCTION PHASE AND 10 WORKING DAYS IN DESIGN STAGE–STOP CALL Pennsylvania One Call System, Inc. 1-800-242-1776

ALL LOCATIONS OF EXISTING UTILITIES, SHOWN ON THIS PLAN, HAVE BEEN DEVELOPED FROM FIELD LOCATIONS OF VISIBLE ABOVE-GROUND UTILITY STRUCTURES AND INFORMATION FURNISHED BY THE UTILITY COMPANIES.

ALL LOCATIONS SHOULD BE CONSIDERED APPROXIMATE. COMPLETENESS OR ACCURACY OF THE LOCATIONS AND DEPTH OF ALL STRUCTURES CANNOT BE GUARANTEED. CONTRACTORS MUST VERIFY ALL LOCATIONS AND DEPTHS OF ALL UNDERGROUND UTILITIES AND FACILITIES BEFORE THE START OF ANY WORK.

AS PER ACT 187 HOUSE BILL 2627, BEFORE THE START OF ANY EXCAVATION WORK THE CONTRACTOR SHALL NOTIFY THE AFFECTED UTILITY COMPANIES THROUGH THE PENNSYLVANIA "ONE CALL SYSTEM" 1-800-242-1776 THREE DAYS PRIOR TO THE START OF ANY EXCAVATION. THE CONTRACTOR SHALL VERIFY THE LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO THE START OF ANY CONSTRUCTION.

UTILITY CONTACTS

GAS
PECO
1060 W SWEDESFORD ROAD
BERWYN, PA 19312
1-800-454-4100

WATER
AQUA AMERICA, INC
DEANNA CIOTTI
700 W SPROUL ROAD
SPRINGFIELD, PA 19064
610-541-4160

ELECTRIC
PECO
1060 W SWEDESFORD ROAD
BERWYN, PA 19312
1-800-454-4100

SANITARY SEWER
HAVERFORD TOWNSHIP, SEWER DEPARTMENT
2325 DARBY ROAD
HAVERTOWN, PA 19083
610-446-1000

C:\USERS\MWASCH\APPDATA\LOCAL\TEMP\ACPUBLISH_10888\A01

SYMBOL LEGEND

- IRON PIN
- CONCRETE MONUMENT
- HANDICAP PARKING SPACE
- LIGHT POLE
- SANITARY MANHOLE
- WATER VALVE
- BOLLARD
- CLEANOUT
- STORM MANHOLE
- AC UNIT
- ELECTRIC BOX
- FIRE HYDRANT
- FIRE VALVE
- GAS VALVE
- DECIDUOUS TREE
- EVERGREEN TREE
- STORM INLET
- TELEPHONE BOX
- GAS METER
- ELECTRIC MANHOLE
- POSTED SIGN
- BENCHMARK

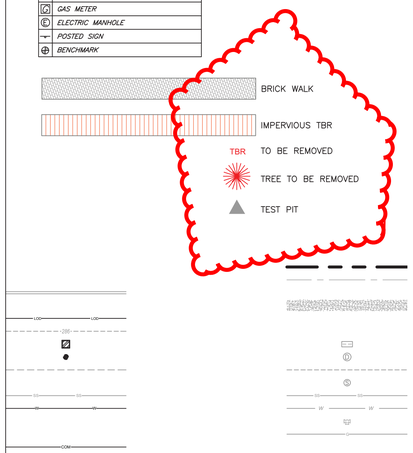
BRICK WALK

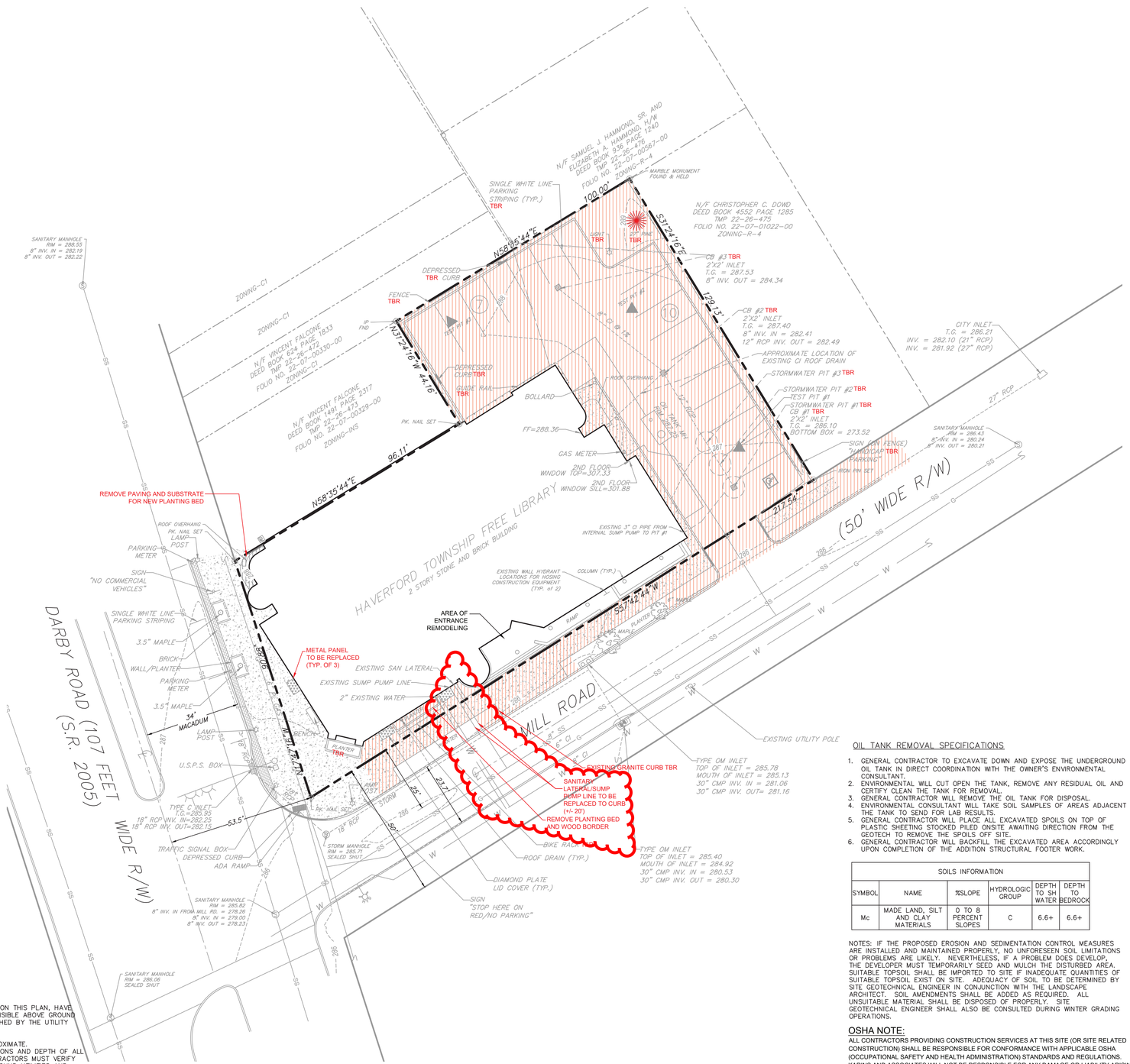
IMPERVIOUS TBR

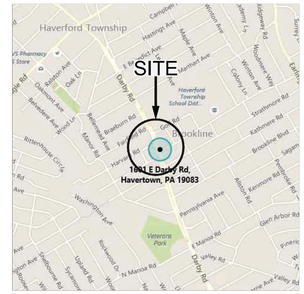
TBR TO BE REMOVED

TREE TO BE REMOVED

TEST PIT







LOCATION MAP
SCALE: 1" = 2,000'

TAX PARCEL MAP:
22-26-474

TAX PARCEL NUMBER:
22-07-00328-00

SOURCE OF DEED:
BOOK 2631, PAGE 837

OWNER/APPLICANT AND ADDRESS:
TOWNSHIP OF HAVERFORD
1601 DARBY ROAD, HAVERTOWN, PA 19083

SITE ADDRESS:
1601 DARBY ROAD,
HAVERTOWN, PA 19083

TOTAL AREA:(TO THE TITLE LINE)
22,318 S.F. (0.512 ACRES)

NET LOT AREA:
22,318 (0.512 ACRES)

ERROR OF CLOSURE:
1:100,000+

TEST PIT #1

TEST	INFILTRATION RATE (IN/HR)
1A	0.008
1B	0.075
1C	0.113

TEST PIT #2

TEST	INFILTRATION RATE (IN/HR)
2A	0.011
2B	0.004

TEST PIT #3

TEST	INFILTRATION RATE (IN/HR)
3A	0.040
3B	0.020

GENERAL NOTES:

1. THE NOTED SURVEY PLAN REPRESENTS AN ACTUAL FIELD SURVEY PERFORMED ON THE PREMISES ON FEBRUARY 14, 2017 AND NOVEMBER 21, 2022 AND DEPICTS CONDITIONS ON THAT DATE.
2. PUBLIC SANITARY SEWER AND PUBLIC WATER SERVICE ARE UTILIZED ON THIS PROPERTY.
3. THE EXISTENCE AND/OR LOCATION OF ALL SUB SURFACE UTILITIES SHALL BE CONSIDERED APPROXIMATE AND MUST BE FIELD VERIFIED BY ALL CONTRACTORS PRIOR TO CONSTRUCTION.
4. SOIL DATA RETRIEVED VIA THE WEB SOIL SURVEY PROVIDED BY THE UNITED STATES DEPARTMENT OF AGRICULTURE AVAILABLE ONLINE AT http://websoilsurvey.nrcs.usda.gov/.
5. THE REFERENCED SURVEY PLAN WAS PREPARED WITHOUT THE BENEFIT OF A TITLE REPORT AND SUBJECT TO ANY FACTS THAT MAY BE DISCLOSED IN A FULL AND ACCURATE TILE REPORT.
6. IN ACCORDANCE WITH FEMA PANEL NUMBER 42045C0106F EFFECTIVE DATE NOVEMBER 18, 2009, PREMISES IS LOCATED IN ZONE X, AREAS DETERMINED TO BE OUTSIDE THE 500 YEAR FLOOD PLAIN.
7. BEARINGS ON THIS PLAN ARE SHOWN IN ACCORDANCE TO PA STATE PLANE SOUTH ZONE 3702.
8. THE VERTICAL DATUM SHOWN ON THIS PLAN IS NAVD 1988 OBTAINED VIA GPS NETWORK.
9. CONTOURS DEVELOPED FROM A TOPOGRAPHIC SURVEY BY KARINS AND ASSOCIATES BENCHMARK(BM) – INLET ELEVATION – 285.40.
10. CONTRACTOR TO CONTACT GAS LINE OWNER FOR INSTRUCTIONS WITH CONSTRUCTION IN THE VICINITY OF THE GAS LINE.
11. TOPSOIL, IF ENCOUNTERED, SHALL BE STORED OFFSITE AND SPREAD ON-SITE FOLLOWING CONSTRUCTION COMPLETION.
12. BURYING OF STUMPS OR CONSTRUCTION MATERIAL IS PROHIBITED. TREES, STUMPS AND CONSTRUCTION WASTE MATERIAL TO BE REMOVED FROM THE SITE.
13. EXISTING OIL TANK TO BE REMOVED BY GENERAL CONTRACTOR. SOILS WILL BE TESTED BY ENVIRONMENTAL CONSULTANTS TO DETERMINE THE EXTENT, IF ANY, OF HYDROCARBON CONTAMINATION. REMEDIATION PROVIDED AS DIRECTED BY THE ENVIRONMENTAL CONSULTANT. REFER TO REMOVAL SPECIFICATIONS THIS SHEET.
14. APPROXIMATELY THE FIRST 24 INCHES OF SOIL BENEATH THE DRIVEWAY/PARKING LOT SHALL BE REMOVED AND PROPERLY DISPOSED OF. REPLACEMENT OF THIS MATERIAL WILL BE WITH STRUCTURAL CLEAN FILL AS APPROVED BY GEOTECH ENGINEER OR 2A STONE.

REFERENCES:

1. A PLAN TITLED "CONSTRUCTION PLAN OF 1601 DARBY ROAD" PREPARED BY MOMENEE INC., DATED NOVEMBER 9, 2017
2. A PLAN TITLED "BOUNDARY & TOPOGRAPHIC SURVEY OF 1601 DARBY ROAD" PREPARED BY MOMENEE INC., DATED FEBRUARY 14, 2017.

OIL TANK REMOVAL SPECIFICATIONS

1. GENERAL CONTRACTOR TO EXCAVATE DOWN AND EXPOSE THE UNDERGROUND OIL TANK IN DIRECT COORDINATION WITH THE OWNER'S ENVIRONMENTAL CONSULTANT.
2. ENVIRONMENTAL WILL CUT OPEN THE TANK, REMOVE ANY RESIDUAL OIL AND CERTIFY CLEAN THE TANK FOR REMOVAL.
3. GENERAL CONTRACTOR WILL REMOVE THE OIL TANK FOR DISPOSAL.
4. ENVIRONMENTAL CONSULTANT WILL TAKE SOIL SAMPLES OF AREAS ADJACENT THE TANK TO SEND FOR LAB RESULTS.
5. GENERAL CONTRACTOR WILL PLACE ALL EXCAVATED SPOILS ON TOP OF PLASTIC SHEETING STOCKED PILED ONSITE AWAITING DIRECTION FROM THE GEOTECH TO REMOVE THE SPOILS OFF SITE.
6. GENERAL CONTRACTOR WILL BACKFILL THE EXCAVATED AREA ACCORDINGLY UPON COMPLETION OF THE ADDITION STRUCTURAL FOOTER WORK.

SOILS INFORMATION					
SYMBOL	NAME	%SLOPE	HYDROLOGIC GROUP	DEPTH TO SH WATER	DEPTH TO BEDROCK
Mc	MADE LAND, SILT AND CLAY MATERIALS	0 TO 8 PERCENT SLOPES	C	6.6+	6.6+

NOTES: IF THE PROPOSED EROSION AND SEDIMENTATION CONTROL MEASURES ARE INSTALLED AND MAINTAINED PROPERLY, NO UNFORESEEN SOIL LIMITATIONS OR PROBLEMS ARE LIKELY. NEVERTHELESS, IF A PROBLEM DOES DEVELOP, THE DEVELOPER MUST TEMPORARILY SEED AND MULCH THE DISTURBED AREA. SUITABLE TOPSOIL SHALL BE IMPORTED TO SITE IF INADEQUATE QUANTITIES OF SUITABLE TOPSOIL EXIST ON SITE. ADEQUACY OF SOIL TO BE DETERMINED BY SITE GEOTECHNICAL ENGINEER IN CONJUNCTION WITH THE LANDSCAPE ARCHITECT. SOIL AMENDMENTS SHALL BE ADDED AS REQUIRED. ALL UNSUITABLE MATERIAL SHALL BE DISPOSED OF PROPERLY. SITE GEOTECHNICAL ENGINEER SHALL ALSO BE CONSULTED DURING WINTER GRADING OPERATIONS.

OSHA NOTE:

ALL CONTRACTORS PROVIDING CONSTRUCTION SERVICES AT THIS SITE (OR SITE RELATED CONSTRUCTION) SHALL BE RESPONSIBLE FOR CONFORMANCE WITH APPLICABLE OSHA (OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION) STANDARDS AND REGULATIONS. KARINS AND ASSOCIATES WILL NOT BE RESPONSIBLE FOR ANY DAMAGE OR LIABILITY ARISING FROM THE FAILURE OF ANY PARTY TO CONFORM WITH THE APPLICABLE OSHA STANDARDS AND REGULATIONS.

20 0 10 20 40 80

1 INCH = 20 FT.

UTILITY CONTACTS

GAS
PECO
1060 W SWEDESFORD ROAD
BERWYN, PA 19312
1-800-454-4100

WATER
AQUA AMERICA, INC
DEANNA CIOTTI
700 W SPROUL ROAD
SPRINGFIELD, PA 19064
610-541-4160

ELECTRIC
PECO
1060 W SWEDESFORD ROAD
BERWYN, PA 19312
1-800-454-4100

SANITARY SEWER
HAVERFORD TOWNSHIP, SEWER DEPARTMENT
2325 DARBY ROAD
HAVERTOWN, PA 19083
610-446-1000

Serial Number: 20170390179

CALL BEFORE YOU DIG!
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C:\USERS\MWASCH\APPDATA\LOCAL\TEMP\ACPUBLISH_10888\A02

BID DOCUMENTS – JULY 6, 2023 REVISED: SEPTEMBER 20, 2023
BID DOCUMENT ADDENDUM #4 – OCTOBER 11, 2023

REV.	DATE	COMMENTS
2	6/22/2023	TWP. ENG'S REVIEW 6/6/2023
1	5/18/2023	TWP. ENG'S REVIEW 5/9/2023

EXISTING CONDITIONS AND REMOVAL PLAN

FILE NO.: 21-083

MOMENEE, INC.
a Karins Company
ENGINEERING | PLANNING | SURVEYING
919 CONESTOGA ROAD - BRYN MAWR - PA - 19010

MINOR LAND DEVELOPMENT PLAN

1601 DARBY ROAD

HAVERTOWN TOWNSHIP•DELAWARE COUNTY•PENNSYLVANIA

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ROBERT M. NEWTON ENGINEER No. PE048326

Robert M. Newton

ONE-CALL:	20170390179
DRAWN BY:	RC
CHECKED BY:	RMN

APPLICANT
HAVERFORD TOWNSHIP FREE LIBRARY
1601 DARBY ROAD
HAVERTOWN, PA 19083

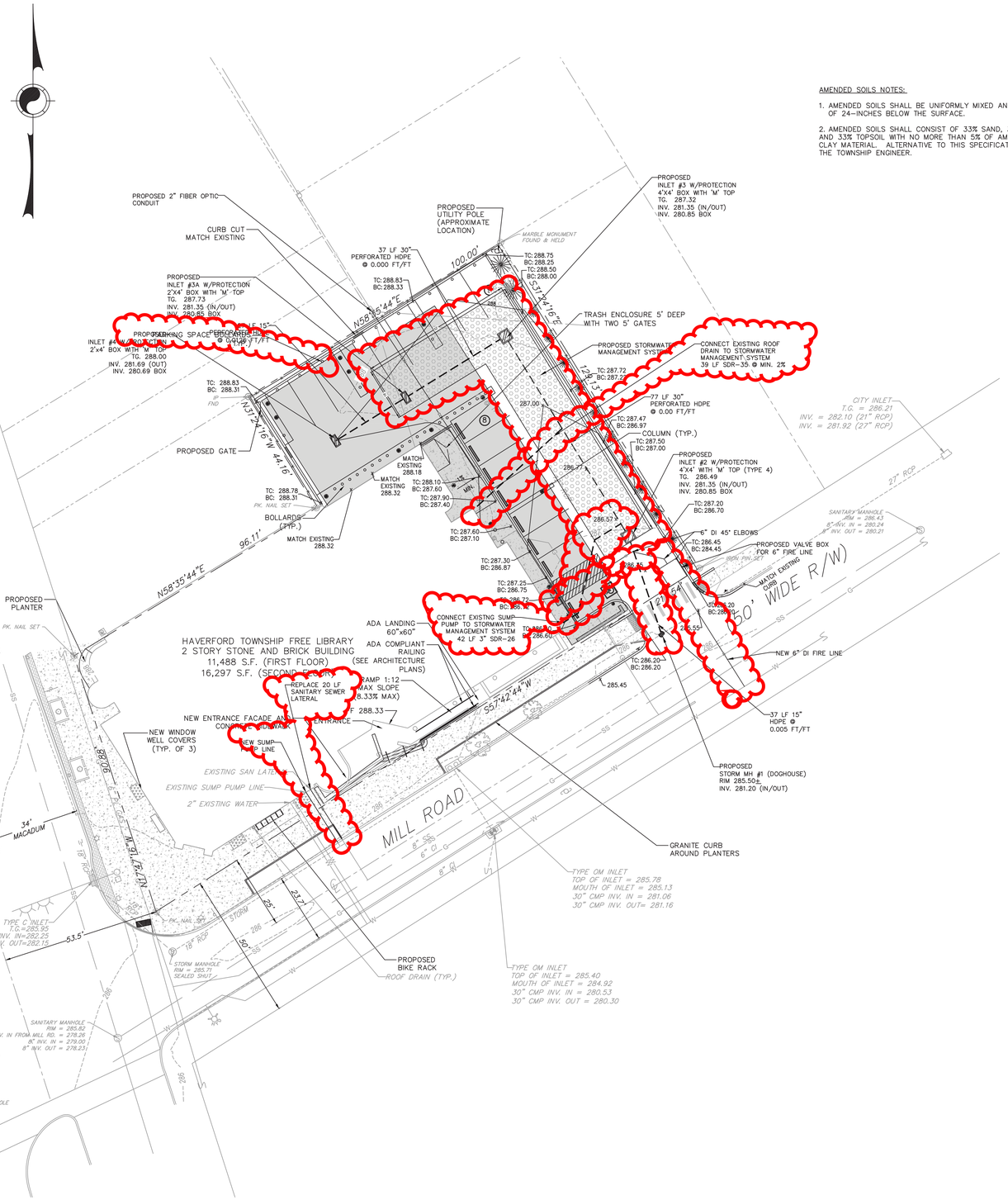
SHEET 2 OF 10
DATE: APRIL 3, 2023
SCALE: 1" = 20'

SYMBOL LEGEND

IRON PIN
CONCRETE MONUMENT
HANDICAP PARKING SPACE
LIGHT POLE
SANITARY MANHOLE
WATER VALVE
BOLLARD
CLEANOUT
STORM MANHOLE
AC UNIT
ELECTRIC BOX
FIRE HYDRANT
FIRE VALVE
GAS VALVE
DECIDUOUS TREE
EVERGREEN TREE
STORM INLET
TELEPHONE BOX
GAS METER
ELECTRIC MANHOLE
POSTED SIGN
BENCHMARK

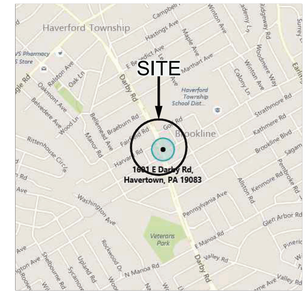
LEGEND

PROPOSED		EXISTING
	RIGHT OF WAY	
	LOT LINES (TITLE LINE)	
	ROADWAY CENTERLINE	
	CURB	
	SIDEWALK	
	LIMITS OF DISTURBANCE	
100 / 100	CONTOUR	94
▨	CATCH BASIN	
●	STORM MANHOLE	Ⓢ
	STORM SEWER PIPE	
Ⓢ	SANITARY MANHOLE	Ⓢ
	SANITARY SEWER PIPE	
	WATER LINE	
	FIRE HYDRANT	
GAS	GAS	GAS
FO	FIBER OPTIC	



20 0 10 20 40 80

1 INCH = 20 FT.



LOCATION MAP
SCALE: 1" = 2,000'

AMENDED SOILS NOTES:

1. AMENDED SOILS SHALL BE UNIFORMLY MIXED AND SPREAD TO A DEPTH OF 24–INCHES BELOW THE SURFACE.

2. AMENDED SOILS SHALL CONSIST OF 33% SAND, 34% ORGANIC MATERIAL, AND 33% TOPSOIL WITH NO MORE THAN 5% OF AMENDED CONSISTING OF CLAY MATERIAL. ALTERNATIVE TO THIS SPECIFICATION IF APPROVED BY THE TOWNSHIP ENGINEER.

GENERAL NOTES:

1. THE INTENT OF THIS PLAN IS TO SHOW THE CONSTRUCTION OF A PROPOSED BUILDING ADDITION, AND OTHER RELATED APPURTENANCES.
2. THE EXISTENCE AND/OR LOCATION OF ALL EXISTING AND PROPOSED UTILITY SERVICES ARE APPROXIMATE AND MUST BE CONFIRMED INDEPENDENTLY WITH LOCAL UTILITY COMPANIES PRIOR TO COMMENCEMENT OF ANY CONSTRUCTION OR EXCAVATION.
3. THE CONTRACTOR IS RESPONSIBLE FOR VERIFICATION OF EXISTING TOPOGRAPHIC INFORMATION AND UTILITY INVERT ELEVATIONS PRIOR TO COMMENCEMENT OF ANY CONSTRUCTION. ANY DISCREPANCIES THAT MAY AFFECT THE PUBLIC SAFETY OR PROJECT COST, MUST BE IDENTIFIED TO THE ENGINEER IN WRITING IMMEDIATELY. PROCEEDING WITH CONSTRUCTION WITH DESIGN DISCREPANCIES IS DONE SO AT THE CONTRACTOR'S OWN RISK.
4. THE TOWNSHIP ENGINEER'S OFFICE SHALL BE NOTIFIED 48 HOURS PRIOR TO THE START OF EARTHMOVING ACTIVITIES.
5. THERE SHALL BE NO GRADE CHANGES WITHIN THREE (3') FEET OF THE PROPERTY LINE IN ORDER TO ENSURE TRANSITION TO THE GRADING ON THE ADJOINING PROPERTY.
6. THE ARCHITECTURAL PLANS MUST BE COORDINATED WITH AND MUST COMPLY WITH THE GRADING PROPOSED WITH THIS PERMIT PLAN.
7. NEWLY GRADED SLOPES OVER 25% MUST BE STABILIZED WITH NORTH AMERICAN GREEN DS75 GEOTEXTILE.
8. ALL WOODY VEGETATION TO BE RETAINED WITHIN TWENTY–FIVE FEET OF A BUILDING SITE OR DISTURBED AREA SHALL BE PROTECTED FROM EQUIPMENT DAMAGE BY FENCING PLACED AT THE DRIPLINES. ACCURATE LOCATION OF THE DRIPLINES SHALL BE PROVIDED. IF TREE PROTECTION FENCE IS NOT AT THE DRIPLINES OF ALL TREES TO REMAIN, THE TOWNSHIP ARBORIST MUST APPROVE THE LOCATION OF THE SHOWN OF THE PLANS. A DETAIL SHALL BE PROVIDED CONFORMING TO TOWNSHIP STANDARDS.
9. GRADE CHANGES AROUND THE DRIPLINES OF TREES TO BE RETAINED SHALL BE MINIMIZED. IMPACTED TREES SHALL BE NOTED ON THE PLAN. TREATMENT OF THE IMPACTED TREES PRIOR TO CONSTRUCTION TO PROTECT THE ROOT SYSTEM SHALL BE PERFORMED IF/AS DIRECTED BY THE TOWNSHIP ARBORIST. THE TOWNSHIP ARBORIST MUST APPROVE THE PROCEDURE.
10. ALL DISTURBED ROOTS MUST BE CUT AS CLEANLY AS POSSIBLE. THE TRENCH MUST BE BACKFILLED AS QUICKLY AS POSSIBLE, AVOIDING COMPACTION. TREE LIMBS MUST BE CUT BACK IN PROPORTION TO THE ROOT AREA LOSS.
11. ON–SITE TREES TO BE SAVED SHALL BE PREPARED FOR CONSTRUCTION BY APPROPRIATE CROWN AND DEEP ROOTING FERTILIZATION AND PROTECTED BY APPROPRIATE FENCING PRIOR TO THE ISSUANCE OF AN EROSION CONTROL OR MINOR GRADING PERMIT. ALL TREES ARE TO BE DEEP ROOT FERTILIZED USING 16–32–16 SLOW RELEASE, WATER DISPERSIBLE @ 15 LBS. PER 100 GALLON OR EQUAL. AN ARBORIST SHALL APPROVE THE PROCEDURE.
12. SHOULD ANY TREES NOT SCHEDULED OR PERMITTED TO BE REMOVED BE IRREPARABLY DAMAGED DURING CONSTRUCTION AND DIE WITHIN EIGHTEEN (18) MONTHS OF THE CONCLUSION OF CONSTRUCTION ACTIVITIES, THOSE TREES WILL BE REQUIRED TO BE REPLACED.
13. GRADING AND EARTHMOVING OPERATIONS SHALL BE MINIMIZED DURING THE PERIOD FROM NOVEMBER 15 TO APRIL 1 WHEN RE–VEGETATION OF EXPOSED GROUND SURFACE IS DIFFICULT. MULCH, STRAW, STONE AND/OR SOD SHALL BE USED TO STABILIZE ALL AREAS DENUDED DURING THIS TIME PERIOD.
14. THE MAXIMUM TIME OF EXPOSURE FOR BARE SOIL AREAS SHALL BE TWENTY (20) DAYS BEFORE STABILIZATION MEASURES ARE IMPLEMENTED.
15. CONTOURS DEVELOPED FROM A TOPOGRAPHIC SURVEY BY KARINS AND ASSOCIATES BENCHMARK(BM) – INLET ELEVATION – 285.40.
16. NO IMPERVIOUS COVER SHALL BE PERMITTED WITHIN THE DRIPLINES OF TREES TO REMAIN WITHOUT APPROVAL FROM AN ARBORIST.
17. IF TRENCHES FOR PIPING OR ANY STORM FACILITIES ARE PROPOSED WITHIN THE DRIPLINES OF TREES, ALL DISTURBED ROOTS MUST BE CUT AS CLEANLY AS POSSIBLE. THE TRENCH MUST BE BACKFILLED AS QUICKLY AS POSSIBLE, AVOIDING COMPACTION. TREE LIMBS MUST BE CUT BACK IN PROPORTION TO THE ROOT AREA LOSS.
18. HDPE PIPE SHALL BE SMOOTH LINED WITH A MANNING'S N VALUE OF 0.012.
19. ROOF DRAINS SHALL NOT DISCHARGE TO SANITARY SEWERS OR DIRECTLY OVER ANY SIDEWALK.
20. ALL FILL SHALL BE PLACED MECHANICALLY AND BE FREE OF ANY DEBRIS OR ORGANIC MATERIAL, ROOTS AND STUMPS. FILL SHALL BE IN 8 INCH LIFTS AND COMPACTED MECHANICALLY WITH EQUIPMENT WEIGHING NOT LESS THEN 10 TONS OR WITH SIMILAR FOOT ROLLER. THE TOWNSHIP MAY REQUIRE AT THE OWNERS EXPENSE A TEST CERTIFYING ADEQUATE COMPACTION OF THE FILL.
21. OWNER OF THE EXISTING GAS SERVICE SHALL BE NOTIFIED PRIOR TO ANY CONSTRUCTION IN THE AREA OF THE GAS LINE.
22. POST CONSTRUCTION AS–BUILT SURVEY WILL BE COMPLETED. THIS SURVEY SHALL INCLUDE LOCATION OF ALL UTILITIES, INLET GRATE ELEVATIONS, PIPE SIZES, TYPES, AND INVERTS, STORM MANHOLE, UNDERGROUND BASIN, CURB LINES, PARKING SPACES, BUILDING LOCATION, ADA RAMP LOCATIONS, VALVES, AND ANY OTHER SIGNIFICANT SURFACE IMPROVEMENTS INCLUDING PLANTERS, PLANTING ISLANDS, AND BIKE RACK.
23. ALL ROOF – SUMP PUMP DRAINS EXITING THE BUILDING SHALL HAVE A CHECK VALVE OR OTHER BACKWATER PREVENTION VALVE.
24. THE GENERAL CONTRACTOR SHALL PURCHASE THE VALVE BOX FROM AQUA APPROVED MANUFACTURING (AC MILLER OR ALTOMARE PRECAST).
25. CONTRACTOR TO PROVIDE TEMPORARY BOX OUT OF PLYWOOD FOR GAS MANIFOLD.
26. REPLACE 20–FEET OF SANITARY LATERAL FOR CONSTRUCTION OF THE STAIR TOWER FOOTER. THE REPLACEMENT LATERAL SHALL BE PVC AT A MINIMUM SLOPE OF 2%.
27. REPLACE 20–FEET OF STORM SEWER FOR CONSTRUCTION OF THE STAIR TOWER FOOTER.

UTILITY CONTACTS

GAS
PECO
1060 W SWEDESFORD ROAD
BERWYN, PA 19312
1–800–454–4100

WATER
AQUA AMERICA, INC
DEANNA CIOTTI
700 W SPROUL ROAD
SPRINGFIELD, PA 19064
610–541–4160

ELECTRIC
PECO
1060 W SWEDESFORD ROAD
BERWYN, PA 19312
1–800–454–4100

SANITARY SEWER
HAVERFORD TOWNSHIP, SEWER DEPARTMENT
2325 DARBY ROAD
HAVERTOWN, PA 19083
610–446–1000

Serial Number: 20170390179

CALL BEFORE YOU DIG!

PENNSYLVANIA LAW REQUIRES 3 WORKING DAYS NOTICE FOR CONSTRUCTION PHASE AND 10 WORKING DAYS IN DESIGN STAGE–STOP CALL Pennsylvania One Call System, Inc. 1–800–242–1776

ALL LOCATIONS OF EXISTING UTILITIES, SHOWN ON THIS PLAN, HAVE BEEN DEVELOPED FROM FIELD LOCATIONS OF VISIBLE ABOVE GROUND UTILITY STRUCTURES AND INFORMATION FURNISHED BY THE UTILITY COMPANIES.

ALL LOCATIONS SHOULD BE CONSIDERED APPROXIMATE. COMPLETENESS OR ACCURACY OF THE LOCATIONS AND DEPTH OF ALL STRUCTURES CANNOT BE GUARANTEED. CONTRACTORS MUST VERIFY ALL LOCATIONS AND DEPTHS OF ALL UNDERGROUND UTILITIES AND FACILITIES BEFORE THE START OF ANY WORK.

AS PER ACT 187 HOUSE BILL 2627, BEFORE THE START OF ANY EXCAVATION WORK THE CONTRACTOR SHALL NOTIFY THE AFFECTED UTILITY COMPANIES THROUGH THE PENNSYLVANIA "ONE CALL SYSTEM" 1–800–242–1776 THREE DAYS PRIOR TO THE START OF ANY EXCAVATION. THE CONTRACTOR SHALL VERIFY THE LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO THE START OF ANY CONSTRUCTION.

C:\USERS\MWASH\APPDATA\LOCAL\TEMP\ACPUBLISH_10888\A03

BID DOCUMENTS – JULY 6, 2023 REVISED: SEPTEMBER 20, 2023
BID DOCUMENT ADDENDUM #4 – OCTOBER 11, 2023

REV.	DATE:	COMMENTS
3	6/29/2023	TWP. ENG'S REVIEW 6/6/2023
2	6/16/2023	TWP. ENG'S REVIEW 6/9/2023
1	6/5/2023	

GRADING AND UTILITY PLAN

FILE NO.: 21–083

MOMENEE, INC. a Karins Company
ENGINEERING | PLANNING | SURVEYING
919 CONESTOGA ROAD - BRYN MAWR - PA - 19010

MINOR LAND DEVELOPMENT PLAN

1601 DARBY ROAD

HAVERTOWN TOWNSHIP•DELAWARE COUNTY•PENNSYLVANIA

ONE–CALL:	20170390179	APPLICANT
DRAWN BY:	RC	HAVERFORD TOWNSHIP FREE LIBRARY
CHECKED BY:	RMN	1601 DARBY ROAD HAVERTOWN, PA 19083

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ROBERT M. NEWTON ENGINEER No. PE048326 — Robert M. Newton

SHEET 3 OF 10
DATE: APRIL 3, 2023
SCALE: 1" = 20'

SYMBOL LEGEND

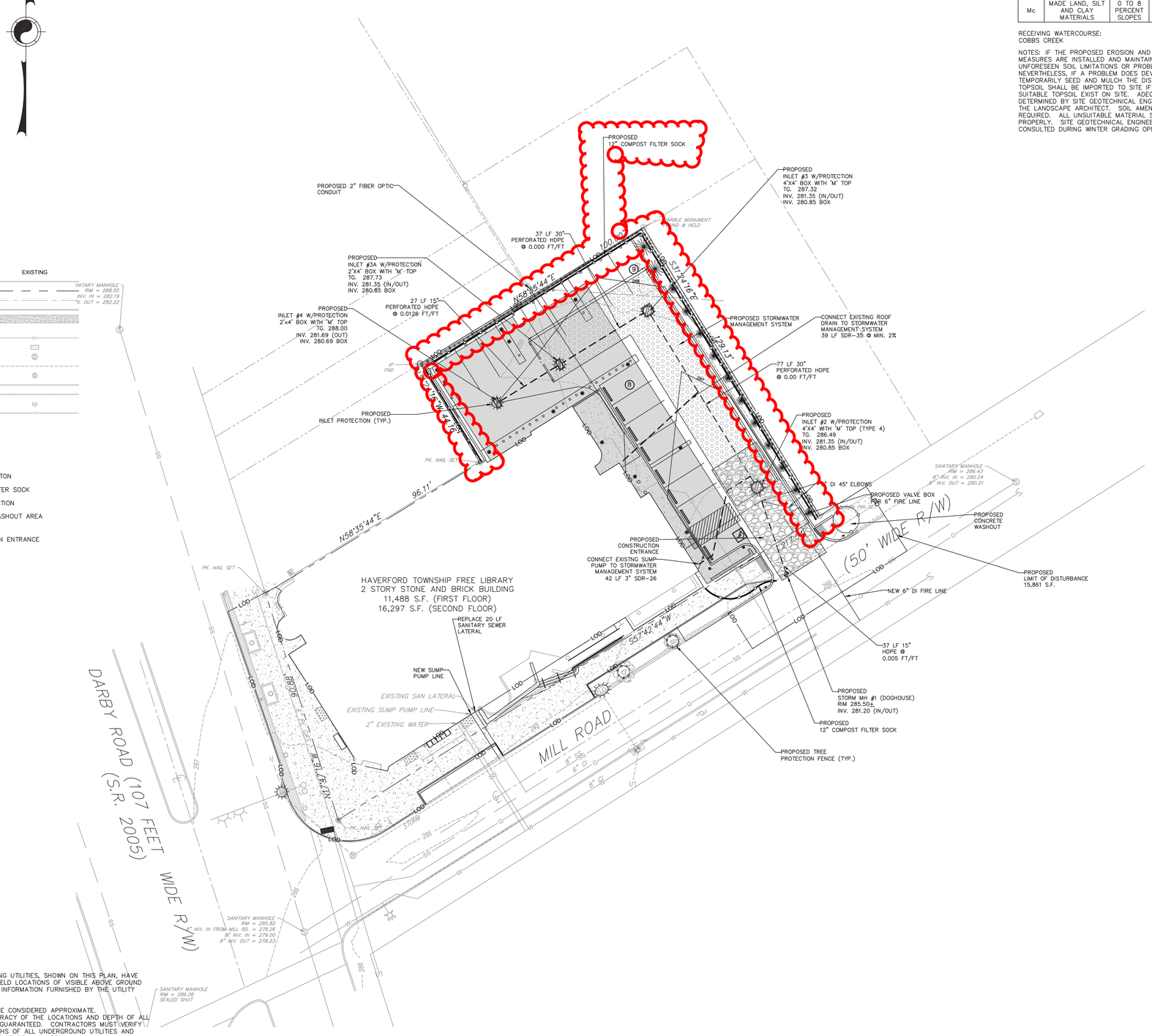
○	IRON PIN
□	CONCRETE MONUMENT
	HANDICAP PARKING SPACE
	LIGHT POLE
S	SANITARY MANHOLE
	WATER VALVE
	BOLLARD
	CLEANOUT
D	STORM MANHOLE
AC	AC UNIT
E	ELECTRIC BOX
	FIRE HYDRANT
	FIRE VALVE
	GAS VALVE
	DECIDUOUS TREE
	EVERGREEN TREE
	STORM INLET
T	TELEPHONE BOX
G	GAS METER
E	ELECTRIC MANHOLE
	POSTED SIGN
	BENCHMARK

LEGEND

PROPOSED		EXISTING
	RIGHT OF WAY	
	LOT LINES (TITLE LINE)	SANITARY MANHOLE RIM = 288.55 INV. IN = 282.19 N. OUT = 282.22
	ROADWAY CENTERLINE	
	CURB	
	SIDEWALK	
LOD LOD	LIMITS OF DISTURBANCE	
200	CONTOUR	201
	CATCH BASIN	
	STORM MANHOLE	D
	STORM SEWER PIPE	
	SANITARY MANHOLE	S
	SANITARY SEWER PIPE	
	WATER LINE	
	FIRE HYDRANT	
	GAS	
COM	FIBER OPTIC	

E&S LINETYPE LEGEND

- TREE PROTECTON
- COMPOST FILTER SOCK
- INLET PROTECTION
- CONCRETE WASHOUT AREA
- CONSTRUCTION ENTRANCE



20 0 10 20 40 80

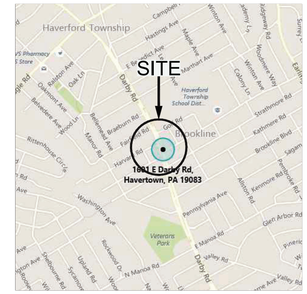
1 INCH = 20 FT.

SOILS INFORMATION

SYMBOL	NAME	%SLOPE	HYDROLOGIC GROUP	DEPTH TO SH WATER	DEPTH TO BEDROCK
Mc	MADE LAND, SILT AND CLAY MATERIALS	0 TO 8 PERCENT SLOPES	C	6.6+	6.6+

RECEIVING WATERCOURSE:
COBBS CREEK

NOTES: IF THE PROPOSED EROSION AND SEDIMENTATION CONTROL MEASURES ARE INSTALLED AND MAINTAINED PROPERLY, NO UNFORESEEN SOIL LIMITATIONS OR PROBLEMS ARE LIKELY. NEVERTHELESS, IF A PROBLEM DOES DEVELOP, THE DEVELOPER MUST TEMPORARILY SEED AND MULCH THE DISTURBED AREA. SUITABLE TOPSOIL SHALL BE IMPORTED TO SITE IF INADEQUATE QUANTITIES OF SUITABLE TOPSOIL EXIST ON SITE. ADEQUACY OF SOIL TO BE DETERMINED BY SITE GEOTECHNICAL ENGINEER IN CONJUNCTION WITH THE LANDSCAPE ARCHITECT. SOIL AMENDMENTS SHALL BE ADDED AS REQUIRED. ALL UNSUITABLE MATERIAL SHALL BE DISPOSED OF PROPERLY. SITE GEOTECHNICAL ENGINEER SHALL ALSO BE CONSULTED DURING WINTER GRADING OPERATIONS.



LOCATION MAP
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14. THE MAXIMUM TIME OF EXPOSURE FOR BARE SOIL AREAS SHALL BE TWENTY (20) DAYS BEFORE STABILIZATION MEASURES ARE IMPLEMENTED.
15. CONTOURS DEVELOPED FROM A TOPOGRAPHIC SURVEY BY KARINS AND ASSOCIATES ELEVATION DATUM NAVD88 SITE BENCHMARK(BM) =FIRST FLOOR ELEVATION = 288.33.
16. NO IMPERVIOUS COVER SHALL BE PERMITTED WITHIN THE DRIPLINES OF TREES TO REMAIN WITHOUT APPROVAL FROM AN ARBORIST.
17. IF TRENCHES FOR PIPING OR ANY STORM FACILITIES ARE PROPOSED WITHIN THE DRIPLINES OF TREES, ALL DISTURBED ROOTS MUST BE CUT AS CLEANLY AS POSSIBLE. THE TRENCH MUST BE BACKFILLED AS QUICKLY AS POSSIBLE, AVOIDING COMPACTION. TREE LIMBS MUST BE CUT BACK IN PROPORTION TO THE ROOT AREA LOSS.
18. HDPE PIPE SHALL BE SMOOTH LINED WITH A MANNING'S N VALUE OF 0.012.
19. TOPSOIL, IF ENCOUNTERED, SHALL BE STORED OFF-STE AND SPREAD ON-SITE FOLLOWING CONSTRUCTION COMPLETION.
20. MINIMUM DEPTH OF TOPSOIL TO BE SPREAD ON-SITE IS 8" OR EQUAL TO THE EXISTING DEPTH OF TOPSOIL ENCOUNTERED ON SITE, WHICHEVER IS GREATER.
21. STUMPS AND WASTE CONSTRUCTION MATERIAL SHALL BE TRANSPORTED AND DISPOSED AT A PADEP PERMITTED FACILITY.

UTILITY CONTACTS

GAS
PECO
1060 W SWEDESFORD ROAD
BERWYN, PA 19312
1-800-454-4100

WATER
AQUA AMERICA, INC
DEANNA CIOTTI
700 W SPROUL ROAD
SPRINGFIELD, PA 19064
610-541-4160

ELECTRIC
PECO
1060 W SWEDESFORD ROAD
BERWYN, PA 19312
1-800-454-4100

SANITARY SEWER
HAVERFORD TOWNSHIP, SEWER DEPARTMENT
2325 DARBY ROAD
HAVVERTOWN, PA 19083
610-446-1000

Serial Number: 20170390179

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PENNSYLVANIA LAW REQUIRES 3 WORKING DAYS NOTICE FOR CONSTRUCTION PHASE AND 10 WORKING DAYS IN DESIGN STAGE-STOP CALL Pennsylvania One Call System, Inc. 1-800-242-1776

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M:_SHARED FOLDERS_PA INVOICE PROJECT FOLDERS_PROJECTS 1982-2021\2021\21083\MA\DRAWINGS\A04

BID DOCUMENTS - JULY 6, 2023 REVISED: SEPTEMBER 20, 2023
BID DOCUMENT ADDENDUM #4 - OCTOBER 11, 2023

REV.	DATE	COMMENTS
2	6/27/2023	TWP. ENG'S REVIEW 6/6/2023
1	5/26/2023	TWP. ENG'S REVIEW 5/9/2023

EROSION AND SEDIMENT CONTROL PLAN

FILE NO.: 21-083

MOMENEE, INC.
a Karins Company
ENGINEERING | PLANNING | SURVEYING
919 CONESTOGA ROAD - BRYN MAWR - PA - 19010

MINOR LAND DEVELOPMENT PLAN

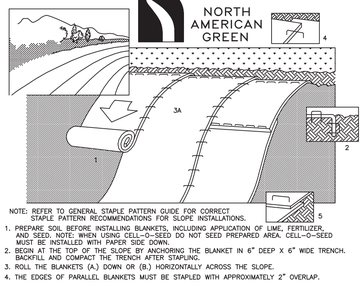
1601 DARBY ROAD

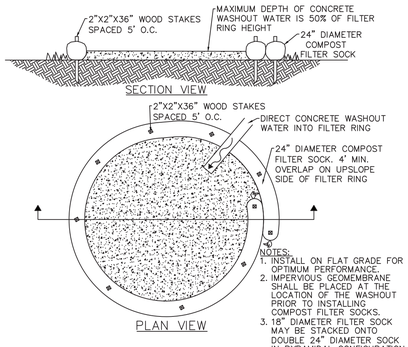
HAVERTOWN TOWNSHIP*DELAWARE COUNTY*PENNSYLVANIA

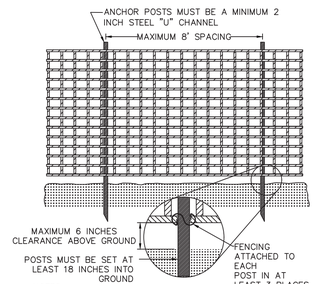
ONE-CALL:	20170390179	APPLICANT
DRAWN BY:	RC	HAVERFORD TOWNSHIP FREE LIBRARY
CHECKED BY:	RMN	1601 DARBY ROAD HAVERTOWN, PA 19083

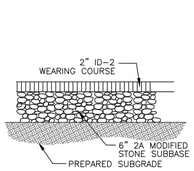
COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ROBERT M. NEWTON ENGINEER No. PE048329 Robert M. Newton

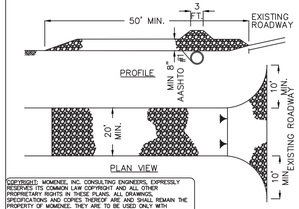
SHEET 4 OF 10
DATE: APRIL 3, 2023
SCALE: 1" = 20'

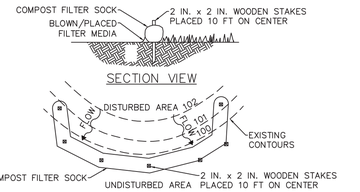


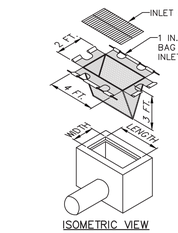












NOTES:

1. NEWLY GRADED SLOPES TWENTY FIVE PERCENT (25% OR GREATER) SHALL BE SODDED OR STABILIZED WITH EROSION CONTROL NETTING, NORTH AMERICAN GREEN S75 GEOTEXTILE.
2. GEOTEXTILE FABRIC SHALL BE CLASS 1. GEOTEXTILE FABRIC IN ACCORDANCE WITH PENNDOT SPECIFICATION FROM 408. THE TYPE AND/OR THICKNESS SHALL BE DUPONT TYPAR #3401, AMOCO PROPEX #4545 OR APPROVED EQUAL OR AS OTHERWISE INDICATED ON THE PLAN.
3. TO ALL AREA WHICH REMAIN DISTURBED FOR MORE THAN 20 DAYS AND WILL BE SUBJECT TO THE ACTION OF EARTHMOVING AND OTHER EQUIPMENT, APPLY A MULCH (WOODCHIP–20 TONS PER ACRE; HAY OR STRAW–3 TONS PER ACRE). ALL OTHER DISTURBED AREAS REMAINING OPEN FOR MORE THAN 20 DAYS SHALL BE TEMPORARILY SEEDED AND MULCHED.
4. SHOULD UNFORESEEN EROSIVE CONDITIONS DEVELOP DURING CONSTRUCTION, THE CONTRACTOR SHALL TAKE ACTION TO REMEDY SUCH CONDITIONS AND TO PREVENT DAMAGE TO ADJACENT PROPERTIES AS A RESULT OF INCREASED RUNOFF/AND OR SEDIMENT DISPLACEMENT. STOCKPILES OF WOODCHIPS, HAY BALES, CRUSHED STONE AND OTHER MULCHES SHALL BE HELD IN READINESS TO DEAL IMMEDIATELY WITH EMERGENCY PROBLEMS OF EROSION.
5. THE CONTRACTOR SHALL, BY SCHEDULING THE CONSTRUCTION, UTILIZE NEW PLANTINGS AND PROPERLY INSTALL EROSION CONTROL FENCING, HAY BALES AND OTHER EROSION CONTROL MEASURES TO MINIMIZE EROSION DAMAGE.
6. ANY DISTURBED AREA ON WHICH ACTIVITY HAS CEASED AND WHICH WILL REMAIN EXPOSED FOR MORE THAN 20 DAYS MUST BE SEEDED AND MULCHED IMMEDIATELY. DURING NON–GERMINATING PERIODS, MULCH MUST BE APPLIED AT THE RECOMMENDED RATES. DISTURBED AREAS WHICH ARE NOT AT FINISHED GRADE AND WHICH WILL BE REDISTURBED WITHIN ONE YEAR MAY BE SEEDED AND MULCHED WITH A QUICK GROWING TEMPORARY SEEDING MIXTURE AND MULCH. DISTURBED AREAS WHICH ARE EITHER AT FINISHED GRADE OR WILL NOT BE REDISTURBED WITHIN ONE YEAR MUST BE SEEDED AND MULCHED WITH A PERMANENT SEED MIXTURE AND MULCH. DIVERSIONS, CHANNELS, SEDIMENTATION BASINS, SEDIMENT TRAPS, AND STOCKPILES MUST BE SEEDED AND MULCHED IMMEDIATELY.
7. A ROUTINE "END–OF–DAY–CHECK" SHALL BE MADE DURING CONSTRUCTION TO MAKE SURE THAT ALL CONTROL MEASURES ARE WORKING PROPERLY. ALL PERSONS ENGAGED IN LAND DISTURBANCE ACTIVITIES SHALL DESIGN, IMPLEMENT, AND MAINTAIN CONTROL MEASURES WHICH PREVENT ACCELERATED EROSION AND SEDIMENTATION. THERE SHALL BE NO ADVERSE DISCHARGE OF THE SEDIMENT OR OTHER SOLID MATERIALS FROM THE SITE AS THE RESULT OF STORMWATER RUNOFF.
8. TEMPORARY EROSION CONTROL MEASURES MAY BE REMOVED ONLY AFTER THE CONSTRUCTION AREA AND CONTAINED SILT IS STABILIZED AND THE LAWN AREA ESTABLISHED.

HYDROSEEDING SPECIFICATIONS

DEFINITION: STABILIZING SEDIMENT PRODUCING AND SEVERELY ERODED AREAS BY ESTABLISHING PERMANENT GRASS COVER.

PURPOSE: TO PROVIDE PERMANENT VEGETATIVE COVER TO CONTROL RAPID RUN–OFF AND EROSION.

PROCEDURE: SURFACE TO BE HYDRO–SEEDED SHALL BE CLEANED OF ALL DEBRIS AND OTHER MATTER HARMFUL TO UNIFORM GERMINATES. A WATER–SLURRY MIXTURE COMPOSED OF THE BELOW MENTIONED "MATERIALS" SHALL BE SPRAYED UNIFORMLY OVER THE AREAS TO BE HYDRO–SEEDED.

MATERIALS: APPLICATION RATE

PERMANENT SEEDING

NAME	DESCRIPTION	(PER ACRE)
SEED MIXTURE % BY WEIGHT	60% PENNSTAR KENTUCKY BLUEGRASS 30% PENNLAWN RED RESCUE 10% PENNFINE PERENNIAL RYEGRASS	260 LBS.
COMMERCIAL FERTILIZER	10–20–20	1,000 LBS.
LIME	GROUND AGRICULTURAL LIMESTONE (MAY BE APPLIED SEPARATELY)	2 TONS
MULCH	HAY OR STRAW	3 TONS
SOIL STABILIZER	TERRA TACK OR EQUIVALENT	20 LBS.
TEMPORARY		
	ANNUAL RYEGRASS (95% PURE)	40 LBS.
COMMERCIAL FERTILIZER	5–5–5	1,000 LBS.
LIME	GROUND AGRICULTURAL LIMESTONE (MAY BE APPLIED SEPARATELY)	1 TON
MULCH	HAY OR STRAW	3 TONS

SLOPE INSTALLATION

14649 HIGHWAY 41 NORTH, EVANSVILLE, INDIANA 47711
USA 1–800–772–2040 CANADA 1–800–448–2040

NORTH AMERICAN GREEN

NOTE: REFER TO GENERAL STAPLE PATTERN GUIDE FOR CORRECT STAPLE PATTERN RECOMMENDATIONS FOR SLOPE INSTALLATIONS.

1. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING APPLICATION OF LIME, FERTILIZER, AND SEED. NOTE: WHEN USING CELL–O–SEED DO NOT SEED PREPARED AREA. CELL–O–SEED MUST BE INSTALLED WITH PAPER SIDE DOWN.
2. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE BLANKET IN 6" DEEP X 6" WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
3. ROLL THE BLANKETS (A.) DOWN OR (B.) HORIZONTALLY ACROSS THE SLOPE.
4. THE EDGES OF PARALLEL BLANKETS MUST BE STAPLED WITH APPROXIMATELY 2" OVERLAP.
5. WHEN BLANKETS MUST BE SPLICED DOWN THE SLOPE, PLACE BLANKETS END OVER END (SHINGLE STYLE) WITH APPROXIMATELY 4" OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" APART.

EROSION CONTROL BLANKET

NORTH AMERICAN GREEN S75 GEOTEXTILE
NOT TO SCALE

NOTES:

1. REMOVE TOPSOIL PRIOR TO INSTALLATION OF ROCK CONSTRUCTION ENTRANCE. EXTEND ROCK OVER FULL WIDTH OF ENTRANCE.
2. RUNOFF SHALL BE DIVERTED FROM ROADWAY TO A SUITABLE SEDIMENT REMOVAL BMP PRIOR TO ENTERING ROCK CONSTRUCTION ENTRANCE.
3. MOUNTABLE BERM SHALL BE INSTALLED WHEREVER OPTIONAL CULVERT PIPE IS USED AND PROPER PIPE COVER AS SPECIFIED BY MANUFACTURER IS NOT OTHERWISE PROVIDED. PIPE SHALL BE SIZED APPROPRIATELY FOR SIZE OF DITCH BEING CROSSED.

MAINTENANCE: ROCK CONSTRUCTION ENTRANCE THICKNESS SHALL BE CONSTANTLY MAINTAINED TO THE SPECIFIED DIMENSIONS BY ADDING ROCK. A STOCKPILE SHALL BE MAINTAINED ON SITE FOR THIS PURPOSE. ALL SEDIMENT DEPOSITED ON PAVED ROADWAYS SHALL BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE IMMEDIATELY. IF EXCESSIVE AMOUNTS OF SEDIMENT ARE BEING DEPOSITED ON ROADWAY, EXTEND LENGTH OF ROCK CONSTRUCTION ENTRANCE BY 50 FOOT INCREMENTS UNTIL CONDITION IS ALLEVIATED OR INSTALL WASH RACK. WASHING THE ROADWAY OR SWEEPING THE DEPOSITS INTO ROADWAY DITCHES, SEWERS, CULVERTS, OR OTHER DRAINAGE COURSES IS NOT ACCEPTABLE.

STANDARD CONSTRUCTION DETAIL #3–1
ROCK CONSTRUCTION ENTRANCE

NOT TO SCALE

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PLACING TOPSOIL OR TOPSOIL MIXTURE

PREPARATION OF AREAS TO BE TOPSOILED

1. GRADE THE AREAS TO BE COVERED BY TOPSOIL. USING ACCEPTABLE METHODS, LOOSEN SOIL TO A DEPTH OF 2 INCHES BEFORE PLACING THE TOPSOIL.
2. REMOVE STONES AND OTHER FOREIGN MATERIAL 2 INCHES OR LARGER IN DIMENSION.
3. REMOVE AND SATISFACTORILY DISPOSE OF UNSUITABLE AND SURPLUS MATERIAL.

PLACING AND SPREADING TOPSOIL

1. PLACE TOPSOIL ON THE PREPARED AREAS AND, UNLESS OTHERWISE INDICATED, SPREAD AND COMPACT TO A 4–INCH UNIFORM DEPTH ± 1 1/2 INCHES.
2. COMPACT WITH A ROLLER WEIGHING NOT OVER 120 POUNDS PER FOOT WIDTH OF ROLLER OR BY OTHER ACCEPTABLE METHODS, AS DIRECTED.
3. REMOVE OVERDEPTH TOPSOIL, UNLESS OTHERWISE AGREED UPON IN WRITING.
4. DO NOT PLACE TOPSOIL IN A WET OR FROZEN CONDITION.

WHERE DENUDED AREAS ARE DESIRED TO BE LAWN:

1. PERFORM ALL CULTURAL OPERATION AT RIGHT ANGLES TO THE SLOPE.
2. APPLY LIME ACCORDING TO TEST OR AT THE RATE OF 25 LBS. OF GROUND LIMESTONE PER 1,000 SQ. FT.
3. APPLY FERTILIZER ACCORDING TO SOIL TEST OR WORK IN DEEPLY 20 LBS. OF 0–20–20 OR EQUIVALENT PER 1,000 SQ. FT. AND AT THE TIME OF SEEDING, WORK INTO THE SURFACE 10 LBS. OF 10–10–10 OR EQUIVALENT PER 1,000 SQ. FT. OR OTHER APPROVED MIXTURE.
4. SMOOTH AND FIRM SEEDED PRIOR TO SEEDING.
5. SEED USING A MIXTURE OF 60% PENNSTAR KENTUCKY BLUEGRASS, 30% PENNLAWN RED FESCUE AND 10% PENNFINE PERENNIAL RYEGRASS AT THE RATE OF FIVE (5) POUNDS PER 1,000 SQ. FT. OR OTHER APPROVED MIXTURE.
6. COVER GRASS AND LEGUME SEEDS WITH 1/4" OF SOIL WITH SOIL EQUIPMENT, MULCH, USING 2 BALES/1,000 SQ. FT.
7. MOW AS REQUIRED.
8. WHERE SLOPES EXCEED 25% NORTH AMERICAN GREEN DS75 OR OTHER APPROVED (EQUAL) SLOPE STABILIZATION MEASURES SHALL BE UTILIZED. IN ADDITION, THE SEEDING SPECIFICATIONS FOR STEEP SLOPES SHALL BE INCREASED TO INCLUDE 3 LBS/1,000 SQ. FT. OF ANNUAL RYEGRASS FOR RAPID VEGETAL ESTABLISHMENT.

SEEDING TABLE A

FORMULA AND SPECIES	% BY WEIGHT	MINIMUM %		MAX. %	SEEDING RATE PER 1000 SQ. YD. POUNDS
		PURITY	GERMINATION	WEED SEED	
FORMULA B					44.0 TOTAL
● PERENNIAL RYEGRASS MIXTURE (LOLIUM PERENNE) A COMBINATION OF IMPROVED CERTIFIED VARIETIES WITH NO ONE VARIETY EXCEEDING 50% OF THE TOTAL	20	97	90	0.10	8.5
● CREEPING RED FESCUE OR CHEWINGS FESCUE	30	97	85	0.10	12.5
● KENTUCKY BLUEGRASS MIXTURE (POA PRATENSIS) A COMBINATION OF IMPROVED CERTIFIED VARIETIES WITH NO ONE VARIETY EXCEEDING 50% OF THE TOTAL BLUEGRASS COMPONENT	45	97	80	0.15	21.0
● ANNUAL RYEGRASS (LOLIUM MULTIFLORUM)	5	95	90	0.10	2.0
FORMULA C					12.0 TOTAL
● CROWNVETCH (CORONILLA VARIA)	45	99	70	0.10	5.5
● ANNUAL RYEGRASS (LOLIUM MULTIFLORUM)	55	95	90	0.10	6.5
FORMULA D					50.0 TOTAL
● TALL FESCUE (FESTUCA ARUNDINACEA VAR. KENTUCKY 31)	70	98	85	0.15	30.0
● CREEPING RED FESCUE OR CHEWINGS FESCUE	30	98	85	0.15	15.0
● ANNUAL RYEGRASS (LOLIUM MULTIFLORUM)	10	95	90	0.10	5.0
FORMULA E					
● RYGRASS, ANNUAL (LOLIUM MULTIFLORUM)	100	95	90	0.10	10.0 TOTAL
FORMULA L					48.0 TOTAL
● HARD FESCUE MIXTURE (FESTUCA LONGIFOLIA) A COMBINATION OF IMPROVED CERTIFIED VARIETIES WITH NO ONE VARIETY EXCEEDING 50% OF THE TOTAL.	55	97	85	0.10	26.4
● CREEPING RED FESCUE	35	97	85	0.10	16.8
● ANNUAL RYEGRASS (LOLIUM MULTIFLORUM)	10	95	90	0.10	4.8
FORMULA N CONSERVATION MIX					30.0 TOTAL
● HARD FESCUE MIXTURE (FESTUCA LONGIFOLIA). A COMBINATION OF IMPROVED CERTIFIED VARIETIES WITH NO ONE VARIETY EXCEEDING 50% OF THE TOTAL HARD FESCUE COMPONENT.	30	97	85	0.10	9.0
● CREEPING RED FESCUE (FESTUCA RUBRA) (IMPROVED AND CERTIFIED)	30	97	85	0.10	9.0
● LITTLE BLUESTEM (ANDROPOGON SCOPARIUS)	4	80	70	0.20	1.2
● CANADA WILD RYE (ELYMUS CADADEIS)	6	85	70	0.20	1.8
● VIRGINIA WILD RYE (ELYMUS VIRGINICUS)	4	85	70	0.20	1.2
● INDIANGRASS (SORGHASTRUM NUTANS)	3	85	70	0.20	0.9
● ANNUAL RYEGRASS (LOLIUM MULTIFLORUM)	10	95	90	0.10	3.0
● BLACK EYED SUSAN (RUDBECKIA HIRTA)	5	80	60	0.20	1.5
● NEW ENGLAND ASTER (SYMPHYOTRICHUM NOVAE–ANGLIE)	3	80	50	0.20	0.9
● OX–EYE SUNFLOWER (HELIOPSIS HELIANTHOIDES)	5	80	60	0.20	1.5
FORMULA W					15.0 TOTAL
● TALL FESCUE (FESTUCA ARUNDINACEA VAR. KENTUCKY 31)	30	96	85	0.10	4.5
● BIRDSFOOT TREFOIL MIXTURE (LOTUS CORNICULATUS)	10	92	80	0.10	1.5
● REDTOP (AGROSTIS ALBA)	10	92	80	0.20	1.5
● VIRGINIA WILD RYE (ELYMUS VIRGINICUS)	24	85	70	0.20	3.6
● TIOGA DEERTONGUE (PANICUM CLANDESTINUM)	14	95	80	0.20	2.1
● FOX SEDGE (CAREX VULPINOIDES)	12	85	60	0.20	1.8

PENNDOT PUBLICATION 408, SECTION 804 – SEEDING AND SOIL SUPPLEMENTS

SEED CONFORMING TO THE REGULATIONS OF CHAPTER 71 – SEED OF THE PENNSYLVANIA SEED ACT 164 OF 2004, EFFECTIVE JANUARY 29, 2005, AND AMENDMENTS. MEET OTHER APPLICABLE REGULATIONS OF THE SEED, TESTING AND CERTIFICATION PROGRAMS OF THE PENNSYLVANIA DEPARTMENT OF AGRICULTURE (PDA), BUREAU OF PLANT INDUSTRY.

PROVIDE SEEDS THAT HAVE BEEN TESTED AND APPROVED FOR THE SPECIFIED SEED FORMULA'S PURITY, GERMINATION, WEE SEED ANALYSIS LIMITS AND OTHER APPLICABLE PDA RULES FOR SEED TESTING.

PROVIDE CERTIFIED SEED FOR ALL KENTUCKY BLUEGRASS, PERENNIAL RYEGRASS, CREEPING RED FESCUE, CHEWINGS FESCUE, AND HARD FESCUE VARIETIES SUBMITTED FOR EACH SEED FORMULA.

PROVIDE PREMIXED SEED MIXTURES FORM A LICENSED SEED DISTRIBUTOR/SEED MIXING COMPANY LOCATED WITHIN THE STATE AND MIXED UNDER THE SUPERVISION OF THE PDA FOR THE DESIGNATED TABLE A SEED FORMULAS. USE ONLY SEED THAT HAS AN APPROVED SEED INSPECTOR'S TAG OR LABEL SIGNED BY A PDA INSPECTOR SEWN OR STAPLED TO THE OUTSIDE OF EACH SEED BAG OR OTHER CONTAINER IN A CONSPICUOUS PLACE. PRESSURE SENSITIVE LABELS MAY BE USED ON PAPER OR PLASTIC CONTAINERS

SEED MIXTURES MAY ALSO BE MIXED TO PROJECT SPECIFICATIONS AT THE PROJECT SITE FOR SPECIAL SEED FORMULAS OR MIXTURES NOT SPECIFIED IN TABLE A, IF ALL SPECIFIED SEED SPECIES HAVE BEEN PREVIOUSLY INSPECTED, TESTED, AND APPROVED BY PDA FOR THE DESIGNATED PURITY, GERMINATION, WEED SEED LIMITS, OR PURE LIVE SEED ANALYSIS. MIX THE SEED SPECIES TO THE DESIGNATED FORMULA OR MIXTURE SPECIFICATIONS UNDER DEPARTMENT SUPERVISION.

DRIVEWAY PAVING RESTORATION
CROSS SECTION

NOT TO SCALE

NOTES:

1. INSTALL ON FLAT GRADE FOR OPTIMUM PERFORMANCE.
2. IMPERVIOUS GEOMEMBRANE SHALL BE PLACED AT THE LOCATION OF THE WASHOUT PRIOR TO INSTALLING COMPOST FILTER SOCKS.
3. 18" DIAMETER FILTER SOCK MAY BE STACKED ONTO DOUBLE 24" DIAMETER SOCK IN PYRAMIDAL CONFIGURATION FOR ADDED HEIGHT.

TYPICAL COMPOST SOCK WASHOUT INSTALLATION

NOT TO SCALE

COMPOST SOCK FABRIC MINIMUM SPECIFICATIONS

MATERIAL TYPE	3 MIL HDPE	5 MIL HDPE	5 MIL HDPE	MULTI–FILAMENT POLYPROPYLENE (MFPP)	HEAVY DUTY MULTI–FILAMENT POLYPROPYLENE (HDMFPP)
MATERIAL CHARACTERISTICS	PHOTO–DEGRADABLE	PHOTO–DEGRADABLE	BIO–DEGRADABLE	PHOTO–DEGRADABLE	PHOTO–DEGRADABLE
SOCK DIAMETERS	12" 18"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"
MESH OPENING	3/8"	3/8"	3/8"	3/8"	1/8"
TENSILE STRENGTH		26 PSI	26 PSI	44 PSI	202 PSI
ULTRAVIOLET STABILITY % ORIGINAL STRENGTH (ASTM G–155)	23% AT 1000 HR.	23% AT 1000 HR.		100% AT 1000 HR.	100% AT 1000 HR.
MINIMUM FUNCTIONAL LONGEVITY	6 MONTHS	9 MONTHS	6 MONTHS	1 YEAR	2 YEARS

TWO–PLY SYSTEMS	
INNER CONTAINMENT NETTING	HDPE BIAXIAL NET
	CONTINUOUSLY WOUND
	FUSION–WELDING JUNCTURES
	3/4"x3/4" MAX. APERTURE SIZE
OUTER FILTRATION MESH	COMPOSITE POLYPROPYLENE FABRIC (WOVEN LAYER AND NON–WOVEN FLEECE MECHANICALLY FUSED VIA NEEDLE PUNCH)
	3/16" MAX. APERTURE SIZE

SOCK FABRICS COMPOSED OF BURLAP MAY BE USED ON PROJECTS LASTING 6 MONTHS OR LESS.

COMPOST STANDARDS

ORGANIC MATTER CONTENT	80% – 100% (DRY WEIGHT BASIS)
ORGANIC PORTION	FIBROUS AND ELONGATED
pH	5.5 – 8.0
MOISTURE CONTENT	35% – 55%
PARTICLE SIZE	98% PASS THROUGH 1" SCREEN
SOLUBLE SALT CONCENTRATION	5.0 dS/m (mmhos/cm) MAXIMUM

NOTES:

1. SOCK FABRIC SHALL MEET STANDARDS OF TABLE 4.1 OF THE PA DEP EROSION CONTROL MANUAL. COMPOST SHALL MEET THE STANDARDS OF TABLE 4.2 OF THE PA DEP EROSION CONTROL MANUAL.
2. COMPOST FILTER SOCK SHALL BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE BARRIER SHALL BE EXTENDED AT LEAST 8 FEET UP SLOPE AT 45 DEGREES TO THE MAIN BARRIER ALIGNMENT. MAXIMUM SLOPE LENGTH ABOVE ANY BARRIER SHALL NOT EXCEED THAT SPECIFIED FOR THE SIZE OF THE SOCK AND THE SLOPE OF ITS TRIBUTARY AREA
3. TRAFFIC SHALL NOT BE PERMITTED TO CROSS COMPOST FILTER SOCKS.
4. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES 1/2 THE ABOVE GROUND HEIGHT OF THE BARRIER AND DISPOSED IN THE MANNER DESCRIBED ELSEWHERE IN THE PLAN.
5. COMPOST FILTER SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION.
6. BIODEGRADABLE COMPOST FILTER SOCKS SHALL BE REPLACED AFTER 6 MONTHS; PHOTODEGRADABLE SOCKS AFTER 1 YEAR. POLYPROPYLENE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
7. UPON STABILIZATION OF THE AREA TRIBUTARY TO THE SOCK, STAKES SHALL BE REMOVED. THE SOCK MAY BE LEFT IN PLACE AND VEGETATED OR REMOVED. IN THE LATTER CASE, THE MESH SHALL BE CUT OPEN AND THE MULCH SPREAD AS A SOIL SUPPLEMENT.

STANDARD CONSTRUCTION DETAIL #4–1
COMPOST FILTER SOCK

NOT TO SCALE

NOTES:

MAXIMUM DRAINAGE AREA = 1/2 ACRE.

INLET PROTECTION SHALL NOT BE REQUIRED FOR INLET TRIBUTARY TO SEDIMENT BASIN OR TRAP. BERMS SHALL BE REQUIRED FOR ALL INSTALLATIONS.

ROLLED EARTHEN BERM IN ROADWAY SHALL BE MAINTAINED UNTIL ROADWAY IS STONED. ROAD SUBBASE BERM ON ROADWAY SHALL BE MAINTAINED UNTIL ROADWAY IS PAVED. EARTHEN BERM IN CHANNEL SHALL BE MAINTAINED UNTIL PERMANENT STABILIZATION IS COMPLETED OR REMAIN PERMANENTLY.

AT A MINIMUM, THE FABRIC SHALL HAVE A MINIMUM GRAB TENSILE STRENGTH OF 120 LBS., A MINIMUM BURST STRENGTH OF 200 PSI, AND A MINIMUM TRAPEZOIDAL TEAR STRENGTH OF 50 LBS. FILTER BAGS SHALL BE CAPABLE OF TRAPPING ALL PARTICLES NOT PASSING A NO. 40 SIEVE.

INLET FILTER BAGS SHALL BE INSPECTED ON A WEEKLY BASIS AND AFTER EACH RUNOFF EVENT. BAGS SHALL BE EMPTIED AND RINSED OR REPLACED WHEN HALF FULL OR WHEN FLOW CAPACITY HAS BEEN REDUCED SO AS TO CAUSE FLOODING OR BYPASSING OF THE INLET. DAMAGED OR CLOGGED BAGS SHALL BE REPLACED. A SUPPLY SHALL BE MAINTAINED ON SITE FOR REPLACEMENT OF BAGS. ALL NEEDED REPAIRS SHALL BE INITIATED IMMEDIATELY AFTER THE INSPECTION. DISPOSE ACCUMULATED SEDIMENT AS WELL AS ALL USED BAGS ACCORDING TO THE PLAN NOTES.

DO NOT USE ON MAJOR PAVED ROADWAYS WHERE PONDING MAY CAUSE TRAFFIC HAZARDS.

STANDARD CONSTRUCTION DETAIL #4–16
FILTER BAG INLET PROTECTION – TYPE M INLET

NOT TO SCALE

REMOVED CHAIN LINK FENCE DETAIL

NOTES:

1. PROTECTION BARRIERS SHALL BE 4 FEET HIGH, CONSTRUCTED OF DURABLE AND HIGHLY VISIBLE MATERIAL (PLASTIC ORANGE CONSTRUCTION FENCE AND SNOW–FENCE MAY BE USED)
2. PROTECTION BARRIERS SHALL BE MAINTAINED THROUGHOUT THE DURATION OF THE WORK AT THE SITE.
3. ADDITIONAL WARNING SIGNS SHOULD ALSO BE PLACED ON THE FENCING AND IN APPROPRIATE AREAS NEAR THE WORK ZONE.

TREE/PEDESTRIAN PROTECTION BARRIER FENCING

NOT TO SCALE

RECOMMENDED MINIMUM TRENCH WIDTHS

PIPE DIAM.	MIN. TRENCH WIDTH
12"	30"
15"	34"
18"	39"
24"	48"
30"	56"
36"	64"
42"	72"
48"	80"
54"	88"
60"	96"

NOTES:

1. ALL BACKFILL SHALL BE PLACED AND COMPACTED IN 6" LIFTS.
2. MEASURES SHOULD BE TAKEN TO PREVENT MIGRATION OF NATIVE FINES INTO BACKFILL MATERIAL, WHEN REQUIRED.
3. FOUNDATION: WHERE THE TRENCH BOTTOM IS UNSTABLE, THE CONTRACTOR SHALL EXCAVATE TO A DEPTH REQUIRED BY THE ENGINEER AND REPLACE WITH SUITABLE MATERIAL AS SPECIFIED BY THE ENGINEER. AS AN ALTERNATIVE AND AT THE DISCRETION OF THE DESIGN ENGINEER, THE TRENCH BOTTOM MY BE STABILIZED USING A GEOTEXTILE MATERIAL.
4. BEDDING: PIPE BEDDING FOR WATER UTILITIES SHALL BE SAND. PIPE BEDDING FOR SANITARY AND STORMWATER SEWER UTILITIES SHALL BE 3/4" DIAMETER CRUSHED STONE.
5. INITIAL BACKFILL: SUITABLE MATERIAL SHALL BE CLASS I, II, OR III IN THE PIPE ZONE EXTENDING NOT LESS THAN 6" ABOVE CROWN OF PIPE. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. MATERIAL SHALL BE INSTALLED AS REQUIRED IN ASTM D2321, LATEST EDITION.
6. MINIMUM COVER: MINIMUM COVER, H, SHALL MATCH EXISTING.

ROOF DRAIN UTILITY TRENCH DETAIL

NOT TO SCALE

SEQUENCE OF CONSTRUCTION

THE TOWNSHIP ENGINEER SHALL BE NOTIFIED THAT EARTHMOVING ACTIVITIES ARE TO COMMENCE A MINIMUM OF 48–HOURS PRIOR TO START OF CONSTRUCTION.

1. NOTIFY THE TOWNSHIP THAT CONSTRUCTION IS TO COMMENCE. ANTICIPATED START DATE WILL BE Fall, 2023.
2. USE THE EXISTING MACADUM DRIVEWAY ENTRANCE FROM MILL ROAD AS A SHORT TERM CONSTRUCTION ENTRANCE.
3. INSTALL TEMPORARY PEDESTRIAN BARRICADES, CONTROL AND OTHER WARNING DEVICES NECESSARY TO PROTECT THE PUBLIC.
4. INSTALL TEMPORARY EROSION CONTROL DEVICES AS NOTED ON THE EROSION CONTROL PLANS.
5. ONCE THE BARRICADES, TRAFFIC CONTROL AND EROSION CONTROL BMPS ARE IN PLACE AND FUNCTIONING, COMMENCE GRADING – DEMOLITION ACTIVITIES.
6. REMOVE 48–INCH TREE AT THE NORTHEAST CORNER OF THE PROPERTY AND OTHER EXISTING INFRASTRUCTURE IMPROVEMENTS INCLUDING THE EXISTING STORM WATER MANAGEMENT SYSTEM AND OTHER TANKS WITHIN THE PARKING AREA, FENCE ALONG DOWD PROPERTY (TMP 22–26–475), SIGNAGE, ETC.
7. START REMOVAL OF CURB, ASPHALT AND UNSUITABLE MATERIAL AT THE NORTHWEST CORNER THE PARKING LOT AND TERMINATE AT THE INTERSECTION WITH MILL ROAD. PROVIDE TRAFFIC CONTROL IN ACCORDANCE WITH TRAFFIC/PEDESTRIAN CONTROL DETAILS. SHEET 8.

   A SITE GEOTECHNICAL EVALUATION OF THE SOILS INDICATES THAT APPROXIMATELY THE TOP 24–INCHES OF MATERIAL IS INADEQUATE FILL AND THAT MATERIAL NEEDS TO BE REMOVED FROM THE PROPERTY. DISPOSE OF THIS MATERIAL IN ACCORDANCE WITH ALL LOCAL AND STATE REGULATIONS. NOTE, IT IS NOT ANTICIPATED TO ENCOUNTER TOPSOIL ON THIS PROPERTY, HOWEVER, IF TOPSOIL IS OBSERVED, IT WILL BE STORED OFFSITE AND PROTECTED BY PLACEMENT OF 12–INCH COMPOST FILTER SOCK AROUND THIS MATERIAL AND IMMEDIATELY VEGETATED.
8. INSTALL STONE CONSTRUCTION ENTRANCE AS NOTED ON THE EROSION CONTROL PLAN.
9. COMMENCE INSTALLATION OF THE FOOTERS AND COLUMNS.
10. ONCE FOOTERS AND COLUMNS HAD BEEN INSTALLED, COMMENCE IMPORTING STRUCTURAL FILL MATERIAL TO BRING THE PARKING LOT TO GRADE.
11. GRADE PROPOSED PARKING AREA FOR CONSTRUCTION OF THE PARKING LOT.
12. INSTALL STORMWATER MANAGEMENT SYSTEM AND OTHER UNDERGROUND UTILITIES. ADD INLET PROTECTION AROUND ALL INLETS. ALSO, CONNECT THE STORM SEWER TO THE EXISTING PIPING SYSTEM ON MILL ROAD.
13. INSTALL CURB, STONE SUBBASE AND PAVE THE BINDER COURSE. CONCURRENTLY, INSTALL SIGNAGE, LIGHTING AND OTHER MISCELLANEOUS CONSTRUCTION ITEMS.
14. COMMENCE CONSTRUCTION OF THE SECOND FLOOR EXPANSION.CONTINUE BUILDING CONSTRUCTION UNTIL THE PROJECT IS COMPLETE.
15. CONSTRUCT CURB AND SIDEWALK ALONG MILL ROAD REMOVED AS PART OF THIS PROJECT. TRAFFIC CONTROL IN ACCORDANCE WITH SPECIFICATIONS ON SHEET 8.
16. ONCE THE BUILDING EXPANSION IS COMPLETE, APPLY A WEARING COURSE PAVEMENT TO THE PARKING LOT.
17. STRIPE PARKING LOT FOR 17–PARKING SPACES WITH ONE SPACE BEING VAN ACCESSIBLE PARKING
18. REPLACE FENCE ALONG THE DOWD PROPERTY.
19. APPLY TOPSOIL TO NON–IMPERVIOUS AREAS AND VEGETATE ACCORDING TO THE LANDSCAPING PLANS.
20. REMOVE PEDESTRIAN AND TRAFFIC BARRIERS AND CONSTRUCTION SIGNAGE
21. SITE CONSTRUCTION WILL BE CONSIDERED COMPLETE ONCE THE SITE IS STABILIZED WITH 70% PERENNIAL GROUNDCOVER OR EROSION RESISTANT SURFACES.

SOIL LIMITATIONS

Soil Name	Cutbanks Cave	Corrosive to Concrete -Steel	Droughty	Easily Erodible	Flooding	Depth to Saturated Zone /Seasonal High Water Table	Hydric Inclusions	Low strength Landslide Prone	Slow Percolation	Frost Action	Piping	Poor Source of Topsoil	Shrink -Swell Potential	Sinkhole	Ponding	Wetness
Manmade	X	c/s				X	X	X	X	X	X	X				

BID DOCUMENTS – JULY 6, 2023 REVISED: SEPTEMBER 20, 2023
BID DOCUMENT ADDENDUM #4 – OCTOBER 11, 2023

REV.	DATE	COMMENTS
2	6/22/2023	TWP. ENG'S REVIEW 6/6/2023
1	5/18/2023	TWP. ENG'S REVIEW 5/9/2023

EROSION CONTROL DETAILS AND NOTES

FILE NO.: 21–083

919 CONESTOGA ROAD - BRYN MAWR - PA - 19010

MINOR LAND DEVELOPMENT PLAN

1601 DARBY ROAD

HAVERFORD TOWNSHIP * DELAWARE COUNTY * PENNSYLVANIA

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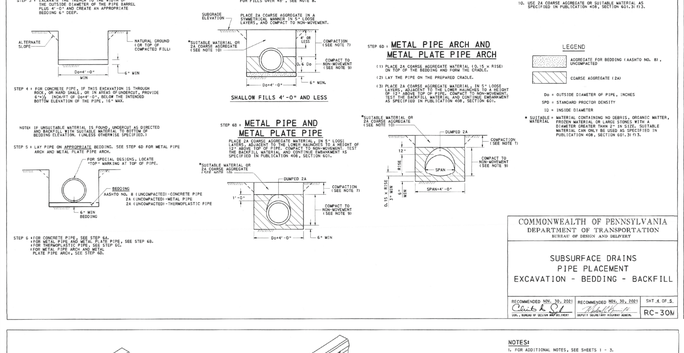
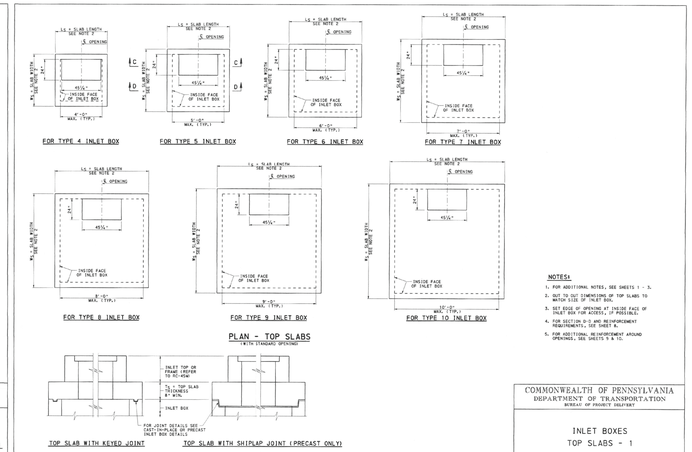
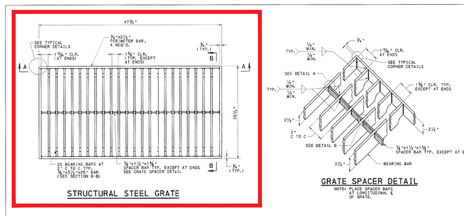
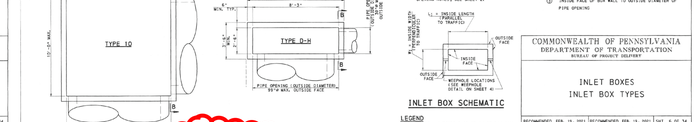
ROBERT M. NEWTON
No. PE048326
Robert M. Newton

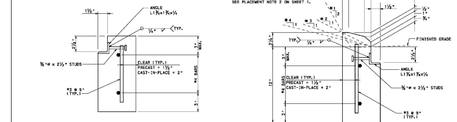
SHEET 5 OF 10
DATE: APRIL 3, 2023
SCALE: 1" = 20'

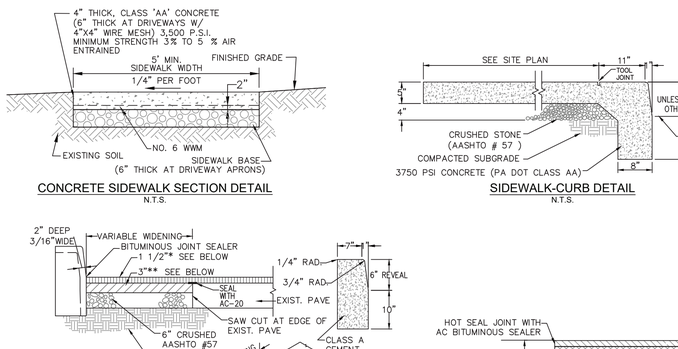


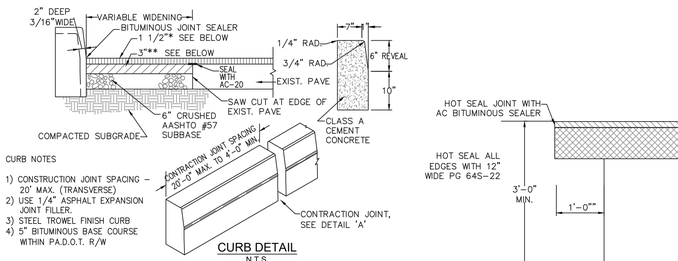


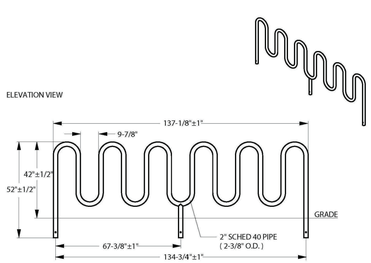












CONCRETE SIDEWALK SECTION DETAIL
N.T.S.

SIDEWALK-CURB DETAIL
N.T.S.

PARKING LOT PAVING SECTION DETAIL
N.T.S.

STOP BAR (WHITE) DETAIL
N.T.S.

COLORS: LETTERS & BORDER = WHITE (REFLECTORIZED)
BACKGROUND = RED (REFLECTORIZED)

SIGN SIZE	DIMENSIONS			SERIES	BORDER	BLANK STD
	A	B	C			
24" X 24"	24"	8"	10"	C	5/8"	B1-24
30" X 30"	30"	10"	12-1/2"	C	3/4"	B1-30

R1-1 SIGN DETAIL
N.T.S.

ANTI-SEEP COLLAR DETAIL
N.T.S.

CURB NOTES

1) CONSTRUCTION JOINT SPACING – 20' MAX. (TRANSVERSE)
2) USE 1/4" ASPHALT EXPANSION JOINT FILLER.
3) STEEL TROWEL FINISH CURB
4) 5" BITUMINOUS BASE COURSE WITHIN PA.D.O.T. R/W

CURB DETAIL
N.T.S.

* SUPERPAVE ASPHALT MIXTURE DESIGN, HMA WEARING COURSE, PG 64–22, 0.3 TO <3.0 MILLION ESALS,
9.5MM MIXTURE, 1 1/2" DEPTH, SRL–H

** SUPERPAVE ASPHALT MIXTURE DESIGN, HMA BINDER COURSE, PG 64–22, 0.3 TO <3.0 MILLION ESALS, 19MM MIXTURE

FLEXIBLE PAVEMENT RESTORATION DETAIL
N.T.S.

NOTES:
1. EXPOSED VERTICAL AND HORIZONTAL SURFACES SHALL BE PREPARED AS PER PUB 408, SECT. 413.3(g).
2. MINIMUM 1' PAVEMENT CUTBACK, EXCAVATE OLD AND TEMPORARY MATERIAL, RECOMPACT SUBBASE, TACK COAT ALL VERTICAL EDGES. INSTALL ONLY BASE COURSE AND BINDER COURSE IN ONE DAY.
3. PAVEMENT RESTORATION WILL BE PROVIDED IN ACCORDANCE WITH CHAPTER 157–30G.
4. THE PERMITTEE SHALL INCLUDE BASE REPAIR, SURFACE MILLING, AND OVERLAY FOR THE FULL WIDTH OF THE CARTWAY TO INCLUDE EDGE OF PAVING TO EDGE OF PAVING FOR THE GREATER OF THE ENTIRE BLOCK OR 100 LINEAR FEET UNDER ANY OF THE FOLLOWING CIRCUMSTANCES:
   A. WHERE THE STREET HAS BEEN OVERLAID WITHIN THE MOST RECENT FIVE YEARS.
   B. WHERE OPENINGS OF MORE THAN 25 SQUARE FEET HAVE BEEN MADE WITHIN 100 LINEAR FEET OF PAVEMENT.
   C. WHERE AN OPENING OF 50 CONTINUOUS LINEAR FEET HAS BEEN MADE.
5. ALL PAVEMENT RESTORATION SHALL BE IN ACCORDANCE WITH PAVEMENT RESTORATION CHAPTER 150–306

HEAVY DUTY WINDER | 11 LOOPS 13 BIKES

BIKE RACK DETAIL
N.T.S.

BOLLARD DETAIL
N.T.S.

STOP SIGN DETAIL
N.T.S.

STORMWATER MANAGEMENT FACILITY MAINTENANCE PLAN
THE STORMWATER MANAGEMENT SYSTEM ON THIS LOT CONSISTS AN UNDERGROUND DETENTION BED SURROUNDED BY FILTER FABRIC. WATER RUNOFF IS DIRECTED TO THE STORMWATER SYSTEM VIA CONVEYANCE PIPING THAT COLLECTS STORMWATER FROM PORTIONS OF THE ROOF. INLETS ARE PROVIDED WITH A ONE FOOT MINIMUM SUMP SO THAT DEBRIS CAN BE COLLECTED AND PEAK FLOW RATES CONTROLLED. THE SYSTEM IS DESIGNED TO PROMOTE GROUNDWATER RECHARGE.

THE RESPONSIBILITY FOR THE CONTINUED OPERATION AND MAINTENANCE OF THE STORMWATER MANAGEMENT FACILITIES ON THIS LOT IS THAT OF THE PROPERTY OWNER.

MAINTENANCE OF THE FACILITIES SHALL BE IN ACCORDANCE WITH THE FOLLOWING:

1. THE OWNER, OCCUPANT, TENANT OR OTHER USER OF THE PROPERTY SHALL NOT IMPEDE THE FLOW OF WATER DRAINING TO THE STONE BED.
2. ALL ROOF DOWNSPOUTS, INLETS, AND OTHER WATER WAYS SHALL BE KEPT OPEN TO PASS THE FLOW OF WATER TO THE BED AS INTENDED.
3. GRASS AND LANDSCAPING IN THE VICINITY OF ALL INLETS SHALL BE KEPT TRIM AND FREE FROM DEBRIS ACCUMULATION, AND DOWNSPOUTS AND INLETS SHALL BE KEPT FREE OF OBSTRUCTIONS THAT COULD BLOCK THE FREE FLOW OF WATER.
4. CLEANOUTS/INLETS SHALL BE CLEANED OF ACCUMULATED DEBRIS TO PREVENT DEBRIS FLOWING INTO THE SYSTEM. CLEANOUT/INLETS STRUCTURES SHALL BE INSPECTED AT LEAST MONTHLY TO INSURE THAT THEY ARE CLEAN AND REMAIN OPERATIONAL.
5. SUBSURFACE PIPES SHALL BE INSPECTED ON AN ANNUAL BASIS TO INSURE THAT THEY ARE CLEAN AND OPERATIONAL. ANY ACCUMULATED DEBRIS AND SILT SHALL BE REMOVED IN A TIMELY MANNER. THE SUBSURFACE PIPES SHALL BE KEPT FREE OF OBSTRUCTIONS THAT COULD BLOCK THE FREE FLOW OF WATER WITHIN THEM.
6. PROMPT REMEDIAL MEASURES ARE TO BE TAKEN IN THE EVENT OF ANY BLOCKAGE OR MALFUNCTION OF THE SYSTEM.

THE OWNER, OCCUPANT, TENANT OR OTHER USER OF THE PROPERTY SHALL NOT TAKE ANY MEASURES TO DISRUPT OR IN ANY WAY IMPAIR THE EFFECTIVENESS OF THE BED OR ITS CONTROLS. THIS INCLUDES ALTERATION OF GRADES IN ANY MANNER THAT WOULD DIVERT RUNOFF AWAY FROM THE SYSTEM.

CONSTRUCTION SPECIFICATIONS STORMWATER INFILTRATION SYSTEM
1. ALTER AND REFINE THE GRADES AS NECESSARY TO BRING SUBGRADE TO REQUIRED GRADES AND SECTIONS AS SHOWN IN THE DRAWINGS.
2. THE TYPE OF EQUIPMENT USED IN SUBGRADE PREPARATION CONSTRUCTION SHALL NOT CAUSE UNDUE SUBGRADE COMPACTION. TRAFFIC OVER SUBGRADE SHALL BE KEPT AT A MINIMUM.
3. INSTALL POLYPROPYLENE GEOTEXTILE FABRIC (I.E., DUPONT TYPAR #3401, AMOCO PROPEX #4545, OR APPROVED EQUAL) ON BOTTOM OF BED AREAS AND TACK UP SIDES OF EXCAVATION. WHERE EDGES OF ROLLS OVERLAP, THEY SHALL DO SO BY AT LEAST TWO FEET. ADEQUATE FABRIC SHALL BE LEFT ON THE ROLLS (NOT CUT FROM SIDE INSTALLATION) TO FACILITATE OVERTOPPING THE STONE AT COMPLETION OF BED AREA.
4. ALL STONE USED SHALL BE CLEAN, WASHED, CRUSHED STONE AGGREGATE MEETING PENNDOT/AASHTO #57 SPECIFICATIONS.
5. STONE BASE COURSE SHALL BE LAID OVER A DRY SUBGRADE, TO A DEPTH SHOWN IN DRAWINGS, IN LIFTS TO LAY NATURALLY COMPACTED. DO NOT ROLL OR COMPACT THE STONE BASE COURSE. KEEP THE BASE COURSE CLEAN FROM DEBRIS, CLAY AND ERODING SOIL.
6. COVER STONE BED WITH REMAINING FABRIC.
7. STONE BED TO BE TOTALLY ENCLOSED IN THE GEOTEXTILE FABRIC.

INFILTRATION BMP NOTES:
1) BMP FILTER FABRIC AND STONE SHOULD BE KEPT CLEAN OF SOIL/SEDIMENT DURING THE INSTALLATION PROCESS. IF INSPECTION INDICATES THAT SOIL SEDIMENT HAS ENTERED THE BED, APPROPRIATE MEASURES (i.e. CLEANING THE SOIL/SEDIMENT FROM FABRIC, STONE, BED ETC. AND OR REPLACEMENT OF THE FABRIC AND STONE) SHOULD BE ADDRESSED.
2) ALL STONE FOR THE CONSTRUCTION OF THE BMP SHOULD BE UNIFORMLY GRADED AND CLEAN WASHED AGGREGATE.
3) THE BOTTOM OF ALL BMPs SHALL BE UNDISTURBED OR UNCOMPACTED SUBGRADE.
4) INFLOW AND OUTFLOW POINTS INTO THE SYSTEM SHOULD BE KEPT CLEAR OF LEAVES AND OTHER DEBRIS. ANY LEAVES AND DEBRIS WILL NEGATIVELY IMPACT THE PERFORMANCE OF THE SYSTEM. ALL DOWNSPOUTS AND OVERFLOW PIPES SHOULD BE KEPT IN GOOD WORKING ORDER.
5) ALL BMPS SHALL BE LOCATED A MINIMUM OF 10' FROM A BASEMENT WALL.
6) AFTER THE BED IS COMPLETELY INSTALLED, ALL HEAVY CONSTRUCTION EQUIPMENT SHALL BE RESTRICTED FROM THE BED TO ELIMINATE IMPACTS WHICH MAY COMPROMISE IT. IN THE EVENT ANY IMPACTS COMPROMISE THE FUNCTIONALITY OF THE BEDS, IT MUST BE IMMEDIATELY REPAIRED OR REPLACED TO DESIGN SPECIFICATIONS.

STORMWATER OPERATION AND MAINTENANCE NOTES
LANDSCAPING
THE PROPERTY OWENRE SHALL PROVIDE INSPEXTION AND MAINTENANCE IN THE SPRING AND FALL. MAINTENANCE INCLUDES MULCHING, PRUNING, MOWING, WATERING, APPLYING FERTILIZER AND REMOVAL / REPLAMENT OF DEAD OR DYING VEGETATION.

BASIN
PROPOSED DETENTION BASIN THAT WILL PROVIDE STORMWATER MANAGEMENT FOR THE PROPERTY. THE PROPERTY OWNER IS RESPONSIBLE FOR BIANNUAL INSPECTION AND MAINTENANCE. MAINTENANCE INCLUDES REMOVAL OF DBRIS AND TRASH FROM THE BASIN, REPAIR OF EROSIONAL FEATURES, INSPECTION OF HE OUTLET STRUCTURE AND DISCHARGE PIPING SYSTEM, AS WELL AS MAINTAINING 90% GROUND COVER DURING PERIODS OF DROUGHT. DURING DROUGHTY PERIODS, VEGETATION MIGHT REQUIRE IRRIGATION.

DETENTION BASIN OUTLET STRUCTURE
THE OUTLET STRUCTURE PRIMARY FUNCTION IS TO MITIGATE RUNOFF FROM THE PROPERTY, SO THAT DISCHARGES FROM THE BASIN COMPLY WITH LEGAL REQUIREMTNTS AS ESTABLISHED BY THE COMMONWEALTH OF PENNSYLVANIA AND HAVERFORD TOWNSHIP. THE PROPERTY OWER IS RESPONSIBLE FOR INSPECTION AND MAINTENANCE. INSPECTIONS SHALL BE CONDUCTED EACH SPRING AND FALL AND THE APPROPRIATE MAINTENANCE PROVIDED. MANINTENANCE SHALL INCLUDE REMOVAL OF DEBRIS INCLUDING SEDIMENT AND STRUCTURALOR FOUNDATION REPAIRS, IF NECESSARY.

VEGETATED NON–IMPERVOUS AREAS
PERENNIAL GROUNDCOVER INCLUDING GRASS AND LANDSCAPE MATERIALS SUCH AS TREES, SHRUBS, ANNUAL / PERENNIAL BEDS AND MULCH ARE PROPOSED TO ASSIMILATE AND FILTER STORMWATER RUNOFF. THE PROPERYT OWNERE WILL PROVIDE MAINTENANCE. THIS MEINTENANCE INCLUDES PROVIDING LAWN AREAS WITH A MINIMUM OF NINETY PERCENT (90%) GROUND COVER, WATERING, PRUNING, APPLYING FERTILIZER, AND REPLACMETN OF MULCH AND DEAD OR DYING VEGETATION. LANDSCAPING INSPECXTION SHALL BE CONDUCTED IN THE SPRING AND FALL OF EACH YEAR.

MPT NOTES
1. THIS WORK CONSISTS OF MAINTENANCE OF TRAFFIC AND PROTECTION OF THE PUBLIC WHEN APPROACHING AND DEPARTING THE CONSTRUCTION AREA AND WITHIN THE LIMITS OF CONSTRUCTION.
2. FURNISH, ERECT, PLACE AND MAINTAIN TRAFFIC CONTROL SIGNS AND DEVICES. MAINTAIN TRAFFIC DURING HOURS OF CONSTRUCTION AND AT ALL OTHER TIMES CONSISTENT WITH THE METHODS INDICATED ON THESE DRAWINGS AND THE FOLLOWING:
   2.1. THE SPECIAL PROVISIONS OF THE CONTRACT.
   2.2. 67 PA CODE, CHAPTER 203/212, WORK ZONE TRAFFIC CONTROL.
   2.3. 67 PA CODE, CHAPTER 211/212, OFFICIAL TRAFFIC CONTROL DEVICES.
   2.4. PENNDOT PUBLICATION NO. 35, APPROVED CONSTRUCTION MATERIALS (BULLETIN 15).
   2.5. PENNDOT PUBLICATION NO. 408, SPECIFICATIONS.
3. REMOVE THESE DEVICES IMMEDIATELY UPON COMPLETION OF THE WORK. THE DEPARTMENT WILL REMOVE ANY TRAFFIC CONTROL DEVICES ERECTED BY DEPARTMENT FORCES.
4. PERMITTEE MUST ARRANGE FOR INSPECTION OF ALL TRAFFIC CONTROL DEVICES PRIOR TO START OF WORK.
5. COVER OR REMOVE ALL CONFLICTING SIGNS AND ERADICATE ALL CONFLICTING PAVEMENT MARKINGS.
6. MOUNT ALL LONG TERM ADVANCE WARNING SIGNS ON TYPE III BARRICADES UNLESS OTHERWISE NOTED OR INSTRUCTED BY DISTRICT OFFICE.
7. ALL SIGNS AND DEVICES TO BE MAINTAINED IN NEW OR LIKE NEW CONDITION.
8. DRIVEWAYS WILL BE KEPT ACCESSIBLE AT ALL TIMES. LOCATE ALL SIGNS SO THAT SIGHT DISTANCES WILL NOT BE OBSTRUCTED AT DRIVEWAYS AND LOCAL ROADS.
9. ALL LONG TERM ADVANCE WARNING SIGNS ARE TO CONFORM TO CURRENT STANDARDS (E.G. TYPE VIII REFLECTORIZED SHEETING ON FREEWAYS OR EXPRESSWAYS AND TYPE III REFLECTORIZED SHEETING ON OTHER ROADS).
10. NO TRAFFIC RESTRICTIONS OR LANE CLOSURES ARE PERMITTED ON LEGAL HOLIDAYS AND/OR BETWEEN THE HOURS OF 6:00 AM TO 9:00 AM AND 3:00 PM TO 6:00 PM, MONDAY THROUGH FRIDAY.
11. PERMITTEE SHALL NOTIFY LOCAL EMERGENCY AUTHORITIES (E.G. POLICE, FIRE, MEDICAL), AFFECTED BUSINESSES, SCHOOL DISTRICT(S), THE GENERAL PUBLIC, THE DISTRICT PERMIT MANAGER AND THE DISTRICT APRAS COORDINATOR AT LEAST FOURTEEN DAYS PRIOR TO ANY SIGNIFICANT TRAFFIC IMPACTS (E.G. LATERAL WIDTH RESTRICTIONS LESS THAN 16 FEET, DETOURS).

BID DOCUMENTS – JULY 6, 2023 REVISED: SEPTEMBER 20, 2023

BID DOCUMENT ADDENDUM #4 – OCTOBER 11, 2023

REV.	DATE	COMMENTS
2	6/22/2023	TWP. ENG'S REVIEW 6/6/2023
1	5/18/2023	TWP. ENG'S REVIEW 5/9/2023

STORMWATER / CONSTRUCTION DETAILS

FILE NO.: 21–083

919 CONESTOGA ROAD - BRYN MAWR - PA - 19010

MINOR LAND DEVELOPMENT PLAN

1601 DARBY ROAD

HAVERFORD TOWNSHIP * DELAWARE COUNTY * PENNSYLVANIA

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ROBERT M. NEWTON
No. PE048326

Robert M. Newton

SHEET	6 OF 10
DATE:	APRIL 3, 2023
SCALE:	AS NOTED

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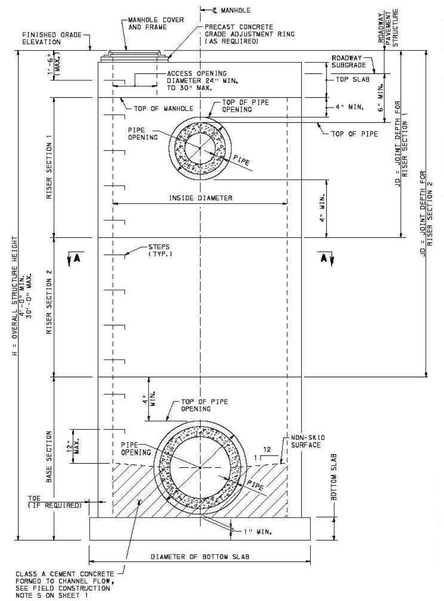
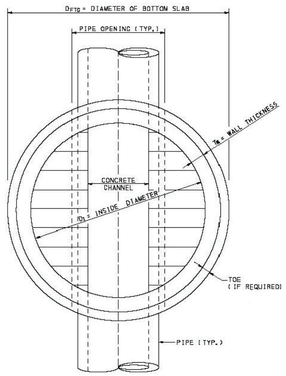


STORMWATER MANHOLE ASSEMBY DETAIL
N.T.S.

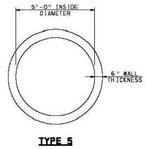


SECTION A-A

NOTES:

1. FOR NOTES, SEE SHEETS 1 - 3.
2. FOR PIPE LOCATION AND PIPE OPENING NOTES SEE SHEET 2.
3. FOR MANHOLE TYPES, SEE SHEET 4.
4. FOR ADDITIONAL MANHOLE ASSEMBLIES, SEE SHEET 6.
5. FOR PRECAST GRADE ADJUSTMENT RING DETAILS, SEE SHEET 8.
6. FOR MANHOLE COVER AND FRAME DETAILS, SEE SHEET 9.
7. FOR STEP DETAILS, SEE SHEET 10.
8. FOR TOP SLAB DETAILS, SEE SHEETS 11 - 15.
9. FOR ROUND TRANSITION SLAB DETAILS, SEE SHEETS 16 & 17.
10. FOR SQUARE TRANSITION SLAB DETAILS, SEE SHEETS 18 & 19.

MILL STREET PLANTING ISLANDS
GRANITE CURB DETAIL
N.T.S.



NOTES:

1. FOR NOTES, SEE SHEETS 1 - 3.
2. FOR MANHOLE ASSEMBLIES, SEE SHEETS 5 & 6.

TYPE 5

STORMWATER MANHOLE TYPE 5 DETAIL
N.T.S.

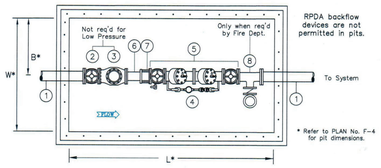
FIRE SERVICE LINES - 4", 6", 8", and 10"

"Closed System" has no fire hydrants

Residential — LOW PRESSURE (up to 100 psi) — HIGH PRESSURE (over 100 psi) See notes below.

Non-Residential — LOW PRESSURE (up to 150 psi) — HIGH PRESSURE (where pressure may exceed 150 psi) See note below.

RPZA for systems with chemical additives (anti-freeze systems)
DCVA for systems with no chemical additives



	ITEM				
1	Line Size (Cement-lined D.I.P.) as approved by Aqua	4"	6"	8"	10"
2	R.S. Gate Valve, O.S.&Y., Flanged	4"	6"	8"	10"
3	Pressure Reducing Valve (PRV)	SIZED BY CUSTOMER			
4	Meter (by Aqua)	5/8 x 3/4"	5/8 x 3/4"	5/8 x 3/4"	5/8 x 3/4"
5	Backflow Device Assembly — DCDA or RPDA	4"	6"	8"	10"
6	Spool Piece, Fig x PE — Length = 12 in. (min.)	4"	6"	8"	10"
7	Flanged Coupling Adapter	Ford Style FFCA or Smith-Blair Style 913			
8	Tee for FDC, only if req'd by local Fire Dept.	4"	6"	8"	10"
	Branchline sized by local Fire Department if required.	SIZED BY LOCAL FIRE DEPARTMENT			

Notes:

A. It is the CUSTOMER's responsibility to address THERMAL EXPANSION before the installation of a PRV or backflow device. All Fire systems should have a Pressure Relief Valve.

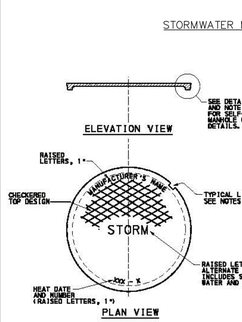
B. Water Company Rules & Regulations require that all of the specifications are met and a meter is set before water service is turned on.

C. It is the CUSTOMER's responsibility to size the pressure reducing valve(s) to fit their flow needs. Two-stage reduction may be needed where there is a wide variation between the initial pressure and the reduced pressure. Parallel installation may be needed where there is a wide variation of reduced pressure requirements, where it is vital to maintain a continuous water supply, or other reasons for improved performance.

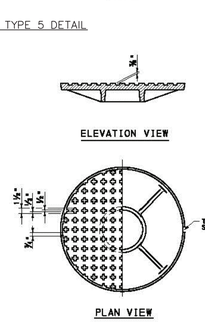
D. Each part must be NSF/ANSI 61 (Annex F & G) compliant. Entire unit must be NSF/ANSI 372 compliant.

E. DCDA & RPDA Assemblies must be UL & FM approved.

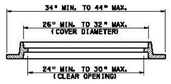
6" FIRE VALVE BOX DETAIL
N.T.S.



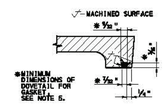
CAST IRON MANHOLE COVER
(PLATEN COVER)



CAST IRON MANHOLE COVER
(RIBBED COVER)
(PLAIN COVER SHOWN, SEE PLATEN COVER DETAIL FOR LETTERING REQUIREMENTS)



ELEVATION VIEW OF MANHOLE FRAME

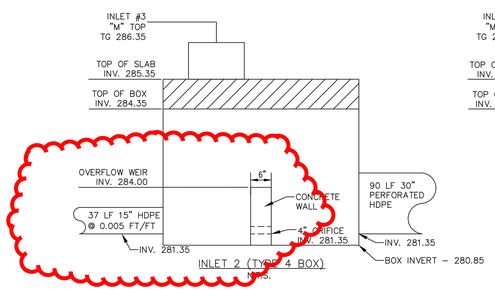


DETAIL A
GASKET SEALING SYSTEM

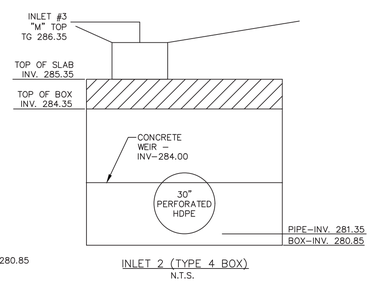
MANHOLE COVER AND FRAME NOTES:

1. PROVIDE MANHOLE COVERS AND FRAMES AS SPECIFIED IN PUBLICATION 408, SECTION 605.2(b).
2. DESIGN MANHOLE COVERS AND FRAMES FOR PHL-93 OR HS-25 LOADINGS. IF MANHOLES ARE NOT IN OR ADJACENT TO ROADWAY, DESIGN FOR ALL POSSIBLE LIVE LOADS AS APPROVED BY THE DEPARTMENT.
3. PROVIDE GRAY CAST IRON CONFORMING TO AASHTO M105, CLASS 35B AND AASHTO M306.
4. PROVIDE MANHOLE COVERS AND FRAMES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. FOR DEVIATIONS OR MODIFICATIONS OF THE STANDARDS, SUBMIT SHOP DRAWINGS TO THE BUREAU OF DESIGN AND DELIVERY, HIGHWAY DESIGN AND TECHNOLOGY DIVISION CHIEF FOR REVIEW AND ACCEPTANCE.
5. PROVIDE A GASKET SEALING SYSTEM, DOVETAIL GROOVE AND CONTINUOUS GASKET, AS INDICATED IN DETAIL A, TO PREVENT INFLOW THROUGH THE BEARING SURFACES, OR SURFACE RUNOFF WATER INTO THE MANHOLE SYSTEM, WHEN SPECIFIED. PROVIDE 1/2" DIAMETER ONE PIECE SELF-SEAL POLYISOPRENE ROUND GASKET, 40 DUROMETER GLUED IN PLACE. PROVIDE TWO (2) LIFT HOLES AT 180 DEGREES TO FACILITATE COVER REMOVAL FOR SELF-SEALING MANHOLE COVER.
6. PROVIDE TWO (2) LIFT HOLES AT 180 DEGREES TO FACILITATE COVER REMOVAL FOR NON-SEALING MANHOLE COVER.
7. FRAME TO HAVE A MINIMUM BEARING SEAT OF 1" FOR MANHOLE COVER.
8. LOCATE TOP OF FRAME 1/2" BELOW THE TOP OF THE ROADWAY SURFACE.
9. ATTACH FRAME AND/OR PRECAST CONCRETE GRADE ADJUSTMENT RINGS RIGIDLY TO THE TOP OF THE MANHOLE. USE 3-1/2" THREADED STUDS (MINIMUM WITH HEX HEAD NUTS AND WASHERS), INSERTED THROUGH 3/4" DIAMETER HOLES (MINIMUM) THROUGH THE FRAME AND/OR RING. SPACE HOLES AT 120 DEGREES (MAXIMUM) AND 2" (MINIMUM) FROM OUTSIDE EDGE OF FRAME/RING. EMBED STUDS 4" MINIMUM INTO MANHOLE. GROUT STUDS INTO MANHOLE.
10. SET THE BASE OF THE FRAME ON A NON-SHRINK GROUT PAD TO PROVIDE FULL BEARING ON THE SUPPORTING SURFACE. NON-SHRINK GROUT IS ALSO PERMITTED FOR CROSS SLOPE AND LONGITUDINAL GRADE ADJUSTMENTS.
    - PROVIDE NON-SHRINK GROUT AS SPECIFIED IN PUBLICATION 408, SECTION 1001.2(d).
    - MINIMUM GROUT DEPTH = 1/2"
    - MAXIMUM GROUT DEPTH = 1"

STORMWATER MANHOLE COVERS AND FRAMES
N.T.S.



INLET 2 (TYPE 4 BOX)
N.T.S.



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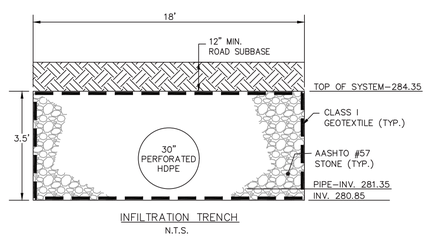
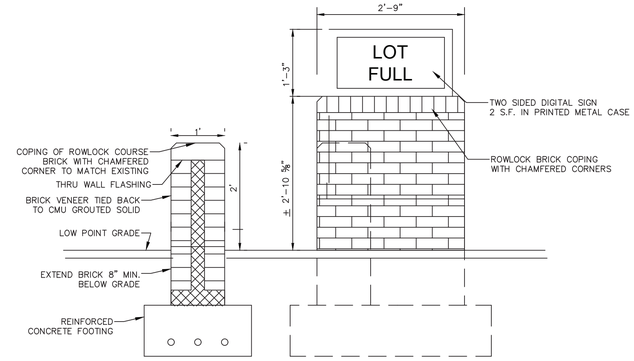


INFILTRATION TRENCH
N.T.S.



WALL SECTION
N.T.S.

WALL ELEVATION
N.T.S.

BID DOCUMENTS – JULY 6, 2023 REVISED: SEPTEMBER 20, 2023
BID DOCUMENT ADDENDUM #4 – OCTOBER 11, 2023

REV.	DATE:	COMMENTS
2	6/22/2023	TWP. ENG'S REVIEW 6/6/2023
1	5/18/2023	TWP. ENG'S REVIEW 5/9/2023

STORMWATER / CONSTRUCTION DETAILS

FILE NO.: 21-083

919 CONESTOGA ROAD - BRYN MAWR - PA - 19010

MINOR LAND DEVELOPMENT PLAN

1601 DARBY ROAD

HAVERFORD TOWNSHIP * DELAWARE COUNTY * PENNSYLVANIA

ONE-CALL:	20170390179	APPLICANT
DRAWN BY:	RC	HAVERFORD TOWNSHIP FREE LIBRARY
CHECKED BY:	RMN	1601 DARBY ROAD HAVERTOWN, PA 19083

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ROBERT M. NEWTON ENGINEER No. PE048329

Robert M. Newton

SHEET 7 OF 10
DATE: APRIL 3, 2023
SCALE: 1" = 20'

C:\USERS\MWASCH\APPDATA\LOCAL\TEMP\ACPUBLISH_10888\A05-A10

ABBREVIATIONS

A	
AFF	ABOVE FINISHED FLOOR
ADD	ADDENDUM
ADDL	ADDITIONAL
ADJ	ADJACENT
ALT	ALTERNATE
APPROX	APPROXIMATE
ARCH	ARCHITECTURAL
AESS	ARCHITECTURAL EXPOSED STRUCTURAL STEEL
B	
BM	BEAM
BRG, BRNG	BEARING
BP	BEARING PLATE
BW	BEARING WALL
BTWN	BETWEEN
BLKG	BLOCKING
BS	BOTH SIDES
BOT	BOTTOM
B.O.	BOTTOM OF
BLDG	BUILDING
C	
CANT	CANTILEVER
CANT LE	CANTILEVER LEFT END
CANT RE	CANTILEVER RIGHT END
CIP	CAST IN PLACE
CTR	CENTER
CL	CENTER LINE
CTD	CENTERED
CLR	CLEAR
COL	COLUMN
CONC	CONCRETE
CC	CONCRETE COLUMN
CMU	CONCRETE MASONRY UNIT
CONN	CONNECTION
CJ	CONSTRUCTION JOINT
CONST	CONSTRUCTION
CONT	CONTINUOUS
CJ	CONTROL JOINT
COORD	COORDINATE
CW	CURTAIN WALL
D	
DL	DEAD LOAD
DJ	DEFLECTION JOINT
D	DEPTH, DEEP
DET, DTL	DETAIL
DIA, Ø	DIAMETER

DIM	DIMENSION
DBL	DOUBLE
DWLS	DOWELS
DN	DOWN
DWG	DRAWING
DWGS	DRAWINGS
E	
EA	EACH
EF	EACH FACE
EW	EACH WAY
EWEF	EACH WAY EACH FACE
EOS	EDGE OF SLAB
EL	ELEVATION
ELEV	ELEVATOR
EQ	EQUAL
EQUIP	EQUIPMENT
EXIST	EXISTING
EI	EXISTING
EXP BLT	EXPANSION BOLT
EJ	EXPANSION JOINT
EXT	EXTERIOR
EIFS	EXTERIOR INSULATION FINISH SYSTEM
F	
FIN	FINISH
FF	FINISH FLOOR
FLR	FLOOR
FD	FLOOR DRAIN
FT	FOOT
FDN	FOUNDATION
FRM	FRAMING
G	
GALV	GALVANIZED
GA	GAUGE
GEN	GENERAL
GT	GIRDER TRUSS
GR	GRADE
GB	GRADE BEAM
GND	GROUND
GYP BD	GYPSUM BOARD
H	
HDW	HARDWARE
HS	HAUNCHED SLAB
HS	HEADED STUD
HT	HEIGHT
HP	HIGH POINT

HB	HOIST BEAM
HK	HOOK
HORZI	HORIZONTAL
HEF	HORIZONTAL EACH FACE
HIF	HORIZONTAL INSIDE FACE
HOF	HORIZONTAL OUTSIDE FACE
HR	HOUR
HSKP	HOUSEKEEPING
I	
INT	INTERIOR
IBC	INTERNATIONAL BUILDING CODE
J	
JT	JOINT
K	
k	KIPS (1000lbs)
KSF	KIPS PER SQUARE FOOT
KO	KNOCK-OUT
L	
L	ANGLE
LBS	POUNDS
LW	LIGHT WEIGHT CONCRETE
LL	LIVE LOAD
LOC	LOCATION
LG	LONG
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LP	LOW POINT
M	
MFR, MANUF	MANUFACTURER
MAS	MASONRY
MO	MASONRY OPENING
MAT'L	MATERIAL
MAX	MAXIMUM
MECH	MECHANICAL
MEP	MECHANICAL, ELECTRICAL, PLUMBING
MEMB	MEMBRANE
MTL	METAL
MIN	MINIMUM
MISC	MISCELLANEOUS
N	
NS	NEAR SIDE
NOM	NOMINAL
NBL	NON-BEARING LINTEL

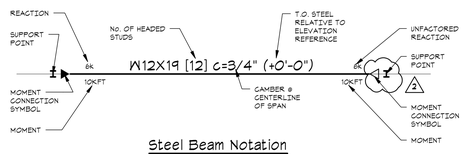
NBMH	NON-BEARING METAL HEADER
NBWH	NON-BEARING WOOD HEADER
NW	NORMAL WEIGHT CONCRETE
N/A	NOT AVAILABLE
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
O	
o/c	ON CENTER
OPNG	OPENING
OPP	OPPOSITE
OH	OPPOSITE HAND
OD	OUTSIDE DIAMETER
OSF	OUTSIDE FACE
P	
PTD	PAINTED
PK	PAIR
PENT	PENTHOUSE
PL	PLATE
PLUMB	PLUMBING
PLYWD	PLYWOOD
PT	POINT
PCF	POUNDS PER CUBIC FOOT
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
P/C	PRECAST CONCRETE
PREFAB	PREFABRICATED
PT	PRESSURE TREATED
PL	PROPERTY LINE
R	
RAD	RADIUS
REF	REFER OR REFERENCE
RCP	REFLECTED CEILING PLAN
REINF	REINFORCING
REBAR	REINFORCING BAR
REQ'D	REQUIRED
RW	RETAINING WALL
RD	ROOF DRAIN
RR	ROOF RAFTER
RM	ROOM
RO	ROUGH OPENING
S	
SCHED	SCHEDULE
SECT	SECTION
SIM	SIMILAR
SOG	SLAB ON GRADE
SSF	SOLID SURFACE

SPCG	SPACING
SPEC	SPECIFICATION
SQ	SQUARE
SS	STAINLESS STEEL
STD	STANDARD
SBC	STANDARD BUILDING CODE
STL	STEEL
SF	STEPPED FOOTING
STIFF	STIFFENER
STIR	STIRRUP
STRUC	STRUCTURAL
SO	STRUCTURAL OPENING
SDL	SUPERIMPOSED DEAD LOAD
SYM	SYMMETRICAL
T	
THK	THICK, THICKNESS
TS	THICKENED SLAB
TSF	THICKENED SLAB FOOTING
T	TOP
T&B	TOP & BOTTOM
T.O.	TOP OF
T.O.B.	TOP OF BEAM
T.O.C.	TOP OF CONCRETE
T.O.C.B.	TOP OF CURB
T.O.F.	TOP OF FOOTING
T.O.P.	TOP OF PARAPET
T.O.S.	TOP OF SLAB
T.O.STL.	TOP OF STEEL
T.O.W.	TOP OF WALL
TDS	TURNED DOWN SLAB
TN	TRENCH DRAIN
TYP.	TYPICAL
U	
UNO	UNLESS NOTED OTHERWISE
V	
VAR	VARIES
VERT	VERTICAL
W	
WWF	WELDED WIRE FABRIC
WF	WIDE FLANGE
W	WIDTH, WIDE
WL	WIND LOAD
W/	WITH
W/O	WITHOUT
WOOD	WOOD
WP	WORK POINT

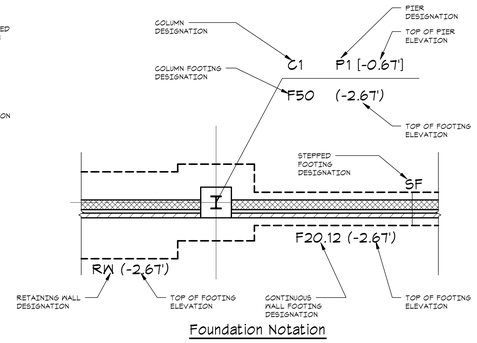
DRAWING SYMBOLS

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	MOMENT CONNECTION - BEAM TO BEAM OR BEAM TO COLUMN - SEE PLAN FOR REQUIRED CONNECTION MOMENT CAPACITY. IF NO LOAD SHOWN, PROVIDE FULL CAPACITY OF BEAM IN ADDITION TO FULL DEPTH SHEAR CONNECTION	1 / S-XXX	SECTION MARK
2	FLEXIBLE MOMENT CONNECTION (FMC) - BEAM TO COLUMN CONNECTION. SEE PLAN FOR REQUIRED CONNECTION MOMENT. IF NO LOAD SHOWN, SEE TYPICAL DETAILS.	1 / S200	BUILDING ELEVATION
	SLIDING CONNECTION @ EXPANSION JOINT	A101	DETAIL/ ENLARGED PLAN CALLOUT
	CRIPPLE POINT IN STEEL MEMBER - SEE TYPICAL DETAIL FOR ADDITIONAL INFORMATION.	RTU 1 1000#	MECHANICAL UNIT ID & WEIGHT
	CHANGE IN SLAB ELEVATION	A	WALL TAG
[...]	SPOT ELEVATION LOCATION	T.O. WHAT EL. (SEE PLAN)	LEVEL DESIGNATION
S/ D_	SLAB/ DECK CONSTRUCTION TAG - SEE SCHEDULE ON DRAWING FOR ADDITIONAL INFORMATION	O	STRUCTURAL GRID DESIGNATION
	UTILITY LINE - COORDINATE SIZE & INVERT W/ UTILITY DRAWINGS	O	EXISTING STRUCTURAL GRID DESIGNATION
	SLAB CONTROL/ CONSTRUCTION JOINT - SEE TYPICAL DETAILS FOR ADDITIONAL INFORMATION		ROOF VALLEY DESIGNATION
	SLAB SLOPE LINE (VALLEY/ HIP IN SLAB)		ROOF HIP/ RIDGE DESIGNATION
FD	FLOOR DRAIN - COORDINATE SIZE & LOCATION W/ ARCHITECTURAL & PLUMBING DRAWINGS	(___)	TOP OF FOOTING ELEVATION
TD	TRENCH DRAIN - COORDINATE SIZE & LOCATION W/ ARCHITECTURAL & PLUMBING DRAWINGS	(___)	TOP OF PIER ELEVATION
SL	SLOPE OF FLOOR/ ROOF/ SLAB	(___)	APPROXIMATE ELEVATION OF EXISTING FOOTING

STRUCTURAL PLAN NOTATION



Steel Beam Notation



Foundation Notation

MATERIAL LEGEND

CONCRETE/ PRECAST CONCRETE	SHEAR WALLS
COMPACTED EARTH / SITEWORK	RIGID INSULATION
CRUSHED STONE	GROUT
ARCHITECTURAL VENEER	STEEL
CONCRETE MASONRY UNIT	PLYWOOD SHEATHING/ DECKING
IVANY CONCRETE MASONRY UNIT	POROUS FILL
AREA OF OVERFRAMING	UNDERPINNING
MECHANICAL UNIT	WOOD
FIBERMESH	POST TENSION STRAND

DRAWING LIST

SHEET NUMBER	SHEET NAME
S0.1	COVER SHEET
S0.2	GENERAL NOTES
S0.3	GENERAL NOTES (CONT.)
S0.4	GENERAL NOTES (CONT.) & PROJECT SCHEDULES
S1.0	FOUNDATION PLAN
S1.1	FIRST FLOOR FRAMING PLAN
S1.2	SECOND FLOOR FRAMING PLAN
S1.3	ROOF & HIGH ROOF FRAMING PLANS
S5.1	TYPICAL FOUNDATION DETAILS
S5.2	FOUNDATION SECTIONS & DETAILS
S5.11	TYPICAL FRAMING DETAILS
S5.12	FRAMING SECTIONS & DETAILS
S5.13	FRAMING SECTIONS & DETAILS

PRICING NOTE: THESE DOCUMENTS REPRESENT THE CURRENT STATE OF A DEVELOPING DESIGN AND AS SUCH, NOT ALL CONDITIONS ARE CURRENTLY SHOWN. ALL STRUCTURAL DETAILS AND CONNECTIONS SHOULD BE ACCOUNTED FOR IN THE GENERAL CONTRACTOR PRICE AND SCOPE OF SERVICES, WHETHER THE SPECIFICS OF THESE CONDITIONS ARE SHOWN OR NOT SHOWN ON THESE DOCUMENTS

BERNARDON
A CORE STATES GROUP COMPANY
ARCHITECTURE
INTERIOR DESIGN
LANDSCAPE ARCHITECTURE

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Wilmington, Delaware 19801
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DCI ENGINEERS®
1255 Drummers Lane, Suite 201
Wayne, PA 19087
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WEBSITE: www.dci-engineers.com
CIVIL / STRUCTURAL

JOB NUMBER: 22181-0254
JOB CONTACT: S. KRUMENACKER

Project:

HAVERFORD TOWNSHIP FREE LIBRARY
1601 Darby Road
Haverford Township
Havertown, PA 19083

Owner:

HAVERFORD TOWNSHIP FREE LIBRARY
1601 Darby Road
Haverford Township
Havertown, PA 19083

Revision/Issue:

0	05/31/2023 - Issued for Permit
1	09/30/2023 - Issued for Bidding
2	10/17/2023 - Addendum 4

Drawn:	CAD
Reviewed:	HVB
Contact:	H. Bands
Project Number:	7010.03-22

Sheet Title:

COVER SHEET

Sheet Number:

S0.1

STRUCTURAL - GENERAL NOTES

GENERAL REQUIREMENTS

GOVERNING CODE: The design and construction of this project is governed by the "International Building Code (IBC)", 2018 Edition, hereafter referred to as the IBC, as adopted and modified by Haverford Township, PA, understood to be the Authority Having Jurisdiction (AHJ).

GOVERNING CODE: The design and construction of this project is governed by the “International Existing Building Code (IEBC)”, 2018 Edition, here after referred to as the IEBC, as adopted and modified by the AHJ.

REFERENCE STANDARDS: Refer to Chapter 35 of 2018 IBC. Where other Standards are noted in the drawings, use the latest edition of the standard unless a specific date is indicated. Reference to a specific section in a code does not relieve the contractor from compliance with the entire standard.

DEFINITIONS: The following definitions cover the meanings of certain terms used in these notes:

“**Architect/Engineer**” – The Architect of Record and the Structural Engineer of Record.

- “**Structural Engineer of Record**” **(SER)** – The structural engineer who is licensed to stamp & sign the structural documents for the project. The SER is responsible for the design of the Primary Structural System.
- "**Submit for review**" - Submit to the Architect/SER for review prior to fabrication or construction.
- “**Per Plan**” – Indicates references to the structural plans, elevations and structural general notes.
- “**Seismic Force Resisting System (SFRS)**” **–** A recognized structural system of components (beams, braces, drags, struts, collectors, diaphragms, columns, walls, etc) of the primary structure that are specially designed and proportioned to resist earthquake-induced ground motions and maintain stability of the structure. Fabrication and installation of components designated as part of the SFRS require the general contractor, subcontractor, or supplier who is responsible for any portion of SFRS fabrication or installation to comply with special requirements (including, but not limited to, material control, compliance certifications, personnel qualifications, documentation, reporting requirements, etc) and to provide the required Quality Control including the required coordination of Special Inspections (Quality Assurance – QA). Special provisions apply to any member designated as part of the SFRS. Refer to plans, elevations, details, Design Criteria and Symbols and Legends for applicable members and connections.
- **“Specialty Structural Engineer” (SSE) –** A professional engineer (PE or SE), licensed in the State where the project is located, (typically not the SER), who performs specialty structural engineering services for selected specialty-engineered elements identified in the Contract Documents, and who has experience and training in the Specialty. Documents stamped and signed by the SSE shall be completed by or under the direct supervision of the SSE.
- **“Bidder-designed” –** Components of the structure that require the general contractor, subcontractor, or supplier who is responsible for the design, fabrication and installation of specialty-engineered elements identified in the Contract Documents to retain the services of an SSE. Submittals of “Bidder-designed” elements shall be stamped and signed by the SSE.

SPECIFICATIONS: Refer to the project specifications issued as part of the contract documents for information supplemental to these drawings.

OTHER DRAWINGS: Refer to the architectural, mechanical, electrical, civil and plumbing drawings for additional information including but not limited to: dimensions, elevations, slopes, door and window openings, non-bearing walls, stairs, finishes, drains, waterproofing, railings, curtain walls, elevators, curbs, depressions, mechanical unit locations, and other nonstructural items.

STRUCTURAL DETAILS: The structural drawings are intended to show the general character and extent of the project and are not intended to show all details of the work. Use entire detail sheets and specific details referenced in the plans as “typical” wherever they apply. Similarly, use details on entire sheets with “typical” in the name wherever they apply.

STRUCTURAL RESPONSIBILITIES: The structural engineer (SER) is responsible for the strength and stability of the primary structure in its completed form.

COORDINATION: The Contractor is responsible for coordinating details and accuracy of the work; for confirming and correlating all quantities and dimensions; for selecting fabrication processes; for techniques of assembly; and for performing work in a safe and secure manner.

EXISTING CONDITIONS: Information shown on the drawings related to existing conditions represent the present knowledge, but without guarantee of accuracy. Report conditions that conflict with contract documents to the architect or SEOR. Do not deviate from the contract documents without written direction from the architect and/or SEOR. All existing dimensions and information shall be field verified prior to fabrication as required to coordinate with new construction.

NEW CONSTRUCTION: The contractor shall remove all interfering items for new construction and shall repair or replace all removed items to match the existing conditions in accordance with the architectural drawings. New construction elements shall be designed and installed per current International Building Code 2018, hereafter referred to as IBC as allowed by IEBC.

PRE-CONSTRUCTION MEETINGS: The Contractor is responsible for coordinating pre-construction meetings prior to commencing work. A pre-con meeting, scheduled approximately two weeks prior to the start of the relevant work, is required for the structural steel phase of construction. Attendees for pre-construction meeting are to include contractor, relevant subcontractors, fabricators, inspectors, architect/SER, and representative of the Authority Having Jurisdiction where required. Meeting agendas are to include review of the work scope, project schedule relevant to the work, contact information of responsible parties, inspection points, review of materials and any special cases or issues, procedures for clarifications if required, testing and acceptance, etc.

MEANS, METHODS and SAFETY REQUIREMENTS: The contractor is responsible for the means and methods of construction and all job related safety standards such as OSHA and DOSH (Department of Occupational Safety and Health). Contractor is responsible to adhere to OSHA regulations regarding steel erection items specifically addressed in the latest OSHA regulations. Bolting and field welding at all member connections is to be completed prior to the release of the member from the hoisting mechanism unless reviewed and approved by the General Contractor’s temporary bracing and shoring design engineer. The construction documents represent the completed structure. The contractor is responsible for means and methods of construction related to the intermediate structural conditions (i.e. movement of the structure due to moisture and thermal effects; construction sequence; temporary bracing, etc).

BRACING/SHORING DESIGN ENGINEER: The contractor shall at their discretion employ an SSE, a registered professional engineer for the design of any temporary bracing and shoring.

TEMPORARY SHORING, BRACING: The contractor is responsible for the strength and stability of the structure during construction and shall provide temporary shoring, bracing and other elements required to maintain stability until the structure is complete. It is the contractor's responsibility to be familiar with the work required in the construction documents and the requirements for executing it properly.

CONSTRUCTION LOADS: Loads on the structure during construction shall not exceed the design loads as noted in DESIGN CRITERIA & LOADS below or the capacity of partially completed construction as determined by the Contractor’s SSE for Bracing/Shoring.

CHANGES IN LOADING: The contractor has the responsibility to notify the SER of any architectural, mechanical, electrical, or plumbing load imposed onto the structure that differs from, or that is not documented on the original Contract Documents (architectural / structural / mechanical / electrical or plumbing drawings). Provide documentation of location, load, size and anchorage of all undocumented loads in excess of 400 pounds. Provide marked-up structural plan indicating locations of any new equipment or loads. Submit plans to the Architect/Engineer for review prior to installation.

NOTE PRIORITIES: Plan and detail notes and specific loading data provided on individual plans and detail drawings supplements information in the Structural General Notes.

DISCREPANCIES: In case of discrepancies between the General Notes, Specifications, Plans/Details or Reference Standards, the Architect/Engineer shall determine which shall govern. Discrepancies shall be brought to the attention of the Architect/Engineer before proceeding with the work. Should any discrepancy be found in the Contract Documents, the Contractor will be deemed to have included in the price the most expensive way of completing the work, unless prior to the submission of the price, the Contractor asks for a decision from the Architect as to which shall govern. Accordingly, any conflict in or between the Contract Documents shall not be a basis for adjustment in the Contract Price.

SITE VERIFICATION: The contractor shall verify all dimensions and conditions at the site. Conflicts between the drawings and actual site conditions shall be brought to the attention of the Architect/Engineer before proceeding with the work.

ADJACENT UTILITIES: The contractor shall determine the location of all adjacent underground utilities prior to earthwork, foundations, shoring, and excavation. Any utility information shown on the drawings and details is approximate and not necessarily complete.

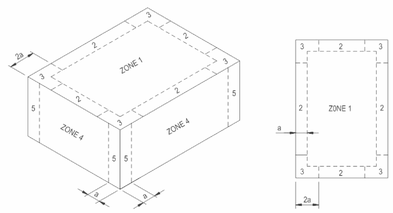
ALTERNATES: Alternate products of similar strength, nature and form for specified items may be submitted with adequate technical documentation (proper test report, etc.) to the Architect/Engineer for review. Alternate materials that are submitted without adequate technical documentation or that significantly deviate from the design intent of materials specified may be returned without review. Alternates that require substantial effort to review will not be reviewed unless authorized by the Owner.

DESIGN CRITERIA AND LOADS

OCCUPANCY:	Risk Category of Building per 2018 IBC Table 1604.5 =	II (new building) & III (existing building)

WIND DESIGN:	**MAIN WIND FORCE RESISTING SYSTEM**	
	Ultimate Design Wind Speed, V_{ULT} (MPH)	**114**
	Exposure Category	**B**
	Internal Pressure Coefficient **Cpi =**	**+/- 0.18**
	Topographic Factor **Kzt =**	**1.0**
	Wind Analysis procedure used:	**Directional**

WIND DESIGN: **COMPONENTS & CLADDING PRESSURES FOR DESIGN (PSF, ULTIMATE)**



ISOMETRIC VIEW

PLAN VIEW

EFFECTIVE WIND AREA (SQ. FT)

a = 7’-0”	**10**	**20**	**50**	**100**
ZONE 1	13/-51	12/-48	11/-43	10/-40
ZONE 2	13/-67	12/-63	11/-57	10/-53
ZONE 3	13/-91	12/-83	11/-71	10/-63
ZONE 4	29/-32	28/-30	26/-29	25/-27
ZONE 5	29/-39	28/-36	26/-33	25/-30

Components and Cladding zone locations are based on ASCE 7-16 Table 30.5-1 for Flat Roofs Θ < 10 deg.

SEISMIC DESIGN:	**Seismic Design Category: SDC =**	B
	Basic Structural System	Steel frame
	Seismic Force Resisting System	Steel frame not specifically detailed
	Response Modification Factor: **R =**	**3**
	Site Classification per IBC 1613.3.2 & ASCE 7-16, Ch. 20 **Site Class =**	**D**
	Seismic Importance Factor per ASCE 7-16 Table 1.5-2 **Ie =**	**1.0 (1.25 existing building)**
	Spectral Response Acceleration (Short Period) **S_s =**	**0.182xx g**
	Spectral Response Acceleration (1-Second Period) **S_1 =**	**0.047xx g**
	Spectral Design Response Coefficient (Short Period) **S_{DS} =**	**0.194xx g**
	Spectral Design Response Coefficient (1-Second Period) **S_{DI} =**	**0.176xx g**
	Seismic response coefficient(s) **Cs =**	**0.068**
	Design Base Shear (North/South Direction) (KIPS)	**36**
	Design Base Shear (East / West Direction) (KIPS)	**36**
	Base shear governed by:	**seismic**
	Seismic Analysis procedure used:	**Equivalent Lateral Force (ELF)**

SNOW LOAD: (1)	Flat Roof Snow Load, (PSF) p_f =	**19** (2)
	Snow Drift Loading required by Authority Having Jurisdiction?	**No**
	Snow Load Importance Factor **I_s =**	**1.0** (3)
	Ground Snow Load, (PSF) **p_g =**	**20**
	Snow Exposure Factor **C_e =**	**B**
	Thermal Factor **C_t =**	**1.0**

1) Snow Load is un-reducible and includes 5 psf rain-on-snow surcharge where ground snow load is greater than zero and 20 psf or less per ASCE 7-16 Section 7.10.
2) Snow Load based on ASCE Fig 7-1.
3) Snow Load Importance Factor per ASCE 7-16 Table 1.5-2.

DESIGN LIVE LOADS	**AREA**	**LIVE LOADS (PSF) UNO**	**REMARKS & FOOTNOTES** (6)
	Handrails & Pedestrian Guardrails	50 PLF or 200 LB	(1)
	Stairs & Exits	100 PSF or 300 LB	Additional requirements per (2)
	Façade Access Equipment / Lifeline Supports	2.5 * Rated Hoist Load	per IBC 1607.9.3 and 1607.9.4; 3100 lbs any direction (lifeline)
	Lobbies	100	2000 lbs
	Corridors at First Floor	100	
	Corridors above First Floor	80	
	Offices	50 + 15	2000 lbs (5)
	Mechanical Rooms	150	
	Light Storage Area	125	
	Roofs	30 PSF or 300 LB	Area load is reducible. Point load per note (2), See above for Snow Load
	Library stacks	150	

(1) Top rail shall be designed to resist 50 PLF line load or 200 lb point load applied in any direction at any point. Intermediate rails (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 LB on an area not to exceed 1 ft square. These three loads are to be considered separately with worst case used for design.

(2) Stair loading requirements:

   a. Treads: Stair treads shall be designed for 100 PSF live load or a 300 lb. concentrated load placed to produce maximum stress, whichever controls. The 300 lb concentrated load shall be placed over 2”x2” area at any point to produce maximum stress. Area load and concentrated load are to be considered separately with worst case used for design.

   b. Stringers and Landings: Stringers and landings shall be designed for 100 PSF live load. Live load deflection shall not exceed 1/360 of the span.

   c. Railings: The completed handrail, guardrail, and supporting structure and their connections shall be designed to resist loads as specified in IBC Section 1607.8.

   d. Seismic Design Parameters: Stairs shall be designed as egress stairs with a seismic importance factor (I_p)=1.5 unless otherwise noted by the Architect. The stair assembly and attachment to the main structure shall be designed for lateral loads per IBC Chapter 16 and **ASCE 7-16 Section 13.3 “Seismic Demands on Non-structural Components.”**

   e. Deflection Compatibility: Stair design shall account for the load effects generated by the primary structure’s seismic inelastic story drifts as provided in the DESIGN CRITERIA AND LOADS section and as defined in **ASCE 7-16 Section 12.8.6**.

   f. Anchorage to Concrete: Portions of the stair system anchored to concrete shall be designed for the overstrength (Ω_o) factor as defined in **ASCE 7-16 Table 13.5-1**.

(3) Need not apply concurrently with other handrail and guardrail loads; applied over not more than 1 square foot.
(4) Apply concentrated wheel load over 4-1/2”x4-1/2” square area.
(5) Floors for Business Group B (Offices) Occupancy shall be designed with a basic floor Live Load plus an additional 15 PSF (minimum) live loading for moveable partitions.
(6) Unless otherwise noted, point loads to be distributed over a 2.5ft x 2.5ft area and located to produce maximum load effects on structural members.

SUBMITTALS

SUBMIT FOR REVIEW: SUBMITTALS of shop drawings, product data, and mill tests are required for items noted in the individual materials sections and for *bidder designed* elements.

SUBMITTAL REVIEW PERIOD: Submittals shall be made in time to provide a minimum of TWO WEEKS or 10 WORKING DAYS for review by the Architect/Engineer prior to the onset of fabrication.

GENERAL CONTRACTOR’S PRIOR REVIEW: Prior to submission to the Architect/Engineer, the Contractor shall review the submittal for completeness. Dimensions and quantities are not reviewed by the SER, and therefore, must be verified by the General Contractor. Contractor shall provide any necessary dimensional details requested by the Detailer and provide the Contractor’s review stamp and signature before forwarding to the Architect/Engineer.

SHOP DRAWING REVIEW: Once the contractor has completed their review, the SER will review the submittal for general conformance with the design concept and the contract documents of the building and will stamp the submittal accordingly. Markings or comments shall not be construed as relieving the contractor from compliance with the project plans and specifications, nor departures there from. The SER will return submittals in the form they are submitted in (either hard copy or electronic). For hard copy submittals, the contractor is responsible for submitting the required number of copies to the SER for review.

SHOP DRAWING DEVIATIONS: When shop drawings (component design drawings) differ from or add to the requirements of the structural drawings they shall be designed and stamped by the responsible SSE.

DEFERRED SUBMITTALS

BIDDER-DESIGNED ELEMENTS
Submit “Bidder-Designed” deferred submittals to the Architect and SER for review. The deferred submittals shall also be submitted to the city for approval, if required by the city.

Design of prefabricated, “bidder designed”, manufactured, pre-engineered, or other fabricated products shall comply with the following requirements:

1) Design considers tributary dead, live, wind and earthquake loads in combinations required by IBC.
2) Design within the Deflection Limits noted herein and as specified or referenced in the IBC.
3) Design shall conform to the specifications and reference standards of the governing code.
4) Submittal shall include:
   a. Calculations prepared, stamped and signed by the SSE demonstrating code conformance.
   b. Engineered component design drawings are prepared, stamped and signed by the SSE.
   c. Product data, technical information and manufacturer’s written requirements and Agency approvals as applicable.
   d. SSE may submit to the Architect/Engineer, a request to utilize relevant alternate design criteria of similar nature and generally equivalency which is recognized by the Code and acceptable to the Authority Having Jurisdiction. Submit adequate documentation of design.

DEFLECTION LIMITS FOR SSE / BIDDER DESIGNED ELEMENTS:	**VERTICAL**	**LIMIT**
	Roof Members, Dead + Live or Snow or Wind, Total Load (TL) Deflection	L / 240, where (L is span length,inches)
	Roof, Live or Snow or Wind Load (RLL)	L / 360
	Floor Members, Total Load (TL) uno	L / 240
	Floor Live Load (LL) uno	L / 360
	Operable Partition Support Members	L / 600 or ¼” maximum
	HORIZONTAL	**LIMIT and FOOTNOTE**
	Members Supporting Brittle Finishes	L / 240 (1)
	Members Supporting Flexible Finishes	L / 180 (1)

(1) Wind Load is reducible to 0.42 times the Component and Cladding Loads per Table 1604.3 footnote f.

GENERAL CONTRACTOR’S PRIOR REVIEW: Once the contractor has completed their review of the SSE component drawings, the SER will review the submittal for general conformance with the design of the building and will stamp the submittal accordingly. Review of the Specialty Structural Engineer's (SSE) shop drawings (component design drawings) is for compliance with design criteria and compatibility with the design of the primary structure and does not relieve the SSE of responsibility for that design. All necessary bracing, ties, anchorage, proprietary products shall be furnished and installed per manufacturer’s instructions or the SSE’s design drawings and calculations. These elements include but are not limited to:

- Underpinning (including design)
- Steel Stairs
- Handrails, Guardrails and Balcony Rail Anchorages
- Metal Deck Edge Forms
- Exterior Cladding Systems: Curtain Wall Systems, Pre-engineered Panels
- Roof Mounted Hatches
- Façade Access Equipment / Lifeline Supports
- Mechanical, Electrical, Plumbing & Sprinkler Hanger Plans
- Temporary Shoring Systems
- Cold-formed Metal Studs - Framing Interior Walls including Partial Height
- Cold-formed Metal Studs & Joists Framing Overhead Soffits
- Façade Access Equipment / Lifeline Supports

INSPECTIONS, QUALITY ASSURANCE VERIFICATIONS AND TEST REQUIREMENTS

INSPECTIONS: Foundations, footings, under slab systems and framing are subject to inspection by the Building Official in accordance with IBC 110.3. Contractor shall coordinate all required inspections with the Building Official.

SPECIAL INSPECTIONS, VERIFICATIONS and TESTS: Special Inspections, Verifications and Testing shall be done in accordance with IBC Chapter 17, the STATEMENT AND SCHEDULES OF SPECIAL INSPECTIONS listed in these drawings, and the AHJ STATEMENT OF SPECIAL INSPECTION.

Structural Observation for this project is not required per IBC Section 1704.6.

CONTRACTOR RESPONSIBILITY: Prior to issuance of the building permit, the Contractor is required to provide the Authority Having Jurisdiction a signed, written acknowledgement of the Contractor’s responsibilities associated with the above Statement of Special Inspections addressing the requirements listed in IBC Section 1704.4. Contractor is referred to IBC Sections 1705.12.5 and 1705.12.6 for architectural and MEP building systems that may be subject to additional inspections (based on the building’s designated Seismic Design Category listed in the CRITERIA), including anchorage of HVAC ductwork containing hazardous materials, piping systems and mechanical units containing flammable, combustible or highly toxic materials, electrical equipment used for emergency or standby power, exterior wall panels and suspended ceiling systems.

SOILS AND FOUNDATIONS

REFERENCE STANDARDS: Conform to IBC Chapter 18 "Soils and Foundations."

GEOTECHNICAL REPORT: Recommendations contained in Geotechnical Report number 4785G1L1by David Blackmore & Associates dated **9/21/16** were used for design.

CONTRACTOR’S RESPONSIBILITIES: Contractor shall be responsible to review the Geotechnical Report and shall follow the recommendations specified therein including, but not limited to, subgrade preparations, pile installation procedures, ground water management and steep slope Best Management Practices.”

GEOTECHNICAL SUBGRADE INSPECTION: The Geotechnical Engineer shall inspect all sub-grades and prepared soil bearing surfaces, prior to placement of foundation reinforcing steel and concrete. Geotechnical Engineers shall provide a letter to the owner stating that soils are adequate to support the "Allowable Foundation Bearing Pressure(s)" shown below.

DESIGN SOIL VALUES:

Allowable Foundation Bearing Pressure	3000	PSF – Native
Passive Lateral Pressure	340	PSF/FT
Active Lateral Pressure (unrestrained)	43	PSF/FT
At-Rest Lateral Pressure (restrained)	63	PSF/FT

FOUNDATIONS and FOOTINGS: Foundations shall bear on either on competent native soil or compacted structural fill as per the geotechnical report. Exterior perimeter footings shall bear not less than 36 inches below finish grade, unless otherwise specified by the geotechnical engineer and/or the building official.

FOOTING DEPTH: Tops of footings shall be as shown on plans with vertical changes as indicated with steps in the footings; locations of steps shown as approximate and shall be coordinated with the civil grading plans.

SLABS-ON-GRADE: All slabs-on-grade shall bear on compacted structural fill or competent native soil per the geotechnical report. All moisture sensitive slabs-on-grade or those subject to receive moisture sensitive coatings/covering shall be provided with an appropriate capillary break and vapor barrier/retardant over the subgrade prepared and installed as noted in the geotechnical report, barrier manufacturer’s written recommendations and coordinated with the finishes specified by the Architect.

UNDERPINNING: Underpinning of adjacent structures shall be installed in a sequential manner that protects the neighboring structure and the working construction site. Underpinning design and sequencing is the responsibility of the contractor. Sequence of installation must be shown on approved deferred submittal permit drawings.

CAST-IN-PLACE CONCRETE

REFERENCE STANDARDS: Conform to:
(1) ACI 301-16 “Specifications for Structural Concrete”
(2) IBC Chapter 19 “Concrete”
(3) ACI 318-14 “Building Code Requirements for Structural Concrete”
(4) ACI 117-10 “Specifications for Tolerances for Concrete Construction and Materials”

FIELD REFERENCE: The contractor shall keep a copy of ACI Field Reference manual, SP-15, “Standard Specifications for Structural Concrete (ACI 301) with Selected ACI and ASTM References.”

CONCRETE MIXTURES: Conform to ACI 301 Section 4 “Concrete Mixtures” and IBC Section 1904.1.

MATERIALS: Conform to ACI 301 Section 4.2.1 “Materials” for requirements for cementitious materials, aggregates, mixing water and admixtures.

SUBMITTALS: Provide all submittals required by ACI 301 Section 4.1.2. Submit mix designs for each mix in the table below. Substantiating strength results from past tests shall not be older than 24 months per ACI 318 Section 26.4.3.1 (b).

TABLE OF MIX DESIGN REQUIREMENTS

Member Type/Location	Strength f’c (psi)	Test Age (days)	Nominal Maximum Aggregate	Exposure Class	Max W/C Ratio	Air Content	Notes (1 to 9 Typical UNO)
Footings	4000	28	1”	-	-	-	-
Exterior Slabs on Grade & Sidewalks	3500	28	1”	F1	0.55	5%	-
Interior Slabs on Grade	3000	28	1”	-	-	-	10
Interior Topping Slabs	3000	28	3/8”	-	-	-	-
Slabs on Metal Deck	3500	28	1”	-	-	-	-

Table of Mix Design Requirements Notes:

(1) W/C Ratio: Water–cementitious material ratios shall be based on the total weight of cementitious materials. Maximum ratios are controlled by strength noted in the Table of Mix Design Requirements and durability requirements given in ACI 318 Section 19.3.

(2) Cementitious Materials:
   a. DCI encourages the reduction of cement content and/or the use of blended hydraulic cements. Where requirements of this section prohibit inclusion of any of these mixes, contact DCI for further coordination.
   b. The use of fly ash, other pozzolans, silica fume, or slag shall conform to ACI 318 Sections 19.3.2 and 26.4.2.2.
   c. For concrete used in elevated floors, minimum cementitious-materials content shall conform to ACI 301 Table 4.1.2.9. Acceptance of lower cement content is contingent on providing supporting data to the SER for review and acceptance.
   d. Cementitious materials shall conform to the relevant ASTM standards listed in ACI 318 Section 26.4.1.1.1(a).

(3) Air Content: Conform to ACI 318 Section 19.3.3.1. Minimum standards for exposure class are noted in the table. If freezing and thawing class is not noted, air content given is that required by the SER. Tolerance is ±1-½%. Air content shall be measured at point of placement.

(4) Aggregates shall conform to ASTM C33. Lightweight aggregates shall conform to ASTM C330.

(5) Slump: Conform to ACI 301 Section 4.2.2.2. Slump shall be determined at point of placement.

(6) Chloride Content: Conform to ACI 318 Table 19.3.2.1.

(7) Non- chloride accelerator: Non-chloride accelerating admixture may be used in concrete placed at ambient temperatures below 50°F at the contractor’s option.

(8) ACI 318, Section 19.3.1.1 exposure classes shall be assumed to be F0 unless different exposure classes are listed in the Table of Mix Design Requirements that modify these base requirements.

(9) Modulus of Elasticity shall be a minimum of 57,000 x $\sqrt{f'c}$ for all mix designs.

FORMWORK & RESHORING: Conform to ACI 301 Section 2 “Formwork and Form Accessories.” Removal of Forms shall conform to Section 2.3.2 except strength indicated in Section 2.3.2.5 shall be 0.75 f’ c.

MEASURING, MIXING, AND DELIVERY: Conform to ACI 301 Section 4.3.

HANDLING, PLACING, CONSTRUCTING AND CURING: Conform to ACI 301 Section 5. In addition, hot weather concreting shall conform to ACI 305R-10 and cold weather concreting shall conform to ACI 306R-10.

CONCRETE CURING: Provide curing compounds for concrete as follows:

(1) Use membrane curing compounds that are compatible with and will not affect surfaces to be covered with finish materials applied directly to concrete.
(2) Apply curing compounds at a rate equivalent to the rate of application at which curing compound was originally tested for in conformance to the requirements of ASTM C 309-07 and the manufacturer’s recommendations.
(3) Apply specified curing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer’s directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
(4) Use curing compound compatible with and applied under direction of system manufacturer of protective sealer.
(5) Apply two separate coats with first allowed to become tacky before applying second. Direction of second application shall be at right angles to direction of first.

CONSTRUCTION JOINTS: Conform to ACI 301 Sections. 2.2.2.5 and 5.3.2.6. Construction joints shall be located and detailed as on the construction drawings. Submit alternate locations per ACI 301 Section 5.1.2.4(a) for review and approval by the SER two weeks minimum prior to forming. Use of an acceptable adhesive, surface retardant, portland cement grout or roughening the surface is not required unless specifically noted on the drawings.

EMBEDDED ITEMS: Position and secure in place expansion joint material, anchors and other structural and nonstructural embedded items before placing concrete. Contractor shall refer to mechanical, electrical, plumbing and architectural drawings and coordinate other embedded items.

GROUT: Use 7000 psi non-shrink grout under column base plates.

POST-INSTALLED ANCHORS to CONCRETE: Anchor location, type, diameter and embedment shall be as indicated on drawings. Reference the POST INSTALLED ANCHORS section for applicable Post-Installed Anchor Adhesives. Anchors shall be installed and inspected in strict accordance with the applicable ICC-Evaluation Service Report (ESR). Special inspection shall be per the TESTS and INSPECTIONS section.

TOPPING SLABS: Conform to ACI 301 and the recommendations of ACI 302.1R-15 “Guide for Concrete Floor and Slab Construction” for Class 3 (unbonded topping floors). Caution: Bonding of two-course floors is a highly critical operation requiring extra care by the contractor. Strict compliance with the concrete mix requirements, especially the water-cement ratio and slump is critical. When a bonding agent is specified, conform strictly to the manufacturer’s instructions for use and for all special surface preparations required.

SHRINKAGE: Conventional concrete slabs will continue to shrink after initial placement and stressing of concrete. Contractor and subcontractor shall coordinate jointing and interior material finishes to provide adequate tolerance for expected structural frame shrinkage and shall include, but not be limited to: curtain wall, dryvit, storefront, skylight, floor finish, and ceiling suppliers. Contact Engineer for expected range of shrinkage.

MODULUS OF ELASTICITY TESTING AND ACCEPTANCE:

Obtain samples and conduct tests of mix designed specified in accordance with ACI 318 Section 19.2.2, ACI 318 R19.2.2, ACI 301 Section 1.6.3.2, ASTM C42 and ASTM C469. Tests data shall be performed at the 28 day compressive test age. Provide a minimum of (2) tests for each mix design used in **Slabs**. Provide a minimum of (1) test for all other elements. The average of the tests shall equal or exceed the specified Modulus of Elasticity. If (2) or more tests are performed, no individual test shall fall below the specified Modulus of Elasticity by more than 20 percent. A “test” for acceptance is the average strength of two 6 by 12 in. cylinders or three 4 by 8 in. cylinders tested at the specified test age.

STRENGTH TESTING AND ACCEPTANCE:

Testing: Obtain samples and conduct tests in accordance with ACI 301 Section 1.6.3.2. Additional samples may be required to obtain concrete strengths at alternate intervals than shown below.

- Cure 4 cylinders for 28-day test age; test 1 cylinder at 7 days, test 2 cylinders at 28 days, and hold 1 cylinder in reserve for use as the Engineer directs. After 56 days, unless notified by the Engineer to the contrary, the reserve cylinder may be discarded without being tested for specimens meeting 28-day strength requirements.
- The number of cylinders indicated above reference 6 by 12 in cylinders. If 4 by 8 in cylinders are to be used, additional cylinders must be cured for testing of 3 cylinders at test age per the table of mix design requirements.

Acceptance. Strength is satisfactory when:

(1) The averages of all sets of 3 consecutive tests equal or exceed the specified strength.
(2) No individual test falls below the specified strength by more than 500 psi.

A “test” for acceptance is the average strength of two 6 by 12 in. cylinders or three 4 by 8 in. cylinders tested at the specified test age.

CONCRETE PLACEMENT TOLERANCE: Conform to ACI 117-10 for concrete placement tolerance.

FLOOR FLATNESS and FLOOR LEVELNESS: Minimum values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for slabs-on-grade are required. Overall minimum values of flatness, F(F) 30; with minimum local values of flatness, F(F) 24; for suspended slabs are required. Concrete slabs that will receive wood flooring shall have a minimum F(F) 35. The preceding values are minimums unless specifications require higher values. Measured values shall be in accordance with ACI 117.

CONCRETE REINFORCEMENT

REFERENCE STANDARDS: Conform to:
(1) ACI 301-16 "Standard Specifications for Structural Concrete", Section 3 "Reinforcement and Reinforcement Supports.”
(2) ACI SP-66(04) "ACI Detailing Manual"
(3) CRSI MSP-09, 28th Edition, "Manual of Standard Practice.”
(4) ANSI/AWS D1.4: 2005, "Structural Welding Code - Reinforcing Steel.”
(5) IBC Chapter 19-Concrete.
(6) ACI 318-14 “Building Code Requirements for Structural Concrete.”
(7) ACI 117-10 “Specifications for Tolerances for Concrete Construction and Materials”

SUBMITTALS: Conform to ACI 301 Section 3.1.2 "Submittals.” Submit placing drawings showing fabrication dimensions and placement locations of reinforcement and reinforcement supports.

MATERIALS:

Reinforcing Bars	ASTM A615, Grade 60, deformed bars. ASTM A706, Grade 60, deformed bars.
Deformed Welded Wire Fabric	ASTM A1064
Bar Supports	CRSI MSP-09, Chapter 3 "Bar Supports."
Tie Wire	16 gage or heavier, black annealed.

FABRICATION: Conform to ACI 301, Section 3.2.2. “Fabrication”, and ACI SP-66 "ACI Detailing Manual.”

WELDING: Bars shall not be welded unless authorized. When authorized, conform to ACI 301, Section 3.2.2.2. "Welding", AWS D1.4, and provide ASTM A706, grade 60 reinforcement.

PLACING: Conform to ACI 301, Section 3.3.2 "Placing.” Placing tolerances shall conform to ACI 117.

CONCRETE COVER: Conform to the following cover requirements unless noted otherwise in the drawings.

Concrete cast against earth	3”
Concrete exposed to earth or weather	2”
Ties in columns and beams	1-½”
Bars in slabs	¾”
Bars in walls	¾”
Exterior bars in Tilt-up Panels	1”

CAST-IN-PLACE CONCRETE COVER AND REINFORCING PROTECTION: Conform to the following cover and corrosion protection requirements unless noted otherwise in the drawings:

Reinforcement Location	Minimum Cover	Rebar Protection
Footing Bottom Reinforcing	3”	Uncoated
Footing Top Reinforcing	2”	Uncoated
Slab-on-Grade Reinforcing	2” from top	Uncoated

SPLICES: Conform to ACI 301, Section 3.3.2.7, “Splices”. Refer to "Typical Lap Splice and Development Length Schedule" for typical reinforcement splices. Splices indicated on individual sheets shall control over the schedule. Mechanical connections may be used when approved by the SER.

FIELD BENDING: Conform to ACI 301 Section 3.3.2.8. "Field Bending or Straightening.” Bar sizes #3 through #5 may be field bent cold the first time. Subsequent bends and other bar sizes require preheating. Do not twist bars. Bars shall not be bent past 45 degrees.

TYPICAL CONCRETE REINFORCEMENT: Unless noted on the plans, concrete walls shall have the following minimum reinforcement. Contractor shall confirm minimum reinforcement of walls with SER prior to rebar fabrication.

REINFORCED UNIT MASONRY

REFERENCE STANDARDS: Conform to:

1) IBC Chapter 21 "Masonry.”
2) TMS 402-16 "Building Code Requirements for Masonry Structures.”
3) TMS 602-16 "Specification for Masonry Structures.”
4) ACI SP-66 "ACI Detailing Manual" including ACI 315 "Details and Detailing of Concrete Reinforcement.”
5) ANSI/AWS D1.4 "Structural Welding Code - Reinforcing Steel.”

SUBMITTALS: Conform to TMS 602-16 Section 1.5. Submit shop drawings for review including:

1) Masonry reinforcement, size, layout, and grade in accordance with plans.
2) Material certificates for all Steel Reinforcing, Anchors, Ties and Metal Accessories certifying compliance with required strength, grade and ASTM standards.
3) Certification letters for masonry block and grout mix design certifying compliance with required strength and respective ASTM standards.
4) Mix Designs for each Grout Mix indicating type and proportions of ingredients in compliance of Proportion Specification Property.

PRICING NOTE: THESE DOCUMENTS REPRESENT THE CURRENT STATE OF A DEVELOPING DESIGN AND AS SUCH, NOT ALL CONDITIONS ARE CURRENTLY SHOWN. ALL STRUCTURAL DETAILS AND CONNECTIONS SHOULD BE ACCOUNTED FOR IN THE GENERAL CONTRACTOR PRICE AND SCOPE OF SERVICES, WHETHER THE SPECIFICS OF THESE CONDITIONS ARE SHOWN OR NOT SHOWN ON THESE DOCUMENTS

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JOB NUMBER: 22191-0254
JOB CONTACT: S. KRUMENACKER

Project:

HAVERFORD TOWNSHIP
FREE LIBRARY
1601 Darby Road
Haverford Township
Havertown, PA 19083

Owner:

HAVERFORD TOWNSHIP
FREE LIBRARY
1601 Darby Road
Haverford Township
Havertown, PA 19083

Revision/Issue:

0	05/31/2023 - Issued for Permit
1	09/30/2023 - Issued for Bidding
2	10/17/2023 - Addendum 4

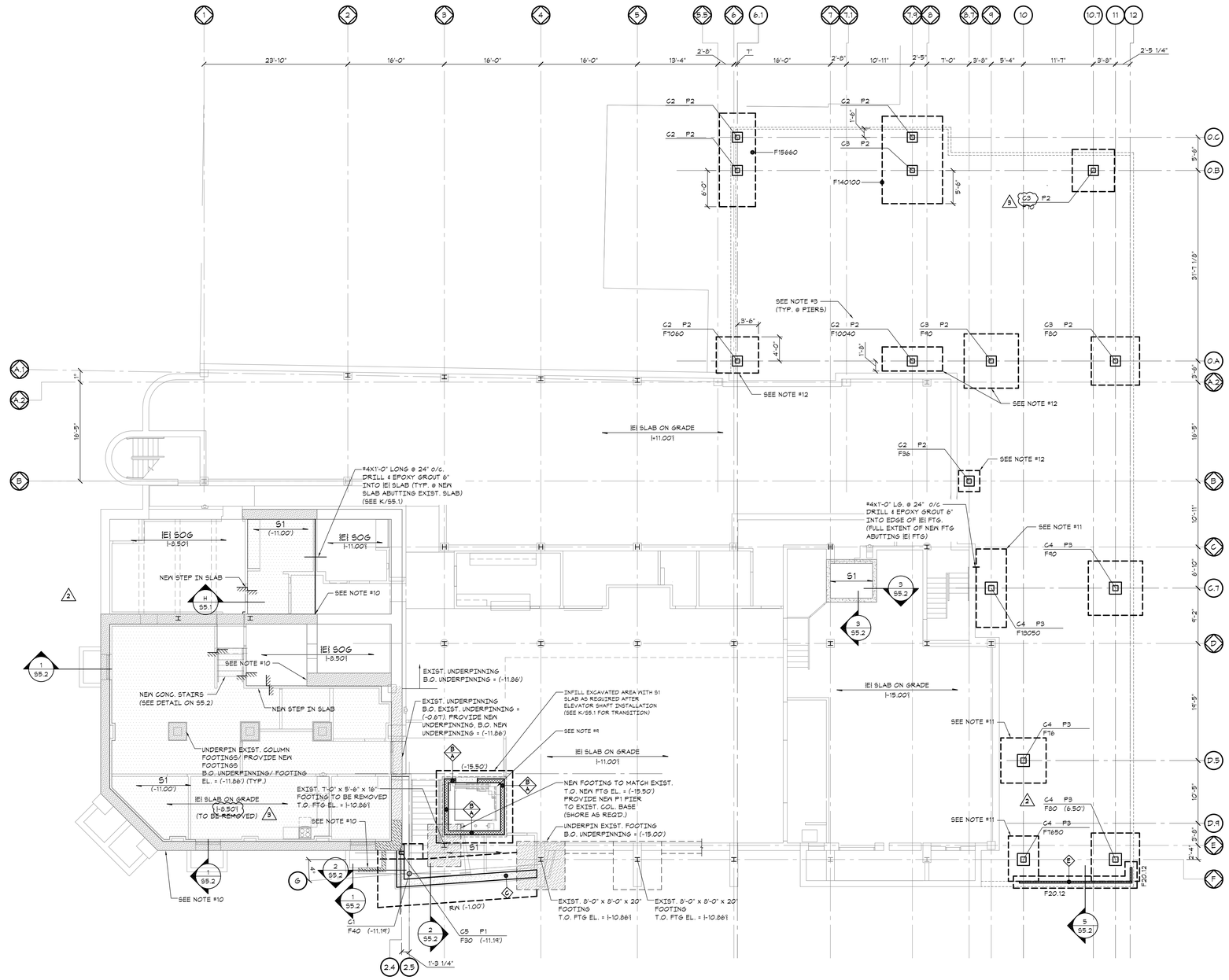
Drawn:	CAD
Reviewed:	HVB
Contact:	H. Bands
Project Number:	7010.03-22

Sheet Title:

GENERAL NOTES

Sheet Number:

S0.2



FOUNDATION PLAN

SCALE: 1/8" = 1'-0"

NOTES:
1. SEE PLAN FOR TOP OF SLAB EL. RELATIVE TO 288.36' DATUM.
2. TOP OF FOOTING EL. = (2.67') BELOW GRADE UNLESS NOTED OTHERWISE THUS (...).
3. TOP OF PIER EL. = [-0.67'] BELOW GRADE UNLESS NOTED OTHERWISE THUS [...].
4. 'S_/ D_' INDICATES FLOOR/ ROOF CONSTRUCTION. SEE FLOOR/ ROOF CONSTRUCTION SCHEDULE ON THIS SHEET FOR ADDITIONAL INFORMATION.
5. COORDINATE ALL UNDER SLAB PIPING WITH ARCHITECTURAL/MECHANICAL DRAWINGS.
6. COORDINATE ALL DIMENSIONS WITH ARCHITECTURAL DRAWINGS PRIOR TO BUILDING LAYOUT.
7. (*) INDICATES DIMENSION TO BE VERIFIED W/ ELEVATOR MANUFACTURER PRIOR TO BUILDING LAYOUT.
8. 'RA_' INDICATES RETAINING WALL. SEE SECTIONS INDICATED FOR ADDITIONAL INFORMATION.
9. PROVIDE 2'-0" x 2'-0" x 2'-0" DEEP SUMP PIT. COORDINATE DIMENSIONS W/ ARCHITECTURAL AND MECHANICAL DIMENSIONS.
10. NEW UNDERPINNING AT EXISTING STONE FOUNDATION WALL. B.O. UNDERPINNING = (-11.86') (UNDERPINNING SCOPE IS DELEGATED).
11. B.O. NEW FOOTING TO MATCH B.O. ADJACENT EXISTING FOOTING (± APPROX. -18.19', TO BE VERIFIED IN FIELD).
12. B.O. NEW FOOTING TO MATCH B.O. ADJACENT EXISTING FOOTING (± APPROX. -2.97', TO BE VERIFIED IN FIELD).
13. ▭ INDICATES EXISTING S.O.G. TO BE REMOVED.

WALL SCHEDULE

MARK	DESCRIPTION	WIDTH
A	12" REINF. CONC.	12"
B	8" CMU	7-5/8"
C	15" REINF. CONC.	15"
D	6" CFMF WALL	6"
E	4" CMU	3-5/8"

FLOOR/ ROOF CONSTRUCTION SCHEDULE

MARK	SECTION	DESCRIPTION
S1		4" NORMAL WEIGHT CONCRETE SLAB ON GRADE w/ 6x6-W1.4xW1.4 WWF OVER 4" CRUSHED STONE
S1A		4" NORMAL WEIGHT CONCRETE (w/ 6% AIR ENTRAINMENT) SLAB ON GRADE w/ 6x6-W1.4xW1.4 WWF OVER 4" CRUSHED STONE
S2		2 1/2" NORMAL WEIGHT CONCRETE ON 1 1/2" 20GA. LOK-FLOOR COMPOSITE DECK w/ 6x6-W1.4xW1.4 WWF (4" TOTAL THICKNESS)
S3		2 1/2" NORMAL WEIGHT CONCRETE ON 1 1/2" 20GA. LOK-FLOOR COMPOSITE DECK w/ 6x6-W1.4xW1.4 WWF + 2" LW CONCRETE TOPPING w/ 4x4xW2.0xW2.0 WWF (6" TOTAL THICKNESS)
D1		1 1/2" 20GA. WIDE RIB METAL ROOF DECK (PAINTED)
D2		3/4" STRUCTO-CRETE DECKING FLOOR
D3		5/8" T&G PLYWOOD ROOF SHEATHING

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JOB NUMBER: 22191-0254
JOB CONTACT: S. KRUMENACKER

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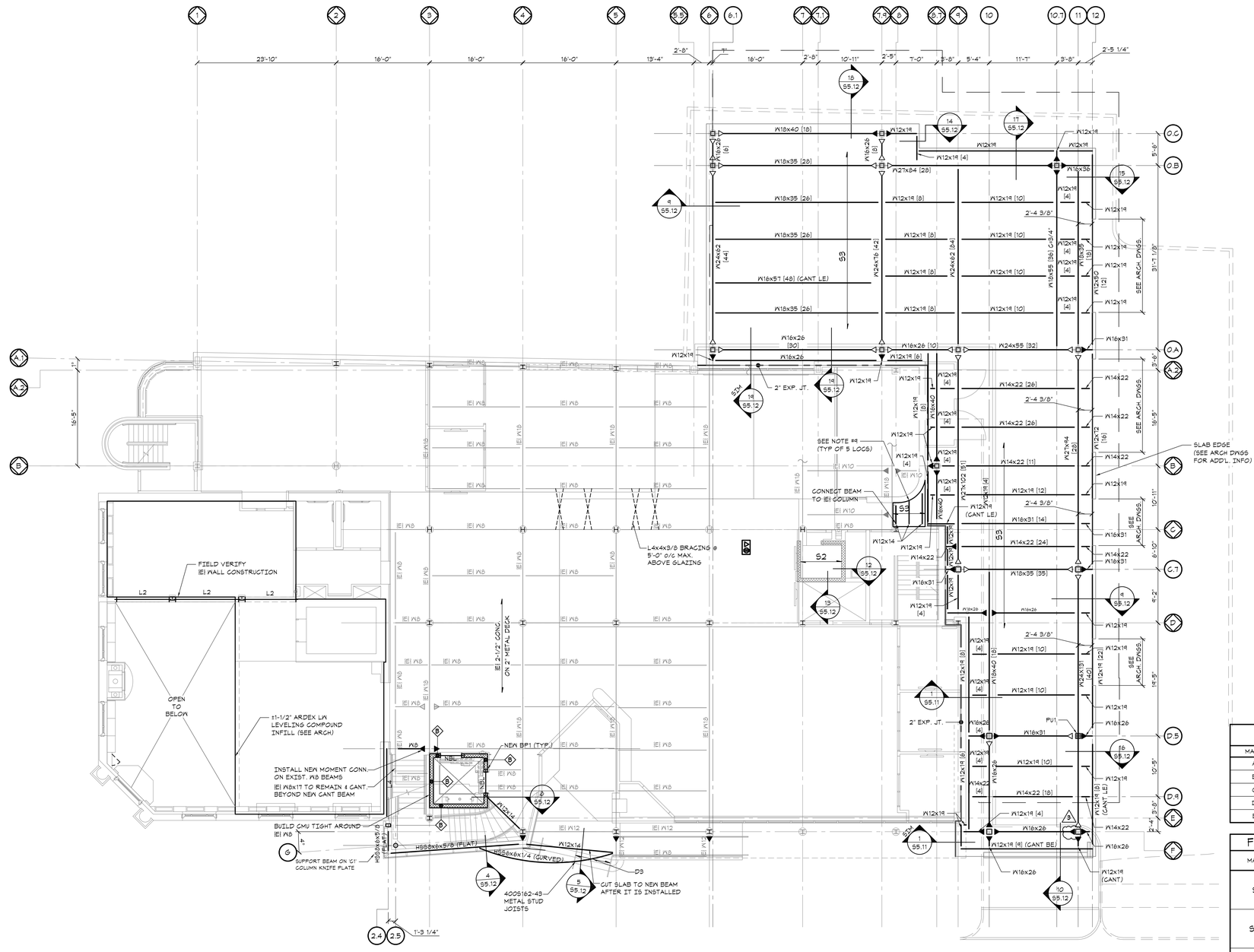
Drawn:	CAD
Reviewed:	HVB
Contact:	H. Bands
Project Number:	7010.03-22

Sheet Title:

FOUNDATION PLAN

Sheet Number:

S1.0



SECOND FLOOR FRAMING PLAN

SCALE: 1/8" = 1'-0"

NOTES:

1. TOP OF SLAB EL. = +11-0" (V.I.F.) TO MATCH EXISTING EL.
2. AT FRONT ENTRY STAIR, TOP OF STEEL EL. = TO MATCH EXISTING EL. AT ADDITION, TOP OF STEEL EL. = +10'-6 1/4".
3. 'S_/ D_' INDICATES FLOOR/ ROOF CONSTRUCTION. SEE FLOOR/ ROOF CONSTRUCTION SCHEDULE ON THIS SHEET FOR ADDITIONAL INFORMATION.
4. 'L_' INDICATES LINTEL. SEE SCHEDULE ON DRAWING S0.4 FOR ADDITIONAL INFORMATION.
5. 'NBL' INDICATES NON-BEARING LINTEL. SEE SCHEDULE ON DRAWING S0.4 FOR ADDITIONAL INFORMATION.
6. ALL STEEL FOR WF MEMBERS SHALL BE ASTM A992.
7. 'PU-_' INDICATES POST-UP. SEE POST UP SCHEDULE ON S0.4 FOR ADDITIONAL INFORMATION.
8. 'BP_' INDICATES BEARING PLATE. SEE SCHEDULE ON DRAWING S0.4.
9. PROVIDE TOE-DOWN L8x4x7/16 x1'-0" (LLH) CUT INTO {E} MORTAR JOINT w/ (2) 3/4"Φ HIT-SC BOLTS INTO FACE OF {E} MASONRY w/ HILTI HY 270. WELD TOE-UP L4x4x3/8 SEAT TO L8.
10. AT ALL NEW CONNECTIONS TO EXISTING CMU, CONTRACTOR TO VERIFY EXISTING MASONRY IS GROUTED. CONTRACTOR TO GROUT ANY HOLLOW CELLS BEFORE INSTALLING FASTENERS.

2

WALL SCHEDULE

MARK	DESCRIPTION	WIDTH
A	12" REINF. CONC.	12"
B	8" CMU	7-5/8"
C	15" REINF. CONC.	15"
D	6" CFMF WALL	6"
E	4" CMU	3-5/8"

FLOOR/ ROOF CONSTRUCTION SCHEDULE

MARK	SECTION	DESCRIPTION
S1		4" NORMAL WEIGHT CONCRETE SLAB ON GRADE w/ 6x6-W1.4x1.4 WWF OVER 4" CRUSHED STONE
S1A		4" NORMAL WEIGHT CONCRETE (w/ 6% AIR ENTRAINMENT) SLAB ON GRADE w/ 6x6-W1.4x1.4 WWF OVER 4" CRUSHED STONE
S2		2 1/2" NORMAL WEIGHT CONCRETE ON 1 1/2" 20GA. LOK-FLOOR COMPOSITE DECK w/ 6x6-W1.4x1.4 WWF (4" TOTAL THICKNESS)
S3		2 1/2" NORMAL WEIGHT CONCRETE ON 1 1/2" 20GA. LOK-FLOOR COMPOSITE DECK w/ 6x6-W1.4x1.4 WWF + 2" LW CONCRETE TOPPING w/ 3 4x4xW2.0xW2.0 WWF (6" TOTAL THICKNESS)
D1		1 1/2" 20GA. WIDE RIB METAL ROOF DECK (PAINTED)
D2		3/4" STRUCTO-CRETE DECKING FLOOR
D3		5/8" T&G PLYWOOD ROOF SHEATHING

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Reviewed: HVB
Contact: H. Bands
Project Number: 7010.03-22

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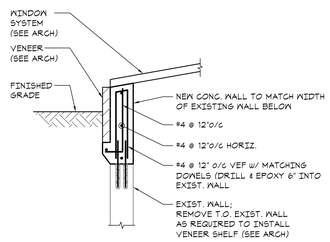
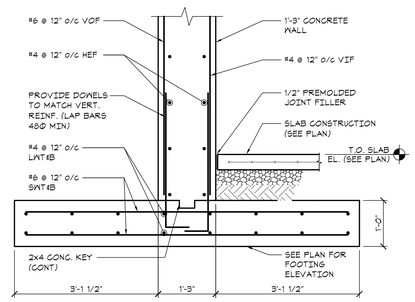
**SECOND FLOOR
FRAMING PLAN**

Sheet Number:

S1.2



Section 1 / 55.2



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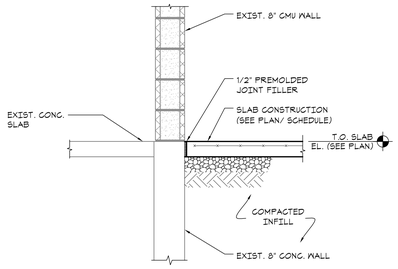

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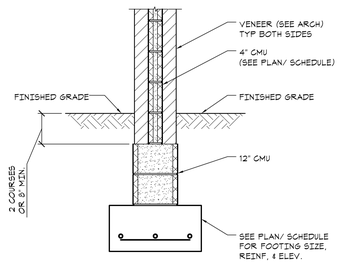

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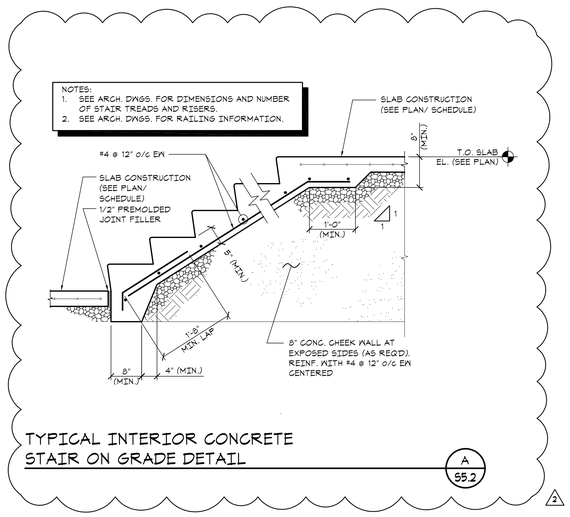

TYPICAL INTERIOR CONCRETE STAIR ON GRADE DETAIL — A / 55.2

2

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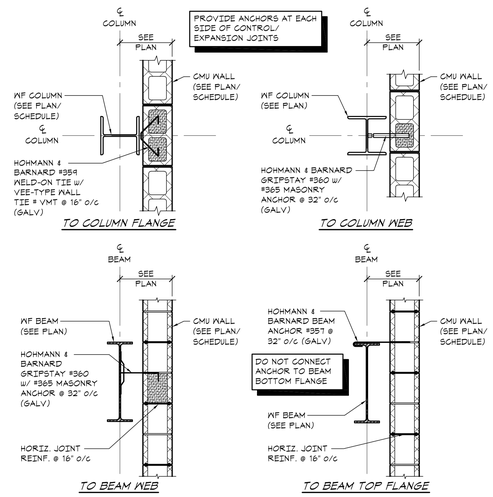
FOUNDATION SECTIONS & DETAILS

Sheet Number:

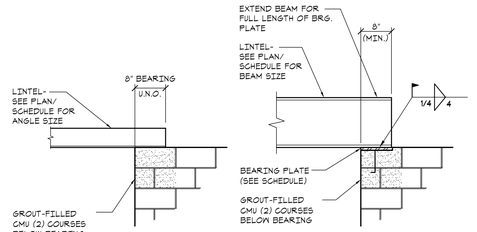
S5.2



TYPICAL LINTEL BEARING DETAILS

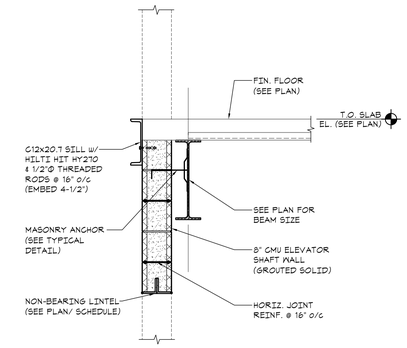
(SEE ARCH DRAWINGS FOR TIE LOCATIONS)

A 55.11



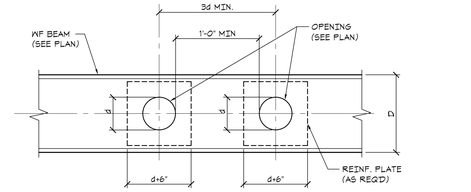
TYPICAL LINTEL BEARING DETAILS

B 55.11



TYPICAL SECTION @ ELEVATOR SILL

C 55.11

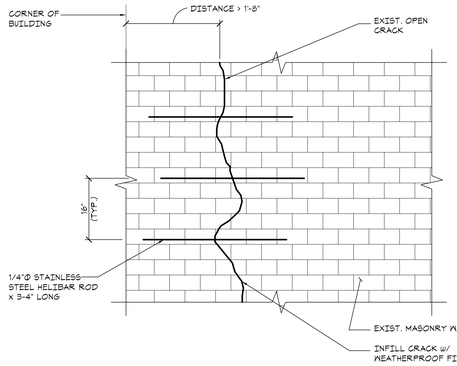


NOTE: ALL HOLES IF POSSIBLE SHALL BE LOCATED IN THE MIDDLE THIRD OF SPAN.

1. IF THE OPENING IS IN THE MIDDLE THIRD OF SPAN AND:
   a) "d" IS 1/3"D" OR SMALLER - NO REINFORCEMENT IS REQUIRED.
   b) "d" IS LARGER THAN 1/3"D" BUT SMALLER THAN 1/2"D" - ADD WEB REINFORCING PLATE SAME THICKNESS AS THE WEB ON ONE SIDE ONLY.
   c) "d" IS LARGER THAN 1/2"D" - CONTACT STRUCTURAL ENGINEER.
2. IF THE OPENINGS ARE LOCATED OUT OF THE MIDDLE THIRD OF THE SPAN AND:
   a) "d" IS 1/4"D" OR SMALLER - NO REINFORCEMENT IS REQUIRED.
   b) "d" IS LARGER THAN 1/4"D" BUT SMALLER THAN 1/3"D" - ADD WEB REINFORCING PLATE SAME THICKNESS AS THE WEB ON ONE SIDE ONLY.
   c) "d" IS LARGER THAN 1/3"D" - CONTACT STRUCTURAL ENGINEER.

TYPICAL DETAIL FOR OPENINGS IN WEB OF STEEL BEAMS

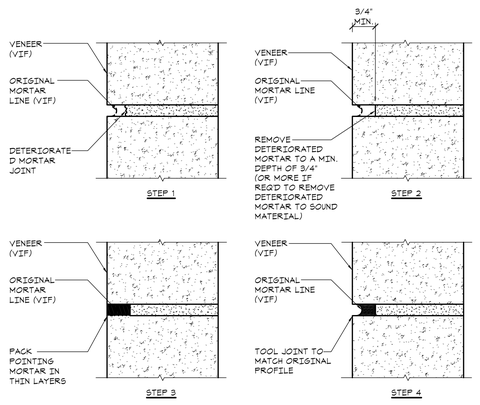
D 55.11



NOTES:
1. RAKE OUT/CUT SLOTS INTO EXISTING HORIZONTAL MORTAR BED (MIN. 1'-8" ON EITHER SIDE OF CRACK).
2. CLEAN CUT SLOT & APPLY HELIBOND PRIMER.
3. INJECT BEAD OF HELIBOND TO THE BACK OF THE SLOT.
4. INSERT STAINLESS STEEL HELIBAR ROD INTO THE SLOT AND GROUT.
5. INJECT ADDITIONAL BEAD OF HELIBOND OVER EXPOSED HELIBAR, FINISHING 1/2" FROM THE FACE.
6. REPOINT THE MORTAR BED AS REQD.
7. FILL VERTICAL CRACK w/ CRACKBOND TE WEATHERPROOF FILLER.
8. IF CRACK IS OBSERVED ON BOTH WALL FACES, REPEAT STEPS 1 THROUGH 7 ON OPPOSITE SIDE

TYPICAL OPEN CRACK IN EXISTING MASONRY VENEER REMEDIATION DETAIL

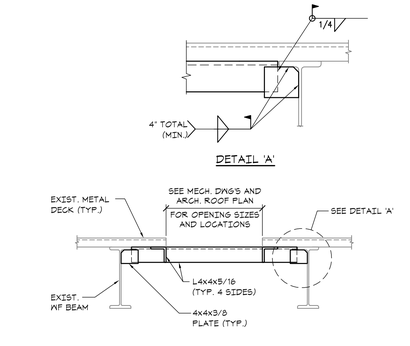
I 55.11



NOTES:
1. MORTAR TO MATCH EXISTING PROFILE & COLOR.

TYPICAL MASONRY POINTING REMEDIATION DETAIL

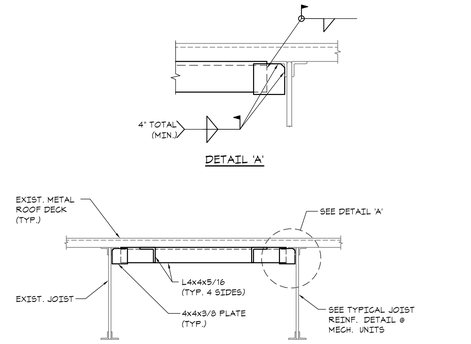
J 55.11



(PROVIDE AT PERIMETER OF ALL ROOFTOP MECHANICAL UNITS AND ROOF OPENINGS LARGER THAN 12" SQ. AS REQUIRED)
(PROVIDE L3x3x5/16 AT ROOF SUMPS)

TYPICAL ROOF CURB SUPPORT DETAIL

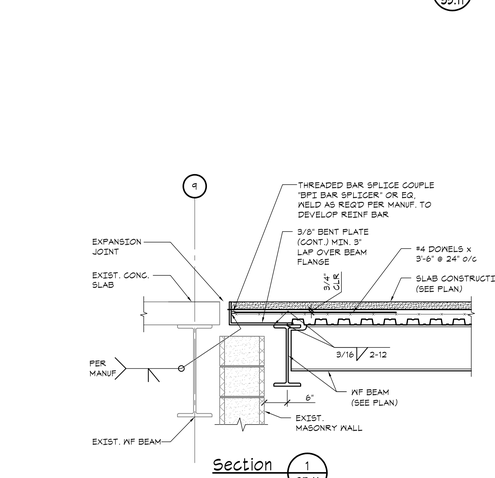
E 55.11



(PROVIDE AT PERIMETER OF ALL ROOFTOP MECHANICAL UNITS)

TYPICAL ROOF CURB SUPPORT DETAIL

F 55.11



NOMINAL BEAM SIZE	FLANGE PLATE				REMARKS
	THICKNESS (tp)	WIDTH (Bp)	BOLTS (EA. FLANGE)	WELD SIZE (W)	
W16 THRU W18	1/2"	5"	2	1/4"	-
W21 THRU W27	1/2"	5"	4	1/4"	-

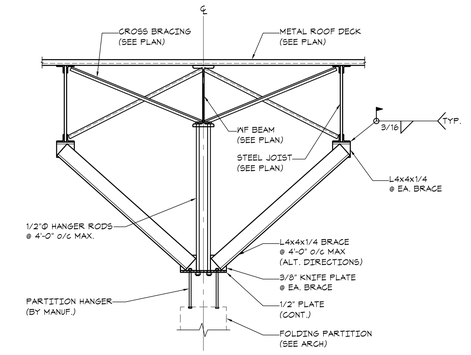
NOTES:
1. WELDING FLANGE PLATES TO BEAM IN LIEU OF BOLTING IS ACCEPTABLE (CONTRACTORS OPTION).

TYPICAL PARTIALLY RESTRAINED MOMENT CONNECTION DETAIL

K 55.11

TYPICAL SCREEN WALL ELEVATION

G 55.11



TYPICAL FOLDING PARTITION SUPPORT DETAIL

H 55.11

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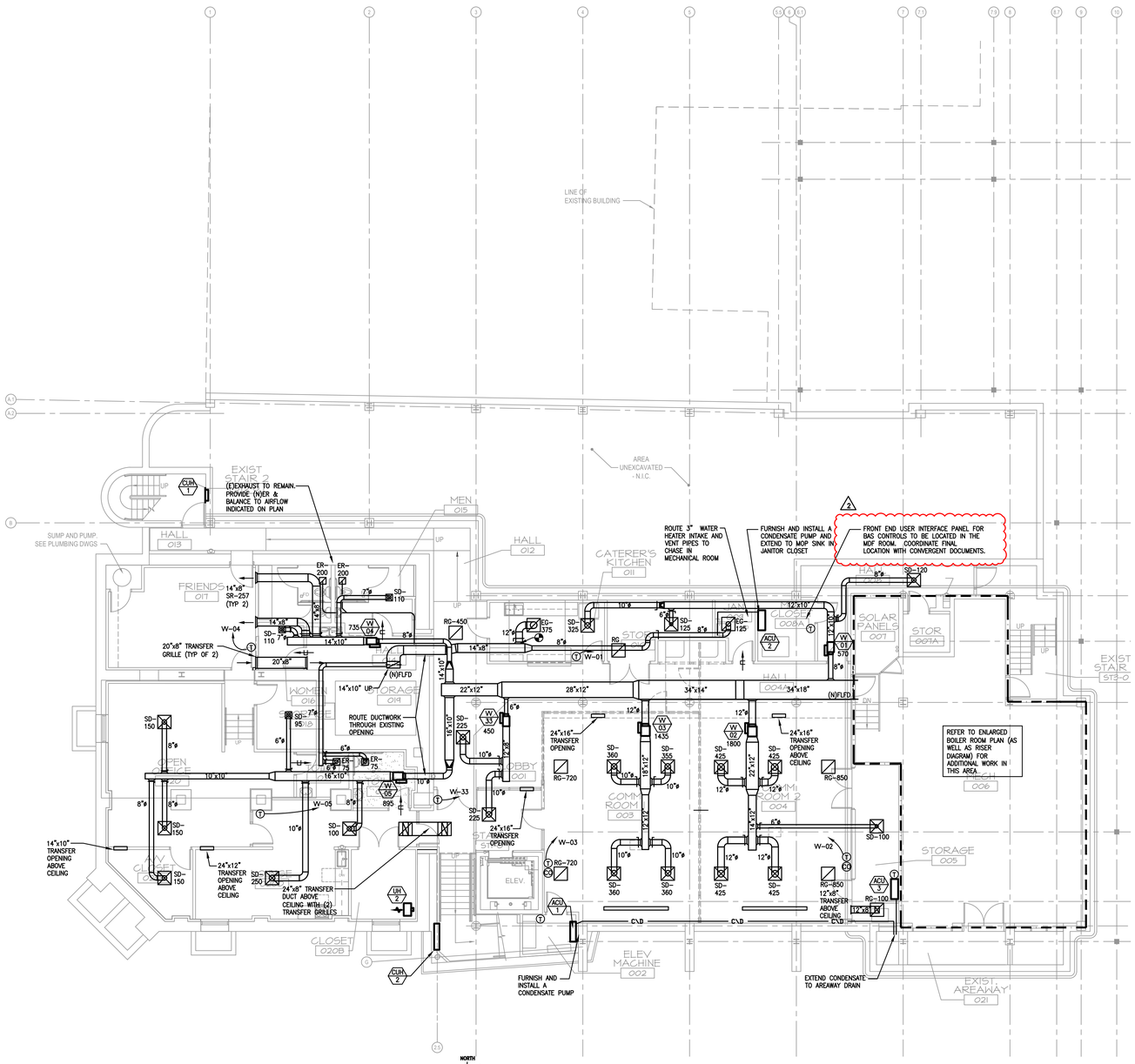
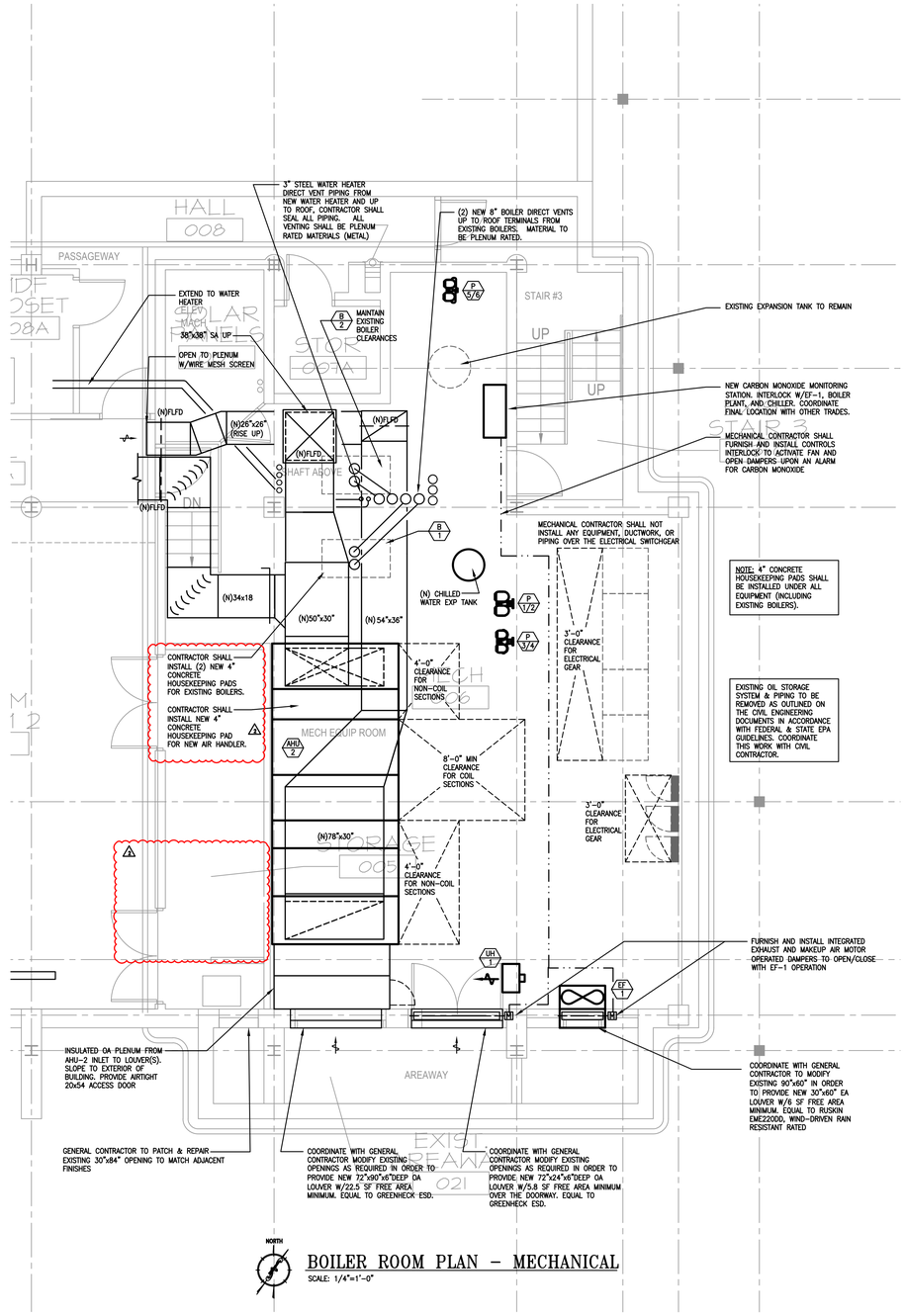
Sheet Number:
S5.11



NORTH

BASEMENT FLOOR PLAN – MECHANICAL DUCTWORK

SCALE: 1/8"=1'-0"



NORTH

BOILER ROOM PLAN – MECHANICAL

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

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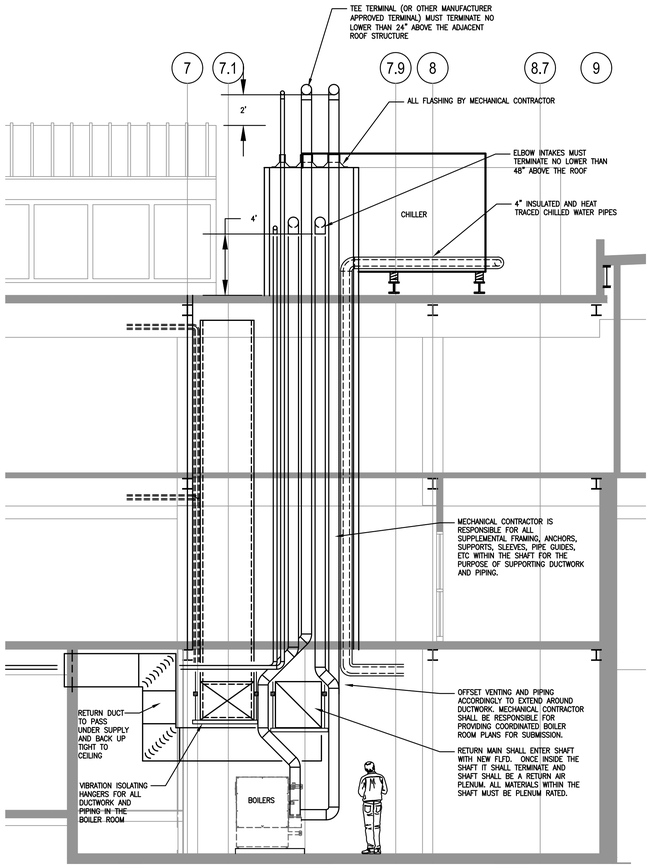
Reviewed:	.
Contact:	Chris Keenan
Project Number:	7010.03-22

Sheet Title:

BASEMENT FLOOR PLAN - MECHANICAL DUCTWORK

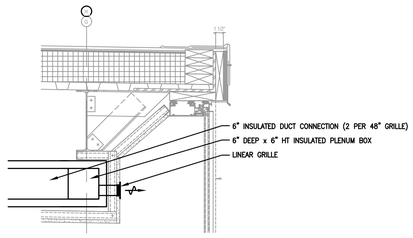
Sheet Number:

M1.0



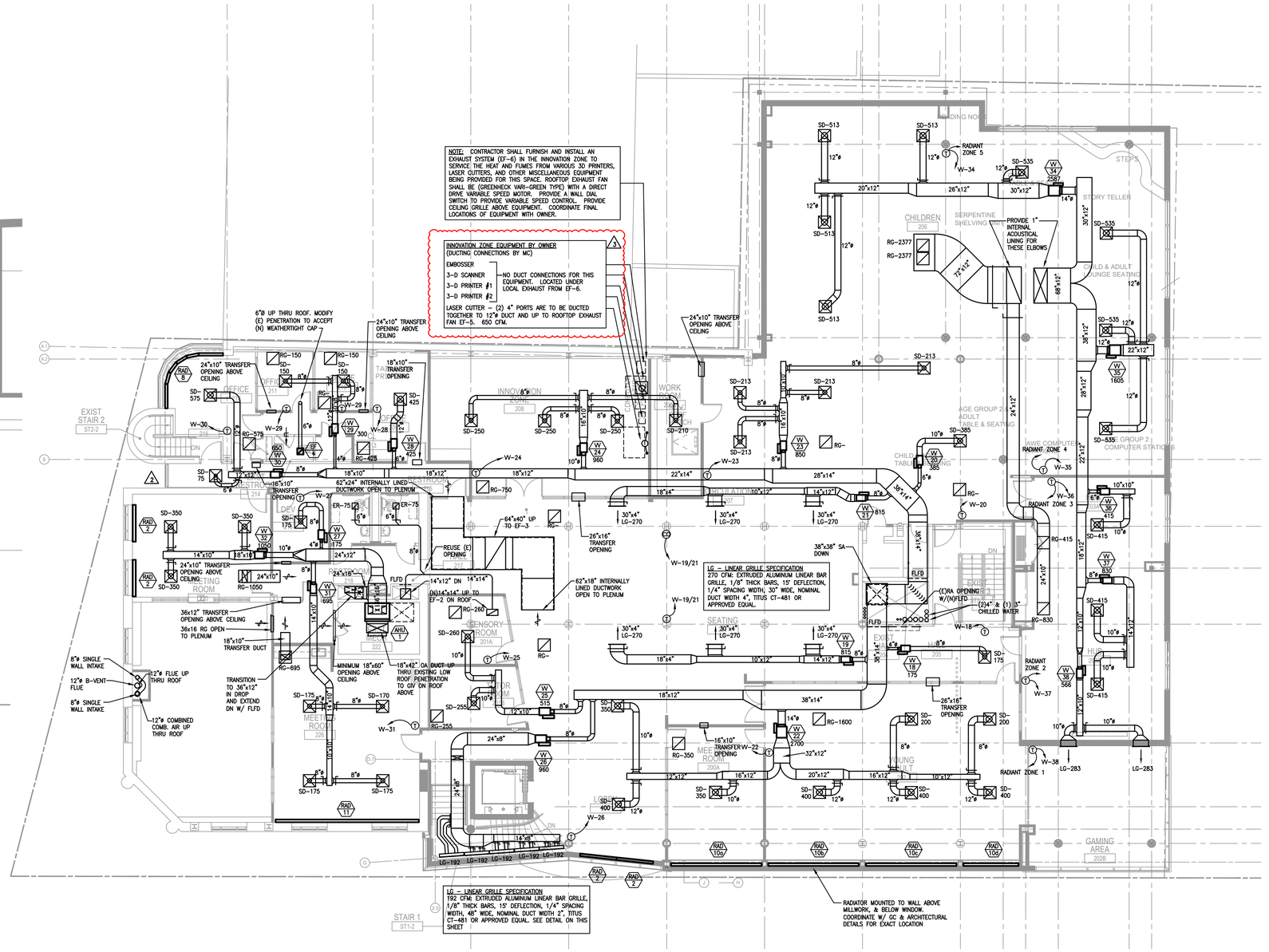
SECTION THROUGH SHAFT – MECHANICAL

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



SECTION AT LOBBY GRILLES– MECHANICAL

SCALE: 1"=1'-0"



SECOND FLOOR PLAN – MECHANICAL

SCALE: 1/8"=1'-0"

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SECOND FLOOR PLAN - MECHANICAL DUCTWORK

Sheet Number:

M1.2

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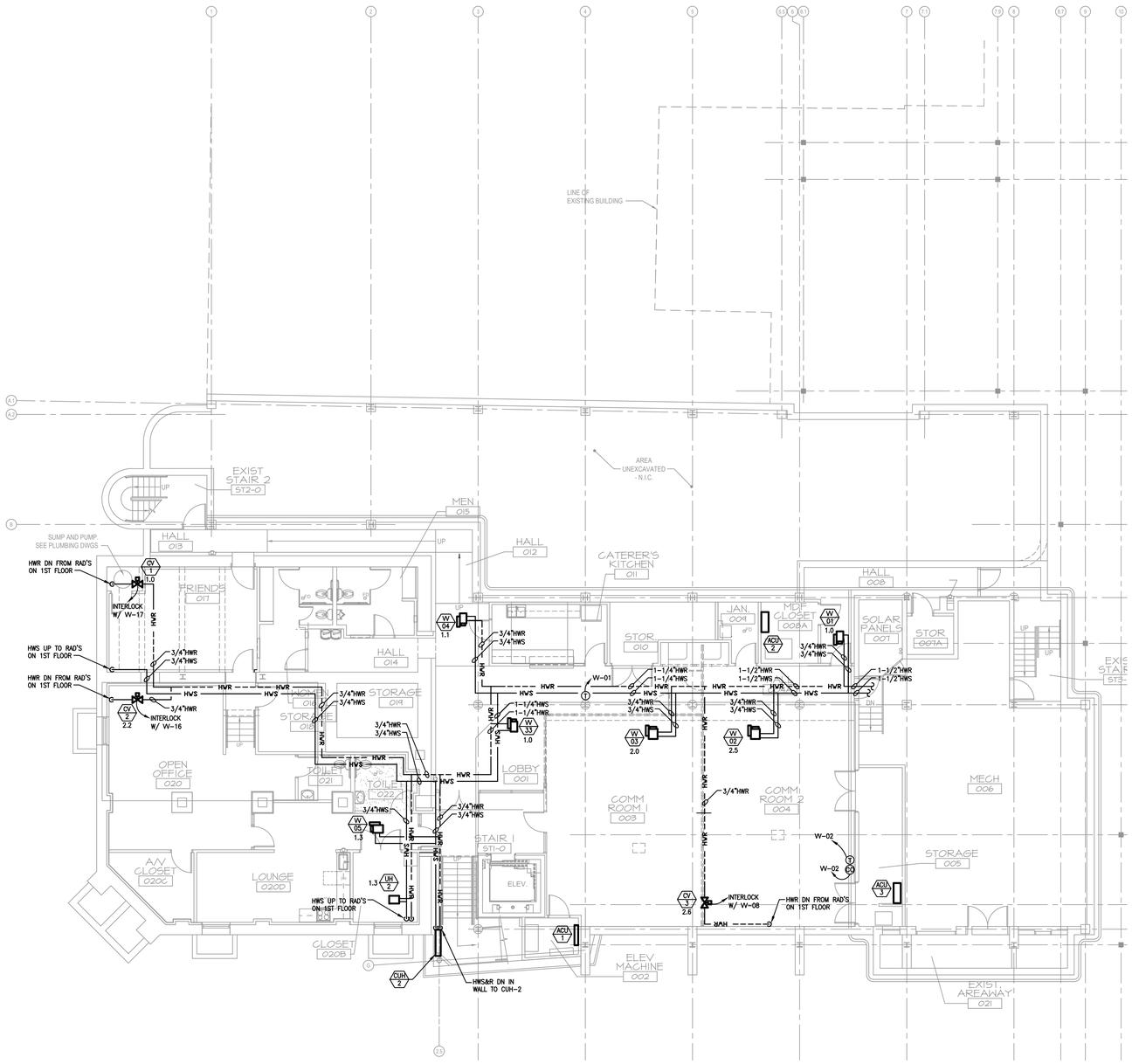
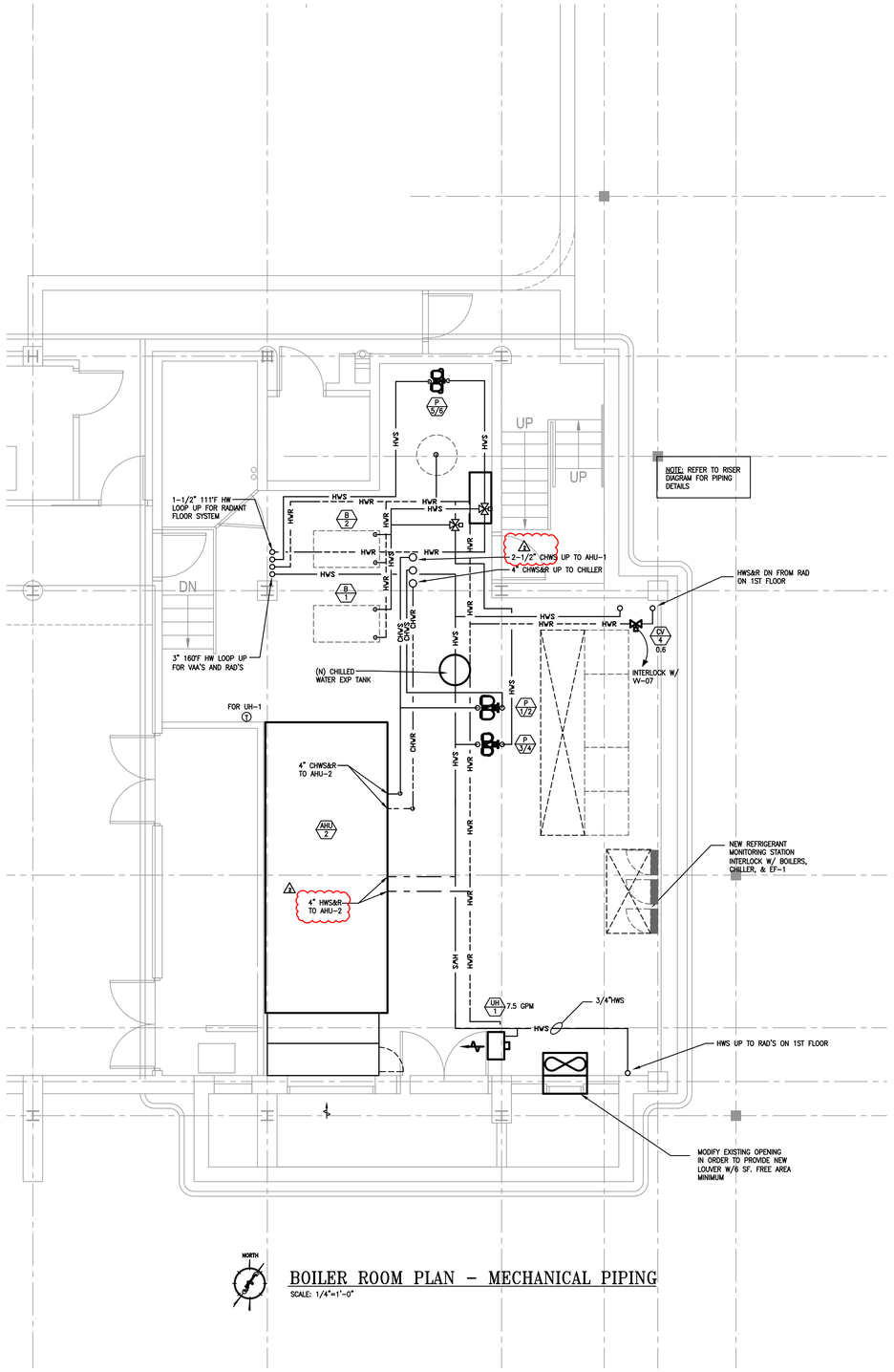


BASEMENT FLOOR PLAN - MECHANICAL PIPING

SCALE: 1/8"=1'-0"



BOILER ROOM PLAN - MECHANICAL PIPING

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

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Project:

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1601 Darby Road
Haverford Township
Havertown, PA 19083

Owner:

HAVERFORD TOWNSHIP FREE LIBRARY
1601 Darby Road
Haverford Township
Havertown, PA 19083

Revision/Issue:

	05/31/23	Issued for Permit
1	09/20/23	Issued for Bidding
2	10/17/23	Addendum 4

Drawn:	CK/MW/DE/KG
Reviewed:	.
Contact:	Chris Keenan
Project Number:	7010.03-22

Sheet Title:

BASEMENT FLOOR PLAN - MECHANICAL PIPING

Sheet Number:

M1.3

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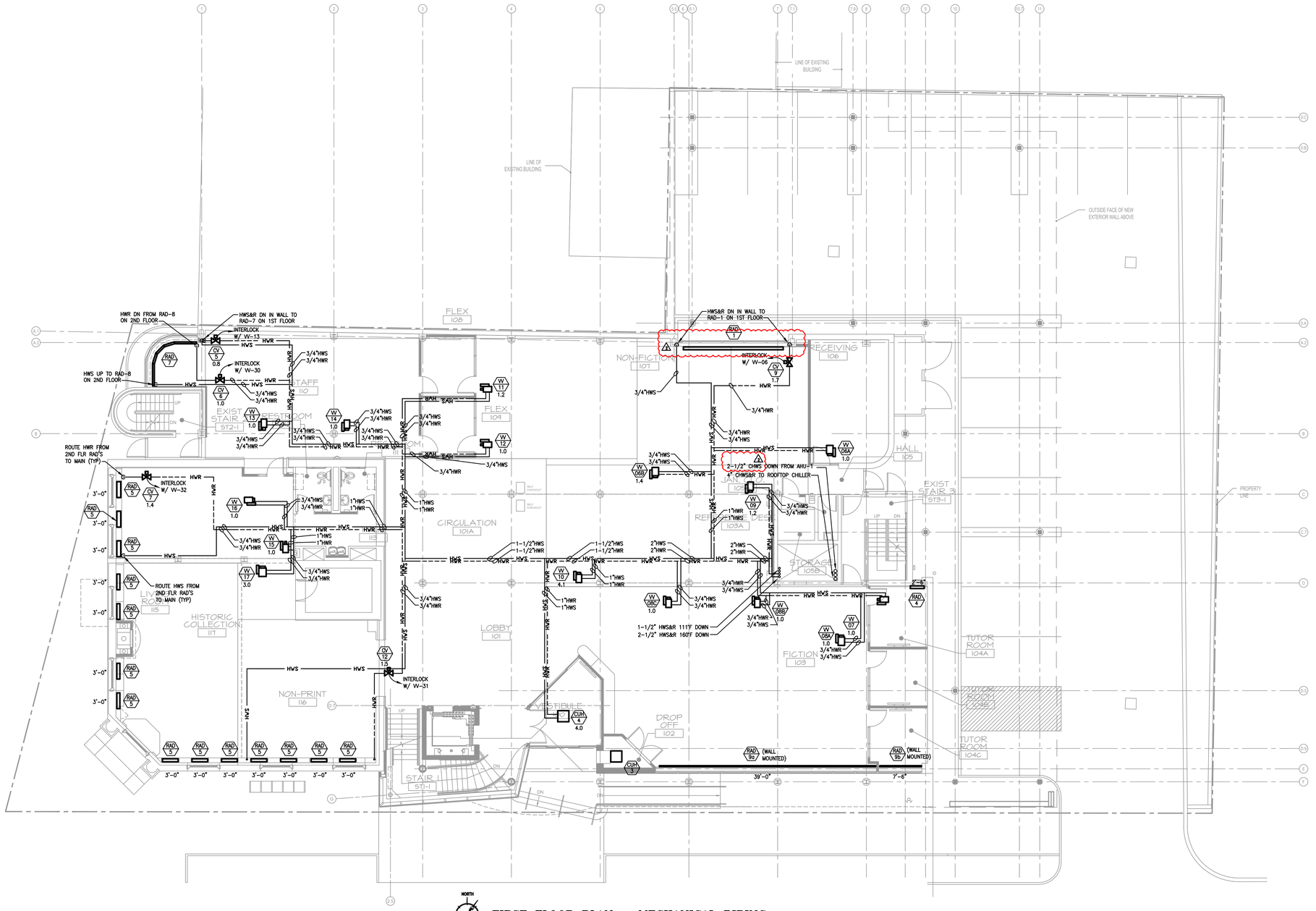

NORTH

FIRST FLOOR PLAN - MECHANICAL PIPING

SCALE: 1/8"=1'-0"

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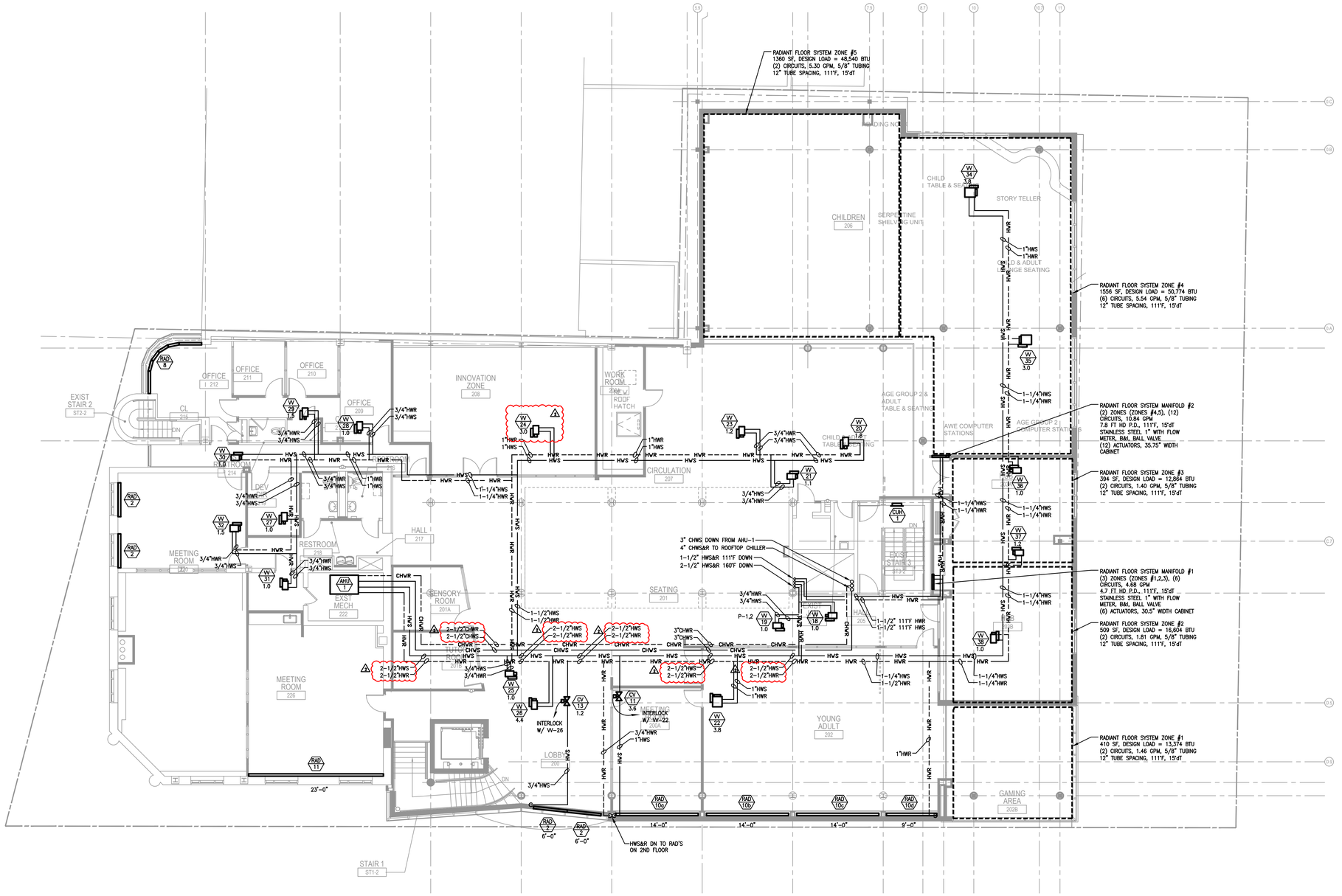
Drawn:	CK/MW/DE/KG
Reviewed:	.
Contact:	Chris Keenan
Project Number:	7010.03-22

Sheet Title:

FIRST FLOOR PLAN - MECHANICAL PIPING

Sheet Number:

M1.4



NORTH

SECOND FLOOR PLAN - MECHANICAL PIPING

SCALE: 1/8"=1'-0"

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THE SCHEDULES AND DRAWINGS REPRESENT ONLY CERTAIN REQUIREMENTS OF THE PROJECT. THERE ARE ADDITIONAL REQUIREMENTS IN THE SPECIFICATIONS BOOKLET WHICH THE CONTRACTOR IS BOUND TO PROVIDE. A SUPPLIER OR CONTRACTOR'S PRICING, WHICH IS BASED ONLY ON DRAWINGS OR SCHEDULES, MAY LEAVE IMPORTANT COSTS UNACCOUNTED FOR WHICH WILL ULTIMATELY BE THE CONTRACTOR OR SUPPLIER'S RESPONSIBILITY TO PROVIDE.

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Drawn:	CK/MW/DE/KG
Reviewed:	.
Contact:	Chris Keenan
Project Number:	7010.03-22

Sheet Title:

SECOND FLOOR PLAN - MECHANICAL PIPING

Sheet Number:

M1.5

CONTROL VALVE SCHEDULE

CV 1–17

NO.	SERVICE	TYPE	GPM	REMARKS
1 & 6	HW RAD.	2–WAY MODULATING	1.0	(1)
2	HW RAD.	2–WAY MODULATING	2.2	(1)
3	HW RAD.	2–WAY MODULATING	3.0	(1)
5	HW RAD.	2–WAY MODULATING	0.8	(1)
7	HW RAD.	2–WAY MODULATING	1.4	(1)
4	HW RAD.	2–WAY MODULATING	0.6	(1)
9	HW RAD.	2–WAY MODULATING	1.7	(1)
11	HW RAD.	2–WAY MODULATING	3.6	(1)
8	AHU	2–WAY MODULATING	5.0	INTEGRATE INTO AHU CONTROLS
10	CUH	2–WAY MODULATING	4.0	(2)
12	HW RAD.	2–WAY MODULATING	1.5	(1)
13	HW RAD.	2–WAY MODULATING	1.2	(1)

(1) INTEGRATE CONTROL VALVE WITH ASSOICATED VAV CONTROLLER (2) WALL MOUNTED THERMOSTAT WITH +/– 3 DEGREE ADJUSTMENT

RADIATOR SCHEDULE

RAD 1–10

NO	QTY	TYPE	BTU/HR/LF	BTU/HR	GPM EACH	DIMENSIONS L	W	H	WATER IN	OUT	BASIS OF DESIGN	REMARKS
1	1	WALL MOUNTED	940	16920	1.7	18'	2"	17–1/4"	160	140	RUNTAL RF–6	(1)(2)(3)(5)(6)(7)(8)
2	4	FLOOR MOUNTED	1100	6600	0.7	6'	2"	17–1/4"	160	140	RUNTAL RF–6	(1)(2)(3)(5)(6)(7)(8)(9)
3	0	NOT USED										
4	1	WALL MOUNTED	2022	5055	0.6	2.5'	5"	17–1/4"	160	140	RUNTAL RSF–6	(1)(3)(4)(5)(6)(7)(8)
5	14	BARE ELEMENT	720	2160	.2	3'	4"	4"	160	140	STERLING VERSA–LINE STYLE "B" BARE ELEMENT	(3)(4)(5)(6)(7)(8)
6	0	NOT USED										
7	1	WALL MOUNTED	570	7980	0.8	12'	5"	11–1/4"	160	140	STERLING DURA–VANE II JDVP31 PEDESTAL MOUNT	(4)(5)(6)(7)(8)(10)
8	1	FLOOR MOUNTED	570	9120	1.0	16'	5"	11–1/4"	160	140	STERLING DURA–VANE II JDVP31 PEDESTAL MOUNT	(4)(5)(6)(7)(8)(11)
9a	1	WALL MOUNTED	625	24375	2.5	39'	2"	11–1/2"	160	140	RUNTAL RF–3	(1)(3)(4)(5)(6)(7)(8)
9b	1	WALL MOUNTED	625	4687	0.5	7.5'	2"	11–1/2"	160	140	RUNTAL RF–3	(1)(3)(4)(5)(6)(7)(8)
10a,b,c	3	WALL MOUNTED	625	8750	1.0	14'	2"	11–1/2"	160	140	RUNTAL RF–3	(1)(2)(3)(5)(6)(7)(8)(12)
10d	1	WALL MOUNTED	625	5625	0.6	9'	2"	11–1/2"	160	140	RUNTAL RF–3	(1)(2)(3)(5)(6)(7)(8)(12)
11	1	WALL MOUNTED	625	14375	1.5	23'	2"	11–1/2"	160	140	RUNTAL RF–3	(1)(2)(3)(5)(6)(7)(8)(12)

(1) FACTORY PROVIDED 12" FULL END CAP TRIM W/ 5" DOUBLE PANEL RETURN. PIPING SHALL BE COMPLETELY CONCEALED

(2) PROVIDE ALL FACTORY PROVIDED RETAINING CLIPS, WALL BRACKETS, AND OFFSET BOLTS REQUIRED FOR MANUFACTURER'S INSTALLTION REQUIREMENTS

(3) COORDINATE RIGHTHAND, LEFTHAND, AND SERIES PIPING CONNECTIONS WITH MASONRY CONTRACTOR CHASING EXISTING EXTERIOR WALL

(4) PROVIDE ALL FACTORY PROVIDED PEDESTAL BRACKETS REQUIRED FOR MANUFACTURER'S INSTALLATION REQUIREMENTS. BRACKETS SHALL BE FACTORY FINISHED TO MATCH RADIATOR.

(5) REFER TO CONTROL VALVE SCHEDULE FOR ADDITIONAL INFORMATION

(6) FINISH BY ARCHITECT FROM STD COLORS. CONCEALED UNITS SHALL BE MFG STD GREY BROWN COLOR 8019

(7) SUPPLY & RETURN BALL VALVES

(8) MANUFACTURERS: RUNTAL, VULCAN, STERLING OR PRIOR APPROVED EQUAL.

(9) PROVIDE VERTICAL PIPE TRIM FROM FINISHED FLOOR TO END CAP TRIM. PIPING SHALL BE COMPLETELY CONCEALED

(10) PROVIDE MITERED CORNERS IN ORDER TO PROVIDE RADIUSED ENCLOSURE. DESIGN INTENT: (3) 2FT SECTIONS, (2) 4FT SECTIONS, & 4 MITERED CORNERS

(11) PROVIDE MITERED CORNERS IN ORDER TO PROVIDE RADIUSED ENCLOSURE. DESIGN INTENT: (4) 2FT SECTIONS, (2) 4FT SECTIONS, & 5 MITERED CORNERS

(12) MOUNT UNIT ON WALL ABOVE MILLWORK, AND BELOW WINDOW. PROVIDE CONNECTORS, TRIM PIECES, AND HARDWARE REQUIRED TO CONCEAL ALL PIPING.

EXHAUST FAN SCHEDULE (EF)

Tag	Serves	Configuration	CFM	External Static (in.)	Fan HP	RPM	Sones	Inlet dBA	Volts	Phase	Control	Basis of Design	Comments
1	MECHANICAL ROOM	SIDEWALL PROPELLER	950	0.25	1	1282	11.4	63	120	1	THERMOSTAT & REFRIGERANT MONITORING STATION	GREENHECK SE1-20-420-VG	1, 2, 5, 6
2	RESTROOMS	CENTRIFUGAL DOWNBLAST	1300	0.5	1/3	1009	7.5	55	208	3	BAS - TIMECLOCK	GREENHECK GB-141	1, 2, 4, 5
3	BUILDING RELIEF	ROOF MOUNTED FABRA HOOD	19400	0.50	5	290	14.2	64	208	3	BUILDING DIFFERENTIAL PRESSURE SENSOR	GREENHECK LB-54-50	1, 2, 3, 5
4	OFFICE RESTROOM	CEILING MOUNTED	100	0.20	23 Watts	290	0.3	-	120	1	BAS - TIMECLOCK	GREENHECK SP-110-VG	2, 4, 5
5	LASER CUTTER	CENTRIFUGAL DOWNBLAST	650	0.50	1/6	1577	9.4	58	120	1	DRY CONTACT INTERLOCK WITH LASER CUTTER	GREENHECK G-095-VG	1, 2
6	INNOVATION ZONE	CENTRIFUGAL DOWNBLAST	400	0.50	1/10	1474	6.8	53	120	1	WALL MOUNTED DIAL SPEED CONTROL SWITCH	GREENHECK G-090-VG	1, 2

Comments

1 Motor operated damper with end switch to prove damper operation. Interlock with fan via BAS. Provide BAS alarm
2 Equal by Acme, Penn Vent, Fantech, Cook
3 Sequence: Start-up - Upon a rise in space pressure above space pressure setpoint (0.05" wg, adjustable) as sensed by differential pressure sensor; motor operated damper shall open, then fan shall enable. Pressure Control - Fan shall modulate to maintain space pressure setpoint (0.05" wg, adjustable). Shut-down - Upon a fall in space pressure below space pressure setpoint (0.05" wg, adjustable) as sensed by differential pressure sensor, fan shall disable, then motor operated damper shall close
4 Sequence: Start-up - Fan shall enable during occupied hours (06:00 - 21:00, adjustable) as scheduled by BAS. Shut-down - Fan shall disable during unoccupied hours (21:00 - 06:00, adjustable) as scheduled by BAS
5 Fan motor with current transducer to prove motor operation. Provide BAS alarm
6 Sequence: Start-up - Upon a rise in space temperature above the space temperature setpoint (80°F, adjustable) as sensed by reverse acting thermostat fan shall enable. Shut-down - Upon a fall in space temperature below the space temperature setpoint (80°F, adjustable) as sensed by reverse acting thermostat fan shall disable. Refrigerant Monitoring Mode - Upon recieving a signal from the RMS, the fan shall enable.

UNIT HEATER SCHEDULE (CUH / UH)

Tag	Type	KW	MBH	GPM	Size L x W x H	Voltage / Phase	Amps	MOCP	Basis of Design	Comments
CUH-1	FAN-FORCED RECESSED WALL HEATER	4.8	16.4	-	16 x 4 x 20	208 / 1	23.1	30	QMARK SSAR4808	1, 2, 3, 6, 7
CUH-2	FAN-FORCED RECESSED WALL HEATER	-	40	4	47 x 9 x 25	120 / 1	0.65	20	STERLING RW-04	3, 8, 9
CUH-3	FAN-FORCED RECESSED CEILING HEATER	4	13.6	-	24 x 24 x 7	208 / 1	19.2	25	QMARK CDF548	3, 4
CUH-4	FAN-FORCED RECESSED CEILING HEATER	-	40	4	47 x 9 x 25	120 / 1	0.65	20	STERLING RC 04	3, 8, 9, 10
UH-1	CEILING HUNG VERTICAL UNIT HEATER	-	44	7.5	19 x 8.5 x 22	120/1	2.2	15	STERLING HS 108	1, 7
UH-2	CEILING HUNG VERTICAL UNIT HEATER	-	8.3	1.3	19 x 8.5 x 22	120/1	0.8	15	STERLING HS 18	1, 7

Comments

1 Provide proportional heating element and fan control
2 Provide digital touchscreen thermostat with 5/2 programmability, 4 periods per day, lockout control, and dry contact connection to BAS
3 Finish selected by architect from standard colors
4 Integral thermostat
5 Provide 2-stage heating element and thermostat
6 Provide fully recessed mounting of backbox in order to provide flush mounting of grille. Coordinate with masonry contractor and electrical contractor in order to provide flush mounting of grille and fully recessed mounting of backbox in masonry walls.
7 Provide manufacture provided integration option in order to integrate with BAS for ENABLE/DISABLE based on OA temperature
8 Provide 3-speed ECM motor, 3-way hot water control valve, wall mounted digital thermostat. Integrate into BAS.
9 Provide high capacity 2-row heating coil
10 Provide flush face, supply duct collar, and return duct collar

PUMP SCHEDULE (P)

Tag	Serves	Configuration	GPM	FT. HD.	RPM	HP	Voltage / Phase	Basis of Design Manufacturer	Basis of Design Model	Comments
1	CHILLED WATER	SENSORLESS CLOSE COUPLED VERTICAL INLINE TANGO PUMP	210	50	2521	5	208 / 3	Armstrong	4372	*1 2 3 4 5 6 8
2	CHILLED WATER	SENSORLESS CLOSE COUPLED VERTICAL INLINE TANGO PUMP	210	50	2521	5	208 / 3	Armstrong	4372	*1 2 3 4 5 6 8
3	HOT WATER	SENSORLESS CLOSE COUPLED VERTICAL INLINE TANGO PUMP	216	50	2826	5	208 / 3	Armstrong	4372	1 2 3 4 7 8
4	HOT WATER	SENSORLESS CLOSE COUPLED VERTICAL INLINE TANGO PUMP	216	50	2826	5 (3)	208 / 3	Armstrong	4372	1 2 3 4 7 8
5	RADIANT FLOOR	SENSORLESS CLOSE COUPLED VERTICAL INLINE TANGO PUMP	16	15	2383	1/3	208 / 3	Armstrong	4372	2 3 4 8
6	RADIANT FLOOR	SENSORLESS CLOSE COUPLED VERTICAL INLINE TANGO PUMP	16	15	2383	1/3	208 / 3	Armstrong	4372	2 3 4 8

*Provide algorithmic controls to maintain 120 gpm minimum flow for proper operation of new chiller

Comments

1 Vibration isolators
2 Flexible connections
3 Pressure gauge discharge/suction
4 Inlet strainer
5 Provide air/dirt separator equal to SPIROTHERM VDT400
6 Provide ASME expansion tank equal to ARMSTRONG AX-60V
7 Provide air/dirt and hydraulic separator equal to SPIROTHERM VDX300
8 Provide Factory Furnished Fused Disconnect accessory

CH 1

AIR COOLED CHILLER SPECIFICATION

- 90 TONS, HIGH EFFICIENCY, AIR COOLED CHILLER WITH "SUPER QUIET" FACTORY SOUND PACKAGE
- 10.21 EER, 15.98 EER (IPLV.IP)
- 208V, 3PH, 60HZ, 395 MCA, 500 MOCP
- (4) COMPRESSORS, (2) CIRCUITS, (4) CAPACITY STEPS
- BASIS OF DESIGN TRANE CGAM (SUBSTITUTIONS REQUIRE ACOUSTICAL AND WEIGHT ANALYSIS AND ENGINEER APPROVAL)
- 210 GPM, 54°F ENT, 44°F LWT, 117 GPM MIN FLOW, 8.11FT HD MAX WATER PD
- FREEZE PROTECTION, HIGH AMBIENT CAPABILITY
- 6,000 LBS WEIGHT
- PROVIDE VIBRATION ISOLATION SPRINGS ON DUNNAGE PROVIDED UNDER STRUCTURAL CONTRACT
- OCTAVE BAND SOUND PRESSURE (DB), 'A' WEIGHTED

AHRI LOAD FACTOR (%)	63 HZ	125 HZ	250 HZ	500 HZ	1000 HZ	2000 HZ	4000 HZ	8000 HZ	OVERALL SOUND PRESSURE LEVEL, LP, DBA @ 1 M (3.3 FT)
100	70	77	69	61	62	59	54	51	68
75	61	67	63	52	56	56	51	49	62
50	63	59	56	45	50	54	52	51	59
25	61	67	62	52	51	51	47	45	59

RTU 1

ROOFTOP UNIT SPECIFICATION

- 15 TON PACKAGED VARIABLE AIR VOLUME (VAV) ROOFTOP GAS/ELECTRIC, DOWNFLOW
- 11.00 EER, 12.20 IEER
- 208V, 3PH, 60HZ, 68 MCA, 90 MOCP
- (2) COMPRESSOR CIRCUITS,
- BASIS OF DESIGN TRANE YSD (SUBSTITUTIONS REQUIRE ACOUSTICAL AND WEIGHT ANALYSIS AND ENGINEER APPROVAL)
- GAS HEAT 350 MBH INPUT (250 MBH 1ST STAGE), 280 MBH OUTPUT (200 MBH 1ST STAGE), 70°F EAT, 113°F LAT
- 184 MBH TOTAL, 149 MBH SENSIBLE
- 2,800 LBS WEIGHT
- PROVIDE VIBRATION ISOLATION ROOF CURB
- ACOUSTICS

SOUND PATH	63 HZ	125 HZ	250 HZ	500 HZ	1 KHZ	2 KHZ	4 KHZ	8 KHZ
DUCTED DISCHARGE	87 DB	82 DB	76 DB	79 DB	72 DB	70 DB	69 DB	63 DB
DUCTED INLET	91 DB	82 DB	74 DB	70 DB	65 DB	60 DB	60 DB	53 DB
OUTDOOR NOISE	89 DB	97 DB	94 DB	92 DB	89 DB	83 DB	79 DB	75 DB

VAV BOX SCHEDULE (VV)

Tag	Box Size	Max CFM	Min CFM	DCV Min CFM CO2	DCV Min CFM OCC*	Inlet Size	Outlet Size	Heating Coil EAT (°F)	LAT (°F)	MBH	GPM	HD LOSS (FT)	EWT (°F)	Control Valve	Basis of Design
VV-01	8	570	171	-	-	8	12x10	55	106	10	1.0	0.8	160	2-WAY	ENVIRO-TEC SDR
VV-02	12	1800	540	0	-	12	16x15	55	95	25	2.5	0.8	160	2-WAY	ENVIRO-TEC SDR
VV-03	12	1435	431	0	-	12	16x15	55	95	20	2.0	0.5	160	2-WAY	ENVIRO-TEC SDR
VV-04	8	735	221	-	-	8	12x10	55	98	11	1.1	0.6	160	2-WAY	ENVIRO-TEC SDR
VV-05	10	895	269	-	-	10	14x12	55	97	13	1.3	0.8	160	2-WAY	ENVIRO-TEC SDR
VV-06A	8	660	198	-	-	8	12x10	55	99	10	1.0	0.6	160	2-WAY	ENVIRO-TEC SDR
VV-06B	10	1020	306	-	-	10	14x12	55	95	14	1.4	0.8	160	3-WAY	ENVIRO-TEC SDR
VV-07	4	225	68	-	0	4	12x8	55	94	10	1.0	0.5	160	2-WAY	ENVIRO-TEC SDR
VV-08A	8	595	180	-	-	8	12x10	55	103	10	1.0	0.6	160	2-WAY	ENVIRO-TEC SDR
VV-08B	8	595	180	-	-	8	12x10	55	103	10	1.0	0.6	160	2-WAY	ENVIRO-TEC SDR
VV-08C	8	595	180	-	-	8	12x10	55	103	10	1.0	0.6	160	2-WAY	ENVIRO-TEC SDR
VV-09	8	865	260	-	-	8	12x10	55	95	12	1.2	0.6	160	2-WAY	ENVIRO-TEC SDR
VV-10	8	900	270	-	-	8	12x10	55	95	41	4.1	4.2	160	2-WAY	ENVIRO-TEC SDR
VV-11	4	250	75	-	0	4	12x8	55	97	12	1.2	0.5	160	2-WAY	ENVIRO-TEC SDR
VV-12	4	225	68	-	0	4	12x8	55	94	10	1.0	0.5	160	2-WAY	ENVIRO-TEC SDR
VV-13	8	675	203	-	-	8	12x10	55	98	10	1.0	0.6	160	2-WAY	ENVIRO-TEC SDR
VV-14	6	450	135	-	-	6	12x8	55	119	10	1.0	0.5	160	3-WAY	ENVIRO-TEC SDR
VV-15	4	200	60	-	0	4	12x8	55	98	10	1.0	0.5	160	2-WAY	ENVIRO-TEC SDR
VV-16	8	630	189	-	-	8	12x10	55	101	10	1.0	0.6	160	2-WAY	ENVIRO-TEC SDR
VV-17	12	1960	588	-	-	12	16x15	55	99	30	3.0	1.6	160	3-WAY	ENVIRO-TEC SDR
VV-18	4	200	60	-	0	4	12x8	55	98	10	1.0	0.5	160	2-WAY	ENVIRO-TEC SDR
VV-19	8	815	245	0	-	8	12x10	55	94	11	1.1	0.8	160	2-WAY	ENVIRO-TEC SDR
VV-20	6	385	116	-	0	6	12x8	55	96	18	1.8	0.7	160	2-WAY	ENVIRO-TEC SDR
VV-21	8	815	245	0	-	8	12x10	55	94	11	1.1	0.8	160	2-WAY	ENVIRO-TEC SDR
VV-22	14	2700	810	-	-	14	20x18	55	96	38	3.8	2.1	160	2-WAY	ENVIRO-TEC SDR
VV-23	6	850	255	-	0	8	12x10	55	96	12	1.2	0.6	160	2-WAY	ENVIRO-TEC SDR
VV-24	10	960	288	-	0	10	14x12	55	85	10	2.0	0.5	160	2-WAY	ENVIRO-TEC SDR
VV-25	8	515	155	-	-	8	12x10	55	111	10	1.0	0.6	160	2-WAY	ENVIRO-TEC SDR
VV-26	8	960	288	-	-	8	12x10	55	95	44	4.4	1.5	160	2-WAY	ENVIRO-TEC SDR
VV-27	4	225	67.5	-	0	4	12x8	55	94	10	1.0	0.5	160	2-WAY	ENVIRO-TEC SDR
VV-28	6	475	143	-	-	6	12x8	55	116	10	1.0	0.5	160	2-WAY	ENVIRO-TEC SDR
VV-29	4	300	90	-	-	4	12x8	55	98	15	1.5	0.5	160	2-WAY	ENVIRO-TEC SDR
VV-30	8	650	195	-	0	8	12x10	55	100	10	1.0	0.6	160	3-WAY	ENVIRO-TEC SDR
VV-31	8	695	210	-	-	8	12x10	55	96	10	1.0	0.6	160	2-WAY	ENVIRO-TEC SDR
VV-33	6	450	135	-	0	6	12x8	55	119	10	1.0	0.5	160	2-WAY	ENVIRO-TEC SDR
VV-34	14	2587	776	-	-	14	20x18	55	97	38	3.8	2.1	160	2-WAY	ENVIRO-TEC SDR
VV-35	12	1605	482	-	-	12	16x15	55	109	30	3.0	1.6	160	3-WAY	ENVIRO-TEC SDR
VV-36	6	415	125	-	0	6	12x8	55	125	10	1.0	0.5	160	2-WAY	ENVIRO-TEC SDR
VV-37	8	830	249	-	-	8	12x10	55	97	12	1.2	0.6	160	2-WAY	ENVIRO-TEC SDR
VV-38	8	566	170	-	-	8	12x10	55	106	10	1.0	0.6	160	2-WAY	ENVIRO-TEC SDR
VV-32	10	1050	315	0	-	10	14x12	55	96	15	1.5	0.3	160	3-WAY	ENVIRO-TEC SDR

3 2

* Integrate room occupancy sensor(s) into VAV controller in order to provide occupancy based demand controlled ventilation of space. Design intent is that occupancy sensors shall be provided with integral 24V output. Coordinate with electrician to ensure output is provided. Provide all accessories required to integrate occupancy sensor into VAV controller in order to provide occupancy based demand controlled ventilation of space including but not limited to wiring, relays, transformers, junction boxes, conduit, fittings, etc.

AIR HANDLING UNIT SCHEDULE

Tag	Type	Supply Fan Type	Qty	Class	Cooling Airflow (CFM)	Heating Airflow (CFM)	Outdoor Airflow (CFM)	RPM	BHP	E.S.P. (inH2O)	T.S.P. (inH2O)	Drive	Motor Voltage	Power (HP)	RPM	Control	Chilled Water Coil Total Capacity (Btu/hr)	Sensible Capacity (Btu/hr)	EAT-DB °F	EAT-WB °F	LAT-DB °F	LAT-WB °F	F.V. (ft/min)	A.P.D. (inH2O)	EWT °F	LWT °F	Flow Rate (GPM)	W.P.D. (ftH2O)	Hot Water Coil Total Capacity (Btu/hr)	EAT-DB °F	LAT-DB °F	F.V. (ft/min)	A.P.D. (inH2O)	EWT °F	LWT °F	Maximum Flow Rate (GPM)	W.P.D. (ftH2O)	Filter Pre-Filter Type	Pre-Filter Depth	Pre-Filter Efficiency	Final Filter Type	Final Filter Depth	Final Filter Efficiency	Basis of Design Mfg	Basis of Design Model	Comments
AHU-1	VERTICAL CENTRAL STATION VAV	FORWARD CURVED	1	1	4800	4800	765	1502	5.7	1.0	2.75	Belt	208 / 3	7.5	1750	VFD	171550	125594	80	67	56.1	55.6	493	0.39	45	55	34.3	8.11	300000	62.3	120.2	511	0.21	160	140	30	5.89	-	-	-	Pleated (MERV 14)	4	90	Daikin	Destiny	1, 2, 3, 4, 5, 6, 7, 8
AHU-2	HORIZONTAL CENTRAL STATION VAV	PLENUM	1	2	19400	19400	4100	1447	25.9	3.0	6.05	Belt	208 / 3	30	1750	VFD	581600	395488	80	67	54.3	53.7	491	0.72	45	55	150	9.9	1273000	60.2	121.0	511	0.21	160	140	127.3	8.6	Pleated (MERV 8)	2	30	Varicel SH cartridge	12	95	Daikin	Vision	6, 7, 8

*comments:

1 Mixing Box
2 Bottom Filter Access
3 Belt Tensioner
4 Hinged Access Panels
5 Provide Airflow Measuring Station
6 Vibration isolating spring mounts
7 Extend condensate to nearby indirect waste drain
8 Supply air static pressure reset to be provided.

DUCTLESS SPLIT SYSTEM SCHEDULE (CU/ACU)

Tag	Basis of Design	Model	Nominal Cooling Capacity (BTU/h)	Cooling Efficiency SEER	Design Outdoor Condition DB / WB	Design Indoor Condition DB / WB	Airflow CFM	Refrigerant Type	Sound Pressure (dBA)	Voltage / Phase	Electrical MCA	Electrical ROCP	Electrical MOCP	Comments
CU-1	MITSUBISHI	PUY-A12NHA4	12000	15.2	95 / 75	-	1200	410A	46	208 / 1	13	15	15	2
CU-2	MITSUBISHI	PUY-A12NHA4	12000	15.2	95 / 75	-	1200	410A	46	208 / 1	13	15	15	2
CU-3	MITSUBISHI	PUY-A12NHA4	12000	15.2	95 / 75	-	1200	410A	46	208 / 1	13	15	15	2
ACU-1	MITSUBISHI	PKA-A12HA4	12000	15.2	-	80 / 67	425	410A	43	DC 24V	-	-	-	1
ACU-2	MITSUBISHI	PKA-A12HA4	12000	15.2	-	80 / 67	425	410A	43	DC 24V	-	-	-	1
ACU-3	MITSUBISHI	PKA-A12HA4	12000	15.2	-	80 / 67	425	410A	43	DC 24V	-	-	-	1

Comments

1 Indoor unit recieves power from outdoor unit through manufacturer provided interconnected wiring.
2 Provide optional wind baffle accessory for operation down to 0°F.

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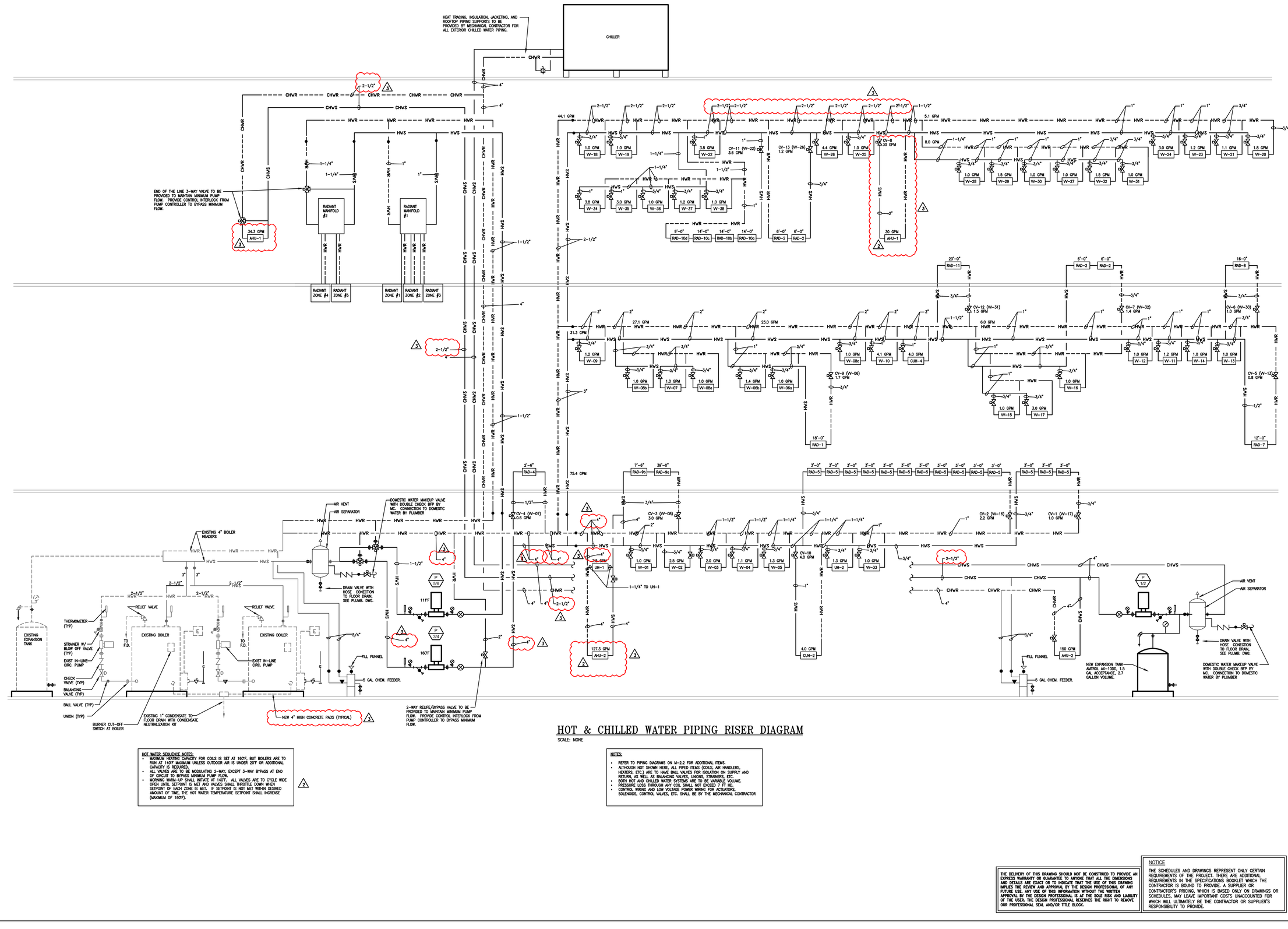
Reviewed: .
Contact: Chris Keenan
Project Number: 7010.03-22

Sheet Title:

DETAILS & SCHEDULES - MECHANICAL

Sheet Number:

M2.0



HOT & CHILLED WATER PIPING RISER DIAGRAM

SCALE: NONE

HOT WATER SEQUENCE NOTES:

- MAXIMUM HEATING CAPACITY FOR COILS IS SET AT 160°F, BUT BOILERS ARE TO RUN AT 140°F MAXIMUM UNLESS OUTDOOR AIR IS UNDER 20°F OR ADDITIONAL CAPACITY IS REQUIRED.
- ALL VALVES ARE TO BE MODULATING 2-WAY, EXCEPT 3-WAY BYPASS AT END OF CIRCUIT TO BYPASS MINIMUM PUMP FLOW.
- MORNING WARM-UP SHALL INITIATE AT 140°F. ALL VALVES ARE TO CYCLE WIDE OPEN UNTIL SETPOINT IS MET AND VALVES SHALL THROTTLE DOWN WHEN SETPOINT OF EACH ZONE IS MET. IF SETPOINT IS NOT MET WITHIN DESIRED AMOUNT OF TIME, THE HOT WATER TEMPERATURE SETPOINT SHALL INCREASE (MAXIMUM OF 160°F).

NOTES:

- REFER TO PIPING DIAGRAMS ON M-2.2 FOR ADDITIONAL ITEMS.
- ALTHOUGH NOT SHOWN HERE, ALL PIPED ITEMS (COILS, AIR HANDLERS, HEATERS, ETC.) ARE TO HAVE BALL VALVES FOR ISOLATION ON SUPPLY AND RETURN, AS WELL AS BALANCING VALVES, UNIONS, STRAINERS, ETC.
- BOTH HOT AND CHILLED WATER SYSTEMS ARE TO BE VARIABLE VOLUME.
- PRESSURE LOSS THROUGH ANY COIL SHALL NOT EXCEED 7 FT HD.
- CONTROL WIRING AND LOW VOLTAGE POWER WIRING FOR ACTUATORS, SOLENOIDS, CONTROL VALVES, ETC. SHALL BE BY THE MECHANICAL CONTRACTOR

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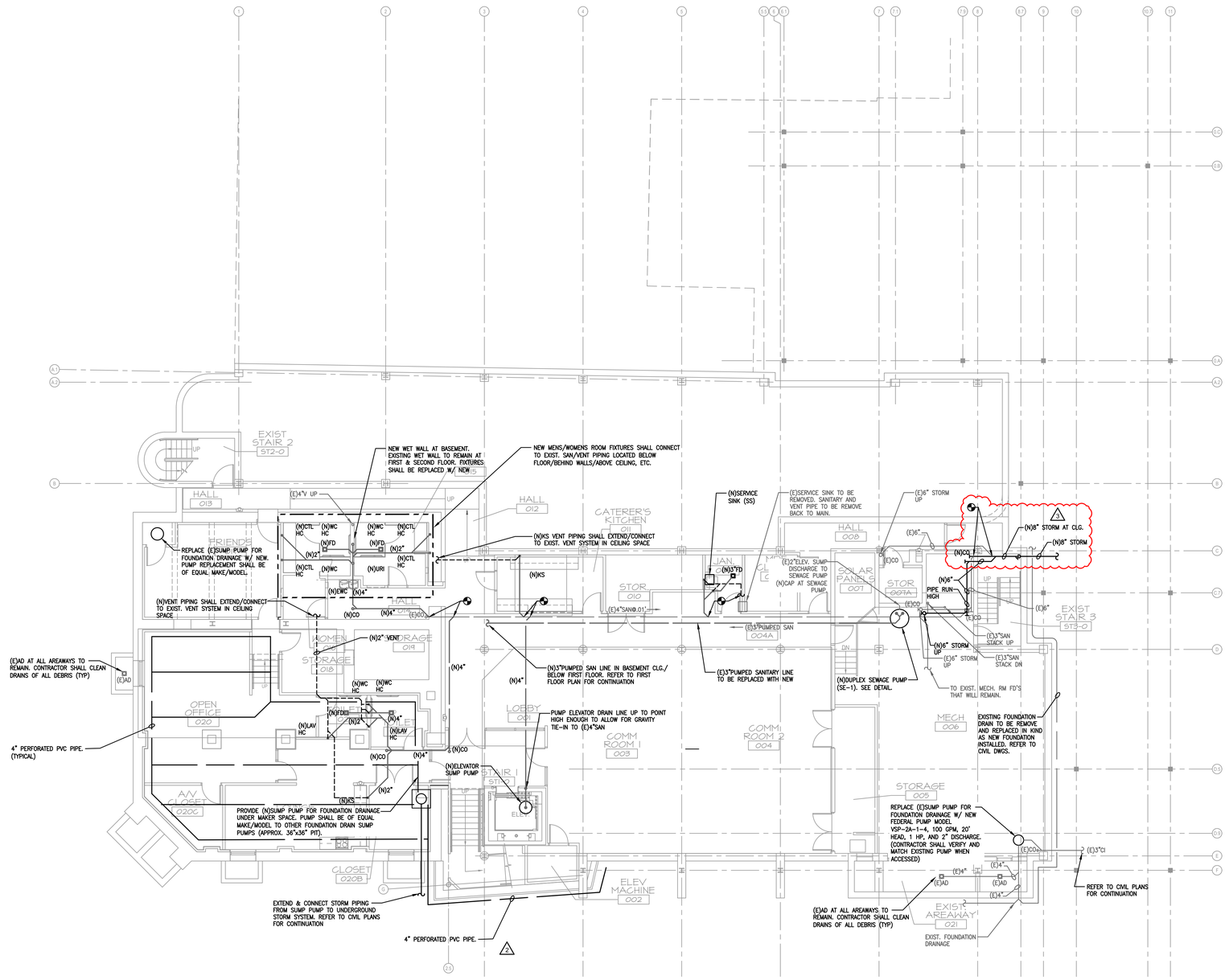
RISER DIAGRAM MECHANICAL

Sheet Number:

M2.3



BASEMENT FLOOR PLAN - SANITARY

SCALE: 1/8"=1'-0"

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BASEMENT FLOOR PLAN - SANITARY

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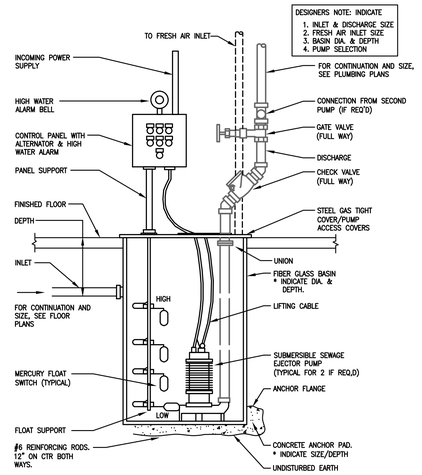
P1.0

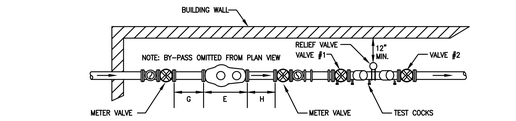


SUMP PUMP DETAIL

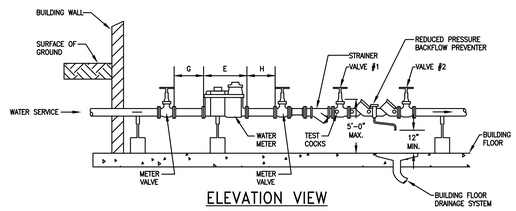
SCALE: NO SCALE

NOTE:
1. ALL SUMP PUMPS FOR FOUNDATION & AREAWAY DRAINAGE SHALL REPLACE EXISTING PUMPS IN KIND OR APPROVED EQUAL.

1



PLAN VIEW



ELEVATION VIEW

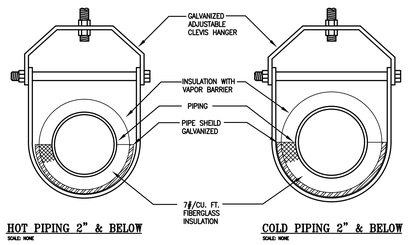
DIMENSION	PIPE SIZE				
	3"	4"	6"	8"	10"
E	2'-1/2"	2'-5 1/2"	3'-1"	4'-5 1/2"	5'-8 3/4"
G	1'-6"	2'-6"	2'-6"	3'-6"	2'-6"
H	1'-0"	1'-0"	1'-6"	2'-0"	2'-6"

NOTE:
BACKFLOW PREVENTERS TO BE SET A MINIMUM OF 12" FROM FLOOR TO THE LOWEST PART OF DEVICE, AND A MAXIMUM OF 5'-0" FROM THE FLOOR TO THE TOP OF DEVICE, AND 12" FROM ANY WALL.

DOMESTIC WATER SERVICE DETAIL

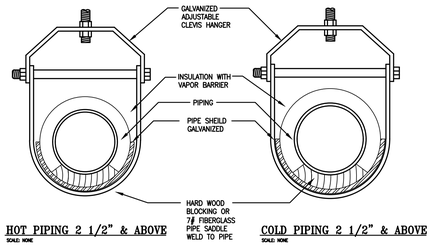
SCALE: NONE

2



HOT PIPING 2" & BELOW
SCALE: NONE

COLD PIPING 2" & BELOW
SCALE: NONE



HOT PIPING 2 1/2" & ABOVE
SCALE: NONE

COLD PIPING 2 1/2" & ABOVE
SCALE: NONE

PIPE HANGER DETAILS

SCALE: NONE

3

PLUMBING SYMBOLS AND ABBREVIATIONS

—W—	WATER SERVICE
———	DOM. COLD WATER
— — —	DOM. HOT WATER
— — — —	DOM. HOT WATER RETURN
—T—	TEMP. WATER
—140—	140°F LAUNDRY HOT WATER
———	SOIL, WASTE
— — —	VENT
— — —	STORM
—A—	COMPRESSED AIR
—G—	GAS
—F—	SPRINKLER SERVICE
SP	WET SANDPIPE
DSP	DRY STANDPIPE
FHC	FIRE HOSE CABINET
FHV	HOSE VALVE CABINET
BFP	BACK FLOW PREVENTER
PRV	PRESS REDUCING VALVE
VTR	VENT THRU ROOF
CO	CLEAN OUT
DWR	DOMESTIC WATER RISERS
GWH	GAS WATER HEATER
EWH	ELECT. WATER HEATER
FU	FIXTURE UNIT
S & VST	SOIL & VENT STACK
W & VST	WASTE & VENT STACK
I.E.	INVERT ELEVATION
SF	SQUARE FEET
BWV	BACKWATER VALVE
	CONTINUATION/BREAK
	INLINE PUMP
	THERMOMETER
	PIPE DOWN
	PIPE UP
	RELIEF VALVE
	CHECK VALVE
	STRAINER W/ BLOW OFF VALVE
	BALANCING VALVE
	UNION
	PIPE REDUCER
	PIPE INCREASER
	PIPE FLEXIBLE CONNECTION
	GATE VALVE
	BALL VALVE
	GAS COCK/GAS RATED BALL VALVE
WH	WALL HYDRANT
HB	HOSE BIBB
FD	FLOOR DRAIN
RD	ROOF DRAIN
RWC	RAIN WATER CONDUCTOR
DS	DOWNSPOUT
MH	MAN HOLE
(N)	NEW
(E)	EXISTING
	NEW CONNECTION TO EXISTING

4

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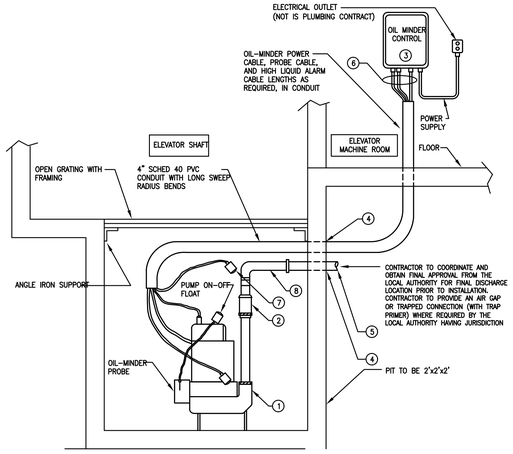


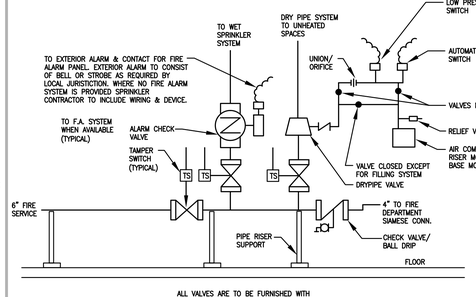
SUMP PUMP DIAGRAM–HYDRAULIC ELEVATOR DIAGRAM

SCALE: NO SCALE

1. STANCOR MODEL SE-50 SUBMERSIBLE EFFLUENT PUMP .5HP, 115 VOLT, 3600 RPM, 2" DISCHARGE CONNECTION, 50 GPM AT 20 FT. HEAD.
2. STANCOR CHECK VALVE
3. STANCOR OIL-MINDER 115V, 1 PHASE CONTROL SYSTEM WITH OPTIONAL BUILT-IN AUDIBLE AND VISUAL ALARM WHEN PUMP DOES NOT RUN DUE TO OIL IN PIT OR HIGH LIQUID CONDITION. PROVIDE SILENCING BUTTON FOR AUDIBLE ALARM BUILT INTO PANEL. PANEL SHALL HAVE ADDITIONAL CONTACT FOR REMOTE ALARM LOCATION.
4. WATERTIGHT SLEEVE
5. ALL BURIED PUMP PRESSURE DISCHARGE PIPING SHALL BE PROTECTED WITH TAPECOAT CT CORROSION PROTECTION TAPE
6. OIL MINDER POWER CABLE, PROBE CABLE, AND HIGH LIQUID ALARM CABLE
7. HIGH LIQUID ALARM FLOAT WITH CLAMP DEVICE TO MOUNT TO PUMP DISCHARGE PIPING
8. PROVIDE UNION AND SHUT-OFF IN DISCHARGE.

NOTES:
1. PROVIDE A MINIMUM OF 5 FT. EXTRA OF EACH CABLE (SLACK) ROLLED AND CLAMPED TO THE DISCHARGE PIPE TO ALLOW FOR THE REMOVAL OF THE PUMP FROM THE PIT.
2. ITEMS 1,2,3,6, & 7 ARE STANCOR PRODUCTS WHICH ARE TO BE PURCHASED & INSTALLED BY THE CONTRACTOR. STANCOR INC. (203)268-7513.
3. EQUIVALENTS BY GOULDS "CENTRIPRO" PUMP, ZOELLER PUMP CO.
4. COORDINATE WORK WITH ELECTRICAL CONTRACTOR.

5

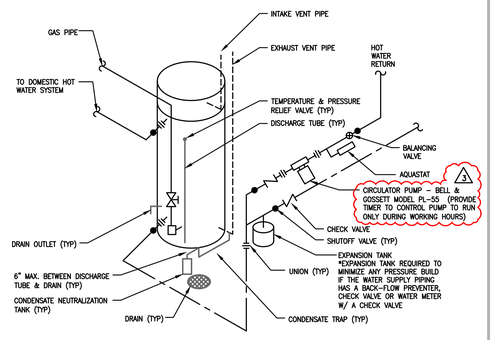


ALL VALVES ARE TO BE FURNISHED WITH TAMPER SWITCHES

SPRINKLER RISER DIAGRAM – WITH DRY PIPE VALVE

SCALE: NONE

6

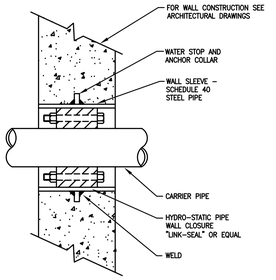


DOMESTIC WATER HEATER DETAIL–GAS FIRED

SCALE: NONE

EXPANSION TANK SIZE SCHEDULE					
WATER HEATER GALLONS	EXTROL SIZE GALLONS		DIAMETER	HEIGHT	CONN. SIZE
	TOTAL	ACCEPTANCE			
1 TO 50	2	.9	8"	12 1/2"	3/4"
51 TO 100	4.4	2.4	11"	15"	3/4"

7



WATERTIGHT WALL PENETRATION DETAIL

SCALE: NONE

8

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DETAILS & SCHEDULES - PLUMBING

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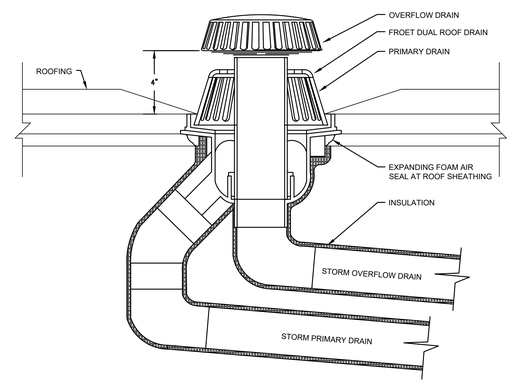
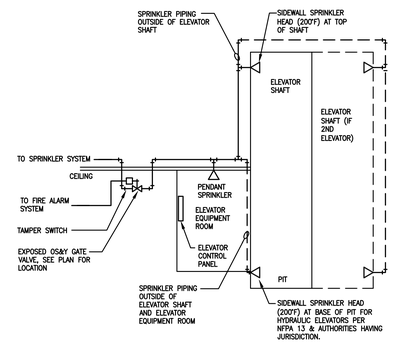
P2.0



ROOF DRAIN DETAIL

SCALE: NONE

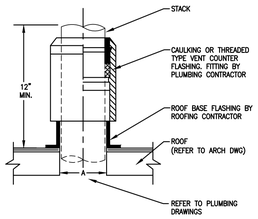
10



ELEVATOR SPRINKLER PIPING DIAGRAM

NO SCALE

11

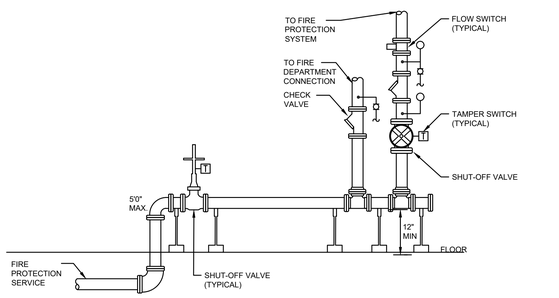


ROOF VENT DETAIL

SCALE: NONE

NOTES:
FITTING IS OF THE COUPLING TYPE THAT PERMITS STACK EXTENSION TO THE DESIRED HEIGHT. COUNTER FLASHING FITTING. J.R. SMITH FIG. 1740C OR 1750T.

12



FIRE SERVICE DETAIL

SCALE: NONE

NOTES:
1. BACKFLOW PREVENTERS TO BE SET A MINIMUM OF 12" FROM FLOOR TO THE LOWEST PART OF DEVICE. AND A MAXIMUM OF 5'-0" FROM THE FLOOR TO THE TOP OF DEVICE. AND 12" FROM ANY WALL.
2. CONTRACTOR TO PROVIDE PRESSURE REDUCING VALVE IF PRESSURE EXCEEDS 80 PSI.
3. CONTRACTOR TO COORDINATE INSTALLATION REQUIREMENTS WITH LOCAL UTILITY COMPANY.

9

THE DELIVERY OF THIS DRAWING SHOULD NOT BE CONSTRUED TO PROVIDE AN EXPRESS WARRANTY OR GUARANTEE TO ANYONE THAT ALL THE DIMENSIONS AND DETAILS ARE EXACT OR TO INDICATE THAT THE USE OF THIS DRAWING IMPLIES THE REVIEW AND APPROVAL BY THE DESIGN PROFESSIONAL OF ANY FUTURE USE. ANY USE OF THIS INFORMATION WITHOUT THE WRITTEN APPROVAL BY THE DESIGN PROFESSIONAL IS AT THE SOLE RISK AND LIABILITY OF THE USER. THE DESIGN PROFESSIONAL RESERVES THE RIGHT TO REMOVE OUR PROFESSIONAL SEAL AND/OR TITLE BLOCK.

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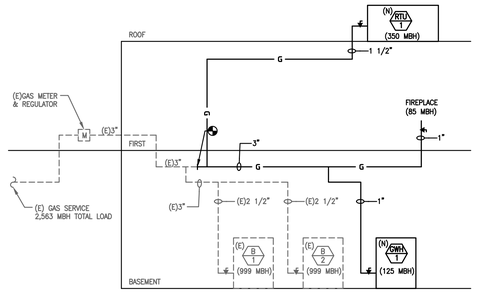
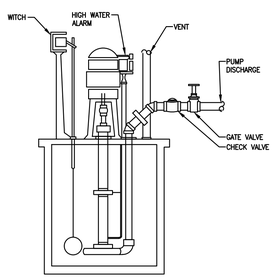


NATURAL GAS RISER DIAGRAM

SCALE: NONE

MAXIMUM FURTHEST RUN OF PIPE NOT TO EXCEED 150 FEET IN LENGTH.
PIPING SIZED BASED ON 2018 IFGC TABLE 402.4(2) SCHEDULE 40
METALLIC PIPE, INLET PRESSURE <2 PSIG, PRESSURE LOSS OF 0.5"WC.



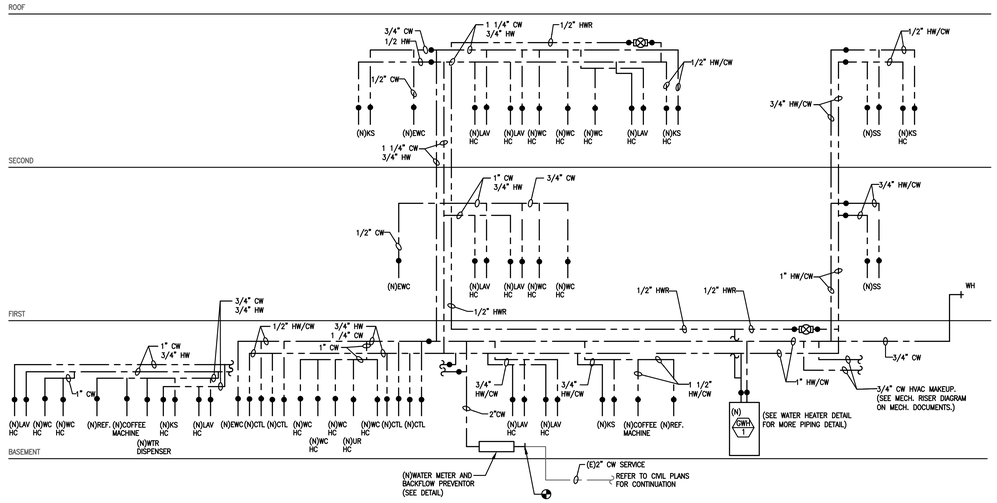
DUPLEX / SEWAGE EJECTOR PUMP DETAIL

SCALE: NO SCALE

WATER HEATER SCHEDULE

TAG	LOCATION	TYPE	MANUFACTURER	MODEL	GALLON STORAGE	UEF	THERMAL EFFICIENCY	RECOVERY 100°F RISE	BTU INPUT	ELECTRICAL			NOTES
										WATTS	VOLTS	PHASE	
GWH-1	STORAGE SPACE	NATURAL GAS	BRADFORD WHITE	LC2PV50H763N	50	0.80	97.0	69 GAL	76,000	-	-	-	28 1/4" JACKET DIAMETER.
GWH-2	STORAGE SPACE	NATURAL GAS	RINNAI	INFINITY ENVIRO32									ADD/ALT #1 - GAS INSTANTANEOUS WATER HEATER

A



DOMESTIC WATER RISER DIAGRAM

SCALE: NONE

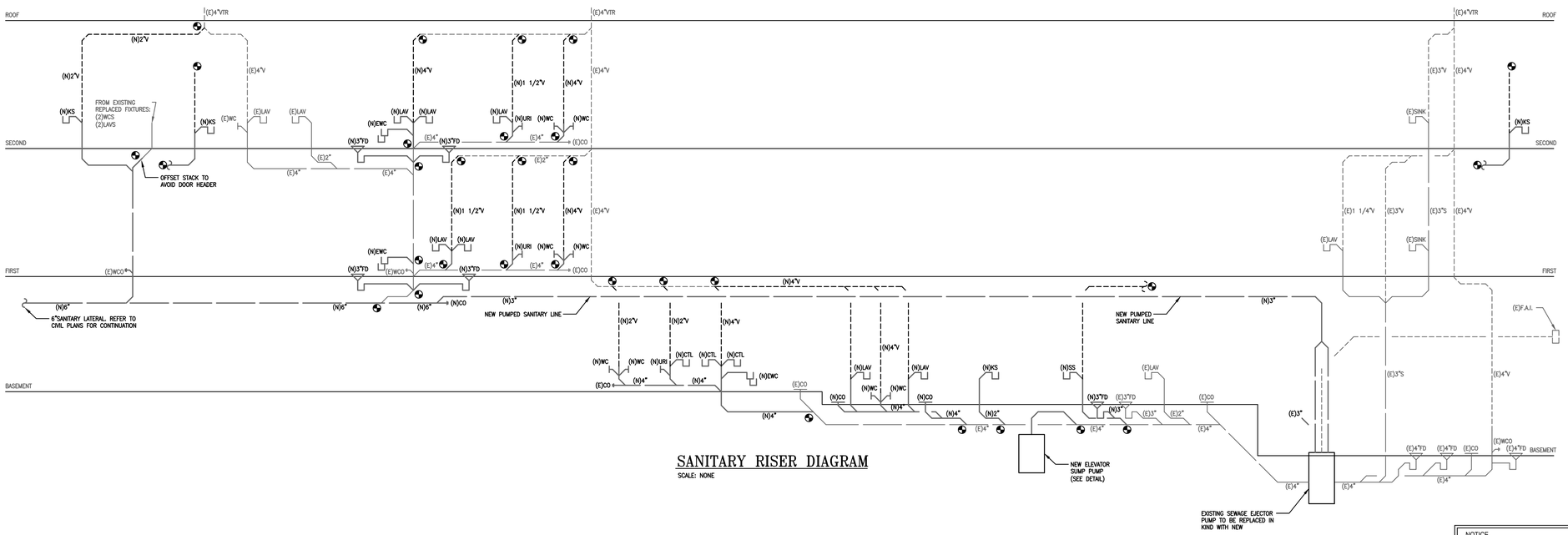
PLUMBING FIXTURE SCHEDULE

1. ALL FIXTURES AND TRIM TO BE LEAD FREE.
2. ALL HANDICAP FIXTURES TO BE INSTALLED ADA COMPLIANT WITH OFFSET WASTE WHERE REQUIRED AND INCLUDING UNDERFIXTURE PROTECTIVE KIT.
3. REFER TO SPECIFICATION SECTION 15450 FOR ADDITIONAL FIXTURE REQUIREMENTS AND ALTERNATE MFR'S.
4. ALL TRIM TO BE CHROME PLATED CAST BRASS.
5. LAVATORIES IN PUBLIC TOILETS TO BE FURNISHED WITH GRID STRAINERS. FIXTURES IN PRIVATE TOILETS AND LOCKER ROOMS SHALL BE FURNISHED WITH POP-UP DRAINS.
6. TRAPS FOR LAV./SINKS SHALL BE SEMI-CAST BRASS/17 GAUGE WASTE 1 1/4"x1 1/2" OR 1 1/2" DEPENDING ON FIXTURE OUTLET.
7. ALL FIXTURES TO BE FURNISHED WITH INDIVIDUAL FIXTURE STOP VALVES. IN PUBLIC AREAS VALVES SHALL BE LOOSE KEY TYPE.
8. ALL WALL HUNG FIXTURES TO BE PROVIDED WITH SUITABLE FLOOR MOUNTED SUPPORTS.
9. WALL HUNG WATER CLOSETS SHALL BE PROVIDED WITH COMBINATION CARRIER WITH HORIZONTAL OR VERTICAL FITTING TO SUIT PIPING ARRANGEMENT.
10. TRIM FOR FIXTURES SHALL BE VANDAL RESISTANT.
11. VENTS NOTED ARE FOR INDIVIDUAL FIXTURE VENTS ONLY.
12. TANK TYPE WATER CLOSETS IN PUBLIC AREAS SHALL HAVE TANK COVER LOCKS.
13. WATER CLOSETS LOCATED IN PUBLIC AREAS SHALL BE PROVIDED WITH OPEN FRONT SEATS.
14. ALL PUBLIC HAND WASHING SINKS SHALL HAVE AN APPROVED TEMPERATURE LIMITING DEVICE THAT CONFORMS TO ASSE 1070.

SYMBOL	DESCRIPTION	HW	CW	WASTE/ SOIL	VENT
WC HC	WATER CLOSET (HANDICAPPED) – AMERICAN STANDARD, "MADERA" #2857.128, VITREOUS CHINA, FLOOR MOUNTED, MANUAL FLUSH VALVE, 1.28 GPF. STANDARD OR HANDICAPPED APPLICATIONS.	N/A	1 1/4"	4"	2"
UR	URINAL – AMERICAN STANDARD, "TRIMBROOK" #6561.017, VITREOUS CHINA, WALL MOUNTED SIPHON JET, LOW CONSUMPTION, #6063.101.002 SENSOR OPERATED FLUSH VALVE.	N/A	1"	2"	1 1/2"
LAV HC	LAVATORY (HANDICAPPED) – BASEMENT: AMERICAN STANDARD, "AQUALYN" #0475.020, VITREOUS CHINA, DROP-IN SINK, LOW FLOW, "INNSBROOK SELECTRONIC" FAUCET. STANDARD OR HANDICAPPED APPLICATIONS. 1ST/2ND FLR: AMERICAN STANDARD, "COMRADE" #0124.024, VITREOUS CHINA, WALL MOUNT, LOW FLOW, "INNSBROOK SELECTRONIC" FAUCET. STANDARD OR HANDICAPPED APPLICATIONS.	1/2"	1/2"	1 1/2"	1 1/4"
KS	KITCHEN SINK – ELKAY, "NEPTUNE" #NLB33224, 20 GAUGE TYPE 304 STAINLESS STEEL, DOUBLE BOWL, UNDERMOUNT, W/ ELKAY #LKD2423BHC GOOSENECK FAUCET.	1/2"	1/2"	1 1/2"	1 1/2"
EWC HC	ELECTRIC WATER COOLER (HANDICAPPED) – OASIS PSSBFSL, BI-LEVEL NON-REFRIGERATED DRINKING FOUNTAIN, VERSAFILLER SPORTS BOTTLE FILLER, VANDAL RESISTANT BUBBLER, PROVIDE OASIS GREEN FILTRATION SYSTEM, ADA COMPLIANT.	N/A	1/2"	1 1/4"	1 1/4"
SS	SERVICE SINK – AMERICAN STANDARD 7692.008.020 LAKEWELL WALL MOUNTED, RIM GUARD, AMERICAN STANDARD 7798.020.020 THREADED P-TRAP, AMERICAN STANDARD 8350.235.004 EXPOSED YOKE UTILITY FAUCET.	1/2"	1/2"	3"	2"
CTL HC	COUNTER TOP LAV – KOHLER CAXTON K-2210, VITREOUS CHINA, UNDERMOUNT, LOW FLOW, "INNSBROOK SELECTRONIC" FAUCET. STANDARD OR HANDICAPPED APPLICATIONS.	1/2"	1/2"	1 1/2"	1 1/4"

PUMP SCHEDULE

TYPE	MANUFACTURER	MODEL	CAP/GPM	DISCHARGE HEAD	HP	VOLTAGE	PHASE	REMARKS
SUMP PUMP (SE-1)	FEDERAL	VSA-4F-1.5-4	100	25 FT	1.5	208	3	DUPLEX SYSTEM



SANITARY RISER DIAGRAM

SCALE: NONE

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1601 Darby Road
Haverford Township
Havertown, PA 19083

Owner:

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Havertown, PA 19083

Revision/Issue:

	05/31/23	Issued for Permit
1	09/20/23	Issued for Bidding
2	10/17/23	Addendum 4

Drawn: CK/MW/DE/KG
Reviewed: .
Contact: Chris Keenan
Project Number: 7010.03-22

Sheet Title:

DETAILS & SCHEDULES - PLUMBING

Sheet Number:

P2.1

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ABBREVIATIONS

ABS	ABSOLUTE	MECH	MECHANICAL
AC	ALTERNATING CURRENT	MCC	MOTOR CONTROL CENTER
AFF	ABOVE FINISHED FLOOR	MCM	THOUSAND CIRCULAR MILLS
AHU	AIR HANDLING UNIT	MFR	MANUFACTURER
AMP, A	AMPERE	MH	MANHOLE, MOUNTING HEIGHT
APP	APPROVED	MIN	MINIMUM
APPROX	APPROXIMATE	MISC	MISCELLANEOUS
ATS	AUTOMATIC TRANSFER SWITCH	MLO	MAIN LUG ONLY
AVG	AVERAGE	MOD	MOTOR OPERATED DAMPER
BLDG	BUILDING	MTD	MOUNTED
C	CONDUIT	(N)	NEW
CB	CIRCUIT BREAKER	NA	NOT APPLICABLE
COL	COLUMN	N.C.	NORMALLY CLOSED
CONN	CONNECTION	NEUT.	NEURAL
CONT	CONTINUED	NIC	NOT IN CONTRACT
CONTR	CONTRACTOR	NL	NIGHT LIGHT, UNSWITCHED 24/7 OPERATION
DB	DECIBEL	N.O.	NORMALLY OPEN
DEG	DEGREE	NO.	NUMBER
DIA	DIAMETER	NTS	NOT TO SCALE
DN	DOWN	OD	OUTSIDE DIAMETER
DT	DOUBLE THROW	OH	OVERHEAD
DWG	DRAWING	OHD	OVERHEAD DOOR
(E)	EXISTING	%	PERCENT
E.C.	ELECTRICAL CONTRACTOR	PB	PUSH BUTTON
EF	EXHAUST FAN	PH	PHASE-ELECTRICAL
EL	ELEVATION	PNL	PANEL
ELEC	ELECTRICAL	PVC	POLYVINYL CHLORIDE PIPE
EQ	EQUAL	(R)	REMOVE EXISTING
EQUIP	EQUIPMENT	(RE)	RELOCATE EXISTING
EWC	ELECTRIC WATER COOLER	R&D	RESEARCH & DEVELOPMENT
EWH	ELECTRIC WATER HEATER	REQ	REQUIRED
EXT	EXTERIOR	RM	ROOM
°F	DEGREE FAHRENHEIT	SCH	SCHEDULE
FACP	FIRE ALARM CONTROL PANEL	SF	SQUARE FEET
FBO	FURNISHED BY OTHERS	SPD	SURGE PROTECTION DEVICE
FD	FLOOR DRAIN	SPEC	SPECIFICATION
FDC	FIRE DEPARTMENT CONNECTION	SQ	SQUARE
FHC	FIRE HOSE CABINET	SS	SAFETY SWITCH
FIN	FINISH	ST	SINGLE THROW
FF	FINISHED FLOOR	STD	STANDARD
FLR	FLOOR	STL	STEEL
FT	FEET	STRUC	STRUCTURAL
FU,F	FUSED	SW	SWITCH
GALV	GALVANIZED	SWBD	SWITCHBOARD
GFCI	GROUND FAULT CURRENT INTERRUPTER	SWGR	SWITCHGEAR
GRD, GND	GROUND	TEMP	TEMPERATURE
GWH	GAS WATER HEATER	TEL	TELEPHONE
HC	HANDICAP	THERM	THERMOMETER
HP	HORSEPOWER	TYP	TYPICAL
HR	HOUR	UG	UNDERGROUND
HT	HEIGHT	UH	UNIT HEATER
HTR	HEATER	UL	UNDERWRITER'S LABORATORY
HV	HIGH VOLTAGE	U.O.N.	UNLESS OTHERWISE NOTED
HVAC	HEATING VENTILATION AIR CONDITIONING	UTIL	UTILITY
HZ	FREQUENCY-ELECTRICAL	V	VOLTS
ID	INSIDE DIAMETER	VB	VACUUM BREAKER
ID	INDIRECT DRAIN	VERT	VERTICAL
JB	JUNCTION BOX	VFD	VARIABLE FREQUENCY DRIVE
KV	KILOVOLTS	VIF	VERIFY IN FIELD
KVA	KILOVOLT AMPERE	VPC	VIA PHOTOCELL
KW	KILOWATT	VTC	VIA TIME CLOCK
KWH	KILOWATT HOUR	W	WIRE
LF	LINEAR FEET	W/	WITH
LV	LOW VOLTAGE	WP	WEATHERPROOF
MAU	MAKE-UP AIR UNIT	W/O	WITHOUT
MAX	MAXIMUM	XFMR	TRANSFORMER
MCB	MAIN CIRCUIT BREAKER	YR	YEAR

GENERAL NOTES

1. ALL WORK IS TO CONFORM WITH THE 2017 NATIONAL ELECTRICAL CODE AND ALL APPLICABLE CODES, REGULATIONS AND STANDARDS. NOT ALL CODE REQUIREMENTS HAVE BEEN DESCRIBED IN THIS SPECIFICATION OR INDICATED ON THE DRAWINGS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO BE FAMILIAR WITH THE CODES AND INSTALL THE WORK IN ACCORDANCE WITH CODES.
2. OBTAIN AND PAY FOR ALL BUILDING PERMITS, INSPECTIONS, CONNECTION CHARGES, AND FEES.
3. PROVIDE ALL LABOR, MATERIALS, EQUIPMENT AND SUPERVISION NECESSARY TO INSTALL COMPLETE OPERATING ELECTRICAL SYSTEMS AS INDICATED ON THE DRAWINGS AND SPECIFIED HEREIN, INCLUDING ALL SITE WORK ON THE SITE AND WITHIN THE PROPOSED CONSTRUCTION AREAS TO ACCOMPLISH THE REQUIRED WORK.
4. THE CONTRACTOR IS TO BE RESPONSIBLE FOR COORDINATION OF ALL WORK ASSOCIATED WITH THE ELECTRIC UTILITY COMPANY. MAKE ALL ARRANGEMENTS IN A TIMELY FASHION FOR CONNECTION OF THE ELECTRICAL SERVICE.
5. DRAWINGS AND SPECIFICATIONS ARE INTENDED TO BE TAKEN AS A WHOLE. IF A CONFLICT OR CONTRADICTION EXISTS BETWEEN THE DRAWINGS AND SPECIFICATIONS, THE MORE STRINGENT WILL APPLY. THE ARCHITECT'S AND ENGINEER'S INTERPRETATION OF THE DOCUMENTS ARE TO BE BINDING UPON THE CONTRACTOR.
6. PROVIDE SHOP DRAWINGS OF ALL EQUIPMENT FOR REVIEW PRIOR TO ORDERING. COORDINATE ALL PHYSICAL DIMENSIONS PRIOR TO SHOP DRAWING SUBMISSION.
7. IF THE CONTRACTOR ELECTS TO SUBMIT ALTERNATE EQUIPMENT, MANUFACTURERS, SYSTEMS, METHODS, OR MATERIALS NOT SPECIALLY IDENTIFIED IN THE DRAWINGS AND SPECIFICATIONS, IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE THE WORK WITH OTHER TRADES AND PAY FOR ANY ADDITIONAL COSTS ASSOCIATED WITH THE SUBSTITUTION OR CHANGE.
8. THE CONTRACTOR IS TO SURVEY AND VERIFY ALL EXISTING CONDITIONS PRIOR TO BID SUBMISSION AND BECOME AWARE OF ALL CONDITIONS WHICH MAY IMPACT THE REQUIRED WORK. CONTRACTOR IS TO INCLUDE ALL ASSOCIATED COSTS (MATERIALS/ LABOR) DETERMINED TO BE REQUIRED DURING SITE INSPECTIONS. CONTRACTOR'S BID SUBMISSION IS TO BE CONSIDERED PROOF THAT THIS REQUIREMENT HAS BEEN MET.
9. FINAL LOCATIONS OF ALL DEVICES IN FINISHED SPACES ARE TO BE COORDINATED, AND APPROVED BY THE ARCHITECT/ OWNER PRIOR TO ROUGH-IN AND INSTALLATION.
10. COORDINATE LOCATIONS AND ROUGH-IN REQUIREMENTS WITH ALL TRADES PRIOR TO INSTALLATION.
11. PROVIDE 3/8" = 1'-0" SCALE DRAWINGS OF THE MAIN ELECTRICAL ROOM INDICATING ALL ELECTRICAL, MECHANICAL, PLUMBING, TELEPHONE, SECURITY, FIRE ALARM, AND LIFE SAFETY EQUIPMENT TO BE INSTALLED WITHIN THIS ROOM. ALL EXACT DIMENSIONS OF EQUIPMENT, PADS, ETC., ARE TO BE INDICATED. PROVIDE TWO CROSS-SECTIONS AT IMPORTANT POINTS. OBTAIN INFORMATION FROM OTHER SUB-CONTRACTORS AS NEEDED, AND APPROPRIATE. SUBMIT THE ABOVE FOR REVIEW, AND APPROVAL ALONG WITH ELECTRICAL EQUIPMENT SUBMITTALS. EQUIPMENT WILL NOT BE APPROVED PRIOR TO REVIEW OF THIS DRAWING.
12. PROVIDE ADDRESSABLE FIRE ALARM SYSTEM WITH BATTERY BACKUP, HORN/ STROBES, MANUAL PULL STATIONS, DETECTORS, STROBES, DUCT DETECTORS, REMOTE ANNUNCIATOR, ELEVATOR CONTROLS (FOR RECALL AND DE-ENERGIZING), TELEPHONE AUTO DIALER, FIRE-FIGHTER PHONES, AND ALL ASSOCIATED CONTROLS, AND APPURTENANCES.
13. PROVIDE POWER TO HVAC AND PLUMBING EQUIPMENT AS REQUIRED FOR COMPLETE, OPERATIONAL SYSTEMS.
14. PROVIDE LUMINAIRES THROUGH-OUT, WITH EXTERIOR LUMINAIRES AT ALL EGRESS DOORS.
15. THE CONTRACTOR IS TO BE RESPONSIBLE FOR SELECTING PARTICULAR MOUNTING ARRANGEMENTS OF FIXTURES TO SUIT THE CONSTRUCTION, OR CEILING TYPE. THE CONTRACTOR OR HIS AGENT IS TO REVIEW ALL ARCHITECTURAL PLANS, ELEVATIONS AND DETAILS TO VERIFY ALL CEILING TYPES PRIOR TO PREPARING SHOP DRAWINGS FOR SUBMISSION. IT IS NOT TO BE UNDERSTOOD THAT THE LIGHTING FIXTURE SCHEDULE ACCOUNTS FOR THE MOUNTING TYPES. CEILING TYPES ARE FREQUENTLY CHANGED AFTER THE SCHEDULE HAS BEEN COMPLETED.
16. FIXTURES AND DEVICES RECESSED IN A FIRE-RATED CEILING ARE TO BE PROVIDED WITH A FIRE-RATED ENCLOSURE THAT MAINTAINS THE FIRE-RATING OF THE CEILING SYSTEM. THE INSTALLATION OF THE ENCLOSURE IS TO MEET THE REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION. WHERE APPLICABLE, FIXTURES AND DEVICES ARE TO BE RATED FOR INSULATION CONTACT (IC) FOR HIGH-TEMPERATURE OPERATION.
17. ALL ROOMS ARE TO BE PROVIDED WITH LUMINAIRE CONTROLS. PROVIDE MANUAL SWITCH(ES) AND APPROPRIATE, CODE-REQUIRED LUMINAIRE CONTROL DEVICES, WIRING METHODS, AND COMPONENTS.
18. PROVIDE EGRESS AND EMERGENCY LUMINAIRES AS REQUIRED BY CODE IN ALL SPACES TO MEET REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION. ALLOW FOR TEN ADDITIONAL LUMINAIRES TO BE INSTALLED WHERE DIRECTED BY THE AUTHORITY HAVING JURISDICTION.
19. PROVIDE GROUNDING SYSTEM FOR FACILITY IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE.
20. PROVIDE ROOF PENETRATIONS FOR ALL ASSOCIATED ELECTRICAL WORK.
21. ALL DEVICES ARE TO BE INSTALLED SQUARE, LEVEL, PLUMB, AND TRUE.
22. SWITCH PLATES AND OUTLET BACKBOXES ARE NOT TO BE INSTALLED BACK-TO-BACK IN ADJACENT ROOMS. BACKBOX LOCATIONSARE TO BE OFFSET A MINIMUM OF 0'-3" TO REDUCE NOISE TRANSFER. THIS APPLIES TO RECEPTACLES, LIGHTING FIXTURES, TV OUTLETS, TELEPHONE OUTLETS, AND DATA OUTLETS.
23. ALL DEVICES LOCATED ON OPPOSING SIDES OF A FIRE-RATED WALL ASSEMBLY ARE TO BE SEPARATED BY A HORIZONTAL DISTANCE OF NOT LESS THAN 2'-0".
24. GROUND FAULT CIRCUIT INTERRUPTERS ARE TO BE PROVIDED FOR ALL OUTDOOR RECEPTACLE CIRCUITS, RECEPTACLE CIRCUITS WITHIN TOILET AND BATHROOMS, AREAS IN CLOSE PROXIMITY TO WATER, AND WHEREVER ELSE INDICATED ON THE DRAWINGS OR AS REQUIRED BY CODE. WHILE-IN-USE TYPE COVERS ARE TO BE USED FOR ALL EXTERIOR LOCATIONS.
25. PROVIDE CODE REQUIRED SIGNAGE (I.E., NEC 110.34, NEC 700.8, AND 695.4 B3).
26. PROVIDE THIRD-PARTY CERTIFICATION OF ALL PACKAGED SYSTEMS BY A NATIONALLY RECOGNIZED TESTING LABORATORY (NRTL) IN ACCORDANCE WITH OSHA FEDERAL REGULATIONS 29CFR1910.303 AND .399 AS WELL AS PAMPHLET #70 AND NATIONAL ELECTRICAL CODE ARTICLE 90-7.
27. ALL EQUIPMENT PANELS, CONTROLS, SAFETY SWITCHES, AND DEVICES ARE TO BE PROVIDED WITH PERMANENT BLACK LAMINATED MICARTA WHITE CORE LABELS WITH 3/8" LETTERS. THIS ALSO APPLIES TO ALL CONTROLLERS, REMOTE START/ STOP PUSHBUTTONS, EQUIPMENT CABINETS, AND WHERE DIRECTED BY THE ARCHITECT AND ENGINEER. THIS REQUIREMENT DOES NOT APPLY TO INDIVIDUAL ROOM THERMOSTATS, AND LOCAL LUMINAIRE CONTROL DEVICES.
28. ALL THREE PHASE STARTER EQUIPMENT IS TO BE PROVIDED BY THE ELECTRICAL CONTRACTOR AND IS TO BE MAGNETIC, ACROSS-THE-LINE WITH AUXILIARY CONTACTS. ALL SINGLE PHASE STARTER EQUIPMENT IS TO BE PROVIDED BY ELECTRICAL CONTRACTOR. ALL FINAL CONNECTIONS ARE TO BE COORDINATED.
29. ALL WORK IS TO BE CONCEALED, UNLESS OTHERWISE INDICATED.
30. ALL EXPOSED INTERIOR WIRING, PANEL FEEDERS, HOME RUNS, AND EQUIPMENT FEEDERS ARE TO BE INSTALLED IN EMT (ELECTRICAL METALLIC TUBING). ALL EMT IS TO BE SECURELY FASTENED AT INTERVALS NOT EXCEEDING 10-0" AND WITHIN 3'-0" OF ALL BOXES. NOTE: "EXPOSED" INDICATES ALL WIRING METHODS NOT INSTALLED WITHIN WALLS, ABOVE SUSPENDED CEILINGS, OR WITHIN A PRE-MANUFACTURED RACEWAY. ANY EXPOSED RACEWAY IN A FINISHED SPACE IS TO BE COORDINATED WITH THE ARCHITECT/ ENGINEER PRIOR TO INSTALLATION.
31. ALL CONCEALED BRANCH CIRCUIT WIRING METHODS INSTALLED ABOVE SUSPENDED CEILINGS, AND IN STUD PARTITIONS IS TO BE MC (METAL CLAD) CABLE. MC CABLE IS TO BE SECURELY FASTENED AT INTERVALS NOT EXCEEDING 4'-6", AND WITHIN 1'-0" OF ALL BOXES AND/OR FITTINGS.
32. PROPERLY INSTRUCT OWNER'S PERSONNEL IN THE OPERATION AND MAINTENANCE OF ALL SYSTEMS AND EQUIPMENT. PROVIDE THREE INSTRUCTION AND MAINTENANCE MANUALS. SUBMIT MANUALS FOR REVIEW PRIOR TO OPERATING INSTRUCTION.
33. PROVIDE ONE SET OF ELECTRONIC AS-BUILT DRAWINGS AT COMPLETION OF WORK. SUBMIT TO OWNER AND ENGINEER FOR REVIEW AND APPROVAL.
34. THE WORD "PROVIDE" MEANS "FURNISH AND INSTALL COMPLETE, TESTED, AND ADJUSTED AS NECESSARY WITH ALL ACCESSORIES, CIRCUITING, SWITCHING, LENSES, MOUNTING HARDWARE, COVER PLATES, HANGERS AND SUPPORTS".
35. ALL WIRING METHODS ASSOCIATED WITH THE SECURITY AND I.T. SYSTEMS ARE TO BE PROVIDED BY THE ELECTRICAL CONTRACTOR. REFER TO CONVERGENT TECHNOLOGIES PLANS, MATRICES, AND SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS AND SCOPE INFORMATION. (2)

PROJECT DEDUCT/ ADD ALTERNATES

ADD ALTERNATE:

1. PROVIDE A LIGHTNING PROTECTION SYSTEM PER SPECIFICATION SECTION 26 41 13.
2. IN LIEU OF MANUAL ROLLER SHADES AT ALL BASE BID EXTERIOR WINDOWS, PROVIDE MOTORIZED ROLLER SHADES. AT THESE LOCATIONS, THE ELECTRICAL CONTRACTOR IS TO PROVIDE 120V-1Ø POWER VIA BRANCH CIRCUITS INDICATED OR AS REQUIRED BY THE MANUFACTURER. COORDINATE ALL CONTROL REQUIREMENTS WITH THE FINAL EQUIPMENT SELECTIONS AND PROVIDE LINE VOLTAGE WIRING METHODS AS REQUIRED. ALL LOW VOLTAGE CONTROLS ARE TO BE PROVIDED BY THE LOW VOLTAGE CONTRACTOR (CONVERGENT).

DEDUCT ALTERNATE:

1. ALL PANELBOARD FEEDERS AND BRANCH CIRCUIT WIRING METHODS, 100 AMPS AND LARGER AS WELL AS PRIMARY CABLE, TRANSFORMER COILS, BUSWAYS AND SWITCHBOARDS ARE TO BE ALUMINUM IN LIEU OF COPPER PER SPECIFICATION SECTION 26 00 00.
2. ALL FIRE ALARM WIRING IS TO BE FPLP PLENUM RATED FIRE ALARM CABLE IN LIEU OF FIRE ALARM MC CABLE PER SPECIFICATION SECTION 28 30 00.

ELECTRICAL SYMBOLS

- S — SINGLE-POLE WALLBOX SWITCH
- S_3 — 3-WAY WALLBOX SWITCH
- S_4 — 4-WAY WALLBOX SWITCH
- S_D — LUMINAIRE CONTROL SYSTEM DIMMER
- S_{LV} — LOW VOLTAGE LUMINAIRE CONTROL SYSTEM WALLBOX SCENE CONTROL CONTROL FOR TIMECLOCK PROGRAM OVERRIDE.
- S_{MS} — MOTORIZED SHADE CONTROL. PROVIDE LOCKABLE COVER.
- S_E — EMERGENCY SHUT-DOWN SWITCH
- S_T — SINGLE-POLE WALLBOX SWITCH WITH INTEGRAL TIMER FUNCTION.
- S_P — SINGLE-POLE WALLBOX SWITCH WITH PILOT LIGHT
- O — DUAL TECHNOLOGY, WALL BOX OCCUPANCY SENSOR WITH OFF/ AUTO OVERRIDE SWITCH
- O — DUAL TECHNOLOGY, CEILING MOUNTED OCCUPANCY SENSOR
- V XX — DUAL TECHNOLOGY, WALL BOX VACANCY SENSOR WITH OFF/ AUTO OVERRIDE SWITCH
  TAG (NONE = STANDARD DEVICE):
  D = DEVICE WITH INTEGRAL 0-10V DIMMING CONTROL
- V — DUAL TECHNOLOGY, CEILING MOUNTED VACANCY SENSOR
- P XX — 0-10V DIMMING LUMINAIRE CONTROL POWER PACK
  TAG (NONE = SINGLE ZONE):
  2 = TWO ZONE
  3 = THREE ZONE
  EM = PROVIDED WITH UL924 DEVICE
- RECESSED, OR SURFACE MOUNTED LED LUMINAIRE CONNECTED TO NORMAL POWER. REFER TO THE LUMINAIRE SCHEDULE FOR ADDITIONAL INFORMATION.
- 4'-0", LENSED LED INDUSTRIAL STRIP LUMINAIRE
- LENSED, LED UNDER CABINET LUMINAIRE. LENGTHS AS INDICATED ON PLANS.
- A4 — INDICATES LUMINAIRE TYPE
  2 — INDICATES BRANCH CIRCUIT DESIGNATION
  a — INDICATES CONTROL ZONE
- BATTERY PACK EMERGENCY LIGHTING UNIT WITH SOLID STATE CHARGER. CONNECT AHEAD OF ANY SWITCHING. REMOTE CAPABLE WHERE REQUIRED.
- REMOTE EMERGENCY LIGHTING UNIT CONNECTED TO EMERGENCY POWER, OR PROVIDED WITH INTEGRAL BATTERY BACK-UP. REFER TO THE LIGHTING FIXTURE SCHEDULE FOR ADDITIONAL INFORMATION.
- EXIT SIGN LUMINAIRE GENERATOR OR BATTERY POWERED
- WALL MOUNTED EXIT SIGN LUMINAIRE GENERATOR OR BATTERY POWERED
- SURFACE MOUNTED DISTRIBUTION PANEL SERVED VIA NORMAL POWER FEEDER
- SURFACE MOUNTED LIGHTING, OR POWER BRANCH CIRCUIT PANEL SERVED VIA NORMAL POWER FEEDER
- RECESSED MOUNTED LIGHTING, OR POWER BRANCH CIRCUIT PANEL SERVED VIA NORMAL POWER FEEDER
- MOTOR
- S_M — MOTOR RATED SWITCH (PROVIDE MANUAL MOTOR STARTER FOR OVERLOAD PROTECTION, AS REQUIRED)
- UN-FUSED DISCONNECT SWITCH
- XXAF/XXAT — FUSIBLE DISCONNECT SWITCH
  XXAF = FRAME CAPACITY
  XXAT = TRIP RATING
- MOTOR STARTER
- COMBINATION MOTOR STARTER/ DISCONNECT SWITCH
- +XX" A.F.F. — INDICATES HEIGHT ABOVE FINISHED FLOOR TO CENTER OF DEVICE(S)
- 3#2 — WIRING METHOD DESIGNATION (CONDUCTOR QUANTITY AND SIZE)
- LP–1 — PANEL, AND POLE SPACE DESIGNATION (CONCEALED WIRING METHOD)
- CONCEALED BRANCH CIRCUIT WIRING METHOD
- J XX — JUNCTION BOX
  TAG:
  AC = POWER LOCATION FOR ACCESS CONTROL EQUIPMENT
  CO = POWER LOCATION FOR CARBON MONOXIDE DETECTION EQUIPMENT
  CP = CONNECTION FOR CONDENSATE PUMP
  DO = POWER LOCATION FOR MOTORIZED DOOR OPENER. PROVIDE DISCONNECTING MEANS ADJACENT EQUIPMENT
  HD = 120V-1Ø DEDICATED 20-AMP CONNECTION FOR HAND DRYER EQUIPMENT.
  HT = PROVIDE GFCI PROTECTED BRANCH CIRCUIT HEAT TRACE. COORDINATE ALL REQUIREMENTS WITH THE MECHANICAL CONTRACTOR.
  MOD = POWER LOCATION FOR MOTORIZED DAMPER EQUIPMENT. PROVIDE DISCONNECTING MEANS ADJACENT EQUIPMENT
  MS = POWER LOCATION FOR MOTORIZED SHADE EQUIPMENT.COORDINATE ALL REQUIREMENTS WITH FINAL EQUIPMENT SELECTIONS. ADD ALTERNATE 2(A).
  WF = WALL FURNITURE WHIP. COORDINATE ALL REQUIREMENTS WITH FINAL EQUIPMENT SELECTIONS.
- XX — DUPLEX RECEPTACLE DEVICE
  TAG:
  D = DEDICATED OVERCURRENT PROTECTION DEVICE
  U = INTEGRAL USB OUTLETS
  C = DEVICE MOUNTED 0'-8" ABOVE COUNTER TOP
  T = TAMPER RESISTANT DEVICE
- GFCI (GROUND-FAULT CIRCUIT-INTERRUPTER) DUPLEX RECEPTACLE DEVICE FOR PERSONAL PROTECTION
- SINGLE RECEPTACLE DEVICE FOR EQUIPMENT
- DOUBLE DUPLEX RECEPTACLE DEVICE
- SPECIAL RECEPTACLE DEVICE (COORDINATE NEMA CONFIGURATION WITH FINAL EQUIPMENT SELECTIONS)
- WX, OR FX — POWER, CCTV, OR CATV. REFER TO THE LOW VOLTAGE CONSULTANT'S PLANS AND SPECIFICATIONS FOR ALL LOW VOLTAGE DEVICE REQUIREMENTS.
  W = WALL SOURCE
  F = FLOOR SOURCE
  X = 2, 3, OR 4 GANG BOX
- WX, OR FX — FLUSH MOUNTED, ADJUSTABLE FLOOR BOX WITH POWER, IG POWER, AND VOICE/ DATA OUTLETS
  W = WALL SOURCE
  F = FLOOR SOURCE
  X = 2, 3, OR 4 GANG BOX
- XX — SECURITY/ ACCESS CONTROL. DEVICE DERIVES POWER FROM THE SECURITY/ ACCESS CONTROL HEAD-END EQUIPMENT. COORDINATE ALL POWER REQUIREMENTS WITH THE SECURITY/ ACCESS CONTROL VENDOR.
  INDICATES DEVICE TYPE:
  AI = AI PHONE EQUIPMENT
  CR = CARD READER
  DC = DOOR CONTACT
  ES = ELECTRIC DOOR STRIKE
  EX = REQUEST TO EXIT
- F — HORN/ STROBE
- S — STROBE ONLY
- F WP — WEATHERPROOF EXTERIOR BELL AND STROBE, WALL MOUNTED ABOVE FIRE DEPARTMENT CONNECTION APPROXIMATELY 1'-0" ABOVE FINSHED GRADE
- F — ADDRESSABLE MANUAL PULL STATION
- MM — ADDRESSABLE MONITORING MODULE
- CM — CONTROL MODULE
- FS — SPRINKLER SYSTEM FLOW SWITCHES: ALLOW FOR _____
- TS — SPRINKLER SYSTEM TAMPER SWITCHES: ALLOW FOR _____
- PS — DRY-PIPE SPRINKLER SYSTEM LOW PRESSURE SWITCHES: ALLOW FOR_____
- RI — REMOTE INDICATOR
- S — ADDRESSABLE AREA SMOKE DETECTOR
- H — ADDRESSABLE HEAT DETECTOR
- S_D — ADDRESSABLE DUCT SMOKE DETECTOR WITH TWO AUXILIARY CONTACTS
- H_D — ADDRESSABLE DUCT HEAT DETECTOR WITH TWO AUXILIARY CONTACTS
- S_E — ELEVATOR RECALL WITH AUXILIARY CONTACTS
- C J CR — 120V-1Ø POWER AND FIRE ALARM CONNECTION FOR ACCESS CONTROL EQUIPMENT. REFER TO LOW VOLTAGE CONSULTANT'S PLANS AND SPECIFICATIONS FOR ADDITIONAL INFORMATION AND REQUIREMENTS

DRAWING LIST

HAVERFORD TOWNSHIP FREE LIBRARY		
DMPE1.0	BASEMENT DEMO FLOOR PLAN	- MECH/PLUMB/ELECT
DMPE1.1	FIRST FLOOR DEMO PLAN	- MECH/PLUMB/ELECT
DMPE1.2	SECOND FLOOR DEMO PLAN	- MECH/PLUMB/ELECT
DMPE1.3	ROOF DEMO PLAN	- MECH/PLUMB/ELECT
M.01	COVER SHEET	- MECHANICAL
M1.0	BASEMENT FLOOR PLAN - DUCTWORK	- MECHANICAL
M1.1	FIRST FLOOR PLAN - DUCTWORK	- MECHANICAL
M1.2	SECOND FLOOR PLAN - DUCTWORK	- MECHANICAL
M1.3	BASEMENT FLOOR PLAN - PIPING	- MECHANICAL
M1.4	FIRST FLOOR PLAN - PIPING	- MECHANICAL
M1.5	SECOND FLOOR PLAN - PIPING	- MECHANICAL
M1.6	ROOF PLAN	- MECHANICAL
M2.0	DETAILS & SCHEDULES	- MECHANICAL
M2.1	DETAILS & SCHEDULES	- MECHANICAL
M2.2	DETAILS & SCHEDULES	- MECHANICAL
M2.3	RISER DIAGRAM	- MECHANICAL
P.01	COVER SHEET	- PLUMBING
P1.0	BASEMENT FLOOR PLAN - SANITARY	- PLUMBING
P1.1	BASEMENT FLOOR PLAN - SERVICE PIPING	- PLUMBING
P1.2	FIRST FLOOR PLAN - SANITARY	- PLUMBING
P1.3	FIRST FLOOR PLAN - SERVICE PIPING	- PLUMBING
P1.4	SECOND FLOOR PLAN - SANITARY	- PLUMBING
P1.5	SECOND FLOOR PLAN - SERVICE PIPING	- PLUMBING
P1.6	ROOF PLAN	- PLUMBING
P2.0	DETAILS & SCHEDULES	- PLUMBING
P2.1	DETAILS & SCHEDULES	- PLUMBING
E.001	COVER SHEET - ELECTRICAL	- ELECTRICAL
E1.0	BASEMENT FLOOR PLAN-LIGHTING	- ELECTRICAL
E1.1	FIRST FLOOR PLAN-LIGHTING	- ELECTRICAL
E1.2	SECOND FLOOR PLAN-LIGHTING	- ELECTRICAL
E1.3	BASEMENT FLOOR PLAN-POWER	- ELECTRICAL
E1.4	FIRST FLOOR PLAN-POWER	- ELECTRICAL
E1.5	SECOND FLOOR PLAN-POWER	- ELECTRICAL
E1.6	ROOF PLAN	- ELECTRICAL
E2.0	DETAILS & SCHEDULES	- ELECTRICAL
E2.1	DETAILS & SCHEDULES	- ELECTRICAL
E2.2	SCHEDULES	- ELECTRICAL

NOTICE

THE SCHEDULES AND DRAWINGS REPRESENT ONLY CERTAIN REQUIREMENTS OF THE PROJECT. THERE ARE ADDITIONAL REQUIREMENTS IN THE SPECIFICATIONS BOOKLET WHICH THE CONTRACTOR IS BOUND TO PROVIDE. A SUPPLIER OR CONTRACTOR'S PRICING, WHICH IS BASED ONLY ON DRAWINGS OR SCHEDULES, MAY LEAVE IMPORTANT COSTS UNACCOUNTED FOR WHICH WILL ULTIMATELY BE THE CONTRACTOR OR SUPPLIER'S RESPONSIBILITY TO PROVIDE.

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Revision/Issue:

	05/31/23	Issued for Permit
1	09/20/23	Issued for Bidding
2	10/17/23	Addendum 4

Drawn: CK/MW/DE/KG
Reviewed: .
Contact: Chris Keenan
Project Number: 7010.03-22

Sheet Title:
COVER SHEET-ELECTRICAL

Sheet Number:
E0.1

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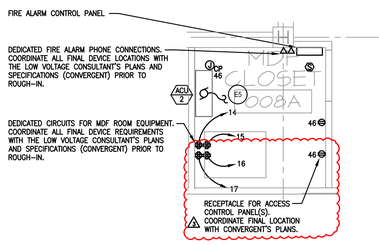
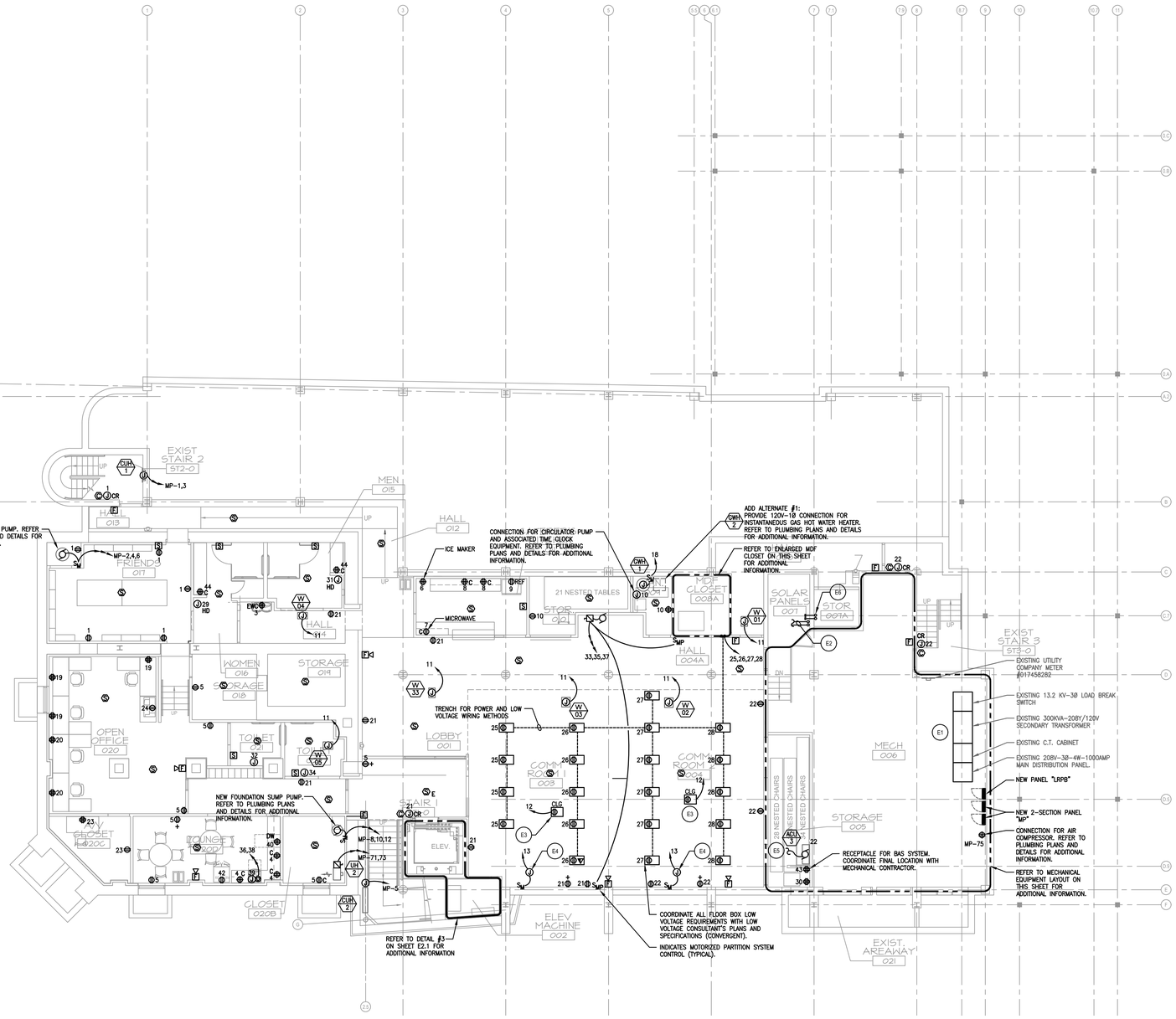
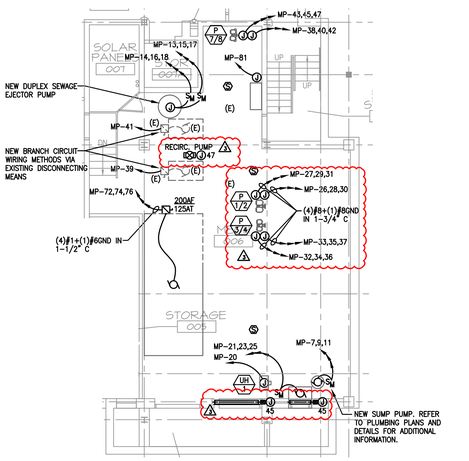


ENLARGED MDF CLOSET - POWER

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





MECHANICAL ROOM EQUIPMENT LAYOUT - POWER

SCALE: 1/8"=1'-0"

BASEMENT FLOOR PLAN - POWER

SCALE: 1/8"=1'-0"

ELECTRICAL NOTES:

1. COORDINATE LOCATIONS AND MOUNTING HEIGHTS OF ALL WIRING DEVICES WITH OWNER/ TENANT/ ARCHITECT PRIOR TO ROUGH-IN. REFER TO DETAILS AND SPECIFICATIONS FOR TYPICAL MOUNTING HEIGHTS.
2. REMOVE ALL EXISTING BRANCH CIRCUIT PANELBOARDS AND PROVIDE NEW AS INDICATED ON PLANS. FURNISH AND INSTALL NEW FEEDERS AND ASSOCIATED DISCONNECTING MEANS.
3. UNLESS OTHERWISE NOTED, BRANCH CIRCUIT NUMBERS ARE VIA PANEL "LRPB".
4. CONTRACTOR IS TO CONCEAL WIRING WHENEVER POSSIBLE. CUT AND PATCH ALL EXISTING PLASTER AND DRYWALL AS REQUIRED, AND REFINISH TO MATCH ADJACENT. ALL EXPOSED WIRING IS TO BE INSTALLED IN EMT. CONTRACTOR IS TO PAINT AS DIRECTED BY THE ARCHITECT. CONDUIT PATH IS TO BE AS INCONSPICUOUS AS POSSIBLE. COORDINATE CONDUIT ROUTE WITH ARCHITECT/ OWNER PRIOR TO ROUGH-IN AND INSTALLATION.

ELECTRICAL KEYNOTES:

- E1 RESERVED.
- E2 (2) 4" CONDUITS TO ACCESSIBLE CEILING ABOVE FOR LOW VOLTAGE PATHWAY. ~~COORDINATE ALL REQUIREMENTS WITH THE LOW VOLTAGE CONSULTANT'S PLANS AND~~ SPECIFICATIONS (CONVERGENT).
- E3 120V-1Ø POWER FOR CEILING MOUNTED PROJECTOR EQUIPMENT. COORDINATE ALL FINAL LOCATIONS WITH THE ARCHITECTURAL REFLECTED CEILING PLANS. COORDINATE ALL FINAL POWER REQUIREMENTS WITH THE LOW VOLTAGE CONSULTANT'S PLANS AND SPECIFICATIONS (CONVERGENT).
- E4 120V-1Ø POWER AND CONTROL FOR MOTORIZED DROP-DOWN SCREEN EQUIPMENT. COORDINATE ALL FINAL LOCATIONS WITH THE ARCHITECTURAL REFLECTED CEILING PLANS. COORDINATE ALL FINAL POWER REQUIREMENTS WITH THE CONSULTANT'S PLANS AND SPECIFICATIONS (CONVERGENT).
- E5 POWER FOR ACU IS DERIVED FROM CU LOCATED ON THE ROOF. ALL LOW VOLTAGE WIRING METHODS ARE TO BE PROVIDED BY THE MECHANICAL CONTRACTOR.
- E6 (2) 4" CAPPED CONDUITS WITH PULL-STRINGS UP TO ROOF FOR FUTURE SOLAR PATHWAY.

NOTICE

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2	10/04/23	Addendum 3
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Drawn: CK/MW/DE/KG
Reviewed: .
Contact: Chris Keenan
Project Number: 7010.03-22

Sheet Title:

BASEMENT FLOOR PLAN - POWER

Sheet Number:

E1.3

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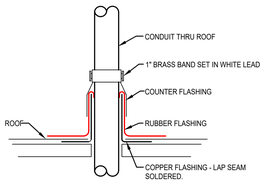
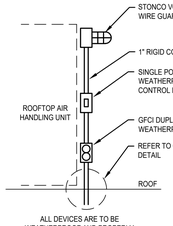


CONDUIT THROUGH ROOF DETAIL

SCALE: NONE

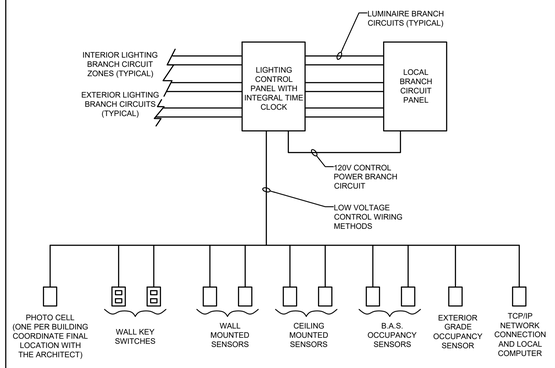
1



ROOFTOP DEVICE MOUNTING DETAIL

SCALE: NONE

2



LIGHTING CONTROL SCHEMATIC DIAGRAM

SCALE: NONE

DIAGRAM IS SCHEMATIC ONLY AND DOES NOT REPRESENT ACTUAL DEVICE QUANITITES. EVERY DEVICE INDICATED MAY NOT BE UTILIZED FOR THIS PROJECT. REFER TO FLOOR PLAN DRAWINGS FOR DEVICE QUANTITIES. REFER ALSO TO SPEC SECTION 16720 FOR FURTHER INFORMATION.

3

LUMINAIRE SCHEDULE

LISTED, APPROVED EQUALS. IT IS NOT UNDERSTOOD THAT THIS IMPLIES THAT A STANDARD LUMINAIRE IS ACCEPTABLE. THE LUMINAIRE MUST MEET ALL TECHNICAL REQUIREMENTS AS WELL AS BEING NAMED. ALTERNATE MANUFACTURERS ARE NOT ACCEPTABLE UNLESS APPROVED BY OWNER PRIOR TO THE G.M.P. ISSUE. REFER TO SPECIFICATION SECTION 26 50 00 FOR ADDITIONAL INFORMATION. THE CONTRACTOR IS RESPONSIBLE FOR SELECTING MOUNTING TYPE (SURFACE, RECESSED, LAY-IN, FLANGED, WALL, PENDANT, ETC). UNLESS OTHERWISE NOTED, ALL CCT AND CRI RATINGS ARE TO BE CONSISTENT THOUGH OUT THE LUMINAIRE PACKAGE. ALL DRIVERS ARE TO BE ELECTRONIC WITH 0-10V DIMMING CAPABILITY. ALL LENSES ARE TO BE SHIPPED WITHIN A PROTECTIVE COVERING. EMERGENCY FIXTURES ARE INDICATED AS PARTIALLY SHADED AND/ OR WITH AN "E" SUFFIX, FOR EXAMPLE, "A4E".

TAG	DESCRIPTION MANUFACTURER: MODEL NUMBER	LAMP WATTAGE	CCT/ CRI	VOLTAGE	EQUIVALENT MANUFACTURERS
COMMON AREA LUMINAIRES					
AL1A	4" APERTURE, 6'-0"L RECESSED LINEAR LED TRUGROOVE: 39 0 1 L 930 22 M S XX 06 D E 1 N NN W COORDINATE CEILING TYPES WITH ARCHITECTURAL PLANS	56W	3000/ 80+	120	FINELITE HP-4-R
AL1B	4" APERTURE, 12'-0"L RECESSED LINEAR LED TRUGROOVE: 39 0 1 L 930 22 M S XX 12 D E 1 N NN W COORDINATE CEILING TYPES WITH ARCHITECTURAL PLANS	112W	3000/ 80+	120	FINELITE HP-4-R
AL1C	4" APERTURE, 4'-0"L RECESSED LINEAR LED TRUGROOVE: 39 0 1 L 930 22 M S XX 04 D E 1 N NN W COORDINATE CEILING TYPES WITH ARCHITECTURAL PLANS	37W	3000/ 80+	120	FINELITE HP-4-R
AL1D	4" APERTURE, 8'-0"L SURFACE MOUNTED LINEAR LED TRUGROOVE: 29 1 1 L 930 22 QN 08 D E 1 N NN W SF	37W	3000/ 80+	120	FINELITE HP-4-R
AL1E	4" APERTURE, 18'-0"L WALL MOUNTED LINEAR LED WALL GRAZER FOCAL POINT: SEEM 2 FSM2PR	37W	3000/ 80+	120	FINELITE HP-4-R
AL2	2'x2' LED RECESSED BASKET TROFFER DAY-BRITE: 2 CAX G 38L 830 2 DS UNV DIM	29W	3000/ 80+	120	COLUMBIA LCAT22
AL4	2'x4' LED RECESSED BASKET TROFFER DAY-BRITE: 2 CAX G 38L 830 4 DS UNV DIM	36W	3000/ 80+	120	COLUMBIA LCAT24
AL17	6"Ø LED RECESSED DOWNLIGHT FOCAL POINT: FLC6D RO 1000L 120 LD1 T LC6 RD 1000L 30K DN CD NP	11.4W	3000/ 80+	120	PRESCOLITE LTR-6RD
AL18	6"Ø ADJUSTABLE LED RECESSED DOWNLIGHT FOCAL POINT: FLC6W RO 1000L 120 LD1 T LC6 RD 1000L 30K WW CD NP	11.4W	3000/ 80+	120	PRESCOLITE LTR-6RA
AL19	RESERVED				
AL20	6"Ø LED RECESSED DOWNLIGHT FOCAL POINT: FL6H RO 4000L 30K NFL 120 L11 T L6H RD DN CD NP	24.3W	3000/ 80+	120	PRESCOLITE LTR-6RD
AL20A	6"Ø LED RECESSED DOWNLIGHT FOCAL POINT: FL6H RO 4000L 30K FL 120 L11 T L6H RD DN CD NP	14.6W	3000/ 80+	120	PRESCOLITE LTR-6RD
CL1	4'-0"L LINEAR LED STRIP KELVIX: QX 550 30K LENGTH 010V 120277 SV	18W	3000/ 90+	UNV	VLT MAINLINE
CL2	LINEAR LED LUMINAIRE EDISON LIGHTING: ED VECTOR+ 10 7W/FT DD 120V DL WM OP WH 30K 90CRI	100W	3000/ 90+	120	FINELITE HP-2-P
CL3	RECESSED LINEAR LED LUMINAIRE ZENLITE: ZNLT NC1 2G PRL XX LIGHTMODULE 24V 95C 30K OLNS 2G ZO ST. COORDINATE BOTTOM OF FIXTURE HEIGHT WITH ARCHITECTURAL ELEVATIONS.	4.4W/FT	3000/ 90+	120	LUMINII SLOT
DL1	4'-0"L LED SURFACE MOUNTED LINEAR WITH INTEGRAL BATTERY BACK UP AND OCCUPANCY DETECTION DAY-O-LITE: STWL-D1 WOA 30 HO 4 WM W DIMST SMS EPC10	30.4W	3000/ 80+	120	LAMAR VOLG5
DL2	4'-0"L INDUSTRIAL LED SURFACE/ CHAIN MOUNTED STRIP DAY-BRITE: SDS 4 2448L 8CST UNV DIM FKR-126	21W	3000/ 80+	120	COLUMBIA CLS
DL3	3.5"Ø" SURFACE MOUNTED LED CYLINDER FOCAL POINT: "ID•" FLCY RD BKR 1500L 830K 1C UNV DPC L11 XX DNY WFL CD PS. COORDINATE MOUNTING REQUIREMENTS WITH THE ARCHITECT.	23W	3000/ 95+	120/ 24	INTENSE GRAVITY CYLINDER
DP1	42 LAMP LED PENDANT NEMO: CRO HLW 5A G9 LED KIT NEMO	92.4W	3000/ 80+	120	APPROVED EQUAL
DP2	30 LAMP LED PENDANT NEMO: CRO HLT 52 G9 LED KIT NEMO	66W	3000/ 80+	120	APPROVED EQUAL
DS1	FOUR LAMP LED WALL SCONCE NEMO: CRO HLW 32 G9 LED NEMO	8.8W	3000/ 80+	120	APPROVED EQUAL
FL1	29"L LED SURFACE MOUNTED VANITY OXYGEN: 3-552-30-24	14.7W	3000/ 80+	120	APPROVED EQUAL
FL3	96"Ø LED PENDANT LUMOS: RPM-UP-DN-96 3000 ASL SPC	134W	3000/ 80+	120	APPROVED EQUAL
G1	18.5"Ø LED SURFACE MOUNTED GARAGE LUMINAIRE GARDCO: SVPG AG3 830 TYR SUR 120 MG EM = PROVIDE EMERGENCY BATTERY PACK, COLD RATED	52W	3000/ 80+	120	BEACON SRT1
G2	LED WALL MOUNT SCONCE GARDCO: 101L 16L 700 WW-G2 4 EBPC UNV DD PCB MGY EM = PROVIDE EMERGENCY BATTERY PACK, COLD RATED	38	3000/ 80+	120	BEACON RWL2
TR6	6'-0"L SINGLE CIRCUIT, SURFACE MOUNTED TRACK WITH HEADS LIGHTOLIER: TRACK = 6112NWH/ 6033/ PLD120WH HEAD = LC L 10 930 WH TE LLMRNF FR PROVIDE ALL REQUIRED MOUNTING ACCESSORIES	17.7W	3000/ 80+	120	HEAD: CONTECH CTL9051 TRACK: CONTECH LT
TR9	9'-6"L SINGLE CIRCUIT, SURFACE MOUNTED TRACK WITH HEADS LIGHTOLIER: TRACK = 6112NWH/ 6033/ PLD120WH HEAD = LC L 10 930 WH TE LLMRNF FR PROVIDE ALL REQUIRED MOUNTING ACCESSORIES	23.6W	3000/ 80+	120	HEAD: CONTECH CTL9051 TRACK: CONTECH LT
TR10	6'-0"L SINGLE CIRCUIT, SURFACE MOUNTED TRACK WITH HEADS LIGHTOLIER: TRACK = 6112NWH/ 6033/ PLD120WH HEAD = LC L 10 930 WH TE LLMRNF FR PROVIDE ALL REQUIRED MOUNTING ACCESSORIES	29.5W	3000/ 80+	120	HEAD: CONTECH CTL9051 TRACK: CONTECH LT
TR12	12'-0"L SINGLE CIRCUIT, SURFACE MOUNTED TRACK WITH HEADS LIGHTOLIER: TRACK = 6112NWH/ 6033/ PLD120WH HEAD = LC L 10 930 WH TE LLMRNF FR PROVIDE ALL REQUIRED MOUNTING ACCESSORIES	29.5W	3000/ 80+	120	HEAD: CONTECH CTL9051 TRACK: CONTECH LT
E	EXIT SIGN CHLORIDE: 44RLU1RM/ 44RLU2R (FACES AND ARROWS AS INDICATED ON PLANS)	2.5W	RED	120	DUALLITE LES
EM	EMERGENCY LIGHTING BATTERY UNIT CHLORIDE: CLU2 N W 2R	.04W	---	120	COMPASS CU2RC
ER	EMERGENCY REMOTE HEAD(S) CHLORIDE: CLR1W = SINGLE HEAD CLR2W = DUAL HEAD (AS INDICATED ON PLANS)	.04W	---	120	COMPASS CIRS/ CIRD

NOTE:

1. ALL FINISH SELECTIONS ARE TO BE REVIEWED AND APPROVED BY THE ARCHITECT.

PANEL SCHEDULE — MDP

PANEL LABEL: MDP — MAINS: 1000 AMP — ENCLOSURE
A.I.C.: 65K — MCB: 1000 AMP 3 POLE — NEMA: ___
208/120 VOLT 3 PHASE 4 WIRE — LUGS: MLO or FT or SF — MOUNTING: ___
TOP___BOTTOM___ — WIDTH: ___

CKT	TRIP	POLE	DESCRIPTION	WATT	WATT	DESCRIPTION	TRIP	POLE	CKT
1									2
3	400	3	PANEL MP2	88894	39344	PANEL LRPB	20	3	4
5									6
7									8
9	20	1	PANEL LRP1	21798	52027	PANEL LRP2	20	3	10
11									12
13									14
15	20	3	ELEVATOR FEEDER	31703	52558	PANEL MP1	20		16
17									18
19	20	1	SPARE			SPARE	20	1	20
21	20	1	SPARE			SPARE	20	1	22
23	20	1	SPARE			SPARE	20	1	24
25			PREPARED SPACE			SPARE	20	1	26
27			PREPARED SPACE			SPARE	20	1	28
29			PREPARED SPACE			SPARE	20	1	30
				142396	143930	286325	993	AMPS	

PANEL SCHEDULE — MP1

PANEL LABEL: MP1 — MAINS: 400 AMP — ENCLOSURE
A.I.C.: 22K — MCB: 400 AMP 3 POLE — NEMA: 1
208/120 VOLT 3 PHASE 4 WIRE — LUGS: — MOUNTING: S
TOP___BOTTOM: X — WIDTH: 20"

CKT	TRIP	POLE	DESCRIPTION	WATT	WATT	DESCRIPTION	TRIP	POLE	CKT
1									2
3	30	2	CUH-1 STAIR #2	4805	1261	SUMP PUMP	15	3	4
5	20	1	CUH-2 STAIR #1	78					6
7									8
9	15	3	SUMP PUMP	1261	1261	SUMP PUMP	15	3	10
11									12
13									14
15	15	3	SUMP PUMP	2378	2378	SUMP PUMP	15	3	16
17									18
19	15	1	ELEVATOR SUMP PUMP	1176	264	UH-1	15	1	20
21						PREPARED SPACE			22
23	15	3	EF-1	1657		PREPARED SPACE			24
25									26
27					6305	PUMP P-1	35	3	28
29	35	3	PUMP P-2	6305					30
31									32
33					6305	PUMP P-3	35	3	34
35	35	3	PUMP P-4	6305					36
37									38
39					6016	PUMP P-7	25	3	40
41	30	2	CUH-1	4805					42
				28769	23789	52558	146	AMPS	

2

PANEL SCHEDULE — MP2

PANEL LABEL: MP2 — MAINS: 400 AMP — ENCLOSURE
A.I.C.: 22K — MCB: — NEMA: 1
208/120 VOLT 3 PHASE 4 WIRE — LUGS: MLO — MOUNTING: S
TOP___BOTTOM___ — WIDTH: 20"

CKT	TRIP	POLE	DESCRIPTION	WATT	WATT	DESCRIPTION	TRIP	POLE	CKT
43					4805	CUH-1	30	2	44
45	25	3	PUMP P-8	6016					46
47					3994	CUH-3 DROP-OFF	25	2	48
49	20	1	CUH-4 VESTIBULE	78					50
51	30	2	CUH-1 STAIR #3	4805	4805	CUH-1	30	2	52
53									54
55	30	2	CUH-1	4805	9104	AHU-1	50	3	56
57									58
59	30	2	HEAT TRACE	3120					60
61					864	EF-2	15	1	62
63			SPACE FOR GFCI		180	SUMP PUMP CONTROL PANEL	20	1	64
65	30	1	ELEVATOR CAB	550	280	ELEVATOR PIT DEVICES	20	1	66
67			PREPARED SPACE		280	ELEVATOR MACHINE ROOM DEVICES	20	1	68
69			PREPARED SPACE		900	OIL MINDER SYSTEM	20	1	70
71	20	2	UH-2	3000	33105	AHU-2	125	3	72
73									74
75	20	1	AIR COMPRESSOR	900					76
77	15	1	BOILER B-1	720	2807	FIRE FEATURE (PROVIDE NEUTRAL)	20	2	78
79	15	1	BOILER B-2	720					80
81	20	1	CO DETECTION HEAD END	250	2807	FIRE FEATURE (PROVIDE NEUTRAL)	20	2	82
83			PREPARED SPACE						84
				24964	63930	88894	247	AMPS	

PANEL SCHEDULE — LRPB

PANEL LABEL: LRPB — MAINS: 200 AMP — ENCLOSURE
A.I.C.: 10K — MCB: 200 AMP 3 POLE — NEMA: 1
208/120 VOLT 3 PHASE 4 WIRE — LUGS: — MOUNTING: S
TOP___BOTTOM: X — WIDTH: 20"

CKT	TRIP	POLE	DESCRIPTION	WATT	WATT	DESCRIPTION	TRIP	POLE	CKT
1	20	1	RCPTS- FRIENDS ROOM	720	360	RCPTS- MEN/ WOMENS ROOM	20	1	2
3	20	1	ELECTRIC WATER COOLER	750	540	RCPTS- MEETING ROOM	20	1	4
5	20	1	RCPTS- STAFF/ LOUNGE/ A.V	1080	900	ICE MAKER- KITCHEN	20	1	6
7	20	1	MICROWAVE- KITCHEN	1200	180	RCPTS- KITCHEN	20	1	8
9	20	1	REF- KITCHEN	900	360	RCPTS- STORAGE/ JANITOR	20	1	10
11	20	1	V.A.V. CONTROLLER VI-01-05,33	500	360	POWER- CEILING	20	1	12
13	20	1	POWER-MOTORIZED WINDOWS	1000	360	QUAD RCPTS- MDF	20	1	14
15	20	1	QUAD RCPTS- MDF	360	360	QUAD RCPTS- MDF	20	1	16
17	20	1	QUAD RCPTS- MDF	360	572	GAS WATER HEATER	20	1	18
19	20	1	QUAD RCPTS- STAFF	1080	720	QUAD RCPTS- STAFF	20	1	20
21	20	1	RCPTS- COMM ROOM 1	1080	720	RCPTS- COMM ROOM 2	20	1	22
23	20	1	QUAD RCPT- A.V	540	500	COPIER	20	1	24
25	20	1	FLOOR BOX RECEPTACLES	720	900	FLOOR BOX RECEPTACLES	20	1	26
27	20	1	FLOOR BOX RECEPTACLES	900	900	FLOOR BOX RECEPTACLES	20	1	28
29	20	1	HAND DRYER	1000	360	QUAD A.V. RACK	20	1	30
31	20	1	HAND DRYER	1000	1000	HAND DRYER	20	1	32
33					1000	HAND DRYER	20	1	34
35	20	3	MOTORIZED PARTITION	2080	8000	RANGE LOUNGE	50	2	36
37									38
39	20	1	BASEMENT LIGHTING	RANGE HOOD	250	1200	DISHWASHER LOUNGE	20	1	40
41	20	1	BASEMENT LIGHTING	1176	900	REFRIG LOUNGE	20	1	42
43	20	1	BAS RECEPTACLE	360	360	BATHROOM GFCI	20	1	44
45	20	1	MOTORIZED DAMPERS	200	360	RCPTS- MDP CLOSET	20	1	46

PANEL SCHEDULE — LRP1

PANEL LABEL: LRP1 — MAINS: 200 AMP — ENCLOSURE
A.I.C.: 10K — MCB: 200 AMP 3 POLE — NEMA: 1
208/120 VOLT 3 PHASE 4 WIRE — LUGS: — MOUNTING: S
TOP___BOTTOM: X — WIDTH: 20"

CKT	TRIP	POLE	DESCRIPTION	WATT	WATT	DESCRIPTION	TRIP	POLE	CKT
1	20	1	RCPTS- STAFF 110	540	460	RCPTS- STAFF 100/ CARD READERS	20	1	2
3	20	1	RCPTS-FLEX 108/ 109	1260	540	RCPTS- STAFF 110	20	1	4
5	20	1	ELECTRIC WATER COOLER	900	540	RCPTS-POKE THRU DEVICES- 114/ 115	20	1	6
7	20	1	WALL FURNITURE WHIP	360	360	WALL FURNITURE WHIP	20	1	8
9	20	1	SPARE FOR WALL FURNITURE WHIP			SPARE FOR WALL FURNITURE WHIP	20	1	10
11	20	1	SPARE FOR WALL FURNITURE WHIP			SPARE FOR WALL FURNITURE WHIP	20	1	12
13	20	1	SPARE FOR WALL FURNITURE WHIP			SPARE FOR WALL FURNITURE WHIP	20	1	14
15	20	1	POWER FLOOR POKE THRU	720	720	QUAD RCPTS- LAPTOP BAR	20	1	16
17	20	1	QUAD RCPTS-IDF	360	900	RCPTS-	20	1	18
19	20	1	COPIER/PRINTER	900	360	POKE THRU DEVICES	20	1	20
21	20	1	SPARE		1440	POKE THRU DEVICES	20	1	22
23	20	1	RCPTS AND CARD READERS	900	1500	ELECTRIC SLIDING DOORS	20	1	24
25	20	1	V.A.V. CONTROLLER VI-10-17	500	500	V.A.V. CONTROLLER-06A-09	20	1	26
27	20	1	POWER- DOOR SECURITY	750	540	RCPTS-	20	1	28
29	20	1	WALL FURNITURE WHIP	360	360	WALL FURNITURE WHIP	20	1	30
31	20	1	HAND DRYER	1000		CLOCK	20	1	32
33	20	1	HAND DRYER	1000		CLOCK	20	1	34
35	20	1	SPARE			"LIBRARY" SIGN	20	1	36
37	20	1	PREPARED SPACE		500	PARKING COUTER HEAD END	20	1	38
39	20	1	1ST FLOOR LIGHTING	1176		PREPARED SPACE			40
41	20	1	1ST FLOOR LIGHTING	1176	1176	1ST FLOOR LIGHTING	20	1	42
				11902	9896	21798	76	AMPS	

PANEL SCHEDULE — LRP2

PANEL LABEL: LRP2 — MAINS: 200 AMP — ENCLOSURE
A.I.C.: 10K — MCB: 200 AMP 3 POLE — NEMA: 1
208/120 VOLT 3 PHASE 4 WIRE — LUGS: — MOUNTING: S
TOP___BOTTOM: X — WIDTH: 20"

CKT	TRIP	POLE	DESCRIPTION	WATT	WATT	DESCRIPTION	TRIP	POLE	CKT
1	20	1	EF-4/ RCPTS- OFFICES	1103	1440	RCPTS- OFFICES AND RECEPTION	20	1	2
3	20	1	RCPTS-INNOVATION ZONE 208	900	540	RCPTS-INNOVATION ZONE 208	20	1	4
5	20	1	RCPTS-INNOVATION ZONE 208	720	540	RCPTS-INNOVATION ZONE 208	20	1	6
7	20	1	POWER- RECORDING STUDIO 208	540	1260	RCPTS- CHILDREN 206	20	1	8
9	20	1	RCPTS- CHILDREN 206	900	1080	RCPTS- CHILDREN 206	20	1	10
11	20	1	RCPTS- HUB 203B	720	1220	RCPTS/ PROJ/ SCREEN- HUB 203B	20	1	12
13	20	1	POKE THRU DEVICES- HUB 203B	720	900	POKE THRU DEVICES- HUB 203B	20	1	14
15	20	1	RCPTS- READING ROOM 202B	720	1260	RCPTS- YOUNG ADULT 202	20	1	16
17	20	1	RCPTS- HALL 205	900	500	CHARGING KIOSK- 202	20	1	18
19	20	1	RCPTS- MEETING ROOM 200A	1080	540	RCPTS- MEETING ROOM 226	20	1	20
21	20	1	RCPTS- MEETING ROOM 226	900	1260	RCPTS- 217/ 218/ 219/ 221/ 222	20	1	22
23	20	1	RCPTS- MEETING ROOM 220	1080	900	RCPTS- SENSORY 203A/ TUTOR 203B	20	1	24
25	20	1	RCPTS- SEATING 201	540	360	QUAD RCPT-IDF	20	1	26
27	20	1	ELECTRIC WATER COOLER	900	1000	HAND DRYER	20	1	28
29	20	1	V.A.V. BOXES VV-26 THRU 32	500	1000	HAND DRYER	20	1	30
31	20	1	V.A.V. BOXES VV-18 THRU 25	500	720	WORK ROOM 208A	20	1	32
33	20	1	WALL FURNITURE WHIP		360	WALL FURNITURE WHIP	20	1	34
35	20	1	SPARE FOR WALL FURNITURE WHIP			SPARE FOR WALL FURNITURE WHIP	20	1	36
37	20	1	SPARE FOR WALL FURNITURE WHIP			SPARE FOR WALL FURNITURE WHIP	20	1	38
39	20	1	SPARE FOR WALL FURNITURE WHIP			SPARE FOR WALL FURNITURE WHIP	20	1	40
41	20	1	SPARE		864	EF-2	15	1	42
43	20	1	RADIANT FLOOR MANIFOLD #1	500	2704	CU-1	15	2	44
45	20	1	RADIANT FLOOR MANIFOLD #2	500					46
47	20	1	SERVICE RCPTS ON THE ROOF	540	2704	CU-2	15	2	48
49									50
51	25	3	EF-3	6016	2704	CU-3	15	2	52
53									54
55	20	1	SECOND FLOOR LUMINAIRES	1176	1176	SECOND FLOOR LUMINAIRES	20	1	56
57	20	1	SECOND FLOOR LUMINAIRES	1176	1176	SECOND FLOOR LUMINAIRES	20	1	58
59	20	1	EF-5		864	EF-5	20	1	60
61	20	1	MOTORIZED SHADES	600	500	V.A.V. BOXES VV-34 THRU 37	20	1	62
63	20	1	SPARE			SPARE	20	1	64
65	20	1	SPARE			SPARE	20	1	66
				24455	27572	52027	181	AMPS	

THE DELIVERY OF THIS DRAWING SHOULD NOT BE CONSTRUED TO PROVIDE AN EXPRESS WARRANTY OR GUARANTEE TO ANYONE THAT ALL THE DIMENSIONS AND DETAILS ARE EXACT OR TO INDICATE THAT THE USE OF THIS DRAWING IMPLIES THE REVIEW AND APPROVAL BY THE DESIGN PROFESSIONAL OF ANY FUTURE USE. ANY USE OF THIS INFORMATION WITHOUT THE WRITTEN APPROVAL BY THE DESIGN PROFESSIONAL IS AT THE SOLE RISK AND LIABILITY OF THE USER. THE DESIGN PROFESSIONAL RESERVES THE RIGHT TO REMOVE OUR PROFESSIONAL SEAL AND/OR TITLE BLOCK.

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THE SCHEDULES AND DRAWINGS REPRESENT ONLY CERTAIN REQUIREMENTS OF THE PROJECT. THERE ARE ADDITIONAL REQUIREMENTS IN THE SPECIFICATIONS, BOOKLET WHICH THE CONTRACTOR IS BOUND TO PROVIDE. A SUPPLIER OR CONTRACTOR'S PRICING, WHICH IS BASED ONLY ON DRAWINGS OR SCHEDULES, MAY LEAVE IMPORTANT COSTS UNACCOUNTED FOR WHICH WILL ULTIMATELY BE THE CONTRACTOR OR SUPPLIER'S RESPONSIBILITY TO PROVIDE.

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Project:

HAVERFORD TOWNSHIP FREE LIBRARY
1601 Darby Road
Haverford Township
Havertown, PA 19083

Owner:

HAVERFORD TOWNSHIP FREE LIBRARY
1601 Darby Road
Haverford Township
Havertown, PA 19083

Revision/Issue:

	05/31/23	Issued for Permit
1	09/20/23	Issued for Bidding
2	10/17/23	Addendum 4

Drawn: CK/MW/DE/KG
Reviewed: .
Contact: Chris Keenan
Project Number: 7010.03-22

Sheet Title:

SCHEDULES- ELECTRICAL

Sheet Number:

E2.2

2/20/2023 5:31:41 PM C:\Revit Locals\7010_03-22 Haverford Township Free Library_dbodgetK6SX.rvt

SECTION 0030 00 – AVAILABLE INFORMATION

The following are incorporated into this section:

1. Hazardous Materials Investigation – Haverford Township Free Library, dated April 20, 2016, by Element Environmental (Consultant to Owner), 14 pages

2. Report of Geotechnical Exploration, undated, by David Blackmore & Associates, Inc. (Consultant to Owner), 38 pages.

3. Redevelopment Assistance Capital Program (RACP) Key Compliance Guidelines, 5 pages.

4. Guidance on Steel Certification Relative to the Redevelopment Assistance Capital Program (RACP), updated March 2023, 4 pages.

5. 2022 List of Exempt Machinery and Equipment Steel Products, 5 pages.

6. Haverford Township Free Library Roofing Preventive Maintenance (PM) Inspection report, dated ~~02/01/21, by Intertek (Consultant to Owner), 34 pages.~~

7. Addition & Renovations, Haverford Township Free Library construction drawings, dated March 1, 1977, by The Johnson/Smith Partnership and consulting engineers (Consultant to Owner), 30 pages. These drawings are provided for information only and may not reflect current as-built conditions. Bidders to review field conditions to confirm accuracy.

This section contains one hundred thirty (130) pages, not including cover page.

END OF SECTION

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ADDITION & RENOVATIONS

HAVERFORD TOWNSHIP FREE LIBRARY

DARBY AND MILL ROADS HAVERTOWN PA.

THE JOHNSON/SMITH PARTNERSHIP ARCHITECTS AND PLANNERS

PENNELL AND WILTBERGER CONSULTING MECHANICAL ENGINEERS

LAWRENCE ARATA, JR. STRUCTURAL ENGINEER

ABBREVIATIONS

A.F.F.	ABOVE FINISHED FLOOR	H.M.	HOLLOW METAL
AC or ACO	ACOUSTICAL	HR.	HOUR
ALT.	ALTERNATE	IN. or INS.	INSULATED
ALUM.	ALUMINUM	JAN.	JANITOR
ANOD.	ANODIZED	MACH.	MACHINE
B	BOTTOM	MFR.	MANUFACTURER
BLDG.	BUILDING	MAS.	MASONRY
BD.	BOARD	MAT.	MATERIAL
B.L.	BORROWED LIGHT	MECH.	MECHANICAL
		M.	MEN
		MET.	METAL
BRK.	BRICK	M.L.	METAL LATHE
B.P.T.	BRICK PAVING TILES	N.I.C.	NOT IN CONTRACT
B.U.R.	BUILT UP ROOFING	N.T.S.	NOT TO SCALE
C.H.	CEILING HEIGHT	NO.	NUMBER
		O.C.	OVER CENTERS
CEM.	CEMENT	PART.	PARTIAL
C.T.	CERAMIC TILES	PL. or PLAS.	PLASTER
C.L.	CENTER LINE	R.	RADIUS, RISER
COL.	COLUMN	REINF.	REINFORCED
COMPR.	COMPRESSIBLE	RM.	ROOM
CONC.	CONCRETE	STL.	STEEL
C.M.U.	CONCRETE MASONRY UNIT	STRUCT.	STRUCTURAL, STRUCTURE
CONN.	CONNECTION	T.	TOP, TREAD
CONT.	CONTINUOUS	T.C.	TERRA COTTA
CORR.	CORRUGATED	TYP.	TYPICAL
D.F.	DRINKING FOUNTAIN	VEN.	VENEER
DET.	DETAIL	W/	WITH
ELECT.	ELECTRICAL	W.	WOMEN
EL.	ELEVATION	WD.	WOOD
ELEV.	ELEVATOR		
ENT.	ENTRANCE		
EQUIP.	EQUIPMENT		
EX.	EXISTING		
EXT.	EXTERIOR		
FDN.	FOUNDATION		
F.P.	FIRE PROOFING		
FL. or FLUO.	FLUORESCENT		
GALV.	GALVANIZED		
HAND.	HANDICAPPED		
HGT.	HEIGHT		

SYMBOLS AND MATERIALS

SYMBOLS

PROPERTY LINE

SECTION LINE

ROOM NUMBERS

DOOR NUMBERS

MATERIALS

CONCRETE IN SECTION

BRICK IN SECTION

BLOCK IN SECTION

GRANITE STONE IN SECTION

EARTH

CRUSHED STONE

PLASTER

WOOD FINISHED

WOOD BLOCKING

METAL PANEL

INSULATION

LIST OF DRAWINGS

ARCHITECTURAL

CS1	COVER SHEET SURVEY & TOPOGRAPHIC PLAN
A-1	SITE & ROOF PLAN
A-2	BASEMENT FLOOR PLAN
A-3	FIRST FLOOR PLAN
A-4	SECOND FLOOR PLAN
A-5	ELEVATIONS
A-6	WALL SECTIONS
A-7	MONITOR DETAILS
A-8	MAIN ENTRANCE DETAILS & STAIR #1
A-9	DETAIL STAIR #2 & 3 AND SERVICE CORE DETAILS
A-10	STAIR # 2 & 3 SECTIONS & DETAILS
A-11	REFLECTED CEILING PLANS & DETAILS
A-12	REFLECTED CEILING PLAN & DETAILS

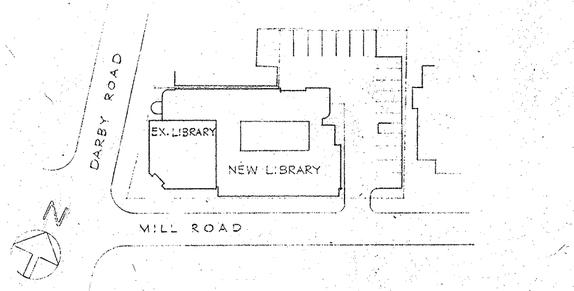
STRUCTURAL

S-1	FOUNDATION PLAN
S-2	FIRST FLOOR FRAMING PLAN
S-3	SECOND FLOOR FRAMING PLAN
S-4	ROOF FRAMING PLAN
S-5	SCHEDULES AND DETAILS

PLUMBING-MECHANICAL-ELECTRICAL

PME-1	SITE PLAN & DETAILS-PLUMBING, HEATING & ELECT.
P-1	BASEMENT FLOOR PLAN-PLUMBING
P-2	FIRST FLOOR PLAN-PLUMBING
P-3	SECOND FLOOR PLAN-PLUMBING
H-1	BASEMENT FLOOR PLAN-HEATING
H-2	FIRST FLOOR PLAN-HEATING
H-3	SECOND FLOOR PLAN-HEATING
E-1	BASEMENT FLOOR PLAN-POWER & LIGHTING
E-2	FIRST FLOOR PLAN-LIGHTING - ELECTRICAL
E-3	SECOND FLOOR PLAN-LIGHTING - ELECT.
E-4	FIRST FLOOR PLAN-POWER - ELECTRICAL
E-5	SECOND FLOOR PLAN-POWER-ELECTRICAL

LOCATION PLAN



CONSTRUCTION DRAWINGS FROM THE 1970'S ARE PROVIDED FOR INFORMATION ONLY. AND MAY NOT REFLECT CURRENT AS-BUILT CONDITIONS. BIDDERS ARE TO REVIEW FIELD CONDITIONS TO CONFIRM ACCURACY.

PROJECT APPROVED:

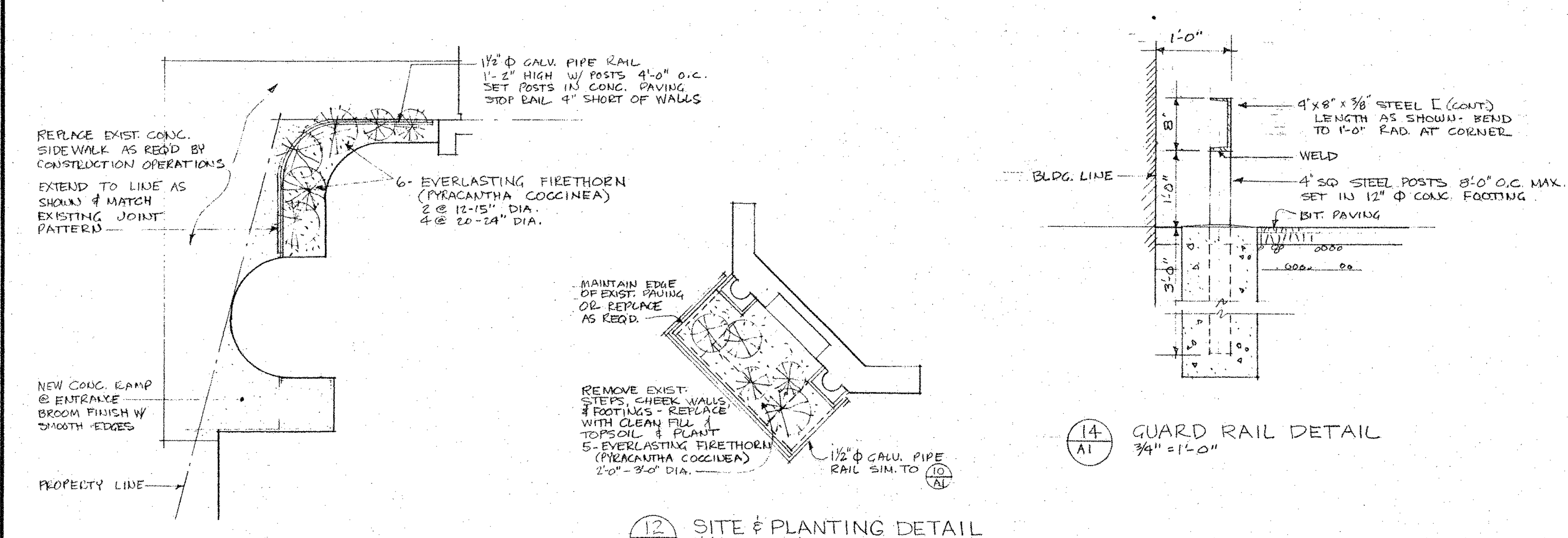
TITLE

COVER SHEET

DATE

MARCH 1, 1977

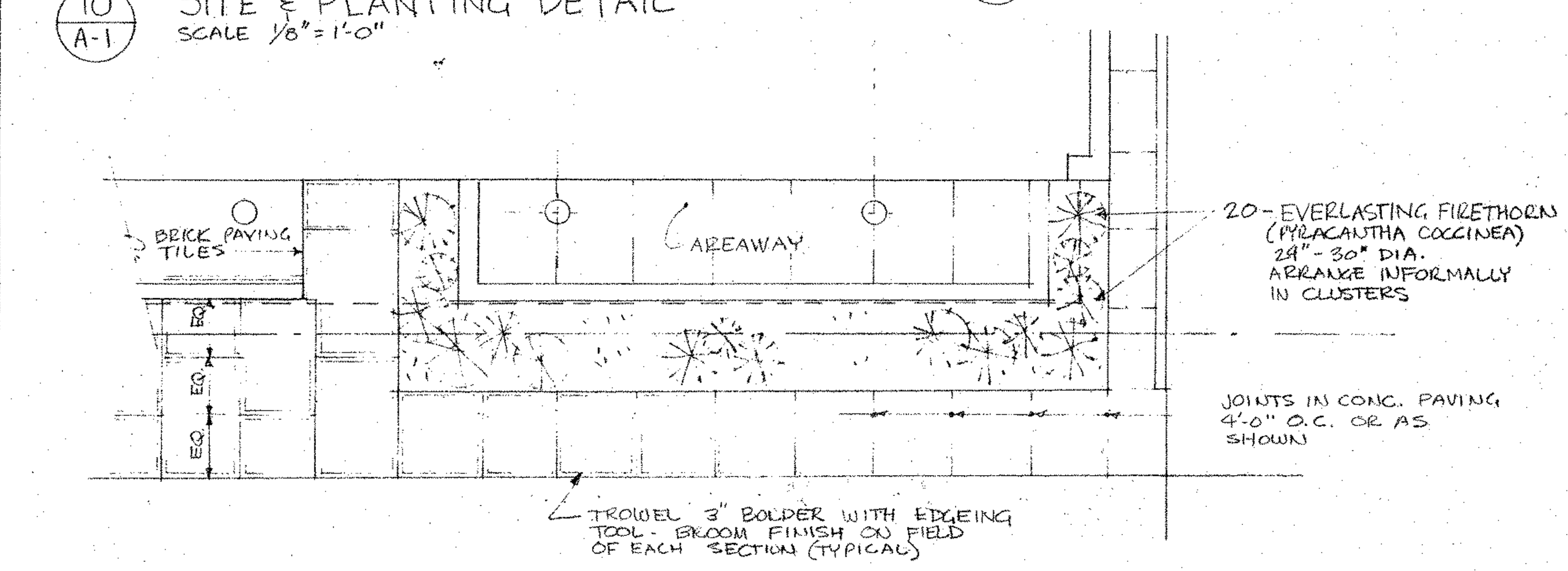
CS1



10 A-1 SITE & PLANTING DETAIL SCALE 1/8" = 1'-0"

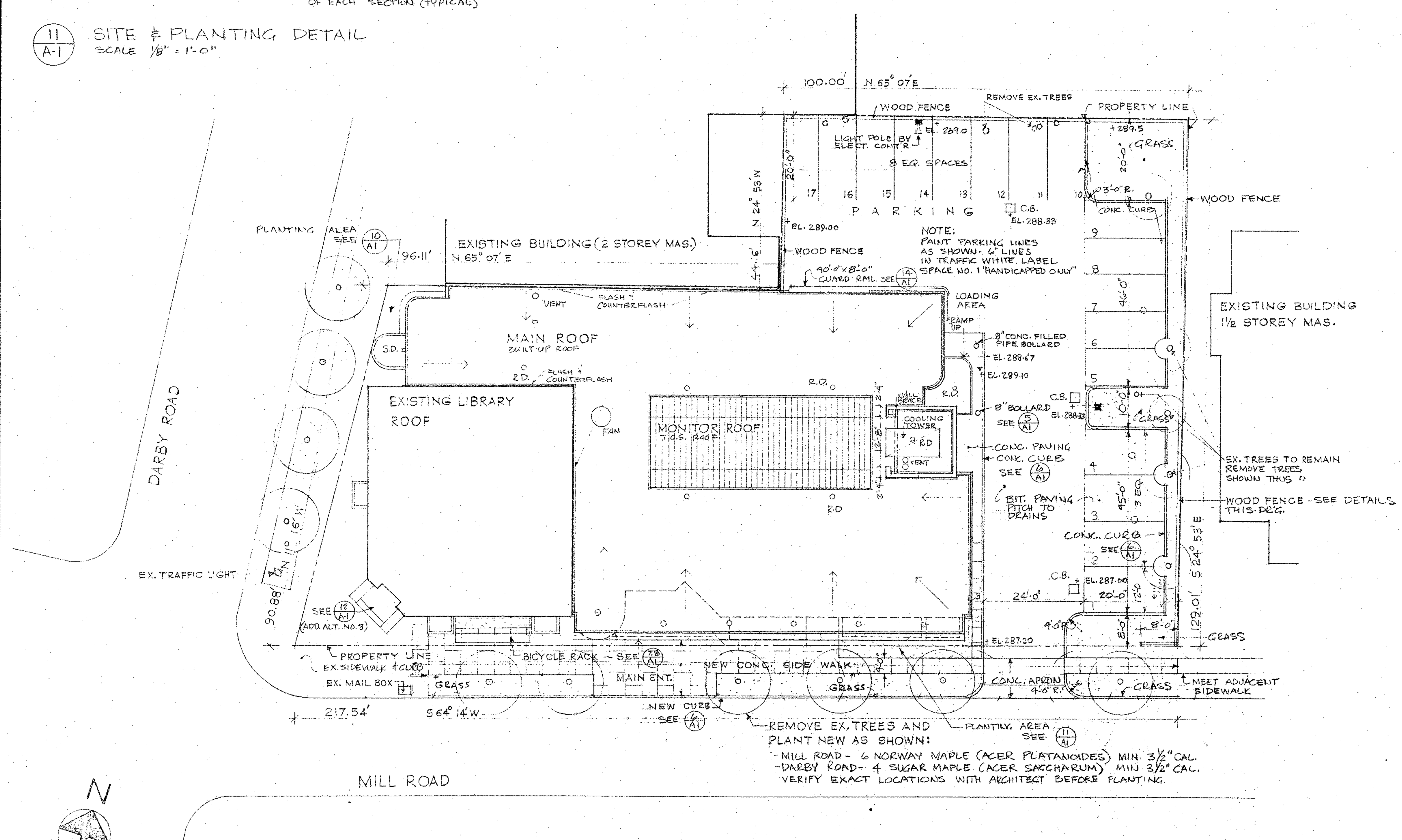
12 A-1 SITE & PLANTING DETAIL 1/8" = 1'-0" (ADD ALT. NO. 3 ONLY)

14 A1 GUARD RAIL DETAIL 3/4" = 1'-0"

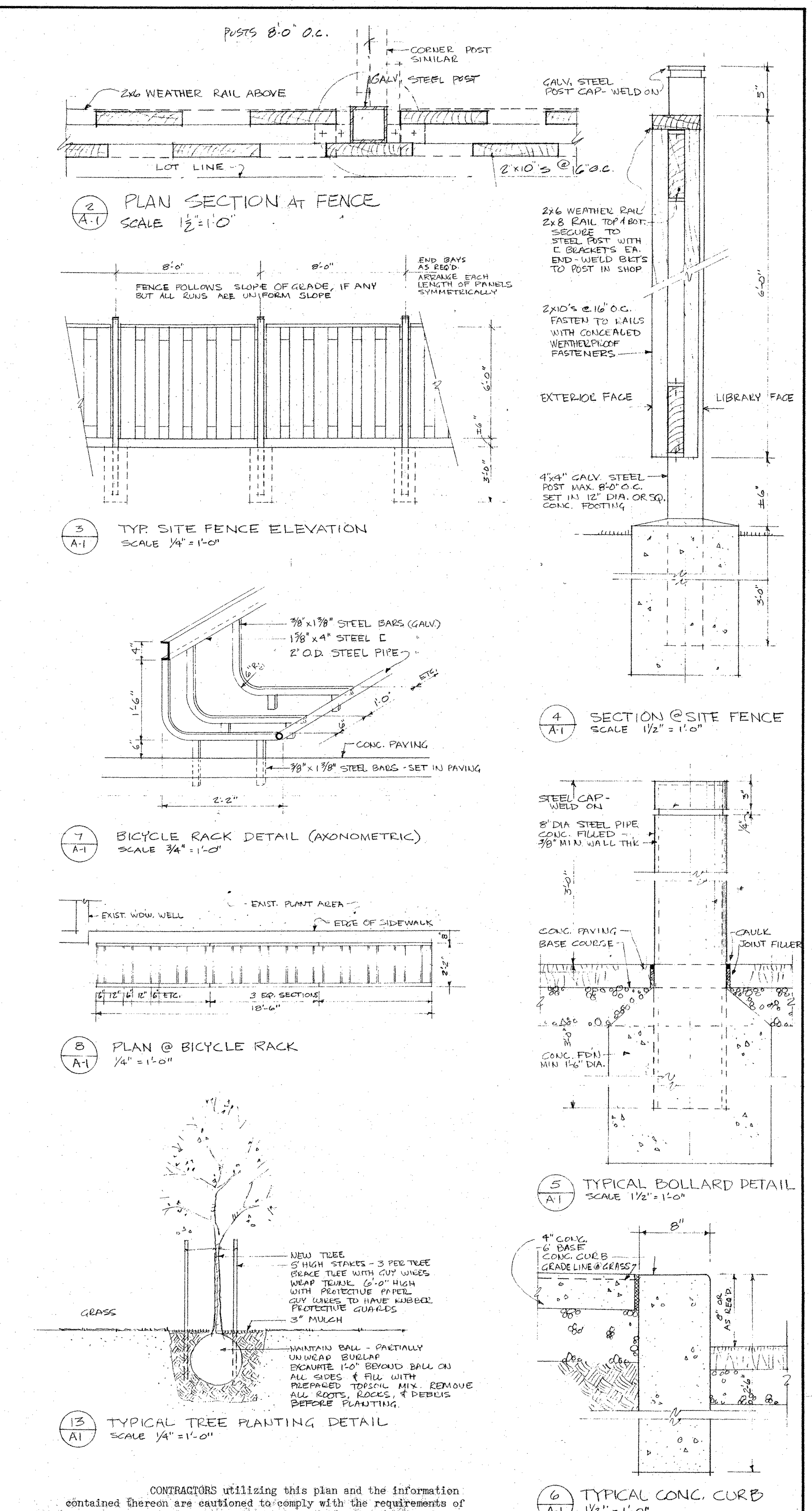


11 A-1 SITE & PLANTING DETAIL SCALE 1/8" = 1'-0"

CONSTRUCTION DRAWINGS FROM THE 1970'S ARE PROVIDED FOR INFORMATION ONLY. AND MAY NOT REFLECT CURRENT AS-BUILT CONDITIONS. BIDDERS ARE TO REVIEW FIELD CONDITIONS TO CONFIRM ACCURACY.



1 A-1 SITE AND ROOF PLAN SCALE 1" = 20'-0"



2 A-1 PLAN SECTION AT FENCE SCALE 1 1/2" = 1'-0"

3 A-1 TYP. SITE FENCE ELEVATION SCALE 1/4" = 1'-0"

4 A-1 SECTION @ SITE FENCE SCALE 1/2" = 1'-0"

7 A-1 BICYCLE RACK DETAIL (AXONOMETRIC) SCALE 3/4" = 1'-0"

8 A-1 PLAN @ BICYCLE RACK 1/4" = 1'-0"

5 A-1 TYPICAL BOLLARD DETAIL SCALE 1 1/2" = 1'-0"

13 A1 TYPICAL TREE PLANTING DETAIL SCALE 1/4" = 1'-0"

6 A-1 TYPICAL CONC. CURB 1 1/2" = 1'-0"

"CONTRACTORS utilizing this plan and the information contained thereon are cautioned to comply with the requirements of Pennsylvania Act 287, House Bill 2543, entitled EXCAVATION AND DEMOLITION WORK - PROTECTION OF UNDERGROUND UTILITIES."

THE J/S JOHNSON/SMITH PARTNERSHIP ARCHITECTS AND PLANNERS 15 WEST HIGHLAND AVE. PHILADELPHIA

PENNELL AND WILTBERGER CONSULTING MECHANICAL LAWRENCE ANASTASI STRUCTURAL ENGINEERS

HAVERFORD TOWNSHIP FREE LIBRARY

DARBY ROAD AND MILL ROAD HAVERTOWN PA.

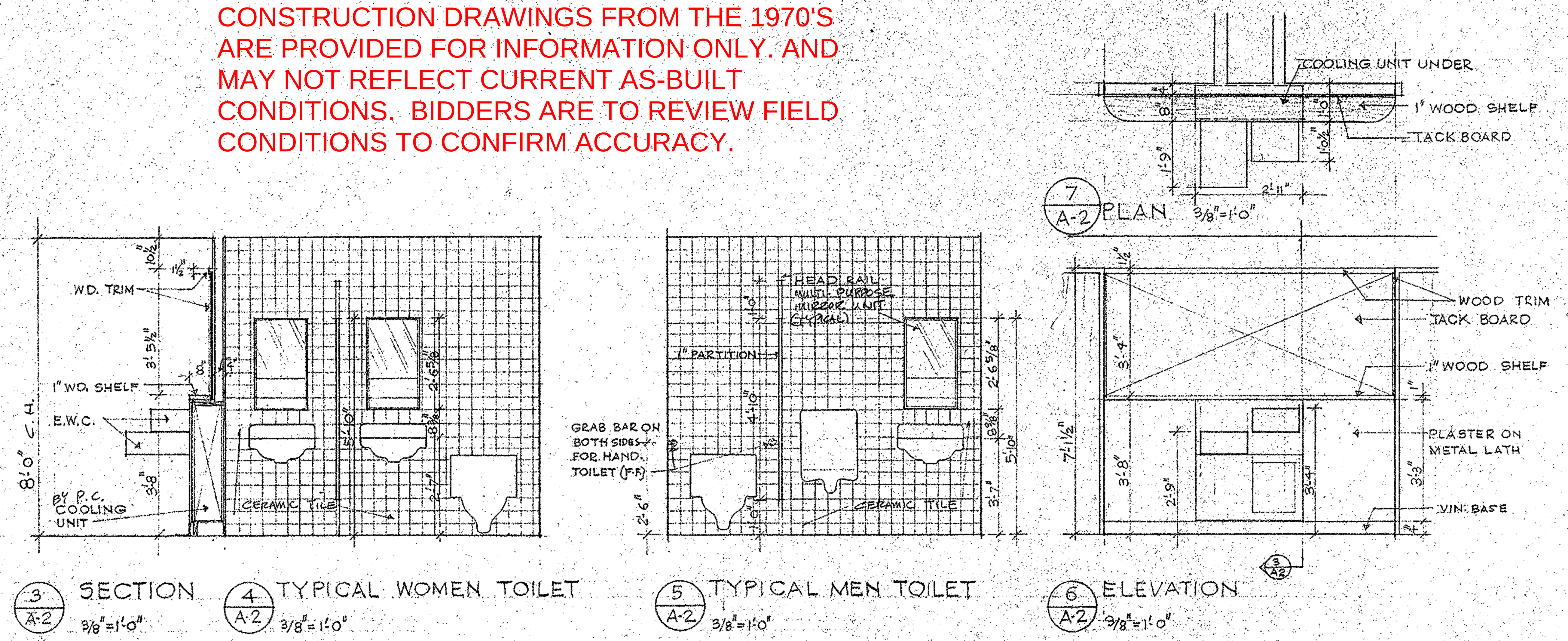
NO.	REVISIONS	DATE

SITE AND ROOF PLAN

DRAWN J. KHURANA CHK'D G.W.S. DATE MAR. 1, 1977 SCALE 1" = 20'-0"

A1

CONSTRUCTION DRAWINGS FROM THE 1970'S ARE PROVIDED FOR INFORMATION ONLY. AND MAY NOT REFLECT CURRENT AS-BUILT CONDITIONS. BIDDERS ARE TO REVIEW FIELD CONDITIONS TO CONFIRM ACCURACY.



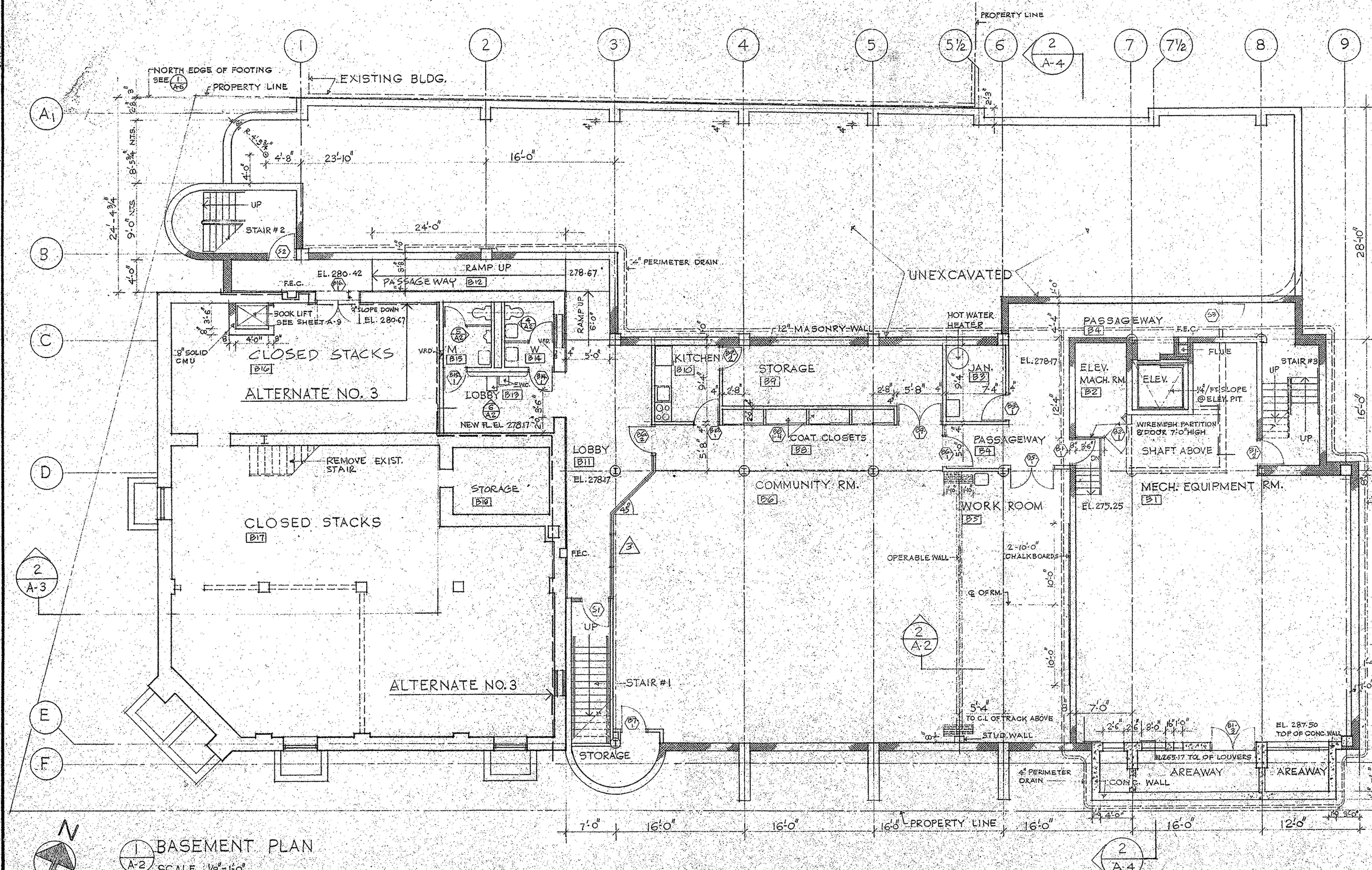
ROOM FINISH SCHEDULE

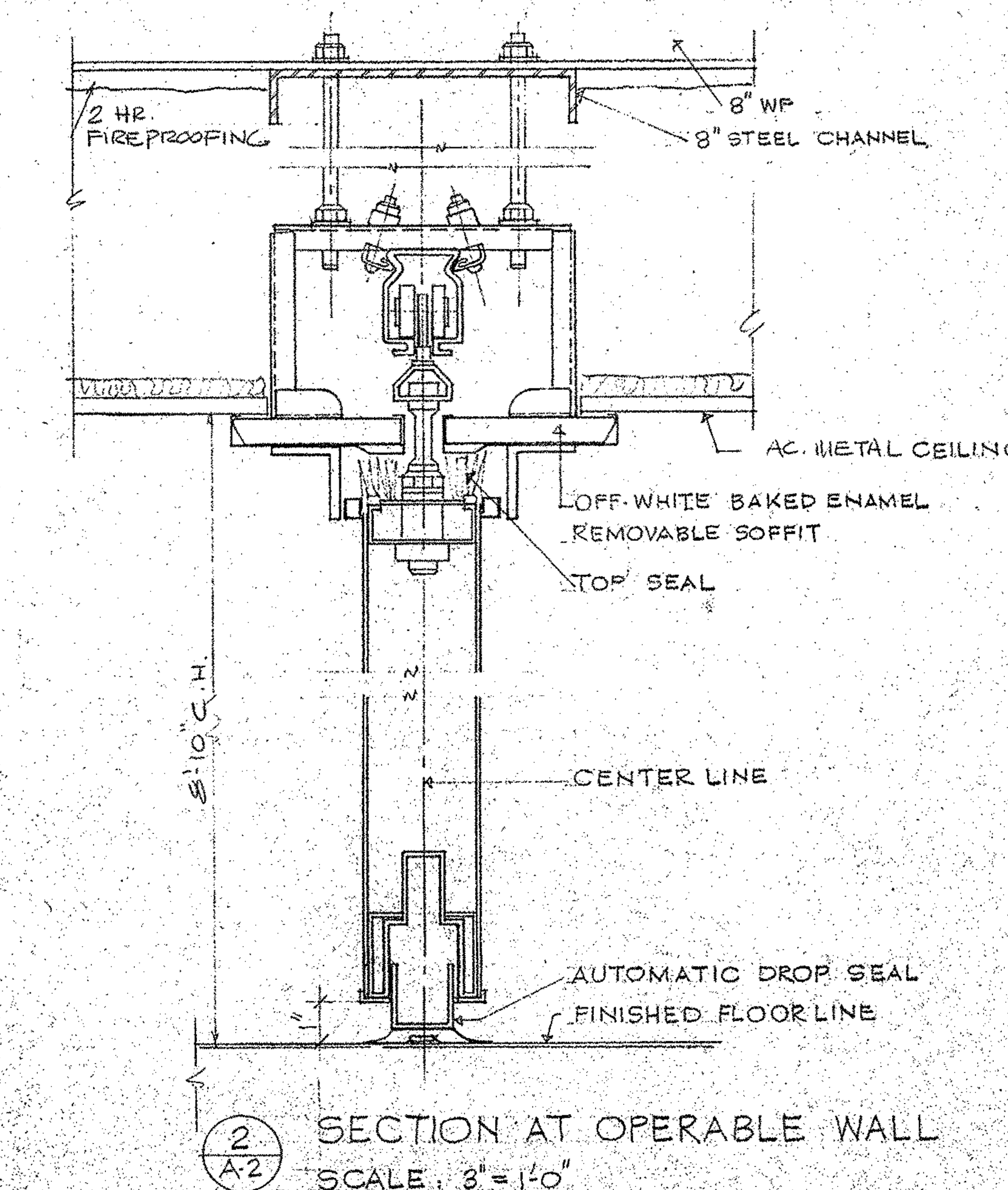
SPACE NAME	RM No.	FLOOR	BASE HGT. & MAT.	WALL	CEILING	CLNG. HGT.	REMARKS
MECH. EQUIP.	B1	CONC.	—	C.M.U.	F.P. STL		FIREPROOFING 2 HR RATED
ELEV. MACH.	B2	CONC.	—	C.M.U.	F.P. STL		DITTO
JANITOR	B3	V.A.T.	4" VINYL	VEN. PL.	STL PTD		
PASSAGEWAY	B4	V.A.T.	4" VINYL	VEN. PL.	PL.	8'-0"	
WORK ROOM	B5	V.A.T.	4" VINYL	VEN. PL.	PL.	8'-0"	CEILING 1 HR. RATED
COMMUNITY RM.	B6	V.A.T.	4" VINYL	VEN. PL.	PL. & AC.	8'-10"	FIREPROOFING 1½ HR RATED ON BEAMS
STORAGE	B7	V.A.T.	4" VINYL	VEN. PL.	PL.	8'-0"	CEILING 1 HR. RATED
COAT CLOSETS	B8	V.A.T.	4" VINYL	VEN. PL.	PL.	8'-0"	
STORAGE	B9	V.A.T.	4" VINYL	VEN. PL.	PL.	8'-0"	
KITCHEN	B10	V.A.T.	4" VINYL	VEN. PL.	PL.	8'-0"	
LOBBY	B11	V.A.T.	4" VINYL	VEN. PL.	PL.	8'-0"	
PASSAGEWAY	B12	V.A.T.	4" VINYL	VEN. PL.	PL.	8'-0"	
LOBBY	B13	V.A.T.	4" VINYL	VEN. PL.	PL.	8'-0"	
TOILET WOMEN	B14	C.T.	C.T.	C.T.	PL.	8'-0"	
TOILET MEN	B15	C.T.	C.T.	C.T.	PL.	8'-0"	
CLOSED STACKS	B16	CONC (EX)	—	MAS. (EX)	CONC (EX)	—	PAINT EXISTING CONC. & MAS. SURFACES
CLOSED STACKS	B17	CONC (EX)	—	MAS. (EX)	CONC (EX)	—	DITTO
STORAGE	B18	CONC (EX	—	MAS. (EX)	CONC (EX)	—	DITTO
STAIR #1		B.P.T.	STL & VINYL	VEN. PL.	PL.	—	
STAIR #2		V.A.T.	STL & VINYL	C.M.U.	STL	—	
STAIR #3		V.A.T.	STL & VINYL	C.M.U.	STL	—	

ALTERNATE NO. 2
ALT. NO3

DOOR SCHEDULE

DOORS						FRAMES					REMARKS
No.	TYPE	MAT.	SIZE W	SIZE H	SIZE T	TYPE	MAT.	SIZE W	SIZE H	HARDW. SET No.	
B1-1	1	WOOD	3'-0"	7'-0"	1¾"	1	H.M	3'-3"	7'-1½"	2	"B" LABEL GASKETED
B1-2	1	H.M.	3'-0"	7'-0"	1¾"	1	H.M	3'-3"	7'-1½"	2	"B" LABEL
B1-3	3	H.M.	2/2'-8"	7'-0"	1¾"	1	H.M	5'-7"	7'-1½"	3	
B2-1		WIRE MESH	3'-0"	7'-0"			-	-	-	6	
B3-1	4	WOOD	3'-0"	7'-0"	1¾"	1	H.M.	3'-3"	7'-1½"	6	2 SQ. FT. LOUVER
B5-1	3	WOOD	2/2'-8"	7'-0"	1¾"	1		5'-7"	7'-1½"	3	
B6-1	1	WOOD	3'-4"	7'-0"	1¾"	2		3'-7"	7'-1½"	4	
B6-2	1	WOOD	3'-4"	7'-0"	1¾"	2		3'-7"	7'-1½"	4	
B7-1	1	WOOD	3'-0"	7'-0"	1¾"	1		3'-3"	7'-1½"	6	
B8-(1-4)	5	WOOD	2/2'-8"	7'-0"	1¾"	1		5'-7"	7'-1½"	-	SLIDING DOORS
B9-1	3	WOOD	2/2'-8"	7'-0"	1¾"	1		5'-7"	7'-1½"	3	1" UNDERCUT-NO VISION SLIT
B9-2	1	WOOD	3'-0"	7'-0"	1¾"	1		3'-3"	7'-1½"	6	1" UNDERCUT
B10-1	1	WOOD	3'-0"	7'-0"	1¾"	1		3'-3"	7'-1½"	6	
B14-1	4	WOOD	2'-8"	7'-0"	1¾"	1		2'-11"	7'-1½"	5	3 SQ. FT. LOUVER
B15-1	4	WOOD	2'-8"	7'-0"	1¾"	1		2'-11"	7'-1½"	5	3 SQ. FT. LOUVER
B16-1	3	WOOD	2/2'-8"	7'-0"	1¾"	1		5'-7"	7'-1½"	3	
S1	1	WOOD	3'-4"	7'-0"	1¾"	2		3'-7"	7'-1½"	1	"C" LABEL
S2	2	WOOD	3'-4"	7'-0"	1¾"	1		3'-7"	7'-1½"	1	"B" LABEL
S3	2	WOOD	3'-4"	7'-0"	1¾"	1		3'-7"	7'-1½"	1	"B" LABEL





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DRAWN	BASEMENT FLOOR PLAN		
J. KHURANA	DETAILS & SCHEDULES		
CHK'D	NO.	REVISIONS	DATE
G.W.S			
DATE MARCH 1, 1977			
SCALE AS NOTED			

A2

ROOM FINISH SCHEDULE

SPACE NAME	RM No.	FLOOR	BASE HGT. & MAT.	WALL	CEILING	CLNG. HGT.	REMARKS
VESTIBULE	101	B.P.T.	ALUM.	GLASS	AC.	8'-10"	
NON-FICTION	102	CARPET	4" VINYL	VEN. PL.	AC.	8'-10"	
REFERENCE	103	CARPET	4" VINYL	VEN. PL.	PL.	8'-10"	
NON-FICTION	104	CARPET	4" VINYL	VEN. PL.	AC.	8'-10"	
READING	105	CARPET	4" VINYL	VEN. PL.	PL.	8'-10"	
RECEIVING & WORK	106	V.A.T.	4" VINYL	VEN. PL.	AC.	8'-10"	
PASSAGEWAY	107	V.A.T.	4" VINYL	VEN. PL.	AC.	8'-10"	
JANITOR	108	V.A.T.	4" VINYL	C.M.U.	PL.	8'-10"	
PASSAGEWAY	109	V.A.T.	4" VINYL	VEN. PL. (HIGH)	PL.	8'-10"	
LOBBY	110	CARPET	4" VINYL	VEN. PL.	PL.	8'-10"	
HANDI. WOMEN	111	C.T.	C.T.	C.T.	PL.	8'-0"	
HANDI. MEN	112	C.T.	C.T.	C.T.	PL.	8'-0"	
FICTION	113	CARPET	4" VINYL	VEN. PL. (EX)	AC.	8'-0"	PAINT EX. INTERIOR PL. SURFACES
BROWSING	114	CARPET	4" VINYL	VEN. PL. (EX)	AC.	8'-0"	DITTO.
WORK AREA	115	V.A.T.	4" VINYL	VEN. PL. (EX)	AC.	8'-0"	DITTO.
RARE BOOKS	116	V.A.T.	4" VINYL	PL. (EX)	PL. (EX)	(EX)	DITTO.
CHARGING DESK	117	V.A.T.	4" VINYL	PL. (EX)	AC.	8'-0"	
STAIR #1		B.R.T./CAR.	STL/CAR.	PL.	PL.	-	
STAIR #2		V.A.T.	STL/VINYL	CMU	STL	-	
STAIR #3		V.A.T.	STL/VINYL	CMU	STL	-	

DOOR SCHEDULE

DOORS No.	TYPE	MAT.	SIZE W	SIZE H	SIZE T	FRAMES TYPE	FRAMES MAT.	FRAMES SIZE W	FRAMES SIZE H	HARDW. SET No.	REMARKS
E1	—	GLASS	2'-8 1/4"	7'-0"	1/2"	—	-			7	SEE DETAILS SHEET A-8
E2	—	GLASS	3'-4"	7'-0"	1/2"	—	ALUM.	3'-7"	7'-1 1/2"	7	SEE DETAILS SHEET A-9
E3	2	H.M.	3'-4"	7'-0"	1 3/4"	1	H.M.	3'-7"	7'-1 1/2"	4	
E4	2	H.M.	3'-8"	7'-0"	1 3/4"	1	H.M.	3'-11"	7'-1 1/2"	4	FRAME, 8'-0" HIGH WITH FIXED PANEL
101-1	—	GLASS	2'-9 1/4"	7'-0"	1/2"	—	-			7	SEE DETAILS SHEET A-8
106-1	3	H.M.	2'-2 5/8"	7'-0"	1 3/4"	1	H.M.	5'-7"	7'-1 1/2"	3	DOOR E/FRAME BY DEMOUNTABLE PART. MFR.
108-1	1	WOOD	2'-8"	7'-0"	1 3/4"	1		2'-11"	7'-1 1/2"	6	2 SQ. FT. LOUVER
109-1	2	WOOD	3'-4"	7'-0"	1 3/4"	1		3'-7"	7'-1 1/2"	1	"B" LABEL
111-1	4	WOOD	2'-8"	7'-0"	1 3/4"	1		2'-11"	7'-1 1/2"	5	3 SQ. FT. LOUVER
112-1	4	WOOD	2'-8"	7'-0"	1 3/4"	1		2'-11"	7'-1 1/2"	5	3 SQ. FT. LOUVER
116-1	1	WOOD	2'-8"	7'-0"	1 3/4"	1	↓	2'-11"	7'-1 1/2"	6	
S1-1	—	GLASS	3'-4"	7'-0"	1/2"	-	-			7	SEE DETAILS SHEET A-8
S3-1	2	WOOD	3'-4"	7'-0"	1 3/4"	1	H.M.	3'-7"	7'-1 1/2"	1	"B" LABEL
S3-2	2	WOOD	3'-4"	7'-0"	1 3/4"	1	H.M.	3'-7"	7'-1 1/2"	1	"B" LABEL

2 A-3 LONG. SECTION

SCALE 1/8" = 1'-0"

312.08 HIGH EDGE OF STRUCT.
300.17 SECOND FLOOR
289.17 FIRST FLOOR
280.67 EX. BASEMENT
278.17 NEW BASEMENT

NEW INSULATION
EXT. WALLS FURRED, INSULATED AND PLASTERED
NEW B.L. IN H.M. FRAME
NEW A.C. CEILING
WORK SP.
NEW CEILING BEYOND
BROWSING
SHELVING
ALTERNATE NO. 3
CLOSED STACKS
FLASHING & MIST. COUNTER FLASHING (CONT.)
MONITOR
DEMOUNTABLE PARTITION
GLASS
CHILDREN'S RM.
REFERENCE
LOBBY
KIT.
STORAGE
1 HR. PL. CEILING
JAN.
PASS.
ELEV. MACH. ROOM
ELEV. SHAFT
MECH. EQUIP
2 HR. F.P.
PLYWOOD PANELLING
WOOD SHELVING
CONNECTOR
COOLING TOWER BY H.V.A.C.C.
R.D.
JAN.
STAIR #3
ALT. NO. 3

1 A-3 FIRST FLOOR PLAN

SCALE 1/8" = 1'-0"

PROPERTY LINE
EXISTING BLDG.
PLANTING SEE SHEET A-1
READING 105
CONVECTOR BY H.V.A.C.C.
STAIR #2 SEE SHEET A-9 & A-10 FOR DETAILS
RAMP
PASS. 109
BOOK LIFT SEE SHEET A-9
ALT. NO. 3
FICTION 113
HANDI. W. 111
HANDI. M. 112
GRAB BARS
E.W.C.
DUCT & PIPE SPACE
LOBBY 110
NEW FLOOR AT EX. STAIR OPENING
EDGE OF FLOOR ABOVE
RARE BOOKS 116
PLAQUE
EXT. WALLS FURRED, INSULATED & PLASTERED
CONVECTOR (TYP.)
ACC. PANEL (TYP. AT VALVE LOCATION)
BROWSING 114
CHARGING DESK (N.I.C.) 117
LOW PARTITIONS (N.I.C.)
ALTERNATE NO. 3
REMOVE EX. PARTITIONS
WORK AREA 115
WD. SHELVING
DISPLAY WINDOW
DEMOLISH EX. STEPS & PLATFORMS PLANTING (SEE SHEET A-1)
BI-CYCLE RACK (SEE SHEET A-1)
PROPERTY LINE
STAIR #1
BRICK PAVING TILE
DISPLAY & BULLETIN BOARD
CONVECTOR
VESTIBULE 101
BOOK DEPOSITORY
MAIN ENTRANCE
SEE SHEET A-8 FOR STAIR #1 & ENT. DET.
LANDING
NON FICTION 104
REFERENCE 103
NON FICTION 102
PLASTER CEILING
FIN TUBE RADIATION BY H.V.A.C.C.
RAMP UP
BRICK PAVING TILE
GRANITE
RAILING
NEW CONC. SIDEWALK ALONG MILL ROAD
CONVECTOR (TYP.)
SHELVING (TYP.)
FIN TUBE
RECEIVING AND WORK AREA 106
CANOPY ABOVE
8" CONC. FILLED PIPE BOLLARD (SEE SHEET A-1)
LOADING PLATFORM
DEMOUNTABLE PARTITION — GLASS 7'-1 1/2" A.F.F. TO CEILING
CARPET
PASSAGEWAY 107
E.A.T.
E.C.
STAIR #3
ELEV.
JAN. 108
MECH. SHAFT
2'-8" X 3'-0" 2 HR. RATED ACCESS PANEL 1'-6" ABOVE FINISHED FLOOR
SEE SHEET A-9 & A-10 FOR SERVICE CORE DETAILS
ACCESS PANEL (TYP. AT VALVE LOCATION)
SHELVING (TYP.)
CONC. WALK
CONC. CURB
AREAWAY
6" GRATING SECTIONS
BRICK COPING
PLANTING SEE SHEET A-1
SECOND FL. DOTTED
EL. 289.0
EL. 287.25

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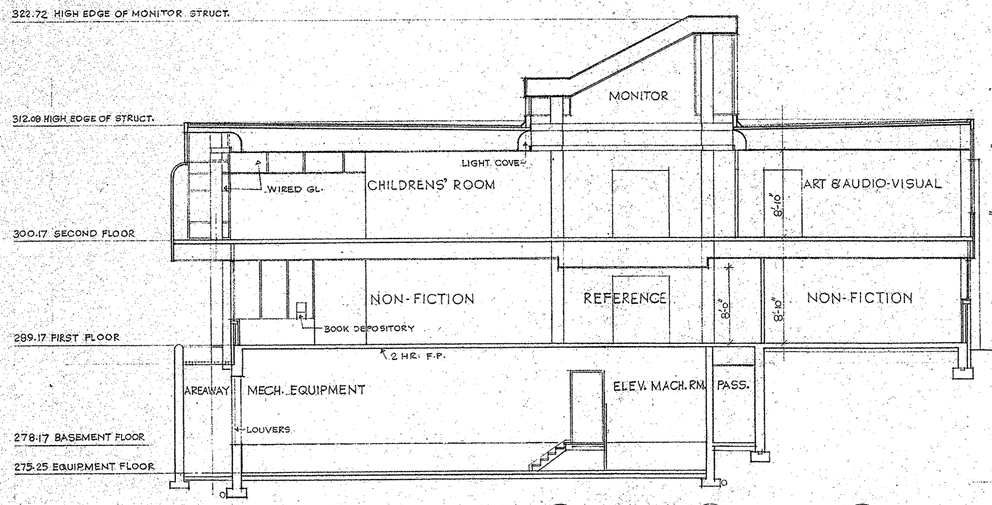
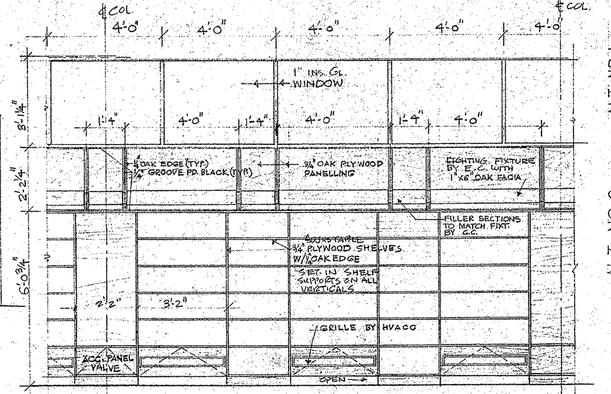
FIRST FLOOR PLAN
SECTION & SCHEDULES

NO.	REVISIONS	DATE

DRAWN J.K.H./D.R.A.
CHK'D @ W.S.
DATE MARCH 1977
SCALE 1/8" = 1'-0"

A3





8 / A-4 PART. ELEVATION (TYP. ON SOUTH WALL - 2ND FL.)
SCALE: 3/8"=1'-0"

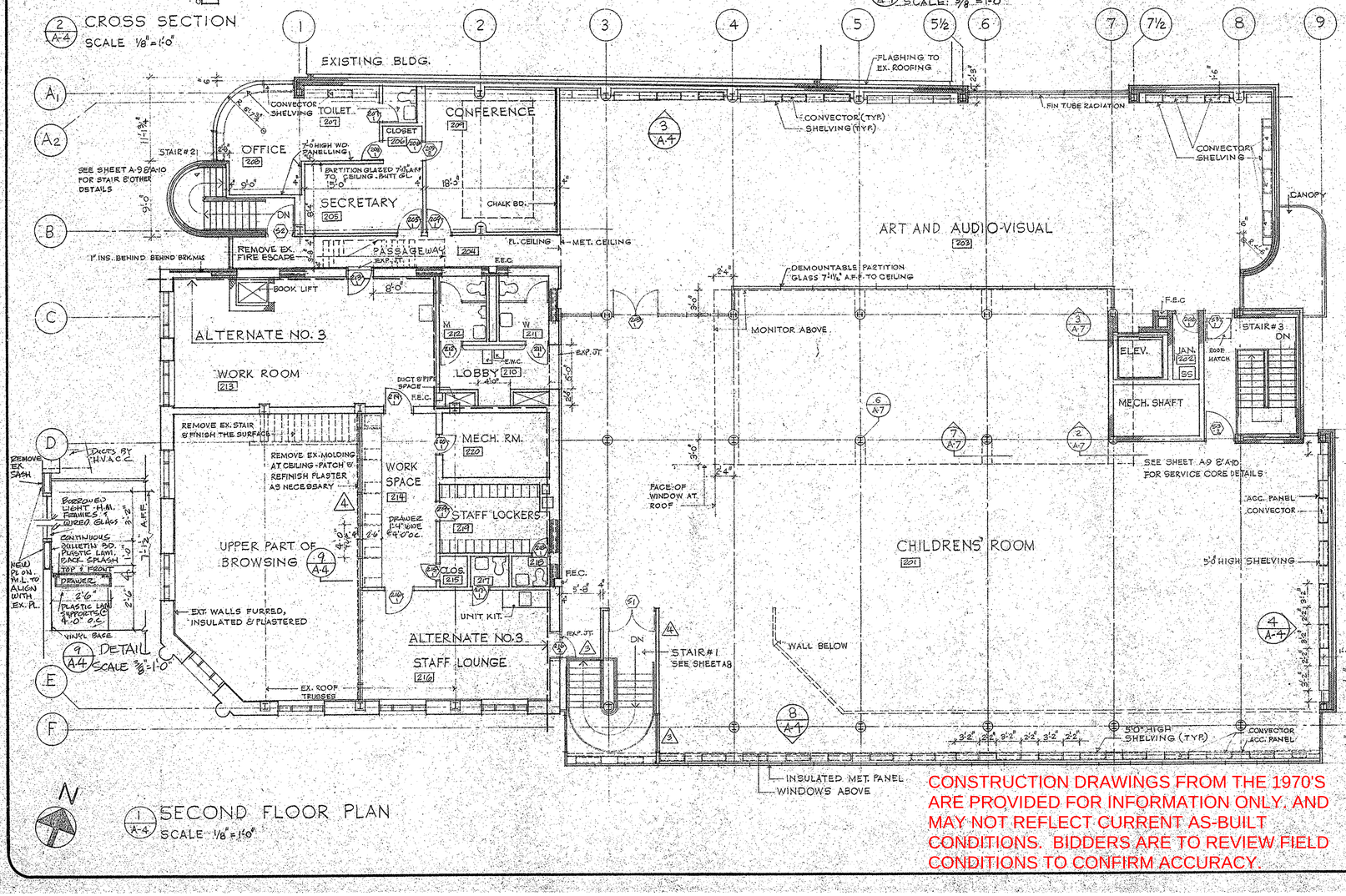
ROOM FINISH SCHEDULE

SPACE NAME	RM No.	FLOOR	BASE HGT. & MAT.	WALL	CEILING	CLNG. HGT.	REMARKS
CHILDRENS' RM.	201	CARPET	4" VINYL	VEN. PL.	AC. & PL.	8'-10"	
JANITOR	202	V.A.T.	4" VINYL	C.M.U.	PL.	7'-3"	
ART & AUDIO VIS.	203	CARPET	4" VINYL	VEN. PL.	AC.	8'-10"	
PASSAGEWAY	204	CARPET	4" VINYL	VEN. PL.	PL.	7'-9½"	
SECRETARY	205	CARPET	4" VINYL	VEN. PL.	PL.	7'-9½"	
CLOSET	206	CARPET	4" VINYL	VEN. PL.	PL.	7'-9½"	
TOILET	207	C.T.	C.T.	C.T.	PL.	7'-9½"	
OFFICE	208	CARPET	4" VINYL	VEN. PL. & PW	PL.	7'-9½"	
CONFERENCE	209	CARPET	4" VINYL	VEN. PL.	PL. LAM.	7'-9½"	
LOBBY	210	CARPET	4" VINYL	VEN. PL.	PL.	8'-0"	
TOILET WOMEN	211	C.T.	C.T.	C.T.	PL.	8'-0"	
TOILET MEN	212	C.T.	C.T.	C.T.	PL.	8'-0"	
WORK ROOM	213	V.A.T.	4" VINYL	PL. (EX)	AC.	7'-6"	
WORK SPACE	214	V.A.T.	4" VINYL	PL. (EX)	AC.	7'-6"	
CLOSET	215	V.A.T.	4" VINYL	PL. (EX)	PL. (EX)	–	PAINT. EX. INTERIOR PLAS. SURFACES.
STAFF LOUNGE	216	V.A.T.	4" VINYL	PL. (EX)	AC.	7'-6"	DITTO.
TOILET	217	(EX.)	(EX.)	(EX.)	PL. (EX.)	–	DITTO.
TOILET	218	(EX.)	(EX.)	(EX.)	PL. (EX.)	–	DITTO.
STAFF LOCKERS	219	V.A.T.	PL. (EX.)	PL. (EX.)	PL. (EX.)	–	DITTO.
MECH. RM.	220	V.A.T.	PL. (EX.)	PL. (EX.)	PL. (EX.)	–	DITTO.
STAIR # 1		CARPET	CARPET	PL.	PL.	–	
STAIR # 2		V.A.T.	STL. & VINYL	C.M.U.	PL. & CONC.		
STAIR # 3		V.A.T.	STL. & VINYL	C.M.U.	PL.		

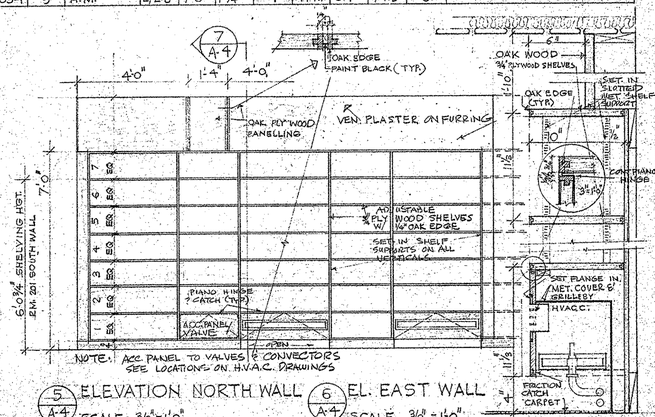
DOOR SCHEDULE

DOORS						FRAMES					
			SIZE					SIZE			
No.	TYPE	MAT.	W	H	T	TYPE	MAT.	W	H	HARDW. SET No.	REMARKS
202-1	1	WOOD	2'-8"	7'-0"	1¾"	1	H.M.	2'-11"	7'-1½"	6	
205-1	2	WOOD	3'-0"	7'-0"	1¾"	1		3'-3"	7'-1½"	2	
206-1	5	WOOD	2/2'-8"	7'-0"	1⅜"	1		2'-11"	7'-1½"	10	SLIDING DOOR
207-1	1	WOOD	2'-8"	7'-0"	1¾"	1		2'-11"	7'-1½"	9	1" UNDERCUT
208-1	1	WOOD	3'-0"	7'-0"	1¾"	1		3'-3"	7'-1½"	2	
209-1	1	WOOD	3'-0"	7'-0"	1¾"	1		3'-3"	7'-1½"	2	
209-2	1	WOOD	3'-0"	7'-0"	1¾"	1		3'-3"	7'-1½"	9	
211-1	4	WOOD	2'-8"	7'-0"	1¾"	1		2'-11"	7'-1½"	5	3 SQ. FT. LOUVER
212-1	4	WOOD	2'-8"	7'-0"	1¾"	1		2'-11"	7'-1½"	5	3 SQ. FT. LOUVER
213-1	2	WOOD	3'-0"	7'-0"	1¾"	1		3'-3"	7'-1½"	6	
214-1	2	WOOD	3'-0"	7'-0"	1¾"	1	↓	3'-3"	7'-1½"	6	
215-1		EXIST				1					
216-1	2	WOOD	3'-0"	7'-0"	1¾"	1	H.M.	3'-3"	7'-1½"	2	
216-2	1	WOOD	3'-0"	7'-0"	1¾"	1	H.M.	3'-3"	7'-1½"	2	
217-1		EXIST									1" UNDERCUT
218-1		EXIST									1" UNDERCUT
219-1		EXIST									
220-1	1	WOOD	2'-8"	7'-0"	1¾"	1	H.M.	2'-11"	7'-1½"	2	GASKETED
91	3	WOOD	2/2'-8"	7'-0"	1¾"	1	H.M.	5'-7"	7'-1½"	8	"C" LABEL
92	2	WOOD	3'-4"	7'-0"	1¾"	1	H.M.	3'-7"	7'-1½"	1	"B" LABEL
93-1	2	WOOD	3'-4"	7'-0"	1¾"	1	H.M.	3'-7"	7'-1½"	1	"B" LABEL
93-2	2	WOOD	3'-4"	7'-0"	1¾"	1	H.M.	3'-7"	7'-1½"	1	"B" LABEL
203-1	3	H.M.	2/2'-8"	7'-0"	1¾"	1	H.M.	5'-7"	7'-1½"	8	DOOR & FRAME BY DEMOUNTABLE PART. MFR.

2 / A-4 CROSS SECTION
SCALE 1/8"=1'-0"

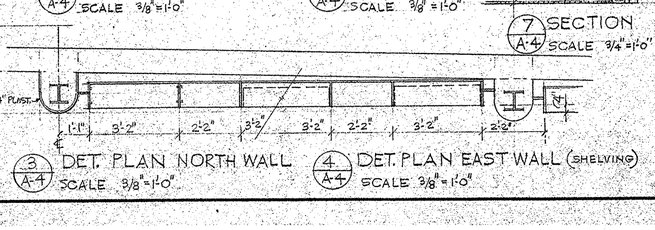


1 / A-4 SECOND FLOOR PLAN
SCALE 1/8"=1'-0"



5 / A-4 ELEVATION NORTH WALL
SCALE 3/8"=1'-0"

6 / A-4 EL. EAST WALL
SCALE 3/8"=1'-0"



7 / A-4 SECTION
SCALE 3/4"=1'-0"

3 / A-4 DET. PLAN NORTH WALL
SCALE 3/8"=1'-0"

4 / A-4 DET. PLAN EAST WALL (SHELVING)
SCALE 3/8"=1'-0"

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SECOND FLOOR PLAN
SECTION & SCHEDULE

NO.	REVISIONS	DATE

DRAWN J.K.H.U.R.A.N.A.
CHK'D G.W.S.
DATE MARCH 1, 1977
SCALE AS NOTED

A4

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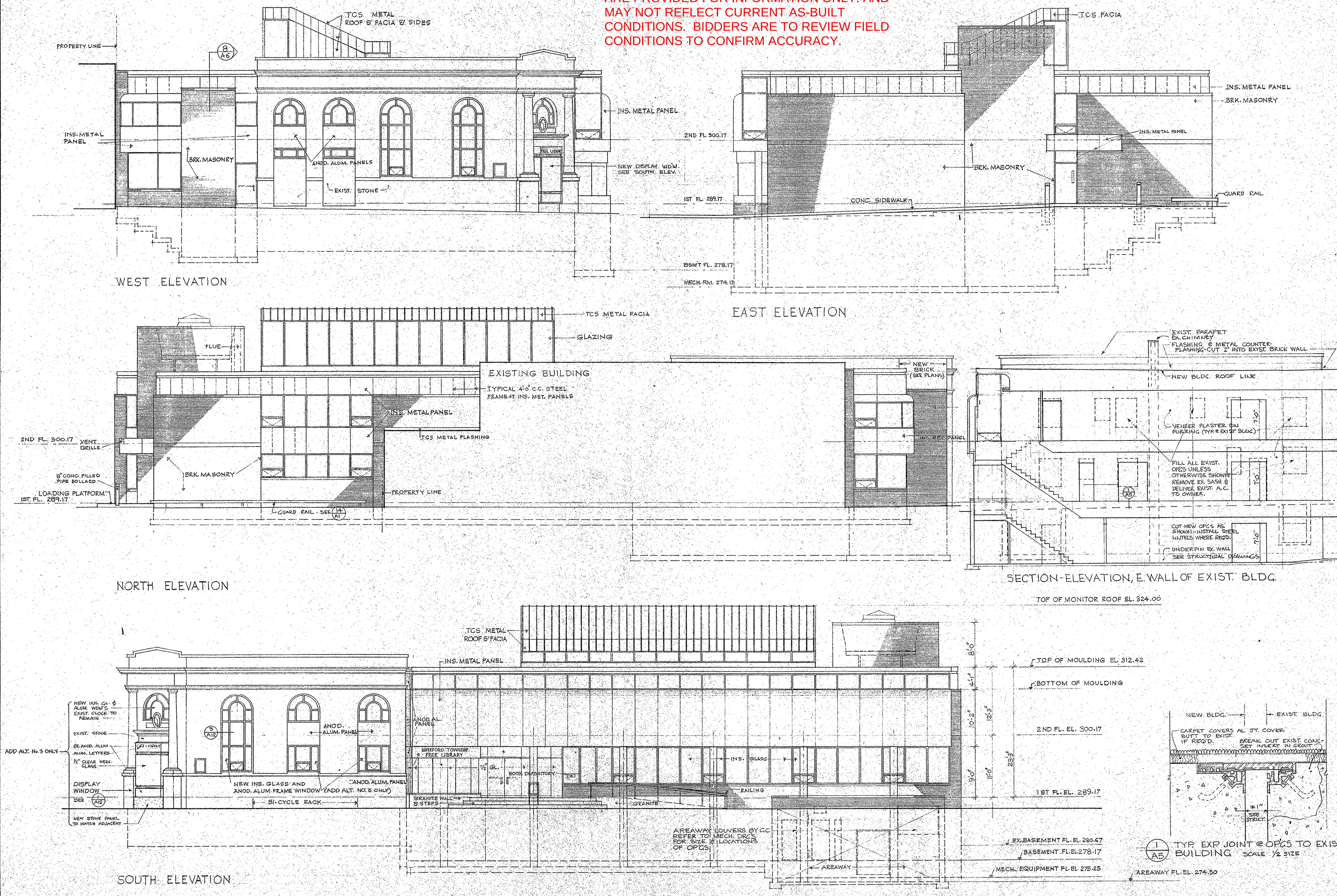

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HAVERTOWN PA

ELEVATIONS

NO.	REVISIONS	DATE

DRAWN J. KHURANA
CHK'D G.W.S.
DATE MAR. 1, 1977
SCALE 1/8"=1'0"

A5

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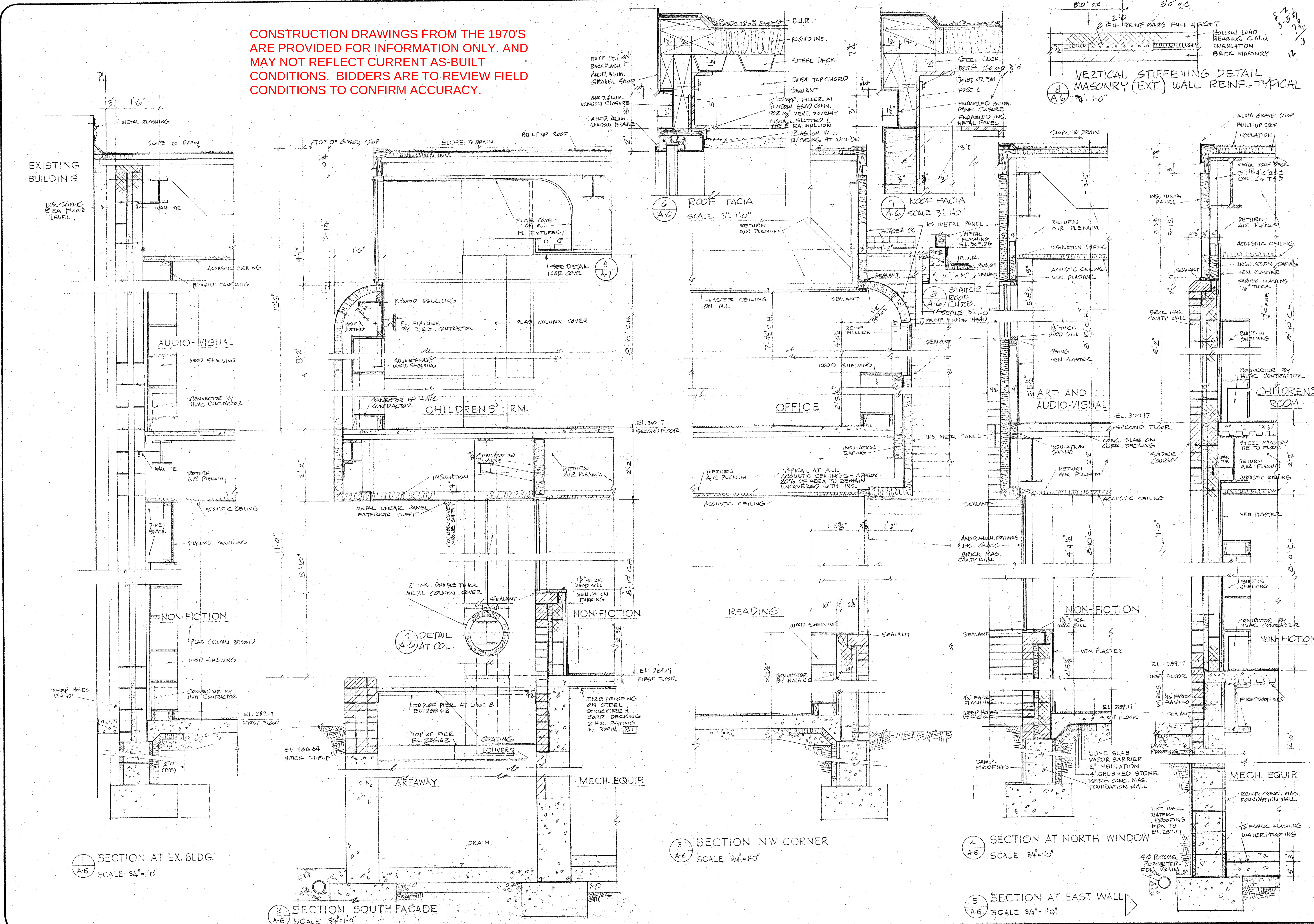

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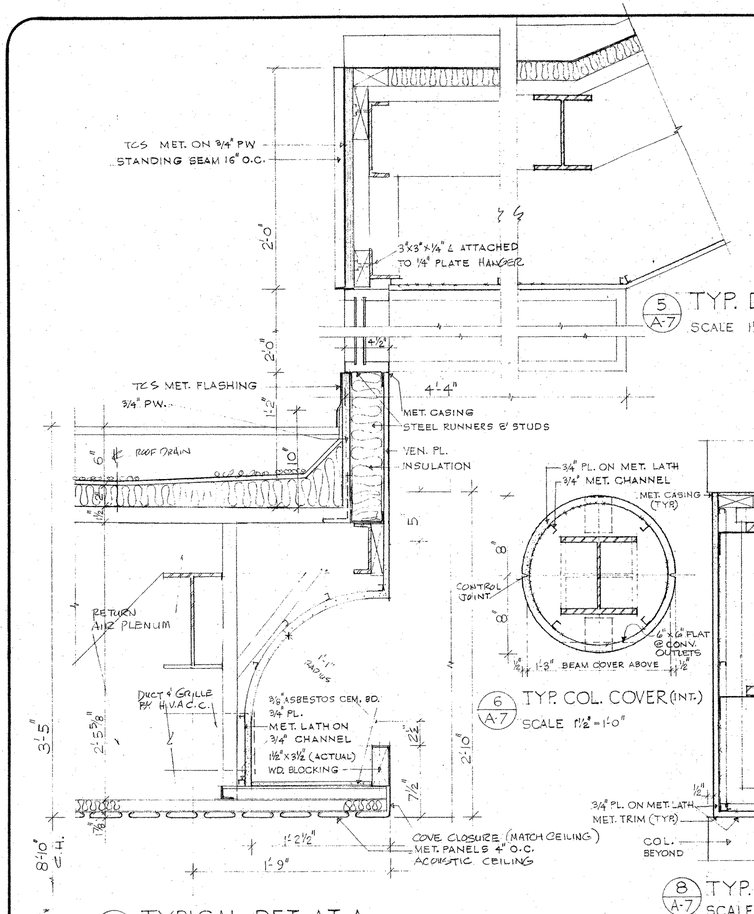
WALL SECTIONS

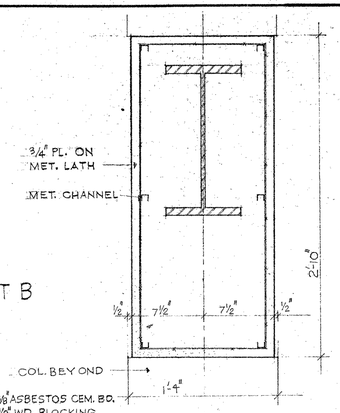
NO.	REVISIONS	DATE

DRAWN J.KHURANA
CHK'D GWS
DATE MARCH 1977
SCALE AS NOTED

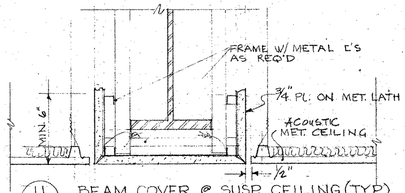
A6



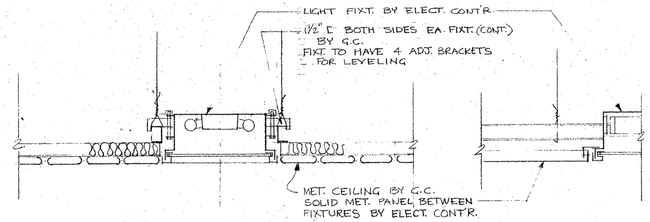
5 A-7 TYP. DET. AT B
SCALE 1 1/2"=1'-0"



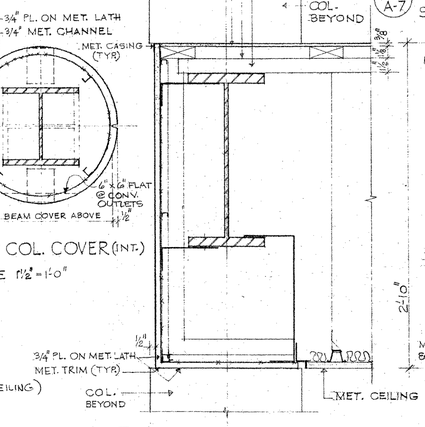
7 A-7 TYP. BEAM COVER
SCALE 1 1/2"=1'-0"



11 A7 BEAM COVER @ SUSP. CEILING (TYP.)
SCALE 1 1/2"=1'-0"

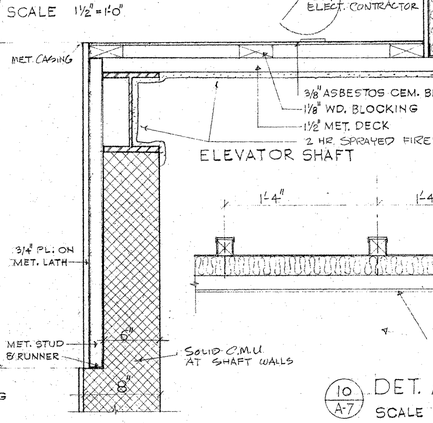


12 A7 CEILING DETAIL @ LIGHT FIXTURE (TYP.)
SCALE 1 1/2"=1'-0"



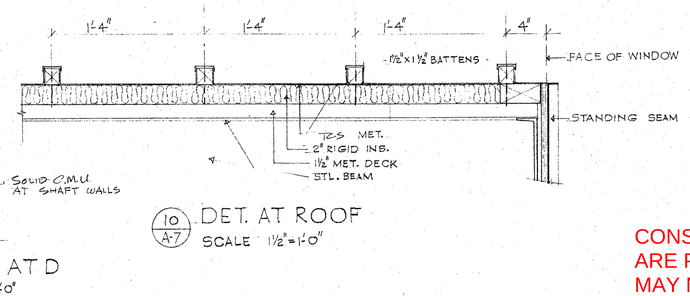
6 A-7 TYP. COL. COVER (INT.)
SCALE 1 1/2"=1'-0"

8 A-7 TYP. DET. AT C
SCALE 1 1/2"=1'-0"

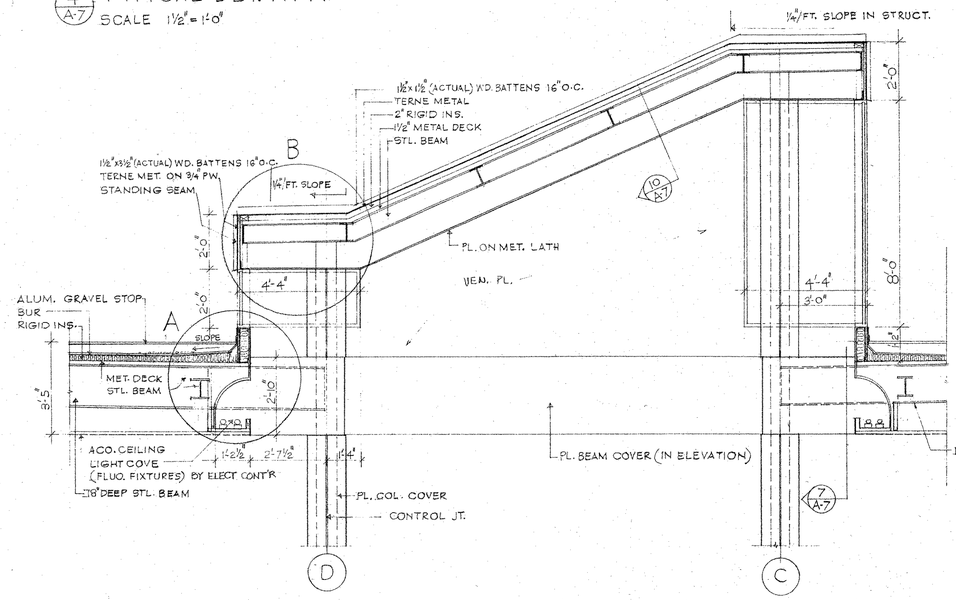


9 A-7 TYP. DET. AT D
SCALE 1 1/2"=1'-0"

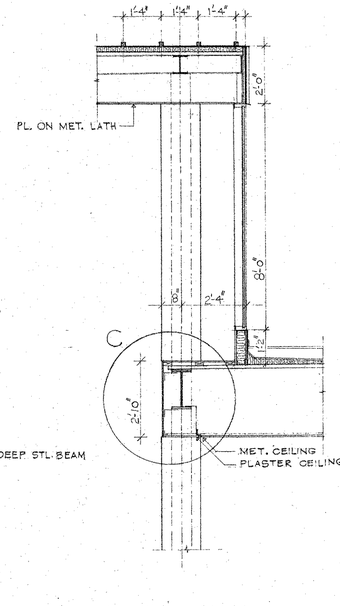
10 A-7 DET. AT ROOF
SCALE 1 1/2"=1'-0"



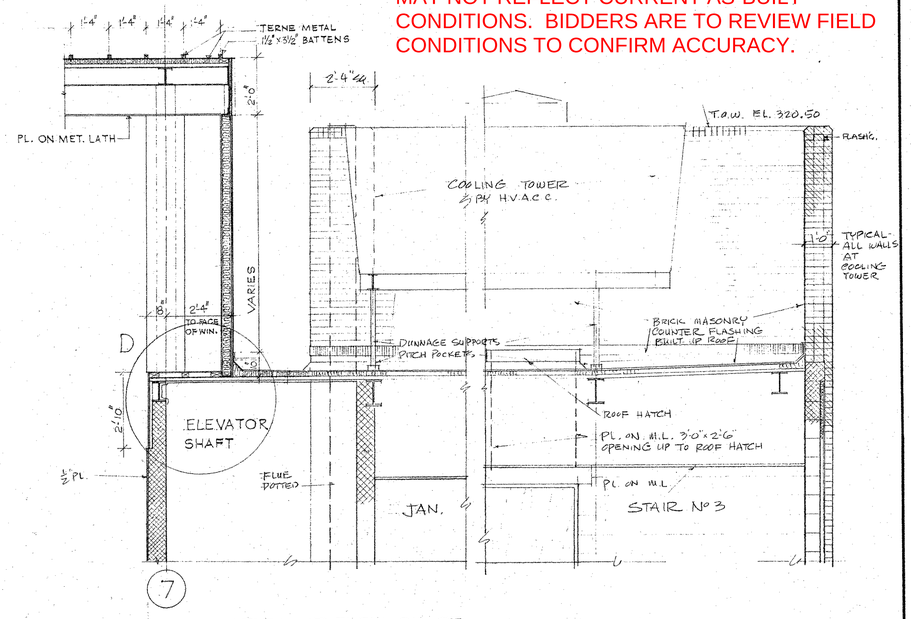
4 A-7 TYPICAL DET. AT A
SCALE 1 1/2"=1'-0"



1 A-7 CROSS SECTION OF MONITOR (LOOKING WEST)
SCALE 3/8"=1'-0"



2 A-7 END SECTION AT WINDOW (TYP.)
SCALE 3/8"=1'-0"



3 A-7 END SECTION AT ELEV. SHAFT
SCALE 3/8"=1'-0"

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MONITOR DETAILS

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CHK'D G.W.S.
DATE MAR. 1, 1977
SCALE AS NOTED

A7

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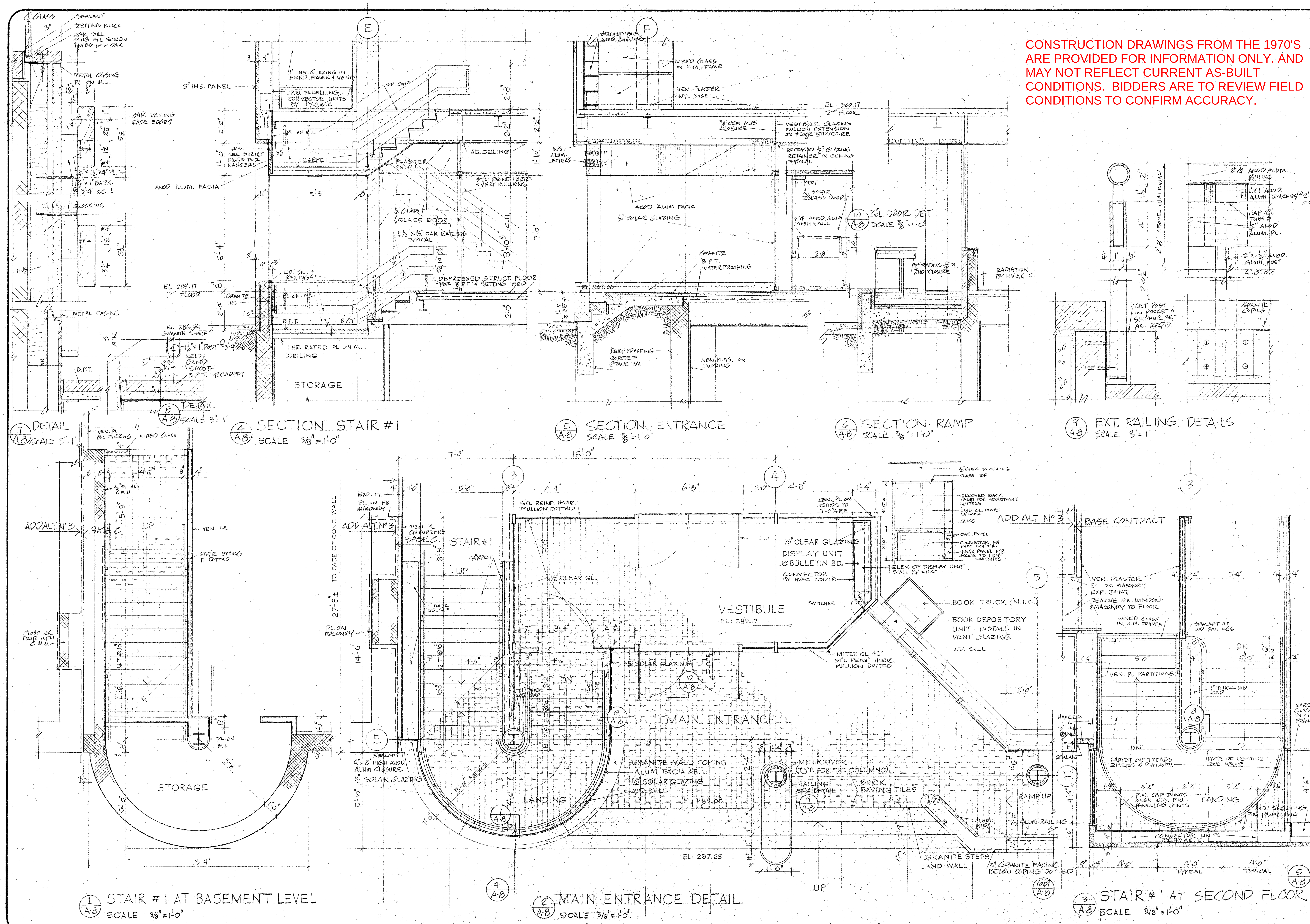

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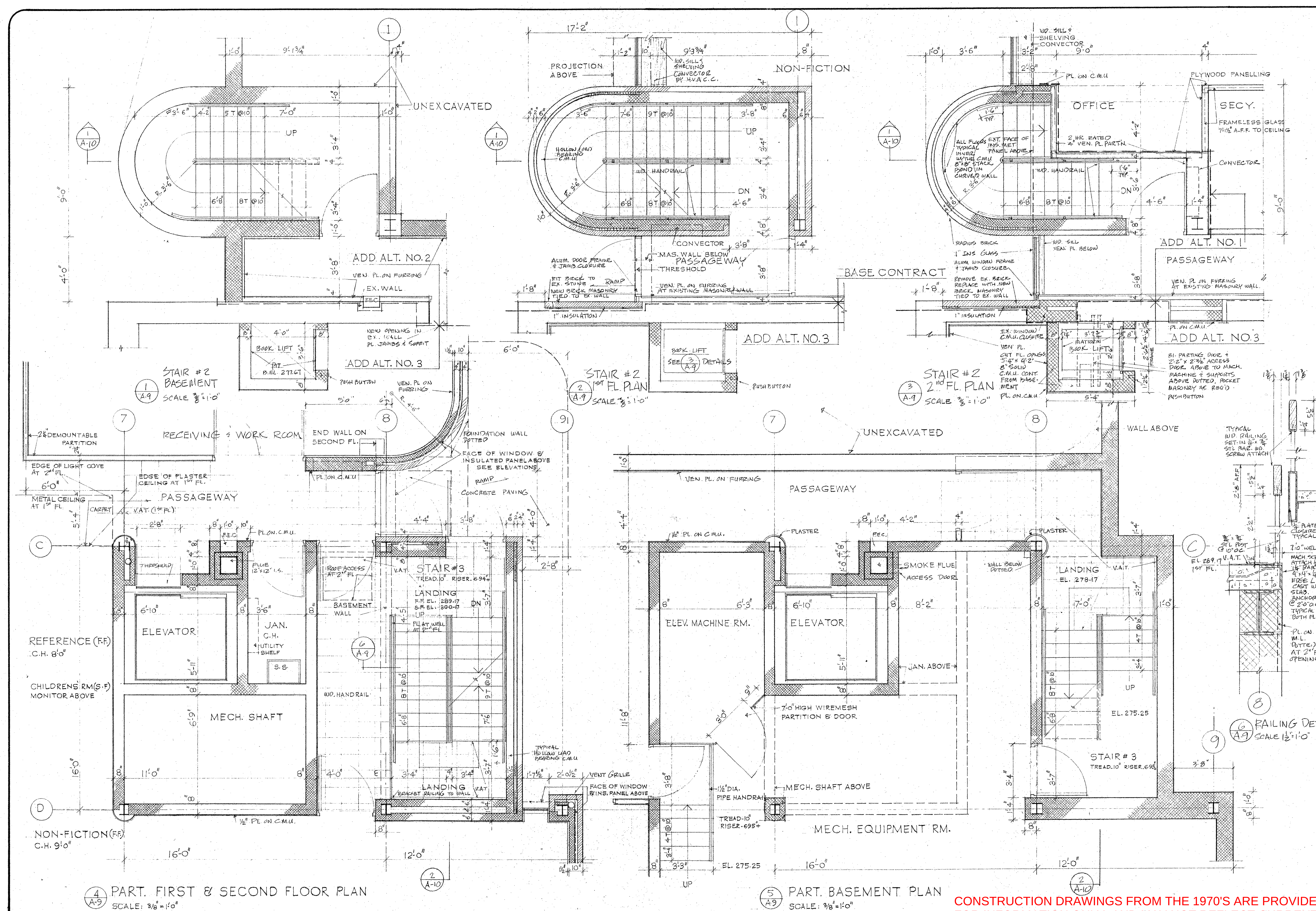
MAIN ENTRANCE DETAILS AND STAIR #1

NO.	REVISIONS	DATE

DRAWN J. KHURANA
CHK'D G W S
DATE MAR 1, 1977
SCALE 3/8" = 1'-0"

A8



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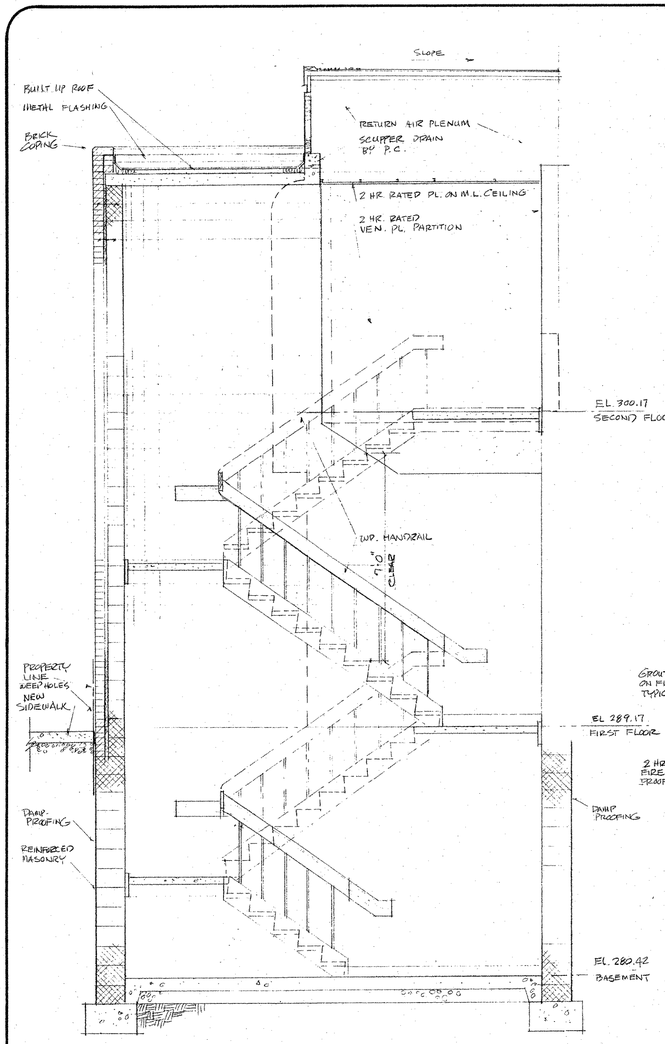
DETAIL OF STAIR # 2 AND 3 AND SERVICE CORE DETAILS

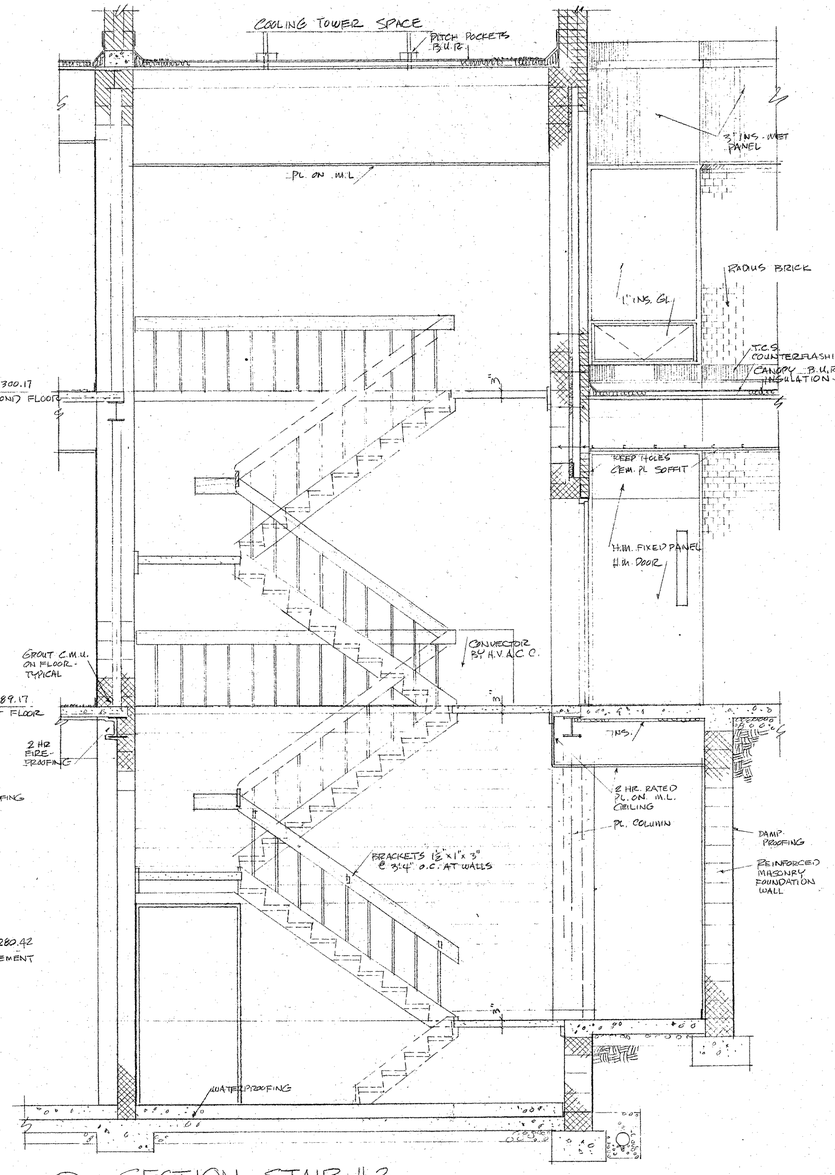
NO.	REVISIONS	DATE

DRAWN J. KHURANA
CHK'D GWS
DATE MAR. 1977
SCALE AS NOTED

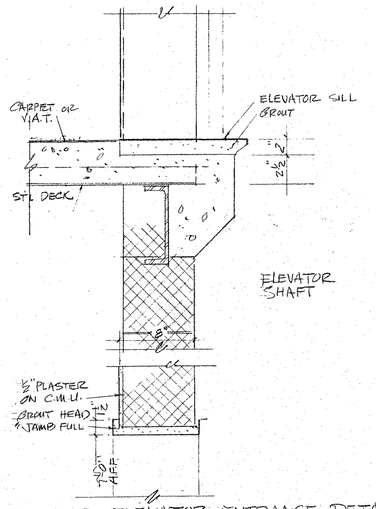
A9



1 / A-10 SECTION - STAIR # 2
SCALE 3/8" = 1'-0"



2 / A-10 SECTION - STAIR # 3
SCALE 3/8" = 1'-0"



4 / A-10 ELEVATOR ENTRANCE DETAILS
SCALE 1 1/2" = 1'-0"

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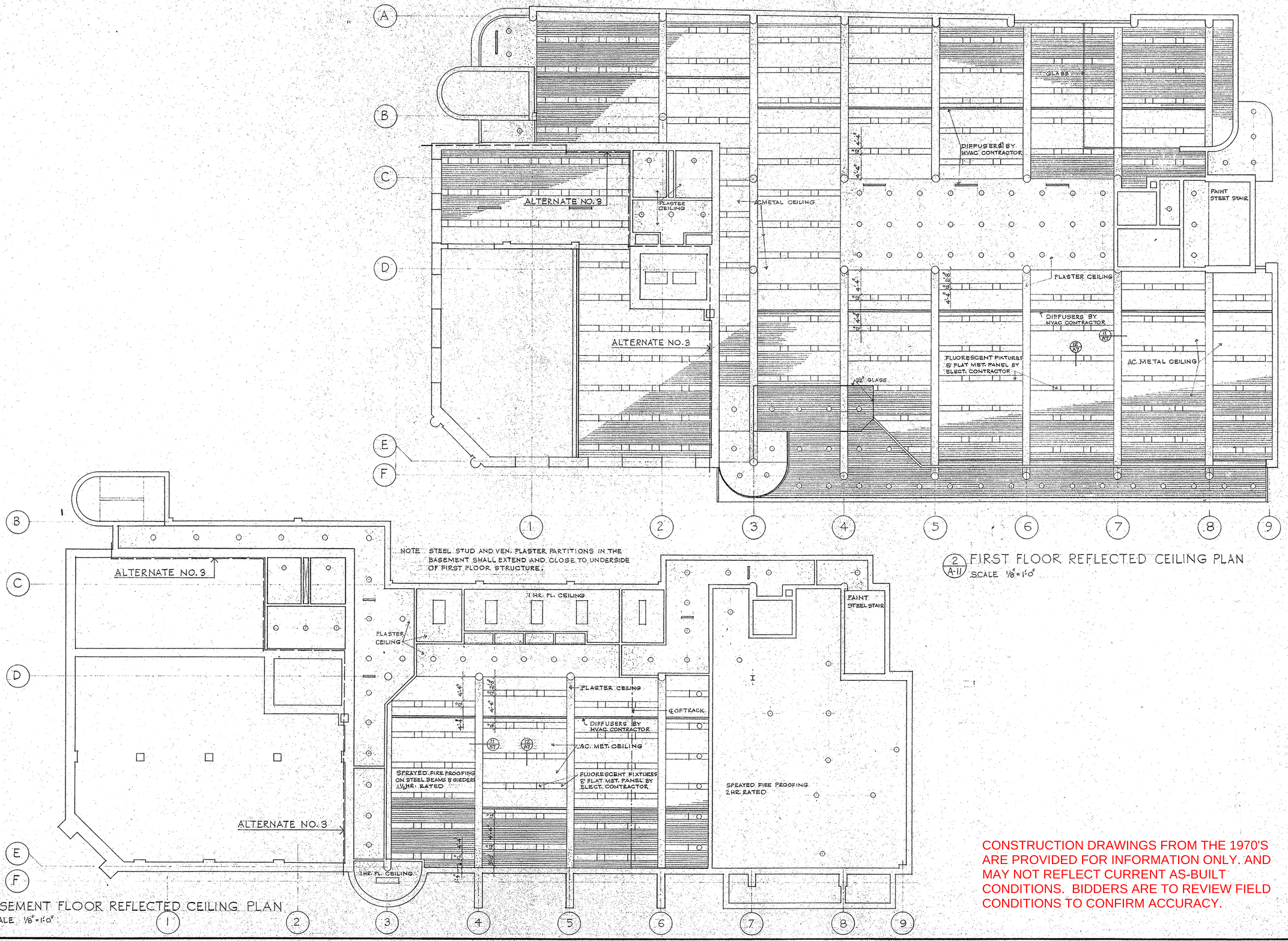
STAIR #2 & 3
SECTIONS AND DETAILS

NO.	REVISIONS	DATE

DRAWN G.W.S
CHK'D G.W.S
DATE MARCH 1, 1977
SCALE AS NOTED

A10



2 A-11 FIRST FLOOR REFLECTED CEILING PLAN
SCALE 1/8" = 1'-0"

1 A-11 BASEMENT FLOOR REFLECTED CEILING PLAN
SCALE 1/8" = 1'-0"

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REGISTERED ARCHITECT GEORGE WM. SMITH EX 3302

REGISTERED ARCHITECT CLINTON L. JOHNSON JR.

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REFLECTED CEILING PLANS

NO.	REVISIONS	DATE

DRAWN J.K.MURANA
CHK'D G.W.S.
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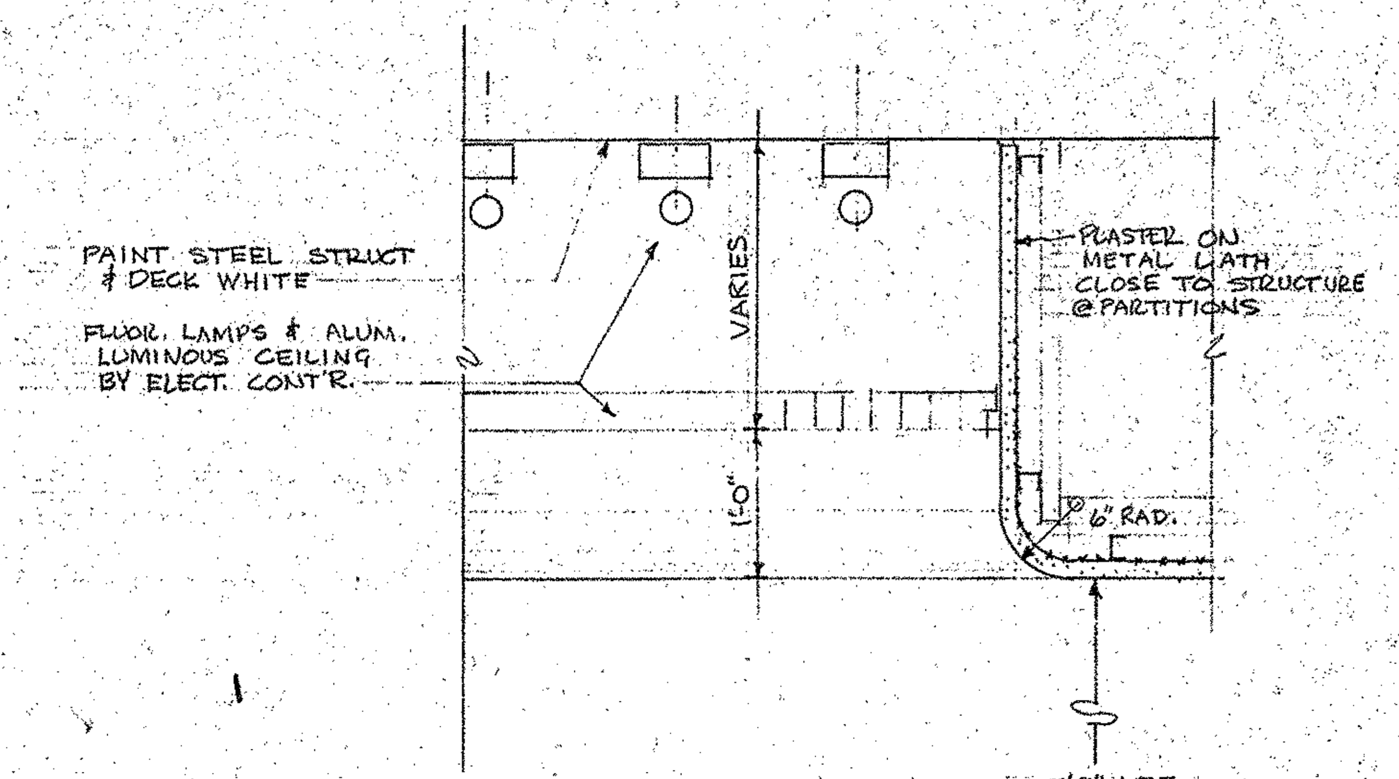
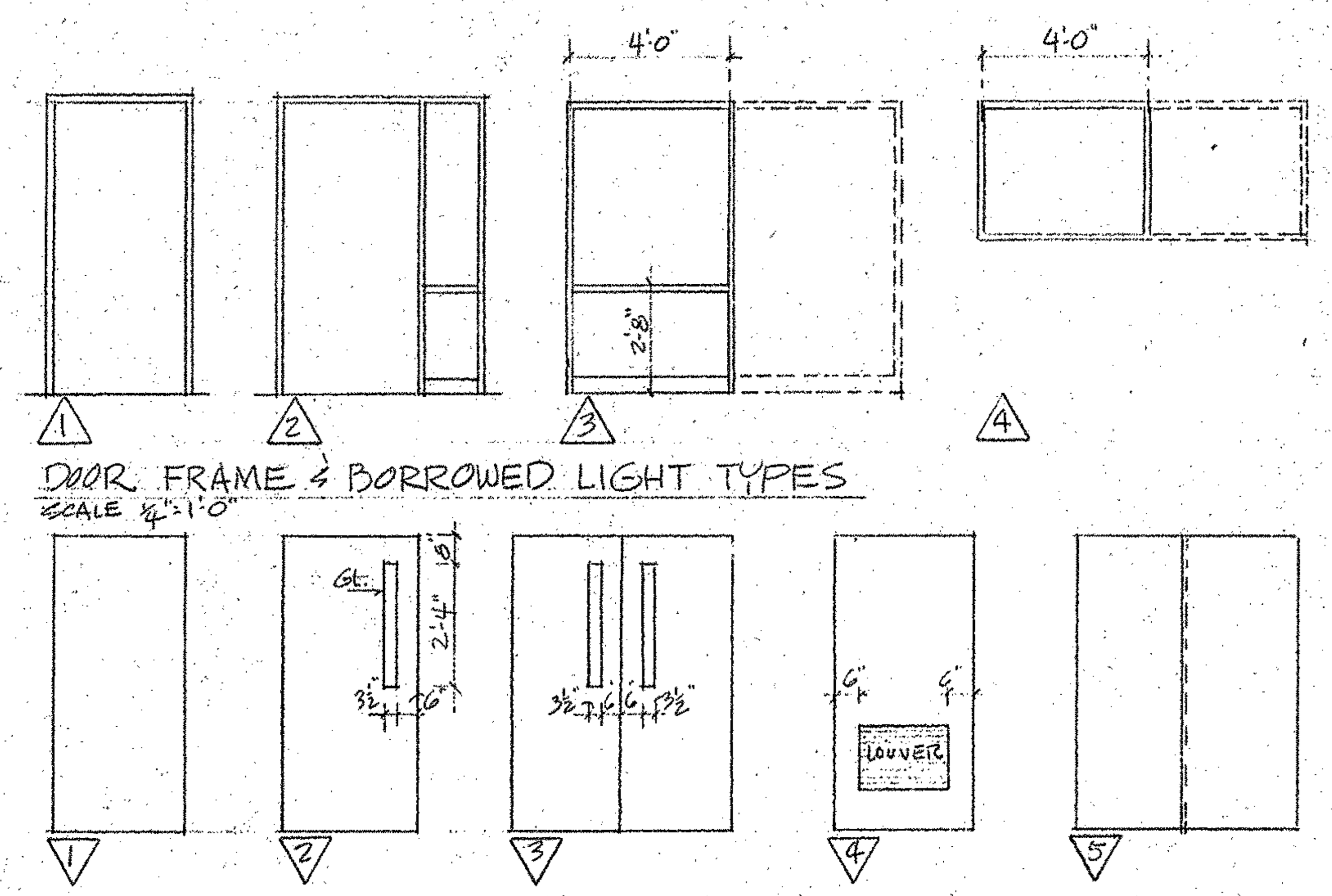
SCALE AS NOTED

A-11

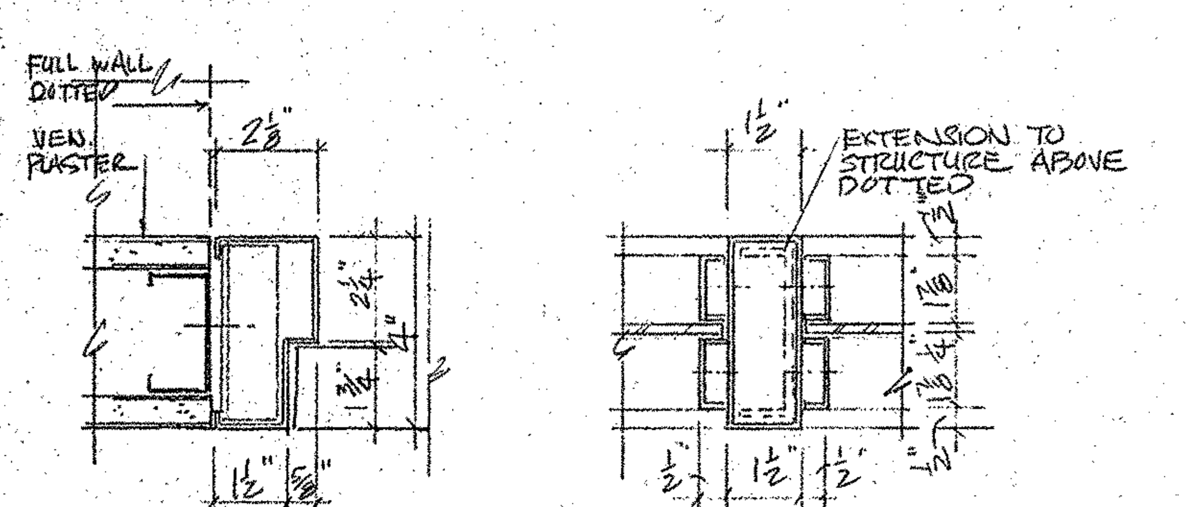


4/A12 CEILING DETAILS @ CONF. RM. (TYPICAL ALL SIDES)
SCALE 3/4" = 1'-0"



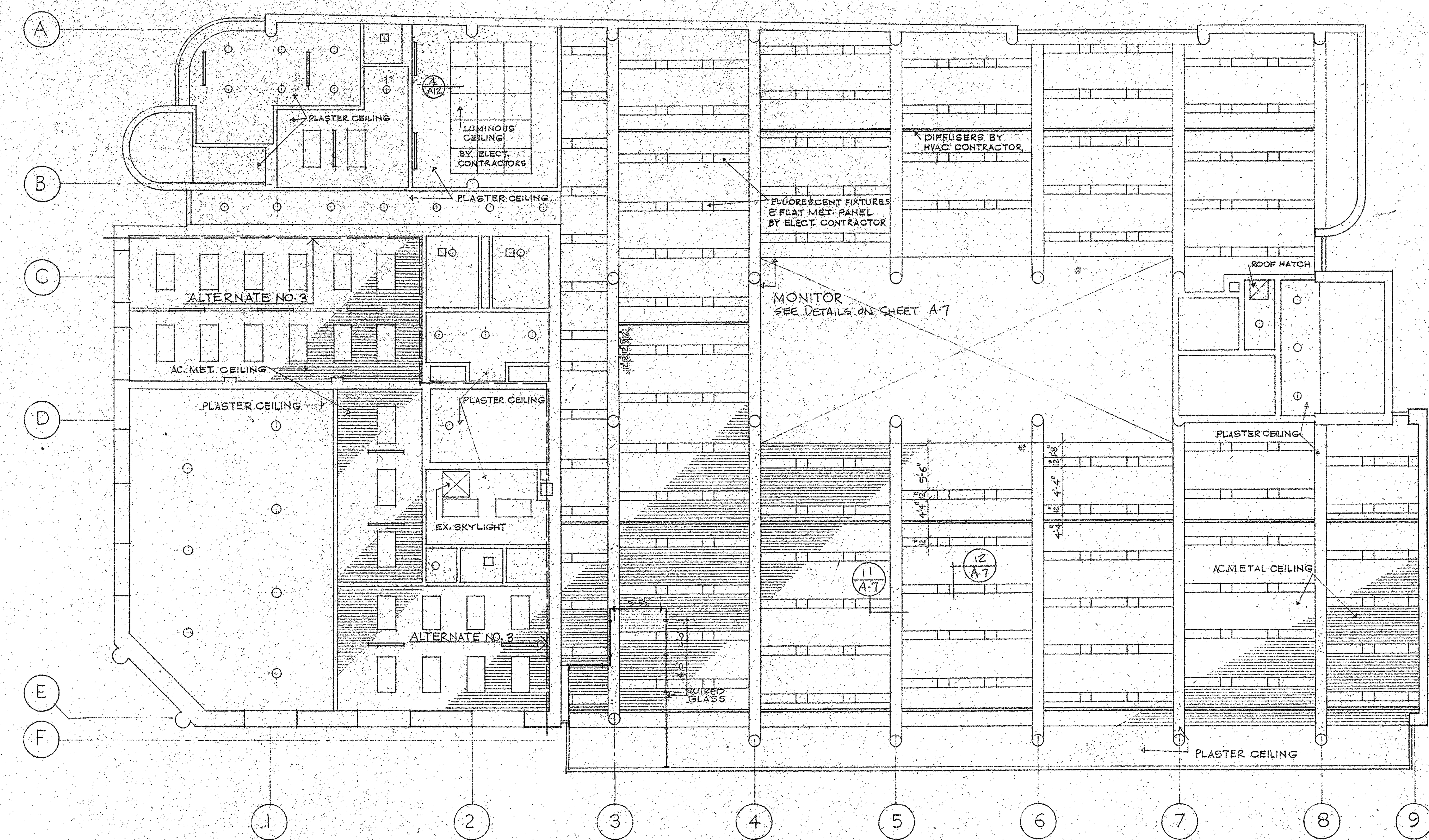
DOOR FRAME & BORROWED LIGHT TYPES
SCALE 1/4" = 1'-0"

DOOR TYPES
SCALE 1/4" = 1'-0"

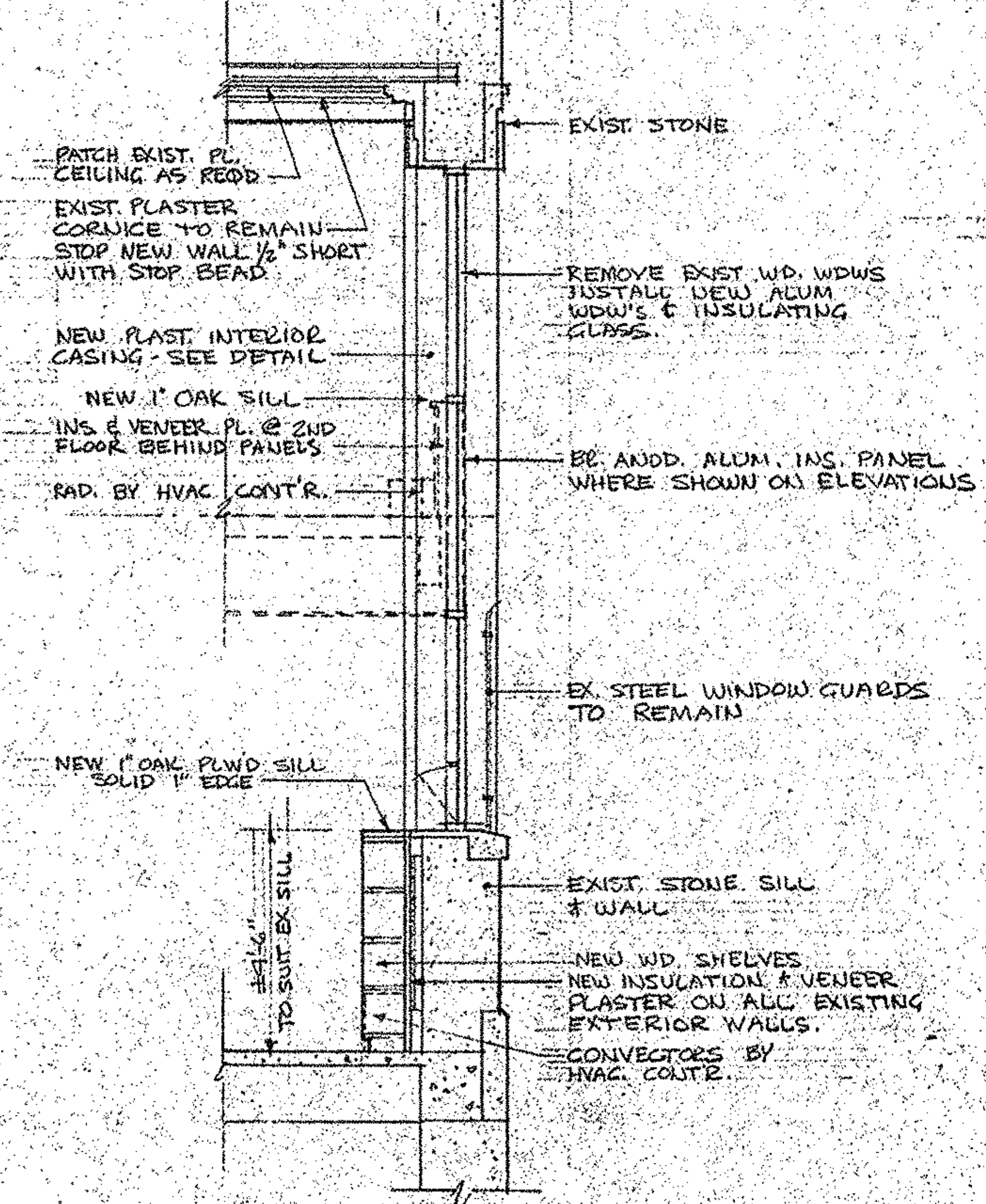


TYPICAL DOOR BUCK
SCALE 3" = 1'-0"

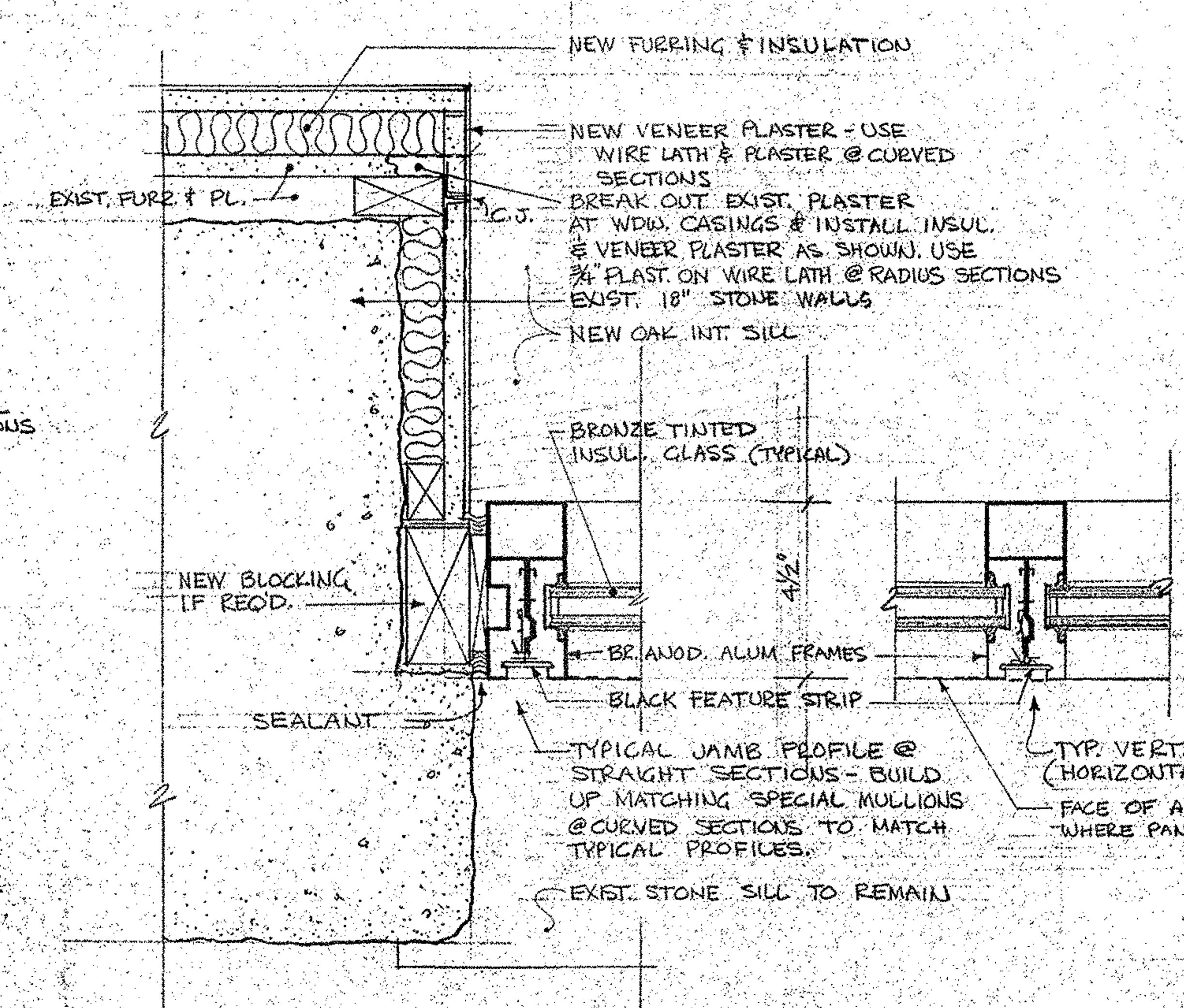
TYPICAL B.L. MULLION



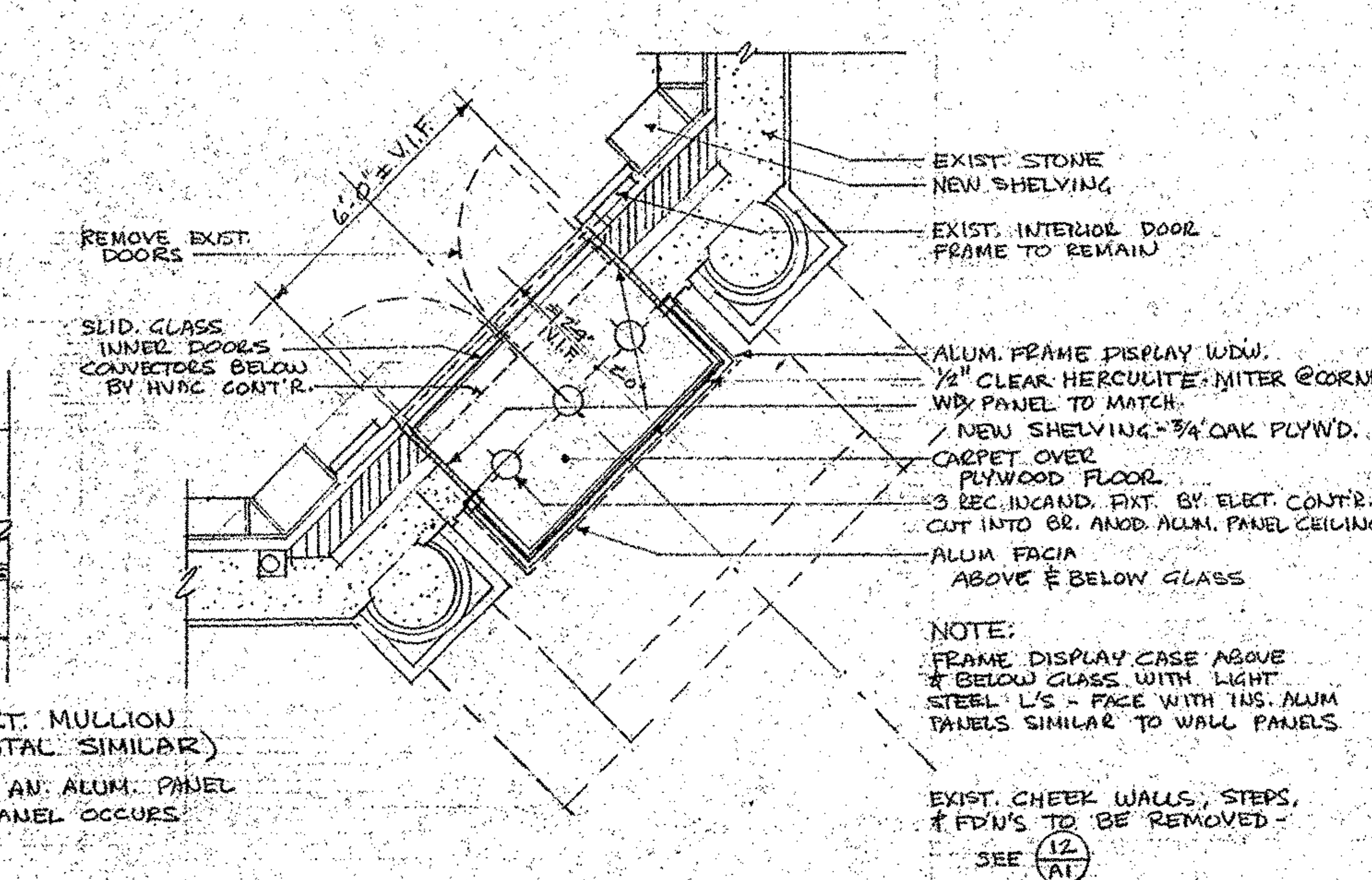
1/A12 SECOND FLOOR REFLECTED CEILING PLAN
SCALE 1/8" = 1'-0"



2/A12 WALL SECTION @ EXIST. BLDG.
1/4" = 1'-0" (ADD. ALT. NO. 3 ONLY)



3/A12 TYPICAL JAMB @ EXIST. BLDG. (HEAD SIMILAR)
SCALE 3" = 1'-0" (ADD. ALT. NO. 3 ONLY)



1/A12 DISPLAY CASE DETAILS
SCALE 1/4" = 1'-0" (ADD. ALT. NO. 3 ONLY)

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A12

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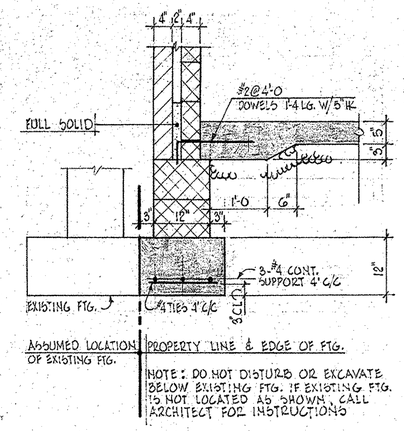
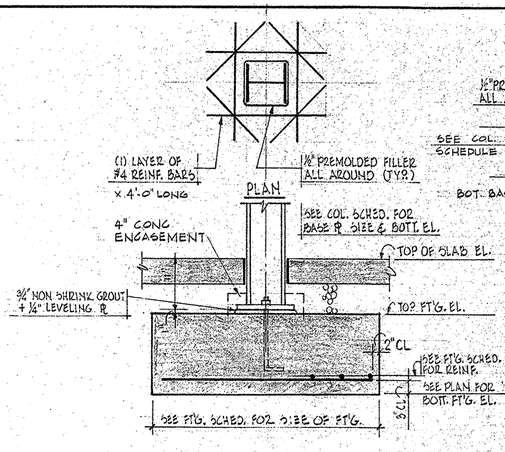
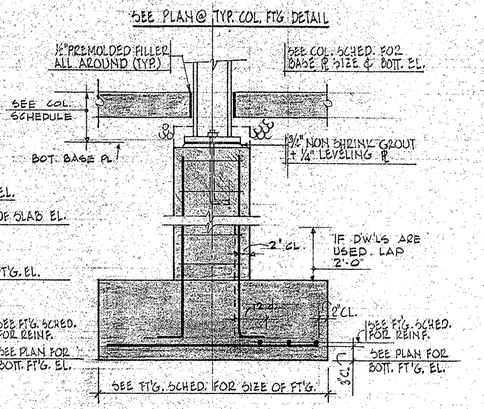


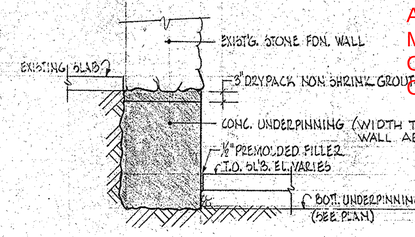
SECTION 1/5-1
SCALE: 3/4"=1'-0



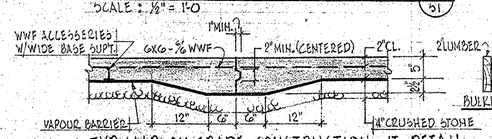
TYPICAL COLUMN FTG. DETAIL
SCALE: 3/4" = 1'-0



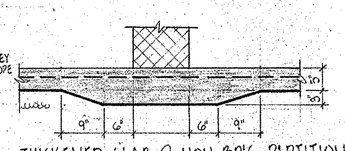
TYPICAL COLUMN PIER DETAIL
SCALE: 3/4" = 1'-0



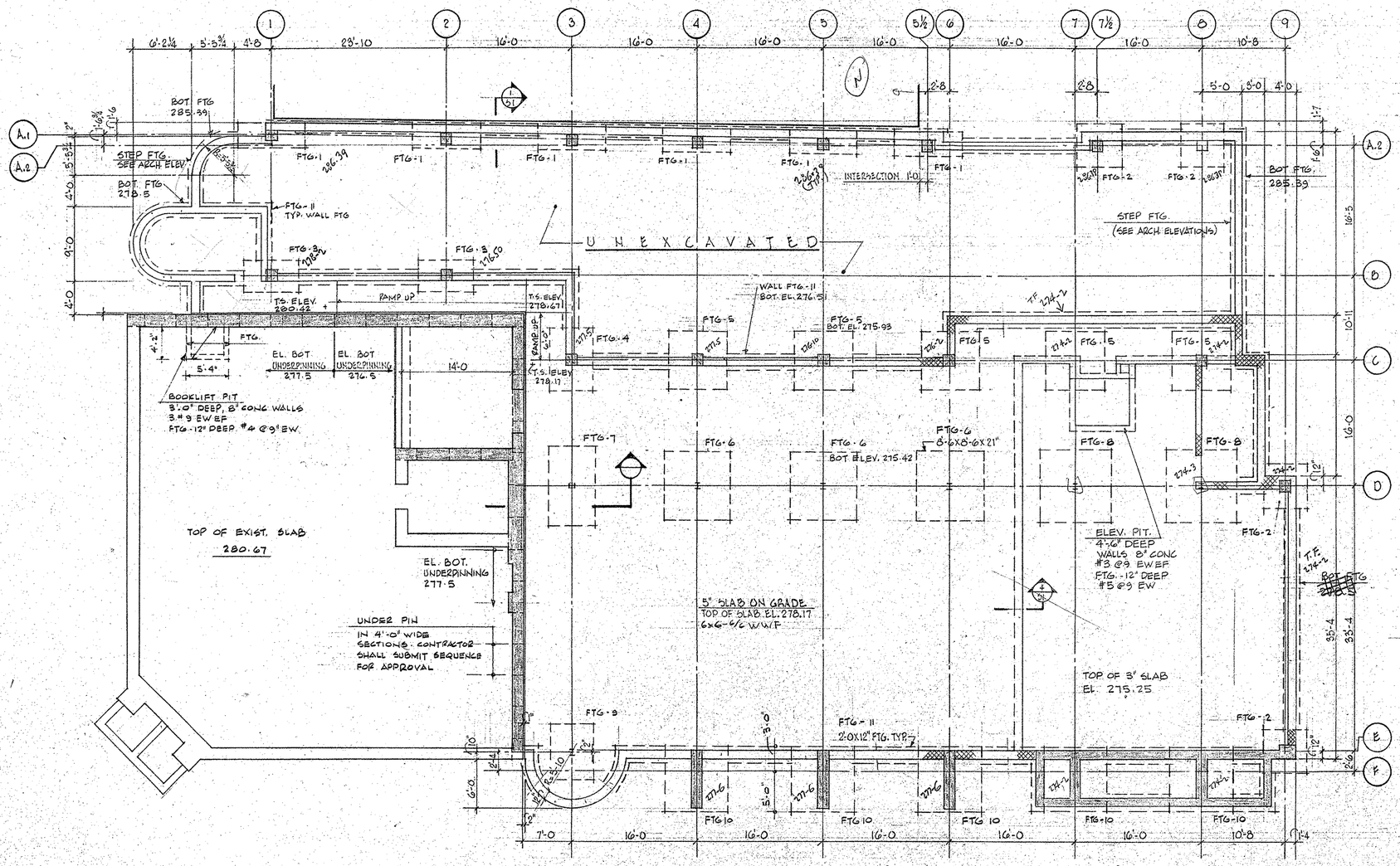
SECTION @ UNDERPINNING (TYPICAL) 2/31
SCALE: 1/2" = 1'-0

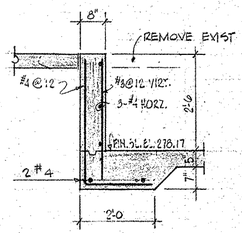


TYP. SLAB ON GRADE CONSTRUCTION JT. DETAIL
SCALE: 3/4" = 1'-0

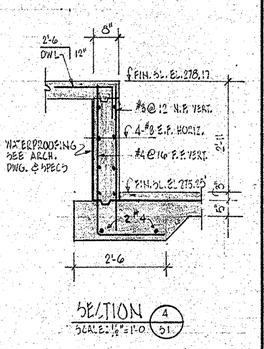


THICKENED SLAB @ NON-BR'G. PARTITIONS
SCALE: 3/4" = 1'-0
NOTE: IF CONSTRUCTION JT. OCCURS UNDER PARTITION PROVIDE KEY & #4 DOWELS X 18" LG 2'-0 C/C





SECTION 3/31
SCALE: 1½"=1'-0



SECTION 4/31
SCALE: 1½"=1'-0

FOOTING SCHEDULE

MARK	SIZE L	SIZE W	SIZE D	REINFORCEMENT L.B.	REINFORCEMENT S.B.	REINFORCEMENT E.W.	REINFORCEMENT CONT.	DOWELS
FTG 1	8'-8"	3'-0"	16	5-#6	8 #6			4 - #6
2	5'-6"	5'-6"	14			6 #6		4 - #6
3	7'-0"	4'-0"	14	5 #6	6 #6			4 - #7
4	8'-0"	5'-6"	19			9 #7		
5	7'-6"	7'-6"	19			9 #7		
6	8'-6"	8'-6"	21			12 #7		
7	10'-0"	6'-0"	24	15 #9	12 #9			
8	9'-0"	9'-0"	24			9 #9		
9	7'-0"	5'-6"	16	9 #7	9 #7			
10	8'-0"	8'-0"	20			10 #7		
11	CONT.	2'-0"	12"		#4@48"	3 #4		(TYP. WALL FTG)

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LAWRENCE & KATAJA, P.E. STRUCTURAL ENGINEER

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NO.	REVISIONS	DATE

DRAWN
CHK'D
DATE MAR. 1977
SCALE 1/8"=1'-0"

FOUNDATION PLAN

S-1
S1


SECTION 1 SCALE: 3/8"=1'-0" S2
SECTION 2 SCALE: 3/8"=1'-0" S2
SECTION 3 SCALE: 3/8"=1'-0" S2
SECTION 4 SCALE: 3/8"=1'-0" S2
SECTION @ AREAWAY 5 S2
5" SLAB ON GRADE W/ (1) LAYER 6X6-9/6 W.W.F.
T.O.S. EL. 289.17'
NOTE: WWF TO BE DELIVERED TO JOB IN FLAT SHEETS TYP. SLAB ON GRADE & SLAB ON ST'L DECK
FIRST FLOOR FRAMING PLAN SCALE: 1/8"=1'-0"
TOP OF SLAB EL. 289.17
TOP OF STEEL (-4 1/2) U.S.O.
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PENNELL AND WILTBERGER CONSULTING MECHANICAL ENGINEERS
LAWRENCE ARATA, JR. STRUCTURAL ENGINEER
NO. REVISIONS DATE
DRAWN
CHK'D
DATE MAR. 1, 1977
SCALE 1/8"=1'-0"
FIRST FLOOR FRAMING PLAN
S2

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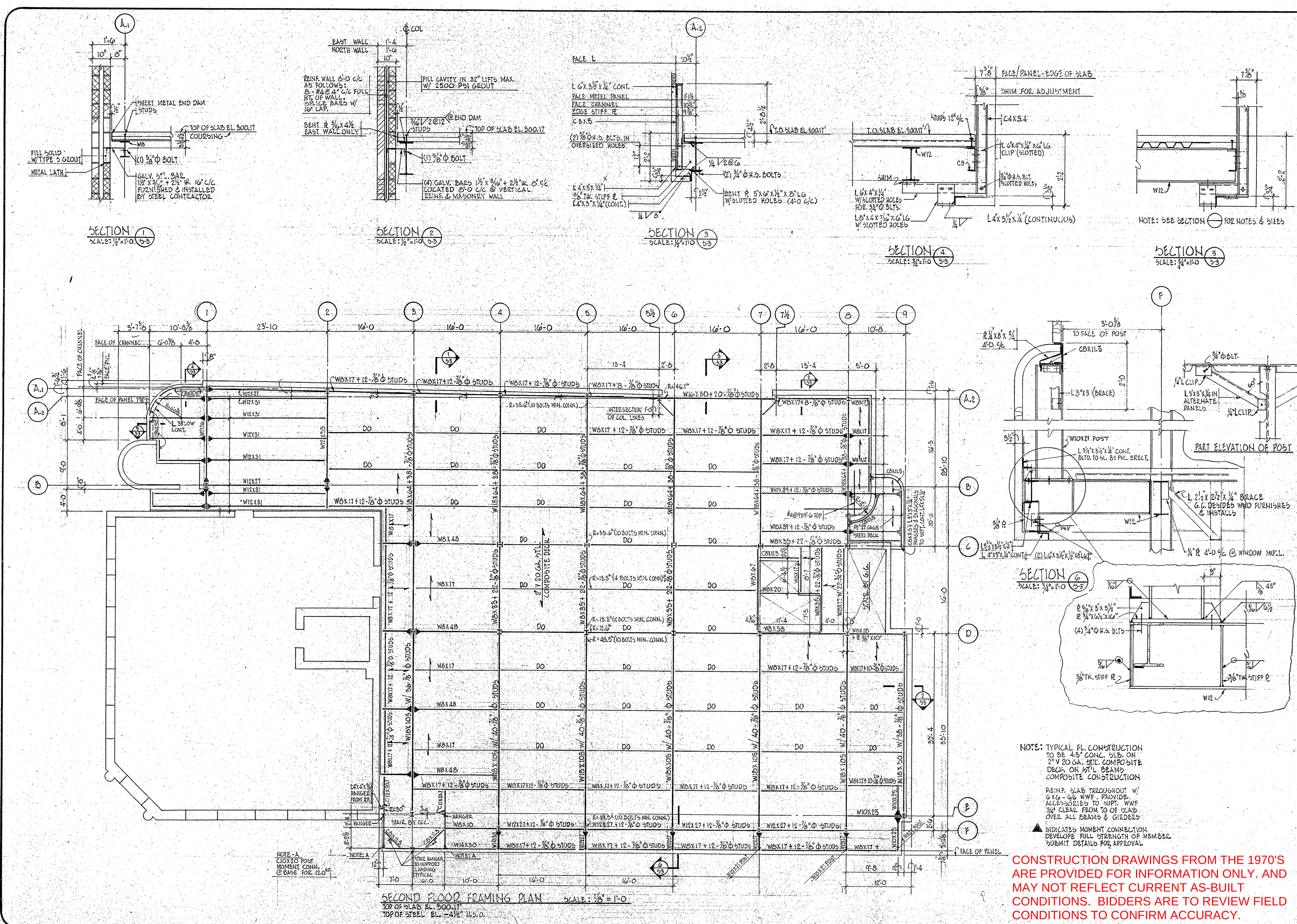
SECTION 1 S-3 SCALE: 1/2"=1'-0
SECTION 2 S-3 SCALE: 1/2"=1'-0
SECTION 3 S-3 SCALE: 1/2"=1'-0
SECTION 4 S-3 SCALE: 3/4"=1'-0
SECTION 5 S-3 SCALE: 3/4"=1'-0
SECTION 6 S-3 SCALE: 3/4"=1'-0
PART ELEVATION OF POST
SECOND FLOOR FRAMING PLAN SCALE: 1/8" = 1'-0
TOP OF SLAB EL. 300.17'
TOP OF STEEL EL. -4 1/2" U.S.O.
NOTE: TYPICAL FL. CONSTRUCTION TO BE 4.5" CONC. SLB. ON 2" V 20 GA. ST'L COMPOSITE DECK ON ST'L BEAMS COMPOSITE CONSTRUCTION
REINF. SLAB THROUGHOUT W/ 6X6 - 6/6 WWF. PROVIDE ACCESSORIES TO SUPT. WWF 3/4" CLEAR FROM TO OF SLAB OVER ALL BEAMS & GIRDERS
INDICATES MOMENT CONNECTION DEVELOPE FULL STRENGTH OF MEMBER SUBMIT DETAILS FOR APPROVAL

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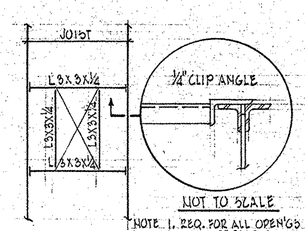
SECOND FLOOR FRAMING PLAN

NO.	REVISIONS	DATE

DRAWN
CHK'D.
DATE
SCALE 1/8"=1'-0"

S3

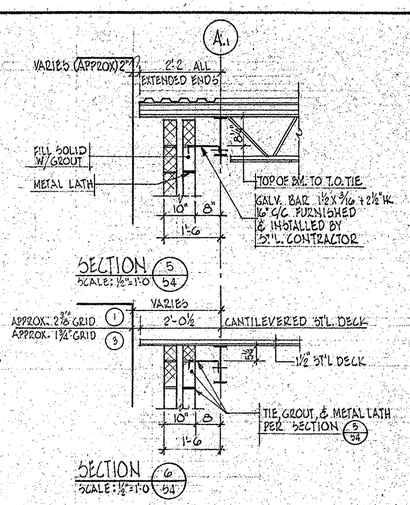


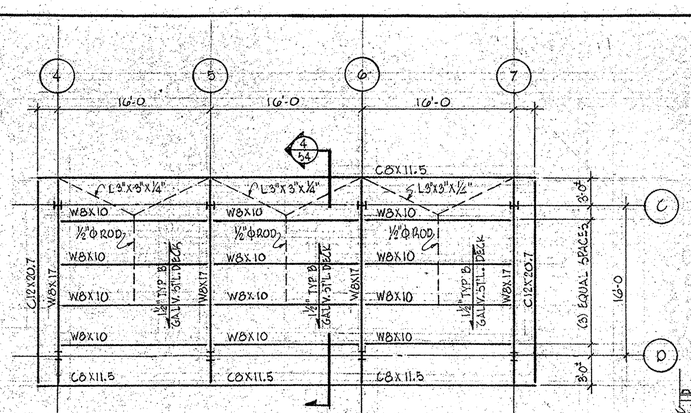
NOT TO SCALE

NOTE 1. Z80. FOR ALL OPEN'GS GREATER THAN 8" PERP. TO 5TL. DECK RIBS.
2. FRAME IS TO BE PLACED BEFORE DECK IS ERECTED.
3. MECHANICAL CONTRACTOR WILL PROVIDE STEEL CONTRACTOR W/ SHOP DWG'S. GIVING EXACT SIZE & LOCATION OF ALL OPENINGS.

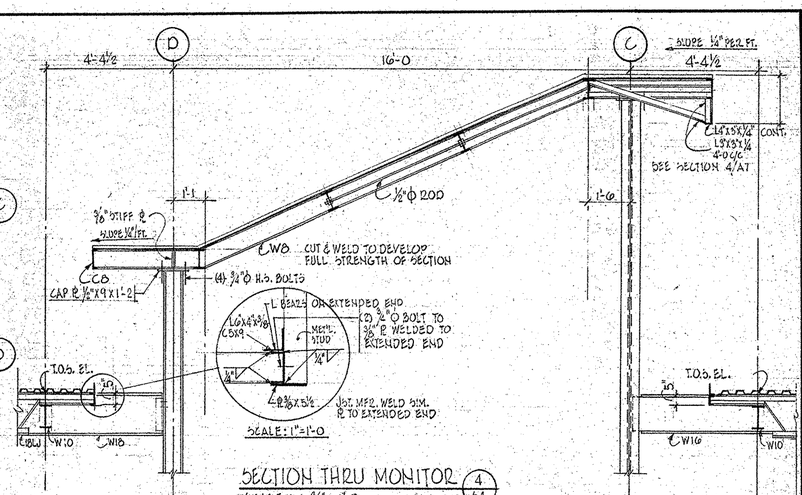
TYPICAL FRAME @ ROOF OPENINGS

NOT TO SCALE

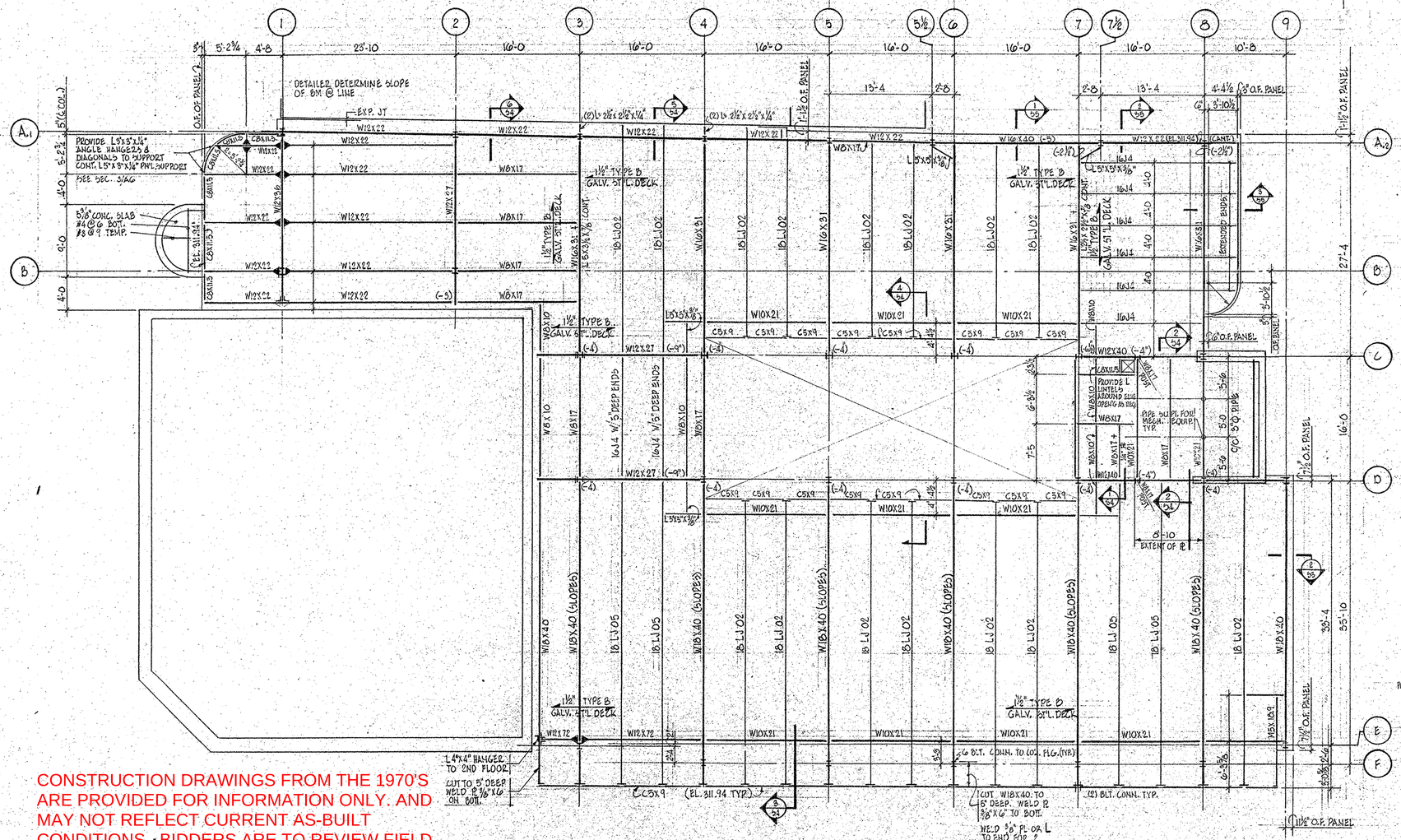




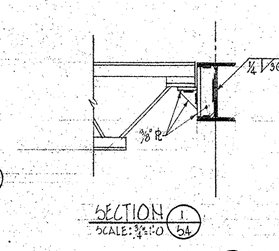
MONITOR ROOF FRAMING PLAN SCALE: ⅛"=1'-0



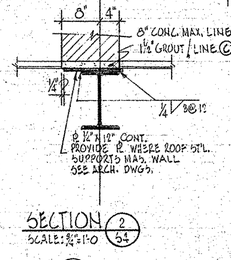
SECTION THRU MONITOR 4/54
SCALE: ⅜"=1'-0



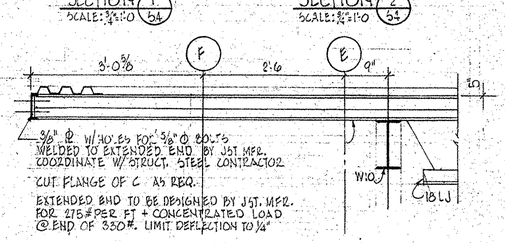
ROOF FRAMING PLAN SCALE: ⅛"=1'-0
TOP OF STEEL REFERENCED TO (EL. 311.94')



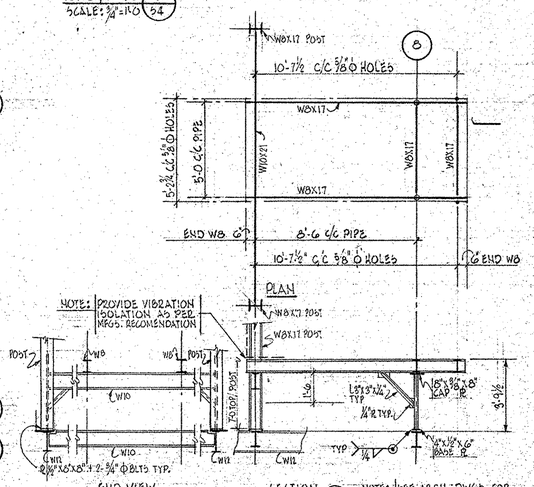
SECTION 1/54
SCALE: ¾"=1'-0



SECTION 2/54
SCALE: ¾"=1'-0



SECTION 3/54
SCALE: ¾"=1'-0



COOLING TOWER SUPPORT
SCALE: ½"=1'-0

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THE J/S JOHNSON/SMITH PARTNERSHIP
ARCHITECTS AND PLANNERS
15 WEST HIGHLAND AVE. PHILADELPHIA
PENNELL MECHANICAL ENGINEER
CONSULTING AND WILTBERGER
LAWRENCE ARAVUJA
STRUCTURAL ENGINEER

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DRAWN	CHK'D	DATE	SCALE
		MARCH 1, 1971	1/8"=1'-0

NO.	REVISIONS	DATE

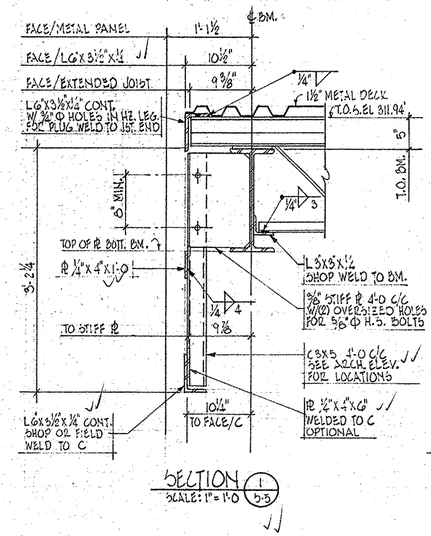
ROOF FRAMING PLAN

S4

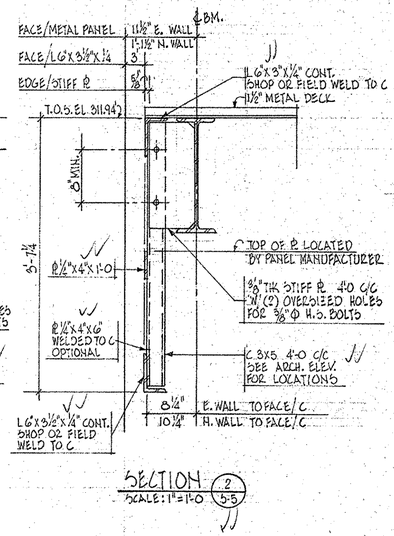
COLUMN SCHEDULE

COLUMN NUMBER		A-1	A-2	A-3	A-4	A-5	A.2-3½	A.2-7½	A.2-8	B-1	B-2	C-3	C-4	C-5	C-6	C-7	C-8	D-3	D-4	D-5	D-6	D-7	D-8	D-9	E-3	F-4	F-5	F-6	F-7	F-8	E-9
CAP PLATE													X	X	X	X			X	X	X	✓									
TOP OF HIGH STEEL@ROOF EL. 311.94																														
TOP OF END FL. SLAB EL. 300.17		W8 x 31	→	→	→	→	→	→	→	→	→	W8 x 40	→	→	→	W8 x 48	W8 x 40	W8 x 58	→	→	→	W8 x 67	W8 x 67	W8 x 31	W8 x 48	→	→	→	→	→	W8 x 31
TOP OF 1ST FL. SLAB EL. 289.17		11"										1'-5"					1'-5"							1'-5"		2'-5 5/8"				2'-3"
DIMENSION TO BOT OF BASE PL. (TYPICAL)																11"						4'-6"			11"					
TOP OF BASEMENT SLAB EL. 278.17																														
BASE PLATE	TYPE	10×10×1	→	→	→	→	→	→	→	→	→	12×12×1	→	→	→	12×12×1 1/4	12×12×1	14×14×1 1/2	→	→	→	→	→	10×10×1	12×12×1 1/4	12 × 12 × 1"					
	SIZE	16×16	→	→	→	→	→	→	→	→	→	→	→	→	→	18×18	16×16							16×16		← SEE SECTION ③ →					16×16
PEDESTAL	REINF. VERT.	4 #6	→	→	→	→	→	→	→	4 #7	4 #7	4 #8	→	→	→	4 #8	4 #8							4 #8		"					4 #8
	REINF. TIES	#3@12	→	→	→	→	→	→	→	→	→	→	→	→	→	#3@12	#3@12							#3@12		"					#3@12

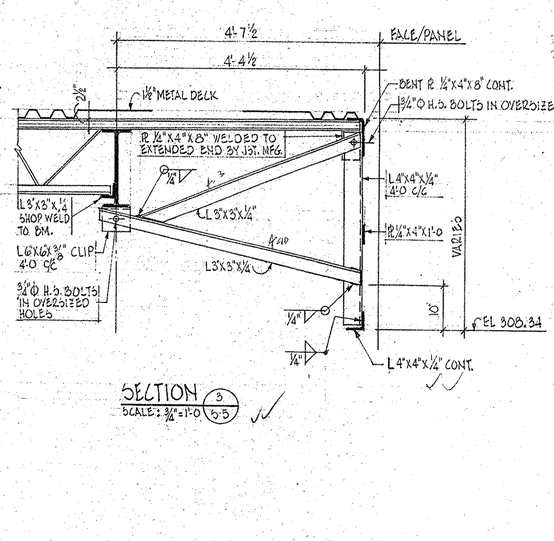
NOTE. PROVIDE 2. 3/4" ϕ ANCHOR BOLTS x 1'-6" LG. ✓
+4" HOOK @ EA. COL.



SECTION ① SCALE: 1"=1'-0 (1/S-5)



SECTION ② SCALE: 1"=1'-0 (2/S-5)



SECTION ③ SCALE: 3/4"=1'-0 (3/S-5)

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THE JOHNSON/SMITH PARTNERSHIP
J/S ARCHITECTS AND PLANNERS
15 WEST HIGHLAND AVE. PHILADELPHIA
PENNELL AND WILTBERGER
CONSULTING MECHANICAL ENGINEERS
LAWRENCE ARATA JR. ENGINEER

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SCHEDULES & DETAILS

NO.	REVISIONS	DATE

DRAWN
CHK'D
DATE MARCH 1971
SCALE

S5

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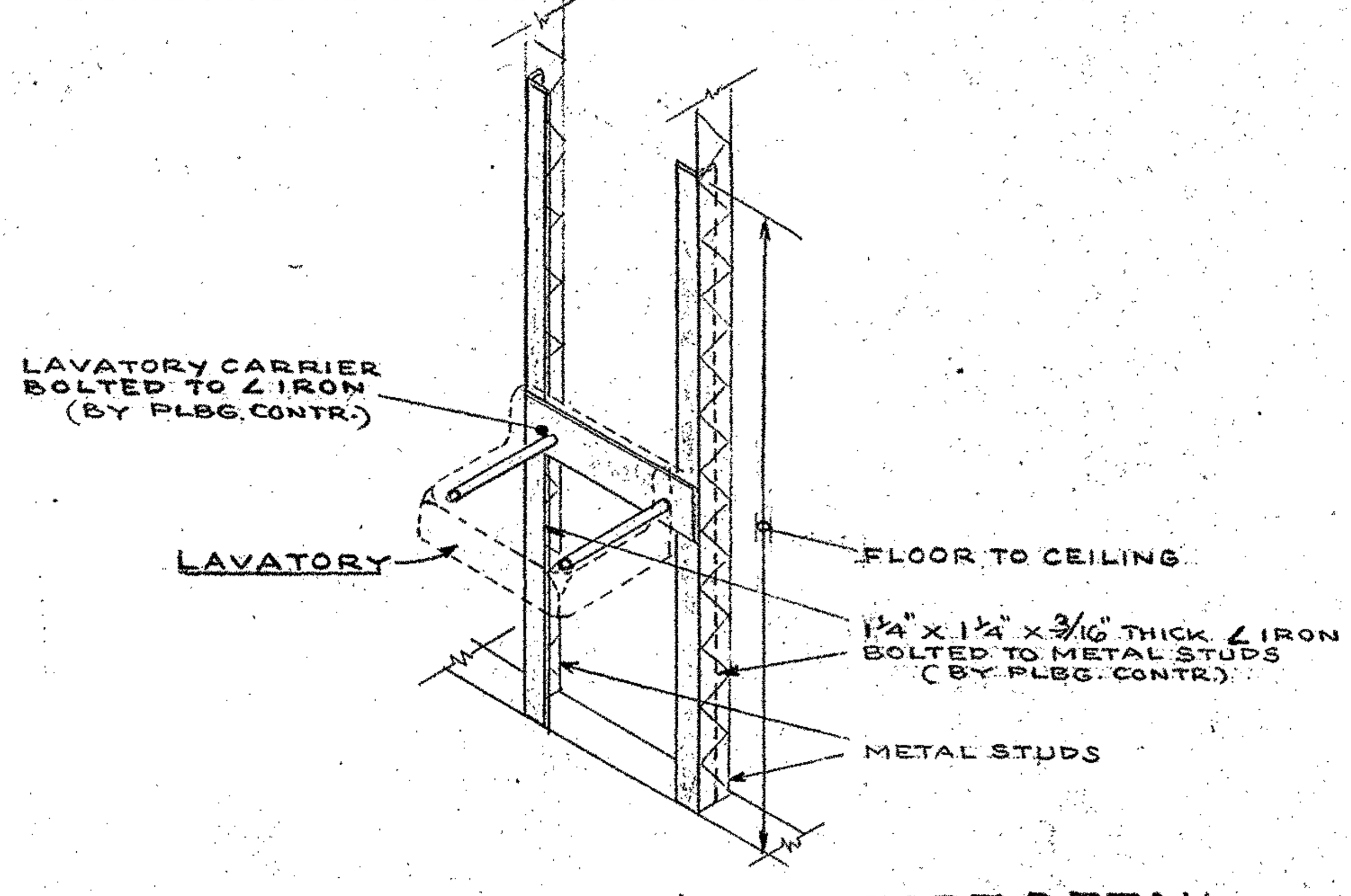
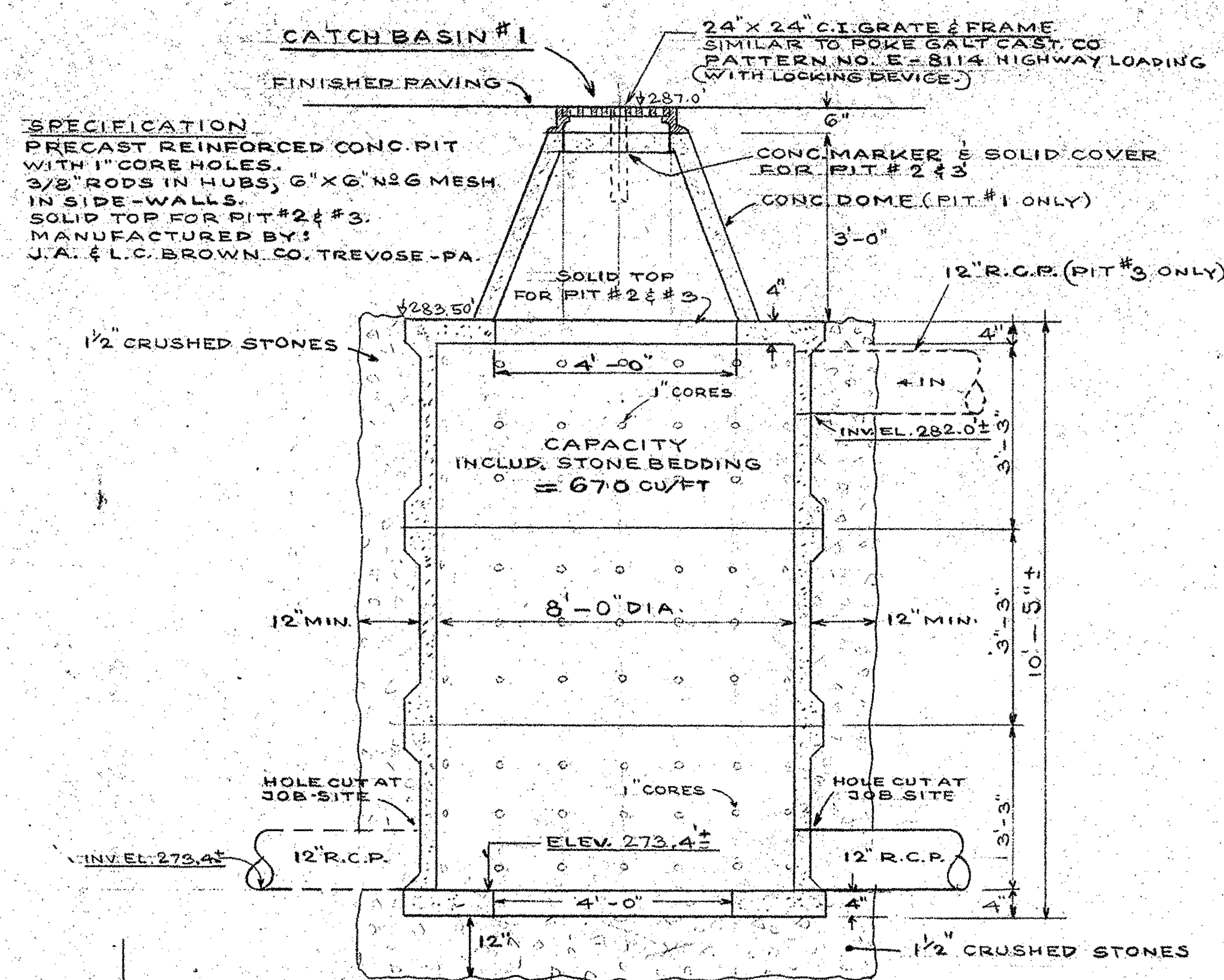
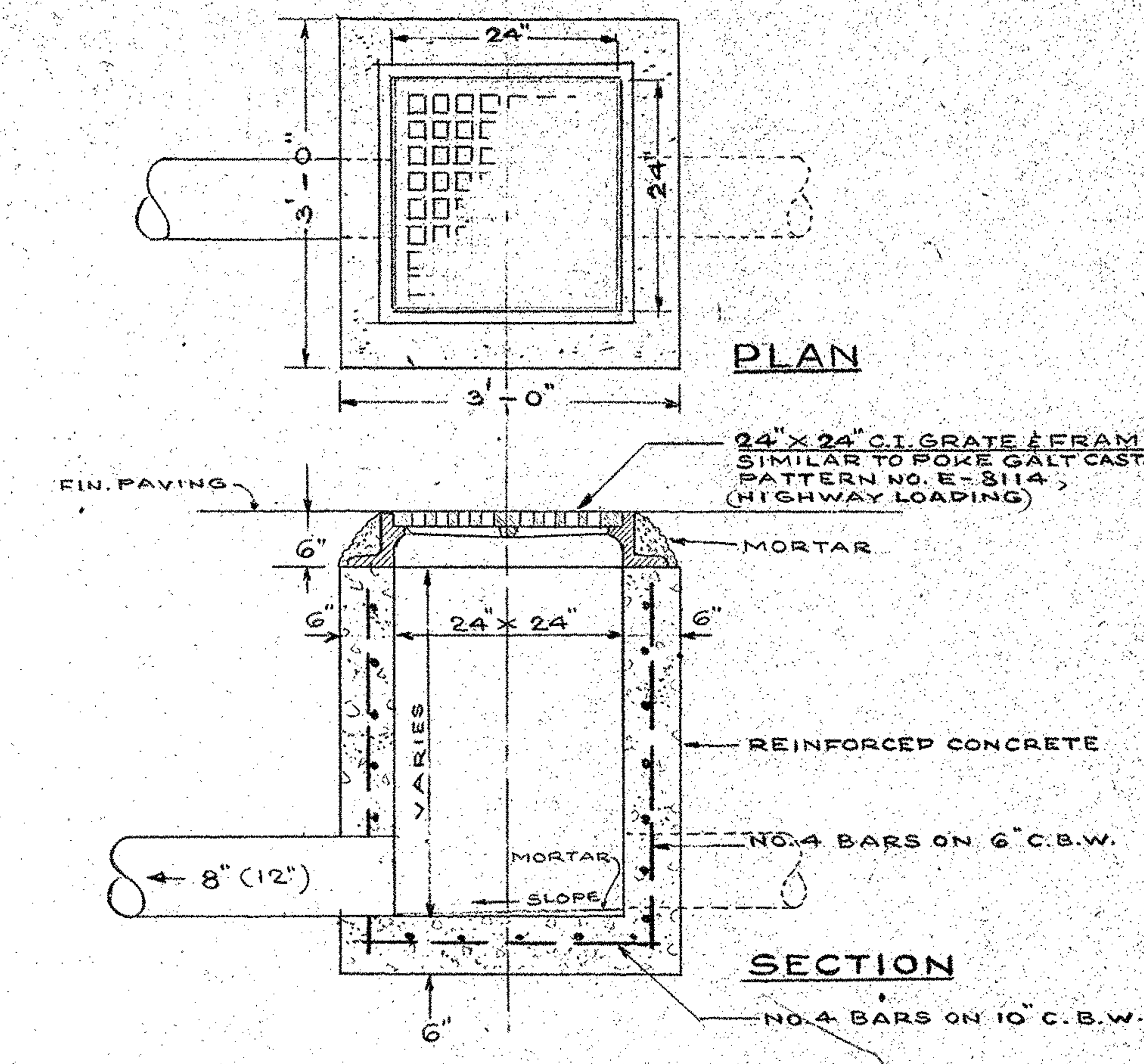


LAVATORY CARRIER AND SUPPORT DETAIL FOR METAL STUD AND DRYWALL WALLS

NO SCALE





DETAIL OF CATCH-BASIN #1 & #3

NO. SCALE

STORMWATER COLLECTING PIT

SHOWING PIT #1 WITH C.B. GRATE & FRAME.
PIT #2 & #3 TO BE MARKED WITH A 4"x4"x18" LONG CONCRETE MARKER. (CENTER OF PIT)

NOTE-'C' – PARKING LOT STANDARDS

GARDCO NO. 21918/208/250MH/BRA WITH 4" SQUARE POLE NO. C49/18BRA DARK BRONZE DURANODIC FINISH. BOTH LIGHTING STANDARD POLES INSTALLED AT THE SAME HEIGHT. w/ CONCRETE BASES BY G.C.

NOTE-'A'

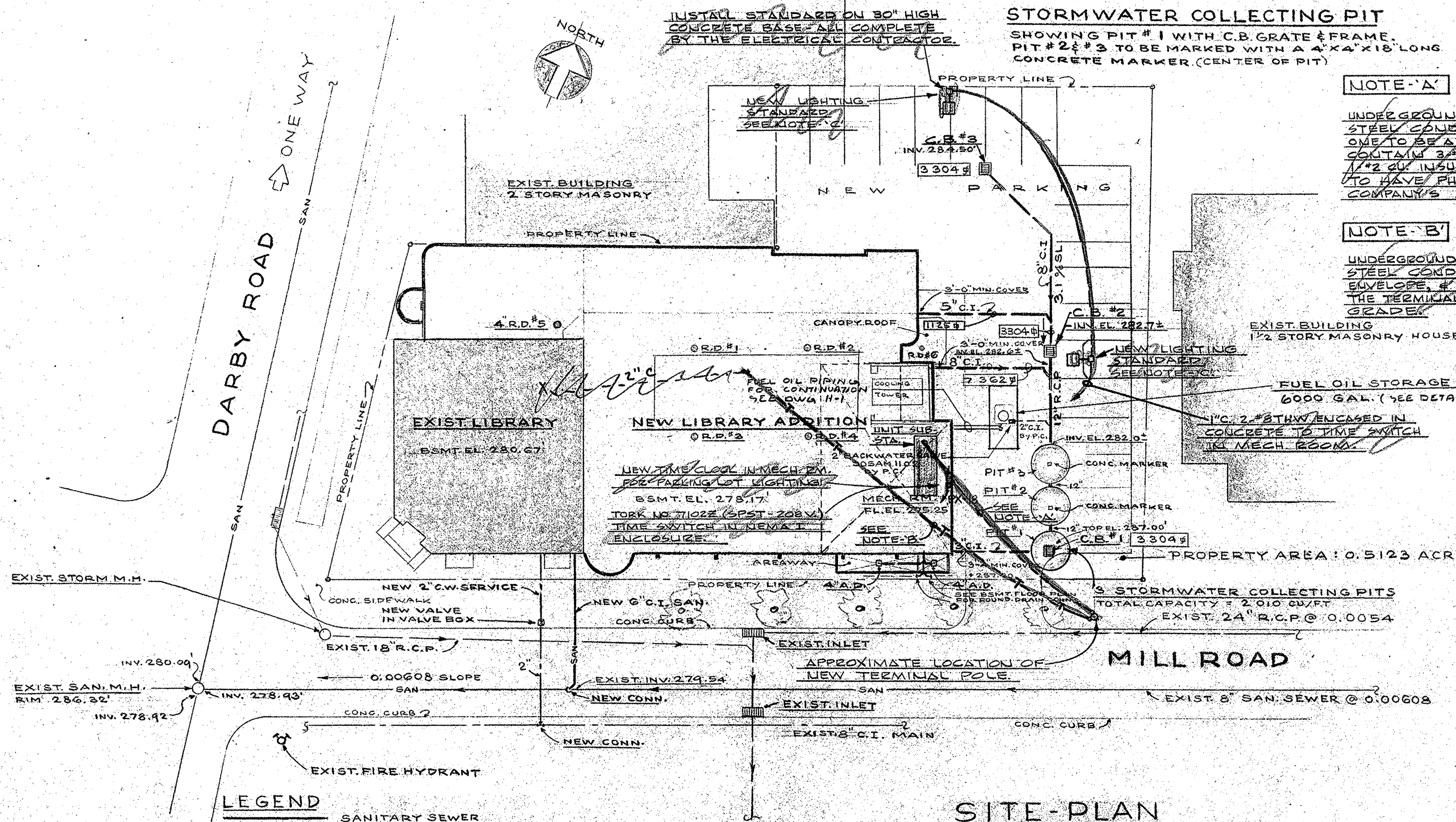
UNDERGROUND ELECTRIC SERVICE - 2-4" GALV. STEEL CONDUITS ENCASED IN CONCRETE. ONE TO BE A SPARE AND ONE SHALL CONTAIN 3-#2 15KV CU. CABLES AND 1-#2 CU. INSULATED GROUND. ALL CABLES TO HAVE PHILADELPHIA ELECTRIC COMPANY'S APPROVAL.

NOTE-'B'

UNDERGROUND TELEPHONE SERVICE - 1-3" GALV. STEEL CONDUIT ENCASED IN A 3" CONCRETE ENVELOPE, & TERMINATED AT THE BASE OF THE TERMINAL POLE 12" ABOVE FINISHED GRADE.

STORMWATER DATA

STORM EXPECTANCY PERIOD:	100 YEARS
ONE-HOUR RAINFALL IN INCHES:	3.25"
EXIST. GRASS - AREA:	18 400 ☐
55% RUN-OFF (18 400 x 0.55):	10 120 ☐
NEW ROOF & PAVED AREA EQUAL TO EXIST. GRASS AREA:	18 400 ☐
95% RUN-OFF (18 400 x 0.95):	17 480 ☐
ADDED RUN-OFF AREA IN ☐ (17 480☐ – 10 120☐):	7 360 ☐
ADDED RUN-OFF IN CUBIC FEET: (7 360 x 3.25)/12:	1 993 CU/FT
CAPACITY OF ONE STORMWATER PIT:	670 CU/FT
TOTAL CAPACITY OF THREE PITS 3 x 670 CU/FT:	2 010 CU/FT



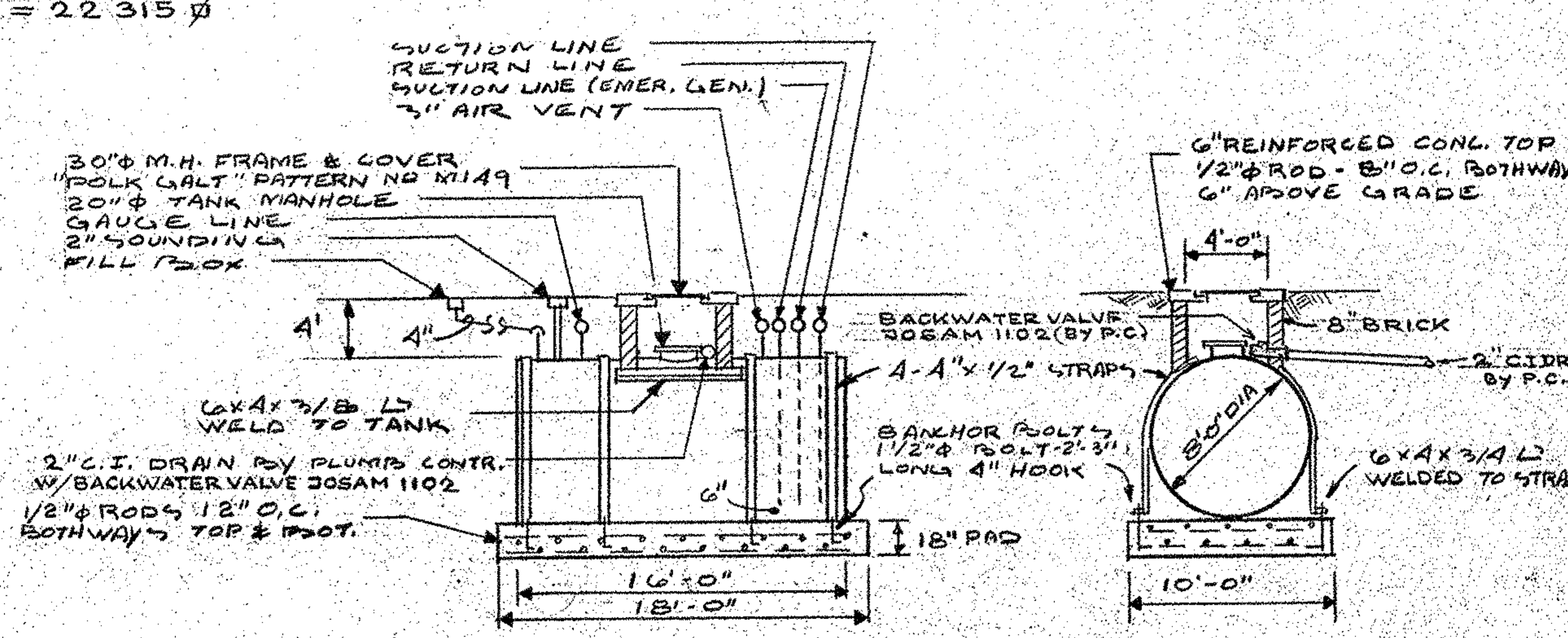
LEGEND

———	SANITARY SEWER
— — —	STORM SEWER
———	C.W. SERVICE
R.C.P.	REINFORCED CONC. PIPE
C.I.	CAST IRON
R.D.	ROOF DRAIN
A.D.	AREA DRAIN

SITE-PLAN

SCALE: 1" = 20 FT.

REFERENCE DWG.: SURVEY & TOPOGRAPHIC PLAN FROM THE OFFICE OF THE TOWNSHIP ENGINEER, DWG. NO. G10-105-01



6000 GALLON FUEL OIL STORAGE TANK

NO SCALE

"CONTRACTORS utilizing this plan and the information contained thereon are cautioned to comply with the requirements of Pennsylvania Act 287, House Bill 2543, entitled EXCAVATION AND DEMOLITION WORK - PROTECTION OF UNDERGROUND UTILITIES."

COMMONWEALTH OF PENNSYLVANIA — REGISTERED PROFESSIONAL ENGINEER — L. WALTON HESS, JR.

THE JOHNSON/SMITH PARTNERSHIP
ARCHITECTS AND PLANNERS
15 WEST HIGHLAND AVE. PHILADELPHIA
BENNETT AND WILTBERGER CONSULTING MECHANICAL ENGINEERS
LAWRENCE ARATA JR. STRUCTURAL ENGINEER

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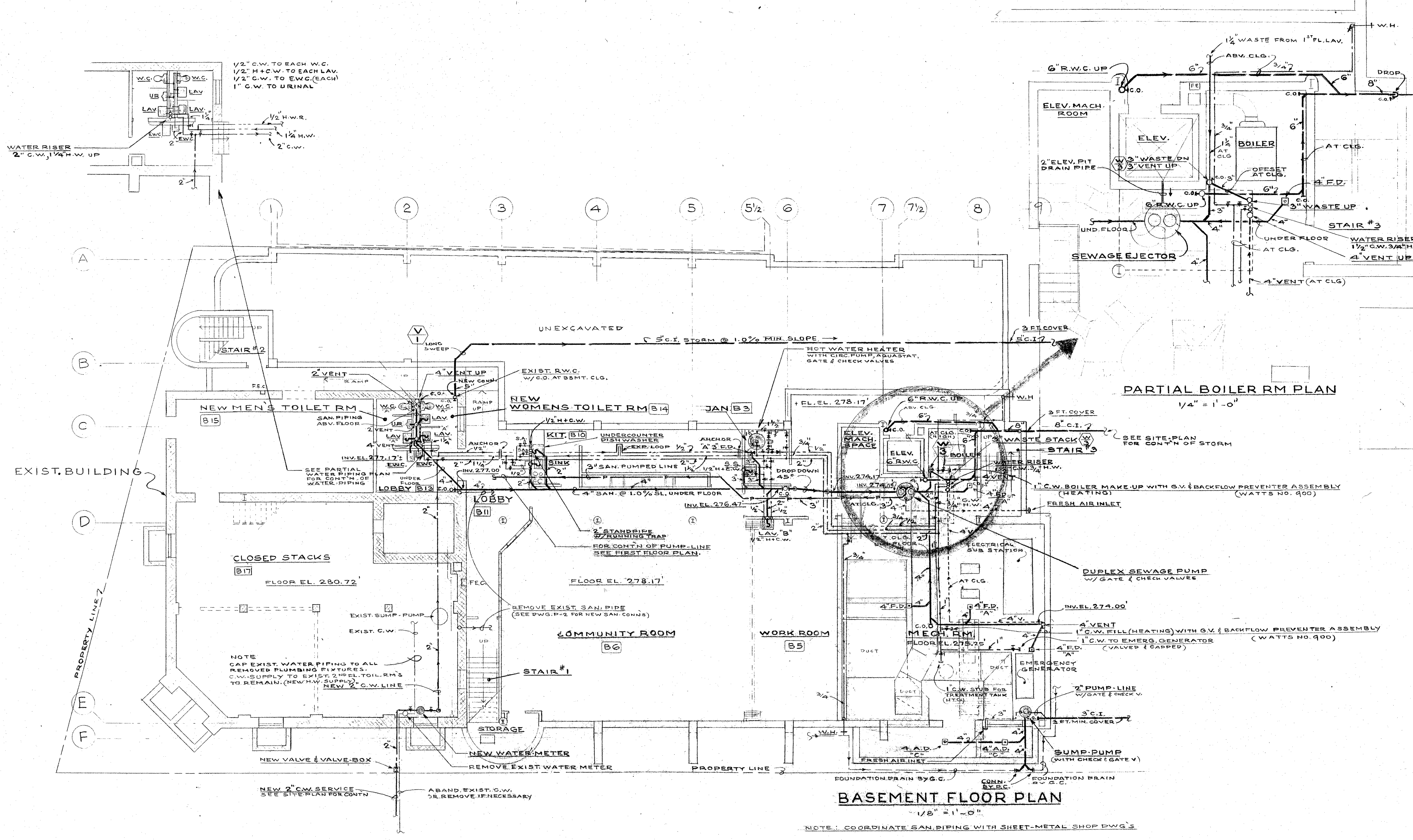
SITE-PLAN & DETAILS PLUMBING

NO.	REVISIONS	DATE

DRAWN: H.O.W.
CHK'D: L.W.H.
DATE: MAR. 1, 1977
SCALE: AS NOTED

PHE-1



PLUMBING FIXTURE SCHEDULE					
FIXTURES	TRAP	DRAIN	VENT	H.W.	C.W.
WATER CLOSET	INTEGRAL	4"	AS NOTED	–	1/2"
URINAL	INTEGRAL	2"		–	1"
LAVATORY	1 1/4"	1 1/4", 2"		1/2"	1/2"
SINK	1 1/2"	1 1/2", 2"		1/2"	1/2"
SERVICE SINK	3"	3"		1/2"	1/2"
ELEC. WATER COOL.	1 1/2"	1 1/4"		–	1/2"
DOMEST. DISHWASHER	1 1/2"	2"		1/2"	1/2"

N

PLUMBING LEGEND

- SANITARY SEWER
- STORM WATER
- VENT LINE
- PUMP LINE
- COLD WATER
- HOT WATER
- HOT WATER RETURN
- C.O. CLEAN-OUT
- BALANCING VALVE
- GATE VALVE

W.C. WATER CLOSET
UR URINAL
LAV. LAVATORY
S.S. SERVICE SINK
E.W.C. ELEC. WATER COOLER
F.D. FLOOR DRAIN
A.D. AREA DRAIN
C.O. CLEAN-OUT
S.A. SHOCK-ABSORBER
V. VENT

R.W.C. RAINWATER CONDUCTOR
R.D. ROOF DRAIN
H.W. HOT WATER
C.W. COLD WATER
R.C.P. REINFORCED CONC. PIPE
C.I. CAST IRON
INV. INVERT ELEVATION
H.B. HOSE BIBB
W.H. WALL HYDRANT
HTG. HEATING

P.C. PLUMBING CONTRACTOR
G.C. GENERAL CONTRACTOR

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L. WALTON HESS, JR.

THE J/S JOHNSON/SMITH PARTNERSHIP
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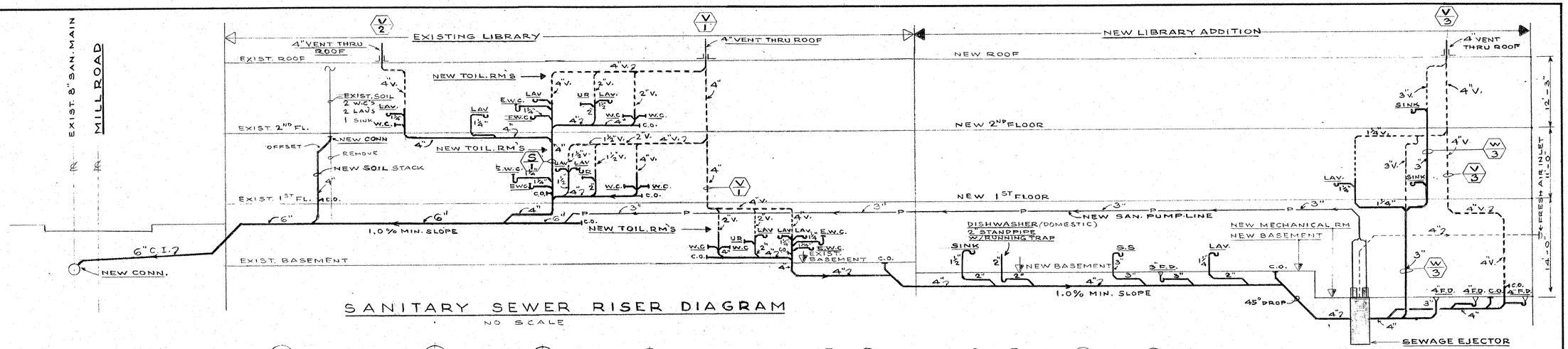
BASEMENT FLOOR PLAN
PLUMBING

NO.	REVISIONS	DATE

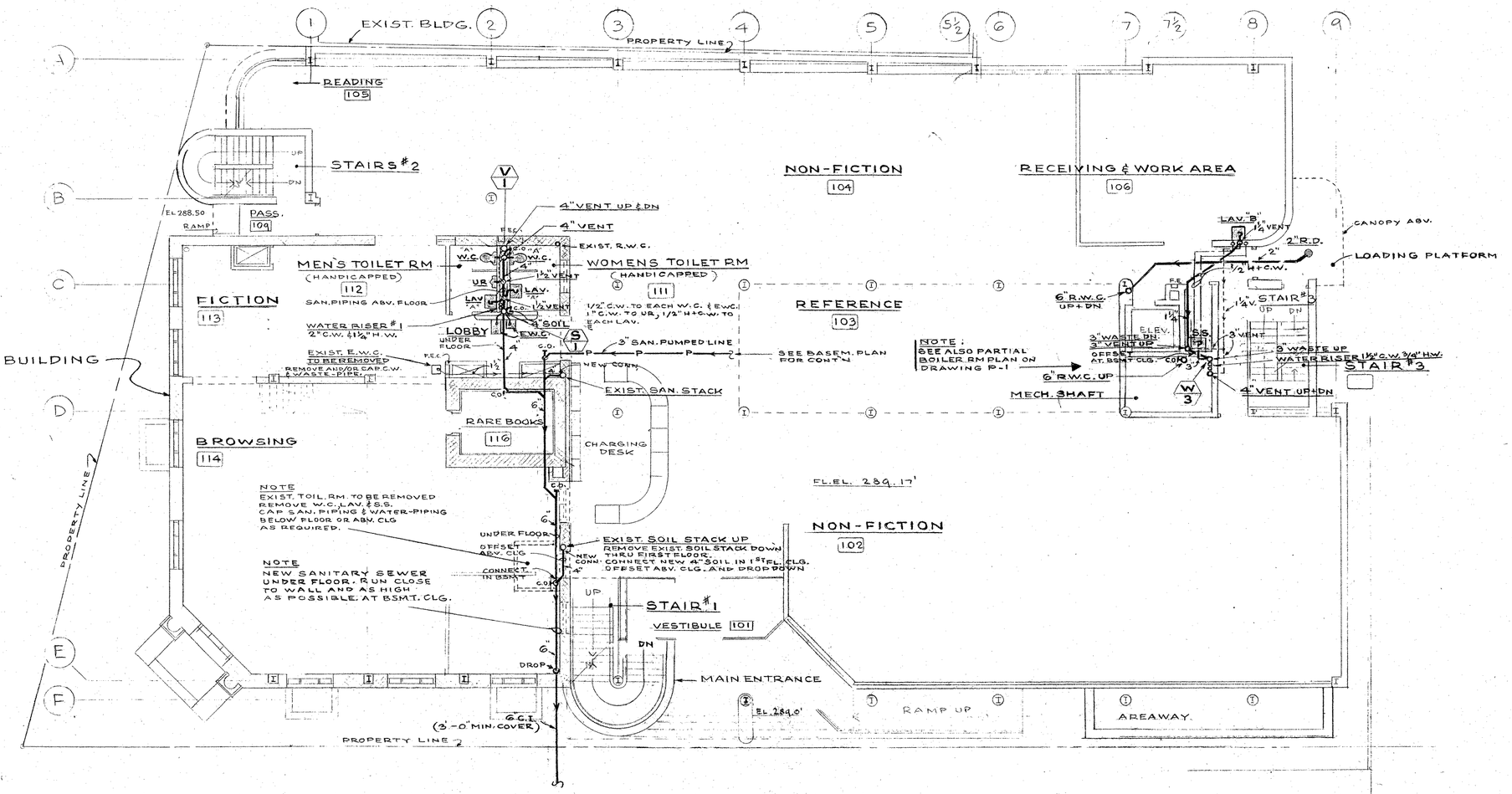
DRAWN H.O.W.
CHK'D L.W.H.
DATE MAR. 1, 1977
SCALE 1/8" = 1'-0"

P-1



SANITARY SEWER RISER DIAGRAM

NO SCALE



FIRST FLOOR PLAN

1/8" = 1'-0"

NOTE: COORDINATE SAN. PIPING WITH SHEET METAL SHOP DWG.

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COMMONWEALTH OF PENNSYLVANIA — L. WALTON HESS, JR. — REGISTERED ARCHITECT

THE JOHNSON/SMITH PARTNERSHIP
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CONSULTING STRUCTURAL ENGINEERS
LAWRENCE ASSOCIATES
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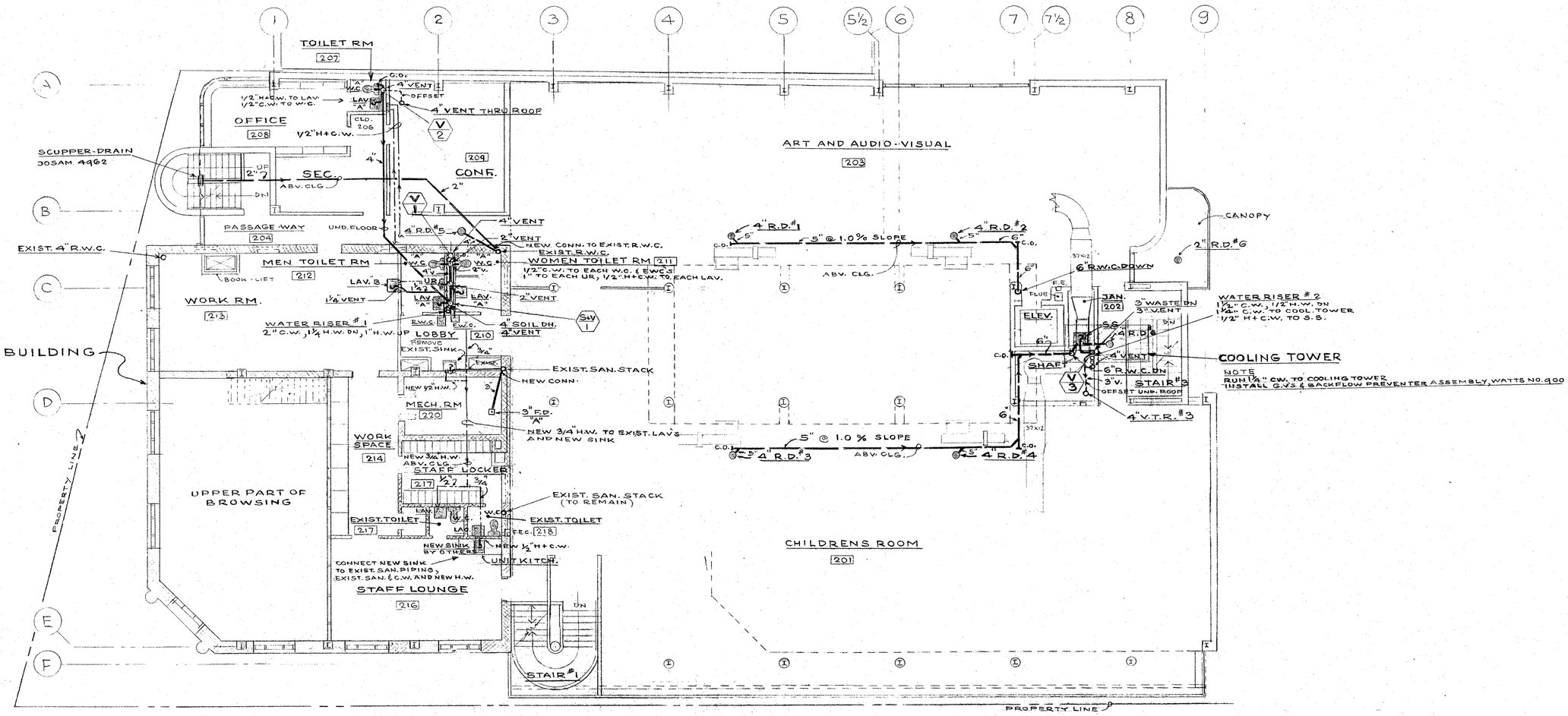
FIRST FLOOR PLAN PLUMBING

NO.	REVISIONS	DATE

DRAWN H.O.W.
CHK'D L.W.H.
DATE MAR. 1, 1977
SCALE AS NOTED

P-2



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SECOND FLOOR PLAN

1/8" = 1'-0"

NOTE: COORDINATE SAN. PIPING WITH SHEET-METAL SHOP DWG'S.

THE J/S JOHNSON/SMITH PARTNERSHIP
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SECOND FLOOR PLAN PLUMBING

NO.	REVISIONS	DATE

DRAWN H.O.W.
CHK'D L.W.H.
DATE MAR. 1, 1977
SCALE 1/8" = 1'-0"

P-3

HOT WATER FLOW DIAGRAM
NO SCALE
SECTION 'B'-'B'
SCALE 1/4"=1'-0"
SYMBOL LIST
HOT WATER SUPPLY & RETURN
CHILLED WATER SUPPLY & RETURN
COOLING TOWER SUPPLY & RETURN
NORMALLY CLOSED
EXPANSION TANK LINE
MANUAL AIR VENT
SOUNDLINED DUCT
MICRO-SWITCH
SHUTOFF VALVE
BUTTERFLY VALVE
THERMOMETER
VOLUME DAMPER
FLEXIBLE CONNECTION
HWS&R
CWS&R
CTS&R
N.C.
ETL
MAV
SLD
M.S.
FIRE DAMPER
SOLENOID VALVE
CHECK VALVE
UNION
STRAINER
BALANCING VALVE
RELIEF VALVE
PRESSURE GAUGE
THERMOSTAT
BASE BID
ALTERNATE #1, 2 OR 3
MECHANICAL EQUIPMENT ROOM PLAN
SCALE 1/4"=1'-0"
BASEMENT FLOOR PLAN
SCALE 1/8"=1'-0"
SECTION 'A' - 'A'
SCALE 1/4"=1'-0"
THE JOHNSON/SMITH PARTNERSHIP
ARCHITECTS AND PLANNERS
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DARBY ROAD AND MILL ROAD
HAVERTOWN PA
BASEMENT PLAN
HEATING
REVISIONS
DATE
NO.
DRAWN
CHK'D
DATE
MAR. 1, 1977
SCALE
AS NOTED
H-1

CONSTRUCTION DRAWINGS FROM THE 1970'S ARE PROVIDED FOR INFORMATION ONLY. AND MAY NOT REFLECT CURRENT AS-BUILT CONDITIONS. BIDDERS ARE TO REVIEW FIELD CONDITIONS TO CONFIRM ACCURACY.

GENERAL NOTES

1. RADIATION TO HAVE SOLENOID VALVE INSTALLED WITHIN ENCLOSURE. VALVE TO OPEN WHEN VARIABLE VOLUME MICRO-SWITCH CLOSES, ELECTRICAL WIRING BY E.C. SOLENOID VALVES ARE TO BE INSTALLED ON ALL RADIATION W/ THE SYMBOL ▲.
2. VAV STRIP DIFFUSER MUST BE COMPATIBLE WITH METAL PANEL CEILING PROVIDED, SEE ARCH. DWG'S & SPECS. THE STRIP DIFFUSER MUST RUN CONTINUOUS WITHIN EACH BAY (15'±), CONNECT DIFFUSER PLENUMS AS REQUIRED. UNUSED PORTIONS OF DIFFUSER TO REMAIN OPEN FOR RETURN AIR.
3. PIPING MAINS TO RUN TIGHT UNDER 8" BEAM & PASS THRU 18" BEAM, HOLES FOR PIPING TO BE PROVIDED BY STEEL CONTRACTOR. NO INSULATION IS REQUIRED WHEN PIPE PASSES THRU BEAM. (HOT WATER ONLY, CHILLED WATER TO HAVE COMPRESSED ARMAFLEX.)
4. SUPPLY AIR DUCTWORK TO PASS THRU 18" BEAM, HOLES TO BE PROVIDED BY STEEL CONTRACTOR. NO DUCT LINER IS REQ'D. WHEN DUCT PASSES THRU BEAM, DECREASE DUCT SIZE AS REQUIRED.
5. VARIABLE AIR VOLUME UNITS, MODEL NO'S., & SIZES ARE BASED ON TEMPMASTER, SEE SPECS. FOR ACCESSORIES. UNITS DESIGNATED WITH M.S. ARE TO BE PROVIDED WITH A MICRO-SWITCH FOR CONTROL OF RADIATION.
6. ALL RADIATION SHALL BE PROVIDED WITH A SHUTOFF & BALANCING VALVE. FIN RAD. & SINGLE CONVECTORS TO HAVE VALVES WITHIN ENCLOSURE. SEE CONVECTOR PIPING DETAIL FOR MULTIPLE CONVECTORS.
7. ALL CONTRACTORS SHALL NOTE THE CLOSE TOLERANCES FOR PIPING & DUCTWORK. ALL PIPING MUST BE COORDINATED ON THE SHEET METAL SHOP DWG'S BEFORE INSTALLATION.
8. EXISTING HEATING SYSTEM TO BE REMOVED COMPLETE INCLUDING BUT NOT LIMITED TO THE BOILER, FUEL OIL TANKS, ASSOCIATED FUEL OIL PIPING, BOILER BREECHING, STEAM PIPING, RADIATION & CONTROLS. EXISTING WINDOW AIR CONDITIONING UNITS ARE TO BE REMOVED COMPLETE. ANY EQUIPMENT NOT DESIRED BY OWNER SHALL BE REMOVED FROM SITE BY HTG. CONTR.
9. ALL RELIEF VALVES SHALL BE PIPED TO FLOOR DRAIN
10. ALL DRAIN VALVES SHALL BE HOSE END TYPES

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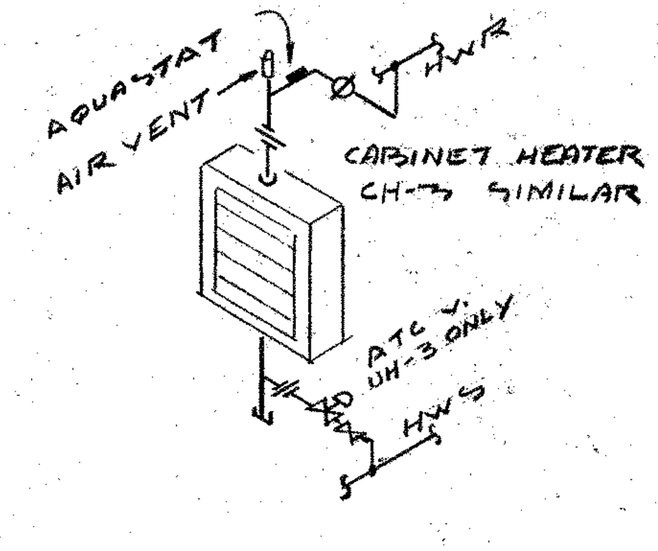
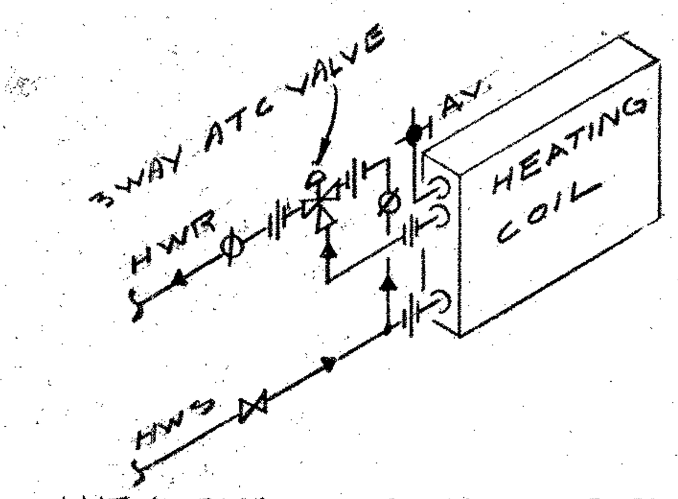
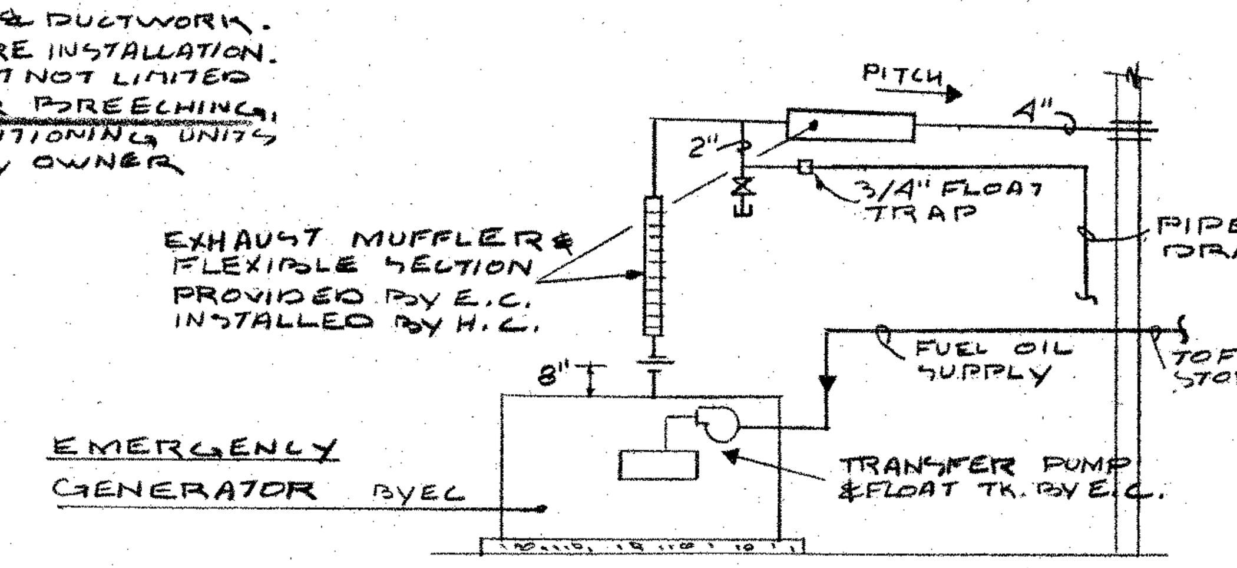


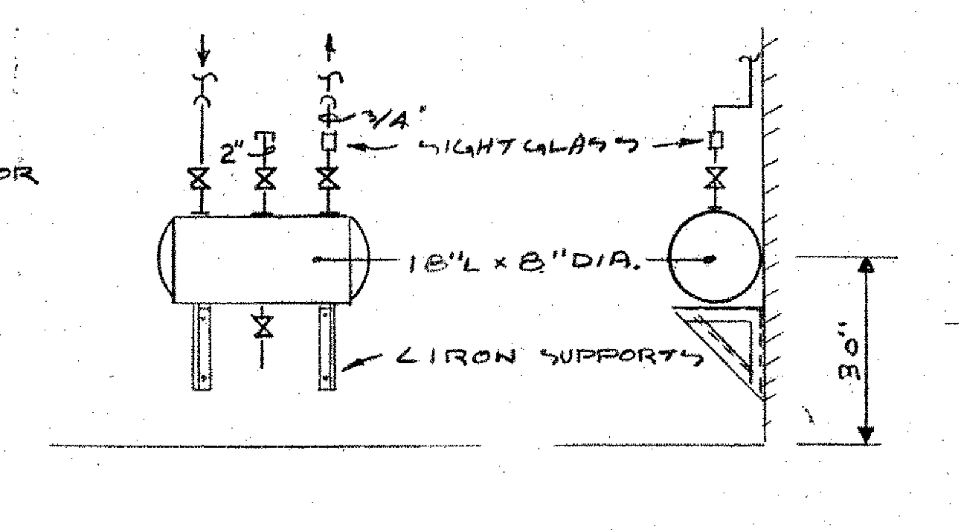
UNIT HEATER DETAIL
NO SCALE



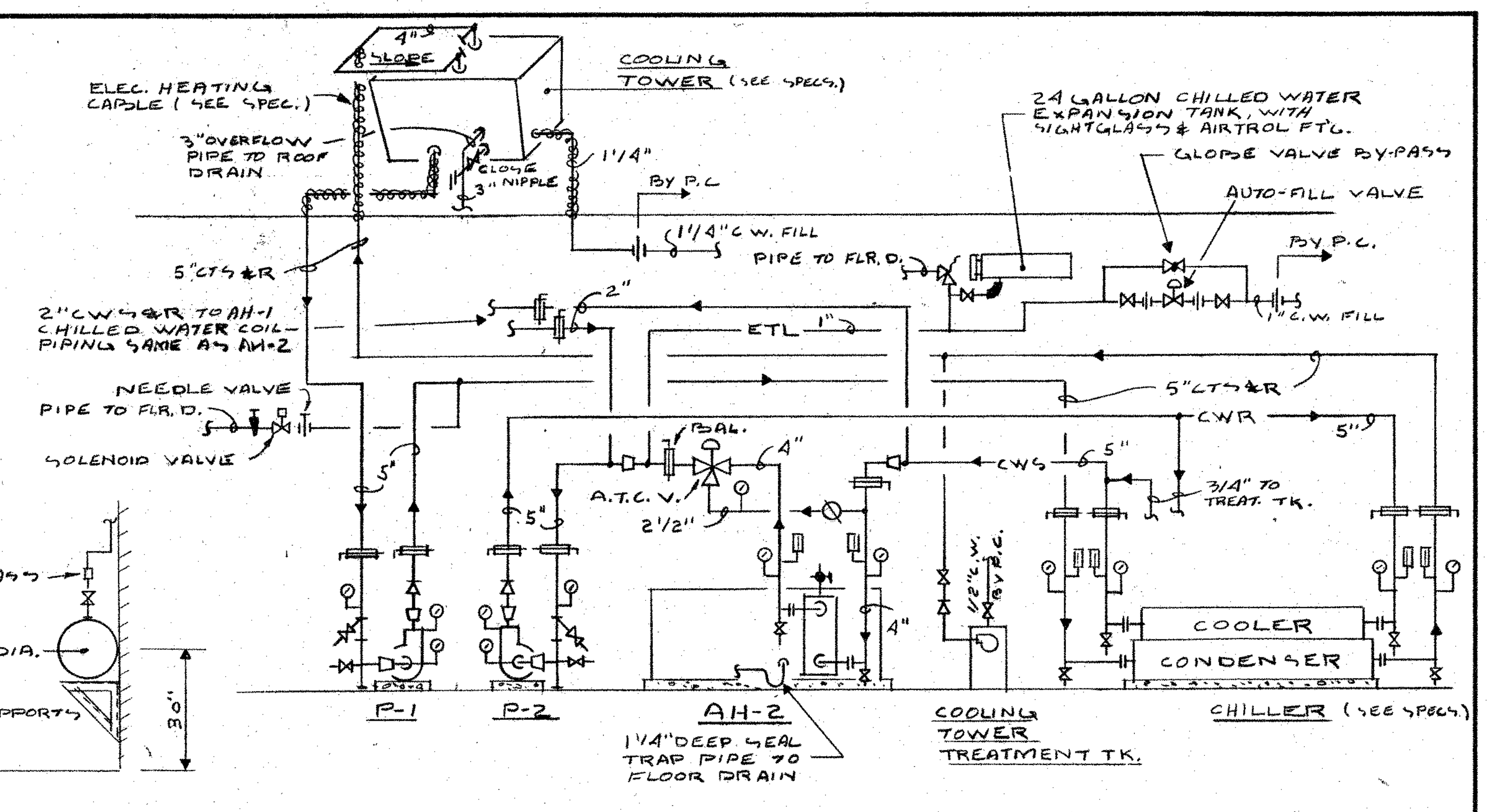
HEATING COIL DETAIL AH-1
NO SCALE



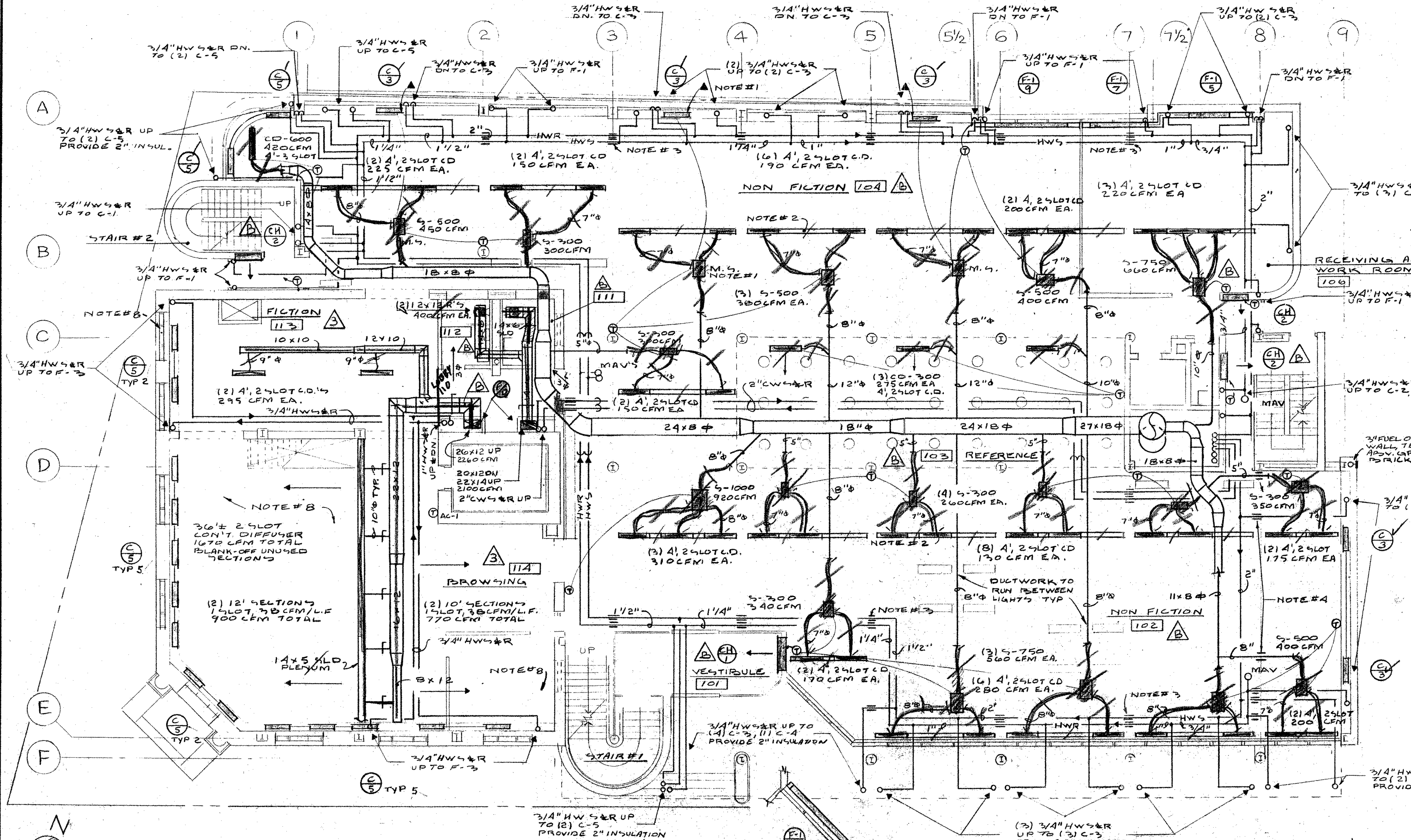
EMERGENCY GENERATOR DETAIL
NO SCALE



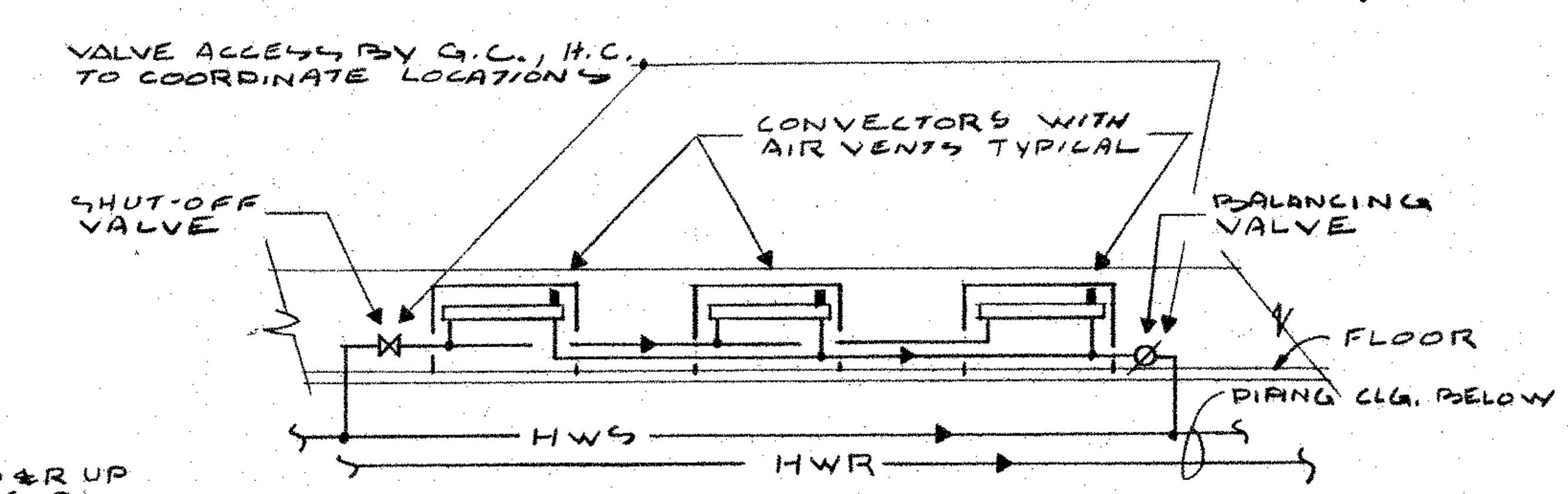
WATER TREATMENT TANK DETAIL
NO SCALE



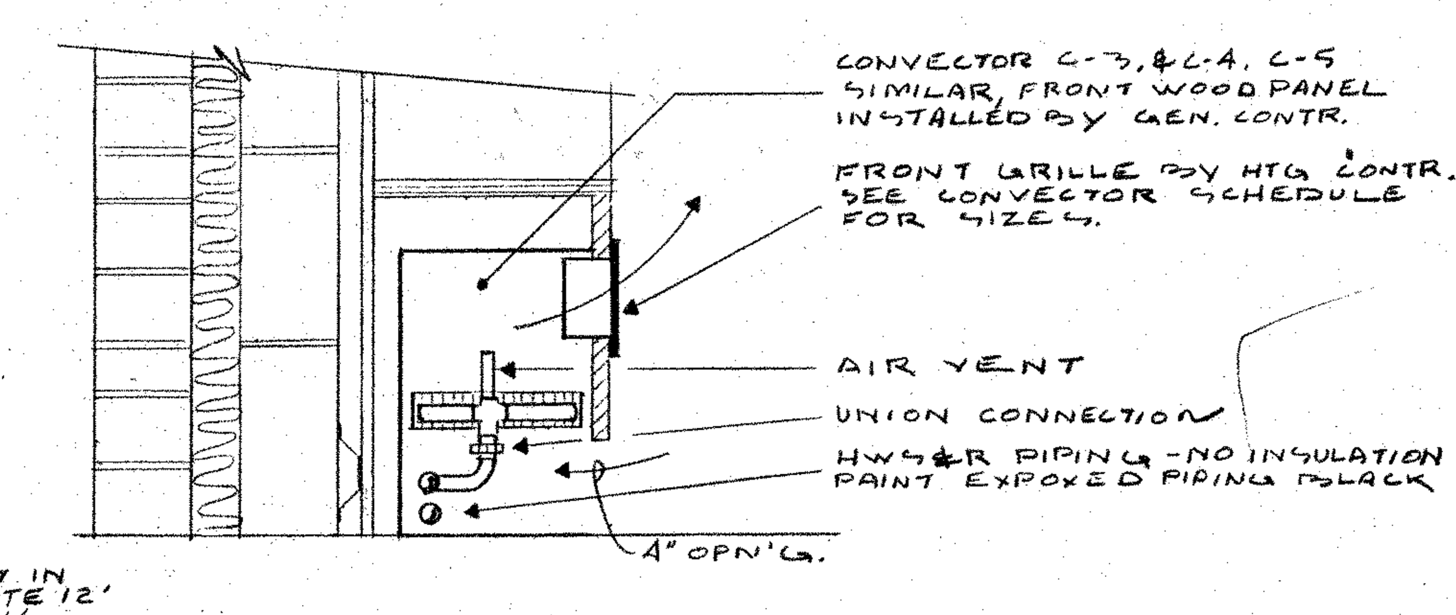
CHILLED WATER FLOW DIAGRAM
NO SCALE



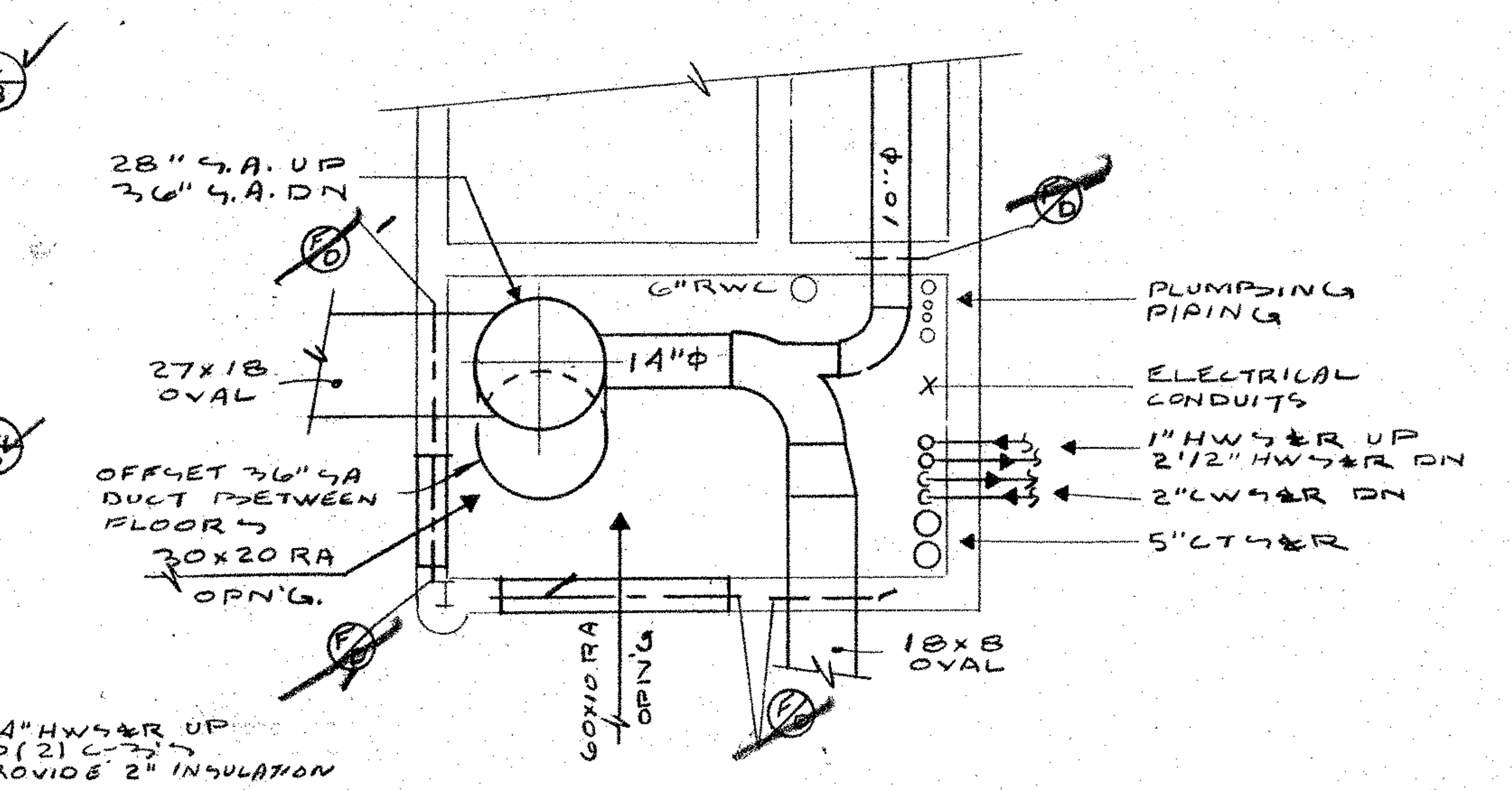
FIRST FLOOR PLAN
SCALE 1/8" = 1'-0"



CONVECTOR PIPING DETAIL
NO SCALE



CONVECTOR SCHEDULE
SCALE 1 1/2" = 1'-0"



PARTIAL SHAFT PLAN
SCALE 1/4" = 1'-0"

THE J/S JOHNSON/SMITH PARTNERSHIP
ARCHITECTS AND PLANNERS
15 WEST HIGHLAND AVE. PHILADELPHIA
PENNELL AND WILTBERGER CONSULTING MECHANICAL ENGINEERS
LAWRENCE ARATA, JR. STRUCTURAL ENGINEERS

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HAVERTOWN PA.

FIRST FLOOR PLAN
HEATING

NO.	REVISIONS	DATE

DRAWN F.M.S.
CHK'D L.W.H
DATE MAR. 1, 1977
SCALE AS NOTED

H-2

AIR HANDLING UNIT SCHEDULE

SYMBOL	CFM	EXT. S.P.	% OSA	RPM	COIL VELOCITY	OUTLET VELOCITY	COOLING COIL - 45° EWT, 6 ROWS: ENT	LVG	MBH	GPM	ΔT	P.D.	HEATING COIL - 170° EWT: ENT.	LVG.	MBH	GPM	ΔT	P.D.	ELEC. CHAR. HP-VOLTS-Φ
AH-1	5,600	.40"	10	958	543	1795	79.9 / 65.0	54.5 / 54.0	184	37	10	7.2'	63	80	103	7	30	3.4'	3 - 208 - 3
*AH-2	24,000	3.0"	15	1285	593	1770	81.3 / 66.4	56.0 / 54.9	843	168	10	18.3	NOT REQUIRED						40 - 208 - 3

* MEDIUM PRESSURE UNIT

CABINET HEATER SCHEDULE - 170° EWT

SYMBOL	CFM	MBH	KW / GPM	RPM	ELEC. CHAR.	TYPE
▲ CH-1	735	25.6	7.5 KW	630	11.3KW TOT. 208V-3Φ	ELEC. FULLY RECESSED
CH-2	280	5.5	1.6KW	750	4.9KW TOT. 208V-3Φ	ELEC. FULLY RECESSED
CH-3	265	20.7	2GPM	750	1/20HP - 120V-1Φ	HOT WATER FLOOR MTD.

▲ INTERGAL THERMOSTAT

FAN SCHEDULE

SYMBOL	CFM	S.P.	RPM	DRIVE	T.S. / O.V.	TYPE	CONTROL	ELEC. CHAR. HP-VOLTS-Φ	SIZE	▲ MFGR
PF-1	5,470	1/4"	1140	DIRECT	8.1 SONES	PROP. FAN	ATC	7/8 - 200 - 3	PV243	ILG
CF-1	90	1/8"	1050	DIRECT	1.6 SONES	CEILING FAN	LOCAL	50 WATTS - 115 - 1	Z-6	PENN ZEPHYR
CF-2		SAME		AS	CF-1	BUT	MUST	BE IN-LINE	MODEL	
CF-3	875	1/8"	1050	DIRECT	4.3 SONES	CEILING FAN IN-LINE	LOCAL	280 WATTS - 115 - 1	Z-12	PENN ZEPHYR
RF-1	20,400	1/4"	805	BELT	1550	TUBULAR	INTERLOCK AH-2	7 1/2 - 208 - 3	B365	BARRY
PE-1	3,200	1/4"	590	BELT	3820	ROOF EXHAUST	ATC	3/4 - 208 - 3	BCR-24	JENN-AIR

BASE (PF-1) BASE (RF-1) BASE (PE-1)

▲ MFGR. IS FOR BASIS OF DESIGN ONLY, SOUND LEVELS SHALL NOT EXCEED EQUIP. LISTED

CONVECTOR SCHEDULE - 170° AWT

SYMBOL	LENGTH	WIDTH	HEIGHT	MBH	GPM	TYPE	* GRILLE SIZE
C-1	28	6	20	3.4	.7	FRG	—
C-2	32	6	20	3.9	.8	FRG	—
* C-3	36	8	12	3.4	.7	FR	34 x 4
* C-4	20	8	12	1.6	.3	FR	18 x 4
* C-5	36	8	20	5.8	1.1	FR	34 x 6
C-6	24	6	24	3.4	1 KW	FR	208 V-1Φ

* UNITS TO HAVE FRONT PANELS SUPPLIED BY GENERAL CONTRACTOR. HEATING CONTRACTOR TO PROVIDE GRILLES IN WOODWORK ACCORDING TO THE ABOVE SCHEDULE. SEE DETAIL ON DWG H-2

UNIT HEATER SCHEDULE - 170° EWT

SYMBOL	MBH	GPM	RPM	CFM	ELEC. CHAR HP-VOLTS-Φ
UH-1	7.4	.5	1550	320	9 WATTS - 115 - 1
UH-2	35.5	3.0	1550	990	1/15 - 115 - 1
UH-3	116	10.0	1050	2,800	1/4 - 115 - 1

PUMP SCHEDULE

SYMBOL	GPM	FT. HD.	TYPE	ELEC. CHAR HP-VOLTS-Φ	DUTY
P-1	270	35	END SUCTION	5 - 208 - 3	CONDENSER WATER
P-2	210	40	END SUCTION	5 - 208 - 3	CHILLED WATER
P-3	70	30	IN-LINE	1 1/2 - 208 - 3	HOT WATER NEW BLDG.
P-4	30	28	IN-LINE	3/4 - 208 - 3	HOT WATER EXIST. BLDG.

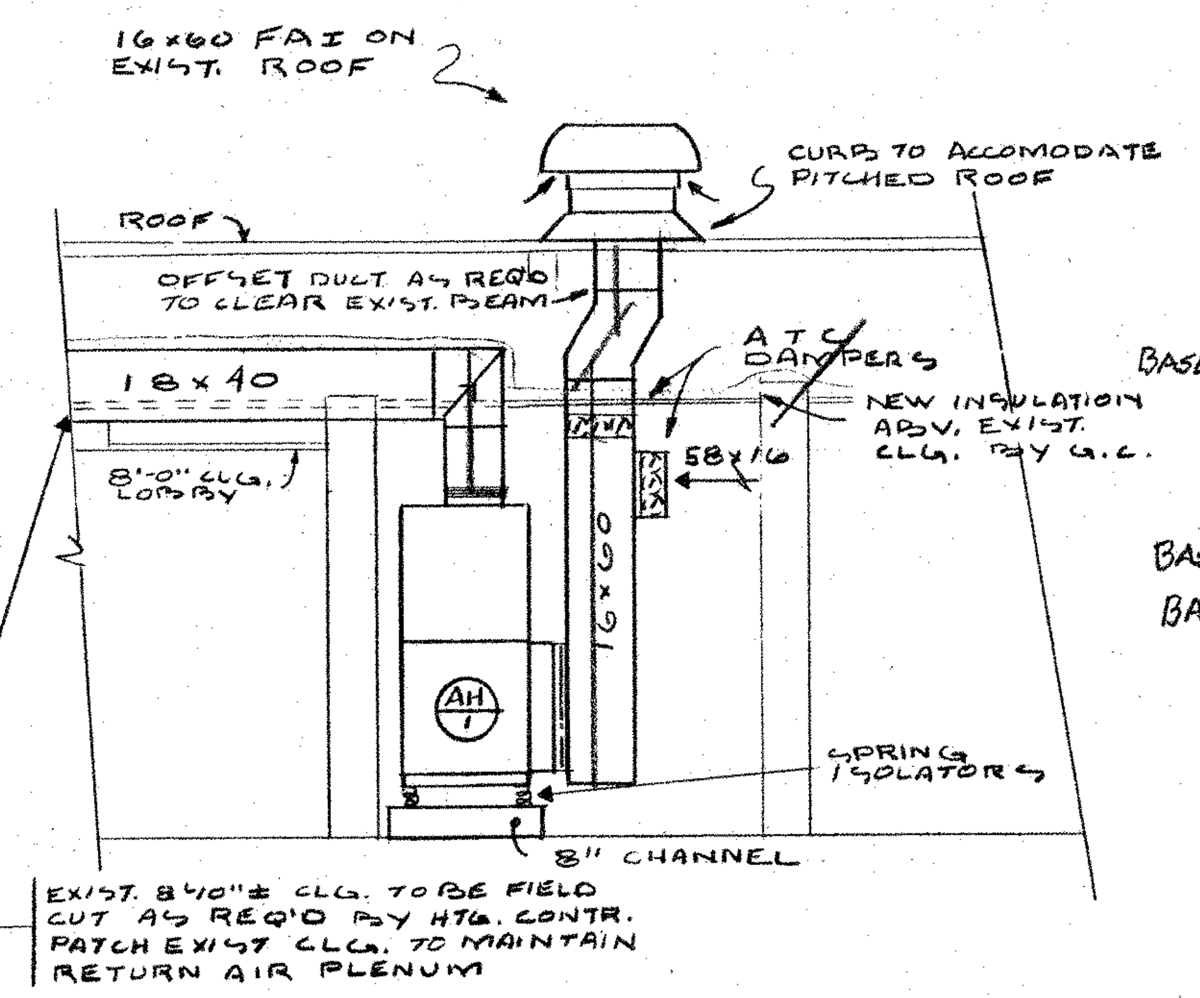
(F-1 / 3) FIN RADIATION - 810 BTU/LF @ 170° AWT, 1" TUBE, 3 3/4 x 2 3/4 ELEMENT, 63 FINS/FT, 1 ROW, 18" INST. HT. (3) INDICATES LENGTH OF ACTIVE FIN ELEMENT

(F-2) FIN RADIATION - 1220 BTU/LF @ 170° AWT, 1 1/4" TUBE, 4 1/4 x 4 1/4 ELEMENT, 48 FINS/FT, 1 ROW, 24" INST. HT.

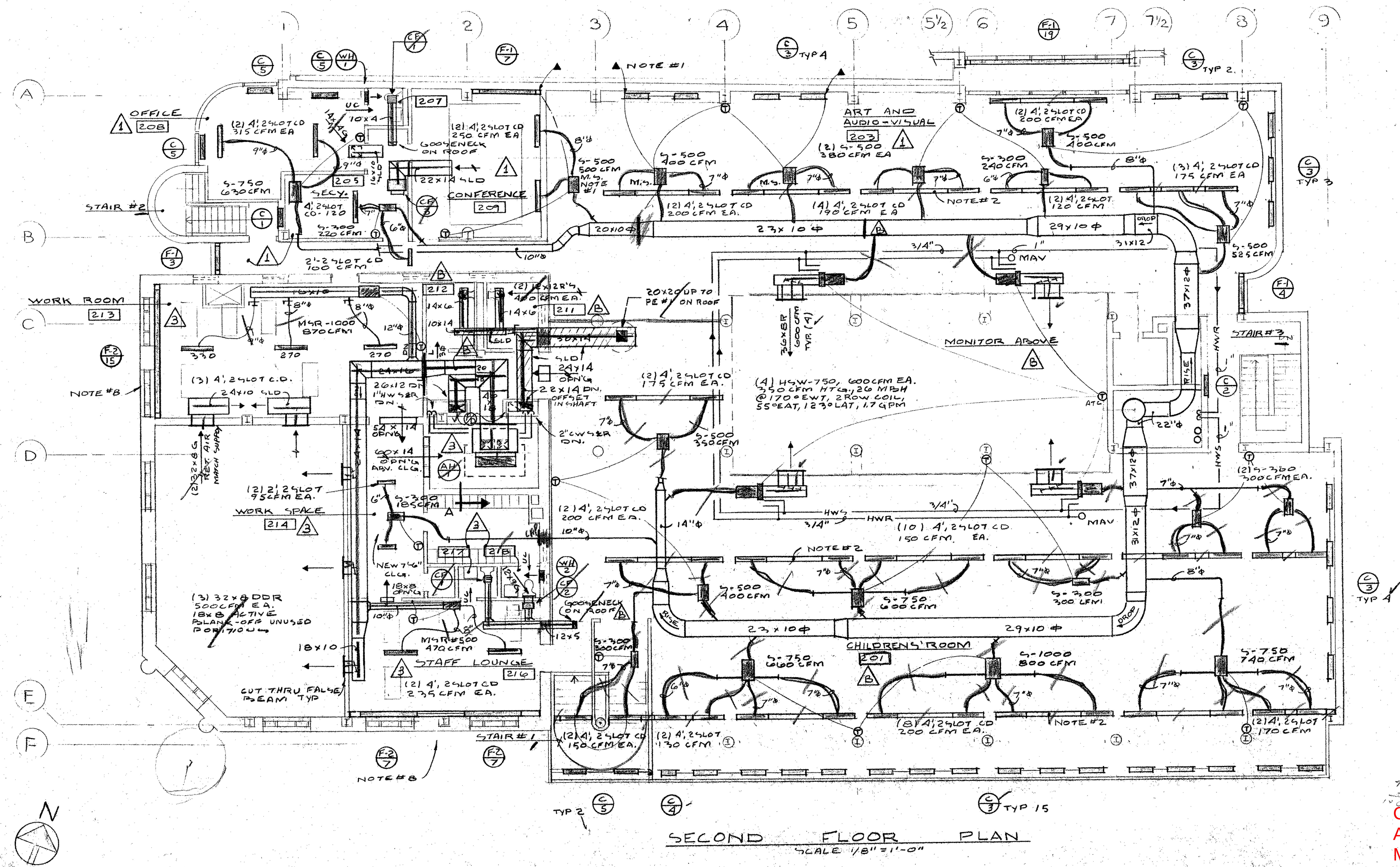
(WH / 1) WALL INSERT HEATER - CHROMALOX MODEL FWH-1000, 2560 BTU, 750 WATTS, 120 VOLTS - 1Φ

(WH / 2) WALL INSERT HEATER - CHROMALOX MODEL RSF-420, 6824 BTU, 2000 WATTS, 208 VOLTS - 1Φ

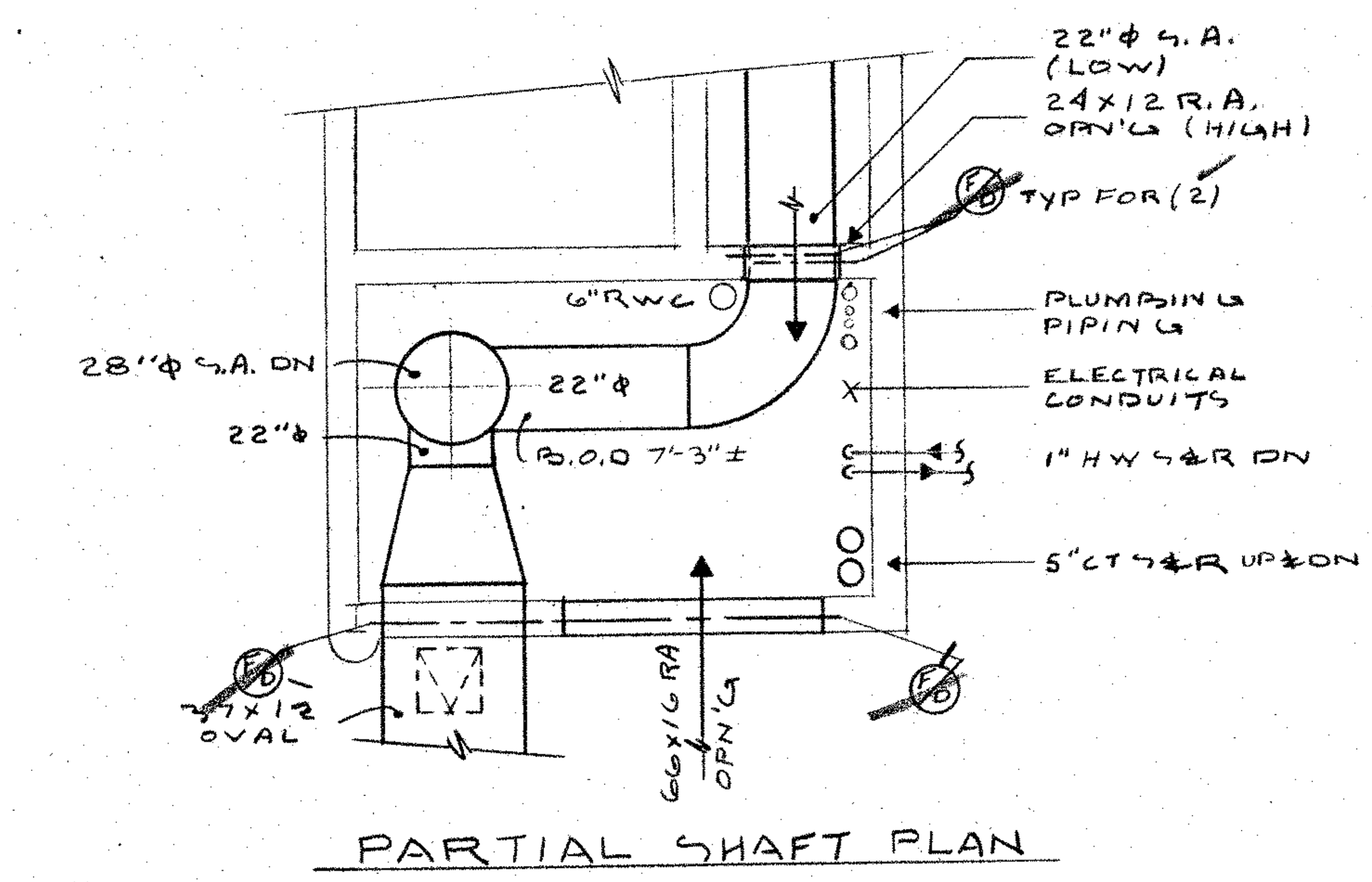
AIR FILTERS: CAMBRIDGE HI-CAP MODEL 45HC-1500, 1600 CFM EA., .21" INITAL P.D., .60" FINAL P.D., 32% AVG. EFFICIENCY, 24 x 24 x 9 DEEP, TOTAL OF 15 FILTERS IN HI-TRACK FRAME. PROVIDE 2" DEEP PREFILTERS.



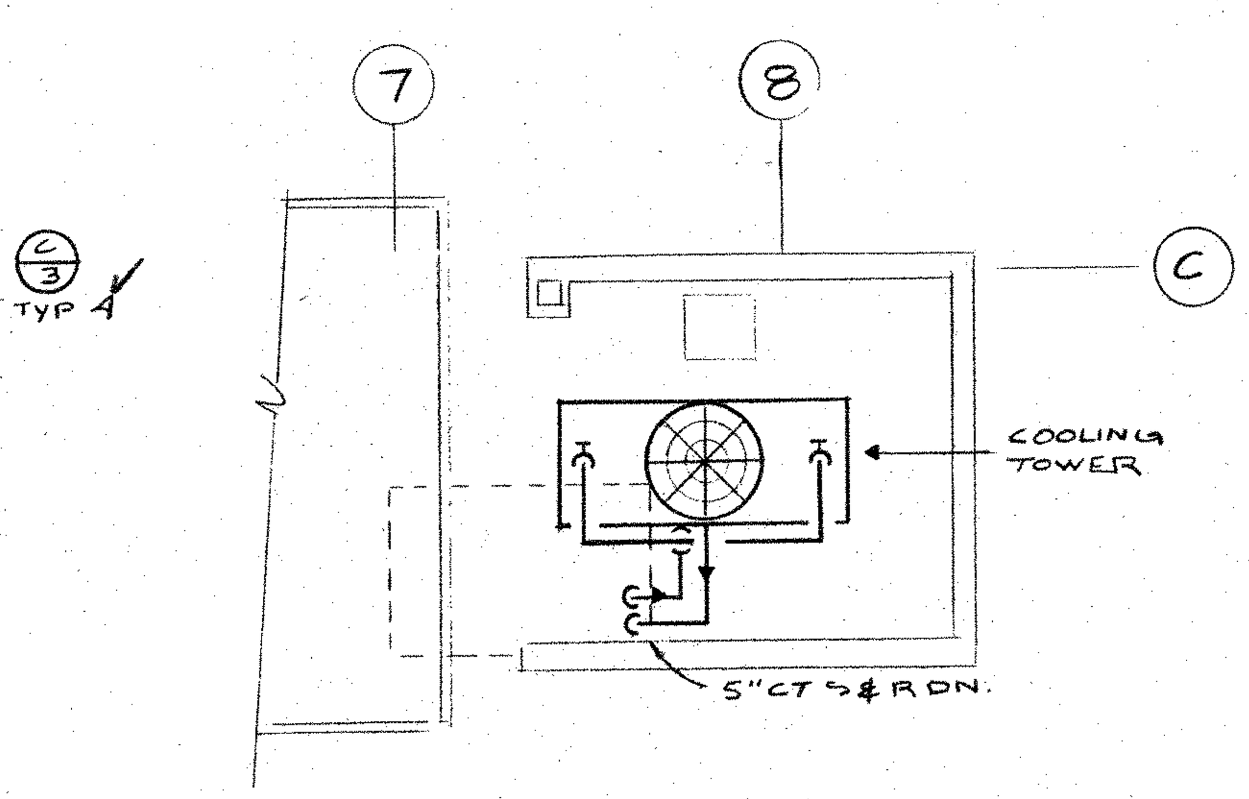
SECTION A-A
SCALE 1/4"=1'-0"



SECOND FLOOR PLAN
SCALE 1/8"=1'-0"



PARTIAL SHAFT PLAN
SCALE 1/4"=1'-0"



PARTIAL ROOF PLAN
SCALE 1/8"=1'-0"

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COMMONWEALTH OF PENNSYLVANIA PROFESSIONAL ENGINEER L. WALTON HEISS, JR.

THE J/S JOHNSON/SMITH PARTNERSHIP ARCHITECTS AND PLANNERS 15 WEST HIGHLAND AVE. PHILADELPHIA

PENNELL AND WILTBERGER CONSULTING MECHANICAL ENGINEERS
LAWRENCE ARATA, JR. STRUCTURAL ENGINEER

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SECOND FLOOR PLAN HEATING

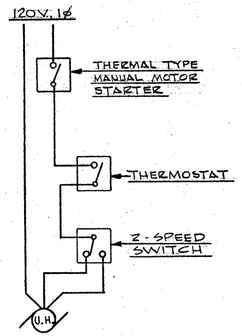
NO.	REVISIONS	DATE

DRAWN F.M.S. CHK'D L.W.H. DATE MAR. 1, 1977 SCALE AS NOTED

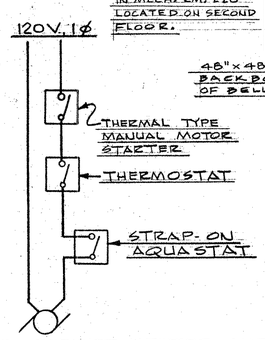
H-3

120/208V, 3φ, 4 WIRE LIGHTING PANELS

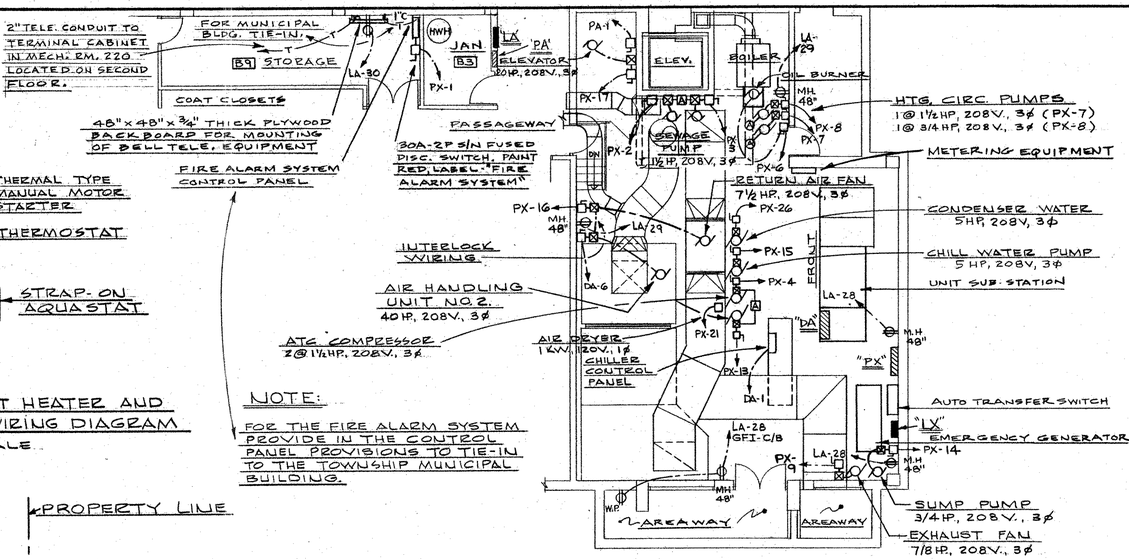
PANEL	CIRCUIT BREAKERS
"LA"	38-20A-1P CIR. BKRS. 2-30A-1P CIR. BKRS. 1-20A-2P CIR. BKRS. FLUSH MOUNTED PASSAGEWAY B-4
"LB"	54-20A-1P CIR. BKRS. 2-30A-1P CIR. BKRS. FLUSH MOUNTED NON-FICTION 104
"LC"	54-20A-1P CIR. BKRS. 2-30A-1P CIR. BKRS. FLUSH MOUNTED ART & AUDIO-VISUAL 203
"LD"	32-20A-1P CIR. BKRS. 1-50A-2P CIR. BKR. 1-30A-2P CIR. BKR. SURFACE MOUNTED MECH. ROOM 220
"LE"	14-20A.-1P. CIR. BKRS. 2-30A.-1P. CIR. BKRS. SURFACE MOUNTED CLOSED STACKS B17



TYPICAL UNIT HEATER WIRING DIAGRAM
NO SCALE



TYPICAL CABINET HEATER AND RECIRC. PUMP WIRING DIAGRAM
NO SCALE



NOTE:
FOR THE FIRE ALARM SYSTEM PROVIDE IN THE CONTROL PANEL PROVISIONS TO TIE-IN TO THE TOWNSHIP MUNICIPAL BUILDING.

MECHANICAL EQUIP. ROOM - PARTIAL PLAN

SCALE: 1/8" = 1'-0"

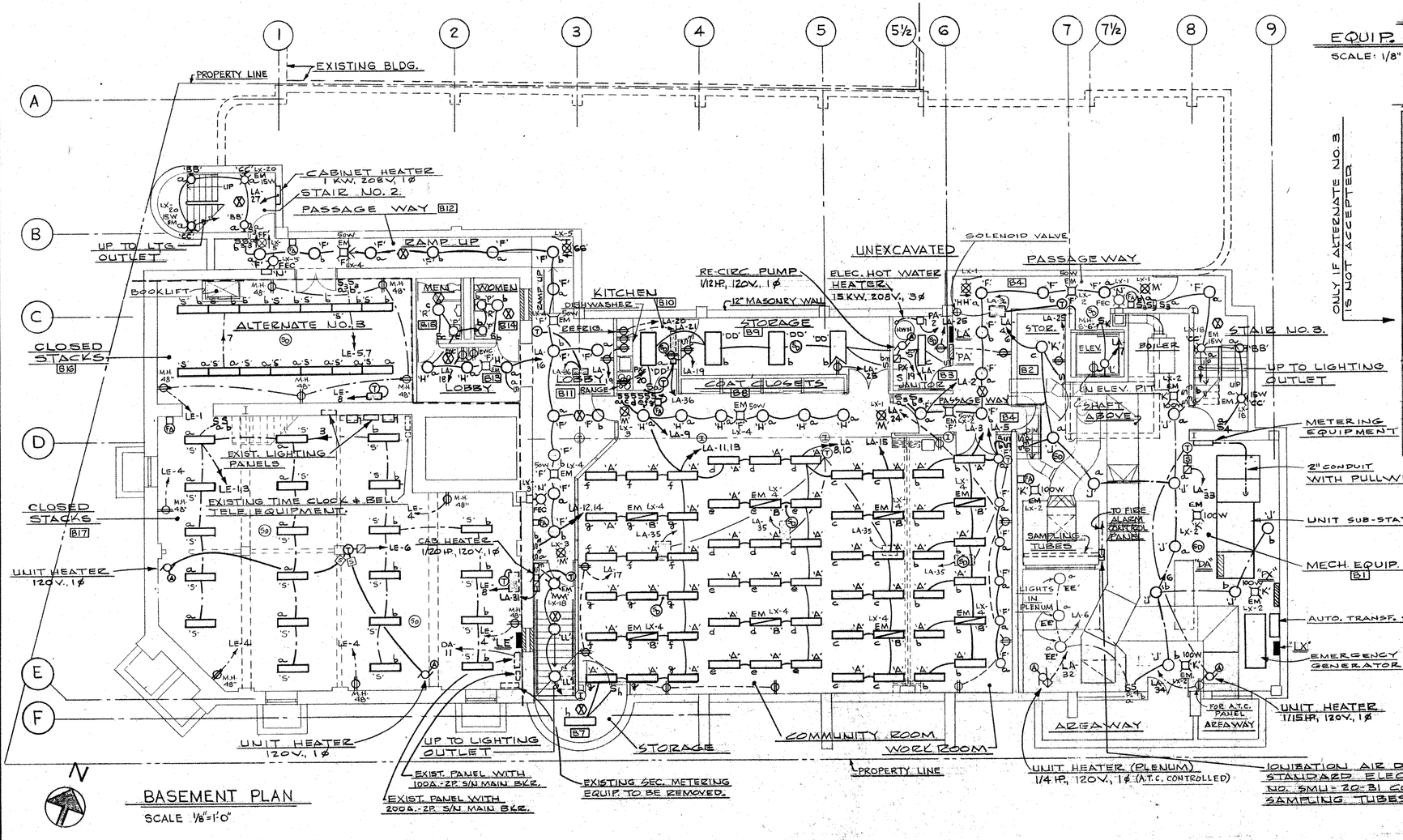
120/208V., 3φ, 4 WIRE PANEL-"DA" MECH. ROOM

SECTION OF UNIT SUB-STATION

CIR. NO.	EQUIPMENT NAME	MOTOR RATING KW-HP	VOLT	φ	FULL LOAD RATING POLES	FR.	TR.	CONDUIT & WIRE SIZE
	MAIN CIR. BREAKER			3	3	1200	1000	65,000 A.I.C.
1	CHILLER	274 FLA'S	208	3	3	600	500	4-2½"Ø RIGID CONDUIT 4-#4/0 THW
2	"LA"	30KW	120/208	3	3	225	150	2"C., 4-#1½ THW
3	"LB"	40KW	120/208	3	3	225	200	2"C., 4-#3/0 THW
4	"LC"	44KW	120/208	3	3	225	200	2"C., 4-#3/0 THW
5	EMERG. GEN. - "LX"/"PX"	30KW	120/208	3	3	225	125	1½"C., 4-#1 THW
6	AIR HAND. UNIT NO. 2	40HP	208	3	3	225	150	1½"C., 3-#1/0 THW
7	"PX"	211HP 31KW	120/208	3	3	400	250	2½"C., 4-250MCM THW
8	"LD"	35KW	120/208	3	3	225	150	2"C., 4-#1/0 THW
9	"PA"	43KW	120/208	3	3	225	200	2"C., 4-#3/0 THW
10	"LE"	7KW	120/208	3	3	100	70	1"C., 4-#6 THW
11.	EXISTING BUILDING	—	120/208	1	2	225	200	2"C., 4-#3/0 THW
12.	SPARE				3	100	100	
13.	SPARE				3	100	100	
14.	SPARE				3	100	100	

MAIN BUS: 1000 AMPS. — SOLID NEUTRAL

ONLY IF ALTERNATE NO.3 IS NOT ACCEPTED



N

BASEMENT PLAN
SCALE 1/8"=1'-0"

ALTERNATE NO.2.

IF ALTERNATE NO.2 IS NOT ACCEPTED THE ELECTRICAL CONTRACTOR SHALL FURNISH & INSTALL TWELVE (12) PORCELAIN LAMPHOLDERS WITH SWITCHES FOR TEMPORARY LIGHTING IN THE OPEN SPACE.

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ALL DIMENSIONS AND EXISTING CONDITIONS SHALL BE CHECKED AND VERIFIED BY CONTRACTOR AT THE SITE.

THE J/S JOHNSON/SMITH PARTNERSHIP
ARCHITECTS AND PLANNERS
15 WEST HIGHLAND AVE. PHILADELPHIA
FENNELL AND WILTBERGER
CONSULTING ENGINEERS

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HAVERFORD

BASEMENT FLOOR PLAN POWER & LIGHTING

NO.	REVISIONS	DATE

DRAWN R.J.K.
CHK'D D.G.D.
DATE MAR. 1, 1977
SCALE AS NOTED

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LIGHTING FIXTURE SCHEDULE

TYPE	MANUFACTURER	DESCRIPTION
"BB"	MCPHILBEN NO. GG-10VT-B STAIRS	WALL MOUNTED INCANDESCENT SQUARE TAPERED WHITE GLASS BLACK ANODIZED FINISH. (100W)
"CC"	MCPHILBEN NO. GG-10VT-B-NL STAIRS	SIMILAR TO TYPE 'BB' EXCEPT FOR ADDITIONAL SOCKET FOR EMERGENCY. (1-100W NORMAL)(15W S-8DC EMERG.)
"DD"	LIGHTING PRODUCTS NO. EV24G19 R440 RARE BOOK	RECESSED 2'x4' RAPID START FLUORESCENT WITH ACRYLIC PRISMATIC LENS. (4-40W)
"EE"	SPERO NO. 2175-XCG PLENUM	CEILING MOUNTED INCANDESCENT VAPOR TIGHT WITH CAST ALUMINUM SCREW ON GUARD. (100W)
"FF"	DEVINE LTG. NO. GC55LR/SW PASSAGE	CEILING MOUNTED INCANDESCENT EXIT LIGHT STENCIL FACE DIRECTIONAL ARROWS & DOWN LIGHT. (2-T-6½-20W)
"GG"	DEVINE LTG. NO. GR50L/SW PASSAGE	WALL MOUNTED INCANDESCENT EXIT LIGHT STENCIL FACE ARROW LEFT DOWNLIGHT (2-T-6½-20 W)
"HH"	DEVINE LTG. NO. GR50R/SW PASSAGE	WALL MOUNTED INCANDESCENT EXIT LIGHT STENCIL FACE DOWNLIGHT. (2-T-6½-20W)

LIGHTING FIXTURE SCHEDULE

TYPE	MANUFACTURER	DESCRIPTION
"R"	KURT VERSEN NO. L832 TOILET ROOM	SURFACE MOUNTED WHITE OPAL GLASS DRUM 12" DIA. INCANDESCENT. (2-60W)
"S"	LIGHTING PRODUCTS NO. 969024 JANITOR	SURFACE MOUNTED RAPID START FLUORESCENT WITH ACRYLIC PRISMATIC DIFFUSER. (2-40W)
"T"	KURT VERSEN NO. F5G38/CR OFFICE	RECESS INCANDESCENT WITH REGRESSED FRESNEL LENS AND COLORED LENS RISERS. (300W PS-25IF)
"U"	KURT VERSEN NO. E7568 OFFICE	RECESS INCANDESCENT WALL WASH DOWNLIGHT WITH RIDGED BAFFLE ALZAK REFLECTOR. (150W R-40 FL)
"W"	KURT VERSEN NO. L830 JANITOR CLOSET	SURFACE MOUNTED WHITE OPAL GLASS DRUM 10" DIA. INCANDESCENT. (2-50W)
"Y"	MCPHILBEN NO. 43-06E EXTERIOR	RECESS INCANDESCENT WITH NO. 43-06FFJB PLASTER FRAME WITH REGRESSED FRESNEL LENS. (150W A-23)
"AA"	MCPHILBEN NO. 43-06E-NL EXTERIOR	SIMILAR TO TYPE-'Y' EXCEPT FOR ADDITIONAL SOCKET FOR EMERGENCY. (150W A-23 NORMAL)(10W EMERG)

* LIGHTING FIXTURE SCHEDULE

TYPE	MANUFACTURER	DESCRIPTION
"A"	LIGHTING PRODUCTS NO. EV14F19R240/G857 READING AREAS	RECESS 1'x4' RAPID START FLUORESCENT WITH PRISMATIC LENS. PROVIDE FILLER PANELS WHERE INDICATED. FINISH AS SELECTED BY THE ARCHITECT. (2-40W)
"B"	LIGHTING PRODUCTS NO. EV14F19R340/G857 READING AREAS	SIMILAR TO TYPE-'A' EXCEPT THREE LAMPS - WITH ONE (1) LAMP EMERGENCY. (3-40W)
"C"	KURT VERSEN NO. R7333-400-120-MH BROWSING	RECESS METAL HALIDE ALZAK REFLECTOR HPF BALLAST PREWIRED. (400W, BT-37)
"D"	KURT VERSEN NO. R7333-400-120-MH-AO BROWSING	SIMILAR TO TYPE-'C' EXCEPT ADDITIONAL SOCKET FOR QUARTZ LAMP. (1-400W, BT-37) (1-Q250T-4)
"E"	KURT VERSEN NO. R7333-400-120-MH-EC BROWSING	SIMILAR TO TYPE-'C' EXCEPT ADDITIONAL SOCKET FOR QUARTZ LAMP. (1-400W, BT-37)(1-Q250T-4)
"F"	KURT VERSEN NO. F5G37/CR REFERENCE	RECESS INCANDESCENT WITH REGRESSED FRESNEL LENS AND COLORED LENS RISERS. (150W, A-23IF)
"G"	LIGHTING PRODUCTS NO. EAV24GB6R440 WORK ROOM	RECESS REGRESSED AIR RETURN TO PLENUM 2'x4' WITH ACRYIC PRISMATIC DIFFUSER. (4-40W)
"H"	KURT VERSEN NO. F5G3G/CR PASSAGE	RECESS INCANDESCENT WITH REGRESSED FRESNEL LENS AND COLORED LENS RISERS. (100W, A-21IF)
"J"	SPERO NO. D514/114-AR MECH. ROOM	PENDANT MOUNTED INCANDESCENT 14" DIA. RLM STANDARD DOME WITH WIRE GUARD. (150W)
"K"	SPERO NO. D512/112-AR MECH. ROOM	PENDANT MOUNTED INCANDESCENT 12" DIA. RLM STANDARD DOME WITH WIRE GUARD. (100W)
"L"	SPERO NO. 2190-CG ELEV. PIT	WALL MOUNTED CLEAR GLASS GUARD INCANDESCENT VAPOR TIGHT UNIT. (100W)
"M"	DEVINE LTG. NO. GC50/SW PASSAGES	CEILING MOUNTED INCANDESCENT EXIT LIGHT STENCIL FACE AND DOWN LIGHT. (2-T-6½-20W)
"N"	PERFECLITE NO. XL-NL-6864-R FIRE EXTINGUISHERS	INCANDESCENT GASKET RED DOME SIGNAL LIGHT - SATIN ALUMINUM FINISH EXTENDED SERVICE LAMP LIFE. (25W)
"P"	ART METAL NO. 9000 TOILET ROOMS	INCANDESCENT OPAL GLASS DIFFUSER OVER MIRROR LIGHT WITH GROUNDED CONVENIENCE OUTLET. (2-60W)

*-CONTRACTOR SHALL VERIFY CEILING CONTRUCTION FOR PROPER MOUNTING IN CEILING TO BE INSTALLED.

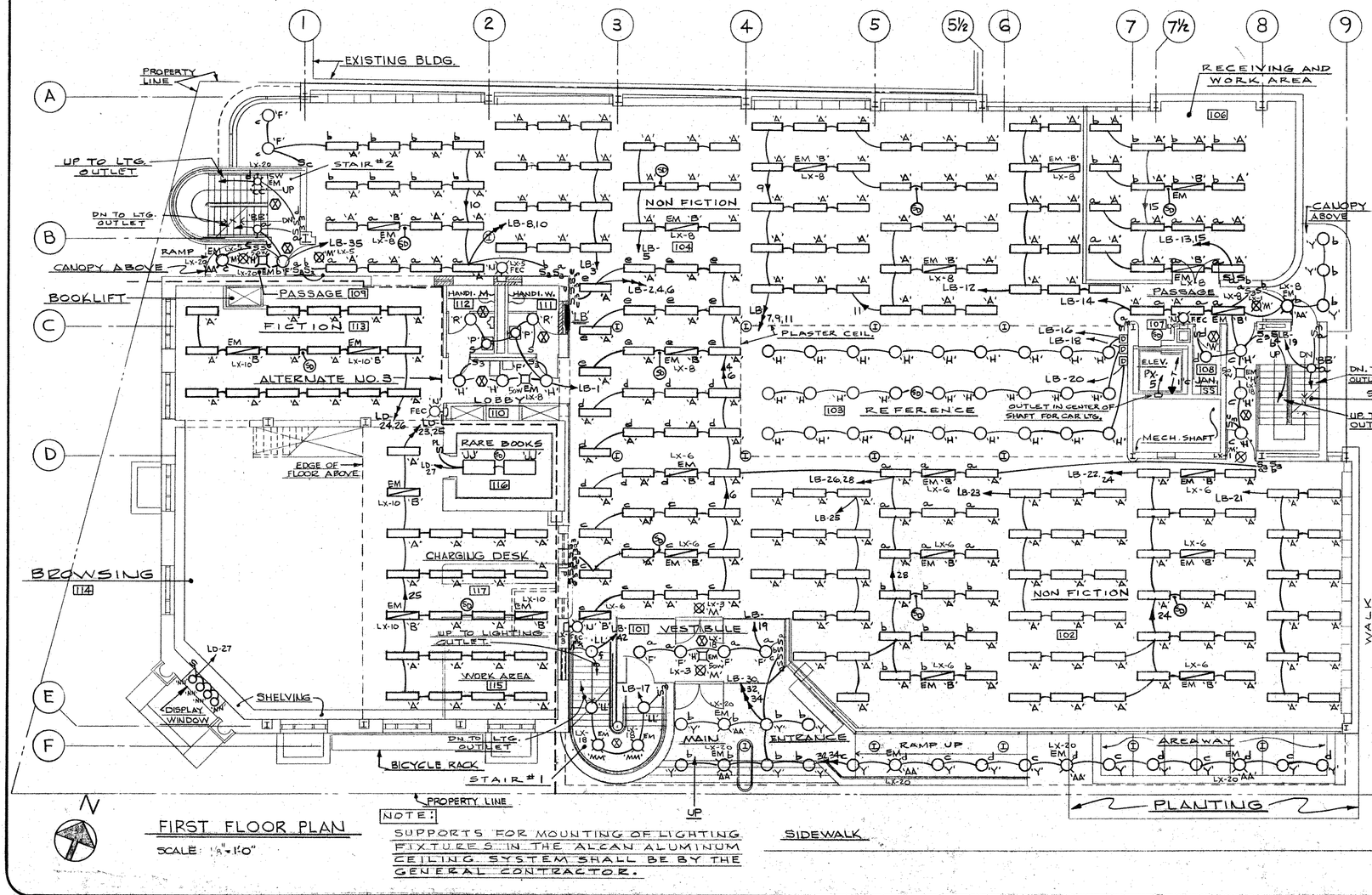
NOTE:

ALL 40 WATT FLUORESCENT TWO LAMP FIXTURES SHALL BE FURNISHED WITH ADVANCE MARK III KOOL-KOIL ENERGY SAVER FULL LIGHT OUTPUT FLUORESCENT BALLASTS. (ADVANCE NO. R2S40-TP.)

[D]-DIMMING SWITCHES SHALL BE HUNT ELECTRONICS NO. A-1500 ROTARY INCANDESCENT DIMMER. (1500 WATT CAPACITY)

LIGHTING FIXTURE SCHEDULE

TYPE	MANUFACTURER	DESCRIPTION
"JJ"	LIGHTING PRODUCTS NO. 969144 RARE BOOKS	SURFACE MOUNTED RAPID START FLUORESCENT WITH ACRYLIC PRISMATIC DIFFUSER. 16" WIDE (4-40W)
"KK"	DEVINE LTG. NO. GR50/SW READING	WALL MOUNTED INCANDESCENT EXIT LIGHT STENCIL FACE DOWNLIGHT. (2-T-6½-20W)
"LL"	MARCO NO. R3-T31J STAIRS	RECESS INCANDESCENT DROP OPAL DIFFUSER WHITE FINISH PREWIRED. (150W)
"MM"	MARCO NO. R3-T31J-NL STAIRS	SIMILAR TO TYPE-"LL" EXCEPT FOR ADDITIONAL SOCKET FOR EMERGENCY. (150W NORMAL)(25W EMERG.)
"NN"	KURT VERSEN NO. G77G7 DISPLAY WINDOW	RECESS INCANDESCENT PREWIRED LOUVER. MATTE WHITE TRIM BLACK LOUVER. (150W A-21IF)



FIRST FLOOR PLAN

SCALE: 1/8"=1'-0"

NOTE:

SUPPORTS FOR MOUNTING OF LIGHTING FIXTURES IN THE ALCAN ALUMINUM CEILING SYSTEM SHALL BE BY THE GENERAL CONTRACTOR.

THE J/S JOHNSON/SMITH PARTNERSHIP
ARCHITECTS AND PLANNERS
15 WEST HIGHLAND AVE. PHILADELPHIA

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HAVERTOWN PA.

FIRST FLOOR PLAN
LIGHTING-ELECTRICAL

NO.	REVISIONS	DATE

DRAWN E.J.K.
CHK'D D.G.D.
DATE MAR.1,1977
SCALE AS NOTED

E-2

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120/208V., 3Ø, 4 WIRE
"PA" - PASSAGE WAY B-4

FLUSH MOUNTED

CIR. NO.	EQUIPMENT NAME	RATING HP, KW	VOLTS	Ø	PNL C/B RATING POLES	FR.	TRIP	CONDUIT & WIRE SIZE
1.	ELEV. CONTROLS	1KW	120/208	1	2	100	30	3/4"C., 3-#10THW
2.	H.W. HEATER	15KW	208	3	3	100	90	1 1/4"C., 4-#4THW
3.	CAB. HEATER	5KW	208	3	3	100	30	3/4"C., 4-#10THW
4.	CAB. HEATER	12KW	208	3	3	100	70	1"C., 4-#6THW
5.	CAB. HEATER	5KW	208	3	3	100	30	3/4"C., 4-#10THW
6.	CAB. HEATER	5KW	208	3	3	100	30	3/4"C., 4-#10THW
7.	SPARE				3	100	20	
8.	SPARE				3	100	20	
9.	SPACE				3	100		
10.	SPACE				3	100		
MAIN BUS: 225 AMPS.	2" C 4-#3/0THW							SOLID NEUTRAL

ELECTRICAL SYMBOL LIST

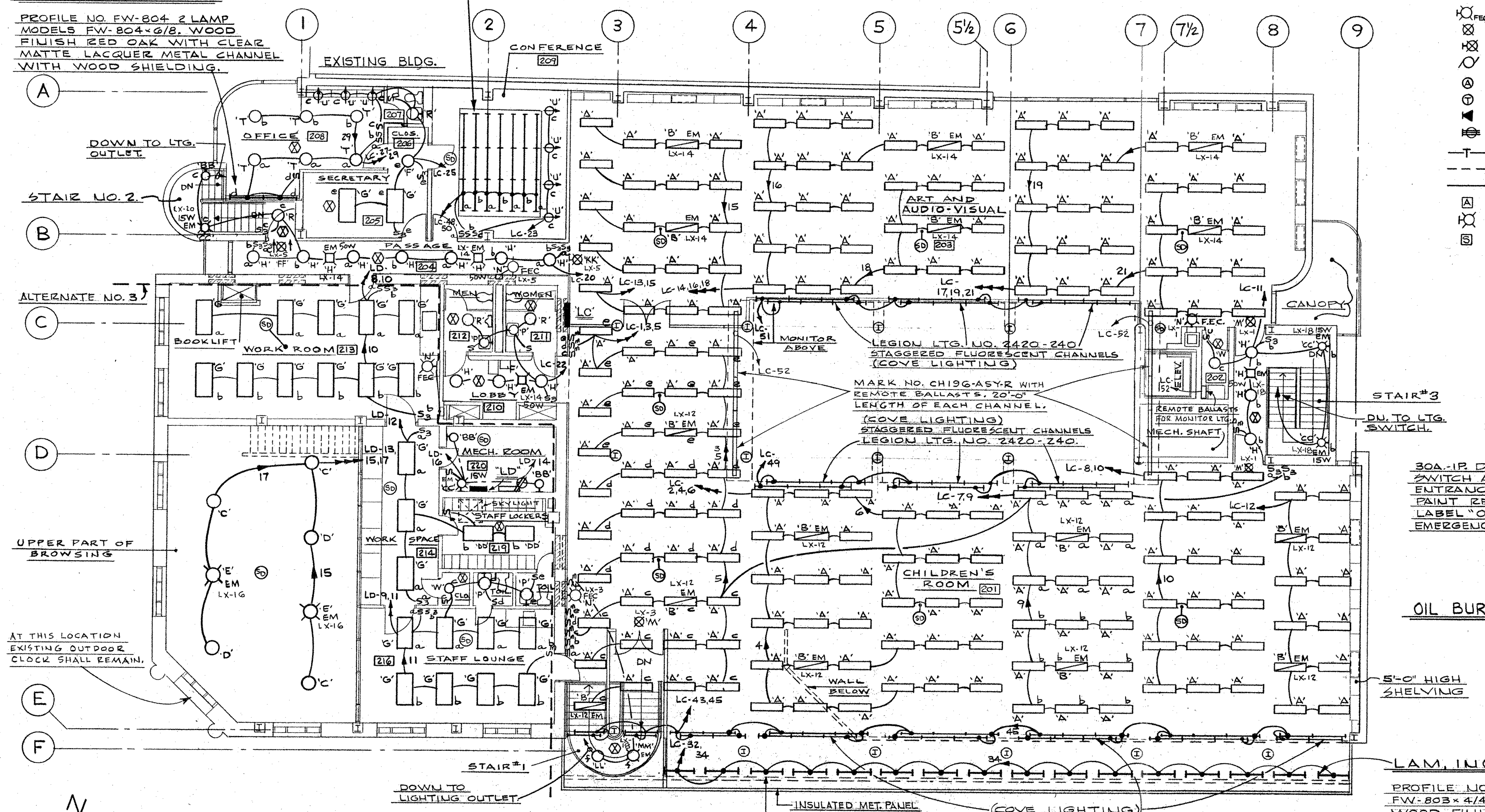
- INCANDESCENT CEILING FIXTURE
- WALL MOUNTED FIXTURE
- FLUORESCENT FIXTURE
- CEILING EMERGENCY LIGHT
- CEILING SMOKE & HEAT DETECTOR
- CEILING HEAT DETECTOR
- FIRE ALARM STATION & GONG
- FIRE ALARM GONG
- FIRE ALARM STATION
- DISCONNECT SWITCH
- MAGNETIC MOTOR STARTER
- THERMAL MOTOR STARTER SWITCH.
- PANEL BOARD
- POWER PANEL
- DUPLEX RECEPTACLE
- CLOCK OUTLET
- S SINGLE POLE SWITCH
- S3 THREE-WAY SWITCH
- S4 FOUR-WAY SWITCH
- M.H. MOUNTING HEIGHT
- EWC ELECTRIC WATER COOLER
- P.L. PILOT LIGHT
- EM. EMERGENCY
- E.F. EXHAUST FAN
- FEC FIRE EXTINGUISHER CABINET LIGHT
- CEILING EXIT LIGHT
- WALL MOUNTED EXIT LIGHT
- MOTOR OUTLET
- AQUA STAT
- THERMO STAT
- BELL TELEPHONE OUTLET
- 3-WIRE HEAVY DUTY RANGE RECEPTACLE - 50 AMP.
- —T— TELEPHONE CONDUIT
- CONDUIT BELOW CONCEALED
- CONDUIT ABOVE CONCEALED
- ALTERNATOR
- WALL MOUNTED COMBINATION NORMAL & EMERGENCY FIXTURE
- SPEED SWITCH

ILLUMINATED CEILING NOTE

ILLUMINATED CEILING SHALL BE 9'-0" x 15'-0" (36"x36" MODULAR) CONTEMPORARY CEILINGS, INC. "LUMATWEED 2000" FIXED LOUVER GOLD FINISH .040" THICK ALUMINUM COMPLETE WITH ALL HANGING AND INSTALLATION ACCESSORIES. LIGHTING FIXTURES SHALL BE KEYSTONE LIGHTING NO. C240 BAKED WHITE ENAMEL FINISH & FLUORESCENT CHANNELS.

LAM, INC. LIGHTING

PROFILE NO. FW-804 2 LAMP MODELS FW-804x6/8. WOOD FINISH RED OAK WITH CLEAR MATTE LACQUER METAL CHANNEL WITH WOOD SHIELDING.



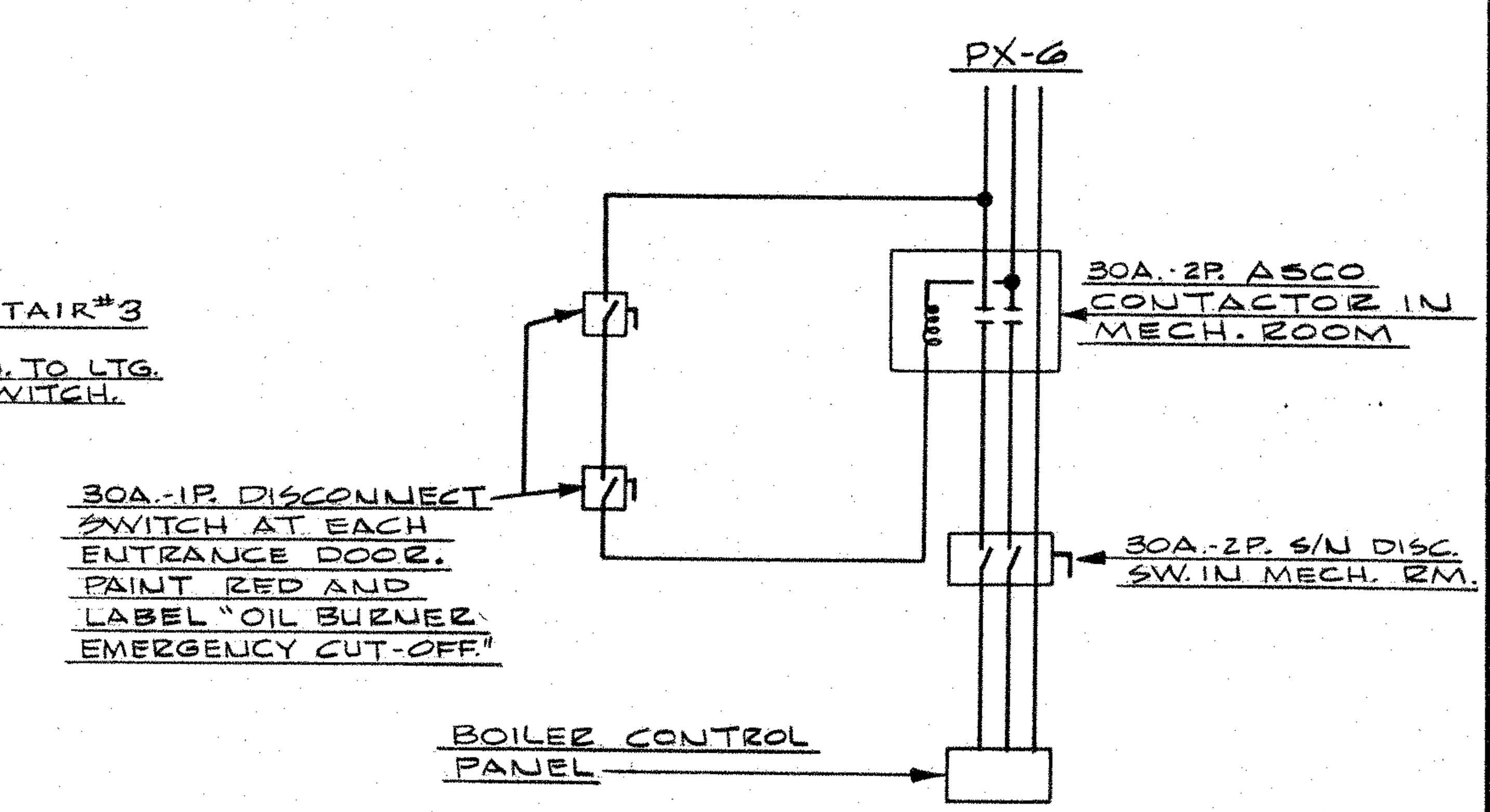
LAM, INC. LIGHTING

PROFILE NO. FW-803-2LAMP MODELS FW-803x4/4 TOTAL OF SIXTEEN (16) UNITS. WOOD FINISH RED OAK WITH CLEAR MATTE LACQUER METAL CHANNEL WITH WOOD SHIELDING.

ALL DIMENSIONS AND EXISTING CONDITIONS SHALL BE CHECKED AND VERIFIED BY CONTRACTOR AT THE SITE.

SECOND FLOOR PLAN

SCALE: 1/8" = 1'-0"



OIL BURNER EMERGENCY CUT-OFF WIRING DIAGRAM

NO SCALE

THE JOHNSON/SMITH PARTNERSHIP
ARCHITECTS AND PLANNERS
15 WEST HIGHLAND AVE. PHILADELPHIA

HAVERFORD TOWNSHIP FREE LIBRARY
DARBY ROAD AND MILL ROAD HAVERTOWN PA

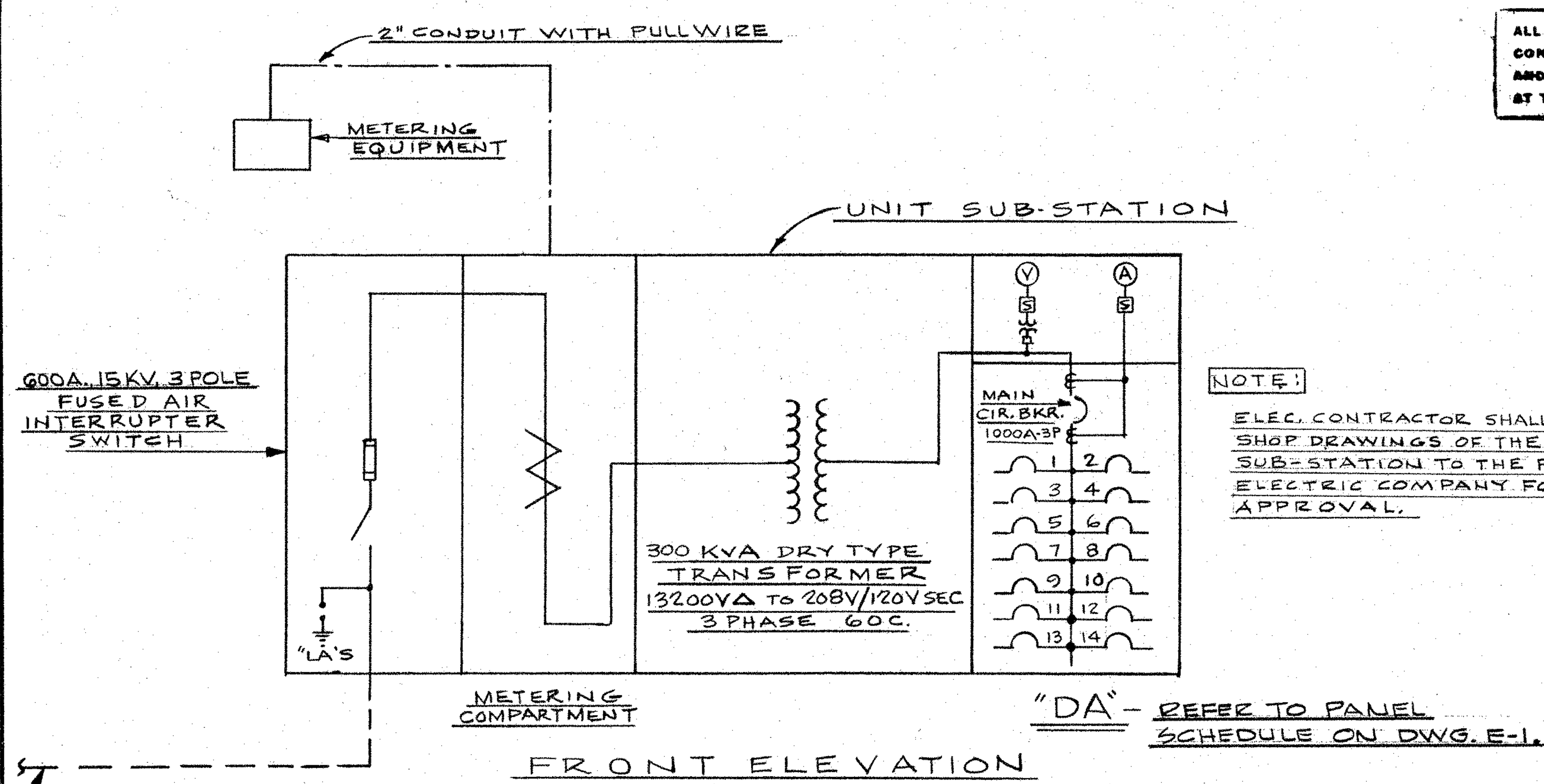
SECOND FLOOR PLAN LIGHTING - ELECTRICAL

NO.	REVISIONS	DATE

DRAWN R.J.K.
CHK'D D.G.D.
DATE MAR. 1, 1977
SCALE AS NOTED

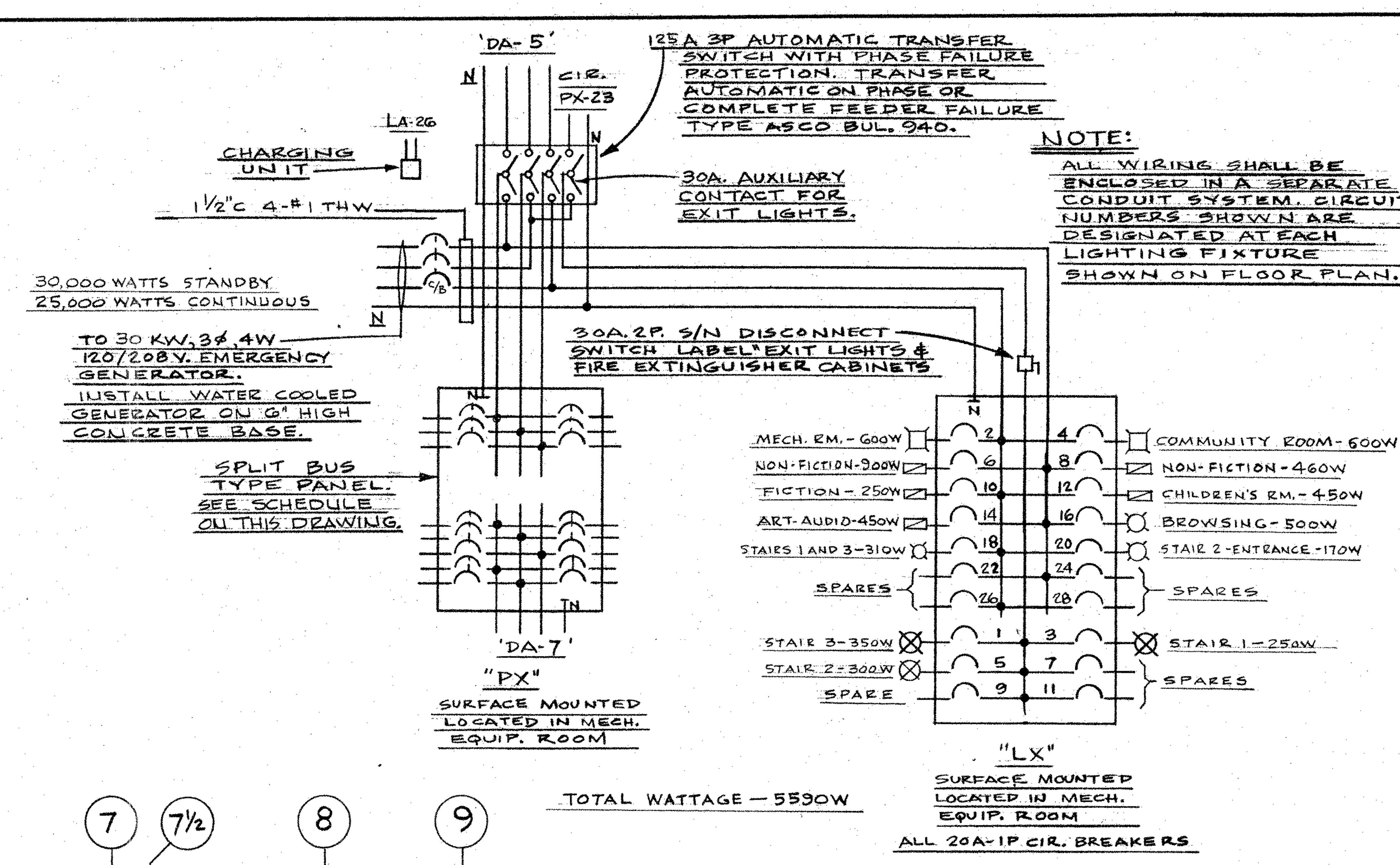
E-3

ALL DIMENSIONS AND EXISTING CONDITIONS SHALL BE CHECKED AND VERIFIED BY CONTRACTOR AT THE SITE.



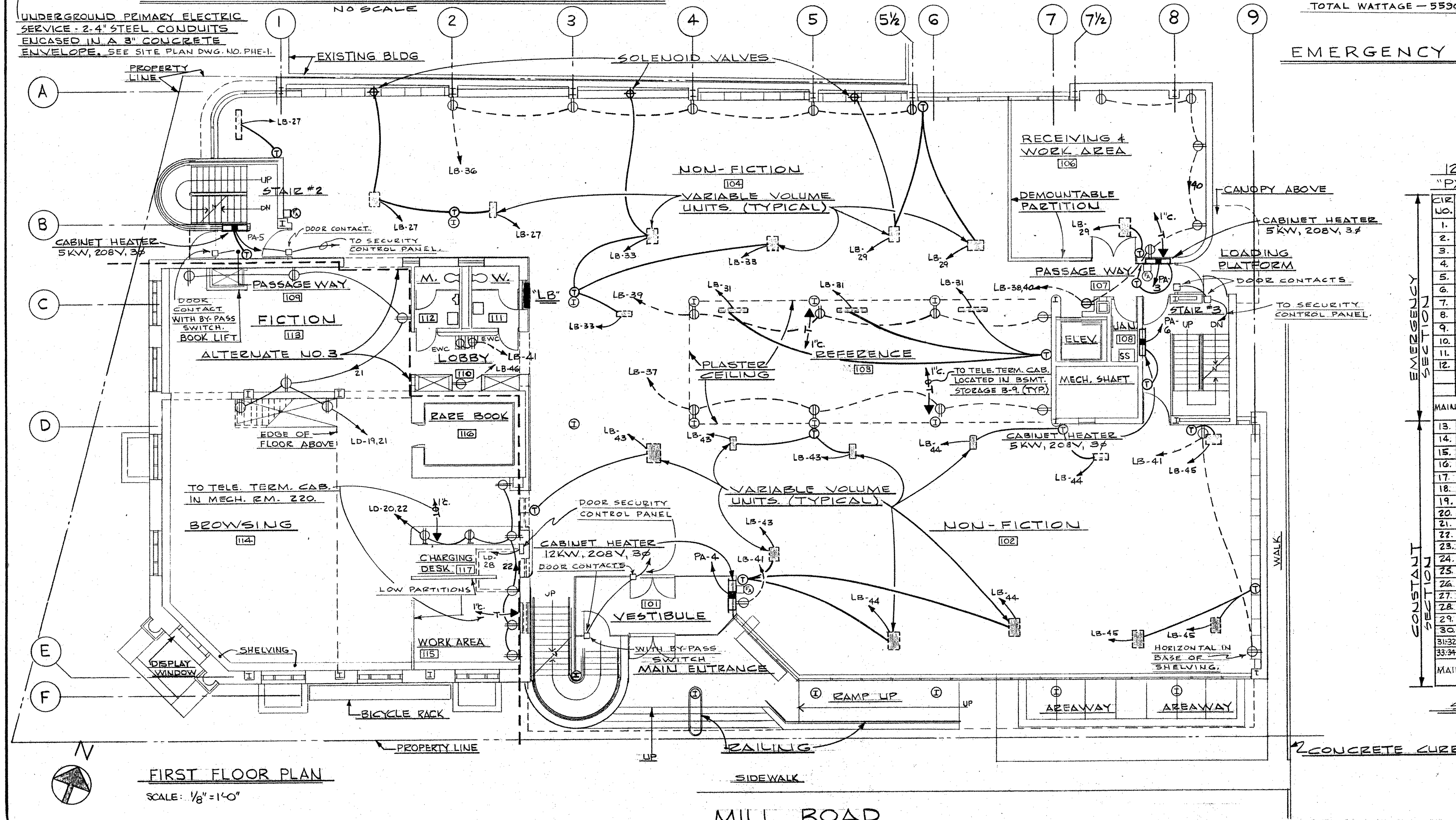
SINGLE LINE SERVICE DIAGRAM

NO SCALE



EMERGENCY SYSTEM WIRING DIAGRAM

NO SCALE



FIRST FLOOR PLAN

SCALE: 1/8" = 1'-0"

120/208V., 3Ø, 4 WIRE

"PX" - MECH. ROOM B-1

SURFACE MOUNTED

Section	CIR. NO.	EQUIPMENT NAME	MOTOR RATING HP. KW	VOLT	Ø	PNL S/B RATING POLES	FR	TR	CONDUIT & WIRE SIZE
EMERGENCY SECTION	1.	FIRE ALARM SYS.	1 KW	120/208	1	2	100	20	3/4"C - 3-#12-THW
	2.	SEWAGE PUMP	1½ HP	208	3	3	100	20	3/4"C., 3-#12THW
	3.	SEWAGE PUMP	1½ HP	208	3	3	100	20	3/4"C., 3-#12THW
	4.	A.T.C. COMPRESSOR	1½ HP	208	3	3	100	20	3/4"C., 3-#12THW
	5.	ELEV. CAR LIGHTS	1 KW	120	1	1	100	20	3/4"C., 2-#12THW
	6.	BOILER	½ HP	120	1	1	100	30	3/4"C., 3-#10 THW
	7.	HTG. CIRC. PUMP	1½ HP	208	3	3	100	20	3/4"C., 3-#12THW
	8.	HTG. CIRC. PUMP	3/4 HP	208	3	3	100	20	3/4"C., 3-#12THW
	9.	EXHAUST FAN	7/8 HP	208	3	3	100	20	3/4"C., 3-#12THW
	10.	SPARE				2	100	20	
	11.	SPARE				3	100	20	
	12.	SPACE				3	100		
	MAIN BUS: 400 AMPS.		1½"C 4-#1 THW						SOLID NEUTRAL
CONSTANT SECTION	13.	A.T.C. COMPRESSOR	1½ HP	208	3	3	100	20	3/4"C., 3-#12THW
	14.	SUMP PUMP	3/4 HP	208	3	3	100	20	3/4"C., 3-#12THW
	15.	CHILL. WATER PUMP	5 HP	208	3	3	100	40	3/4"C., 3-#10THW
	16.	RETURN AIR FAN	7½ HP	208	3	3	100	50	3/4"C., 3-#10THW
	17.	ELEVATOR	20 HP	208	3	3	100	100	1¼"C., 4-#2THW
	18.	PARK. AREA LTG.	500W	208	1	2	100	20	3/4"C., 2-#8 THW
	19.	RE-CIRC. PUMP	1/12 HP	120	1	1	100	20	3/4"C., 2-#12THW
	20.	KITCHEN UNIT	10KW	208	3	3	100	70	1"C., 3-#6THW
	21.	AIR DRYER	1 KW	120	1	1	100	30	3/4"C., 2-#10 THW
	22.	AGITATOR AND TREATMENT PUMP	1/4-1/4	120	1	1	100	30	3/4"C., 2-#10 THW
	23.	EXIT LIGHTS	1 KW	120	1	1	100	30	3/4"C., 2-#10 THW
	24.	FAN HTR. AND PIPE HEATING CABLES	5 KW	120/208	3	3	100	30	3/4"C., 4-#10THW
	25.	COOLING TWR. FAN	5 HP	208	3	3	100	40	3/4"C., 3-#10 THW
	26.	CONDENSER WATER	5 HP	208	3	3	100	40	3/4"C., 3-#10THW
	27.	ROOF EXHAUST FAN	3/4 HP	120	1	1	100	40	3/4"C., 2-#10THW
	28.	BOOKLIFT	1½ HP	208	3	3	100	20	3/4"C., 4-#10 THW
	29.	AIR HAND. UNIT NO. 2	3 HP	208	3	3	100	30	3/4"C., 3-#12THW
	30.	SPARE				3	100	30	
	31-32	SPARES				3	100	20	
	33-34	SPACES				3	100		
	MAIN BUS: 400 AMPS.		2½"C 4-250MCM THW						SOLID NEUTRAL

SPLIT BUS TYPE PANEL

CONSTRUCTION DRAWINGS FROM THE 1970'S ARE PROVIDED FOR INFORMATION ONLY. AND MAY NOT REFLECT CURRENT AS-BUILT CONDITIONS. BIDDERS ARE TO REVIEW FIELD CONDITIONS TO CONFIRM ACCURACY.

THE J/S JOHNSON/SMITH PARTNERSHIP ARCHITECTS AND PLANNERS 15 WEST HIGHLAND AVE. PHILADELPHIA

HAVERFORD TOWNSHIP FREE LIBRARY

DARBY ROAD AND MILL ROAD HAVERTOWN PA

FIRST FLOOR PLAN POWER - ELECTRICAL

NO.	REVISIONS	DATE

DRAWN R.J.K.
CHK'D D.G.D.
DATE MAR. 1, 1977
SCALE AS NOTED

E-4

TYPICAL WIRING DIAGRAM FOR VARIABLE VOLUME UNITS
NO SCALE
VARIABLE VOLUME UNIT LOCATED ABOVE CEILING. BY HEATING CONTR.
TRANSFORMER 120V/24V. BY HEATING CONTR.
DISCONNECT SWITCH BY ELECTRICAL CONTR.
120V.
TO ADDITIONAL VARIABLE VOLUME UNITS ABOVE CEILING.
THERMOSTAT BY HEATING CONTR.
ALL WIRING COMPLETE BY THE ELECTRICAL CONTRACTOR.
ALTERNATE NO. 1.
IF ALTERNATE NO. 1 IS NOT ACCEPTED, THE ELECTRICAL CONTRACTOR SHALL WIRE COMPLETE TWO(2) UNIT HEATERS BEING INSTALLED UNDER THE MECHANICAL CONTRACT.
THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL TWELVE (12) PORCELAIN LAMPHOLDERS WITH SWITCHES FOR TEMPORARY LIGHTING IN THE OPEN SPACE.
TYPICAL WIRING DIAGRAM FOR CHEMICAL FEED SYSTEM
NO SCALE
SOLENOID VALVE (IF REQ'D)
PX-26
PX-22
TREATMENT PUMP MOTOR
TIME CLOCK (IF REQ'D)
J.B.
JUNCT. BOX
MOTOR STARTER
AUX. CONTACT
AGITATOR MOTOR
CONTAINING THERMAL TYPE MANUAL MOTOR STARTERS.
CONDENSER WATER PUMP
TYPICAL WIRING DIAGRAM FOR HEATING CIRC. PUMPS, CHILL WATER PUMP, CONDENSER WATER PUMP, ROOF EXHAUST FAN, COOLING TOWER FAN, AND AIR HANDLING UNITS NO. 1 & NO. 2.
DISCONNECT SWITCH
MAGNETIC MOTOR STARTER
P.E. SWITCH LOCATED ADJACENT TO THE MOTOR STARTERS.
CHILLER POWER & CONTROL WIRING
NO SCALE
2-2½"C'S. EACH CONTAINING 4-#4/0 THW
DA-1
CHILLER DISCONNECT SWITCH
CHILLER STARTER
COND. WATER FLOW SWITCH
CHILL WATER FLOW SWITCH
CHILLER CONTROL TERMINAL STRIP.
COMPRESSOR
COOLING TOWER FAN WIRING DIAGRAM
NO SCALE
PX-25
TWO-SPEED STARTER WITH H-O-A SELECTOR SWITCH IN JAN. CLOS. 202. (FURNISHED BY MECH. CONTRACTOR)
P.E. SWITCH IN JAN. CLOSET 202.
WEATHER-PROOF 6-POLE DISCONNECT SWITCH AT COOLING TOWER.
COOLING TOWER FAN
5 HP, 208V., 3ø (2 SPEED)
SECOND FLOOR PLAN
SCALE: 1/8"=1'-0"
EXISTING BLDG.
SOLENOID VALVES
WALL HEATER 750W, 120V., 1ø
OFFICE 208
CLOSET 206
CEILING EXH. FAN 50W., 120V., 1ø WIRE INTO ROOM LIGHT.
CONFERENCE 209
STAIR #2
SECY 205
PASSAGEWAY 204
FLUSH MOUNTED TERMINAL SWITCH WITH PILOT LIGHT. LABEL - "ROOM EXHAUST FAN".
ROOF EXHAUST FAN 280W., 120V., 1ø (TWO SPEED)
VARIABLE VOLUME UNITS (TYPICAL)
ART AND AUDIO-VISUAL 203
BOOKLIFT 1½HP, 208V., 3ø
OUTLET FOR BOOKLIFT CONTROLS AND LIGHTING.
WORK ROOM 213
ABOVE COUNTER
ALTERNATE NO. 3
TO TELE. TERMINAL CABINET IN MECH. ROOM 220.
M. 212
W. 211
"LC"
LOBBY 210
ROOF EXHAUST FAN - PE-1 3/4 HP., 120V., 1ø
TO MOTOR STARTER IN JAN. CLO. 202.
TO TELE. TERM. CABINET LOCATED IN BASEMENT STORAGE B-9. (TYPICAL)
TO ROOF EXHAUST FAN
JAN. CLO. 202
ELEV.
MECH. SHAFT
ACCESS OPENING TO ROOF ABOVE.
TO COOLING TOWER FAN
STAIR #3
AIR HANDLING UNIT 3 HP., 208V., 3ø
WORK SPACE 214
MECH. ROOM 220
"LD"
STAFF LOCKERS 219
30"W x 36"H x 4"DP. BELL TELE. TERMINAL CABINET WITH 3/4" THICK PLYWOOD BACKBOARD.
UPPER PART OF BROWSING
CLOS. 215
CEILING EXH. FAN 50W., 120V., 1ø
WIRE INTO ROOM LIGHT
TO TELE. TERM. CABINET IN MECH. ROOM 220.
WALL HEATER 2000W, 208V., 1ø
CEILING EXH. FAN 50W., 120V., 1ø WIRE INTO ROOM LIGHT
FOR THE KITCHEN UNIT.
UNIT KITCHEN
STAFF LOUNGE 216
CHILDRENS' ROOM 201
VARIABLE VOLUME UNITS (TYPICAL)
STAIR #1
RECEPTACLES TO BE HORIZONTALLY MOUNTED IN BASE OF SHELVING. TYPICAL FOR FIVE (5) LOCATIONS.
INSULATED MET. PANEL WINDOWS ABOVE
PARTIAL ROOF PLAN
SCALE: 1/8"=1'-0"
TO TWO-SPEED STARTER IN JANITOR CLOSET 202.
ROOF OPENING
6-POLE DISCONNECT SW.
COOLING TOWER 5 HP., 208V., 3ø TWO SPEED
MECHANICAL SHAFT BELOW
DISCONNECT SWITCH FOR FAN HEATER AND PIPE HEATING CABLES. ALL WIRING COMPLETE BY THE ELECTRICAL CONTRACTOR - 5KW., 208V., 3ø
ALL DIMENSIONS AND EXISTING CONDITIONS SHALL BE CHECKED AND VERIFIED BY CONTRACTOR AT THE SITE.
THE J/S JOHNSON/SMITH PARTNERSHIP ARCHITECTS AND PLANNERS
15 WEST HIGHLAND AVE. PHILADELPHIA
HAVERFORD TOWNSHIP FREE LIBRARY
DARBY ROAD AND MILL ROAD HAVERTOWN, PA
SECOND FLOOR PLAN POWER - ELECTRICAL
NO. REVISIONS DATE
DRAWN R.J.K.
CHK'D D.G.D.
DATE MAR. 1, 1977
SCALE AS NOTED
E-5

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SECTION 0041 00 - BID FORM

Project Name: _____

Contract No. Proposed (check contract that applies; if bidding more than one contract, submit separate bid forms for each contract):

☐ Contract No. 1- General Construction

☐ Contract No. 2- Plumbing and Fire Protection Construction

☐ Contract No. 3- HVAC Construction

☐ Contract No. 4- Electrical Construction

Bidder's Contact's Name and Title: _____

Contractor's / Bidder's Name:

Contact's Telephone Number: _____

Address: _____

In conformity with the Plans and Specifications as prepared by Bernardon. 123 Justison Street, Suite 101, Wilmington, DE 19801 after an examination of the site and the Bidding and Contract Documents, the undersigned submits this proposal and enclosed herewith a bond in an amount of not less than ten percent (10%) of the total of the hereinafter stated Base Bid, made payable to or indemnifying the Township of Haverford, 1014 Darby Road, Havertown, PA 19083, which it is understood will be held by the Owner, as security as provided in the Instructions to Bidders, if this proposal or any part thereof is accepted by the Owner, and the undersigned shall fail to furnish approved bond, certificates of insurances, verifications forms and execute the Agreement within ten (10) days from the date of issuance of the Notice of Intent to Award. Should the Owner fail to make an award on this project through no fault or failure on the part of the Bidder, then the Owner shall return said bid security.

It is hereby certified that the undersigned is the only person(s) interested in this proposal as principal, and that the proposal is made without collusion with any person, firm or corporation. The Bidder submits herewith, as such, a Non-Collusion Affidavit in accordance with the provisions of the Pennsylvania Anti-bid-Rigging Act of October 28, 1983.

Bidder hereby agrees to execute the Agreement and furnish surety company bonds in the amount of one hundred percent (100%) of the Contract Sum for the Performance Bond and Labor and Material Payment Bond, within ten (10) days after mailing by the Owner of notice of intent to award, and to begin work with five (5) days after date of Notice to Proceed.

Bidder guarantees that, if awarded contract, he will furnish and deliver all materials, tools, equipment, tests transportation, secure all permits and licenses, do and perform all labor, supervision and all means

of construction, pay all fees and do all incidental work, and to execute, construct and finish, in an expeditious, substantial and workmanlike manner, in accordance with the plans and specifications, to the complete satisfaction and acceptance of the Owner, for the Work of this Contract for the Township of Haverford, Building Renovation for Haverford Township Free Library, located at 1601 Darby Road, Havertown, PA.

It is understood that the Owner, reserves the right to reject any or all proposals, or part thereof, or items therein and to waive technicalities required for the best interest of the Owner. It is further understood that competency and responsibility of bidders will receive consideration before the award of the contract. A certified copy of the Contractor's Qualification Statement, AIA Document A-305 will be submitted as required upon the request of the Owner.

Bidders submit this proposal with the understanding that the work shall be substantially completed 452 calendar days from time that **Notice To Proceed** is issued plus 30 days for punch list and closeout. The time for completion of the work of all contracts shall be considered as of the essence of this Contract.

The Contractor understands and agrees the **TIME IS OF THE ESSENCE** and that stated dates for completion are minimum performance dates. Notwithstanding anything to the contrary contained in the Contract Documents, should the progress of the Project be ahead of schedule dates, the Contractor agrees to coordinate and complete its Work in accordance with the actual Project Progress and the actual pace of the Project without additional compensation.

The bidder agrees that he will not assign his bid or any of his rights or interests thereunder without the written consent of the Owner. In the event of a discrepancy between the verbiage (words) and numbers entered here below, the verbiage shall govern.

The bidder acknowledges that they have visited the site and become thoroughly acquainted with the conditions existing at the building and site, and have satisfied themselves concerning any and all existing conditions that will affect their bid as well as affect the progress and construction as described in the Contract Documents or otherwise necessary to complete the work.

Bid Withdrawal

This proposal is submitted with the definite understanding that it will not be withdrawn for a period of sixty (60) days after Bids are due, or any authorized postponement thereof.

THE BID, as called for, is submitted as follows: Item A. BASE BID:
For all Construction Work, complete, as shown and specified in the Contract Documents for the lump sum of:

_____

Dollars ($_____)

Instructions for Alternates:

1. Alternate bid amounts will be either an add or a deduct dollar amount to/from the lump sum base bid.
2. Under the contract category being bid:
   a. Fill in the amount (ADD or Deduct) for the Alternate. Where "Add/Deduct" Alternates are indicated, cross off the option **Not** used.

b. Failure to make clear on the bid form, which option applies to the amount will by default make the alternate an Add Alternate.
An example for a deduct Alternate: ~~Add~~ / Deduct $_____

c. If an alternate called for does not involve a change in Bidder's price, the Bidder shall so indicate by writing "No Change, None, Zero, 0, no cost, or N/A" in one of the spaces provided.

d. "No Bid" is an acceptable entry, but may be cause for rejection of bid. Failure to make an entry (i.e. leaving it blank) shall be conclusively treated as an entry of "No Bid" for an alternate.

e. Leave spaces blank under the Prime Contract categories Not being bid by this Prime Contract.

ALTERNATES: (See Section 012300 for full description)

Alternate No. 1 - ADD/DEDUCT

_____ Dollars ($)

Alternate No. 2 – ADD/DEDUCT

_____ Dollars ($)

Alternate No. 3 – ADD/DEDUCT

_____ Dollars ($)

Alternate No. 4 – ADD/DEDUCT

_____ Dollars ($)

Alternate No. 5 – ADD/DEDUCT

_____ Dollars ($)

Alternate No. 6 – ADD/DEDUCT

_____ Dollars ($)

Alternate No. 7 – ADD/DEDUCT

_____ Dollars ($)

Alternate No. 8 – ADD/DEDUCT

Dollars ($)

Alternate No. 9 – ADD/DEDUCT

Dollars ($)

Alternate No. 10 – ADD/DEDUCT

Dollars ($)

Alternate No. 11 – ADD/DEDUCT

Dollars ($)

Alternate No. 12 – ADD/DEDUCT

Dollars ($)

Alternate No. 13 – ADD/DEDUCT

Dollars ($)

Alternate No. 14 – ADD/DEDUCT

Dollars ($)

UNIT PRICES

General Construction

Unit Price #G-1 _____

Unit Price #G-2 _____

Unit Price #G-3 _____

Unit Price #G-4 _____

Unit Price #G-5 _____

Unit Price #G-6 _____

Unit Price #G-7 _____

Unit Price #G-8 _____

Unit Price #G-9 _____

Unit Price #G-10 _____

Unit Price #G-11 _____

Unit Price #G-12 _____

Unit Price #G-13 _____

Unit Price #G-14 _____

Unit Price #G-15 _____

Unit Price #G-16 _____

Unit Price #G-17 _____

Unit Price #G-18 _____

Unit Price #G-19 _____

Unit Price #G-20 _____

Unit Price #G-21 _____

Unit Price #G-22 _____

Unit Price #G-23 _____

Unit Price #G-24 _____

Plumbing and Fire Protection Construction

Unit Price #FP-1 _____

Unit Price #FP-2 _____

Unit Price #P-1 _____

Unit Price #P-2_____

HVAC Construction

Unit Price #H-1 _____

Unit Price #H-2 _____

Unit Price #H-3 _____

Unit Price #H-4 _____

Electrical Construction

Unit Price #E-1 _____

Unit Price #E-2 _____

Unit Price #E-3 _____

ATTACHMENTS:

The following Documents are attached and are made a condition of this Bid:

a. Contractor Integrity statement - Attachment A.
b. Non-collusion Affidavit - Attachment B.
c. Non-discrimination Clause - Attachment C.
d. Bid Bond or Bid Security – Attachment D.
e. Bidder Qualification Statement – Attachment E

ACCEPTANCE OF ADDENDA:

In submitting this proposal, I have received and included in this bid, the instructions and information contained in the following Addenda:

Addendum No.	**Dated**
_____	_____
_____	_____
_____	_____
_____	_____

SIGNATURES

The Undersigned here certifies that this Proposal is genuine and not a sham, collusive or fraudulent or made in the interest of or in behalf of any person, firm or corporation not herein named; and that the Undersigned has not, directly or indirectly, induced or solicited any bidder to submit a sham bid, or colluded in any way to prevent any other person, firm or corporation from bidding, and that the Undersigned has not, in any manner, sought by collusion to secure for himself any advantage over any other Bidder.

Individual Bidder

_____

(Printed Name and Signature of Individual Bidder)

_____Seal

WITNESS

_____

Trading and doing business as

_____

Business
Address:_____

** If a fictitious trade name is employed in the conduct of business, insert such name and complete appropriate, by deletion, the following sentence:

The foregoing fictitious trade name (has) (has not) been registered under Pennsylvania Law.

_____

Partnership Bidder

_____
(Name of Partnership)

_____Seal Name and signature of Witness

_____ _____Seal
Print name of Partner Partner's Signature

_____ _____Seal
Print name of Partner Partner's Signature

_____ _____Seal
Print name of Partner Partner's Signature

_____ _____Seal
Print name of Partner Partner's Signature

Business Address:

_____

_____

** If a fictitious or trade name is employed in the conduct of business, insert such name and complete, as appropriate, by deletion, the following statement:

The foregoing fictitious or trade name (has) (has not) been registered under Pennsylvania law.

Complete, as appropriate, the following statement: The Partners constituting the Partnership are:

_____

_____

_____

_____

Corporate Bidder

***_____ (Name of Corporation)

By:_____
(Vice) President's printed name and signature

ATTEST:

_____
(Asst.) Secretary's printed name and signature

(Corporate Seal)

Business Address:

_____

_____

OR (If appropriate)

_____(Name of Corporation)

WITNESS:

_____

***By:_____ Authorized Representative

Business Address:

_____

_____

*** Complete, as appropriate, the following statement:

The Corporation has been organized and is existing under the laws of the State / Commonwealth (**strike one**) of _____
(State)

*** Attach appropriate proof, dates as of the date of the Proposal, evidence authority to execute in behalf of the Corporation in accordance with requirements of the Contract Documents.

END OF BID FORM

SECTION 093000 - TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glazed wall tile.
2. Glass mosaic tile.
3. Porcelain paver tile.
4. Waterproofing for use at exterior paver tile.
5. Metal edge strips.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
2. Section 092900 "Gypsum Board" for tile backer board.

1.2 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."

C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Initial Selection: For tile, grout, and accessories involving color selection.

D. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.
2. Full-size units of each type of trim and accessory for each color and finish required.
3. Metal edge strips in 6-inch (150-mm) lengths.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

C. Product Certificates: For each type of product.

D. Product Test Reports: For tile-setting and -grouting products.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer is a five-star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
2. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.
3. Installer employs Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of each type of floor tile installation.
2. Build mockup of each type of wall tile installation.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Tile: Obtain tile of each type from single source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.

1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:

1. Waterproofing for use at exterior paver tile.
2. Metal edge strips.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

2.3 TILE PRODUCTS

A. Ceramic Tile Type WT-1: Glazed wall tile.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.
2. Module Size: As indicated on Drawings.
3. Thickness: As indicated on Drawings.
4. Tile Color and Pattern: As indicated by manufacturer's designations on Drawings.

B. Ceramic Tile Type WT-2: Glazed wall tile.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.
2. Module Size: As indicated on Drawings.
3. Thickness: As indicated on Drawings.
4. Tile Color and Pattern: As indicated by manufacturer's designations on Drawings.

C. Ceramic Tile Type WT-3: Glazed wall tile.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.
2. Module Size: As indicated on Drawings.
3. Thickness: As indicated on Drawings.
4. Tile Color and Pattern: As indicated by manufacturer's designations on Drawings.

D. Glass Mosaic Tile Type WT-4: Factory-mounted mosaic glass tile.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.
2. Module Size: As indicated on Drawings.
3. Thickness: As indicated on Drawings.
4. Tile Color and Pattern: As indicated by manufacturer's designations on Drawings.

E. Ceramic Tile Base Type TB-1: Glazed tile base.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.
2. Base Module Size: As indicated on Drawings.
3. Thickness: As indicated on Drawings.
4. Tile Color and Pattern: As indicated by manufacturer's designations on Drawings.
5. Internal Corners: Field-butted square corners.

F. Porcelain Paver Tile Type PV-1: Glazed floor paver tile.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.
2. Module Size: As indicated on Drawings.
3. Thickness: As indicated on Drawings.
4. Dynamic Coefficient of Friction: Not less than 0.42.
5. Tile Color and Pattern: As indicated by manufacturer's designations on Drawings.
6. Installation Pattern: As indicated on Drawings.

2.4 WATERPROOFING

A. General: For use at exterior porcelain paver tiles.

B. Manufacturer's standard product that serves as waterproofing membrane, and vapor management layer, and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Carlisle Coatings and Waterproofing MiraSEAL Liquid Applied Waterproofing Membrane; 60 mils thick. Other acceptable manufacturers: Kemper Systems America, Inc. or WR Meadows Inc.
2. Basis-of-Design Product: Subject to compliance with requirements, provide Carlisle Coatings and Waterproofing 500 Reinforcing fabric. Other acceptable manufacturers: Kemper Systems America, Inc. or WR Meadows Inc.
3. Basis-of-Design Product: Subject to compliance with requirements, provide Carlisle Coatings and Waterproofing Protection Board-HS for use as Protection Course as recommended by manufacturer for use with waterproofing membrane. Other acceptable manufacturers: Kemper Systems America, Inc. or WR Meadows Inc.

C. Corrugated Polyethylene: Corrugated polyethylene with dovetail-shaped corrugations and with anchoring webbing on the underside; intended for bonding to substrate using thinset mortar.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Schluter Systems L.P.; DITRA 1/8" thick for use as drainage composite.

2.5 SETTING MATERIALS

A. Improved Modified Dry-Set Mortar (Thinset): ANSI A118.15, for use at interior tile installations.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Basis of Design: Custom Building Products.
   b. Laticrete International, Inc.
   c. MAPEI Corporation.

2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.1.

B. Improved Modified Dry-Set Cement Mortar for Thin-Set Tile, Rapid-Setting: ANSI A118.4F, ANSI A118.11, ANSI A118.15F, and ISO 13007 C2FS2P2, for use at exterior paver tile installation.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Basis of Design Product: MAPEI, Granirapid System.
   b. Equal product by Laticrete.

2.6 GROUT MATERIALS

A. Unsanded Cement Grout: ANSI A118.7.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Basis of Design: Custom Building Products.
   b. Laticrete International, Inc.
   c. MAPEI Corporation.

B. High-Performance Cement Tile Grout: For grout joints from 1/16 inch to 3/4 inch (1.5 mm to 19 mm) and meeting ANSI A118.7 and ISO 13007 CGWAF for use at exterior paver tile installations.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Basis of Design Product: MAPEI, Ultracolor Plus FA
   b. Equal product by Laticrete.

C. Grout Colors: GT-1, GT-2, GT-3, GT-4 and GT-5, as selected by Architect from manufacturer's full range.

2.7 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: Stainless-steel strips, height to match tile and setting-bed thickness, designed specifically for flooring applications; of profiles indicated and to suit conditions, with integral provision for anchorage to substrate and as follows:

1. Basis-of-Design Products: Provide products as indicated on Drawings by Schluter Systems L.P. (800-379-5312, schluter.com) for applications indicated.
2. Finish: Satin stainless-steel.

C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

D. Water-Based Penetrating Sealer: Premium, natural-look, providing maximum protection for interior and exterior natural stone (marble, limestone, sandstone, slate, granite, travertine, etc.), unglazed ceramic tile, masonry. Can also be used as a pre-grouting sealer.
1. Basis of Design Product: MAPEI, UltraCare Penetrating Plus Stone, Tile & Grout Sealer.
2. Apply floor sealer to cementitious grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

E. Sealant: 100-Percent Silicone. Heavy-traffic expansion and movement joints, horizontal and vertical complying with ASTM standards; ASTM – Meets C920, Type S, Grade NS, Class 25, Use T1, T2, NT, I, M, G, A and O, and conforms to C794 adhesion properties, (#23 Clear color meets ASTM C920, Type S, Grade NS, Class 50, Use NT).
1. Basis of Design Product: MAPEI, Mapesil T

2.8 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

    a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

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

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) to drain.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

D. Temporary Protective Coating: If needed to prevent mortar or grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating recommended by tile manufacturer, taking care not to coat unexposed tile surfaces.

3.3 CERAMIC TILE INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.

F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
2. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

G. Joint Widths: Unless otherwise indicated, install tile with joint widths recommended by tile manufacturer and approved by Architect.

H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

J. Metal Edge Strips: Install at locations indicated and where exposed edge of tile flooring meets other flooring that finishes flush with or below top of tile and no threshold is indicated.

3.4 WATERPROOFING MEMBRANE INSTALLATION

A. Install waterproofing and drainage composite to comply with manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

B. System shall be CCW MiraSEAL for horizontal surfaces applied in two coats at 60 mils for each coat (as measured by comb gauge), reinforced by CCW-500 Reinforcing Fabric between coats, and shall meet or exceed the requirements of ASTM C 836.

C. Allow waterproofing membrane to cure and verify by testing that it is watertight before installing tile or setting materials over it.

3.5 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.6 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

B. Floors: Protect from all traffic for at least 72 hours after installation.
1. Do not step on floor for at least 24 hours; if traffic is unavoidable after that, use plywood stepping boards.
2. Protect from heavy traffic for at least 7 days after installation.
3. When fast-setting materials are used to allow faster occupancy, comply with the manufacturer's recommendations.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.7 EXTERIOR AND INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Exterior Floor Installations, Concrete Subfloor:

1. Ceramic Tile Installation: TCNA F102; thinset mortar on waterproofing membrane.

a. Ceramic Tile Type: PV-1.
b. Thinset Mortar: Improved modified rapid-setting dry-set cement mortar.
c. Grout: High-performance quality polymer-modified grout.

B. Interior Wall Installations, Studs or Furring:

1. Ceramic Tile Installation: TCNA W244C or TCNA W244F; thinset mortar on cementitious backer units or fiber-cement backer board.

a. Ceramic Tile Type: WT-1, WT-2, WT-3, WT-4 and TB-1.
b. Thinset Mortar: Improved modified dry-set cement mortar.
c. Grout: Water-cleanable epoxy grout.

1 END OF SECTION 093013

SECTION 23 01 30.52 - EXISTING HVAC AIR DISTRIBUTION SYSTEM CLEANING

NOTE: IT IS THE DESIGN INTENT TO REPLACE ALL DUCTWORK, THUS LEAVING NO DUCTS BEHIND TO CLEAN. THIS SECTION SHALL ONLY APPLY IF ANY EXISTING DUCT IS IDENTIFIED DURING DEMOLITION THAT IS ADEQUATE TO REMAIN. IF SUCH DUCTWORK IS IDENTIFIED BY THE CONTRACTOR, IT MUST BE INCLUDED IN THE DUCTWORK SHOP DRAWINGS, AND APPROVED BY THE ENGINEER.

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes cleaning existing HVAC air-distribution equipment, ducts, plenums, and system components.

1.02 DEFINITIONS

A. ACAC: American Council for Accredited Certification.
B. AIHA-LAP: American Industrial Hygiene Association Lab Accreditation Program
C. ASCS: Air systems cleaning specialist.
D. CESB: Council of Engineering and Scientific Specialty Boards.
E. CMI: Certified Microbial Investigator.
F. CMC: Certified Microbial Consultant.
G. CMR: Certified Microbial Remediator.
H. CMRS: Certified Microbial Remediation Supervisor.
I. EMLAP: Environmental Microbiology Laboratory Accreditation Program.
J. IEP: Indoor Environmental Professional.
K. IICRC: Institute of Inspection, Cleaning, and Restoration Certification.
L. NADCA: National Air Duct Cleaners Association.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Sustainable Design Submittals:
   1. Product Data: For adhesives and sealants, indicating VOC content.
   2. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.

1.04 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.05 QUALITY ASSURANCE

A. ASCS Qualifications: A certified member of NADCA
   1. Certification: Employ an ASCS certified by NADCA on a full-time basis
   2. Supervisor Qualifications: Certified as an ASCS by NADCA
B. IEP Qualifications: CMI who is certified by ACAC and accredited by CESB.
C. IEP Qualifications: CMC who is certified by ACAC and accredited by CESB.

D. CMR Qualifications: Certified by ACAC and accredited by CESB.
E. CMRS Qualifications: Certified by ACAC and accredited by CESB.

PART 2 - PRODUCTS

2.01 HVAC CLEANING AGENTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Apex Engineering Products Corporation.
   2. BBJ Environmental Solutions.
   3. Goodway Technologies Corporation.
   4. Nu-Calgon.
   5. QuestVapco Corporation.
B. Description:
   1. Formulated for each specific soiled coil condition that needs remedy.

2.02 ANTIMICROBIAL SURFACE TREATMENT

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Bio-Cide International, Inc.
   2. Contec, Inc.
   3. Ecolab, Inc.
B. Description: Specific product selected shall be as recommended by the IEP based on the specific antimicrobial needs of the specific Project conditions.
   1. Formulated to kill and inhibit growth of microorganisms.
   2. EPA-registered for use in HVAC systems and for the specific application in which it will be used.
   3. Have no residual action after drying, with zero VOC off-gassing.
   4. OSHA compliant.
   5. Treatment shall dry clear to allow continued visual observation of the treated surface.

PART 3 - EXECUTION

3.01 PREPARATION

A. Inspect HVAC air-distribution equipment, ducts, plenums, and system components to determine appropriate methods, tools, and equipment required for performance of the Work.
B. Cleaning Plan: Prepare a written plan for air-distribution system cleaning that includes strategies and step-by-step procedures.
C. Proceed with work only after conditions detrimental to performance of the Work have been corrected and cleaning plan has been approved.
D. Use the existing service openings, as required for proper cleaning, at various points of the HVAC system for physical and mechanical entry and for inspection.
E. Mark the position of manual volume dampers and air-directional mechanical devices inside the

system prior to cleaning.

3.02 CLEANING

A. Comply with NADCA ACR.
B. Perform electrical lockout and tagout according to Owner's standards or authorities having jurisdiction.
C. Remove non-adhered substances and deposits from within the HVAC system.
D. Systems and Components to Be Cleaned: All air-moving and -distribution equipment.
E. Collect debris removed during cleaning. Ensure that debris is not dispersed outside the HVAC system during the cleaning process.
    1. Particulate Collection: For particulate collection equipment, include adequate filtration to contain debris removed. Locate equipment downwind and away from all air intakes and other points of entry into the building.
    2. HEPA filtration with 99.97 percent collection efficiency for particles sized 0.3 micrometer or larger shall be used where the particulate collection equipment is exhausting inside the building,
F. Control odors and mist vapors during the cleaning and restoration process.
G. Mark the position of manual volume dampers and air-directional mechanical devices inside the system prior to cleaning. Restore them to their marked position on completion of cleaning.
H. System components shall be cleaned so that all HVAC system components are visibly clean. On completion, all components must be returned to those settings recorded just prior to cleaning operations.
I. Clean all air-distribution devices, registers, grilles, and diffusers.
J. Clean non-adhered substance deposits according to NADCA ACR and the following:
    1. Clean air-handling units, airstream surfaces, components, condensate collectors, and drains.
    2. Ensure that a suitable operative drainage system is in place prior to beginning wash-down procedures.
    3. Clean evaporator coils, reheat coils, and other airstream components.
K. Air-Distribution Systems:
    1. Create service openings in the HVAC system as necessary to accommodate cleaning.
    2. Mechanically clean air-distribution systems specified to remove all visible contaminants, so that the systems are capable of passing the HVAC System Cleanliness Tests (see NADCA ACR).
L. Debris removed from the HVAC system shall be disposed of according to applicable Federal, state, and local requirements.
M. Mechanical Cleaning Methodology:
    1. Source-Removal Cleaning Methods: The HVAC system shall be cleaned using source-removal mechanical cleaning methods designed to extract contaminants from within the HVAC system and to safely remove these contaminants from the facility. No cleaning method, or combination of methods, shall be used that could potentially damage components of the HVAC system or negatively alter the integrity of the system.
        a. Use continuously operating vacuum-collection devices to keep each section being cleaned under negative pressure.
        b. Cleaning methods that require mechanical agitation devices to dislodge debris that is adhered to interior surfaces of HVAC system components shall be equipped to safely remove these devices. Cleaning methods shall not damage the integrity of HVAC system components or damage porous surface materials, such as duct and plenum liners.
    2. Cleaning Mineral-Fiber Insulation Components:
        a. Fibrous-glass thermal or acoustical insulation elements present in equipment or

ductwork shall be thoroughly cleaned with HEPA vacuuming equipment while the HVAC system is under constant negative pressure and shall not be permitted to get wet according to NADCA ACR.

b. Cleaning methods used shall not cause damage to fibrous-glass components and will render the system capable of passing the HVAC System Cleanliness Tests (see NADCA ACR).

c. Fibrous materials that become wet shall be discarded and replaced.

N. Coil Cleaning:

1. See NADCA ACR, "Coil Surface Cleaning" Section. Type 1, or Type 1 and Type 2, cleaning methods shall be used to render the coil visibly clean and capable of passing coil cleaning verification.
2. Coil drain pans shall be subject to NADCA ACR, "Non-Porous Surfaces Cleaning Verification." Ensure that condensate drain pans are operational.
3. Electric-resistance coils shall be de-energized, locked out, and tagged before cleaning.
4. Cleaning methods shall not cause any appreciable damage to, cause displacement of, inhibit heat transfer, or cause erosion of the coil surface or fins, and shall comply with coil manufacturer's written recommendations.
5. Rinse thoroughly with clean water to remove any latent residues.

O. Application of Antimicrobial Treatment:

1. Apply antimicrobial agents and coatings if active fungal growth is determined by the IEP to be at Condition 2 or Condition 3 status according to IICRC S520, as analyzed by a laboratory accredited by AIHA-LAP with an EMLAP certificate and with results interpreted by an IEP. Apply antimicrobial agents and coatings according to manufacturer's written recommendations and EPA registration listing after the removal of surface deposits and debris.
2. Apply antimicrobial treatments and coatings after the system is rendered clean.
3. Apply antimicrobial agents and coatings directly onto surfaces of interior ductwork.
4. Microbial remediation shall be performed by a qualified CMR and CMRS.

3.03 CLEANLINESS VERIFICATION

A. Verify cleanliness according to NADCA ACR, "Verification of HVAC System Cleanliness" Section.

B. Surface-Cleaning Verification: Perform visual inspection for cleanliness. If no contaminants are evident through visual inspection, the HVAC system shall be considered clean. If visible contaminants are evident through visual inspection, those portions of the system where contaminants are visible shall be re-cleaned and subjected to re-inspection for cleanliness.

C. Verification of Coil Cleaning: Coil will be considered clean if the coil is free of foreign matter and chemical residue, based on a thorough visual inspection.

D. Prepare a written cleanliness verification report.

3.04 RESTORATION

A. Restore and repair HVAC air-distribution equipment, ducts, plenums, and components according to NADCA ACR, "Restoration and Repair of Mechanical Systems" Section.

B. Restore service openings capable of future reopening. Comply with requirements in [Section 233113 "Metal Ducts] [Section 233116 "Nonmetal Ducts]."

C. Reseal fibrous-glass ducts. Comply with requirements in Section 233116 "Nonmetal Ducts."

D. Replace fibrous-glass materials that cannot be restored by cleaning or resurfacing. Comply with requirements in Section 233113 "Metal Ducts" and Section 233116 "Nonmetal Ducts."

E. Replace damaged insulation according to Section 230713 "Duct Insulation."

F. Ensure that closures do not hinder or alter airflow.

G. New closure materials, including insulation, shall match opened materials and shall have removable closure panels fitted with gaskets and fasteners.
H. Restore manual volume dampers and air-directional mechanical devices inside the system to their marked position on completion of cleaning.

END OF SECTION

SECTION 23 07 13 - DUCT INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes insulating the following duct services:
   1. Indoor, concealed supply and outdoor air.
   2. Indoor, exposed supply and outdoor air.
   3. Indoor, concealed return located in unconditioned space.
   4. Indoor, exposed return located in unconditioned space.

B. Related Sections:
   1. Section 230716 "HVAC Equipment Insulation."
   2. Section 230719 "HVAC Piping Insulation."
   3. Section 233113 "Metal Ducts" for duct liners.

C. Insulation to be in accordance with ASHRAE 90.1-2016.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Sustainable Design Submittals:
   1. For each type of insulation product indicated, include thermal conductivity, water-vapor permeability for closed cell insulations, thickness, applicable ASTM standard specification, and jackets (both factory- and field-applied, if any). For each type of vapor retarder or jacket specified, include water vapor permeability, required thickness, and applicable ASTM standard specification.
   2. Product Data: For adhesives, indicating VOC content.
   3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
   4. Product Data: For coatings, indicating VOC content.
   5. Laboratory Test Reports: For coatings, indicating compliance with requirements for low-emitting materials.
   6. Product Data: For sealants, indicating VOC content.
   7. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
   2. Detail insulation application at elbows, fittings, dampers, specialties, and flanges for each type of insulation.
   3. Detail application of field-applied jackets.
   4. Detail application at linkages of control devices.

1.03 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.04 QUALITY ASSURANCE

A. Install insulation in accordance with the manufacturer's instructions.

Material Certifications: Manufacturers can provide information regarding material and testing certifications from a qualified testing agency acceptable to authorities having jurisdiction (AHJ). The AHJ can use this information for indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. (Many companies published compliance data on public data sheets while also offering technical resources for additional information. The wording was adjusted to reflect this.)

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency. Suggestion: or proper documentation indicating compliance. (Some fabricated materials used by the industry do not come directly from the manufacturer, so this documentation can be provided in those cases).
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

PART 2 - PRODUCTS

2.01 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.
B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871. Products that come in contact with austenitic stainless steel operating at temperatures between 140°F and 250°F shall have a leachable chloride content in accordance with the limits set by ASTM C795 (Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel).
D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795. See above.
E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, [Type I] Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. CertainTeed Corporation.
      b. Johns Manville; a Berkshire Hathaway company.
      c. Knauf Insulation.
      d. Manson Insulation Inc.
      e. Owens Corning.
G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA, or Type IB. For duct and plenum applications, provide insulation with factory applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets"

Article.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. CertainTeed Corporation.
   b. Johns Manville; a Berkshire Hathaway company.
   c. Knauf Insulation.
   d. Manson Insulation Inc.
   e. Owens Corning.

2.02 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Childers Brand; H. B. Fuller Construction Products.
      b. Eagle Bridges - Marathon Industries.
      c. Foster Brand; H. B. Fuller Construction Products.
      d. Mon-Eco Industries, Inc.
   2. Fiberglass adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Childers Brand; H. B. Fuller Construction Products.
      b. Eagle Bridges - Marathon Industries.
      c. Foster Brand; H. B. Fuller Construction Products.
      d. Mon-Eco Industries, Inc.
   2. Adhesive shall have a VOC content of 80 g/L or less (if available) when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. PVC Jacket Adhesive: Compatible with PVC jacket.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Dow Corning Corporation.
      b. Johns Manville; a Berkshire Hathaway company.
      c. P.I.C. Plastics, Inc.
      d. Speedline Corporation.
   2. Adhesive shall have a VOC content of 80 g/L or less (if available) when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.03 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
   1. VOC Content: 420 g/L or less.
   2. Low-Emitting Materials: Mastic coatings shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Foster Brand; H. B. Fuller Construction Products.
      b. Knauf Insulation.
      c. Vimasco Corporation.
   2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
   3. Service Temperature Range: Minus 20 to plus 180 deg. F.
   4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
   5. Color: White.

2.04 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Childers Brand; H. B. Fuller Construction Products.
      b. Eagle Bridges - Marathon Industries.
      c. Foster Brand; H. B. Fuller Construction Products.
      d. Mon-Eco Industries, Inc.
   2. Materials shall be compatible with insulation materials, jackets, and substrates.
   3. Fire- and water-resistant, flexible, elastomeric sealant.
   4. Service Temperature Range: Minus 40 to plus 250° F.
   5. Color: Aluminum.
   6. Sealant shall have a VOC content of 420 g/L or less.
   7. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. Childers Brand; H. B. Fuller Construction Products.
   2. Materials shall be compatible with insulation materials, jackets, and substrates.
   3. Fire- and water-resistant, flexible, elastomeric sealant.
   4. Service Temperature Range: Minus 40 to plus 250° F.
   5. Color: White.
   6. Sealant shall have a VOC content of 420 g/L or less.
   7. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.05 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
   1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
   2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
   3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
   4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
B. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.06 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for ducts.
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. Childers Brand; H. B. Fuller Construction Products.

2.07 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.
C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Johns Manville; a Berkshire Hathaway company.
      b. P.I.C. Plastics, Inc.
      c. Proto Corporation.
      d. Speedline Corporation.
   2. Adhesive: As recommended by jacket material manufacturer.
   3. Color: White
D. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Childers Brand; H. B. Fuller Construction Products.
      b. ITW Insulation Systems; Illinois Tool Works, Inc. Johns Manville
      c. RPR Products, Inc.
   2. [Sheet and roll stock ready for shop or field sizing] [Factory cut and rolled to size].
   3. Finish and thickness are indicated in field-applied jacket schedules.
   4. Moisture Barrier for Indoor Applications: 1-mil-thick, heat-bonded polyethylene and kraft paper.
   5. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
E. Self-Adhesive Outdoor Jacket: 6014-mil-thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous

resin on a cross laminated polyethylene film covered with white aluminum-foil facing.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Polyguard Products, Inc.
   b. VentureClad by 3M

2.08 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Avery Dennison Corporation, Specialty Tapes Division.
   b. Compac Corporation.
   c. Ideal Tape Co., Inc., an American Biltrite Company.
   d. Knauf Insulation.
   e. Venture Tape.
2. Width: 3 inches
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces' force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Avery Dennison Corporation, Specialty Tapes Division.
   b. Compac Corporation.
   c. Ideal Tape Co., Inc., an American Biltrite Company.
   d. Knauf Insulation.
   e. Venture Tape.
2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces' force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Compac Corporation.
   b. Ideal Tape Co., Inc., an American Biltrite Company.
   c. Venture Tape.
   d. PVC Z-Tape, Z-Tape II, Johns Manville, a Berkshire-Hathaway Company
2. Width: 2 inches.
3. Thickness: 6 mils. (5-10 mil)
4. Adhesion: 64 ounces' force/inch in width or (14-64 oz)
5. Elongation: 150-500 percent.
6. Tensile Strength: 18 lbf/inch in width. (15–27 lbf/inch)

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Avery Dennison Corporation, Specialty Tapes Division.
   b. Compac Corporation.
   c. Ideal Tape Co., Inc., an American Biltrite Company.
   d. Knauf Insulation.
   e. Venture Tape.
2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces' force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.09 SECUREMENTS

A. Aluminum Bands: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. ITW Insulation Systems; Illinois Tool Works, Inc.
      b. RPR Products, Inc.

B. Insulation Pins and Hangers:
   1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) AGM Industries, Inc.
         2) Gemco.
         3) Hardcast, Inc.
         4) Midwest Fasteners, Inc.
         5) Nelson Stud Welding.
      b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
      c. Spindle: Aluminum, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
      d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
   2. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) Gemco.
         2) Midwest Fasteners, Inc.
      b. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1 ½ inches in diameter.
      c. Spindle: Nylon, 0.106-inch-diameter shank, length to suit depth of insulation indicated, up to 2 ½ inches.

d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

3. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) AGM Industries, Inc.
      2) Gemco.
      3) Hardcast, Inc.
      4) Midwest Fasteners, Inc.
   b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
   c. Spindle: Aluminum, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
   d. Adhesive-backed base with a peel-off protective cover.
4. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, aluminum sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1 ½ inches in diameter.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) AGM Industries, Inc.
      2) Gemco.
      3) Hardcast, Inc.
      4) Midwest Fasteners, Inc.
      5) Nelson Stud Welding.
   b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
   c. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1 ½ inches in diameter.
   d. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Gemco.
      2) Midwest Fasteners, Inc.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

D. Wire: 0.062-inch soft-annealed, galvanized steel.
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. C & F Wire.

2.10 CORNER ANGLES

A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14.

PART 3 - EXECUTION

3.01 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.02 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
E. Install multiple layers of insulation with longitudinal and end seams staggered.
F. Keep insulation materials dry during storage, application, and finishing.
G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
H. Install insulation with least number of joints practical.
I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
    1. Install insulation continuously through hangers and around anchor attachments.
    2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
    3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
K. Install insulation with factory-applied jackets as follows:
    1. Draw jacket tight and smooth.
    2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
    3. Overlap jacket longitudinal seams at least 1 ½ inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
        a. For below ambient services, apply vapor-barrier mastic over staples.
    4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
    5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.03 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
   4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
   4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
   1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:
   1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
   2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.04 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
   1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
   2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
   3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
      a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches’ maximum from insulation end joints, and 16 inches o.c.
      b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches’ maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.

c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not over compress insulation during installation.
e. Impale insulation over pins and attach speed washers.
f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
   b. Install vapor stops for ductwork and plenums operating below 50 deg. F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive (optional), tape, or and insulation pins. Follow manufacturer’s installation instructions.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
   a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
   b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
   c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
   d. Do not over compress insulation during installation.
   e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1-inch o.c. Install vapor barrier consisting of factory or field applied jacket, adhesive, vapor-barrier mastic, and

sealant at joints, seams, and protrusions.
a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
b. Install vapor stops for ductwork and plenums operating below 50°F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.05 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:
1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1 ½ -inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.
1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, 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 o.c. and at end joints.

3.06 FINISHES

A. Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless-steel jackets.

D. Local building code and fire marshal shall approve before painting.

3.07 FIELD QUALITY CONTROL

A. Perform tests and inspections. Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:
   1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.08 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:
   1. Indoor, concealed supply, return and outdoor air.
   2. Indoor, exposed supply and outdoor air. (This includes at VAV's, as well as upstream and downstream from the VAV's).
   3. Indoor, concealed return located in unconditioned space.
   4. Indoor, exposed return located in unconditioned space.

B. Items Not Insulated:
   1. Fibrous-glass ducts.
   2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
   3. Factory-insulated flexible ducts.
   4. Factory-insulated plenums and casings.
   5. Flexible connectors.
   6. Vibration-control devices.
   7. Factory-insulated access panels and doors.

3.09 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, Supply-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2 inches thick and 0.75-lb/cu. Ft. nominal density. "R" value of 4.2.

B. Concealed, Outdoor-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2 inches thick and 0.75-lb/cu. Ft nominal density. "R" value of 4.2.

C. Exposed, Supply-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2 inches thick and 3-lb/cu. ft. nominal density. "R" value of 4.2.

D. Exposed, Return-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2 inches thick and 3-lb/cu. ft. nominal density. "R" value of 4.2.

E. Exposed, Outdoor-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2 inches thick and 3-lb/cu. ft. nominal density. "R" value of 4.2.

3.10 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.
   1. Ducts and Plenums, Concealed:
      a. None.
      b. PVC: 20 mils thick.
   2. Ducts and Plenums, Exposed:
      a. None.
      b. PVC: 20 milsthick.

3.11 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

1. Ducts and Plenums, Concealed:
   a. None.
   b. Aluminum, Stucco Embossed: 0.020 inch thick.
2. Ducts and Plenums, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches.
   a. Aluminum, Stucco Embossed: 0.020 inch thick.
3. Ducts and Plenums, Exposed, Larger Than 48 Inches in Diameter or with Flat Surfaces Larger Than 72 Inches:
   a. Aluminum, Stucco Embossed with 0.032 inch thick.

END OF SECTION

SECTION 23 09 33 – BUILDING AUTOMATION SYSTEM – HONEYWELL N4 (JAVA BASED)

PART 1 - GENERAL

1.01 OWNERS REQUIREMENTS

A. No additional software shall be required to operate, program, or troubleshoot equipment.
B. All thermostats shall be 24 hr./7 day programmable type, auto changeover type. a +/- 3 degree adjustment by the occupant from the Building Automation System (BAS) setpoint. Thermostats shall not have occupancy override unless otherwise noted in the specifications. Provide locking covers (clear plastic, hinged type).
C. Samples (snapshots) of the graphics shall be included in the Automatic Temperature Control (ATC) submittal.
D. All building alarms must be sent to the local/main building alarm page accessed from the main site plan. Generic alarms are not acceptable and must indicate the reason the alarm has been generated. ATC contractor to coordinate with owner and develop alarm categories (critical, non-critical, maintenance, etc.) and identify which category equipment, systems, components, etc. shall be placed. ATC contractor to coordinate owner's notification requirements (local, remote, personnel, emails, texts, etc.). An alarm shall be sent to the main alarm page whenever a controller loses communication for more than 5 minutes.
E. The ATC contractor shall provide two (4 hour) training sessions for systems orientation, product maintenance, trouble shooting, and emergency contacts. ATC contractor to coordinate with owner/architect/engineer to determine representatives/designated staff to be present for the training. ATC contractor to provide one training session during the heating (winter) season and one during the cooling (summer) season.
F. The user shall have the ability to adjust scheduling blocks for each piece of equipment, floor, building, and the entire campus in addition to the individual zones. (i.e., occupied/unoccupied).
G. An icon in the Navigation Bar shall display the pdf's of As-Built control diagrams and sequence of operations for all systems within the building/system being viewed. This shall open in a pop-up window.
H. Furnish all labor, materials, equipment, and service necessary for a complete and operating control system to be integrated with the central building automation system, utilizing Direct Digital Controls as shown on the drawings and as described herein. Drawings are diagrammatic only.
I. Utilizing the BAS supervisor, the system shall be capable of remotely controlling, monitoring, accessing all equipment and systems controls described in this section and the drawings from multiple locations as determined by the client. All equipment and systems shall match and be compatible with the existing Honeywell WEBs System (Specifier to edit).
J. Contractor to obtain pricing from owner's controls vendor (and include in his bid) for integration work between this project and the existing Honeywell WEBs System (Specifier to edit). Provide standard mapping and graphics integration. Contractor to match existing BAS graphics and standards.
K. Utilize network user function to be programmed into the Server. Passwords will need to be issued by the owner to the contractor prior to programming. No additional users shall be created by the vendor.
L. Contractor to provide a hyperlink to the Main Site Map to open up each building floor plan showing areas under control (via the BAS).
M. Provide emergency shut down for all fan forced systems on emergency shut down page on BAS.
N. System shall be setup for auto backup of JACEs on a weekly basis via the AX Provisioning Service.
O. Provide 1 year software maintenance agreement for each JACE provided. The contractor is

responsible for upgrading and installing any upgrades to the Niagara 4 Software during the warranty period.

P. Additional Graphics Requirements.
1. Building floor plan display should be color coded for each particular zone. (i.e., AHU zone: Area should be shaded differently than other zones.) Thermostat locations and thermostat number shall be identified.
2. Building floor plan to display current temperatures of those rooms.
3. Notification of a “blinking” red light shall be displayed when an area is in alarm.
4. If a controller is offline or lost power, a default value of last known value should not be displayed. It should be defined as “offline” and an alarm should be programmed into the system to notify that system is “offline.” Unit temperature display shall become yellow.
5. From the building area floor plan graphic, there should be hyperlink created that allows one to proceed to HVAC equipment page for equipment serving that area.
6. Equipment should have an automated graphic display showing a status of equipment. This should be confirmed by both status and command values.
7. The dampers should be displayed in the position that they are physically in.
8. Set points should be displayed on the graphics.
9. Ability to override commands of valves, dampers, fans to be provided to allow system corrections and/or troubleshooting.
10. All programmed schedules to be accessible from the main floor plan page. Allow for click and change ability to modify schedules based on calendar year changes.
11. Pages shall have hyperlinks to navigate to main site home page, building home page, and adjacent floors within the building.
12. In lieu of building specific outdoor temperature and humidity sensors, BAS shall reference the National Weather Service, Philadelphia International Airport. This does not apply to equipment with integral OA Temp/RH sensors.
13. The graphics of a piece of equipment (i.e., fan, motor, etc.) in operation (energized, not energized, etc.) shall be displayed on the graphics to match the operations of the physical piece of equipment.
14. Provide hyperlinking between the equipment to the floor plan.

1.02 SUMMARY

A. Scope: Furnish all labor, materials, and equipment for a complete and operating Building Automation System (BAS) utilizing Direct Digital Controls as shown as drawings and as described herein. Drawings are diagrammatic only. All controllers furnished in this section shall communicate on a peer-to-peer open protocol bus (s) such as LonTalk or BACnet.
1. The intent of the specification is to provide to the owner a BAS system(s) running the Niagara 4 ™ open NICS framework and be truly “open” at all levels. “Open” by definition includes “Sourcing” and “Product,” and “Service” and “Expansion.” Any contractor or integrator “certified” on Niagara 4 platform must be able to work on any device or network controller or supervisor without having to use other vendors or software to access parts of the network. This can best be described as an “open source,” “open protocol,” “open controller,” “open supervisor” system with “open maintenance” and “system expansion.”
2. BAS Systems that meet “Open definition”:
   a. **Manufacturers:** Honeywell Inc., Schneider Electric, or prior approved equal.
   b. Control Contractor Requirement:
      1) Honeywell ACI or ACS – Certified Contractor.
      2) Minimum of (2) WEBS Niagara 4 certified employees.
      3) Minimum of (5) WEBS N4 installations with system supervisor interface.
      4) Located within 50miles of project site.
   c. Preapproved Honeywell ACI and ACS contractors for WEBs-N4™ “installation.”

3. Open NIC Statement

Niagara 4 includes a licensing model that provides OEMs with the ability to define the various levels and types of Niagara 4 interoperability their product will support. There are two primary interactions the NICs address – the sharing of data between stations (JACEs – WEBs-AX™ and Supervisors) and the ability for a tool (i.e., N4 workbench 4.3 or above) to engineer a station.

The NICS provides a structure (or schema) that OEMs can use to define the various levels and types of Niagara 4 interdependability their products will support. The NICs definitions are contained in the license file which is checked by a station or tool when it starts up.

Every licensed station and tool has a (Host ID). This field holds a text descriptor that the OEM chooses as the identifier its product line and each station can have only one Host ID entry.

Station Compatibility “In”
The field is a list of brands that this local station will allow Niagara 4™ data to come in from – “this is the list of brands that can accept data from.”

Station Compatibility “Out”
This Field is a list of brands that this local station will allow Niagara 4™ data to be shared with.

Total Compatibility “In”
This field is a list of brands that this station will allow to be connected to it for engineering of its applications.

Total Compatibility “Out”
This field is a list of brands that this tool is allowed to connect to and engineer.

For a BAS System(s) running Niagara 4™ from NICs framework and be truly “Open” at all levels …
Example: No connectivity restrictions:
The station and tool “NICs” would be as follows:

Property	Value
Station Compatibility In	All
Station Compatibility Out	All
Total Compatibility In	All
Total Compatibility Out	All

4. System architecture shall fully support a multi-vendor environment and be able to integrate third party systems via existing vendor protocols including, as a minimum, LonTalk, and Modbus. Non LonTalk communication protocol for specific pieces of equipment must be approved on a case by case basis.
5. System architecture shall provide secure Web access using MS Internet Explorer from any computer on the owner’s LAN.
6. All control devices furnished with this Section shall be programmable directly from the Niagara-4™ Workbench upon completion of this project. The use of configurable or programmable controllers that require additional software tools for post-installation maintenance shall not be acceptable.

7. Any control vendor that must provide additional BAS server software shall be unacceptable. Only systems that utilize the WEBs Niagara 4™ Framework shall satisfy the requirements of this section.
8. The BAS server shall host all graphic files for the control system. All graphics and navigation schemes for this project shall match those that are on the existing campus Niagara 4 framework server.
9. OPEN NIC STATEMENTS - All Niagara 4 software licenses shall have the following NiCS: “accept.station.in=*”; “accept.station.out=*”and “accept.wb.in=*”and “accept.wb.out=*”. All open NIC statements shall follow Niagara 4 Open NIC specifications
10. All JACE hardware products used on this project must be Made in the USA or come through the Tridium Richmond, VA shipping facility. JACE hardware products not meeting these requirements will not be allowed.

B. Furnish all labor, materials, equipment, and service necessary for a complete and operating control system to be integrated with the central BAS System, utilizing Direct Digital Controls as shown on the drawings and as described herein. Drawings are diagrammatic only.
C. All control wiring regardless of if it is line or low voltage and it performs as control wiring, shall be the ATC contractor’s electrical subcontractor responsibility. ATC contractor to allow for electrical contractor compensation for any line voltage work. Power for operation of valves, dampers, thermostats, and miscellaneous devices is control wiring.
D. Drawings of the BAS network and associated systems are diagrammatic only and any apparatus not shown but required to make the system operative to the complete satisfaction of the owner/engineer shall be furnished and installed without additional cost.
E. All wiring to be CAT 6 plenum rated in concealed areas and in conduit where exposed or subject to damage. All exterior exposed control wiring to be in conduit and weather protected. Conduit to be (EMT, galvanized, PVC) (specifier to select). No PVC is permitted in plenum.
F. This contractor shall conform to the General and Supplementary Conditions Provisions under Division 1 of the Specifications. (Where applicable)
G. This contractor shall conform to the Specifications Section 23 05 00: Mechanical General Provisions.
H. Exposed control wiring in interior finished spaces (**specifier to coordinate with architect**);
   1. Applicable spaces: (**specifier to identify spaces**)
   2. Control wiring to run in Wiremold V500 series. (steel raceway, ¾”) and associated fittings.
   3. Finish to be selected by architect.
   4. Contractor to coordinate all final Wiremold run locations and layout with architect/engineer for approval prior to ordering and rough-in.
I. ATC contractor to be present at equipment/system start-up and verify that all wiring and components are installed correctly and the equipment/system sequence of operation is operating as designed. ATC contractor to perform final calibrations of all devices and equipment. ATC contractor to make all the required corrections if the equipment/system does not operate correctly.
J. ATC contractor to coordinate with the test, balancing, and adjusting (TBA) contractor prior to performing equipment/systems tests that all air and hydronic systems have been tested and balanced.
K. The use or installation of all wireless equipment must be pre-approved by the owner and engineer.
L. Tridium has developed a document that addresses many of the issues that IT managers have relating to Tridium’s Niagara 4 Framework™ and platform and station connections. Refer to www. tridium.com for additional document information.
M. All control panels to be NEMA 3R.

1.03 SYSTEM DESCRIPTIONS

A. The entire BAS shall be comprised of interoperable, stand-alone digital controllers communicating via LonMark™/LonTalk™ and/or ™ communication protocols to a Network Area Controller (NAC). Temperature Control System products shall be by approved manufacturer that meet and fully comply

with the intent of Sections 1.1, A.1.

B. The BAS shall consist of controllers, sensors, thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and perform functions specified.

C. The BAS shall be comprised of Network Area Controller(s) (NAC) within the facility. The NAC shall connect to the owner's local or wide area network, depending on configuration. Access to the systems, either locally in this building or remotely from a control site or sites, shall be accomplished through standard WEB browsers, supported MS Internet Explorer via Internet and/or local area network. Each NAC shall communicate to LonMark™/LonTalk™ (ILC) and/or ™ (IBC) controllers and other open protocol system/devices provided under Division 23, Division 26, etc.

D. The BAS as provided in this Division shall be based on a hierarchical architecture incorporating the Niagara N4 Frameware™. All control devices furnished shall be programmable directly from Tridium N4™ Workbench, WEBs Station N4™ or WEB Pro N4™ upon completion of this project. WEBs-N4™ "open" license embedded user interface "UI."

1.04 SPECIFICATION NOMENCLATURE - Acronyms used in this specification are as follows:

Actuator	Control device that opens or closes valve or damper in response to control signal.
AI	Analog Input
AO	Analog Output
Analog	Continuously variable state overstated range of values
BAS	Building Automation System
DDC	Direct Digital Control
Discrete	Binary or digital state
DI	Discrete Input
DO	Discrete Output
FC	Failed Closed position of control device or actuator. Devices move to closed position on loss of control signal or energy source.
FO	Fail open (position of control device or actuator). Device moves to open position on loss of control signal or energy source.
GUI	Graphical User Interface
HVAC	Heating, Ventilating and Air Conditioning
IDC	Interoperable Digital Controller
ILC	Interoperable Lon Controller
LAN	Local Area Network
Modulating	Movement of a control device through an entire range of values, proportional to an infinitively variable input value.
Motorized	Control device with actuator
NAC	Network Area Controller
NC	Normally closed position of switch after control signal is removed or normally closed position of manually operated valves or dampers.
NO	Normally open position of switch after control signal is removed; or the open position of a controlled valve or damper after the control signal is removed; or the usual position of a manually operated valve.
OSS	Operating System Server, host for system graphics, alarms, trends, etc.
Operator	Same as actuator
PC	Personal Computer

Peer-to-Peer	Mode of communication between controllers in which each device connected to network has equal status and each share its database values with all other devices connected to network.
P	Proportional control; control mode with continuous linear relationship between observed input signal and final controlled output element.
PI	Proportional-Integral control, control mode with continuous proportional output plus additional change in output based on both amount and duration of change in controller variable (reset control).
PICS	Product Interoperability Compliance Statement.
PID	Proportional-Integral-Derivative control, control mode with continuous correction of final controller output element versus input signal based on proportional error, its time history (reset) and rate at which it's changing (derivative).
Point	Analog or discrete instrument with addressable database value.
WAN	Wide Area Network
TCS	Temperature Control Systems
FMCS	Facility Management Control System
CD	Compact Disc
NICS	NIAGARA 4™ Compatibility Statement – see Part 1.1.3
IBC	Interoperable Controller
I/O Points	AI, AO, DI, DO
ACI	Honeywell designation acronym: Authorized Control Integrator.
ACS	Honeywell designation acronym: Automation Control Specialist
BCS	Honeywell designation acronym: (See ACS)
WBI	WEB Browser Interface
POT	Portable Operator's Terminal
PMI	Power Measurement Interface
OOT	Object Oriented Technology
ASD	Honeywell Designation: Authorized System Distributor
ISO-9001	Model for Quality Assurance in Design/Development, Production, Installation and Servicing.
PEC	Programmable Equipment Controllers
ASC	Application Specific Controllers
AUC	Advance Unitary Controllers
SNC	System Network Controller
SNMP	Simple Network Management Protocol
OEM	Original Equipment Manufacturer
OBDB	Open Database Connectivity
SQL	Structured Query Language

1.05 DIVISION OF WORK

A. The ATC contractor shall be responsible for all controllers (IDC and IBC), control devices, control panels, controller programming, controller programming software, controller input/output and power wiring and controller network wiring.

B. The ATC contractor shall be responsible for the Network Area Controller(s) (NAC), software and programming of the NAC, graphical user interface software (GUI), development of all graphical screens, Web Browser pages, setup of schedules, logs, and alarms, LonWorks network management and connection of the NAC to the local or Wide Area Network.

1.06 RELATED WORK SPECIFIED ELSEWHERE

A. Reference General Conditions Section 23 05 00 for all portions of work that applies to BAS or BAS contractor.
B. Division 26, Electrical:
   1. Providing starters and disconnect switches (unless otherwise noted).
   2. Power wiring and conduit (unless otherwise noted).
   3. Provision, installation and wiring of smoke detectors (unless otherwise noted).
   4. Other equipment and wiring as specified in Division 26.
C. Division 23, Equipment Interface:
   In the event the Division 23 equipment supplier has interface responsibility specified with the BAS, through communications with Lon™, ™ or ModBus, the ATC contractor shall be responsible for the up-loading of I/O points and operational written perimeters, as detailed in Division 23; HVAC equipment and the here after sequence-of-operations to the NAC. It will be the responsibility of the Division 23 manufacturers/equipment supplier to coordinate the time and date with their factory trained control technician to facilitate/accomplish 100%, the I/O points and control perimeters with the ATC contractor to fully meet the specification requirements. Upon completion and testing by both the BAS and the factory technician, all programming software will be given to the BAS for demonstration to the owner and will become property of the owner for use in the future.
D. Refer to International Mechanical Code.
E. Refer to National Electrical Code.

1.07 AGENCY AND CODE APPROVALS

A. All products of the BAS shall be provided with the following agency approvals. Verification that the approvals exist for all submitted products shall be provided on request, with the submittal package. Systems or products not currently offering the following approvals are not acceptable.
   1. Federal Communications Commission (FCC), Rules and Regulations, Volume II – July 1986 Part 15 Class A Radio Frequency Devices
   2. FCC, Part 15, Subpart J, Class A Computing Devices.
   3. UL 504 – Industrial Control Equipment
   4. UL 506 – Specialty Transformers
   5. UL 910 – Test Method for Fire and Smoke Characteristics of Electrical and Optical-Fiber Cables Used in Air-Handling Spaces
   6. UL 916 – Energy Management Systems All
   7. UL 1449 – Transient Voltage Suppression
   8. Standard Test for Flame Propagation Height of Electrical and Optical – Fiber Cables Installed Vertically in Shafts.
   9. EIA/ANSI 232-E – Interface Between Data Technical Equipment and Data Circuit Terminal Equipment Employing Serial Binary Data Interchange.
   10. EIA 455 – Standard Test Procedures for Fiber Optic Fibers, Cables, Transducers, Connecting and Terminating Devices.
   11. IEEE C62.41 – Surge Voltages in Low-Voltage AC Power Circuits.
   12. IEEE 142- Recommended Practice for Grounding of Industrial and Commercial Power Systems
   13. NEMA 250 – Enclosures for Electrical Equipment (SIC)
   14. NEMA ICS 1 – Industrial Control Systems
   15. NEMA ST 1 – Specialty Transformers
   16. NCSBC Compliance, Energy Performance of Control System shall meet or surpass the requirements of ASHRAE/IESNA 90.1.
B. All BACNET equipment/devices shall bear the “BTL” stamp.
C. The BAS shall be BACNET-SC (secure connect) capable.

1.08 SOFTWARE OWNERSHIP

A. The owner shall have full ownership and full access rights for all network management, operating system server, engineering and programming software required for the ongoing maintenance and operation of the BAS.

1.09 MECHANICAL GENERAL PROVISIONS

A. ATC Contractor shall conform to the general and supplemental condition provisions under Division 23 05 00 and this specification.

1.10 DELIVERY STORAGE AND HANDLING AND SHIPPING TO OEM FACTORY.

A. Provide factory shipping cartons for each piece of equipment and control device.
B. Maintain cartons through shipping, storage, and handling as required to prevent equipment damage. Store equipment and materials inside and protected from the weather.
C. Factory mounted Components: Where control devices are specified in this section or other specifications such as (equipment) to be factory mounted, the BAS shall arrange for shipping of control devices to equipment manufacturer. He will have responsibility of “tagging” control hardware prior to shipping if requested by equipment supplier. The BAS contractor will have the option of either down-loading program(s) prior to shipping or installing programs after mechanical equipment has been installed at site unless specific instructions are specified under 1.5C Equipment Interface.

1.11 QUALITY ASSURANCE

A. Single source Responsibility of BAS.
   1. The ATC Contractor shall be responsible for the complete installation and proper operations of the control system specified. The control system contractor shall exclusively be in regular and customary business of design, installation, and service of computerized building management systems similar in size and complexity to the system specified. Subcontracting the “Single Service Responsibility” tasks to others covering any of the following: design and submission, graphics, software programming, field check, demonstrating operating compliance and warranty including using Automation System Distributor is not accepted.
   2. The ATC Contractor shall have a full service DDC office within 50 miles of the project site. This office shall be staffed with applications’ engineers, software engineers, and field technicians. This office shall maintain parts inventory and shall have all testing and diagnostic equipment to support their work, as well as staff trained in the use of this equipment.
   3. The manufacturers of the BAS digital controllers shall, if necessary, provide documentation supporting compliance with ISO-9001.

1.12 RELATED WORK SPECIFIED ELSEWHERE (SPECIFIER TO EDIT)

A. Products Supplied But Not Installed Under This Section:
   1. Control valves.
   2. Flow switches.
   3. Wells, sockets, and other inline hardware for water sensors (temperature, pressure, flow).
   4. Automatic control dampers, where not supplied with equipment.
   5. Airflow measuring stations.
   6. Terminal unit controllers and actuators, when installed by terminal unit manufacturer.
   7. Variable Frequency Drives. (This does not include VFDs integral to machinery such as chillers or boilers)

B. Products Installed But Not Supplied Under This Section:

1. None.

C. Products Not Furnished or Installed But Integrated with the Work of This Section:
   1. Chiller Control Systems.
   2. Boiler Control Systems.
   3. Pump Control Packages.
   4. In-line Meters (gas, water, power).
   5. Refrigerant Monitors.
   6. Chemical Water Treatment.
   7. Smoke Detectors (through alarm relay contacts).

D. Work Required Under Division 26 Related to This Section:
   1. Power wiring to line side of motor starters, disconnects or variable frequency drives.
   2. Provision and wiring of smoke detectors and other devices relating to fire alarm system.
   3. Campus LAN (Ethernet) connection adjacent to JACE network management controller.

PART 2 - PRODUCTS

2.01 SYSTEM OVERVIEW

A. The facility currently has a BAS server based on (Niagara-4 framework) (Specifier to edit). The ATC Contractor shall integrate with this existing server and provide a uniform interface that matches the existing graphic and navigation.

B. The ATC Contractor shall provide system software based on server/thin-client architecture, designed around the open standards of web technology. The BAS server shall communicate using Ethernet and TCP/IP. Server shall be accessed using a web browser over Owner intranet and remotely over the Internet.

C. The BAS server software must support at least the following server platforms (Windows, and/or Linux). The BAS server software shall be developed and tested by the manufacturer of the system stand-alone controllers and network controllers/routers.

D. The web browser Graphical User Interface (GUI) shall provide a completely interactive user interface and must offer and be configured with the following features as a minimum:
   1. Trending.
   2. Scheduling.
   3. Electrical demand limiting.
   4. Duty Cycling.
   5. Download Memory to field devices.
   6. Real time ‘live’ Graphic Programs.
   7. Tree Navigation.
   8. Parameter change of properties.
   9. Setpoint Adjustments.
   10. Alarm/Event Information.
   11. Configuration of operators.
   12. Execution of global commands.
   13. Add, delete, and modify graphics and displayed data.

E. Software Components: All software shall be the most current version. All software components of the BAS system software shall be provided and installed as part of this project. BAS software components shall include:

F. BAS Server Database: The BAS server software shall utilize a JAVA Database Connectivity (JDBC) compatible database such as: MS SQL 8.0, Oracle 8i or IBM DB2, BAS systems written to Non-Standard and/or Proprietary databases are NOT acceptable.

G. Database Open Connectivity: The BAS server database shall allow real time access of data via the following standard mechanisms:
   1. Open protocol standard like SOAP
   2. OLE/OPC (for Microsoft Client's/Server platform only)
   3. Import/Export of the database from or to XML (Extensible Mark-up Language)

H. The installed system shall provide secure password access to all features, functions and data contained in the overall BAS.

I. Communication Protocol(s): The native protocol of the BAS server software shall be TCP/IP over Ethernet. Proprietary protocols over TCP/IP are NOT acceptable.

J. Thin Client – Web Browser Based: The GUI shall be thin client or browser based and shall meet the following criteria:
   1. Web Browser's for PC's: Only the latest version of Microsoft/Firefox will be required as the GUI, and a valid connection to the server network. No installation of any custom software shall be required on the operator's GUI workstation/client. Connection shall be over an intranet or the Internet.
   2. Secure Socket Layers: Communication between the Web Browser GUI and BAS server shall offer encryption using 128-bit-encryption technology within Secure Socket Layers (SSL). Communication Protocol shall be Hyper-Text Transfer Protocol (HTTP)

2.02 WEB BROWSER GRAPHICAL USER INTERFACE (GUI)

A. Web Browser Navigation: The Thin Client web browser GUI shall provide a comprehensive user interface. Using a collection of web pages, it shall be constructed to "feel" like a single application and provide a complete and intuitive mouse/menu driven operator interface. It shall be possible to navigate through the system using a web browser to accomplish requirements of this specification. The Web Browser GUI shall (as a minimum) provide for navigation, and for display of animated graphics, schedules, alarms/events, live graphic programs, active graphic setpoint controls, configuration menus for operator access, reports, and reporting actions for events.

B. Login: On launching the web browser and selecting the appropriate domain name or IP address, the operator shall be presented with a login page that will require a login name and password. Navigation in the system shall be dependent on the operator's role privileges, and geographic area of responsibility.

C. Navigation: Navigation through the GUI shall be accomplished by clicking on appropriate building on a campus site plan.
   1. Upon navigating to the site, the page shall be broken into two areas, a Navigation Bar and General Area.

D. Navigation Bar: The Navigation Bar shall provide General information of the site and basic navigation functions. It is to be located along the top of the page and shall display the following.
   1. General information such as current time, outdoor temperature/humidity, building name, and page name.
   2. Navigation information that shall be provided is link back to site plan, to site histories, site specific alarm panel, building schedules, and the sites main home page.
      a. Alarm Panel: This shall display the current number of unacknowledged alarms for the site and when selected, open the alarm panel in a popup window.
      b. Histories: This shall display the histories for the current site being viewed and open in a popup window.
      c. Sequence of Operation: This shall display the sequence of operations for all equipment within the site being viewed. This shall open in a pop-up window.

E. General Area: The general area is the main display area for the site. It shall contain information such as floor plans and equipment details.
   1. Floor Plans: The floor plan shall be created from (CAD or REVIT) backgrounds and shall provide a general overview of the building floors that shows building room numbers and

corresponding space temperatures and access to the equipment pages.

2. Equipment pages: The views of equipment shall either be provided in a popup window or on the main general area depending on size of graphic need.
    a. It shall display a general layout of the equipment and display all points created for the equipment. The user shall also have access to set points and be able to adjust with a simple click. Refer to section 2.04 for additional user adjustment requirements.

F. Action Pane: The Action Pane shall provide several functional views for each HVAC or mechanical/electrical subsystem specified. A functional view shall be accessed by clicking on the corresponding button.
    1. Graphics: Using graphical format suitable for display in a web browser, graphics shall include aerial building/campus views, color building floorplans, equipment drawings, active graphic setpoint controls, web content, and other valid HTML elements. The data on each graphic page shall automatically refresh.
    2. Properties: Shall include graphic controls and text for the following: Locking or overriding objects, demand strategies, and any other valid data required for setup. Changes made to the property's pages shall require the operator to depress an 'accept/cancel' button.
    3. Schedules: Shall be used to create, modify/edit and view schedules based on the systems geographical hierarchy (using the navigation bar).
    4. Alarms: Shall be used to view alarm information geographically (using the navigation bar), acknowledge alarms, sort alarms by category, actions and verify reporting actions.
    5. Trends: Shall be used to display associated trend and historical data, modify colors, date range, axis, and scaling.
    6. Logic – Live Graphic Programs: Shall be used to display 'live' graphic programs of the control algorithm, (micro block programming) for the mechanical/electrical system selected in the navigation tree.
    7. Other actions such as Print, Help, Command, and Logout shall be available via a dropdown window.

G. Color Graphics: The Web Browser GUI shall make extensive use of color in the graphic pane to communicate information related to set points and comfort. Animated, gifs or jpgs, vector scalable, active setpoint graphic controls shall be used to enhance usability. Graphic tools used to create Web Browser graphics shall be non-proprietary and conform to the following basic criteria:
    1. Display Size: The GUI workstation software shall graphically display in 1024 by 768 pixels 24 bit True Color.
    2. General Graphic: General area maps shall show locations of controlled buildings in relation to local landmarks.
    3. Color Floor Plans: Floor plan graphics shall show heating and cooling zones throughout the buildings in a range of colors based on temperature. Difference from set point Red = temperature above set point; Blue = temperature below set point; additionally, Yellow = lost communication, Dark Red = alarm as selected by Owner. Provide a visual display of temperature relative to their respective set points. The colors shall be updated dynamically as a zone's actual comfort condition changes.
    4. Mechanical Components: Mechanical system graphics shall show the type of mechanical system components serving any zone through the use of a pictorial representation of components. Selected I/O points being controlled or monitored for each piece of equipment shall be displayed with the appropriate engineering units. Animation shall be used for rotation or moving mechanical components to indicate status of equipment.
    5. Minimum System Color Graphics: Color graphics shall be selected and displayed via a web browser for the following:
        a. Each piece of equipment monitored or controlled including each terminal unit.
        b. Each building
        c. Each floor and zone controlled.

H. Hierarchical Schedules: Utilizing the Navigation Bar displayed in the web browser GUI, an operator

(with password access) shall be able to define a Normal (occupied/ unoccupied), holiday or override schedule for an individual piece of equipment or room or choose to apply a hierarchical schedule to the entire system, site or floor area. For example, Independence Day 'Holiday' for every level in the system would be created by clicking at the top of the geographic hierarchy defined in the Navigation Bar. No further operator intervention would be required and every control module in the system would be automatically downloaded with the 'Independence Day' Holiday. All schedules that affect the system/area/equipment highlighted in the Navigation Bar shall be shown in a summary schedule table and graph.

1. Schedules: Schedules shall comply with the LonWorks and standards, (Schedule Object, Calendar Object, Weekly Schedule property and Exception Schedule property) and shall allow events to be scheduled based on:
   a. Types of schedule shall be Normal, Holiday or override
   b. A specific date.
   c. A range of dates.
   d. Any combination of Month of Year (1-12, any), Week of Month (1-5, last, any), Day of Week (M-Sun, Any).
2. Wildcard (example, allow combinations like second Tuesday of every month).
3. Schedule categories: The system shall allow operators to define and edit scheduling categories (different types of "things" to be scheduled; for example, lighting, HVAC occupancy, etc.). The categories shall include: name, description, icon (to display in the hierarchy tree when icon option is selected) and type of value to be scheduled.
4. Schedule Groups: In addition to hierarchical scheduling, operators shall be able to define functional groups, comprised of an arbitrary group of areas/rooms/equipment scattered throughout the facility and site. For example, the operator shall be able to define an 'individual tenant' group – who may occupy different areas within a building or buildings. Schedules applied to the 'tenant group' shall automatically be downloaded to control modules affecting spaces occupied by the 'tenant group."
5. Intelligent Scheduling: The control system shall be intelligent enough to automatically turn on any supporting equipment needed to control the environment in an occupied space. If the operator schedules an individual room in a VAV system for occupancy, for example, the control logic shall automatically turn on the VAV air handling unit, chiller, boiler, and/or any other equipment required to maintain the specified comfort and environmental conditions within the room.
6. Partial Day Exceptions: Scheduled events shall be able to accommodate a time range specified by the operator (i.e., board meeting from 6 pm to 9 pm overrides normal schedule for conference room).
7. Schedule Summary Graph: The schedule summary graph shall clearly show Normal versus Holiday versus Override Schedules, and the net operating schedule that results from all contributing schedules. Note: In case of priority conflict between schedules at the different geographic hierarchy, the schedule for the more detailed geographic level shall apply.
8. The user shall have the ability to adjust scheduling blocks for the entire building in addition to individual zones.

I. Alarms: Alarms associated with a specific system, area, or equipment selected in the Navigation Bar, shall be displayed in the Action Pane by selecting an 'Alarms' view. Alarms, and reporting actions shall have the following capabilities:

1. Alarms View: Each Alarm shall display an Alarms Category (using a different icon for each alarm category), date/time of occurrence, current status, alarm report, and a bold URL link to the associated graphic for the selected system, area or equipment. The URL link shall indicate the system location, address, and other pertinent information. An operator shall easily be able to sort events, edit event templates and categories, acknowledge, or force a return to normal in the Events View as specified in this section.
2. Alarm Categories: The operator shall be able to create, edit or delete alarm categories such

as HVAC, Maintenance, Fire, or Generator. An icon shall be associated with each alarm category, enabling the operator to easily sort through multiple events displayed.

3. Alarm Templates: Alarm template shall define different types of alarms and their associated properties. As a minimum, properties shall include a reference name, verbose description, severity of alarm, acknowledgement requirements, and high/low limit and out of range information.
4. Alarm Areas: Alarm Areas enable an operator to assign specific Alarm Categories to specific Alarm Reporting Actions. For example, it shall be possible for an operator to assign all HVAC Maintenance Alarm on the 1st floor of a building to email the technician responsible for maintenance. The Navigation Bar shall be used to setup Alarm Areas in the Graphic Pane.
5. Alarm Time/Date Stamp: All events shall be generated at the DDC control module level and comprise the Time/Date Stamp using the standalone control module time and date.
6. Alarm Configuration: Operators shall be able to define the type of Alarm generated per object. A 'network' view of the Navigation Tree shall expose all objects and their respective Alarm Configuration. Configuration shall include assignment of Alarm, type of Acknowledgement and notification for return to normal or fault status.
7. Alarm Summary Counter: The view of Alarm in Graphic Pane shall provide a numeric counter, indicating how many Alarms are active (in alarm); require acknowledgement, and total number of Alarms in the BAS Server database.
8. Alarm Auto-Deletion: Alarms that are acknowledged and closed shall be auto-deleted from the database and archived to a text file after an operator defined period.
9. Alarm Reporting Actions: Alarm Reporting Actions specified shall be automatically launched (under certain conditions) after an Alarm is received by the BAS server software. Operators shall be able to easily define these Reporting Actions using the Navigation Bar and Graphic Pane through the web browser GUI. Reporting Actions shall be as follows:
    a. Print: Alarm information shall be printed to the BAS server's PC or a networked printer.
    b. Email: Email shall be sent via any POP3-compatible e-mail server (most Internet Service Providers use POP3). Email messages may be copied to several email accounts. Note: Email reporting action shall also be used to support alphanumeric paging services, where email services support pagers.
    c. File Write: The ASCII File write reporting action shall enable the operator to append operator defined alarm information to any alarm through a text file. The alarm information that is written to the file shall be completely definable by the operator. The operator may enter text or attach other data point information (such as AHU discharge temperature and fan condition upon a high room temperature alarm).
    d. Write Property: The write property reporting action updates a property value in a hardware module.
    e. SNMP: The Simple Network Management Protocol (SNMP) reporting action sends an SNMP trap to a network in response to receiving an alarm.
    f. Run External Program: The Run External Program reporting action launches specified program in response to an event.
10. All building alarms must be sent to the campus alarm page accessed from the campus site plan.

J. Trends: Trends shall both be displayed and user configurable through the Web Browser GUI. Trends shall comprise analog, digital or calculated points simultaneously. A trend log's properties shall be editable using the Navigation Bar and Graphic Pane.

1. Viewing Trends: The operator shall have the ability to view trends by using the Navigation Bar and selecting a Trends button in the Graphic Pane. The system shall allow y- and x-axis maximum ranges to be specified and shall be able to simultaneously graphically display multiple trends per graph.

2. Local Trends: Trend data shall be collected locally by Multi-Equipment/Single Equipment general-purpose controllers, and periodically uploaded to the BAS server. Trend data, including run time hours and start time date and start time date shall be retained in non-volatile module memory. Systems that rely on a gateway/router to run trends are NOT acceptable.
3. Resolution: Sample intervals shall be as small as one second. Each trended point will have the ability to be trended at a different trend interval. When multiple points are selected for displays that have different trend intervals, the system will automatically scale the axis. Provide 15 minute intervals for all trending points unless otherwise noted.
4. Dynamic Update: Trends shall be able to dynamically update at operator-defined intervals.
5. Zoom/Pan: It shall be possible to zoom-in on a particular section of a trend for more detailed examination and 'pan through' historical data by simply scrolling the mouse.
6. Numeric Value Display: It shall be possible to pick any sample on a trend and have the numerical value displayed.
7. Copy/Paste: The operator must have the ability to pan through a historical trend and copy the data viewed to the clipboard using standard keystrokes (i.e., CTRL+C, CTRL+V).

K. Security Access: Systems that Security access from the web browser GUI to BAS server shall require a Login Name and Password. Access to different areas of the BAS system shall be defined in terms of Roles, Privileges and geographic area of responsibility as specified:
1. Roles: Roles shall reflect the actual roles of different types of operators. Each role shall comprise a set of 'easily understood English language' privileges. Roles shall be defined in terms of View, Edit and Function Privileges.
a. View Privileges shall comprise: Navigation, Network, and Configuration Trees, Operators, Roles and Privileges, Alarm/Event Template and Reporting Action.
b. Edit Privileges shall comprise: Setpoint, Tuning and Logic, Manual Override, and Point Assignment Parameters.
c. Function Privileges shall comprise: Alarm/Event Acknowledgment Control Module Memory Download, Upload, Schedules, Schedule Groups, Manual Commands, Print, and Alarm/Event Maintenance.
2. Geographic Assignment of Roles: Roles shall be geographically assigned using a similar expandable/collapsible Navigation Bar. For example, it shall be possible to assign two HVAC Technicians with similar competencies (and the same operator defined HVAC Role) to different areas of the system.

2.03 GRAPHICAL PROGRAMMING

A. The system software shall include a Graphic Programming Language (GPL) for all DDC control algorithms resident in all control modules. Any system that does not use a drag and drop method of graphical icon programming shall not be accepted. All systems shall a GPL is a method used to create a sequence of operations by assembling graphic microblocks that represent each of the commands or functions necessary to complete a control sequence. Microblocks represent common logical control devices in conventional control systems, such as relays, switches, high signal selectors, etc., in addition to the more complex DDC and energy management strategies such as PID loops and optimum start. Each microblock shall be interactive and contain the programming necessary to execute the function of the device it represents.

B. Graphic programming shall be performed while on screen and using a mouse; each microblock shall be selected from a microblock library and assembled with other microblocks necessary to complete the specified sequence. Microblocks are then interconnected on screen using graphic "wires," each forming a logical connection. Once assembled, each logical grouping of microblocks and their interconnecting wires then form a graphic function block which may be used to control any piece of equipment with a similar point configuration and sequence of operation.

C. GPL Capabilities: The following is a minimum definition of the capabilities of the Graphic

Programming software:

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

D. Additional Graphics Requirements. (SPECIFIER TO COORDINATE WITH PARA. 1.01 P)

1. Building floor plan display should be color coded for each particular zone. (i.e., AHU Zone: Area should be shaded differently than other zones.). Thermostat locations and thermostat number shall be identified.
2. Building floor plan to display current temperatures of those rooms.
3. Notification of a "blinking" red light shall be displayed when an area is in alarm.
4. If a controller is offline or lost power, a default value of last known value should not be displayed. It should be defined as "offline" and an alarm should be programmed into the system to notify that system is "offline." Unit temperature display shall become yellow.
5. From the building area floor plan graphic, there should be hyperlink created that allows one to proceed to HVAC equipment page for equipment serving that area.
6. Equipment should have an automated graphic display showing a status of equipment. This should be confirmed by both status and command values.
7. The dampers should be displayed in the position that they are physically in.
8. Set points should be displayed on the graphics.
9. Ability to override commands of valves, dampers, fans to be provided to allow system corrections and/or troubleshooting.
10. All programmed schedules to be accessible from the main floor plan page. Allow for click and change ability to modify schedules based on calendar year changes.
11. Pages shall have hyperlinks to navigate to main site home page, building home page, and adjacent floors within the building.
12. In lieu of building specific outdoor temperature and humidity sensors, BAS shall reference the National Weather Service, Philadelphia International Airport. This does not apply to equipment with integral OA Temp/RH sensors.
13. The graphics of a piece of equipment (i.e., fan, motor, etc.) in operation (energized, not

energized, etc.) shall be displayed on the graphics to match the operations of the physical piece of equipment.

14. Provide hyperlinking between the equipment to the floor plan.

E. Contractor prior to programming the system graphics, shall obtain approved equipment templates from the owner to keep the graphics consistent.

2.04 GRAPHIC EXAMPLES:
(Specifier to add specific graphic samples if available.)

2.05 BEST PRACTICES:

A. Local building supervisor:
1. The local supervisor shall have its time synced with the NTP server.
2. The passwords for the platform and administration shall be per the owner's standard.
3. Histories and alarm extensions will reside at this level and then sent up to server.

B. Campus Supervisor:
1. Local building PX pages shall reside in a folder named for the building and shall not depend on files outside of this for display.
2. New supervisors shall be added to the scheduled backup for of station.

2.06 LONWORKS NETWORK MANAGEMENT

A. Systems requiring the use of third party LonWorks network management tools shall not be accepted.

B. Network management shall include the following services: device identification, device installation, device configuration, device diagnostics, device maintenance and network variable binding.

C. The network configuration tool shall also provide diagnostics to identify devices on the network, to reset devices, and to view health and status counters within devices.

D. These tools shall provide the ability to "learn" an existing LonWorks network, regardless of what network management tool(s) were used to install the existing network, so that existing LonWorks devices and newly added devices are part of a single network management database.

E. The network management database shall be resident in the Network Area Controller (NAC), ensuring that anyone with proper authorization has access to the network management databases at all times. Systems employing network management databases that are not resident, at all times, within the control system, shall not be accepted.

2.07 OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURE

A. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system utilizing the LonWorks technology communication protocol and/or in one open, interoperable system.

B. The supplied computer software shall employ object-oriented technology (OOT) for representation of all data and control devices within the system.

C. All components and controllers supplied under this contract shall be true "peer-to-peer" communicating devices. Components or controllers requiring "polling" by a host to pass data shall not be acceptable.

D. The supplied system must incorporate the ability to access all data using Java enabled browsers without requiring proprietary operator interface and configuration programs. An Open Database Connectivity (ODBC) or Structured Query Language (SQL) compliant server database is required for all system database parameter storage. This data shall reside on the existing Operating System Server currently located in the Facilities Office on the LAN. Systems requiring proprietary database and user interface programs shall not be acceptable.

E. A hierarchical topology is required to assure reasonable system response times and to manage the

flow and sharing of data without unduly burdening the customer's internal intranet network. Systems employing a "flat" single tiered architecture shall not be acceptable.

1. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 5 seconds for network connected user interfaces.
2. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 60 seconds for remote or dial-up connected user interfaces.

2.08 PORTABLE OPERATOR'S TOOL (LAPTOP COMPUTER) (ADD ALTERNATE)

A. The laptop computer shall consist of an Intel Premium based laptop computer (minimum processing speed of 2.0 GHz with 8GB RAM with minimum 64 bit O.S. and a 500-gigabyte minimum hard drive). It shall include a CD-ROM drive, and appropriate connectors and cables for communication with the Ethernet network. Operating system shall be Microsoft Windows 10 or latest version.

2.09 BAS SERVER HARDWARE (ADD ALTERNATE)

A. Computer Configuration (Hardware Independent)
1. Central Server. Owner shall provide a dedicated BAS server with configuration that includes the following components as a minimum:
2. 2 GHz, Intel Core I5 or higher, Core 2 Dual also acceptable P4 or higher CPU – Dual Processor.
3. 8 GB of RAM Minimum, 500 gigabyte minimum hard drive, solid state hard drive.
4. 40 gigabytes hard disk, 1.44M 3 ½" floppy drive, SVGA Card with 1024 x 768, 24-bit True Color, Back-up system 24X CD Rom R/W Drive minimum, 24" Flat Screen Color Monitor, Keyboard, and mouse. Dual band wireless, bluetooth.
5. Operating System for the server shall be Microsoft Windows 10 or latest version, 64 bits minimum.
6. Internet Explorer 11.0 or later
7. 10/10/1000 Mbps T Ethernet Port
8. Standard Client: The thin-client Web Browser, BAS GUI shall be Microsoft Internet Explorer (11.0 or later) running on 10 or latest version (with LX Compatibility Mode. No special software shall be required to be installed on the PCs used to access the BAS via a web browser.

2.10 BAS SERVER FUNCTIONS

A. A central server shall be provided. The server shall support all Network Area Controllers (NAC) connected to the customer's network whether local or remote.
B. Local connections shall be via an Ethernet LAN. Remote connections can be via ISDN, ADSL, T1 or dial-up connection.
C. It shall be possible to provide access to all Network Area Controllers via single connection to the server. In this configuration, each Network Area Controller can be accessed from a remote Graphical User Interface (GUI) or from a standard Web browser (WBI) by connecting to the server.
D. The server shall provide the following functions, at a minimum:
1. Global Data Access: The server shall provide complete access to distributed data defined anywhere in the system.
2. Distributed Control: The server shall provide the ability to execute global control strategies based on control and data objects in any NAC in the network, local or remote.
3. The server shall include a master clock service for its subsystems and provide time synchronization for all Network Area Controllers (NAC).
4. The server shall accept time synchronization messages from trusted precision Atomic Clock

Internet sites and update its master clock based on this data.

5. The server shall provide scheduling for all Network Area Controllers and their underlying filed control devices.
6. The server shall be capable of providing demand limiting that operates across all Network Area Controllers. The server must be capable of multiple demand programs for sites with multiple meters and or multiple sources of energy. Each demand program shall be capable of supporting separate demand shed lists for effective demand control.
7. The server shall implement the Command Prioritization Scheme (16 levels) for safe and effective contention resolution of all commands issued to Network Area Controllers. Systems not employing this prioritization shall not be accepted.
8. Each Network Area Controller supported by the server shall have the ability to archive its log data, alarm data and database to the server, automatically. Archiving options shall be user-defined including archive time and archive frequency.
9. The server shall provide central alarm management for all Network Area Controllers supported by the server. Alarm management shall include:
    a. Routing of alarms to display, printer, email, and pagers.
    b. View and acknowledge alarms.
    c. Query alarm logs based on user-defined parameters.
10. The server shall provide central management of log data for all Network Area Controllers supported by the server. Log data shall include process logs, runtime and event counter logs, audit logs and error logs. Log data management shall include:
    a. Viewing and printing log data
    b. Exporting log data to other software applications
    c. Query log data based on user-defined parameters.

2.11 LIBRARY

A. A Standard library of objects shall be included for development and setup of application logic, user interface displays, system services, and communication networks.

B. The objects in this library shall be capable of being copied and pasted into the user's data base and shall be organized according to their function. In addition, the user shall have the capability to group objects created in their application and store the new instances of these objects in a user-defined library.

C. In addition to the standard libraries specified here, the supplier of the system shall maintain an on-line accessible (over the Internet) Library, available to all registered users to provide new or updated objects and applications as they are developed.

D. All control objects shall conform to the control objects specified in the specification.

E. The library shall include applications or objects for the following functions, at a minimum:
    1. Scheduling Object. The schedule must conform to the schedule object as defined in the specification, providing 7 day plus holiday and temporary scheduling features and a minimum of 10 on/off events per day. Data entry to be by graphical sliders to speed creation and selection of on-off events.
    2. Calendar Object. The calendar must conform to the calendar object as defined in the specification, providing 12 month calendar features to allow for holiday or special event data entry. Data entry to be by graphical "point and click" selection. This object must be linkable" to any or all scheduling objects for effective event control.
    3. Duty Cycling Object. Provide a universal duty cycle object to allow repetitive on/off time control of equipment as an energy conserving measure. Any number of these objects may be created to control equipment at varying intervals.
    4. Temperature Override Object. Provide a temperature override object that is capable of overriding equipment turned off by other energy saving programs (scheduling, duty cycling, etc.) to maintain occupant comfort or for equipment freeze protection.

5. Start-Stop Time Optimization Object. Provide a start-stop time optimization object to provide the capability of starting equipment just early enough to bring space conditions to desired conditions by the scheduled occupancy time. Also, allow equipment to be stopped before the scheduled unoccupancy time just far enough ahead to take advantage of the building's "flywheel" effect for energy saving. Provide automatic tuning of all start/stop time object properties based on the previous day's performance.
6. Demand Limiting Object. Provide a comprehensive demand-limiting object that is capable of controlling demand for any selected energy utility (electric, oil, and gas). The object shall provide the capability of monitoring a demand value and predicting (by use of a sliding window prediction algorithm) the demand at the end of the user defined interval period (1-60 minutes). This object shall also accommodate a utility meter time sync pulse for fixed interval demand control. Upon a prediction that will exceed the user defined demand limit (supply a minimum of 6 per day), the demand limiting object shall issue shed commands to either turn off user specified loads or modify equipment set points to effect the desired energy reduction. If the list of sheddable equipment is not enough to reduce the demand to below the set point, a message shall be displayed on the user's screen (as an alarm) instructing the user to take manual actions to maintain the desired demand. The shed lists are specified by the user and shall be selectable to be shed in either a fixed or rotating order to control which equipment is shed the most often. Upon suitable reductions in demand, the demand-limiting object shall restore the equipment that was shed in the reverse order in which it was shed. Each sheddable object shall have a minimum and maximum shed time property to effect both equipment protection and occupant comfort.

F. The library shall include control objects for the following functions. All control objects shall conform to the objects as specified in the specification.
1. Analog Object – Minimum requirement is to comply with the standard for data sharing. Allow high, low and failure limits to be assigned for alarming. Also, provide a time delay filter property to prevent nuisance alarms caused by temporary excursions above or below the user defined alarm limits.
2. Analog Output Object – Minimum requirement is to comply with the standard for data sharing.
3. Binary Input Object – Minimum requirement is to comply with the standard for data sharing. The user must be able to specify either input condition for alarming. This object must also include the capability to record equipment run-time by counting the amount of time the hardware input is in an "on" condition. The user must be able to specify either input condition as the "on" condition.
4. Binary Output Object – Minimum requirement is to comply with the BAC net standard for data sharing. Properties to enable minimum on and off time for equipment protection as well as interstart delay must be provided. The Command Prioritization priority scheme shall be incorporated to allow multiple control applications to execute commands on this object with the highest priority command being invoked. Provide sixteen levels of priority as a minimum. Systems not employing the method of contention resolution shall not be acceptable.
5. PID Control Loop Object – Minimum requirement is to comply with the standard for data sharing. Each individual property must be adjustable as well as to be disabled to allow proportional control only, or proportional with integral control, as well as proportional, integral, and derivative control.
6. Comparison Object – Allow a minimum of two analog objects to be compared to select either the highest, lowest, or equality between the two linked outputs. Also, allow limits to be applied to the output value for alarm generation.
7. Math Object – Allow a minimum of four analog objects to be tested for the minimum or maximum, or the sum, difference, or average of linked objects. Also, allow limits to be applied to the output value for alarm generation.
8. Custom Programming Objects – Provide a blank object template for the creation of new

custom objects to meet specific user application requirements. This object must provide a simple BASIC-like programming language that is used to define object behavior. Provide a library of functions including math and logic functions, string manipulation, and e-mail as a minimum. Also, provide a comprehensive on-line debug tool to allow complete testing of the new object. Allow new objects to be stored in the library for re-use.

9. Interlock Object – Provide an interlock object that provides a means of coordination of objects within a piece of equipment such as an Air Handler or other similar types of equipment. An example is to link the return fan to the supply fan such that when the supply fan is started, the return fan object is also started automatically without the user having to issue separate commands or to link each object to a schedule object. In addition, the control loops, damper objects, and alarm monitoring (such as return air, supply air, and mixed air temperature objects) will be inhibited from alarming during a user-defined period after start-up to allow for stabilization. When the air handler is stopped, the interlocked return fan is also stopped, the outside air damper is closed, and other related objects within the air handler unit are inhibited from alarming thereby eliminating nuisance alarms during the off period.
10. Temperature Override Object – Provide an object whose purpose is to provide the capability of overriding a binary output to an “On” state in the event a user specified high or low limit value is exceeded. This object is to be linked to the desired binary output object as well as to an analog object for temperature monitoring, to cause the override to be enabled. This object will execute a Start command at the temperature override level of start/stop command priority unless changed by the user.
11. Composite Object – Provide a container object that allows a collection of objects representing an application to be encapsulated to protect the application from tampering, or to more easily represent large applications. This object must have the ability to allow the user to select the appropriate parameters of the “contained” application that are represented on the graphical shell of this container.

G. The object library shall include objects to support the integration of devices connected to the Network Area Controller (NAC). At a minimum, provide the following as part of the standard library included with the programming software:
1. LonMark/LonWorks devices. These devices shall include, but not be limited to, devices for control of HVAC, lighting, access, and metering. Provide Lon Mark manufacturer-specific objects to facilitate simple integration of these devices. All network variables defined in the LonMark profile shall be supported. Information (type and function) regarding network variables not defined in the LonMark profile shall be provided by the device manufacturer.
2. For devices not confirming to the LonMark standard, provide a dynamic object that can be assigned to the device based on network variable information provided by the device manufacturer. Device manufacturer shall provide an XIF file, resource file and documentation for the device to facilitate device integration.
3. For devices, provide the following objects at a minimum:
    a. Analog In
    b. Analog Out
    c. Analog Value
    d. Binary
    e. Binary In
    f. Binary Out
    g. Binary Value
    h. Multi9-State In
    i. Multi-State Out
    j. Multi-State Value
    k. Schedule Export
    l. Calendar Export

m. Trend Export
n. Device

4. For each object, provide the ability to assign the object a device and object instance number.
5. For devices, provide the following support at a minimum.
   a. Segmentation
   b. Segmented Request
   c. Segmented Response
   d. Application Services
   e. Read Property
   f. Read Property Multiple
   g. Write Property
   h. Who-has
   i. I-have
   j. Who-is
   k. I-am
   l. Media Types
   m. Ethernet
   n. IP Annex J
   o. MSTP
   p. Broadcast Management Device (BBMD) function
   q. Routing

   Note: Depending on the project configuration and requirements, it may be desired to integrate data from devices that are not LonMark or. These could include industrial or plant floor devices such as PLC's. Because of the many drivers available, a common method of providing this integration is: Dynamic Data Exchange (DDE), MODBUS (DDEE), and Ole for Process Control (OPC).

2.12 NETWORK AREA CONTROLLER (NAC)/SYSTEM NETWORK CONTROLLER (SNC)

A. These controllers are designed to manage communications between the programmable equipment controllers (PEC), application specific controllers (ASC), and advanced unitary controllers (AUC) which are connected to its communications trunks, manage communications between itself and other system network controllers (SNC) and with any operator workstations (OWS) that are part of the BAS, and perform control and operating strategies for the system based on information from any controller connected to the BAS.
B. The controllers must be fully programmable to meet the unique requirements of the facility it must control.
C. The controllers must be capable of peer-to-peer communications with other SNC's and with any OWS connected to the BAS, whether the OWS is directly connected, connected via modem or connected via the Internet.
D. The communication protocols utilized for peer-to-peer communications between SNC's will be Niagara 4, TCP/IP and SNMP. Use of proprietary communication protocol for peer-to-peer communications between SNC's is not allowed.
E. The SNC shall be capable of executing application control programs to provide:
   1. Calendar functions
   2. Scheduling
   3. Trending
   4. Alarm monitoring and routing
   5. Time synchronization.
   6. Integration of LonWorks and ModBus controller data.
   7. Network management functions for all SNC, PEC and ASC based devices.
F. The SNC must provide the following hardware features as a minimum:

1. One Ethernet Port-10/100 Mdps
2. One RS-232/485 port
3. One LonWorks Interface Port – 78KB FTT-10A
4. Battery Backup
5. Flash memory for long term data backup (if battery backup or flash memory is not supplied, the controller must contain a hard disk with at least 1 gigabyte storage capacity)

G. The SNC shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 16 simultaneous users.

H. The SNC shall provide alarm recognition, storage, routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.

I. The SNC shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via dial-up, telephone connection, or wide-area network.
   1. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including but not limited to:
      a. Alarm
      b. Return to normal
      c. To default
   2. Alarms shall be annunciated in any of the following manners as defined by the user:
      a. Screen message text
      b. Email of complete alarm message to multiple recipients.
      c. Pagers via paging services that initiate a page on receipt of email message.
      d. Graphics with flashing alarm object(s).
   3. The following shall be recorded by the SNC for each alarm (at a minimum):
      a. Time and date.
      b. Equipment (air handler #, accessway, etc.)
      c. Acknowledge time, date, and user who issued acknowledgement.

J. Programming software and all controller “Setup Wizards” shall be embedded into the SNC.

K. Operator Touch Screen Interface
   Provide a color graphic display touch screen operator interface mounted on panel face as indicated on drawings. The Operator Touch Screen Interface shall serve as the user interface to the entire TCS and shall allow the monitoring and the control of all systems points without the use of a mouse or keyboard.
   Access to the system shall be permission-based, configurable permission access levels based on operator’s role.
   Information on the color graphic display shall be dynamic and automatically updated.

2.13 PROGRAMMABLE EQUIPMENT CONTROLLER (PEC)

A. HVAC control shall be accomplished using LonMark™ based devices where the application has a LonMark™ profile defined. Where LonMark™ devices are not available for a particular application; devices based on LonMark™ shall be acceptable. For each LonWorks™ device that does not have LonMark™ certification, the device supplier must provide an XIF file for the device. The controller platform shall provide options and advanced system functions, programmable and configurable using Niagara 4 Framework™, that allow standard and customizable control solutions required in executing the “Sequence of Operation.”

B. All PECs shall be application programmable and shall at all times maintain their LonMark™ certification. All control sequences within or programmed into the ILC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery to be retained.

C. The PECs shall communicate with the SNC at a baud rate of not less than 78.8K baud. The PEC shall provide LED indication of communication and controller performance to the technician, without cover removal.

D. The following integral and remote Inputs/Outputs shall be supported per each PEC:

1. Four integral dry contact digital inputs.
2. Six integral analog inputs (configurable as 0-10V, 0-10,000 ohm or, 20K NTC).
3. Three integral 4-20 ma analog outputs.
4. Eight integral 24 Vac Triac digital outputs, configurable maintained or floating motor control outputs.
5. One integral 20 Vdc, 65-mA power supply for auxiliary devices.

E. Each PEC shall have expansion ability to support additional I/O requirements through the use of remote Input/Output modules.

2.14 APPLICATION SPECIFIC CONTROLLERS (ASC'S)

A. Application Specific Controllers (ASC's) shall be standalone EEPROM based configured to perform the sequences specified, and with I/O selected for the application. All unitary DDC controllers shall support the LonMark™ Functional Profile for the given application. ASCs shall be tested and listed under UL916 for computing devices. ASC enclosures shall be flame retardant compact plastic conforming to UL94-V5 for plenum mounting or plated steel. Each ASC shall be provided with face mounted LED type annunciation to continually display its operational mode: power, normal, or in an alarm state. As an alternative to the face mounted integral LED, the control contractor shall provide relay driven pilot lights mounted at the AC location, which shall provide the specified annunciation. ASCs shall be configured for DIN rail mounting using industry standard clip on adapters or direct panel mounted. The controller shall be programmable and configurable using Niagara 4 Framework™ and provide control solutions as required to executing the "Sequence of Operation."

Input/Output Module

a. Provide a remote Input/Output module that connects sensors and actuators onto the field bus network for use by the NAC, ILC and ASC DDC Controllers. I/O Device shall support LonMark standard network communication technology for controller-to-controller communications. I/O Device shall have extended operating temperature rating from -40F to +150F so Device can be mounted directly in wiring cabinet of monitored appliances.

2.15 ADVANCED UNITARY CONTROLLER

A. The advanced unitary controller (AUC) platform shall be designed specifically to control HVAC – ventilation, filtration, heating, cooling, humidification, and distribution. Equipment includes: water service heat pumps, air handlers, heat pumps, natural convection units. The controller platform shall provide options and advanced system functions, programmable and configurable using Niagara 4 Framework™, that allows standard and customizable control solutions required in executing the "Sequence of Operation."

B. Minimum Requirements:

1. The Controller shall be fully programmable with full functionality on any Niagara 4 brand platform.
   a. Support downloads to the controller from any brand of Niagara 4 platform.
   b. Support uploads from the controller to any brand of Niagara 4 platform.
   c. Support simulation/debug mode of the controller.
   d. Maintain native GUI.
   e. Native function-block programming within the Niagara 4 environment.
2. The controller shall be capable of either integrating with other devices or standalone operation.
3. The controller shall have two microprocessors. The Host processor contains on-chip FLASH program memory, FLASH information memory, and RAM to run the main HVAC application. The second processor for network communications. Controller memory minimum requirements include:

a. FLASH Memory Capacity: 60 Kilobytes with 8 Kilobytes for application program.
b. FLASH Memory settings retained for ten years.
c. RAM: 2 Kilobytes.

4. The controller shall have an FTT transformer-coupled communications port interface for common mode-noise rejection and DC isolation.
5. The controller shall have an internal time with the ability to automatically revert from a master time clock on failure.
   a. Operating Range: 24 hours, 365 days, multi-year-calendar including day of week and configuration for automatic day-light savings time adjustment to occur on configured start and stop dates.
   b. Accuracy: +/- minute per month at 77° F (25° C).
   c. Power Failure Backup: 24 hours at 32° to 122° F (0° to 50° C).
6. The controller shall have Significant Event Notification, Periodic Update capability, and Failure Detect when network inputs fail to be detected within their configurable time frame.
7. The controller shall have an internal DC power supply to power external sensors.
   a. Power Output: 20 VDC +/- 10% at 75 Ma
8. The controller shall have visual indication (LED) of the status of the devise:
   a. Controller operating normally.
   b. Controller in process of download.
   c. Controller in manual mode under control of software tool.
   d. Controller lost it configuration.
   e. Now power to controller, low voltage, or controller damage.
   f. Processor and/or controller are not operating.
9. The minimum controller Environmental ratings:
   a. Operating Temperature Ambient Rating: -40° to 150° F (-40 to 65.5° C).
   b. Storage Temperature Ambient Rating: -40° to 150° F (-40 to 65.5° C).
   c. Relative Humidity: 5% to 95% non-condensing.
10. The controller shall have the additional approval requirements, listings, and approvals:
    a. UL/cUL (E87741) listed under UL916 (Standard for Open Energy Management Equipment) with plenum rating.
    b. CSA (LR95329-3) Listed.
    c. Meets FCC Part 15, Subpart B, Class B (radiated emissions) requirements.
    d. Meets Canadian standard C108.8 (radiated emissions).
    e. Conforms requirements European Consortium standard EN 61000-6-1; 2001 (EU Immunity)
    f. Conforms requirements European Consortium standard EN 61000-6-3; 2001 (EU Emission)
11. The controller housing shall be UL plenum rated mounting to either a panel or DIN rail (standard EN50022; 7.5mm x 35 mm).
12. The controller housing shall have a mix of digital inputs (DI), digital Triac Outputs (DO), analog outputs and universal inputs (UI).
    a. Analog outputs (AO) shall be capable of being configured as digital outputs (DO).
    b. Input and Output wiring terminals shall be removable from the controller without disconnecting the wiring.
    c. Input and Output wiring terminals shall be designated with color coded labels.
    d. Universal inputs shall be capable of being configured as binary inputs, resistive inputs, voltage inputs (o-10 VDC), or current inputs (4-20mA).
13. The controller shall provide for “user defined’ Network Variables (NV) for customized configurations and naming using Niagara 4 Framework™.
14. The controller shall provide “continuous” automated loop tuning with Adaptive Integral Algorithm Control Loop.
15. The controller platform shall have standard HVAC application programs that are modifiable

to support both the traditional and specialized “sequence of operations” as outline in Section four.

a. Discharge air control and low limit.
b. Pressure-dependent dual duct without flow mixing.
c. Variable air volume with return flow tracking.
d. Economizer with differential enthalpy.
e. Minimum airflow coordinated with CO2.
f. Unit ventilator cycle (1, 2, 3) 2-pipe.
g. Unit ventilator cycle (1, 2, 3) 2-pipe with face/bypass
h. Unit ventilator cycle (1, 2, 3) 4-pipe.
i. Unit ventilator cycle (1, 2, 3) 4-pipe with EOC valve.

2.16 VARIABLE FREQUENCY DRIVES

A. The VFD shall generate the required variable frequency through three main input voltage lines connected to a coil capacitor LC filter and diode bridge. This shall produce a DC voltage for an insulated gate bi-polar transistor (BGT) bridge. The IGBT bridge shall produce a pulse-width modulated (PWM) AC voltage for the motor. A microprocessor shall control the motor according to measured signals and control commands set from the VFD control panel. Control commands may be provided by stand-alone sensor input or by output from a DDC building management system.
   1. Integral power supply shall be one of the following as required by each motor:
      a. 200-240 VAC, 3 phase, 45-66 Hz ± 10%
      b. 380-500 VAC, 3 phase, 45-66 Hz ±10%
      c. 525-690 VAC, 3 phase, 45-66 Hz ± 10%
   2. The ambient ratings and temperature ranges shall:
      a. Operating 14°F to 104°F (-10°C to 40°C)
      b. Storage: -40°F to 104°F (-40°C to 60°C)
      c. Humidity range: 5 to 95% RH, non-condensing
B. The Enclosure shall be rated NEMA 1.
C. The VFD shall be RoHS compliant. The VFD will not contain electrolytic capacitors. The VFD circuit shall be lead-free.
D. All Variable Frequency Drives shall have the following standard features:
   1. The VFD shall have Pump and Fan Startup Wizards that can be modified using a personal computer-based commissioning tool with an optional software package, or a field removable control panel. The graphic display shall be removable for separate mounting, a minimum of 45 feet away from the VFD.
   2. The VFD shall log and display as a minimum, without adding separate instruments or equipment, the following:
      a. Temperature of the heat sink.
      b. Motor temperature
      c. Output frequency
      d. Status of analog and digital inputs and outputs
      e. Motor speed in rmp
      f. Total kWh consumed
      g. Total kWh trip counter
      h. Total kWh run counter
      i. Total hours run.
   3. The VFD shall be UL, cUL, and CE approved.
   4. The VFD shall be provided with built-in RFI filters and all models 3 HP or more shall include a DC or AC Choke.
   5. The VFD shall have the capability of communicating with over the following protocols:
      a. /MSTP and /IP

b. LonBus
c. Modbus RTU and Modbus/TCP
d. N2

6. The VFD shall accept a 0-10 Vdc or 4-20 mA signal, as well as six programmable digital inputs.
7. The VFD shall have a real-time clock for timed functions.
8. The VFD shall include a minimum of two programmable output relays, to provide signals such as run, ready or fault. It shall also include one 4-20 mA or 0-20 mA programmable output to provide signals such as motor speed, output frequency, or any other selected information.
9. The VFD shall include a Proportional + Integral + Derivative (PID) controller as standard to provide closed loop control directly from a signal transmitter without the need for external signal conditioning.

E. The VFD shall have the ability to be placed into Panel Control mode. In the panel control mode, the operator shall have the ability to enter a speed reference into the display to control the speed of the motor.

F. The VFD shall have sufficient capacity and provide a quality waveform so as to achieve full output power of the motor without causing excessive additional heat rise.
1. The minimum efficiency of the drive shall be:
a. >96% at 100% load
b. >92% at 20% load

G. The VFD shall comply with the following EMC standards:
1. Immunity: EN50082-1, -2, EN61800-3
2. Emission: EN50081-1, -2, EN61800-3

H. Output frequency range of 0-320 Hz with a resolution of 0.01 Hz
1. It shall be possible to set switching frequency within the range of 3 kHz to 16 kHz to minimize audible motor noise.

I. A minimum of 8 preset motor speeds shall be available.

J. The VFD shall provide 3 skip frequencies with lower and upper frequency set-points to avoid mechanical resonance.

K. The VFD shall protect itself against:
1. Input transients to VDEO160 class W2
2. Loss of motor phase
3. Grounding of any output phase
4. Loss of speed reference.

L. The VFD shall have an input for a motor thermistor to monitor motor temperature. If a motor thermistor is not connected, the VFD shall model the motor temperature in its software. When overheating of the motor is predicted, an alarm or automatic shutdown shall be initiated.

M. The VFD shall provide full electrical isolation between power and control components, including input and output signals.

N. The VFD shall have the following protection functions:
1. Heat sink over-temperature.
2. Under-voltage protection.
3. Over-voltage protection.
4. Over-current protection
5. Earth fault protection
6. VFD fault protection
7. Loss of input/output phase protection
8. Motor stalled protection
9. Motor under-load protection
10. Motor over-temperature protection
11. Short circuit protection

12. External fault injection

O. The VFD shall consist of separate modules for the control section, power section, and fan. Each section shall consist of separate modules for the control section, power section, and fan. Each section shall be able to be removed and replaced independent of the other sections.

P. The entire power section must be in a steel enclosure. No other enclosures are acceptable.

Q. The control unit section of the VFD shall have the ability to be powered by an external 24 Vdc power supply to allow access to the stored data and to allow for: commissioning, field bus applications, and checkout prior to connecting the main supply.

R. The VFD control panel shall display at least five run status indicators, including:
1. Run
2. Ready
3. Fault
4. Motor Direction
5. Stop

S. The VFD control panel shall have the ability to monitor at least 9 real-time actual values or parameters.

T. The control panel shall allow the user to lock out parameters by choice of a password or parameter selection.

U. The control panel shall have EEPROM to retain all parameters when the VFD is powered down.

V. The control panel shall show, on a fault condition, the following information:
1. Operation days
2. Operation hours
3. Output frequency
4. Motor current
5. Motor voltage
6. Motor Power
7. Motor Torque
8. DC Voltage
9. Unit Temperature
10. Run Status

W. Software
1. The VFD Manufacturer shall offer the following software, at no additional charge or license fee:
   a. VFD commissioning software
   b. Updated versions of VFD system software
   c. Updated versions of VFD applications software
   d. Updated versions of VFD option board software

X. Installation

The VFD shall be installed by the Mechanical Contractor. The contractor shall install the drive-in accordance with the recommendations of the VFD manufacturer, as outlined in the installation manual.

The VFD power wiring shall be completed by the electrical contractor. The contractor shall complete all power wiring in accordance with wiring recommendations of the VFD manufacturer, as outlined in the installation manual.

Y. Warranty

Z. All VFD components, parts and assemblies shall be guaranteed against defects in materials and workmanship for 36 months.

AA. VFD to be LON and open protocol.

BB. Manufacturer: ABB

2.17 ENERGY ANALYSIS AND MANAGEMENT SYSTEM SOFTWARE

A. Operating System: The Energy Suite shall run Windows 10 or latest version or utilize Niagara 4 Analytics 2.0 framework (Niagara 4 Supervisor).

B. The Energy Suite shall employ browser-based functionality for ease of navigation. It shall include a tree view (similar to Windows Explorer) allowing users to view and manipulate underlying systems without the need for dedicated workstations or client software. In addition, menu-pull downs, and toolbars shall employ buttons, commands, and navigation to permit the user access to real-time analysis, computations, and reports with a minimum knowledge and basic computing skills.

C. The Energy Suite shall support, as needed, unlimited point and meter capacity.

D. The Energy Suite shall provide a comprehensive M&V Tool that meets International Performance Measurement and Verification Protocol (IPMVP) guidelines.

E. Energy and Enterprise Profiler. The profile shall provide extensive reporting flexibility allowing users to profile any data point over any period of time. The user shall be able to trend and analyze energy, temperature, production, and facility data with, at a minimum, the following reports:

F. Aggregation Analysis. Compute's consumption and demand along with load factor for a point or group of points.

G. Average Daily Profile. Displays an average 24 hour period for any day or combination of days.

H. Enterprise Ranking. Ranks energy usage in the enterprise to identify the most and least efficient buildings.

I. Equipment Operation. Displays runtime and runtime percentage for digital points.

J. Exceptions. Allows user to compare data values versus a baseline or against a defined range of values.

K. Load Duration. Identifies the length of time that a demand exceeds a certain level.

L. Point Trending. Performs statistical analysis to determine correlations, standard deviations, slope, regression line, and mean.

M. Relative Contribution. Determines how sub meters or multiple main meters contribute to total energy within or between sites.

N. Spectrum Summary. Utilizes pattern recognition to quickly identify anomalies with inconsistent patterns indicating a need for more detail analysis.

O. Correlation. Shows the correlation between two data logs to determine if any relationship exists between them.

P. Cost Profiler. The profile shall provide extensive reporting flexibility allowing users to compare energy costs based on metered interval data and applicable rate structures. The user shall be able to benchmark facilities, identify inefficiencies, implement changes, and measure the cost impact of energy reduction strategies to proactively manage budgets and calculate accurate cost projections. In addition, the user shall be able to compare different procurement strategies and rate structures without actually switching energy providers or rates. Provide at a minimum the following reports:

Q. Bill Reconciliation. Compare utility invoices to calculated values to identify billing errors. User can establish a historical baseline with manually entered date from utility invoices.

R. Cost Contribution. Determine how meters, whether sub meters within a building or main meter across an enterprise, contribute to the aggregate energy expense.

S. Cost Ranking. Ranks meters to determine the most costly. Normalize data based on outside air temperature and floor area.

T. Budget Report. User can enter budgets or use historically generated data, then compare against actual costs and make projections for reporting periods.

U. What-If Analyzer. Enables prediction of future costs. User can manipulate consumption patterns and demand levels to project savings from various strategies.

V. Rate Comparison. Analyze alternative rates and energy providers. Determine the effect of an energy strategy prior to implementation.

2.18 OTHER CONTROL SYSTEM HARDWARE

A. Motorized control dampers that are not be integral to the equipment shall be furnished and installed by the Mechanical Contractor/ATC Contractor. Control damper frames shall be constructed of galvanized, steel, formed into changes and welded or riveted. Dampers shall be galvanized, with nylon bearings. Blade edge seals shall be vinyl. Blade edge and tip seals shall be included for all dampers. Blades shall be 16-guage minimum and 6 inches wide maximum and frame shall be of welded channel iron. Bearings shall be composed of a Celcon inner bearing with aluminum hexagon blade pivot pin, rotating within a poly carbonate outer bearing inserted in the frame. The dampers shall be equal to Tamco series 9000 ECT for parallel blade dampers and for opposed blade dampers. Dampers shall have a closed leakage rate of not more than 1.4 CFM per sq. ft. for 3'x3' damper at 1" S.P leakage class 1A.

B. Control damper actuators shall be furnished by the ACT Contractor. Two-position or proportional electric actuators shall be direct-mount type sized to provide a minimum of 5 in-lb torque per square foot of damper area. Damper actuators shall be spring return type. Operators shall be heavy-duty electronic type for positioning automatic dampers in response to control signal. Motor shall be of sufficient size to operate damper positively and smoothly to obtain correct sequence as indicated. All applications requiring proportional operation shall utilize truly proportional electric actuators. All damper actuators (motors) installed in conjunction with an Air Handler/HVAC unit must be of the spring return, 2 position, occupied/unoccupied type, or modulating where an economizer cycle is required. Combustion air damper actuators shall be of the 2 position, spring return type.

C. Control Valves: Control valves shall be 2-way, or 3-way pattern as shown and constructed for tight shutoff at the pump shut-off head or steam relief valve pressure. Control valves shall operate satisfactorily against system pressures and differentials. Two position valves shall be ‘line’ size. Proportional control valves shall be sized for a maximum pressure drop for a maximum pressure drop of 5.0 psi at rated flow (unless otherwise noted or scheduled on the drawings). Valves with sizes up to and including 2 inches shall be “screwed’ configuration and 2-1/2 inch and larger valves shall be “flanged” configuration. All control valves, including terminal unit valves, less than 2 inches shall be globe valves. Electrically actuated control valves shall include spring return type actuators sized for tight shut-off against system pressures (as specified above) and, when specified, shall be furnished with integral switches for indication of valve position (open-closed). Pneumatic actuators for valves, when utilized, shall be sized for tight shut-off against system pressures (as specified above).

D. Control Valve Actuators: Actuators for VAV terminal unit heating coils shall be “drive-closed” type.

All actuators shall have inherent current limiting motor protection. Valve actuators shall be 24-volt, electronic type, modulating or two-position as required for the correct operating sequence. Actuators on valves needing 'fail-safe' operation shall have spring return to Normal position. Modulating valves shall be positive positioning in response to the signal. All valve actuators shall be UL listed.

E. All control valves 2 ½" or larger shall have position indication. All hot water control valves shall be Normally-Open arrangement; all chilled water control valves shall be Normally-Closed arrangement.

F. Dynamic Pressure-Regulating Control Valves

G. The valve and actuator combination product family shall be a factory assembled and tested unit.

H. Wall Mount Room Temperature sensors: Each room temperature sensor shall provide temperature indication to the digital controller, provide the capability for a software-limited occupant set point adjustment (warmer-cooler slider bar or switch) and limited operation override capability. Room temperature Sensors shall be 20,000-ohm thermistor type with a temperature range of -40 to 140 degrees F. The sensor shall be complete with a decorative cover and suitable for mounting over a standard electrical utility box. These devices shall have an accuracy of 0.5 degrees, F., over the entire range.

I. [Digital Wall Module Option]
   1. The Digital Wall Sensor shall have the ability to:
      a. Control user access to control parameters
      b. Customize parameter access by using the Niagara 4 Workbench tool.
      c. Be programmable for: Home screen options, tenant access, contractor access, access to controller parameters, setpoint, override, fan, and other parameters.
      d. Balance the VAV system from the wall module.
      e. Configurable Home screen options
      f. Network bus jack
      g. Retain user configuration, including set points after a power outage.

J. Duct-mounted and Outside Air Temperature Sensors: 20,000-ohm thermistor temperature sensors with an accuracy of ±0.2°C. Outside air sensors shall include an integral sun shield. Duct-mounted sensors shall have an insertion measuring probe of a length appropriate for the duct size, with a temperature range of -40 to 160 degrees F. The sensor shall include a utility box and a gasket to prevent air leakage and vibration noise. For all mixed air and preheat air applications, install bendable averaging duct sensors with a minimum 8 – foot long sensor element. These devices shall have accuracy of 0.5 degrees F, over the entire range.

K. Humidity sensors shall be thin-film capacitive type sensor with on-board nonvolatile memory, accuracy to plus or minus two percent (2%) at 0 to 90% RH, 12 – 30 VDC input voltage, analog output (0-10 VDC or – 20 mA output). Operating range shall be 0 to 100% RH and 32 59 140-degree F. Sensors shall be selected for wall, duct, or outdoor type installation as appropriate.

L. Carbon Dioxide Sensors (CO2): Sensors shall utilize Non-dispersive infrared technology (N.D.I.R.), repeatable to plus or minus five percent (5%) or 75 PPM, whichever is greater. Response shall be less than one minute. Input voltage shall be 20 to 30 VAC or DC. Output shall be 0 – 10 VDC. Sensor shall be wall or duct mounted type, as appropriate for the application, housed in a high impact plastic enclosure.

M. Current Sensitive Switches: Solid state, split core current switch that operates when the current level (sensed by the internal current transformer) exceeds the adjustable trip point. Current switch to include an integral LED for indication of trip condition and a current level below trip set point.

N. Differential Analog (duct) Static Pressure Transmitters provide a pressure transmitter with integral capacitance type sensing and solid-state circuitry. Accuracy shall be plus or minus 1% of full range; range shall be selected for the specific application. Provide zero and span adjustment capability. Device shall have integral static pickup tube.

O. Differential Air Pressure Switches: Provide SPDT type, UL-approved, and selected for the appropriate operating range where applied. Switches shall have adjustable set points and barbed pressure tips. +/- 5% accuracy, -1" to + 1" P.G.

P. Water Flow Switches: Provide a SPST type contact switch with bronze paddle blade, size for the

actual pipe size at the location. If installed outdoors, provide a NEMA-4 enclosure. Flow switch shall be UL listed.

Q. Temperature Control Panels: Furnish temperature control panels of code gauge steel with locking doors for mounting all devices as shown. All electrical devices within a control panel shall be factory wired. Control panel shall be assembled by the BAS in a UL-Certified 508A panel shop. A complete set of 'as-built' control drawings (relating to the controls within the panel) shall be furnished within each control panel.

R. Pipe and Duct Temperature sensing elements: 20,000-ohm thermistor temperature sensors with and accuracy of ±1% accuracy. Their range shall be -5 to 250°F. Limited range sensors shall be acceptable provided they are capable of sensing the range expected for the point at the specified accuracy. Thermal wells with heat conductive gel shall be included.

S. Low Air Temperature Sensors: Provide SPST type switch, with 15 to 55 degrees F., range, and vapor-charged temperature sensor. Honeywell model L482A, or approved equivalent.

T. Relays: Start/stop relay model shall provide either momentary or maintained switching action as appropriate for the motor being started. All relays shall be plugged in, interchangeable, mounted on a subbase and wired to numbered terminals strips. Relays installed in panels shall all be DPDT with indicating lamp. Relays installed outside of controlled devices shall be enclosed in a NEMA enclosure suitable for the location. Relays shall be labeled with UR symbol. RIB-style relays are acceptable for remote enable/disable.

U. Emergency Stop Switches: Provide toggle-type switch with normally-closed contact. Switch shall be labeled "AIR HANDLER EMERGENCY SHUTOFF, NORMAL – OFF."

V. Transducers: Differential pressure transducers shall be electronic with a 4-20 mA output signal compatible to the Direct Digital Controller. Wetted parts shall be stainless steel. Unit shall be designed to operate in the pressure ranges involved.

W. Control Power Transformers: Provide step-down transformers for all DDC controllers and devices as required. Transformers shall be sized for the load, but shall be sized for 50 watts, minimum. Transformers shall be UL Listed Class 2 type, for 120VAC/24VAC operation.

X. Line voltage protection: All DDC system control panels that are powered by 120 VAC circuits shall be provided with surge protection. This protection is in addition to any internal protection provided by the manufacturer. The protection shall meet UL, ULC 149, IEEE C62.41B A grounding conductor, (minimum 12 AWG), shall be brought to each control panel.

2.19 ECONOMIZER

A. HVAC units shall be provided with economizer controls where indicated on the drawings or elsewhere in these specifications or on any system 4 tons or over. Enthalpy selection system shall consist of one enthalpy transmitter in the outside air, one enthalpy transmitter in the return air, and a relay to select the lower of the two enthalpies. In operation, the signal from the two enthalpy transmitters shall be compared by the differential switching relay so that when the outside air enthalpy is lower than the return air enthalpy, the temperature control system shall modulate the outside, return, and relief dampers to supply up to 100% outside air for "free cooling". When the outside air enthalpy is higher than the return air, the system shall position to minimum outside air. The use of separate temperature and humidity transmitters to arrive at enthalpy is not acceptable. Outside air transmitter shall not be damaged by operation during fog conditions.

B. The economizer module shall be ASHRAE 90.1 compliant (latest version).

C. The module shall have a local display screen for diagnostics at the unit.

D. On projects with building automation systems the economizer shall have a BACNET output and shall be interconnected to the building automation system.

E. The module shall have fault detection diagnostics.

F. Manufacturer: Belimo Zip Economizer series. Equal by Honeywell.

2.20 CONTROL DEVICES

A. All electrical wiring for the control system shall be as specified in this section and the Electrical Section of the Specifications and as required by local codes. The wiring shall be by this contractor.
B. Electric thermostats shall be low-voltage, modulating type to control modulating devices, or low- or line-voltage type with heat anticipator for two-position controls. Provide locking covers (clear plastic, hinged type).
C. All thermostats to be 24hr./7 day programmable type, auto changeover type, +/-3 degree adjustment capability (when integrated with building automation system), WIFI capability. Manufacturer: Honeywell. Provide locking cover (clear plastic, hinged type).

2.21 DUCT SMOKE DETECTORS

A. Duct smoke detectors shall be of the photo-electronic type with sampling tube of ample length to traverse the entire width of the duct. Duct smoke detectors shall be manufactured by the control companies, the fire alarm companies, B.R.K. Electronics or approved equal. All HVAC units of 2000 CFM or more shall have duct smoke detectors in both the supply and return air streams. A single duct smoke detection in the return air stream shall be provided only when acceptable to the local authority having jurisdiction.
B. Duct smoke detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.
C. Units of 15,000 CFM or more shall have two detectors. (supply and return air)
D. Furnish and install where indicated on the drawings or required elsewhere in the specifications air duct smoke detectors. They shall integrate photoelectric, ionization and heat sensing technologies for optimum detection accuracy and to prevent unwanted alarms. Auxiliary contacts shall be provided to shut down the air handling unit fan. The detector shall output to a remote alarm indicator.
E. Duct smoke detectors to be furnished by the (mechanical contractor/electrical contractor).
F. Duct smoke detectors shall be installed by the mechanical contractor.
G. Interconnection between the duct smoke detectors and fire alarm system shall be performed by the electrical contractor/fire alarm contractor.
H. Control's integration to shut down the HVAC equipment in alarm shall be performed by the mechanical contractor/ATC contractor.

2.22 FREEZESTATS

A. The freezestat shall be of the vapor pressure type with a 20 foot minimum element. Element shall respond to the lowest temperature sensed by any one foot section.
B. The freezestat shall be manual reset. Provide reset button and red indicator light. Location to be coordinated with architect.
C. All coils (heating hot water, chilled water, condenser water/water source) with outside air and hot water in ducts or units shall have freezestats.

PART 3 - EXECUTION

3.01 SUBMITTALS

A. The materials, equipment and software design shall be submitted as follows:
    1. Control Contractor shall submit qualifications as outlined in Part 1, 1.1.A.2.b Control contractor requirement including:
        a. Names of Tridium/WEBS N4 certified employees in your employ today.

b. List (5) WEBs-N4™/ WEBs-N4™ Supervisor projects of similar size.
c. Location of principal place of business that would respond to service requests the first year.
d. Letter from Honeywell Regional representative stating your company is in good standing with the ACI and ACS Program.
e. Requirements (a thru d above) shall be submitted to project engineer for review for approval. No work shall be allowed without written approval. All information shall be handled in confidence and not for distribution to third parties.

2. Submittals to include but not limited to:
   a. Submit shop drawings of all components.
   b. Submit manufacturers' data sheets of valve Cv performance.
   c. Submit design data and sequence of operations descriptions for all systems.
   d. Submit wiring diagrams of electrical or electronic control systems.
   e. ATC Contractor to include all input and output points for engineer review and approval. (Specifier: add any owner specific points)
   f. At the completion of the project, submit final “as-built” drawings/CAD disk, all associated component/equipment cut-sheets/submittals, wiring diagrams, and final/actual sequence of operations descriptions of each system. Include ATC emergency contact information.
3. Ten copies of shop drawings or the entire control system shall be submitted and shall consist of a complete list of equipment and materials, including manufacturers’ catalog data sheets and installation instructions, samples of written controller checkout sheets and performance verification procedures for applications similar in scope shall be included for approval.
4. Shop drawings shall also contain complete wiring I/O point list for each system, schematic diagrams, sequences of operations, control system bus layout and any other details required to demonstrate that the system has been coordinated and will properly function as a system. Shop drawings shall be approved before any equipment is installed. Please allow 10 days for submission, review and return by engineer.
5. All dampers and actuator valves and actuator shall be sized and submitted with shop drawing. Schedule shall include:
   a. Identification tags all dampers/valves.
   b. Location all damper/valves.
   c. Damper and/or Valve type.
   d. Actuator size and type.
   e. Damper and/or valve pressure drop.
6. Submittal shall also a “sample of prior art” for project of the graphics. This web-based interface with the network via dynamic color shall include a flowchart (site map) indicating how the graphics are to be linked to one another for system navigation.
   a. Minimum depiction for graphics for project:
   b. Building picture and site plot plan (aerial or ground view provided by owner).
   c. Building floor plan.
   d. Each mechanical system.
   e. Control devices depicted by point-and-click graphics.

Note:

Floor plan shall indicate each mechanical zone with different colors shaded as required to depict which zones are not maintaining temperature/humidity/pressure/CO_2, etc programmable levels/limits and which zones are in alarm.
Provide animated graphic for each system component including rooftop units, air handling units, UAV terminals, fan powered terminals, exhaust fans, supply fans, hot water systems – boilers, hot water pumps; chilled water systems – chillers, cold water pump condenser water pumps, cooling towers, etc.

The graphics are intended to be 20% - 30% complete at this stage with changes to be based on review comments from the engineer and/or owner.

B. Upon completion of the work, provide a complete set of as-built drawings on compact disk (CD). Additionally, all control device furnished with this section shall be programmable directly from Tridium N4™ workbench.

C. Upon completion of this project, the following copies of software shall be included on CD for the owner:
   1. The ATC contractor shall use the “contract CD to owner – software package” to simulate all software application programs to ensure such programs are free from design errors and they accurately accomplish the application(s) sequence-of-operation. This simulation shall include the WEBs-N4™ embedded tool in controller allowing for the capability of other Niagara 4 factory certified contractor(s) access to the programming capability. The simulation shall be demonstrated before the owner/engineer at time and place arranged by the owner. Allow for a minimum of (8) hours for the demonstration and software changes resulting from the demonstration the owner feels should be changed/enhanced, etc. will/may result in another demonstration if so requested by owner. These changes will be made at no additional expense to owner.
   2. Four copies of the “as-built” drawings shall be provided in addition to the document on compact disk. All “as-built” drawings shall also be installed into the BAS server in a dedicated directory. For each JACE™ (WEBs-N4™) the station shall be copied to supervisor and distribution file copy back-up and written to CD to owners’ hands.
   3. Control contractor shall provide “quote” to owner to install mechanical equipment service information such as, spare parts list, mechanical service contractors, etc into FMCS server as a dedicated directory. Owner, working with engineer, shall develop specification requirements for control contractor. ATC contractor shall include (8) hours of technical support, including updating information as requested by owner, covering the time interval of the warranty period.

3.02 INSTALLATION

A. Install system and materials in accordance with manufacturer’s instructions, and as detailed on the project drawing set.

B. Line and low voltage electrical connections to control equipment show specified or show on the control diagrams shall be furnished and installed by the ATC Contractor in accordance with these specifications.

C. Equipment furnished by the Mechanical Contractor that is normally wired before installation shall be furnished completely wired. Control wiring normally performed in the field will be furnished and installed by the ATC Contractor (ATC Contractor to coordinate with the Mechanical Contractor).

D. All control devices mounted on the face of control panels shall be clearly identified as to function and system served with permanently engraved phenolic label.

E. Installation of Network
   1. Ethernet
      a. The network shall employ Ethernet LAN architecture, as defined by IEEE 802.3. The Network Interface shall be fully Internet Protocol (IP) compliant allowing connection to currently installed IEEE 802.3, Compliant Ethernet Networks.
      b. The network shall directly support connectivity to a variety of cabling types. As a minimum provide the following connectivity: 10 Base 2 (ThinNet RG-58 A/U Coaxial cabling with BNC connectors, 10 Base T (Twisted-Pair-RJ-45 terminated UTP cabling).
   2. LonWorks
      a. The network shall employ LonTalk communications FTT-10.
   3. MS/TP

a. The network shall employ MS/TP EIA-485-A Standard.
b. The MS/TP EIA-485 network shall use shielded, twisted-pair cable with a characteristic impedance between 100 and 130 ohms.

4. Third Party Interfaces: Contractor shall integrate real-time data from building systems by other trades and databases originating from other manufacturers as specified and required to make the system work as one system.

F. Installation of Digital Controllers and Programming
1. Provide a separate digital control panel for each major piece of equipment, such as air handling unit, chiller, pumping unit etc. Points used for control loop reset such as outdoor air, outdoor humidity, or space temperature could be located on any of the remote control units.
2. Provide sufficient internal memory for the specified control sequences and trend logging. There shall be a minimum of 25 percent of available memory free for future use.
3. System point names shall be modular in design, permitting easy operator interface without the use of a written point index.
4. Provide software programming for the applications intended for the systems specified and adhere to the strategy algorithms provided.
5. Provide graphics for each piece of equipment and floor plan in the building. This includes each chiller, cooking tower, air handling unit, fan, terminal unit, boiler, pumping unit etc. These graphics shall show all points dynamically as specified in the point list.

3.03 WIRING

A. All wiring to be CAT 6 plenum rated in concealed areas and in conduit where exposed or subject to damage. All exterior exposed control wiring to be in conduit and weather protected. Conduit to be (EMT, galvanized, PVC) (specifier to select). No PVC is permitted in plenum.
B. All control wiring and power wiring to the control panels, NAC, computers, and network components shall be the responsibility of the ATC contractor.
C. All wiring shall be in accordance with the National Electrical Code and any applicable local codes. All wiring shall be installed in the conduit types specified unless otherwise allowed by the National Electrical Code or applicable local codes.

3.04 START UP

A. The ATC contractor shall verify that all wiring is properly connected and free of all shorts and ground faults. Verify that all connections are tightened appropriately. Calibrate each device as required by the manufacturer's recommendations.
B. Verify that the digital output devices operate properly and that the normal positions are correct.
C. Verify that all analog output devices are functional, that start point and span are correct, and that direction and normal positions are correct including fail-safe positions. The ATC contractor shall check all control valves and automatic dampers to ensure proper action and closure. The ATC contractor shall make any necessary adjustment to valve stem and damper blade travel.
D. Complete software shall be installed and tested (dry run) prior to start-up.
E. Software technician shall observe and fine tune all control loops.
F. Alarms and interlocks:
1. Check each alarm separately by including an appropriate signal at a value that will trip the alarm.
2. Interlocks shall be tripped using field contracts to check the logic, as well as to ensure that the fail-safe condition for all actuators is in the proper direction.
G. Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action.
H. Return the system to a normal operating state after each phase of start-up, commissioning, and

demonstration. Any points overridden, devices place in manual position, setpoint adjusted, etc. are to be restored to normal operation condition prior to acceptance.

I. Connection to the Internet must be tested and communication confirmed.

3.05 SYSTEM VALIDATION AND DEMONSTRATION

A. As part of final system acceptance, a system demonstration is required (see below). Prior to start of this demonstration, the ATC contractor is to perform a complete validation of all aspects of the Controls and Instrumentation System.

B. Validation
   1. Prepare and submit for approval a Validation Test Plan including Test Procedures for the performance verification tests. Test Plan shall address all specified functions of the Engineering Control Center and all specified sequences of operation. Explain in detail actions and expected results used to demonstrate compliance with the requirements of this specification. Explain the method for simulating the necessary conditions of operation used to demonstrate performance of the system. Test plan shall include a Test Check List to be used by the Installer's agent to check and initial that each test has been successfully completed. Deliver Test Plan documentation for the performance verification tests to the Architect or Owner's Representative, 30 calendar days prior to start of performance verification tests. Provide draft copy of operation and maintenance manual with performance verification test.
   2. After approval of the Validation Test Plan, Installer shall carry out all tests and procedures therein. Installer shall completely check out, calibrate, and test all connected hardware and software to insure that system performs in accordance with approved specifications and sequences of operation submitted. Installer shall complete and submit Test Check List

C. Demonstration
   1. System operation and calibration to be demonstrated by the ATC Contractor in the presence of the Engineer, Architect or Owner's representative on random samples of equipment as dictated by the Owner's representative. Should random sampling indicate improper commissioning, the owner reserves the right to subsequently witness complete calibration of the system at no additional cost to the owner.
   2. Demonstrate to authorities that all required safeties and life safety functions are fully functional and complete.
   3. Make accessible personnel to provide necessary adjustments and corrections to systems as directed by balancing agency.
   4. Witnessed validation demonstration of Operator's Terminal functions shall consist of:
      a. Running each specified report.
      b. Display and demonstrate each data entry to show site specific customizing capability. Demonstrate parameter changes.
      c. Step through penetration tree, display all graphics, demonstrate dynamic update, and direct access to graphics.
      d. Execute digital and analog commands in graphic mode.
      e. Demonstrate DDC loop precision and stability via trend logs of inputs and outputs 6 loops minimum.
      f. Demonstrate BAS performance via trend logs and command trace.
      g. Demonstrate scan, update, and alarm responsiveness.
      h. Demonstrate spreadsheet/curve plot software, and its integration with database.
      i. Demonstrate on-line user guide, and help function and mail facility.
      j. Demonstrate digital system configuration graphics with interactive upline and downline load, and demonstrate specified diagnostics.
      k. Demonstrate multitasking by showing dynamic curve plot, and graphic construction operating simultaneously via split screen.

l. Demonstrate class programming with point options of beep duration, beep rate, alarm archiving, and color banding.

3.06 PROJECT CLOSEOUT - ACCEPTANCE TESTING

A. Upon completion of the installation, the BAS Contractor shall load all system software and start-up system. The ATC Contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to insure that the system is functioning in full accordance with these specifications.

B. System Acceptance: Satisfactory completion is when the ATC Contractor has performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner's Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

3.07 OPERATOR TRAINING

A. During system commissioning and at such time acceptable performance of the Control System hardware and software has been established, the ATC Contractor shall provide on-site operator instruction to the owner's operating personnel. Operator instruction shall be done during normal working hours and shall be done during normal working hours and shall be performed by a competent representative familiar with the system hardware, software, and accessories.

B. The BAS Contractor shall provide 8 hours of comprehensive training in three separate sessions (24 hours total) for system orientation, product maintenance and troubleshooting, programming, and engineering, if not provided under a previous contract at the site using the same brand and type of controllers within the previous 3 years.

B. The ATC Contractor shall provide two (2, 4, 8 hour) training sessions for systems orientation, product maintenance, trouble shooting, and emergency contacts. ATC Contractor to coordinate with owner/architect/engineer to determine representatives/designated staff to be present for the training. ATC Contractor to provide one training session during the heating (winter) season and one during the cooling (summer) season.

C. Train the designated staff or representative to enable them to do the following:
   1. Day-to-Day Operations:
      a. Proficiently operate the system.
      b. Understand control system architecture and configuration.
      c. Understand BAS system components.
      d. Understand system operation, including BAS system control and optimizing routines (algorithms).
      e. Operate the workstation and peripherals.
      f. Log on and off the system.
      g. Access graphics, point reports, and logs.
      h. Adjust and change system set points, time schedule, and holiday schedules.
      i. Recognize malfunctions of the system by observation of the printed copy and graphical visual signals.
      j. Understand system drawings and Operation and Maintenance Manuals.
      k. Understand job layout and location of control components.
      l. Access data from BAS controllers and application specific controllers.
      m. Operate portable operator terminals.
   2. Advanced Operators:
      a. Make and change graphics on the workstation.
      b. Create, delete, and modify alarms, including annunciation and routing of these.
      c. Create, delete, and modify point trend logs and graphic or print these both on an ad-hoc basis and at user-definable intervals.

d. Create, delete, and modify reports.
e. Perform BAS system field checkout procedures.
f. Perform BAS controller unit operation and maintenance procedures.
g. Perform workstation and peripheral operation and maintenance procedures.
h. Perform BAS diagnostic procedures.
i. Configure hardware including PC boards, switches, communication, and I/O points.
j. Adjust, calibrate, and replace system components.

3. System Managers/Administrators
a. Interface with job-specific, third party operator software.
b. Add new users and understand password procedures.

D. Sessions shall be scheduled so that at least one training session shall occur during heating season and one during cooling season.

3.08 WARRANTY PERIOD SERVICES

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

3.09 WARRANTY ACCESS: Verify with owner(s) and/or IT representative on the model of service access into your BAS system for the warranty period. This access shall cover diagnostics and troubleshooting.

A. The Owner shall grant to the ATC Contractor reasonable access to the BAS during the warranty period. Remote access to the BAS (for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period) will be allowed.

3.10 OPERATION & MAINTENANCE MANUALS

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

6. (1) Copy of “Owner’s CD” as specified in Section 23 00 00.
7. All equipment manufacturers/suppliers shall provide in writing (and documented if requested by the Owner) a NICS statement indication the interface with their equipment has no connectivity restrictions.
8. Niagara 4 JACE start up form must be submitted for each JACE provided. This is to include:
   a. TCP/IP Settings
   b. Platform Credentials
   c. Administration level station access credentials
   d. Installed version number.
   e. Licensed version number.
   f. Model, serial, and Host ID.

   The station and tool “NICS” would be as follows:

Property	Value
Station Compatibility In	All
Station Compatibility Out	All
Total Compatibility In	All
Total Compatibility Out	All

3.11 CONTRACT EQUIPMENT PROFILE UNDER BAS CONTRACT

The following listed equipment shall be under direct control or monitored by the specified **automated** systems. Project ATC Contractor, under this division, is responsible for all listed equipment and all other equipment references under the specifications and/or mechanical plans for automation interface. NICS full connectivity without restrictions shall apply:

PART 4 - SEQUENCE OF OPERATIONS

4.01 GENERAL NOTES

A. The mechanical contractor shall retain a qualified ATC sub-contractor to furnish all labor, materials, equipment, and service necessary for a complete and operating ATC system, utilizing direct digital controls (DDC) as shown on the drawings and described herein. The BAS shall provide standalone access using a standard web browser, HVAC system control, energy management, alarming, monitoring, trending, and reporting functions with operator interface. The BAS shall include a web-based operator interface depict each mechanical system and building floor plan by a point-and-click graphic. The web server shall reside on the building owner's network and shall be provided with an IP address by the owner. The web server shall gather data from the mechanical systems and generate web pages accessible through a conventional web browser on each pc connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface.

B. The BAS system shall provide:
   1. Stand-alone independent control for all mechanical systems as described in the sections that follow.
   2. Complete energy management software and firmware that resides and executes in networked field controllers. Operator workstation software shall not be utilized for energy management execution.
   3. Alarm management capability for all mechanical equipment described in the sections that follow – including alarm occurrence, annunciation, remote dial-out to remote sites or pagers,

acknowledgement, problem diagnostics, and reporting functions.

4. Complete password protected system monitoring through a local networked operator workstation, or through remote operator workstations. Remote workstations shall utilize telephone or internet or ethernet communications links, as required.
5. Standard and customized manual or automatic reports of trends, runtimes, consumables, alarms, and system operator activities.
6. The ATC contractor shall provide one central “master” manual shutdown switch to serve all of the mechanical equipment that is connected to the building automation system. The shutdown switch shall be located where directed by the local code official (near a main entrance). The ATC contractor shall provide all associated control wiring, programming, and a break-glass pushbutton manual shutdown switch. The switch shall be labelled "HVAC emergency shut-down". (Verify with the fire marshal. Emergency shut-down switch may need to be located in fire command panel. Coordinate with the electrical contractor).
7. The mechanical contractor shall submit equipment submittals of all mechanical equipment to the ATC contractor for review prior to ordering the equipment.
8. BAS web controllers and main control panel shall be connected to 120v emergency power provided by the electrical contractor.
9. All ATC wiring, components and installation shall comply with the national electric code.
10. ATC contractor shall utilize low voltage conductors (solid or stranded) of the appropriate gauge and approved by the thermostat manufacturer.
11. All occupied, unoccupied and morning warm-up periods and all temperature set points for all spaces and systems, shall be defined by the BAS and be fully adjustable.

4.02 INDOOR VAV AIR HANDLING UNITS WITH CHILLED WATER COOLING AND HOT WATER PRE-HEAT

A. General
1. Air handling unit shall be provided with an open protocol BACNET controller.
2. ATC contractor shall provide, install, and wire the duct mounted pressure sensors for VFD operation.
3. A duct mounted temperature sensor shall be shipped loose and field mounted in the supply ductwork to control the heating and cooling cycles of the unit.
4. The unit shall be provided with outside air temperature, outside air dew point, "proof of flow" air flow and dirty filter sensors.
5. ATC contractor shall provide, install, and wire the chilled water and hot water pre-heat motorized two-way (3-way) valves.
6. Occupied/unoccupied shall be determined by the BAS time clock.
7. The ATC contractor shall furnish and install a freezestat.

B. Operation
1. The supply fan shall operate continuously in occupied hours and cycle in unoccupied hours/evening hours. The supply fan shall operate continuously and the supply fan VFD shall vary the fan speed in response to a signal from the supply duct mounted pressure sensor.
2. Ventilation air - during occupied hours, the outside air damper shall be open. During the evening hours and unoccupied hours, the outside air damper shall be closed unless unoccupied cooling can be achieved via economizer.
3. Air-side economizer - when the outside air temperature is lower than the space air temperature and the outside air dewpoint temperature is below 55ºF, the unit shall operate in 100% outside air mode with no mechanical cooling as needed (the supply fan shall still operate variably in response to airflow demand). ATC contractor to integrate remote relief air controls.
4. Cooling - on a call for cooling, the chilled water coil shall maintain a minimum 55ºF (adj.) Leaving air temperature with the outside air damper in the minimum position to satisfy the

space cooling requirements. The supply air temperature can be reset to 65ºF max if all cooling loads are satisfied.

5. Heating - on a call for heating, the control valves on the hot water pre-heat coil shall modulate to maintain 55ºF (adj.) Leaving air temperature with the outside air damper in the minimum position to satisfy the space heating requirements. If all spaces are satisfied for cooling, the heating supply air temperature shall be reset to 65ºF max.
6. "Morning warm-up" mode
   a. The supply fan shall operate continuously and the outside air damper shall be closed.
   b. The BAS shall command all of the VAV boxes to fully open their inlet damper and the control valves on the hot water pre-heat coil shall modulate to raise the building space temperature to 70ºF (adj.).
   c. The outdoor air temperature sensor shall anticipate the warm-up start time to achieve occupied temperatures at opening.
7. (All single duct VAV box systems only) unoccupied heating - on a call for heating, the BAS shall command all of the VAV boxes to fully open their inlet damper and the control valves on the hot water pre-heat coil shall modulate to maintain 65ºF (adj.) In the building. The outside air damper shall be closed during unoccupied heating.
8. Provide a duct smoke detector in each unit 2,000 CFM or over in the return air connection and in the supply air ductwork.
9. Fire alarm shutdown – If the duct smoke detectors sense smoke, then any combination fire/smoke dampers shall close and the associated unit shall be de-energized. The unit shall not be permitted to operate until all trouble signals are cleared on the fire alarm system.
10. The freezestat shall be wired with the fan starter. Whenever the air temperature upstream of the coils is 36°F, the fan shall stop, the outside air damper shall close and the chilled water and heating water valves shall open. A manual reset shall return the unit to normal operation.
11. Integrate with the BAS.

4.03 BOILER

A. General
   1. The boilers shall be furnished with a boiler control panel to operate, modulate and control the heating hot water plant (boiler) operation. A field mounted gateway to BACNET shall be provided to interface the boiler control panel with the BAS.
   2. A pipe mounted temperature sensor shall be installed upstream of the boiler plant.

B. Operation
   1. The BAS shall enable the heating hot water plant via the boiler control panel.
   2. Once the boiler(s) and air switch are enabled, a water flow switch shall be enabled before the modulating gas valve on each boiler opens.
   3. The boiler integral control/safety circuit is activated by the BAS whenever there is a call for heat in any zone. The hot water boilers shall be modulated to maintain setpoint at the hot water discharge immersion sensor. The hot water discharge setpoint is reset based on outside air temperature as follows:

OUTSIDE AIR TEMP.	HOT WATER LOOP DISCHARGE TEMP.
70 degrees F or above	100 degrees F
50 degrees F	120 degrees F
40 degrees F	140 degrees F
30 degrees F	150 degrees F
20 degrees F	160 degrees F
0 degrees F or below	180 degrees F

4. The primary and secondary circulating pump (s) shall be energized any time the boiler (s) are allowed to operate. On a rise in outside air temperature above 65 degrees F the boiler shall be de-activated and the pump(s) de-energize.
5. Emergency shutdown - an emergency shutdown switch shall be provided by the electrical contractor in the mechanical/boiler room at each egress doors. In the event of an emergency, the switch shall have the ability to turn off power and disable the boilers.
6. Carbon monoxide detection - see carbon monoxide detection section.
7. Combustion air - see combustion air section.
8. Combustion air – combustion air shall be provided by direct vent kit.
9. The boiler shall be furnished with a chemical free water treatment system. The ATC contractor shall wire all controls, control panels and conductivity meters. The treatment module shall operate in accordance with the boiler manufacturers and water treatment vendors recommendations.
10. Integrate with the BAS.

4.04 CHILLED WATER SYSTEM PLANT - WATER COOLED CHILLERS

A. On a call for cooling (by the BAS):
1. The condenser water three way valve shall open to the minimum position to maintain a minimum of 60°F EWT to the chiller.
2. The motor operated valves at the chiller condenser water supply and chilled water return connections shall open.
3. If the outside air temperature is above 45°F, the motor operated valves at the cooling tower supply & return connections shall open. The cooling tower winter bypass connection motor operated valve shall be closed.
4. If the outside air temperature is below 45°f, the cooling tower supply and winter bypass connections motor operated valves at the cooling tower shall open. The cooling tower return motor operated valve shall be closed.
5. The lead chilled water pump and lead condenser water pump shall operate.
6. Once flow is proven through the flow switch, the chiller shall operate to maintain 44°Fchilled water to the building.

B. Primary loop temperature control
1. The BAS shall monitor the chilled water and condenser water loop temperatures, free cooling heat exchanger operation, cooling tower operation, pump status and flow.
2. Provide two (2) temperature sensors in each loop - condenser water and chilled water.
3. The chilled water loop pumps shall run continuously. (Modulate via carriable frequency drive)
4. The condenser water loop pumps shall run continuously and the condenser water three way valve shall modulate to maintain the condenser water loop temperature above 60°F to the chiller.
5. Emergency shutdown - if the condenser water loop temperature rises to above 100ºF, the BAS shall execute an emergency shutdown - shut down the chiller from running and continue to operate the pumps. Once the loop temperature reaches 95ºF (adj.), the BAS shall command the chiller to commence cooling again.

C. Primary loop pump control
1. Each chilled water and condenser water pump shall be provided with a variable frequency drive. Provide a differential pressure transducer to be mounted in the loop piping per the drawings (coordinate final location with engineer).
2. Loop pump start/stop - the loop pumps shall run continuously. The BAS shall operate the condenser water system pumps in a lead/lag pump arrangement. The BAS shall start and modulate the lead pump speed (via the VFDs) to match the system pressure set point.
3. Pump status - a current transformer shall be provided on pump motor to determine pump

status (on/off). Additionally, a pressure switch shall be provided on each pump (between the suction and discharge) to verify pump status in the event that pump drive shaft fails.

4. Lead/lag determination - the pumps shall operate as primary/standby. The pumps shall rotate weekly. If the lead pump is commanded on and the pump status detects no flow, then the BAS shall start the lag pump. If the BAS has commanded both pumps to start and both flow switches indicate no water flow or the differential pressure sensor indicates no pressure is present, the BAS shall command both pumps and the chiller to stop running. To restart the system, a pump must be energized manually.

D. Chilled water - see chiller (water cooled) sequence of operation.

E. Heat rejection (cooling tower) - see cooling tower section of sequence of operation.

F. Alarms

1. The building control system shall enable two high temperature alarms and one low temperature alarm.
2. High temperature alarm #1 - 105ºF
3. High temperature alarm #2 - 110ºF
4. Low temperature alarm #1 (chiller cooling mode) - 60ºF
5. Low temperature alarm #1 (free cooling mode) - 35ºF
6. The BAS shall signal an audible and visual alarm (at the BAS workstation) for each alarm condition.
7. Make-up water - the BAS shall indicate the presence of water flow in the chilled water system make-up water line as measured by the flow switch. If the flow switch measures water flow for extended period of time, the BAS shall enable an alarm condition signal.

G. Integrate with the BAS.

4.05 AIR COOLED CHILLER

A. General

1. The chiller shall be furnished with a unit mounted control panel (BACNET controller and integrated with the BAS) that shall initiate the start-up and control the internal components of the chiller.
2. All alarms generated by the chiller control panel shall be repeated on the BAS workstation.
3. Chilled water temperatures and evaporator barrel heater shall be monitored by the chiller control panel and the BAS.
4. The chiller shall be provided with motorized two-way valves on the chilled water supply & return.
5. The chiller controller shall go through a pre-defined pre-start delay routine that prevents short cycling, checks all chiller safeties, and shuts off oil sump heaters.

B. Operation

1. Once chilled water flow is proven by the chiller internal flow switches, the control panel shall start the chiller to operate and maintain 44°F leaving water. The internal controls shall modulate the chiller compressors to satisfy the maximum and minimum loads.
2. If flow is not detected, the chiller internal controls shall de-energize the chiller and generate an alarm on the BAS.
3. The unit controller shall utilize outside air reset when the chilled water load can be satisfied with higher temperature chilled water.
4. Heat trace - all outdoor / exposed piping with heat trace shall be operated when the outdoor air temperature falls below 35ºF (adj.)

C. Integrate with the BAS.

4.06 ROOFTOP CONSTANT VOLUME DX/GAS HEATING UNITS

A. General

1. Rooftop unit shall be provided with an open protocol BACNET controller.
2. Occupied/Unoccupied hours shall be determined by the BAS time clock.

B. Operation
1. The supply fan shall operate continuously in occupied hours and cycle in unoccupied hours/evening hours.
2. Ventilation air - during occupied hours, the outside air damper shall be open. During unoccupied and evening hours, the outside air damper shall be closed.
3. Economizer - when the outside air temperature is lower than the space air temperature and the outside air dewpoint temperature is below 55ºF, the unit shall operate in 100% outside air mode with no mechanical cooling.
4. Cooling - on a call for cooling, the unit shall operate the compressors to maintain 55ºF (adj.) Leaving air temperature.
5. Heating - on a call for heating, the gas fired heating section shall operate to maintain 70ºF (adj.) In the space.
6. Provide a duct smoke detector in each unit 2,000 CFM or over in the return air connection and in the supply air ductwork.
7. Fire alarm shutdown – If the duct smoke detectors sense smoke, then any combination fire/smoke dampers shall close and the associated unit shall be de-energized. The unit shall not be permitted to operate until all trouble signals are cleared on the fire alarm system.
8. Integrate with the BAS.

4.07 FAN/COIL UNITS - HEATING AND COOLING

A. General:
1. Fan coils shall be provided with an open protocol BACNET controller, 24V temperature controller, circuit setter and motorized control valves on the return piping.
2. Each unit shall be provided with a wall mounted temperature sensor with slide adjustment and local override.
3. Each unit shall be provided with a wire condensate overflow switch.
4. Each unit shall be provided with motorized control valves. ATC contractor shall wire valves to the fan coil controller.
5. If the unit receives un-tempered outside air, it shall be provided with a freezestat.
6. Provide duct mounted smoke detector on the return, for units over 2,000 CFM.

B. Operation
1. The supply fan shall cycle.
2. Outside air temperature shall be open to the minimum position during occupied hours.
3. Cooling: The fan coil controller shall modulate the chilled water 3-way (2-way) valve to maintain 72°F. (adj.)
4. Heating - on a call for heating, the unit shall modulate the heating hot water two or three-way valve to maintain 70°F. (adj.).
5. Unoccupied hours: Fan shall be off and the outside air damper shall be closed.
   a. Cooling: When space temperature rises above the unoccupied setpoint of 80°F (adj.), the fan shall start and the controller shall modulate the valve to maintain the setpoint.
   b. Heating: When space temperature falls below the unoccupied setpoint of 60°F (adj.), the fan shall start and the controller shall modulate the valve to maintain the setpoint.
6. The condensate overflow switch mounted in the coil drain pan shall disable the unit whenever moisture is sensed. Fan coil unit must be manually restarted.
7. Fire alarm shutdown – If the duct smoke detectors sense smoke, then any combination fire/smoke dampers shall close and the associated unit shall be de-energized. The unit shall not be permitted to operate until all trouble signals are cleared on the fire alarm system.

8. The freezestat shall be wired with the fan starter. Whenever the air temperature upstream of the coils is 36°F, the fan shall stop, the outside air damper shall close and the chilled water valve shall open. A manual reset shall return the unit to normal operation.
9. Integrate with the BAS. The following monitoring points shall be available:
   a. System status: indication and adjustment
   b. Freezestat status: indication and alarm.
   c. Space temperature set point: indication and adjustment.
   d. Space temperature: indication.
   e. Condensate level alarm.

4.08 VAV BOX WITH HOT WATER REHEAT

A. General
1. VAV boxes shall be provided with an open protocol BACNET controller with morning warm-up controls.
2. VAV boxes shall be provided with wall mounted space sensors (as shown on the plans) with override.

B. Operation
1. Occupied cooling - on a call for cooling, the VAV box primary air valve shall modulate to satisfy the space setpoint temperature. Once the cooling requirements of the space are met, the VAV box primary air valve shall modulate to maintain the minimum cooling supply air CFM setpoint and the VAV box supply fan shall modulate to maintain constant volume in the space.
2. Occupied heating - on a call for heating, the VAV box primary air valve shall close to minimum position and the 2-way control valve shall modulate to maintain space temperature. Once the heating requirements of the space are met, the control valve shall modulate closed.
3. Unoccupied cooling - on a call for cooling, the VAV box primary air valve shall modulate to satisfy the unoccupied space setpoint temperature.
4. Unoccupied heating - on a call for heating, the VAV box primary air valve shall modulate to satisfy the unoccupied space setpoint temperature.
5. Integrate VAV box controls with associated air handling unit and associated VFD controls.

C. All VAV boxes shall be grouped in time-of-day zones indexed globally by the new BAS controller and according to the time-of-day schedule for the air handling unit serving them. During the occupied mode (based on time-of-day schedule as specified by the owner (adjustable) and indexed through the central BAS controller), the VAV boxes in each zone shall be indexed to “occupied”.

D. The supply air damper is controlled with minimum and maximum CFM settings. The VAV box controller will monitor the room temperature sensor and the air velocity sensor. The controller will modulate the damper, and modulate the heating hot water control valve to maintain the desired room temperature.

E. Integrate with the BAS.

4.09 DUCTLESS SPLIT SYSTEM

A. General
1. The indoor unit shall be furnished with a wireless, wall mounted programmable 24 hr./7-day thermostat. ATC contractor shall install and wire thermostat.
2. ATC contractor shall wire outdoor unit to the indoor unit.
3. The unit shall include a low ambient kit. ATC contractor shall wire the outside air temperature sensor.
4. The units shall be circuited to standby power.
5. Ductless split system to be furnished with a BACNET network card.
6. Integrate with the BAS.

B. Operation
   1. Cooling - on a call for cooling, the indoor unit shall operate to maintain 72ºF (adj.) In the space.
   2. Heating - on a call for heating, the indoor unit shall operate to maintain 60ºF (adj.) In the space.

C. Integrate with the BAS

4.10 EXHAUST FANS

A. General:
   1. Provide a 24 hr./7 day time clock which shall start and stop the toilet room exhaust fans according to the schedule directed by the owner. Contactors and relays shall be provided by the ATC Contractor. The toilet room exhaust fans shall be controlled by the BAS.
   2. Exhaust fans shall be interlocked with the HVAC system serving the area. Whenever the HVAC system is in the occupied cycle of operation, the associated exhaust fan in the area shall be energized.
   3. Rooftop exhaust fans shall have automatic motor operated dampers in the roof curb which shall close when the fan is de-energized. Mechanical Contractor/ATC Contractor to provide power to the dampers.
   4. Ceiling-mounted exhaust fans shall be controlled with the lights in the area served or an individual local switch as indicated on the drawings.
   5. (Residential Unit) Energy Star ceiling exhaust fans shall have an integral programmable controller. The controller shall ramp the fan from low speed to high speed by either a wall switch, motion detector, or condensate sensor.
   6. Fan status (on/off) and start/stop points shall be shown on the BAS workstation.
   7. 0-10V speed controllers shall be furnished with each exhaust fan listed in the equipment schedule for balancing purposes.
   8. Exhaust fans connecting/ serving vertical exhaust duct riser (s) with sub-ducts shall be connected to emergency standby power.

B. Operation:
   1. EF-X (toilet room) - the fan shall be interlocked with the lighting circuit. The fan shall operate when the light switch is turned "on". Provide time delay switch (set to (3) minutes) for each fan.
   2. EF-X (boiler room ventilation) - the fan(s) shall be interlocked with the motor operated damper(s) on gravity ventilator (louver). The fan(s) shall operate when the space temperature rises 80ºF. An alarm signal shall be sent to the BAS if the room temperature exceeds 95ºF.

C. Refer to exhaust fan schedule for specific controls descriptions.

D. Integrate with the BAS. The following monitoring points shall be available:
   1. Fan Status ON/OFF
   2. Alarm

4.11 CARBON MONOXIDE DETECTION SYSTEM - BOILER ROOM

A. A CO detection system and associated control panel shall be provided in the boiler room and it shall be wired to the BAS.

B. If the presence of carbon monoxide is detected above acceptable levels, the exhaust fan(s) shall be enabled, the motor operated dampers shall open, and an alarm shall be sent to the BAS.

C. If the CO concentration in the room does not dissipate, or keeps increasing as the fan runs, the boilers shall be shut down.

D. The CO detection system shall be integrated with the fire alarm system.

E. CO detectors shall be located in the following spaces: boiler room and spaces adjacent to the boiler

room.

F. Integrate with the BAS.

4.12 RADIANT FLOOR HEATING SYSTEM

A. On a call for heat, the radiant floor pumps shall modulate to meet the flow of the zone (or zones) requiring heat. The modulating 3-way tempering valve shall modulate to maintain the maximum heating temperature of 111 degrees F.
B. As additional zones require heat, the zone actuators shall control the flow to each zone via the manifold. As zones become satisfied, the zone actuators shall close off the flow to each zone via the manifold.
C. Integrate with the BAS.

4.13 CARBON DIOXIDE RESET

A. Applies to: All HVAC units with outside air. Specifiers identify unit tags or spaces.
B. Furnish and install a carbon dioxide space sensor which shall reset the outside air damper position to respond to occupancy carbon dioxide levels. Integrate with associated HVAC unit controls.
C. Sensor shall be installed in a protective cover (clear plastic with locking cover). Coordinate final location with engineer.
D. On a rise in carbon dioxide levels above the set point (700 PPM) the outside air damper shall gradually open. Maximum fresh air CFM is noted on the AHU schedule.
E. On a fall in carbon dioxide levels below the set point, the outside air damper shall gradually close. Minimum fresh air CFM shall be 20% of the maximum fresh air CFM.
F. Integrate with the BAS.

4.14 SUSPENDED UNIT HEATERS - HOT WATER

A. General - Refer to equipment schedule additional information.
B. Provide a wall mounted thermostat which shall start and stop the unit heater to maintain space temperatures. Fan shall start and stop and control valve (2-way, 3-way) shall modulate open/closed to maintain space temperature.
C. Unit heaters in public areas such as stair towers, lobbies and vestibules shall be furnished with integral tamperproof unit mounted thermostats.
D. Unit heaters in mechanical rooms, electrical rooms and other back-of-house areas shall be furnished with wall mounted thermostats unless noted otherwise.
E. Do not integrate with the BAS.

4.15 CONVECTORS, CABINET UNIT HEATERS, EXTENDED FIN RADIATION - HOT WATER

A. General - Refer to equipment schedule for additional information.
B. Furnish and install a wall mounted thermostat which shall gradually modulate a two-way or three-way control valve to pass more or less hot water through the heating element to maintain space temperatures.
C. Baseboard/extended fan radiation heaters, wall convectors and cabinet unit heaters in stair towers, lobbies and vestibules shall be furnished with integral tamperproof unit mounted thermostats.
D. Do not integrate with the BAS.

4.16 FREEZESTATS

A. All units with chilled water or heating hot water coils within the units or duct mounted heating hot

water coils shall have averaging freezestats on the leaving side of the water coil.

B. Whenever the air temperature upstream of the water coil is 36°F, the fan shall stop, the outside air damper shall close, the return air damper (if required) shall fully open, and the water valves shall open. A manual reset shall return the unit to normal operation.

C. The unit shall be de-energized, the outside air damper shall close, the return air damper (if required) shall fully open, and the hot water control valve shall fully open, if the freezestat falls below 36°F (adj) degrees.

D. Applies to Water source heat pumps with outside air, and air handling units with heating hot water coils, chilled water coils, and outside air.

E. Integrate with the BAS.

4.17 DUCT MOUNTED SMOKE DETECTORS

A. In air systems with a capacity greater than 2,000 CFM, furnish and install duct mounted smoke detectors in the supply air (downstream the air filters and upstream of any branch duct) and return air ductwork.

B. In multi-story buildings at each story with a commonly shared return and having a capacity greater than 15,000 CFM's furnish and install smoke detectors before the connection to the common return and before any connection to any recirculation or fresh air inlet in the return air systems. This includes plenums where the plenum is used for a common return.

C. The fire alarm sub-contractor shall furnish a fire alarm monitoring module for each required air handling system. The ATC Contractor shall wire the fire alarm monitoring module to the emergency shutdown contacts or combination motor starter/disconnect on each air handling system.

D. Detectors shall de-energize the unit and signal the addressable fire alarm system if smoke is detected.

E. Detectors shall be accessible. Mechanical contractor shall be responsible for providing all necessary access panels and doors.

F. Duct smoke detectors to be furnished by the Electrical/ Mechanical Contractor.

G. Integrate with the BAS.

4.18 VARIABLE FREQUENCY DRIVES

A. Application: Heating hot water pump (s), chilled water pump (s), condenser water pump (s), and rooftop unit (s).

B. Refer to the variable frequency drive specifications for additional information and points.

C. Control points as a minimum.
   1. VFD Speed (H2)
   2. VFD Amps
   3. VFD RPM
   4. Run time (hrs.)
   5. Drive Temperature.
   6. Drive Command
   7. Current Amps.
   8. KW
   9. Alarms/faults
   10. Emergency override stats.
   11. Hand/Off/Auto Status.

D. Integrate with the BAS.

E. ATC Contractor to provide Modbus interface.

END OF SECTION

SECTION 23 21 13 - HYDRONIC PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes pipe and fitting materials and joining methods for the following:
   1. Steel pipe and fittings.
   2. Plastic pipe and fittings.
   3. Joining materials.
   4. Transition fittings.
   5. Dielectric fittings.
   6. Bypass chemical feeder.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of the following:
   1. Pipe.
   2. Fittings.
   3. Joining materials.
   4. Bypass chemical feeder.

B. Sustainable Design Submittals:
   1. Product Data: For adhesives, indicating VOC content.
   2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
   3. Environmental Product Declaration: For each product.

C. Delegated-Design Submittal:
   1. Design calculations and detailed fabrication and assembly of pipe anchors and alignment guides, hangers and supports for multiple pipes, expansion joints and loops, and attachments of the same to the building structure.
   2. Locations of pipe anchors and alignment guides and expansion joints and loops.
   3. Locations of and details for penetrations, including sleeves and sleeve seals for exterior walls, floors, basement, and foundation walls.
   4. Locations of and details for penetration and firestopping for fire and smoke rated wall and floor and ceiling assemblies.

1.03 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.04 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
   1. Hot-Water Heating Piping: 100 psig at 200 deg. F.
   2. Chilled-Water Piping: 150 psig 73 deg. F.
   3. Condenser-Water Piping: 150 psig at 73 deg. F.
   4. Makeup-Water Piping: 150 psig at 73 deg. F.
   5. Condensate-Drain Piping: 180 deg. F.
   6. Blowdown-Drain Piping: 180 deg. F.
   7. Air-Vent Piping: 200 deg. F.
   8. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

2.02 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.
B. Annealed-Temper Copper Tubing: ASTM B 88, Type K.
C. DWV Copper Tubing: ASTM B 306, Type DWV.
D. Grooved, Mechanical-Joint, Wrought-Copper Fittings: ASME B16.22.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Anvil International.
      b. Victaulic Company.
   2. Grooved-End Copper Fittings: ASTM B 75 (ASTM B 75M), copper tube or ASTM B 584, bronze casting.
   3. Grooved-End-Tube Couplings: Rigid pattern unless otherwise indicated; gasketed fitting. Ductile-iron housing with keys matching pipe and fitting grooves, prelubricated EPDM gasket rated for minimum 230 deg. F for use with housing, and steel bolts and nuts.
E. Wrought-Copper Unions: ASME B16.22.

2.03 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; welded and seamless, Grade B, and wall thickness as indicated in "Piping Applications" Article.
B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in "Piping Applications" Article.
C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in "Piping Applications" Article.
D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in "Piping Applications" Article.
E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in "Piping Applications" Article.
F. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
   1. Material Group: 1.1.
   2. End Connections: Butt welding.
   3. Facings: Raised face.
G. Grooved Mechanical-Joint Fittings and Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Anvil International.
   b. Victaulic Company.
2. Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47/A 47M, Grade 32510 malleable iron; ASTM A 53/A 53M, Type F, E, or S, Grade B fabricated steel; or ASTM A 106/A 106M, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
3. Couplings: Ductile- or malleable-iron housing and EPDM gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.

2.04 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
   1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.
      a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
      b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

E. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.05 TRANSITION FITTINGS

A. Plastic-to-Metal Transition Fittings:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Charlotte Pipe and Foundry Company.
      b. IPEX USA LLC.
      c. KBI (King Bros. Industries).
      d. Viega LLC.
   2. One-piece fitting with one threaded brass or copper insert and one solvent-cement-joint end of material and wall thickness to match plastic pipe material.

B. Plastic-to-Metal Transition Unions:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Charlotte Pipe and Foundry Company.
      b. IPEX USA LLC.
      c. KBI (King Bros. Industries).
      d. NIBCO INC.
   2. Brass or copper end, solvent-cement-joint end of material and wall thickness to match plastic pipe material, rubber gasket, and threaded union.

2.06 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
B. Dielectric Unions:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. A.Y. McDonald Mfg. Co.
      b. Capitol Manufacturing Company.
      c. Central Plastics Company.
      d. HART Industrial Unions, LLC.
      e. Jomar Valve.
      f. Matco-Norca.
      g. Watts; a Watts Water Technologies company.
      h. Wilkins.
      i. Zurn Industries, LLC.
   2. Description:
      a. Standard: ASSE 1079.
      a. Pressure Rating: 125 psig minimum at 180 deg. F.
      b. End Connections: Solder-joint copper alloy and threaded ferrous.

2.07 BYPASS CHEMICAL FEEDER

A. Description: Welded steel construction; 125-psig working pressure; 5-gal. capacity; with fill funnel and inlet, outlet, and drain valves.
   1. Chemicals: Specially formulated, based on analysis of makeup water, to prevent accumulation of scale and corrosion in piping and connected equipment.

2.08 SOLIDS SEPARATOR

A. A centrifugal vortex separator shall be furnished for installation in the liquid supply/circulation system to remove separable solids from the system. Actual solids removal efficiency to be predicated on the difference in specific gravity (Sp. Gr.) between the liquid and the separable solids. Typical single pass performance with sand and water shall be 98% efficiency to 74 microns: for a recirculated system, the level of efficiency to be 98% to 40 microns. Performance exceeding this level to be predictable when the difference in specific gravity between the liquid and separable solids exceeds the differential between sand (Sp. Gr. of 2.6) and water (Sp. Gr. of 1.0)
   NOTE: Separable Solids: Typical performance efficiency criteria applies to moderate viscosity (minus 100 SSU) liquids in the 1.0 specific gravity range and moderate density solids with a specific gravity of 1.8 or greater.
B. The separator shall be designed with tangential entry into the acceptance chamber. Upon tangential entry, the liquid/solids shall be drawn through internal tangential slots and accelerated into the reduced diameter separation cylinder. The solids heavier than the carrying liquid shall be centrifugally spiraled down the perimeter of the separation cylinder past the deflector stool and allowed to accumulate in the separator's collection chamber. The liquid (free of separable solids) will follow the vortex created and centered on the deflector stool up through the interior of the separation cylinder and into the vortex finder which becomes the separator outlet.
C. Quiescent solids accumulation shall also be facilitated by the baffle spin arrestor below the deflector stool in the collection chamber. Separation and collection of solids shall not promote excessive wear nor require a continuous "involuntary" underflow.
D. The separator shall be of the size and capacity indicated on the drawings or be capable of 25% of total system flow at not more than 5 psi pressure drop.

E. The separator shall have a 3/4 inch purge outlet.
F. The separator shall be designed for maximum operating pressure of 150 psi.
G. The separator shall be fabricated of stainless steel with shell material and head material of 0.135" wall or better.
H. The separator(s) shall be Lakos Separator or prior approved equal.

PART 3 - EXECUTION

3.01 PIPING APPLICATIONS (CHOOSE MATERIAL AND JOINING METHOD)

A. Hot-water heating piping, aboveground, NPS 2-inch and smaller, shall be the following:
   1. Type L, drawn-temper copper tubing, wrought-copper fittings, and [soldered] [brazed] [pressure-seal] joints.
   2. Schedule 40 steel pipe, Grade B, ASTM 53, Seamless; Class 125, cast-iron fittings; screwed fittings.
B. Hot-water heating piping, aboveground, NPS 2 ½ -inch and larger, shall be the following:
   1. Type L, drawn-temper copper tubing, wrought-copper fittings, and [soldered] [brazed] joints.
   2. Schedule 40 steel pipe, Grade B, ASTM 53, Seamless; Class 125, cast-iron fittings; cast-iron flanges and flange fittings.
C. Hot-Water Heating Piping Installed Belowground and within Slabs: Type K, annealed-temper copper tubing, wrought-copper fittings, and soldered brazed joints. Use the fewest possible joints.
D. Chilled-water piping, aboveground, NPS 2-inch and smaller, shall be the following:
   1. Type L, drawn-temper copper tubing, wrought-copper fittings, and [soldered] [brazed] [pressure-seal] joints.
   2. Schedule 40 steel pipe, Grade B, ASTM 53, Seamless; Class 125, cast-iron fittings; screwed fittings.
E. Chilled-water piping, aboveground, NPS 2 ½ -inch and larger, shall be the following:
   1. Type L, drawn-temper copper tubing, wrought-copper fittings, and [soldered] [brazed] joints.
   2. Schedule 40 steel pipe, Grade B, ASTM 53, Seamless; Class 125, cast-iron fittings; cast-iron flanges and flange fittings.
   3. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.
F. Chilled-Water Piping Installed Belowground and within Slabs: Type K, annealed-temper copper tubing, wrought-copper fittings, and soldered brazed joints. Use the fewest possible joints.
G. Condenser-water piping, above ground, NPS 2-inch and smaller, shall be the following:
   1. Type L, drawn-temper copper tubing, wrought-copper fittings, and [soldered] [brazed] [pressure-seal] joints.
   2. Schedule 40 steel pipe, Grade B, ASTM 53, Seamless; Class 125, cast-iron fittings; screwed fittings.
   3. Schedule 80 steel pipe; Class 125, cast-iron fittings; cast-iron flanges and flange fittings; and threaded joints.
H. Condenser-water piping, aboveground, NPS 2 ½ -inch and larger, shall be the following:
   1. Type L, drawn-temper copper tubing, wrought-copper fittings, and [soldered] [brazed] joints.
   2. Schedule 40 steel pipe, Grade B, ASTM 53, Seamless; Class 125, cast-iron fittings; cast-iron flanges and flange fittings.
   3. Schedule 80 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.
   4. Schedule 40 CPVC plastic pipe and fittings and solvent-welded joints.

I. Condenser-Water Piping Installed Belowground and within Slabs: Type K, annealed-temper copper tubing, wrought-copper fittings, and soldered brazed joints. Use the fewest possible joints.
J. Makeup-water piping installed aboveground shall be the following:
   1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered brazed joints.
   2. Schedule 40CPVC plastic pipe and fittings, and solvent-welded joints.
K. Makeup-Water Piping Installed Belowground and within Slabs: Type K, annealed-temper copper tubing, wrought-copper fittings, and soldered joints. Use the fewest possible joints.
L. AC Condensate-Drain Piping: Type DWV, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
M. AC Condensate-Drain Piping: Schedule 40 PVC plastic pipe and fittings and solvent-welded joints.
N. Blowdown-Drain Piping: Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.
O. Air-Vent Piping:
   1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.
   2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.
P. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.

3.02 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
E. Install piping to permit valve servicing.
F. Install piping at indicated slopes.
G. Install piping free of sags and bends.
H. Install fittings for changes in direction and branch connections.
I. Install piping to allow application of insulation.
J. Select system components with pressure rating equal to or greater than system operating pressure.
K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
L. Install drains, consisting of a tee fitting, NPS 3/4-inch ball valve, and short NPS 3/4-inch threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.
N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
O. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.
P. Install valves according to the following:
   1. Section 230523.11 "Globe Valves for HVAC Piping."
   2. Section 230523.12 "Ball Valves for HVAC Piping."
   3. Section 230523.13 "Butterfly Valves for HVAC Piping."
   4. Section 230523.14 "Check Valves for HVAC Piping."
   5. Section 230523.15 "Gate Valves for HVAC Piping."

Q. Install unions in piping, NPS 2-inch and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
R. Install flanges in piping, NPS 2 ½ -inch and larger, at final connections of equipment and elsewhere as indicated.
S. Install shutoff valve immediately upstream of each dielectric fitting.
T. Comply with requirements in Section 230516 "Expansion Fittings and Loops for HVAC Piping" for installation of expansion loops, expansion joints, anchors, and pipe alignment guides.
U. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.
V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."
Y. Piping shall not be installed over electrical panels, equipment, transformers, motor control centers, switch, gear, or substations. If absolutely necessary piping may be sleeved to prevent water from falling on electrical gear provided the installation is acceptable to the electrical inspectors and shall be approved by the engineer prior to installation.
Z. Allow clearances for expansion and contraction. Provide swing ells at connection points so as not to strain piping systems.
AA. Exposed insulated risers shall be covered with 22 gauge galvanized steel sleeves from floor to ceiling.
BB. All piping shall be installed on the interior conditioned side of the building insulation.
CC. Piping shall not be insulated until it is pressure and leak tested and until the building is closed in.

3.03 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
B. Dielectric Fittings for NPS 2-iinch and Smaller: Use dielectric unions.
C. Dielectric Fittings for NPS 2 ½ -inch to NPS 4-inch: Use dielectric flanges.
D. Dielectric Fittings for NPS 5-inchand Larger: Use dielectric flange kits.

3.04 HANGERS AND SUPPORTS

A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.
B. Comply with requirements in Section 230548 "Vibration and Seismic Controls for HVAC" for seismic restraints.
C. Install the following pipe attachments:
    1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
    2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet (6 m) or longer.
    3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
    4. Spring hangers to support vertical runs.
    5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
    6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
   1. NPS 3/4-inch: Maximum span, 7 feet.
   2. NPS 1-inch: Maximum span, 7 feet.
   3. NPS 1 ½ -inch: Maximum span, 9 feet.
   4. NPS 2-inch: Maximum span, 10 feet.
   5. NPS 2 ½ -inch: Maximum span, 11 feet.
   6. NPS 3-inch and Larger: Maximum span, 12 feet.

E. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
   1. NPS 3/4 -inch: Maximum span, 5 feet; minimum rod size, 1/4 inch.
   2. NPS 1-inch: Maximum span, 6 feet; minimum rod size, 1/4 inch.
   3. NPS 1 ¼ -inch: Maximum span, 6 feet; minimum rod size, 3/8 inch.
   4. NPS 1 ½ -inch: Maximum span, 6 feet; minimum rod size, 3/8 inch.
   5. NPS 2 -inch: Maximum span, 10 feet; minimum rod size, 3/8 inch.
   6. NPS 2 ½ -inch: Maximum span, 10 feet; minimum rod size, 3/8 inch.
   7. NPS 3-inch and Larger: Maximum span, 10 feet; minimum rod size, 3/8 inch.

F. Plastic Piping Hanger Spacing: Space hangers according to pipe manufacturer's written instructions for service conditions. Avoid point loading. Space and install hangers with the fewest practical rigid anchor points. PVC piping to be supported on 4’-0” spacing unless approved otherwise.

G. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

3.05 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8/A5.8M.

E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

G. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
   1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
   2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
   3. PVC Pressure Piping: Join ASTM D 1785 schedule number, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule number PVC pipe and socket fittings according to ASTM D 2855.
   4. PVC Nonpressure Piping: Join according to ASTM D 2855.

H. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.

I. Mechanically Formed, Copper-Tube-Outlet Joints: Use manufacturer-recommended tool and procedure, and brazed joints.

3.06 WELDING

A. All concealed black steel piping shall be fusion welded.
B. Welding shall be performed in conformance with the ASME Boiler and Pressure Vessel Code Section IX.
C. Elbows, tees, and branch connections shall be made with welding fittings ANSI B16.9.
D. Furnish welder test certificates for review. Certificates of successful welder qualification by the following organizations shall be acceptable;
   ASME Boiler and Pressure Vessel Code
   ANSI Code for Pressure Piping
   National Certified Pipe Welding Bureau
   Military Specification MIL-STD-248.
E. Weld-o-lets and Thread-o-lets are allowed but shall be a maximum of one size smaller than line size, i.e., a maximum of a 3 inch weld-o-let on a 4 inch pipe.

3.07 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.
B. Install control valves in accessible locations close to connected equipment.
C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.
D. Install ports for pressure gages and thermometers at coil inlet and outlet connections. Comply with requirements in Section 230519 "Meters and Gages for HVAC Piping."

3.08 CHEMICAL TREATMENT

A. Fill system with fresh water and add liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products from piping. Circulate solution for a minimum of 24 hours, drain, clean strainer screens, and refill with fresh water.
B. Add initial chemical treatment and maintain water quality in ranges noted above for the first year of operation.

3.09 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:
   1. Leave joints, including welds, uninsulated and exposed for examination during test.
   2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
   3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
   4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
   5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
B. Perform the following tests on hydronic piping:
   1. Use ambient temperature water as a testing medium unless there is risk of damage due to

freezing. Another liquid that is safe for workers and compatible with piping may be used.

2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION

SECTION 23 31 13 - METAL DUCTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Rectangular ducts and fittings.
   2. Sheet metal materials.
   3. Sound attenuating duct lining.
   4. Sealants and gaskets.
   5. Hangers and supports.
   6. Seismic-restraint devices.

B. Related Sections:
   1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
   2. Section 233116 "Nonmetal Ducts" for fibrous-glass ducts, thermoset fiber-reinforced plastic ducts, thermoplastic ducts, PVC ducts, and concrete ducts.
   3. Section 233119 "HVAC Casings" for factory and field fabricated casings for mechanical equipment.
   4. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.02 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ANSI/ASHRAE 62.1.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Submittals:
   1. Product Data: For ventilation equipment, indicating compliance with ASHRAE 62.1, Section 5 - "Systems and Equipment."
   2. Product Data: For adhesives, indicating VOC content.
   3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
   4. Product Data: For sealants, indicating VOC content.
   5. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings:

1. Ductwork shop drawings must be properly submitted. Any ductwork installed without prior approval by the engineer and found to be incorrect, shall be replaced at the expense of the contractor.
2. Submit shop drawings of all sheet metal for review. Drawings shall be not less than 1/4" scale and show all light fixtures, steel, piping, conduit, equipment and architectural features. It is unacceptable to resubmit and modify McHugh design documents for sheet metal drawing purposes.
   a. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
   b. Factory- and shop-fabricated ducts and fittings.
   c. Duct layout indicating sizes, configuration, and static-pressure classes.
   d. Elevation of top of ducts. Verify ductwork fits in available space.
   e. Dimensions of main duct runs from building grid lines.
   f. Fittings.
   g. Reinforcement and spacing.
   h. Seam and joint construction.
   i. Penetrations through fire-rated and other partitions.
   j. Equipment
   k. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
   l. Hangers and supports, including methods for duct and building attachment and vibration isolation.
   m. Indicate waste and storm piping where it occurs in the area of ductwork.
   n. Locate electrical gear on plan. Ductwork is not to run above panels.
   o. Ductwork is to be shown double line with indicated width and height.
   p. Allowance to be made for lining and/or insulation.
   q. Duct sizes shown on contract drawings may be flattened to a 4 to 1 ratio when necessary to establish clearance. Such transitions are to be included in the contract price.
   r. Ductwork fabrication shall not proceed until shop drawings are submitted for review.
   s. All dampers, grilles, registers, diffusers, access panels, louvers, coils, filters, and other components of the system are to be indicated.
   t. Provide detail of fire damper assembly.
   u. Provide drawing sections when requested by the engineer.
   v. Coordinate sheet metal drawings with light fixture layout and sprinkler system piping and heads and shown on the drawing.

D. Delegated-Design Submittal:
   1. Sheet metal thicknesses.
   2. Joint and seam construction and sealing.
   3. Reinforcement details and spacing.
   4. Materials, fabrication, assembly, and spacing of hangers and supports.

1.04 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
   2. Suspended ceiling components.
   3. Structural members to which duct will be attached.
   4. Size and location of initial access modules for acoustical tile.

5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:
   a. Luminaires.
   b. Air outlets and inlets.
   c. Speakers.
   d. Sprinklers.
   e. Access panels.
   f. Perimeter moldings.

B. Welding certificates.

1.05 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
   2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
   3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

C. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.01 RECTANGULAR DUCTS AND FITTINGS – SMACNA STANDARDS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.02 FABRICATED DUCT REQUIREMENTS - DUCTMATE

A. All interior rectangular ducts shall be constructed with G-60 or better galvanized steel (ASTM A-653-94) LFQ, chem treat. Exterior ductwork shall be G-90 or better galvanized steel LFQ, chem treat. Kitchen, shower, or dishwasher exhaust shall be aluminum with aluminum joints.

B. Materials: Support, access doors not part of ducts, bar or angle reinforcing damper rods and items made of uncoated mild steel shall be painted with two coats of primer or provide galvanized

equivalent.

C. Longitudinal Seams. Pittsburgh lock shall be used on all longitudinal seams. All longitudinal seams will be sealed with mastic sealant. Snaplock is not acceptable.

D. Flanged interior Gasket. Ductmate 440 or a Butyl Rubber Gasket which meets Mil-C 18969B, Type II Class B, TT-C-1796 A, Type II Class B, and TTS-S-001657 must also pass UL-723. This material, in addition to the above, shall not contain vegetable oils, fish oils, or any other type of vehicle that will support fungal and/or bacterial growth associated with dark, damp areas of ductwork. The recommended test procedure for bacterial and fungal growth is found in 21CFR 177, 1210 closures with sealing gaskets for food containers.

E. Ductmate or W.D.C.I. proprietary duct connection systems will be accepted. Duct constructed using these systems will refer to the manufacturers guidelines for sheet gauge, intermediate reinforcement size and spacing, and joint reinforcements.

F. Formed - on flanges (T.D.C./T.D.F./T-25A/T-25B) be accepted. Formed on flanges will be constructed as SMACNA T-25 flanges, whose limits are defined on page 1.36 1995 SMACNA Manual, Second Edition. No other construction pertaining to formed - on flanges will be accepted. Formed on flanges shall be accepted for use on ductwork 42" wide or less and must include the use of corners, bolts, and cleat. (Over 42", the reinforcement/joint deflection criteria no longer conform with the UMC).

G. Rectangular ductwork above the roof or outside shall be 4" water gauge construction.

H. All ductwork in moist areas (Toilet Rooms, locker rooms, kitchens, etc) shall be aluminum construction with aluminum hangers, supports, and fasteners.

2.03 SOUND ATTENUATING DUCT LINING

A. Includes:
   1. High Velocity exhaust ductwork where noted on the plans.
   2. Refer to ductwork insulation specification (23 07 13) for insulation requirements. Lining indicated is in addition to insulation requirements.

B. Duct liner shall have a flame spread of not over 25, a fuel contributed of not over 50 and a smoke developed of not over 50.

C. Liner shall be minimum 1 inch thick, 1.5 Lbs./Cu. Ft. density with a thermal conductance of .24 at 50 deg. F. mean temperature. (Conductance: BTU/Sq. Ft./F/Hr.).

D. Liner shall not spall or deteriorate at air velocities to 4000 FPM when installed in accordance with the manufacturer’s recommendations.

E. Liner shall be Johns-Manville Linacoustic or approved substitute by Owens-Corning, CertainTeed, or Knauf. Observe all installation instructions.

F. Any ductwork in unconditioned spaces or outdoors shall have insulation totaling R-8.3.

2.04 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
   1. Galvanized Coating Designation For Interior Ductwork: G60.
   2. Galvanized Coating Designation For Exterior Ductwork: G90.
   3. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

D. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed

ducts, and standard, one-side bright finish for duct surfaces exposed to view.

E. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
   1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

G. Fiberglass ductboard is not acceptable.

2.05 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:
   1. Application Method: Brush on.
   2. Solids Content: Minimum 65 percent.
   3. Shore A Hardness: Minimum 20.
   4. Water resistant.
   5. Mold and mildew resistant.
   6. VOC: Maximum 75 g/L (less water).
   7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
   8. Service: Indoor or outdoor.
   9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Flanged Joint Sealant: Comply with ASTM C 920.
   1. General: Single-component, acid-curing, silicone, elastomeric.
   2. Type: S.
   3. Grade: NS.
   4. Class: 25.
   5. Use: O.
   6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

E. Round Duct Joint O-Ring Seals:
   1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for10-inch wg static-pressure class, positive or negative.
   2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
   3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.06 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger

Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
H. Trapeze and Riser Supports:
    1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
    2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
    3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.01 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
C. Install ducts in maximum practical lengths.
D. Install ducts with fewest possible joints.
E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.
L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.02 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the

welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.03 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts at a minimum to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
   1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
   2. Outdoor, Supply-Air Ducts: Seal Class A.
   3. Outdoor, Exhaust Ducts: Seal Class C.
   4. Outdoor, Return-Air Ducts: Seal Class C.
   5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
   6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
   7. Unconditioned Space, Exhaust Ducts: Seal Class C.
   8. Unconditioned Space, Return-Air Ducts: Seal Class B.
   9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
   10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
   11. Conditioned Space, Exhaust Ducts: Seal Class B.
   12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.04 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
   1. Where practical, install concrete inserts before placing concrete.
   2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
   3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
   4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
   5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum interval of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.05 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."
B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.06 START UP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.07 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:
    1. Underground Ducts: Concrete-encased, PVC-coated, galvanized sheet steel with thicker coating on duct exterior.
B. Supply Ducts:
    1. All Supply Ductwork:
        a. Pressure Class: Positive 2-inch wg.
        b. Minimum SMACNA Seal Class: C for 0-2”; B for 3”; A for 4”,6”,10”.
        c. SMACNA Leakage Class for Rectangular: 16 for 0-2”; 8 for 3”; 4 for 4”,6”,10”.
        d. SMACNA Leakage Class for Round and Flat Oval: 8 for 0-2”; 4 for 3”; 2 for 4”,6”,10”.
    2. Ductwork from Unit Down Shaft to Floor:
        a. Pressure Class: Positive 3-inch wg.
        b. Minimum SMACNA Seal Class: B.
        c. SMACNA Leakage Class for Rectangular: 8.
        d. SMACNA Leakage Class for Round and Flat Oval: 4.
    3. Ductwork from Shaft to VAV:
        a. Pressure Class: Positive 2-inch wg.
        b. Minimum SMACNA Seal Class: A.
        c. SMACNA Leakage Class for Rectangular: 16.
        d. SMACNA Leakage Class for Round and Flat Oval: 8.
C. Return Ducts:
    1. All Return Ductwork:
        a. Pressure Class: Positive or negative 1-inch wg.
        b. Minimum SMACNA Seal Class: C.
        c. SMACNA Leakage Class for Rectangular: 16.
        d. SMACNA Leakage Class for Round and Flat Oval: 8.
D. Exhaust Ducts:
    1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
        a. Pressure Class: Negative 1-inch wg.
        b. Minimum SMACNA Seal Class: C if negative pressure, and A if positive pressure.
        c. SMACNA Leakage Class for Rectangular: 12.
        d. SMACNA Leakage Class for Round and Flat Oval: 8.
    2. All Other Return Air Ductwork:
        a. Pressure Class: Positive or negative 1-inch wg.
        b. Minimum SMACNA Seal Class: A
        c. SMACNA Leakage Class for Rectangular: 16.
        d. SMACNA Leakage Class for Round and Flat Oval: 8.

E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:
1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:
a. Pressure Class: Positive or negative 1-inch wg.
b. Minimum SMACNA Seal Class: C.
c. SMACNA Leakage Class for Rectangular: 16.
d. SMACNA Leakage Class for Round and Flat Oval: 8.

F. Intermediate Reinforcement:
1. Galvanized-Steel Ducts: Galvanized steel.
2. PVC-Coated Ducts:
a. Exposed to Airstream: Match duct material.
b. Not Exposed to Airstream: Galvanized.
3. Stainless-Steel Ducts:
a. Exposed to Airstream: Match duct material.
b. Not Exposed to Airstream: Galvanized.
4. Aluminum Ducts: [Aluminum] [or galvanized sheet steel coated with zinc chromate].

G. Elbow Configuration:
1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
a. Velocity 1000 fpm or Lower:
1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
2) Mitered Type RE 4 without vanes.
b. Velocity 1000 to 1500 fpm:
1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
c. Velocity 1500 fpm or Higher:
1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments

for 90-degree elbow.

4) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.

c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

H. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
   a. Rectangular Main to Rectangular Branch: 45-degree entry.
   b. Rectangular Main to Round Branch: Spin in.
2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
   a. Velocity 1000 fpm or Lower: 90-degree tap.
   b. Velocity 1000 to 1500 fpm: Conical tap.
   c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION

Haverford Township Free Library
Shelving To Be Removed

2nd Floor 66" Perimeter Shelving Units - 26 Units (1 unit = 36"x66")

2nd Floor 86" Perimeter Shelving Units - 14 (1 unit = 36"x86")


2nd Floor 66" Shelving Units -
32 Units
(1 unit = 36"x66")
Haverford Township Free Library
Shelving To Be Removed
Page 2 of 11
MAGIC SCHOOL BUS
YOU WOULDN'T WANT TO...
NONFICTION (JNF)
WORLD LANGUAGES (JWL)
BAKE, MAKE & LEARN TO COOK VEGETARIAN
THE SCIENCE OF LIGHT
THE YAWN BOOK
THE MONSTER HEALTH BOOK
DRAWING FROM MEMORY
MARIAN ANDERSON
MAYA LIN
Not done yet


2nd Floor 48" Shelving Units - 26 Units
(1 unit = 36"x48")
MOVIES (JDVD) & CDs (JMCD)
SCHOMBURG
You Belong
RACHEL PLATTEN

Stand Alone Units - 4

1st Floor 90" Shelving Units - 142 Units
(1 unit = 36"x90")

**1st Floor Stand Alone 48"
Wood Shelving Units -
9 Units**

1st Floor 90" Magazine Shelving Units - 13 Units (1 unit = 36"x66")

1st Floor 68" Shelving Units - 10 Units
(1 unit = 36"x68")

Haverford Township Free Library
Shelving To Be Removed

1st Floor 48" Perimeter Shelving Units - 4 Units (1 unit = 36"x48")

1st Floor Metal Mesh Shelving Units - 4 Units

1st Floor Metal DVD Shelving Units - 9 Units