AIA® Document G714™ – 2017

Construction Change Directive

PROJECT: *(name and address)* Highland Township Fire Station 1 PIA 18-122A	**CONTRACT INFORMATION:** Contract For: General Construction Date:	**CCD INFORMATION:** Directive Number: 001 Date: June 4, 2020
OWNER: *(name and address)* Highland Township 250 W. Livingston Road Highland, MI 48357	**ARCHITECT:** *(name and address)* PARTNERS in Architecture, PLC 65 Market Street Mount Clemens, MI 48043	**CONTRACTOR:** *(name and address)* Axiom Construction Services Group, LLC 10638 Rushton Road South Lyon, MI 48178

The Contractor is hereby directed to make the following change(s) in this Contract:
(Insert a detailed description of the change and, if applicable, attach or reference specific exhibits.)

Refer to attached Electrical and Mechanical Exhibits for description of work.

PROPOSED ADJUSTMENTS

1. The proposed basis of adjustment to the Contract Sum or Guaranteed Maximum Price is:

- ☐ Lump Sum decrease of $0.00
- ☐ Unit Price of $ per
- ☐ Cost, as defined below, plus the following fee:
  (Insert a definition of, or method for determining, cost)
- ☒ As follows: These changes will result in a credit to the contract. The final amount is to be determined. An adjustment will be made to the contract amount, afterwards, via Change Order.

2. The Contract Time is proposed to remain unchanged. The proposed adjustment, if any, is (0 days).

NOTE: The Owner, Architect and Contractor should execute a Change Order to supersede this Construction Change Directive to the extent they agree upon adjustments to the Contract Sum, Contract Time, or Guaranteed Maximum price for the change(s) described herein.

When signed by the Owner and Architect and received by the Contractor, this document becomes effective IMMEDIATELY as a Construction Change Directive (CCD), and the Contractor shall proceed with the change(s) described above.

Contractor signature indicates agreement with the proposed adjustments in Contract Sum and Contract Time set forth in this CCD.

PARTNERS in Architecture, PLC	Highland Township	Axiom Construction Services Group, LLC
ARCHITECT *(Firm name)*	**OWNER** *(Firm name)*	**CONTRACTOR** *(Firm name)*
Joseph A. Valeri		
SIGNATURE	**SIGNATURE**	**SIGNATURE**
Joseph Valeri, Sr. Project Architect	Ken Chapman, Fire Chief	Deib Mougrabi, Director of Field Operations
PRINTED NAME AND TITLE	**PRINTED NAME AND TITLE**	**PRINTED NAME AND TITLE**
6/4/2020		
DATE	**DATE**	**DATE**

EXHIBIT 'A'

References

Architectural: Sheet A3-30 – Mechanical unit with continuous roof curb, and guard rail to be removed.

Mechanical: Sheet M1-02, M2-01, M2-02, M3-01, M4-01, M5-01, M5-02, M6-01, and M6-02 - MAU unit with all associated ducting and accessories to be removed. Gas Infrared heaters with all associated piping, venting, and other accessories to be added.

Electrical: Sheet E0-02, E0-04, and E3-00 - All electrical associated with MAU unit and ducting to be revised for Gas Infrared heaters with all associated piping, venting, and other accessories.

ROOF PLAN GENERAL NOTES:

A. REFER TO SPECIFICATION FOR ADDITIONAL INFORMATION FOR ROOF RELATED ITEMS.

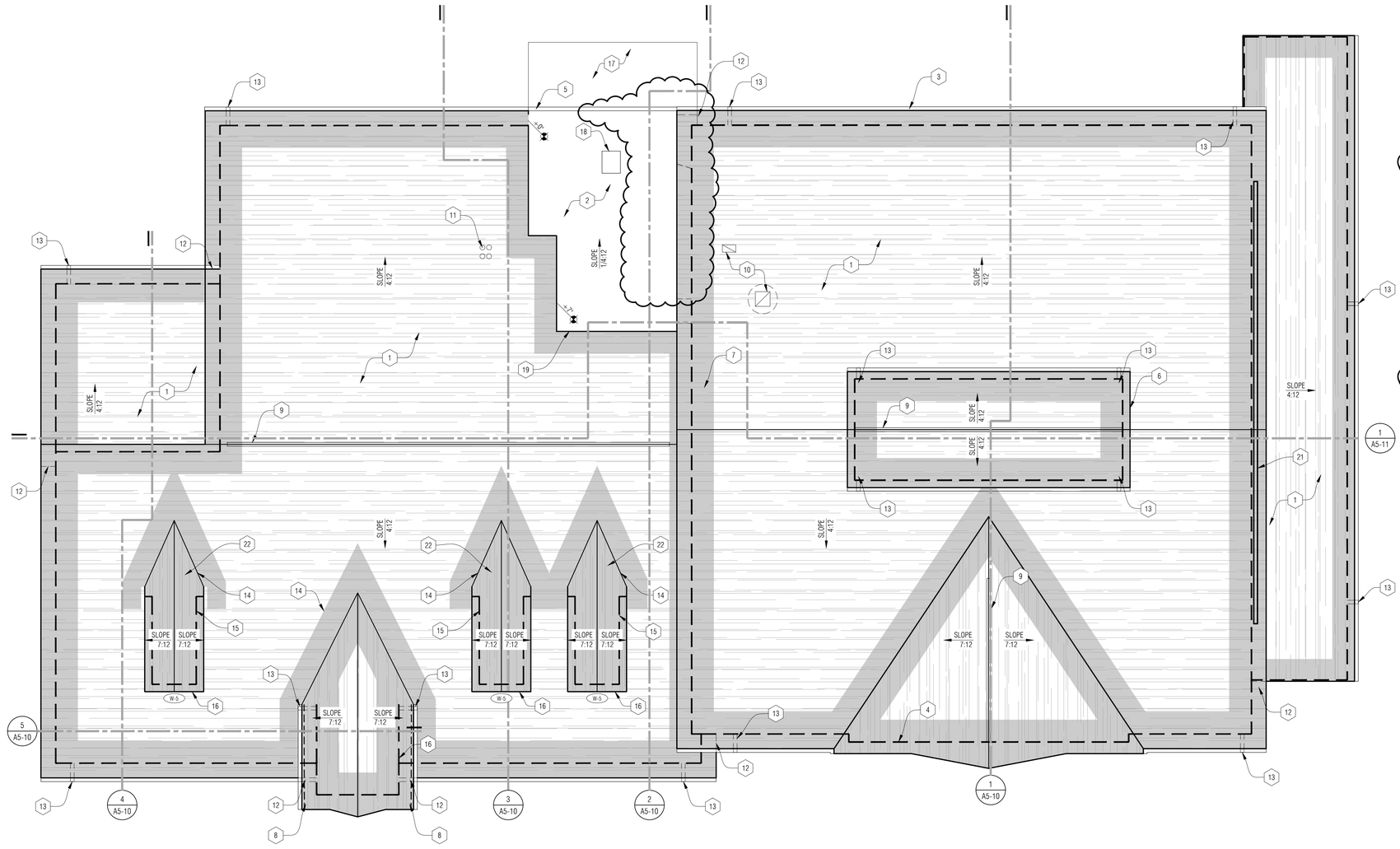
B. TAPERED INSULATION SHALL SLOPE 1/4" PER 1'-0" TOWARDS ROOF SUMP UNLESS OTHERWISE NOTED. SLOPE VALUES ARE APPROXIMATE. IF SLOPE CANNOT BE ACHIEVED, CONTACT ARCHITECT BEFORE PROCEEDING FURTHER. ARROWS SHOWN REPRESENT DOWN SLOPE OF ROOF.

C. REFER TO ROOF DETAILS FOR ALL PIPE PENETRATIONS - COORDINATE LOCATIONS AND QUANTITIES W/ MECHANICAL.

D. DO NOT PENETRATE SHINGLE ROOF - REFER TO MECHANICAL AND ELECTRICAL FOR ALL THRU ROOF PENETRATIONS. FLASH AND SEAL ALL PENETRATIONS IN ACCORDANCE WITH THE ROOF MANUFACTURER'S SPECIFICATIONS AND DETAILS TO ENSURE WARRANTY & DETAILS.

ROOF PLAN KEY NOTES:

1. ASPHALT SHINGLE ROOF. ALL VENTING AND EXHAUST TO BE IN ROOF WELL WALL / RIDGE OR SOFFIT. NO VENTING OR ANY M.E.P. PENETRATIONS THROUGH SHINGLE ROOF ON SOUTH SIDE
2. SINGLE-PLY MEMBRANE ROOFING ON R-15 MIN TAPERED INSULATION
3. 6" K-STYLE METAL GUTTER (MRS-2)
4. LINE OF FACE OF WALL BELOW, TYPICAL (DASHED LINE)
5. WRAP ROOF MEMBRANE OVER SIDING. TWO-PIECE ALUMINUM GUTTER AND FASCIA SYSTEM APPLIED OVER MEMBRANE WRAP
6. PARAPET FLASHING MEMBRANE ON BOTH SIDES OF ROOF CUT-OUT. PROVIDE METAL FLASHING W/ DRIP EDGE AT SHINGLES SEE SIM. DETAIL 4/A3-31
7. SHADED AREA OF ICE AND WATER SHIELD SYSTEM - EXTEND 3'-0" MIN. PAST WALL BELOW AND VALLEYS.
8. CONTINUOUS INTAKE VENT. INSTALL PER MANUFACTURERS INSTRUCTIONS
9. CONTINUOUS RIDGE VENT - REFER TO DETAIL 2/A3-31
10. ROOF VENT - REFER TO MECH. & DETAIL 1/A3-31
11. NOT USED
12. LINE OF ROOF BELOW
13. METAL DOWNSPOUT DRAIN (MRS-2)
14. PROVIDE ICE AND WATER SHIELD AT ALL VALLEYS AND RIDGES (DETAIL 5/A3-21) AND EXTEND 3'-0" BEYOND INTERIOR FACE OF EXTERIOR WALLS (DETAIL 6/A3-21)
15. PROVIDE FLASHING AT SIDEWALL TO ROOF TRANSITION - SEE DETAIL (4/A3-21)
16. WINDOW BELOW ROOF DORMER, REF A0-04: WINDOW SCHEDULE AND WINDOW TYPES
17. LINE OF TRAINING DECK BELOW - ALTERNATE #3
18. ROOF ACCESS HATCH
19. PROVIDE FLASHING AT ASPHALT SHINGLE ROOF TO SINGLY-PLY MEMBRANE ROOF TRANSITION
20. NOT USED
21. CONTINUOUS RIDGE VENT SLOPE TO HIGH WALL - REFER TO SPECIFICATIONS
22. NO SHEATHING BELOW DORMER FOR CONTINUOUS ATTIC ATMOSPHERE



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1 Roof Plan
1/8" = 1'-0"

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KEY PLAN

OWNER

Highland Township
Fire Department

PROJECT NAME

Highland Township
Fire Station No. 1

1600 W. Highland Rd.
Highland, MI 48357

PROJECT NO.

18-122A

ISSUES / REVISIONS

Bidding - Construction	03/27/20
Addendum #1	04/20/20
Construction Set	05/04/20
CCD #1	06/04/20

DRAWN BY

CHECKED BY
LL / AM

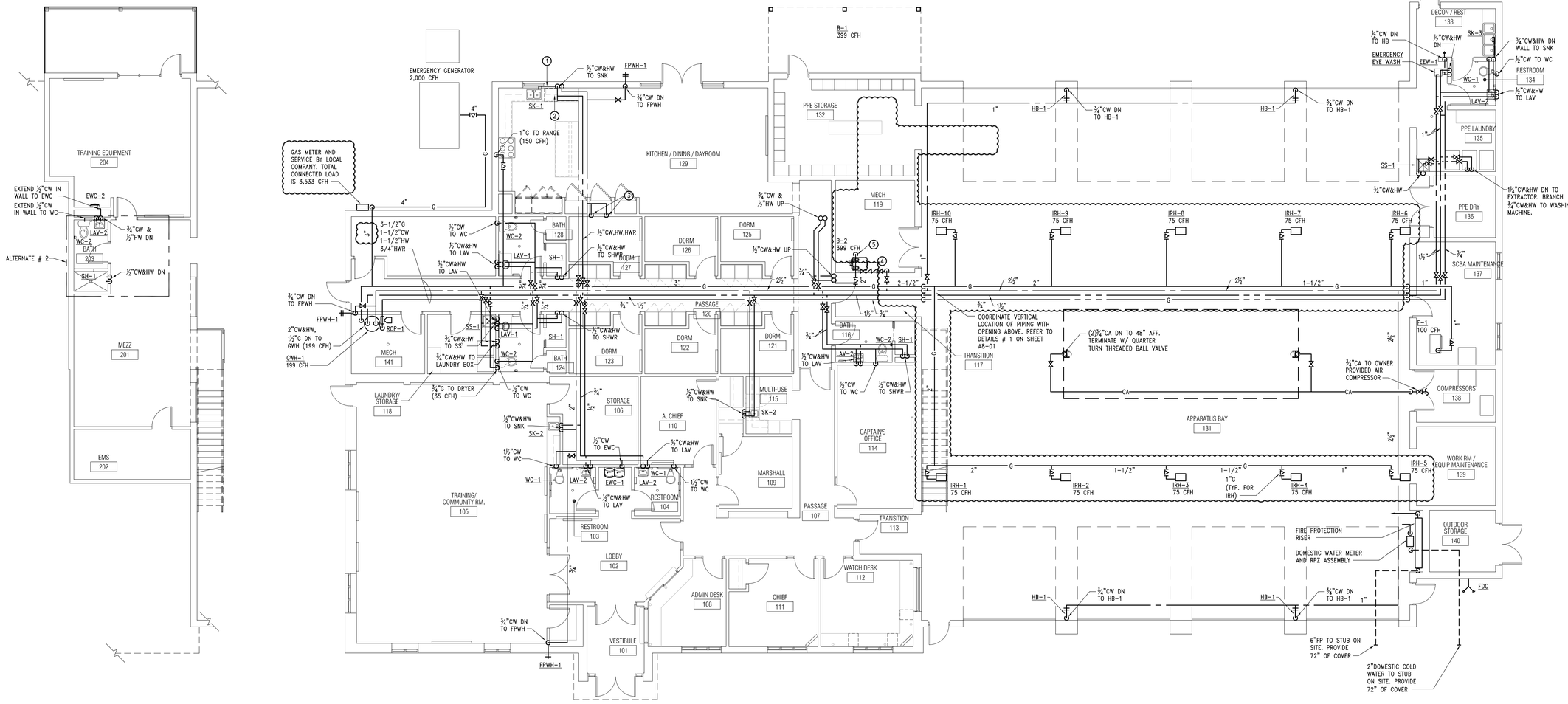
APPROVED BY
DG

SHEET NAME

ROOF PLAN

SHEET NO.

A3-30



2 Mezzanine Level Floor Plan - Domestic Water & gas
1/8" = 1'-0"

1 Main Level Floor Plan - Domestic Water & Gas
1/8" = 1'-0"

NATURAL GAS LOAD SUMMARY

EQUIPMENT	INPUT (CFH)
GWH-1	199
IRH-1 THRU 10	(10x75) 750
B-1	399
GAS RANGE (ALLOCATED)	150
GAS DRYER (ALLOCATED)	35
GENERATOR (ALLOCATED)	2000
F-1	100
TOTAL =	3,533 CFH

PIPE DESIGN BASED ON 7"W.C. @ 250 LINEAR FT. WITH 0.3"W.C. ALLOWABLE PRESSURE DROP.

NEW WORK KEY NOTES:

1. EXTEND DOMESTIC WATER IN WALL TO SINK. KEEP TIGHT TO INTERIOR OF WALL. PROVIDE MINIMUM 2" RIGID INSULATION BEHIND PIPE AN SEAL TO STUD AND ALL SEAMS.
2. EXTEND HOT WATER TO DISHWASHER. PROVIDE FINAL CONNECTION PER MANUFACTURERS RECOMMENDATION.
3. ½" COLD WATER DOWN TO REFRIGERATOR. PROVIDE ONE BACKFLOW PREVENTER APOLLO MODEL #4C-100 SERIES PER COLD WATER DROP ABOVE CEILING. ROUTE DEVICE DRAIN TO SERVICE SINK.
4. 1" COLD WATER TO MECHANICAL EQUIPMENT. PROVIDE RPZ AND PIPE "SPIT" TO FLOOR DRAIN.
5. 2" GAS DOWN TO BOILER. PROVIDE SHUT-OFF IN VERTICAL. (399 CFH EA)
6. BOILER # 1 (IN FLOOR HEAT) IS AN ALTERNATE # 5.

GENERAL NOTES:

A. COORDINATE ALL WORK WITH OTHER TRADES.

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BIDDING-CONSTRUCTION	03-27-2020
ADDENDUM # 1	04-20-2020
CONSTRUCTION	05-04-2020
CCD # 1	06-03-2020

DRAWN BY
MS

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MS

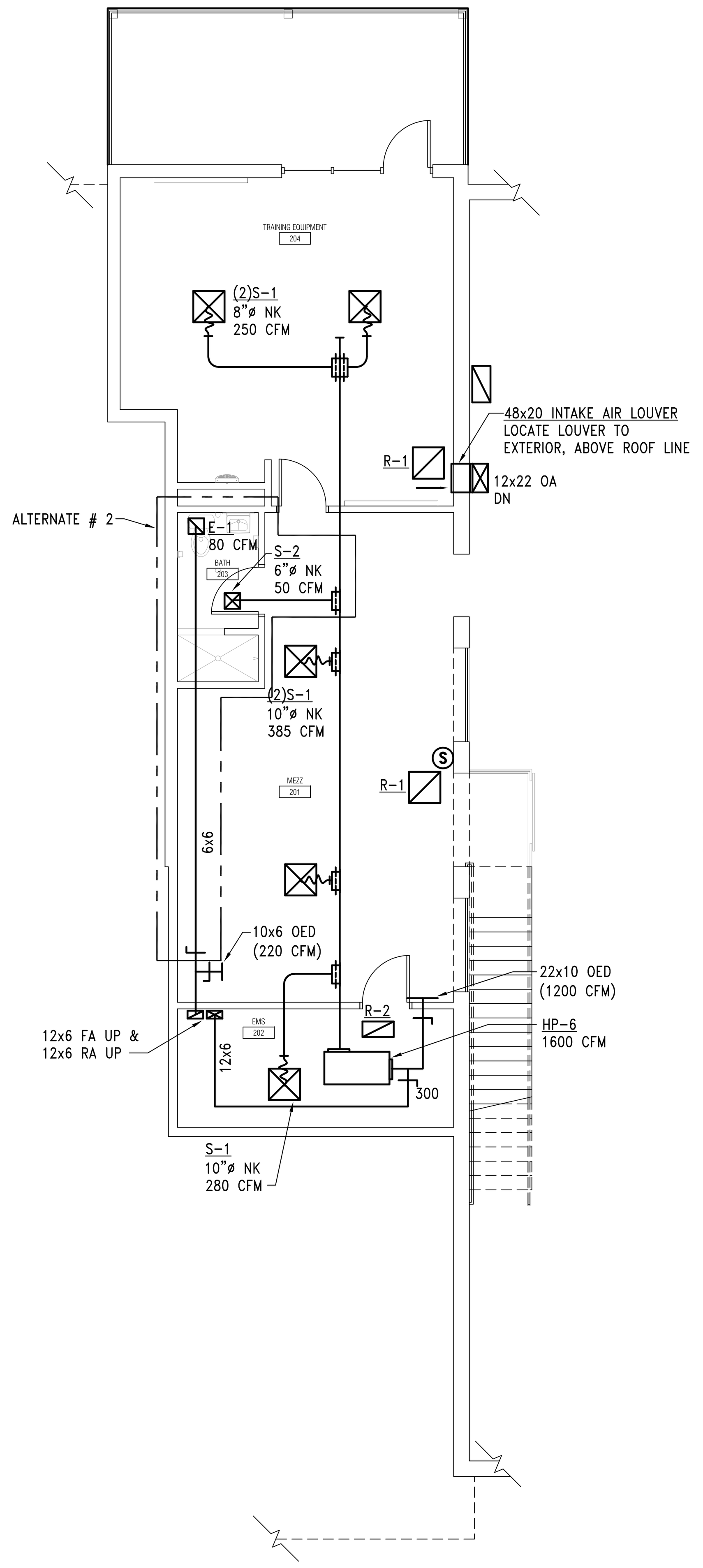
APPROVED BY
MS

SHEET NAME

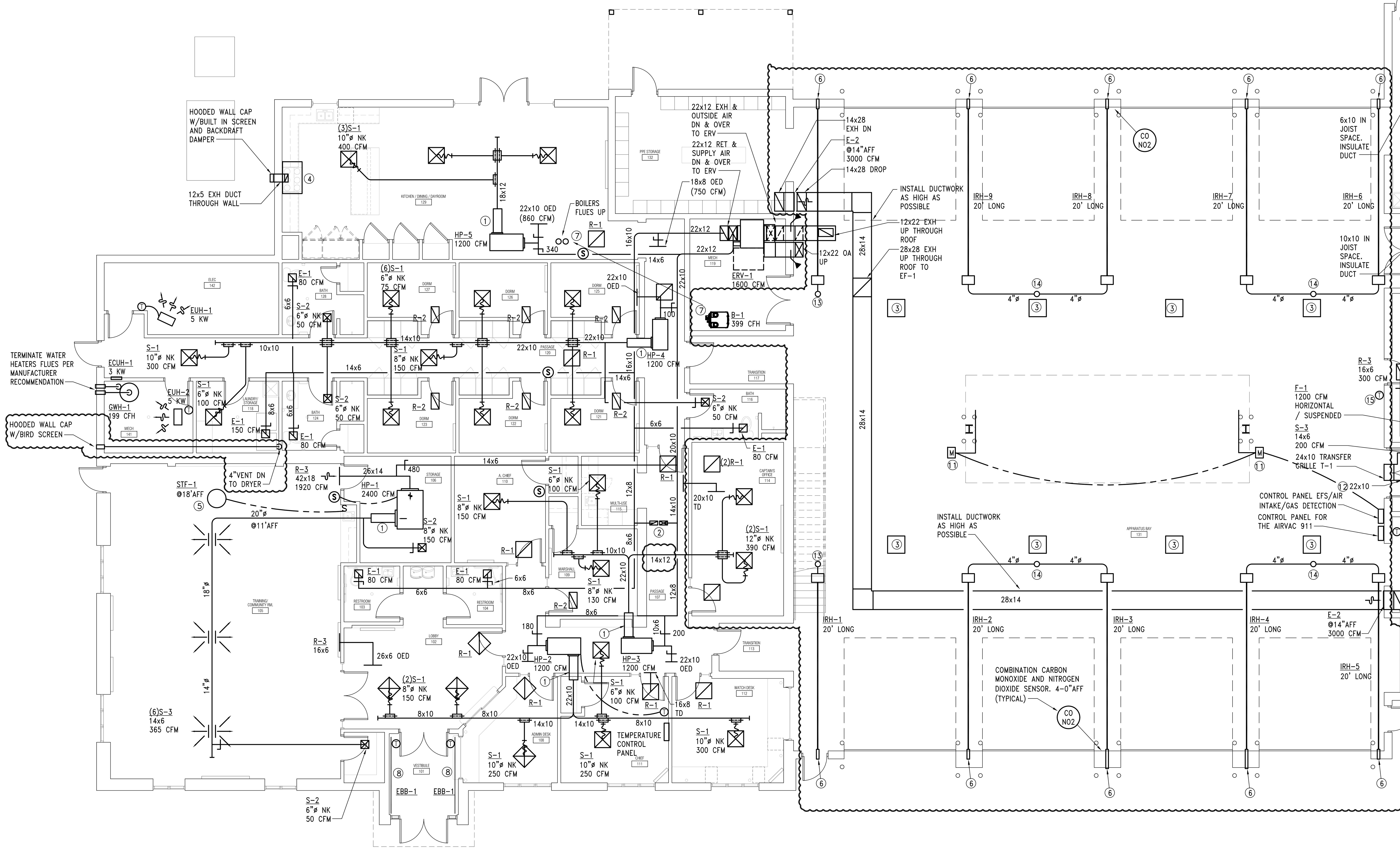
FLOOR PLANS - DOMESTIC WATER AND GAS

SHEET NO.

M1-02



2 Mezzanine Level Floor Plan - HVAC
1/8" = 1'-0"



1 Main Level Floor Plan - HVAC
1/8" = 1'-0"

HVAC KEY NOTES:

1. PROVIDE CIRCULAR MEDIUM VELOCITY SILENCER BY PRICE MANUFACTURER MODEL CM24 SERIES.
2. 12x6 FA UP & 12x6 RA UP. (300 CFM).
3. ENGINE EXHAUST REMOVAL SYSTEM BY AIR VAC 911, 120/1, 3/4" HP, 13 AMPS. PROVIDE COMPLETE SYSTEM; WALL GAS DETECTORS, OVERRIDE SWITCH, CONTROL PANEL. INSTALL BOTTOM OF THE UNIT AT 25' AFF.
4. KITCHEN HOOD BY ACCUREX MODEL XRRS-W-36-R, INTEGRAL FAN, REAR DISCHARGE, 500 CFM.
5. DE-STRATIFICATION (STF-1) FAN BY AIR-ROW FANS MODEL AF-22, 120/1, 1170 CFM, 23 WATTS.
6. 4"ø VENT THROUGH WALL. TERMINATE WITH HORIZONTAL (WALL) CONCENTRIC KIT AND PER MANUFACTURER RECOMMENDATION.
7. PROPOSED FLUES ROUTING SERVING THE BOILER. CONTRACTOR TO CONSULT WITH THE MANUFACTURE INSTALLATION MANUAL FOR INSTALLATION.
8. PEDESTAL MOUNTED ELECTRIC BASEBOARD BY MARKEL MODEL # DBF, 9' LONG, 2250 WATTS, 208/1.
9. DRYER UNIT. SEE SCHEDULES. INSTALL PER MANUFACTURER RECOMMENDATION.
10. NOT IN USE.
11. PROVIDE MOTORIZE DAMPER TO CONTROL (OPEN/CLOSE) THE COPULA LOUVERS. LOUVERS BY ARCHITECT.
12. LINED TRANSFER DUCT FOR SOUND.
13. 4"ø INTAKE UP THROUGH ROOF. TERMINATE WITH PITCH ROOF CAP AND PER MANUFACTURER RECOMMENDATION. PROVIDE BIRDSCREEN.
14. 6"ø INTAKE UP THROUGH ROOF. TERMINATE WITH GOOSENECK AND PER MANUFACTURER RECOMMENDATION. PROVIDE BIRDSCREEN.
15. CONNECT ALL IRH TO THIS THERMOSTAT.

STATE OF MICHIGAN · SALIM M. SESSINE · ENGINEER · No. 34939 · LICENSED PROFESSIONAL ENGINEER

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CCD # 1	06-03-2020

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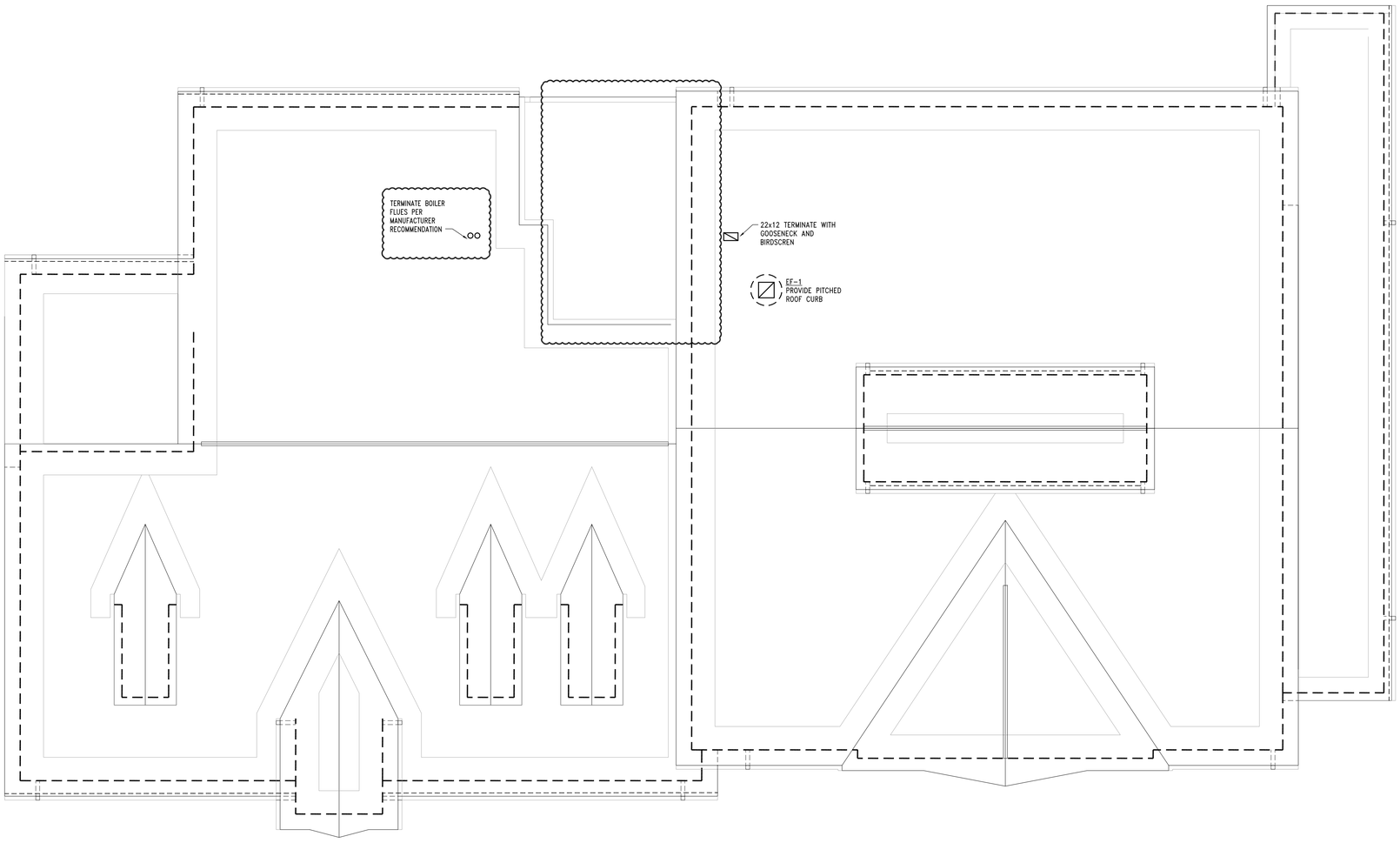
SHEET NAME
FLOOR PLANS - HVAC

SHEET NO.
M2-01



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SALIM M. SESSINE
ENGINEER
No. 34939
LICENSED PROFESSIONAL ENGINEER

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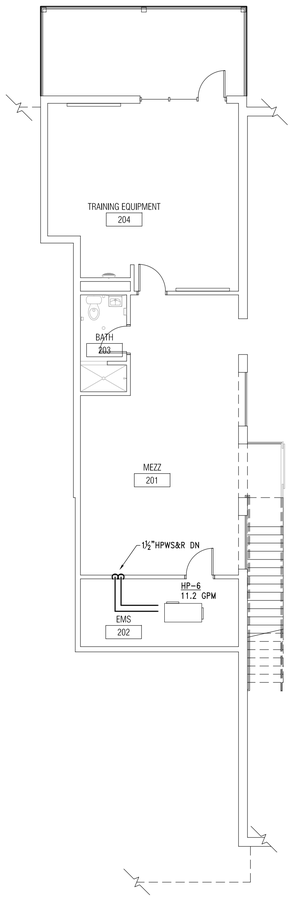
SHEET NAME

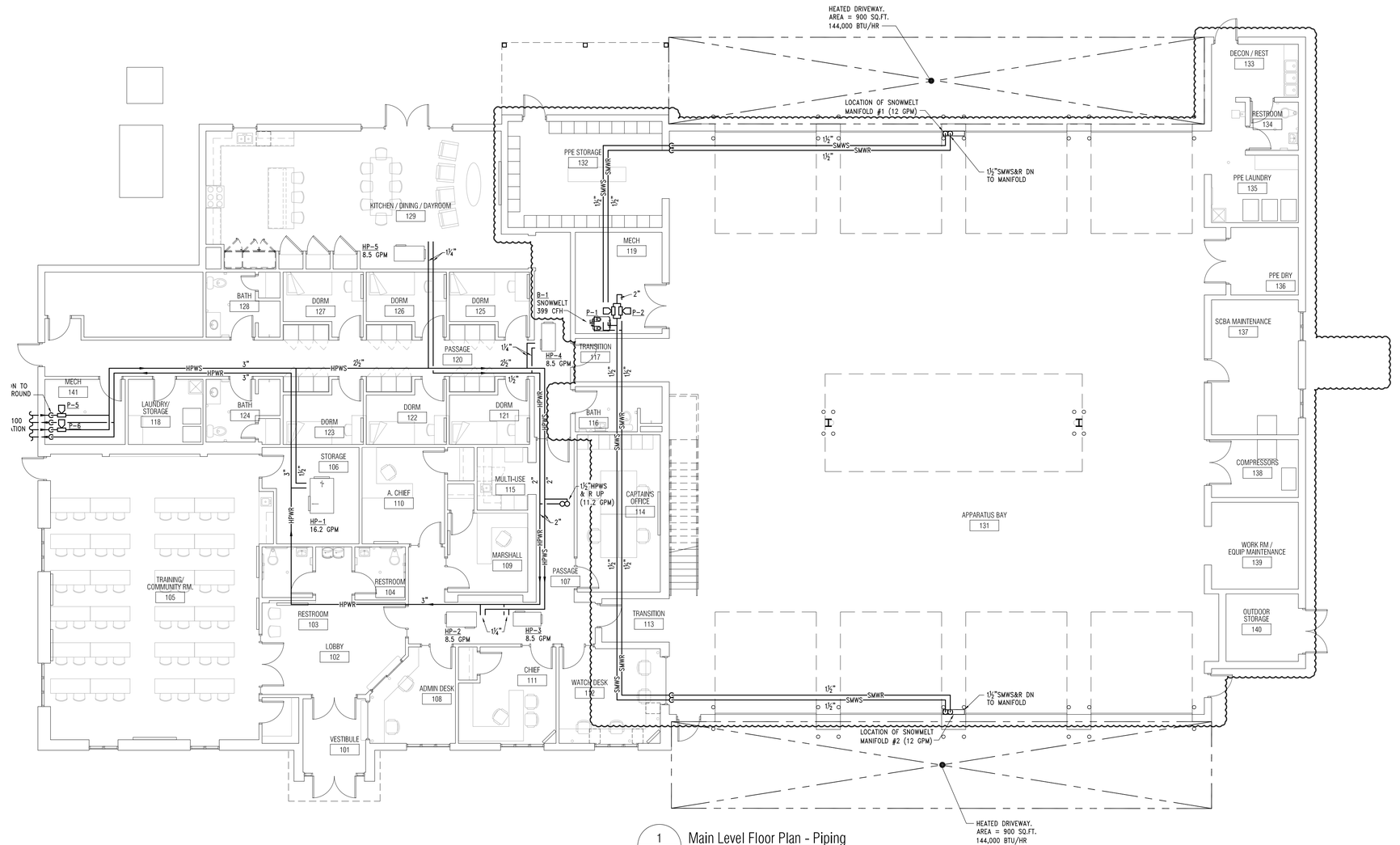
ROOF PLAN - HVAC

SHEET NO.

M2-02



2 Mezzanine Level Floor Plan - Piping
1/8" = 1'-0"



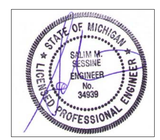
1 Main Level Floor Plan - Piping
1/8" = 1'-0"

PIPING KEY NOTES:

① NOT USED.

GENARAL NOTES:

1. NOT USED



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CONSTRUCTION	05-04-2020
CCD # 1	06-03-2020

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MS

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MS

APPROVED BY
MS

SHEET NAME

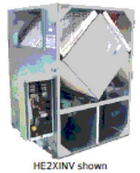
FLOOR PLANS - PIPING

SHEET NO.

M3-01

RENEWAIRE
ERV-1 SCHEDULE WITH ELECTRIC HEATER

PROVIDE DEDICATE CIRCUIT FOR ELECTRIC HEATER
PROVIDE DISCONNECT FOR ERV AND ELECTRIC HEATER



HE2XINV shown

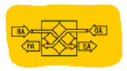
Specifications

Ventilation Type:	Static plate, heat, and humidity transfer
Typical Airflow Range:	500-2,200 CFM
AHRI 1060 Certified Core:	Two L125-G5
OA Filters:	Total Qty. 2, MERV 8: 20" x 20" x 2"
RA Filters:	Total Qty. 2, MERV 8: 20" x 20" x 2"
Unit Weight:	363-583 lbs. (varies by option)

Configuration

Unit Tag	erv-1
Model	[HE-2X] HE-2X
Core Type	[J] G5
Installation Location	[IN] Indoor Unit
Airflow Orientation	[V] Orientation V
Wall	[S] Single (Standard)
Electrical Service	[35] 208-230V / 3 Phase / 60 HZ
Fresh Air Motor	[V] TEFC Belt Drive - 2 HP
Exhaust Air Motor	[V] TEFC Belt Drive - 2 HP
Flow Control	[-] No Dampers (Standard)
Unit Control	[A] Motor Starters & Contactors (Standard)
Shaft Grounding Rings	No
Disconnect	[N] Non Fused (Standard)
Control Option	[3] Enhanced Controls with BACnet Factory Activation
Filter Monitor	[-] Filter monitors are included with controls
Paint	[-] None
Safety Listing	[L] Listed

Airflow Orientation



Unit Accessories and Service Parts

Type	Part Number	Description	Quantity
Electric Heater	EK-1414008SCCHR--23-1SV-N	EK-1414008SCCHR--23-1SV-N	1

Fans

	CFM	ESP	Filters	Fan RPM	BHP	Elevation	Motors Protected by Motor Starters		Motors Protected by VFDs	
							Qty @ HP	FLA	Qty @ HP	FLA
FA	1600	1	2" MERV-8	1382	1.05	627	2@2.0	6.6-5.8	None	-
EA	1636	1	2" MERV-8	1394	1.08					

Unit Electrical Data

Volts	Hertz	Phase	MCA	MOP
208-230	60	3	14.8	20

Specifications

Heater Type:	Electric Duct Heater
Standard Features:	A disconnecting magnetic control contactor per stage or each 48 Amp circuit within a stage
	Open-coil element
	Control terminal board
	Grounding lugs
	Automatic limit switch for primary overtemperature protection
	Manual reset limit switch for secondary overtemperature protection
	Non-adjustable airflow switch
	Disconnect switch

Configuration

Heater Tag	edh-1
Heater Series	[EK] EK Electric Duct Heater
Width	[14] Width
Height	[14] Height
Heater Capacity	[008] Capacity
Mount	[S] Slip-In (Standard)
Element Style	[C] Open Coil (Standard)
Element Material	[C] 60-20-20 Ni-Cr-Fe with Nickel-Plate Terminal Pins (Standard)
Airflow Orientation	[H] Horizontal
Control Box Offset	[R] Right Hand
Control Box Recessed	[-] None
Control Box Dust Tight	[-] None
Electrical Service	[23] 208V / 3 Phase / 60 HZ
Power Fusing	[-] None
Stage	[1] Single Stage
Control Voltage	[S] 24VAC
Control Type	[V] SCR with Thermostat and Sensor
Pilot Light	[N] None

Unit Accessories and Service Parts

No accessories for this unit

Performance

CFM	Temp In	Temp Out	kW	Volts	Hertz	Phase	FLA	MCA	MOPD
1600	48°F	63.75°F	8	208V	60	3	22.21	27.76	30

WATER SOURCE HEAT PUMP SCHEDULE

TAG	MANUFACTURER & MODEL No.	MOUNTING	CFM	EXT. SP IN	ECM FAN HP	COOLING				HEATING			GPM	ELECTRICAL DATA				EER	NOTES/ACCESSORIES
						MBH TOTAL	MBH SENS	EWT DEG F	LWT DEG F	MBH	EWT DEG F	LWT DEG F		VOLT	ELECTRIC HEAT (KW)	MCA	MOCP		
HP-1	TRANE EXH-070	HORIZONTAL	2090	0.4	1	76.7	57.2	45	55.4	63.3	45	38.9	16.2	208/3	6.5	32.3	50	36.4	A B C D E F G
HP-2	TRANE EXH-036	HORIZONTAL	1200	0.4	3/4	41.9	31.6	45	55.8	34.1	45	38.6	8.4	208/3	5	22	25	42.2	A B C D E F G
HP-3	TRANE EXH-036	HORIZONTAL	1200	0.4	3/4	41.9	31.6	45	55.8	34.1	45	38.6	8.4	208/3	5	22	25	42.2	A B C D E F G
HP-4	TRANE EXH-036	HORIZONTAL	1200	0.4	3/4	41.9	31.6	45	55.8	34.1	45	38.6	8.4	208/3	5	22	25	42.2	A B C D E F G
HP-5	TRANE EXH-036	HORIZONTAL	1200	0.4	3/4	41.9	31.6	45	55.8	34.1	45	38.6	8.4	208/3	5	22	25	42.2	A B C D E F G
HP-6	TRANE EXH-048	HORIZONTAL	1500	0.4	3/4	55.6	41.6	45	55.9	45.0	45	38.6	11.2	208/3	6.5	28.9	30	24.2	A B C D E F G

NOTES AND ACCESSORIES DESIGNATION

A	FACTORY MOUNTED CONTROL	D	2" FILTER
B	PROVIDE VIBRATION ISOLATION HANGER	E	BUILT-IN DISCONNECT SWITCH
C	DRAIN CONDENSATE THRU OUTSIDE WALL	F	30% PROPYLENE CLYCOL
		G	BACNET CARD

DOMESTIC WATER HEATER SCHEDULE

TAG	MANUFACTURER & MODEL No.	LOCATION	CAPACITIES			(2)PVC PIPE INTAKE/EXHAUST ø	BTU	NOTES/ACCESSORIES
			STORAGE	RECOVERY	TD °F			
GWH-1	A.O. SMITH BTH-199	BOILER ROOM	100	288	100	4"	199,000	A B C D E F G H

NOTES AND ACCESSORIES DESIGNATION

A	P & T RELIEF TO FD	E	EXPANSION TANK
B	FLOOR MOUNTED	F	NATURAL GAS
C	POWER VENTED	G	120V/1ø, DISCONNECT SWITCH
D	BMS CONTACT FOR REMOTE MONITORING	H	CP-1 BY BELL&GOSSETT MODEL # EROCIRC XL55-45 ALL BRONZE. 20 GPM, 30' OF HEAD, 208/1ø, .5 HP. INTERLOCK W/AQUASTAT (SET AT 110°F)

FAN SCHEDULE

TAG	MANUFACTURER & MODEL NO.	SERVICE	LOCATION	CFM	ESP "WC	FAN KEY	WHEEL TYPE	ELECTRICAL		WEIGHT POUND	NOTES/ ACCESSORIES
								VOLTS /ø	HP		
EF-1	GREENHECK CUBE-200-15	APPERATUS BAY	PITCHED ROOF	6000	0.8	RMC	BI	208/3	2	180	A B C D E
EF-2	GREENHECK SQ-95-VG	DECON REST	INLINE DUCT	480	.4	ILC	BI	120/1	1/10	45	C F H
EF-3	GREENHECK SQ-95-VG	COMPRESSOR RM	INLINE DUCT	600	.4	ILC	BI	120/1	1/10	60	G H
EF-4	GREENHECK SQ-95-VG	WORK RM	INLINE DUCT	800	.4	ILC	BI	120/1	3/4	64	G H

FAN KEY:
RMC - ROOF MOUNTED CENTRIFUGAL
CLG - CEILING MOUNT
ILC - INLINE CENTRIFUGAL
SW - SIDE WALL

WHEEL KEY:
FC - FORWARD CURVED
BI - BACKWARD INCLINED

NOTES AND ACCESSORIES DESIGNATION

A	14"H PITCH ROOF CURB	G	INTERLOCK WITH THERMOSTAT THERMOSTAT SHALL BE ADJUSTABLE
B	GRAVITY BACKDRAFT DAMPER	H	VIRATION ISOLATOR HANGING KIT
C	FACTORY MOUNTED & WIRED DISCONNECT SWITCH	E	INTERLOCK WITH BMS / MAU-1
D	BIRDSCREEN	F	ON ALL THE TIME

GRILLE, REGISTER & DIFFUSER SCHEDULE

TAG	MANUFACTURER & MODEL No.	SERVICE	MOUNTING	OVERALL SIZE	NECK SIZE	NOTES/ ACCESSORIES
S-1	TITUS OMNI	SAD	LAY-IN	24x24	SEE PLAN	A
S-2	TITUS OMNI	SAD	SURFACE	12x12	SEE PLAN	A
S-3	TITUS 272RL	SAD	SURFACE	SEE PLAN	SEE PLAN	A B
S-4						NOT USED
R-1	TITUS 50F	RAR	LAY-IN	24x24	---	A
R-2	TITUS 50F	RAR	LAY-IN	12x24	---	A
R-3	TITUS 25RL	RAR	SURFACE	SEE PLAN	---	A
E-1	TITUS 25RL	RAR	SURFACE	SEE PLAN	---	A
T-1	TITUS 350 RL	TAG	SURFACE	SEE PLAN	---	A

KEY:
SAD - CEILING SUPPLY DIFFUSER
TAG - CEILING OR WALL TRANSFER GRILLE
RAG - CEILING OR WALL RETURN GRILLE
EAG - CEILING OR WALL EXHAUST GRILLE

NOTES AND ACCESSORIES DESIGNATION

A	COLOR BY ARCHITECH		

GAS FIRED BOILER SCHEDULE

94.1 THERMAL EFFICIENCY (%)

TAG	MANUFACTURER & MODEL NO.	SERVICE	LOCATION	TYPE	INPUT CFH MIN/MAX	OUTPUT MBH	SUPPLY °F	TD °F	ELECTRICAL		NOTES/ACCESSORIES
									VOLTS	FLA	
B-1	THERMAL SOLUTIONS APX425C	SNOW MELT	MECH ROOM	HOT WATER	80/399	375	160	30	120/1	10	A B C D E F G H I G K

NOTES AND ACCESSORIES DESIGNATION

A	CONDENSING TYPE	F	4"CONCRETE PAD	K	DISCONNECT SWITCH
B	RELIEF VALVE DRAIN TO FD	G	4 VENT, 4 INTAKE; AL29-4C MATERIALS	L	ALTERNATE # 5
C	BOILER PUMP SEE SCHEDULE (BP-1) FOR EACH BOILER	H	CONDENSATE NEUTRALIZER DRAIN		
D	PROVIDE SINGLE POWER CONNECTION	I	BACNET CARD		
E	5:1 TURNDOWN	G	30% PROPYLENE GLYCOL		

PUMP SCHEDULE

TAG	MANUFACTURER & MODEL No.	LOCATION	SYSTEM SERVED	TYPE	IMPELLER IN	CAPACITIES		MOTOR DATA			NOTES/ACCESSORIES
						GPM	HEAD	HP	VOLTS	RPM	
P-1 P-2	BELL & GOSSETT E-90-1.5AB	MECH ROOM	SNOW MELT	IN LINE	5.5	24	30	3/4	120/1	3250	A B C D
P-5 P-6	BELL & GOSSETT E-90-1.5AAB	LAUNDRY STORAGE	GEO-THERMAL HEAT PUMP	IN LINE	5	61	100	5	208/3	3600	A C D E F
BP-1	BELL & GOSSETT PL-55	MECH ROOM	B-2	IN LINE	--	25	20	2/5	120/1	3250	A B C D

NOTES AND ACCESSORIES DESIGNATION

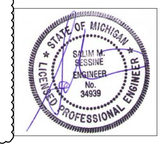
A	30% PROPYLENE GLYCOL	D	BACNET CARD
B	INTERLOCK WITH BOILER	E	VFD
C	DISCONNECT SWITCH	F	SUSPEND FROM STRUCTURE

GAS INFRARED HEATER SCHEDULE

TAG	MANUFACTURER & MODEL No.	AREA SERVED	REFLECTIVE PATTERN ANGLE	INTAKE/ FLUE SIZE	LENGTHS (FT)	GAS DATA			ELECTRICAL		NOTES/ACCESSORIES
						TYPE	MBH HIGH	MBH LOW	VOLTS	AMPS	
IRH-1 THRU IRH-10	RE-VERBER-RAY HL3-20-75	APPARATUS BAY	30	4"	20	NAT	75	50	120	4.8	A B C D E F G

NOTES AND ACCESSORIES DESIGNATION

A	TWO STAGE OPERATION	F	4"SIDE WALL VENT KIT
B	LOW INTENSITY	G	MOUNTING CHAIN KIT
C	ONE THERMOSTAT FOR ALL		
D	MOUNTING @ 16' AFF		
E	UNIT MOUNTED DISCONNECT		



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Highland, MI 48357

PROJECT NO.

18-122A

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CCD # 1	06-03-2020

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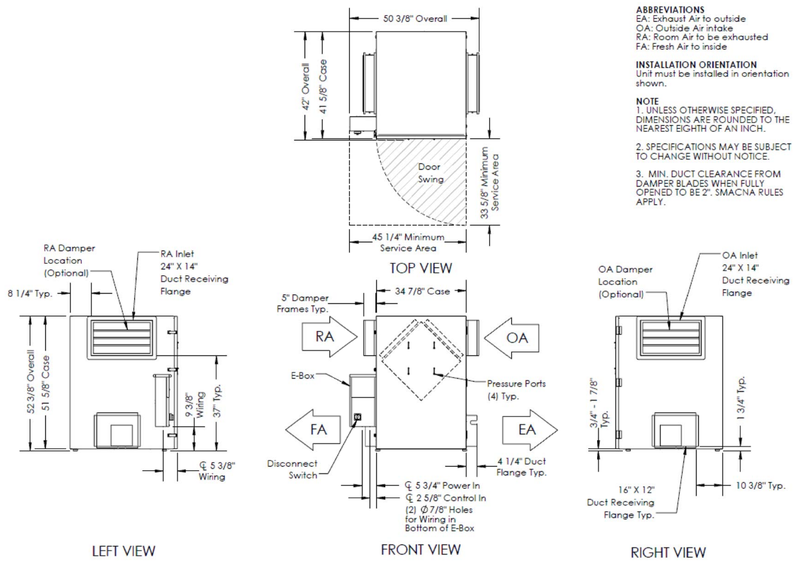
MECHANICAL SCHEDULES

SHEET NO.

M4-01



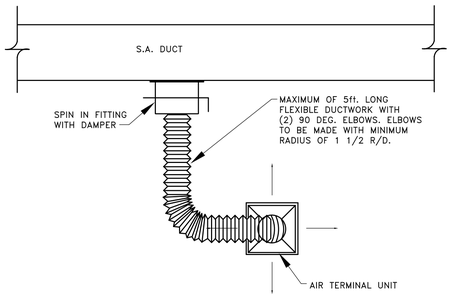
ABBREVIATIONS
EA: Exhaust Air to outside
OA: Outside Air intake
RA: Room Air to be exhausted
FA: Fresh Air to inside

INSTALLATION ORIENTATION
Unit must be installed in orientation shown.

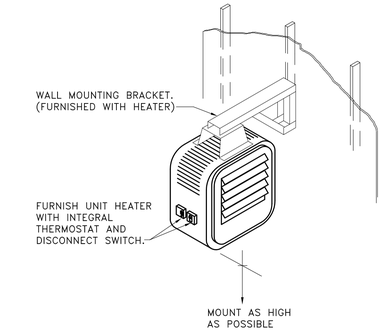
NOTE
1. UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE ROUNDED TO THE NEAREST EIGHTH OF AN INCH.

2. SPECIFICATIONS MAY BE SUBJECT TO CHANGE WITHOUT NOTICE.

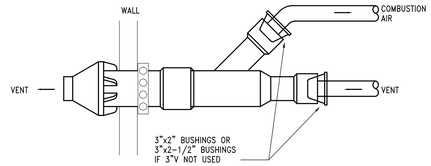
3. MIN. DUCT CLEARANCE FROM DAMPER BLADES WHEN FULLY OPENED TO BE 2". SMACNA RULES APPLY.



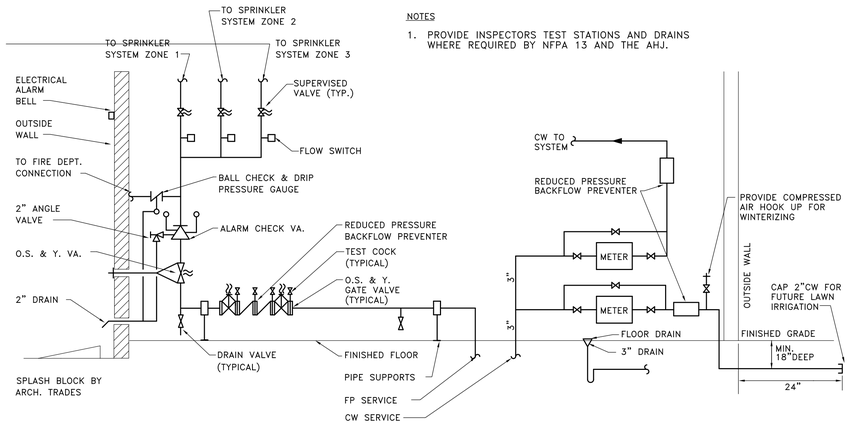
FLEXIBLE DUCT CONNECTION DETAIL
NO SCALE



UNIT HEATER DETAIL
NO SCALE



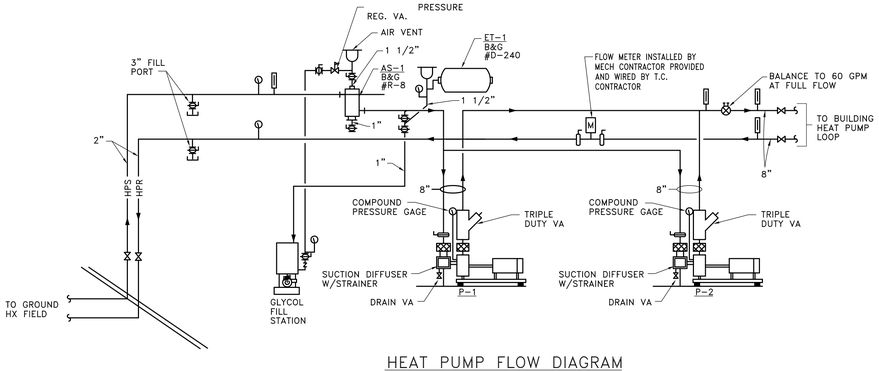
CONCENTRIC VENT KIT (WALL INSTALLATION)
NO SCALE



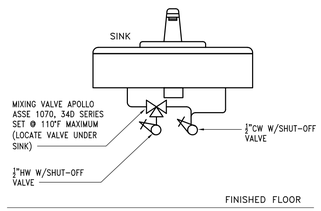
NOTES

1. PROVIDE INSPECTORS TEST STATIONS AND DRAINS WHERE REQUIRED BY NFPA 13 AND THE AHJ.

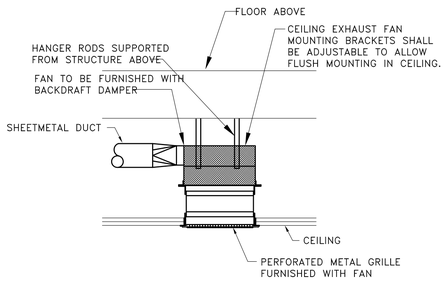
TYPICAL AUTOMATIC SPRINKLER RISER & WATER METER DIAGRAM
NO SCALE



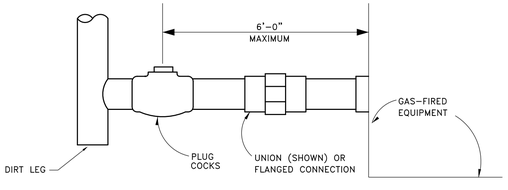
HEAT PUMP FLOW DIAGRAM
NO SCALE



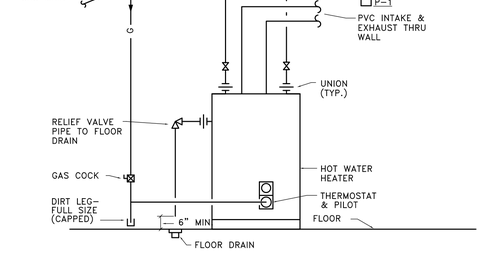
MIXING VALVE PIPING DETAIL
NO SCALE



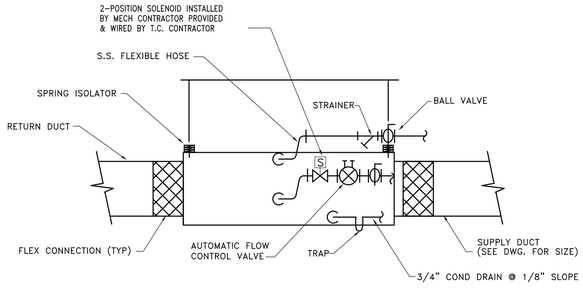
CEILING EXHAUST FAN DETAIL
NO SCALE



TYPICAL GAS PIPING CONNECTION
NO SCALE



DOMESTIC WATER HEATER PIPING SCHEMATIC
NO SCALE



DETAIL OF HORIZONTAL HEAT PUMP INSTALLATION
NO SCALE

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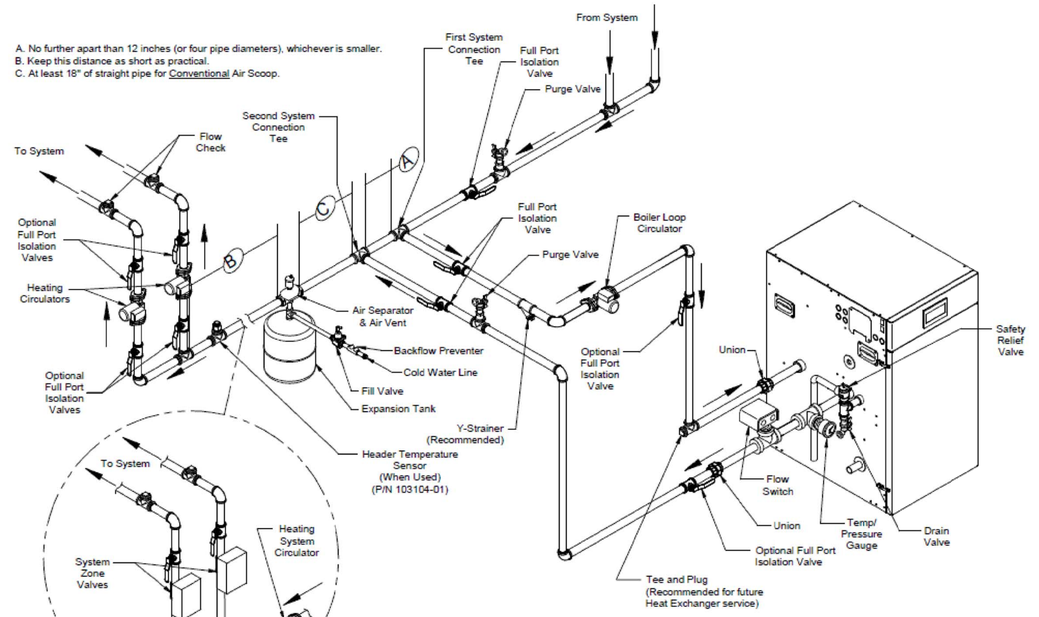
M5-01

A. No further apart than 12 inches (or four pipe diameters), whichever is smaller.
B. Keep this distance as short as practical.
C. At least 18" of straight pipe for Conventional Air Scoop.



OPTIONAL ZONE VALVE CONTROLLED SYSTEM

NOTES:
1. THIS DRAWING IS USED ON MULTIPLE FIGURES IN THE APEX(TS) MANUAL.

REV: A	DR: 83-560-8500	DATE: 11/12/2013	DWN: EJL	CHKD:	APPD:	APPD:	

INITIAL RELEASE.

REFERENCE ASME Y14.5M-1994 FOR GEOMETRIC TOLERANCES. ALL DIMENSIONS IN INCHES. DRAWING NOT TO BE SCALED. NON-BASIC DIMENSIONAL AND ANGULAR TOLERANCES UNLESS OTHERWISE NOTED:
DECIMALS: X.X – ±0.1, X.XX – ±0.03, X.XXX – ±0.005. FRACTIONAL: ±1/32. ANGULAR: ±1°

FIRST USE: APEX(TS)	MATERIAL:			
	TITLE: NEAR BOILER PIPING HEATING ONLY (WITH CENTRAL HEATING CIRCULATORS)			
PROPERTY OF: Thermal Solutions Products LLC, LANCASTER, PA 17604-3244	DRAWING NUMBER: TS-83-150	SCALE: NONE	DWG SIZE: C	SHEET: 1 OF 1

SNOW MELT SYSTEM SCHEMATIC

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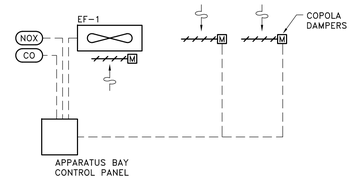
MECHANICAL DETAILS

SHEET NO.

M5-02



EF-1, GAS DETECTION & CUPOLA MOTORIZED DAMPERS CONTROL DIAGRAM

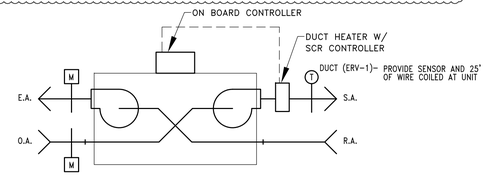
NO SCALE

NOTES:

THE CONTROLS CONTRACTOR SHALL PROVIDE ALL WIRING, TRANSFORMERS, SENSORS, HARDWARE, SOFTWARE AND PROGRAMMING FOR A COMPLETE AND OPERATIONAL CONTROLS SYSTEM. COORDINATE ALL DEVICES WITH HVAC EQUIPMENT. ALL WIRING SHALL BE IN ACCORDANCE WITH ELECTRICAL SPECIFICATIONS.

SEQUENCE OF OPERATION:

1. WHEN THE CO/NOX SYSTEM DETECTS GASSES OUT OF NORMAL RANGE, EF-1 IS ENERGIZED AND THE CUPOLA DAMPERS OPEN ALLOWING MAKE UP AIR INTO THE SPACE UNTIL THE GAS MONITORING RESET GOES TO NORMAL STATUS. WHEN NORMAL RANGE IS DETECTED, EF-1 IS DE-ENERGIZED AND CUPOLA DAMPERS CLOSE.
2. THE CUPOLA DAMPERS WILL HAVE AN OVERRIDE SWITCH TO OPEN AND CLOSE UPON THE OWNER'S PREFERENCE.

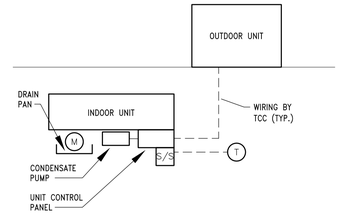


SEQUENCE OF CONTROLS

1. ERV IS STARTED THROUGH AN ON BOARD MICROPROCESSOR CONTROL.
2. DUCT HEATER SCR CONTROLLER MODULATES TO MAINTAIN SET DISCHARGE.

ERV-1 CONTROL DIAGRAM

NO SCALE

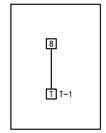


PACKAGED SPLIT SYSTEM CONTROL DIAGRAM

NO SCALE

NOTES:

1. TEMPERATURE CONTROLS CONTRACTOR (TCC) SHALL PROVIDE FIELD WIRING BETWEEN INDOOR UNIT CONTROLS AND THE REMOTE OUTDOOR UNIT. REFER TO MECH FLOOR PLANS FOR LOCATION OF UNITS.
2. TC CONTRACTOR SHALL COORDINATE WITH MANUFACTURER FOR EXACT TERMINATIONS AND WIRING REQUIREMENTS.
3. CONDENSATE PUMP HAS SELF CONTAINED LEVEL CONTROL. PUMP RECEIVES INDEPENDENT POWER.



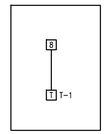
NOTE:
PROVIDE ALL REQUIRED TRANSFORMERS, SAFETIES AND OVERLOADS

ELECTRIC UNIT HEATER CONTROL DIAGRAM

NO SCALE

SEQUENCE OF OPERATION:

1. LOW VOLTAGE THERMOSTAT STARTS FAN AND HEATER WHEN CALLED FOR.



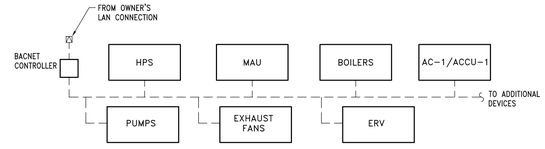
NOTE:
PROVIDE ALL REQUIRED TRANSFORMERS, SAFETIES AND OVERLOADS

ELECTRIC CABINET UNIT HEATER CONTROL DIAGRAM

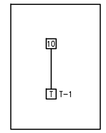
NO SCALE

SEQUENCE OF OPERATION:

1. LOW VOLTAGE THERMOSTAT STARTS FAN AND HEATER WHEN CALLED FOR.



DDC ARCHITECTURE



NOTE:
PROVIDE ALL REQUIRED TRANSFORMERS, SAFETIES AND OVERLOADS

GAS FIRED INFRARED HEATER CONTROL DIAGRAM

NO SCALE

SEQUENCE OF OPERATION:

1. ONE LOW VOLTAGE THERMOSTAT STARTS (10)HEATERS WHEN CALLED FOR HEAT.

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TEMPERATURE CONTROLS

SHEET NO.
M6-01

HOT WATER HEATING SEQUENCE OF OPERATION:

NOTE: ALL SETPOINTS AND TIME INTERVALS SETPOINTS DESCRIBED IN THE SEQUENCE SHALL BE ADJUSTABLE BY SYSTEM OPERATORS (CREATE REQUIRED VIRTUAL POINTS).

HOT WATER HEATING SYSTEM CIRC PUMPS (P-1 & P-2) / (P-3 & P-4) SHALL HAVE START/STOP CAPABILITY FROM THE DDC SYSTEM. THE HAND-OFF-AUTO SWITCH SHALL BE KEPT IN THE "AUTO" POSITION. WHEN OA TEMP IS 55'F OR BELOW, ONE OF TWO SECONDARY PUMPS SHALL BE ACTIVATED BY THE DDC TO OPERATE CONTINUOUSLY. THE OTHER WILL SERVE AS STANDBY.

THE DIFFERENTIAL PRESSURE SENSOR (DPT-1) THRU THE DDC MODULATES THE ACTIVE PUMP VARIABLE SPEED DRIVE TO MAINTAIN THE DESIRED SYSTEM DIFFERENTIAL PRESSURE AS DETERMINED DURING SYSTEM BALANCING.

DDC SHALL ALTERNATE PUMP OPERATION BASED ON RUNTIME HOURS OR AT THE BEGINNING OF EACH MONTH - OPERATOR SELECTABLE.

DDC SHALL MONITOR OPERATING STATUS OF EACH PUMP THRU ITS RESPECTIVE CURRENT SWITCH. UPON PUMP FAILURE, DDC SHALL ACTIVATE A FAILURE ALARM AND AUTOMATICALLY START THE STANDBY PUMP.

THE DDC SYSTEM ENABLES THE MASTER SEQUENCING PANEL WHEN THE OA TEMP IS 55'F OR BELOW. ABOVE 55'F THE DDC DISABLES THE SYSTEM.

THE MASTER SEQUENCING PANEL SHALL ACTIVATE OR DEACTIVATE BOILERS AND BOILER STAGES AS REQUIRED TO MAINTAIN HWH SUPPLY TEMP (T-1) SETPOINT.

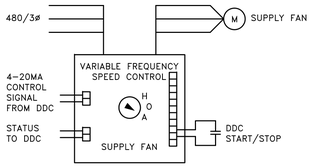
THE MASTER SEQUENCING PANEL SHALL INCLUDE OPERATOR SELECTABLE BOILER LEAD/LAG OPERATION OR FIRST ON/FIRST OFF OPERATION.

WHENEVER A BOILER CIRCUIT IS ACTIVATED, ITS RESPECTIVE PRIMARY CIRCULATION PUMP SHALL BE ACTIVATED BY FACTORY WIRED PUMP RELAY. WHENEVER A BOILER IS DEACTIVATED, A TIME DELAY RELAY SHALL KEEP THE PUMP RUNNING FOR 10 MINUTES (ADJUSTABLE) TO DISSIPATE HEAT FROM THE DEACTIVATED BOILER.

WHEN A BOILER IS ACTIVATED, BOTH SETS OF COMBUSTION AIR DAMPERS SHALL BE OPENED THRU HARDWIRED INTERLOCK. WHEN THE DAMPERS OPEN, END SWITCHES MAKE, AND THE BOILERS ARE ALLOWED TO START.

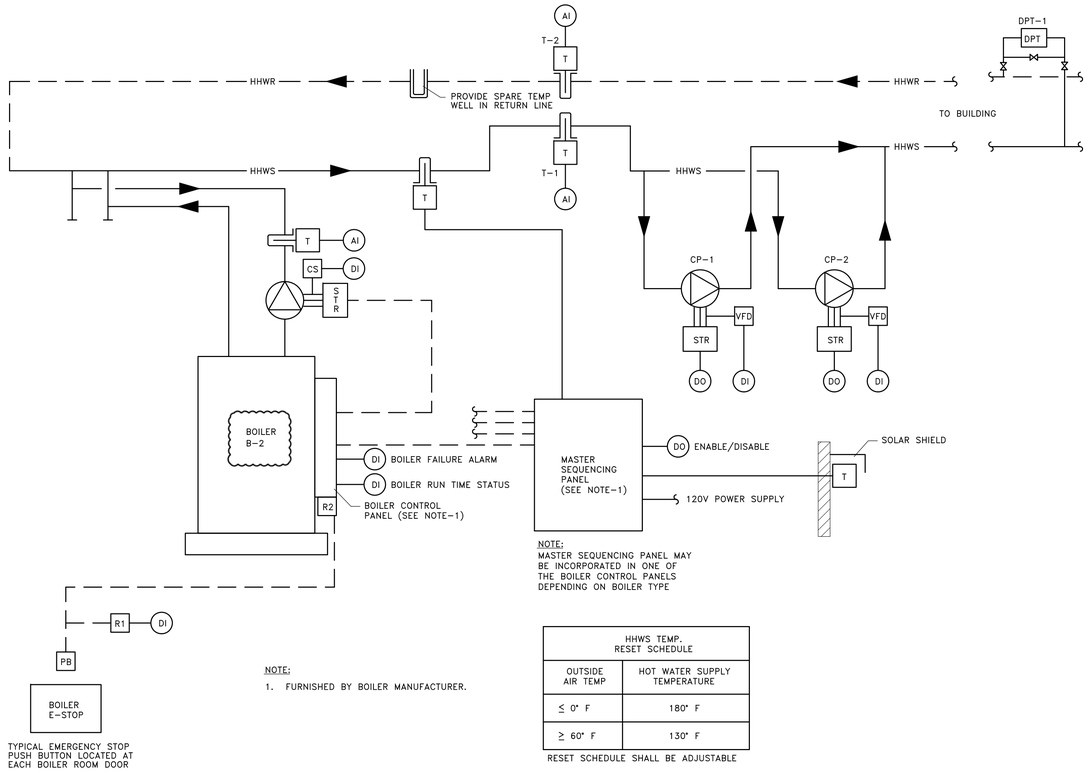
DDC SHALL MONITOR BOILER RUN STATUS AND BOILER FAILURE ALARM AT EACH BOILER THROUGH DRY CONTACTS AVAILABLE IN THE BOILER CONTROL PANEL. BOILER FAILURE MONITORING SHALL INCLUDE "LOW WATER" AND "FLAME FAILURE".

THE EMERGENCY STOP PUSH BUTTON(S), LOCATED AT EACH BOILER ROOM DOOR(S), DEACTIVATES EACH BOILER WHENEVER THE PUSH BUTTON IS ACTIVATED. THE BOILERS REMAIN DE-ACTIVATED UNTIL THE PUSH BUTTON(S) IS MANUALLY RESET.



TYPICAL PUMP VFD ELECTRIC SCHEMATIC

NO SCALE



NOTE:
MASTER SEQUENCING PANEL MAY BE INCORPORATED IN ONE OF THE BOILER CONTROL PANELS DEPENDING ON BOILER TYPE

NOTE:

1. FURNISHED BY BOILER MANUFACTURER.

HHWS TEMP. RESET SCHEDULE	
OUTSIDE AIR TEMP	HOT WATER SUPPLY TEMPERATURE
≤ 0° F	180° F
≥ 60° F	130° F

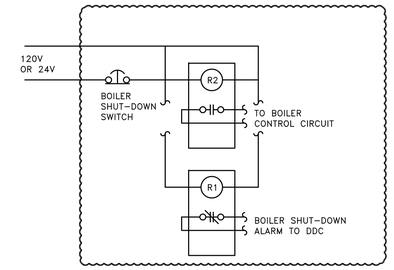
RESET SCHEDULE SHALL BE ADJUSTABLE

	HARDWARE										SOFTWARE								
	OUTPUT			INPUT															
	DIGITAL		ANALOG	DIGITAL	ANALOG														
	CONTROL RELAY	POSITION ADJUSTMENT	4-20ma	CONTACT CLOSURE	TEMPERATURE	% RELATIVE HUMIDITY	PSIG, PSIA, PSID, IN. H2O	FLOW	CO2		SCHEDULED S/S	ECONOMIZER	ENTHALPY	RUN TIME	DAY/NIGHT SET BACK	WARM UP CYCLE	SMOKE CONTROL	TREND LOG CAPABILITY	SYSTEM GRAPHICS
HEATING SYSTEM																			◆
PRIMARY PUMP				4										◆					
BOILER FAILURE ALARM				4															
BOILER RUN STATUS				4										◆					
BOILER DISCH TEMP					4													◆	
SECONDARY PUMP	4			4							◆			◆					
TERTIARY PUMP	2			2							◆			◆					
TERTIARY VFD FAULT				2															
GLYCOL WATER S TEMP					1													◆	
GLYCOL WATER R TEMP					1													◆	
HHWS TEMP					1													◆	
HHWR TEMP					1													◆	
BOILER E-STOP				1															

ROOFTOP UNIT POINTS ARE OBTAINED VIA BACNET WORKS INTERFACE.
COORDINATE WITH RTU MANUFACTURER.

GENERAL NOTES

1. 120 VOLT POWER FROM STARTER TRANSFORMER
2. ■ DENOTES TERMINAL AT STARTER
3. □ DENOTES TERMINAL AT CONTROL PANEL
4. ——— DENOTES FIELD WIRING
5. ——— DENOTES WIRING IN STARTER OR IN CONTROL PANEL
6. ○ DENOTES TERMINAL AT DEVICE



REMOTE BOILER EMERGENCY SHUTDOWN WIRUNG

NO SCALE

NOTES:

1. LOCATE A SWITCH AT EACH ENTRANCE JUST INSIDE BOILER ROOM. REFER TO FLOOR PLANS FOR QUANTITY AND LOCATION OF ROOM ENTRANCES. COORDINATE SWITCH LOCATION WITH ALL OTHER TRADES.
2. TEMPERATURE CONTROLS (TCC) SHALL PROVIDE SIGN (NAME PLATE) TO BE PLACED DIRECTLY ABOVE OR BELOW EACH PUSH BUTTON SWITCH THAT READS: "EMERGENCY BOILER SHUTDOWN".
3. TCC SHALL SUPPLY POWER TO CONTROL RELAY FROM EMERGENCY POWER CIRCUIT. REFER TO ELECTRICAL PANEL SCHEDULES AND COORDINATE WITH ELECTRICAL CONTRACTOR AS NECESSARY.
4. TCC SHALL WIRE BOILERS' CONTROL CIRCUITS (POWER FROM SECONDARY SIDE OF CONTROL TRANSFORMERS) THRU NORMALLY OPEN RELAY CONTACTS. TCC SHALL COORDINATE EXACT WIRING AND TERMINATION REQUIREMENTS WITH BOILER MANUFACTURER.
5. TCC SHALL MOUNT SHUTDOWN CONTROL RELAYS AT RESPECTIVE BOILER CONTROL PANELS.
6. TCC SHALL PROVIDE PUSH BUTTON SWITCH (PUSH TO LATCH - TURN KEY OR PULL TO RELEASE) WITH MUSHROOM HEAD OPERATOR AND NORMALLY CLOSE (NC) CONTACTS. PROVIDE WITH PROPER ENCLOSURE.

SEQUENCE OF OPERATION:

UNDER NORMAL OPERATING CONDITIONS THE CIRCUIT SHALL BE ENERGIZED AND THE RELAYS NORMALLY OPEN (NO) CONTACTS SHALL BE CLOSED. WHEN A SWITCH IS PUSHED (LATCHED) THE RELAY CONTACTS SHALL OPEN AND INTERRUPT EVERY BOILER'S CONTROL CIRCUIT. WHEN SWITCH IS RELEASED, THE RELAY SHALL BE ENERGIZED AND ITS NORMALLY OPEN CONTACTS SHALL CLOSE, ENERGIZING EVERY BOILER'S CONTROL CIRCUIT.

DDC SHALL ACTIVATE AN ALARM WHEN REMOTE SWITCH HAS BEEN PUSHED.

H:\ACAD\FILES\75\75810 - Highland Twp FS-1\CAD\MECH\75810-M6-01-TC.dwg Thu, 04 Jun 2020 - 8:36am

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KEY PLAN

OWNER

Highland Township
Fire Department

PROJECT NAME

Highland Township
Fire Station No. 1

1600 W. Highland Rd.
Highland, MI 48357

PROJECT NO.

18-122A

ISSUES / REVISIONS

SCHEMATIC DESIGN	01-28-2020
BIDDING-CONSTRUCTION	03-27-2020
CONSTRUCTION	05-04-2020
CCD # 1	06-03-2020

DRAWN BY
MS

CHECKED BY
MS

APPROVED BY
MS

SHEET NAME

TEMPERATURE CONTROLS

SHEET NO.
M6-02

RISER KEY NOTES:

1. PROVIDE ALL UNUSED SPACE IN MAIN SWITCHBOARDS MDP AND ALL DISTRIBUTION PANELS DP'S FULLY BUSSED FOR FUTURE USE.
2. PROVIDE CONCRETE PAD FOR ALL GROUND AND FLOOR MOUNTED EQUIPMENT: DISTRIBUTION PANELS, TRANSFORMERS, ETC. CONCRETE PADS NOT SPECIFICALLY INDICATED ON PLANS AND RISER DIA. REFER TO SPECIFICATIONS FOR EXACT REQUIREMENTS.
3. PROVIDE LIGHTING CONTROL RELAY PANEL AS REQUIRED TO CONTROL INTERIOR AND EXTERIOR LIGHTING AS SPECIFIED.
4. PROVIDE GROUNDING AND BONDING PER NEC 250. BOND ALL GROUNDING ELECTRODES PRESENT IN THE BUILDING, INCLUDING CONCRETE ENCASED ELECTRODES (REBARS) AND BUILDING STEEL TO THE SYSTEM GROUND.
5. VFD IS PROVIDED WITH EQUIPMENT, PROVIDE COMPLETE INSTALLATION, COORDINATE WITH MECHANICAL FOR EXACT REQUIREMENTS.
6. DISCONNECT SWITCH PROVIDED WITH EQUIPMENT, REFER TO GENERAL NOTE-G THIS SHEET.
7. COORDINATE WITH APPROVED GENERATOR SUBMITTALS FOR EXACT REQUIREMENTS AND PROVIDE SERVICES AS REQUIRED. PROVIDE BRANCH CIRCUITS FROM RP-1B.

GENERAL RISER NOTES:

A. REFER TO SHEETS E0.003 FOR WIRE SCHEDULES AND SHEETS E0.004 AND E0.005 FOR PANEL SCHEDULES.

B. REFER TO VOLTAGE DROP SCHEDULE ON SHEET E0.001 AND ADJUST FEEDERS ACCORDINGLY.

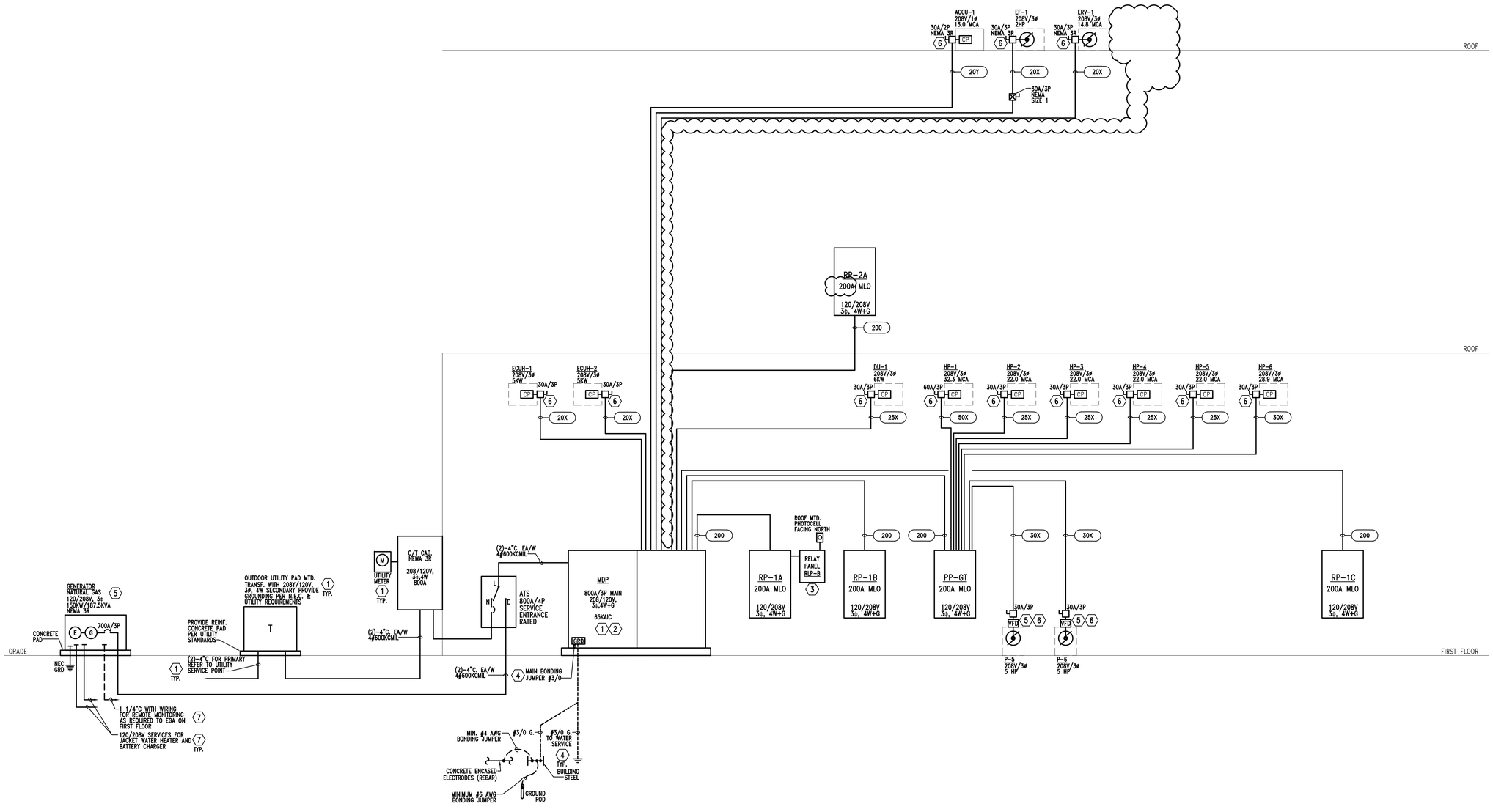
C. RUN ALL UNDERGROUND CONDUITS MIN. 4" UNDER SLAB.

D. NEW ELECTRICAL SERVICE REQUIREMENTS TO BE COORDINATED WITH DTE ENERGY.

E. ALL MOTORS AND EQUIPMENT INDICATED ON THIS RISER DIAGRAM ARE RATED 208V/3ø, UNLESS OTHERWISE NOTED.

F. ALL FLOOR AND GROUND MOUNTED EQUIPMENT (SWITCHBOARDS, DISTRIBUTION PANELS, GENERATOR, CONTROL PANELS ETC.) TO BE PAD MOUNTED, PROVIDE CONCRETE PAD AS REQUIRED PER APPROVED EQUIPMENT SUBMITTAL, COORDINATE WITH ARCHITECT.

G. COORDINATE WITH MECHANICAL FOR DISCONNECT SWITCHES SUPPLIED WITH THE EQUIPMENT, PROVIDE FOR ALL AS INDICATED IF NOT INCLUDED WITH THE EQUIPMENT.



1 E0-02 ELECTRICAL RISER DIAGRAM

Scale: No Scale

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KEY PLAN

OWNER

Highland Township
Fire Department

PROJECT NAME

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1600 W. Highland Rd.
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ISSUES / REVISIONS

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CCD #1	06-03-2020

DRAWN BY
NH

CHECKED BY
EK

APPROVED BY
EK

SHEET NAME

ELECTRICAL RISER DIAGRAM

SHEET NO.
E0-02

STATE OF MICHIGAN LICENSED PROFESSIONAL ENGINEER
SUJIM M. SESSINE
ENGINEER
No. 34039

PROJECT: **HIGHLAND TWP FS-1** | **200A** | **MLO** | CLASS: **208/120V,3PH,4W+G.** | PANEL:
PROJ NO: **75810** | DATE: **06/04/20** | MOUNTING: **SURFACE** | **PP-GT**

BRANCH CIRC.			VA			CODE			REMARKS
NO.	POLES	BKR.	BUS A	BUS B	BUS C	L	R	E	
1	3		3325					E	
3				3325				E	HP-1 32.6 MCA
5		50			3325			E	
7	3		2244					E	
9				2244				E	HP-2 22.0 MCA
11		25			2244			E	
13	3		2244					E	
15				2244				E	HP-3 22.0 MCA
17		25			2244			E	
19	3		2244					E	
21				2244				E	HP-4 22.0 MCA
23		25			2244			E	
25	3		2244					E	
27				2244				E	HP-5 22.0 MCA
29		25			2244			E	
31	3		2948					E	
33				2948				E	HP-6 28.9 MCA
35		30			2948			E	
37	1								SPACE
39	1								SPACE
41	1								SPACE
2	3		2100					E	
4				2100				E	P-5 5 HP
6		30			2100			E	
8	3		2100					E	
10				2100				E	P-6 5 HP
12		30			2100			E	
14	1								SPACE
16	1								SPACE
18	1								SPACE
20	1								SPACE
22	1								SPACE
24	1								SPACE
26	1								SPACE
28	1								SPACE
30	1								SPACE
32	1	20							SPARE
34	1	20							SPARE
36	1	20							SPARE
38	1	20							SPARE
40	1	20							SPARE
42	1	20							SPARE

	BUS A	BUS B	BUS C				
LIGHTING LOAD					NEC 220.42		
REC. LOAD					NEC 220.44	=	
EQUIPMENT	19,449	19,449	19,449	58347 VA	80%		46678 VA
TOTAL LOAD	19,449	19,449	19,449	58347 VA		=	46678 VA
				162 A			130 A
				CONNECTED LOAD			**DEMAND LOAD**

MAIN DISTRIBUTION PANEL MDP
120/208V, 3PH,4W+G, 800A/3P MAIN

POSITION	CIRCUIT BREAKER		EQUIPMENT		CONNECTED LOAD (KVA)	DEMAND LOAD (KVA)	FEEDER SIZE (COPPER) (SEE RISER FOR AL)
	FRAME	TRIP					
1	200A/3P	200 A	PP-GT		58.3	46.7	2"C, 4#3/0 + 1#6G
2	200A/3P	200 A	RP-1A		48.5	40.4	2"C, 4#3/0 + 1#6G
3	200A/3P	200 A	RP-1B		42.0	32.6	2"C, 4#3/0 + 1#6G
4	200A/3P	200 A	RP-1C		52.2	44.1	2"C, 4#3/0 + 1#6G
5	200A/3P	200 A	RP-2A		32.8	27.2	2"C, 4#3/0 + 1#6G
6	30A/3P	20 A	ERV-1	14.8 MCA	4.5	3.6	3/4"C, 3#12 + 1#12G
8	30A/3P	30 A	EF-1	2.0 HP	2.8	2.2	3/4"C, 3#10 + 1#10G
9	30A/2P	15 A	ACCU-1	13.0 MCA	2.3	1.8	3/4"C, 3#12 + 1#12G
10	60A/3P		SPARE				
10	30A/3P	25 A	DU-1	6.0KW	6.0	4.8	3/4"C, 3#10 + 1#10G
11	30A/3P	20 A	ECUH-1	5.0KW	5.0	4.0	3/4"C, 3#12 + 1#12G
12	30A/3P	20 A	ECUH-2	5.0KW	5.0	4.0	3/4"C, 3#12 + 1#12G
13	30A/3P		SPARE				
14	60A/3P		SPARE				
15	30A/3P		SPARE				
16	3P		SPACE				
17	3P		SPACE				
18	3P		SPACE				
			TOTAL DEMAND LOAD:		260 KVA	212 KVA	
					721 A	588 A	

PROJECT: **HIGHLAND TWP FS-1** | **200A** | **MLO** | CLASS: **120/208V,3PH,4W+G.** | PANEL:
PROJ NO: **75810** | DATE: **06/04/20** | MOUNTING: **SURF.** | **RP-2A**

BRANCH CIRC.			WATTS			CODE			REMARKS
NO.	POLES	BKR.	BUS A	BUS B	BUS C	L	R	E	
1	1	20	350			L			LIGHTING
3	1	20		300		L			LIGHTING
5	1	20							SPARE
7	1	20							SPARE
9	1	20							SPARE
11	1	20							SPARE
13	1	20	540				R		3 REC.
15	1	20		540			R		3 REC.
17	1	20			540		R		3 REC.
19	1	20							SPARE
21	**1**	**20**							SPARE
23	1	20			1200			E	B-1
25									SHUNT TRIP
27	1	20		400				E	1 REC.
29	1	20			400			E	1 REC.
31	1	20	400					E	1 REC.
33	1	20		1200				E	DOOR OPERATOR
35	1	20			1200			E	DOOR OPERATOR
37	1	20	1200					E	DOOR OPERATOR
39	1	20		1200				E	DOOR OPERATOR
41	1	20			800			E	DOOR OPERATOR
43	1	20	400					E	CEILING J-BOX
45	1	20		400				E	CEILING J-BOX
47	1	20							SPARE
49	1	20							SPARE
51	1	20							SPARE
53	1	20							SPARE
55	1	20							SPARE
57	1	20							SPARE
59	1	20							SPARE
61	1								SPACE
63	1								SPACE
65	1								SPACE
67	1								SPACE
69	1								SPACE
71	1								SPACE
73	2		400					E	
75				400				E	CEILING J-BOX
77		30			400			E	
79	2		400					E	
81				400				E	CEILING J-BOX
83		30			400			E	
2	1	20	720				R		4 REC.
4	1	20		360			R		2 REC.
6	1	20			540		R		3 REC.
8	1	20	600				R		DEDICATED CKT
10	1	20		800				E	EWC
12	1	20			540		R		3 REC.
14	1	20	1680					E	ENGINE EXHAUST
16	1	20		1680				E	ENGINE EXHAUST
18	1	20			1680			E	ENGINE EXHAUST
20	1	20	1680					E	ENGINE EXHAUST
22	1	20		1680				E	ENGINE EXHAUST
24	1	20			1680			E	ENGINE EXHAUST
26	1	20	1680					E	ENGINE EXHAUST
28	1	20		1680				E	ENGINE EXHAUST
30	1	20			576			E	IRH-1
32	1	20	576					E	IRH-2
34	1	20		576				E	IRH-9
36	1	20			576			E	IRH-10
38	1	20							SPARE
40	1	20							SPARE
42	1	20							SPARE
44	1	20							SPARE
46	1	20							SPARE
48	1	20							SPARE
50	1	20							SPARE
52	1	20							SPARE
54	1	20							SPARE
56	1	20							SPARE
58	1	20							SPARE
60	1	20							SPARE
62	1	20							SPARE
64	1	20							SPARE
66	1	20							SPARE
68	1	20							SPARE
70	1	20							SPARE
72	1	20							SPARE
74	1								SPACE
76	1								SPACE
78	1								SPACE
80	1								SPACE
82	1								SPACE
84	1								SPACE

	BUS A	BUS B	BUS C				
LIGHTING LOAD	350	300		650 VA	NEC 220.42	=	650 VA
RECEPTACLE LOAD	1,860	900	1,620	4380 VA	NEC 220.44	=	4380 VA
EQUIPMENT LOAD	8,416	10,416	8,912	27744 VA	80%	=	22195 VA
						=	
TOTAL LOAD	10,626	11,616	10,532	32774 VA		=	27225 VA
				91 A			76 A
				CONNECTED LOAD			**DEMAND LOAD**

PROJECT: **HIGHLAND TWP FS-1** | **200A** | **MLO** | CLASS: **208/120V,3PH,4W+G.** | PANEL:
PROJ NO: **75810** | DATE: **06/04/20** | MOUNTING: **SURFACE** | **RP-1C**

BRANCH CIRC.			VA			CODE			REMARKS
NO.	POLES	BKR.	BUS A	BUS B	BUS C	L	R	E	
1	1	20	700			L			LIGHTING
3	1	20		784		L			LIGHTING
5	1	20			700	L			LIGHTING
7	1	20	1320					E	F-1
9	1	20		560		L			LIGHTING VIA RLP
11	1	20			380	L			LIGHTING
13	1	20	200					E	FAN
15	1	20		1200		L			SIGN
17	1	20			1200	L			SIGN
19	1	20							SPARE
21	1	20		400				E	EF-3
23	1	**30**			1680			E	EF-4
25	1	20	1000					E	O.H. DOOR
27	1	20		1000				E	O.H. DOOR
29	1	20			1000			E	O.H. DOOR
31	1	20	1000					E	O.H. DOOR
33	1	20		540			R		3 REC.
35	1	20			400			E	CELING J-BOX
37	1	20	400					E	CELING J-BOX
39	1	20		540			R		3 REC.
41	1	20			360		R		2 REC.
43	1	20	400					E	CELING J-BOX
45	1	20		400				E	CELING J-BOX
47	1	20			360		R		2 REC.
49	1	20	576					E	IRH-3
51	1	20		576				E	IRH-4
53	1	20			576			E	IRH-5
55	1	20	576					E	IRH-6
57	1	20		600			R		2 REC.
59	1	20			600			E	DOOR OPENER
61	1	20	360				R		2 REC.
63	1	20		540			R		3 REC.
65	1	20			360		R		2 REC.
67	1	20	576					E	IRH-7
69	1	20		576				E	IRH-8
71	1	20							SPARE
73	2		960					E	
75				960				E	EXTRACTOR 8.0 A
77		15			960			E	
79	1								SPACE
81	1								SPACE
83	1								SPACE
2	1	20	720				R		4 REC.
4	1	20		360			R		2 REC.
6	1	20			400		R		2 M43WP REC.
8	2		400					E	
10				400				E	CEILING J-BOX
12		30			400			E	
14	2		400					E	
16				400				E	CEILING J-BOX
18		30			400			E	
20	2		2500					E	DRYER
22		30		2500				E	
24	2				2500			E	DRYER
26		30	2500					E	
28	1								SPACE
30	1								SPACE
32	2		400					E	
34				400				E	CEILING J-BOX
36		30			400			E	
38	2		400					E	
40				400				E	CEILING J-BOX
42		30			400			E	
44	1	20							SPARE
46	1	20		1200				E	WASHER GFCI
48	1	20			1200			E	WASHER GFCI
50	1	20	720				R		4 REC.
52	1	20		540			R		3 REC.
54	1	20			540		R		3 REC.
56	1	20	900				R		5 REC.
58	1	20		360			R		2 REC.
60	1	20			540		R		3 REC.
62	1	20	540				R		3 REC.
64	1	20		540			R		3 REC.
66	1	20			540		R		3 REC.
68	1	20	360				R		2 REC.
70	1	20		200				E	CO/NO2 SENSOR
72	1	20			360			E	EF-2
74	1	20	400					E	FS/TS AND /AV
76	1	20							SPARE
78	1	20							SPARE
80	1	20							SPARE
82	1	20							SPARE
84	1	20							SPARE

	BUS A	BUS B	BUS C				
LIGHTING LOAD 20	700	2,544	2,280	5524 VA	NEC 220.42		3883 VA
REC. LOAD	3,600	4,020	3,100	10720 VA	NEC 220.44	=	10360 VA
EQUIPMENT	14,008	9,412	10,876	34296 VA	80%		27437 VA
TOTAL LOAD	18,308	15,976	16,256	50540 VA		=	41680 VA
				140 A			116 A
				CONNECTED LOAD			**DEMAND LOAD**

PROJECT: **HIGHLAND TWP FS-1** | **200A** | **MLO** | CLASS: **208/120V,3PH,4W+G.** | PANEL:
PROJ NO: **75810** | DATE: **06/04/20** | MOUNTING: **SURFACE** | **RP-1B**

BRANCH CIRC.			VA			CODE			REMARKS
NO.	POLES	BKR.	BUS A	BUS B	BUS C	L	R	E	
1	1	20	600			L			LIGHTING
3	1	20		679		L			LIGHTING
5	1	20			485	L			LIGHTING VIA RLP
7	1	20	500			L			LIGHTING VIA RLP
9	1	20							SPARE
11	1	20							SPARE
13	1	20	400			L			TRAFFIC LIGHTS
15	1	20							SPARE
17	1	20			1200	L			REC. FOR SIGN VIA RLP
19	1	20	720				R		5 REC.
21	1	20		540			R		3 REC.
23	1	20			1080		R		6 REC.
25	1	20	1200					E	DOOR OPERATOR
27	1	20		1200				E	DOOR OPERATOR
29	1	20			720		R		4 REC.
31	1	20	540				R		3 REC.
33	1	20		900			R		5 REC.
35	1	20			720		R		4 REC.
37	1	20	900				R		5 REC.
39	1	20		540			R		5 REC.
41	1	20			720		R		4 REC.
43	1	20	540				R		3 REC.
45	1	20		1080			R		6 REC.
47	1	20			540		R		3 REC.
49	1	20	540				R		3 REC.
51	1	20		540			R		3 REC.
53	1	20			1080		R		4 REC.
55	1	20	100					E	STF-1
57	1	20		400				E	PA SYSTEM
59	1	20			400			E	RADIO SYSTEM
61	1	20							SPARE
63	1	20							SPARE
65	1	20							SPARE
67	1								SPACE
69	1								SPACE
71	1								SPACE
73	1								SPACE
75	1								SPACE
77	1								SPACE
79	1								SPACE
81	1								SPACE
83	1								SPACE
2	1	20	900				R		5 REC.
4	1	20		400			R		2 REC.
6	1	20			1000			E	PROJECTOR
8	1	20	720				R		4 REC.
10	1	20		1080			R		6 REC.
12	1	20			1080		R		6 REC.
14	1	20	900				R		5 REC.
16	1	20		540			R		3 REC.
18	1	20			900		R		5 REC.
20	1	20	1000					E	COFFEE
22	1	20		1000				E	COFFEE
24	1	20			720		R		4 REC.
26	1	20	540				R		3 REC.
28	1	20		1000				E	TBB
30	1	20			1000			E	TBB
32	1	20	400				R		2 REC.
34	1	20		800			R		2 REC.
36	1	20			900			E	EWC
38	1	20	600					E	EQUIPMENT
40	1	20		900				E	EQUIPMENT
42	1	20			800			E	REF.
44	1	20	600					E	EQUIPMENT
46	1	20		900				E	EQUIPMENT
48	2				1125			E	EBB-1
50		20	1125					E	
52	2			1125				E	EBB-1
54		20			1125			E	
56	1	20							SPARE
58	1	20							SPARE
60	1	20							SPARE
62	1	20							SPARE
64	1	20							SPARE
66	1	20							SPARE
68	1	20							SPARE
70	1	20							SPARE
72	1	20							SPARE
74	1								SPACE
76	1								SPACE
78	1								SPACE
80	1								SPACE
82	1								SPACE
84	1								SPACE

	BUS A	BUS B	BUS C				
LIGHTING LOAD	1,500	679	1,685	3864 VA	NEC 220.42		3302 VA
REC. LOAD	6,700	6,420	7,560	20680 VA	NEC 220.44	=	15340 VA
EQUIPMENT	4,625	6,525	6,350	17500 VA	80%		14000 VA
TOTAL LOAD	12,825	13,624	15,595	42044 VA		=	32642 VA
				117 A			91 A
				CONNECTED LOAD			**DEMAND LOAD**

PROJECT: **HIGHLAND TWP FS-1** | **200A** | **MLO** | CLASS: **208/120V,3PH,4W+G.** | PANEL:
PROJ NO: **75810** | DATE: **06/04/20** | MOUNTING: **SURFACE** | **RP-1A**

BRANCH CIRC.			VA			CODE			REMARKS
NO.	POLES	BKR.	BUS A	BUS B	BUS C	L	R	E	
1	1	20	374			L			LIGHTING VIA RLP
3	1	20		457		L			LIGHTING
5	1	20			553	L			LIGHTING
7	1	20	225			L			EXTERIOR LIGHTING
9	2			270		L			EXTERIOR LIGHTING VIA RLP
11		20			270	L			EXTERIOR LIGHTING VIA RLP
13	1	20	195			L			EXTERIOR LIGHTING VIA RLP
15	1	20		200			R		REC.
17	1	20			400			E	DEDIC. REC.
19	1	20	1200					E	2 REC.
21	1	20		900				E	MW
23	1	20			1000			E	REC.
25	1	20	1200					E	OVEN TOAST
27	1	20		720			R		4 REC.
29	1	20			720		R		4 REC.
31	1	20	360				R		2 REC.
33	1	20		720			R		4 REC.
35	1	20			100			E	GWH-1
37	1	20	720				R		4 REC.
39	1	20		600			R		2 REC.
41	1	20			900			E	WASHER GFCI
43	2		2500					E	DRYER
45		30		2500				E	
47	1	20			900			E	REFR. GFCI
49	1	20	900					E	REFR. GFCI
51	1	20		1000				E	REC.
53	1	20			1200			E	GD
55	1	20	400					E	FACP
57	1	20		400				E	DEDIC. REC.
59	1	20			400			E	DEDIC. REC.
61	1	20	400					E	DEDIC. REC.
63	1	20							SPARE
65	1	20							SPARE
67	1	20	1200			L			SITE SIGN VIA RLP
69	1	20							SPARE
71	1	20							SPARE
73	1								SPACE
75	1								SPACE
77	1								SPACE
79	1								SPACE
81	1								SPACE
83	1								SPACE
2	1	20	540				R		3 REC.
4	1	20		540			R		3 REC.
6	1	20			540		R		3 REC.
8	1	20	540				R		3 REC.
10	1	20		540			R		3 REC.
12	1	20			540		R		3 REC.
14	1	20	540				R		3 REC.
16	1	20		720			R		4 REC.
18	1	20			600		R		REC.
20	1	20	720				R		4 REC.
22	1	20		600			R		REC.
24	1	20			360		R		2 REC.
26	1	20	540				R		3 REC.
28	1	20							SPARE
30	1	20			600		R		REC.
32	1	20	400				R		REC.
34	1	20		600				E	HOOD
36	1	20							SPARE
38	3		1000					E	
40				1000				E	ECUH-1
42		20			1000			E	
44	1	20	360				R		2. REC.
46	1	20							SPARE
48	1	20							SPARE
50	1	20							SPARE
52	1	20							SPARE
54	1	20							SPARE
56	1	**30**	1656					E	P-1 3/4 HP
58	1	**30**		1656				E	P-2 3/4 HP
60	1	20							SPARE
62	1	20							SPARE
64	1								SPACE
66	1								SPACE
68	3		2667					E	
70				2667				E	RANGE
72		50			2667			E	
74	2		520					E	CP-1
76		20		520				E	
78	1								SPACE
80	1								SPACE
82	1								SPACE
84	1								SPACE

	BUS A	BUS B	BUS C				
LIGHTING LOAD	1,994	727	823	3544 VA	NEC 220.42		3190 VA
REC. LOAD	4,720	4,640	3,360	12720 VA	NEC 220.44	=	11360 VA
EQUIPMENT	12,443	11,243	8,567	32252 VA	80%		25802 VA
TOTAL LOAD	19,157	16,610	12,750	48516 VA		=	40352 VA
				135 A			112 A
				CONNECTED LOAD			**DEMAND LOAD**

STATE OF MICHIGAN
SALIM M. SESSINE
ENGINEER
No. 34939
LICENSED PROFESSIONAL ENGINEER

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KEY PLAN

OWNER
Highland Township
Fire Department

PROJECT NAME
Highland Township
Fire Station No. 1

1600 W. Highland Rd.
Highland, MI 48357

PROJECT NO.
18-122A

ISSUES / REVISIONS

SCHEMATIC DESIGN	01-28-2020
BIDDING-CONSTRUCTION	03-27-2020
CONSTRUCTION	05-04-2020
CCD #1	06-03-2020

DRAWN BY
NH

CHECKED BY
EK

APPROVED BY
EK

SHEET NAME
ELECTRICAL PANEL SCHEDULES

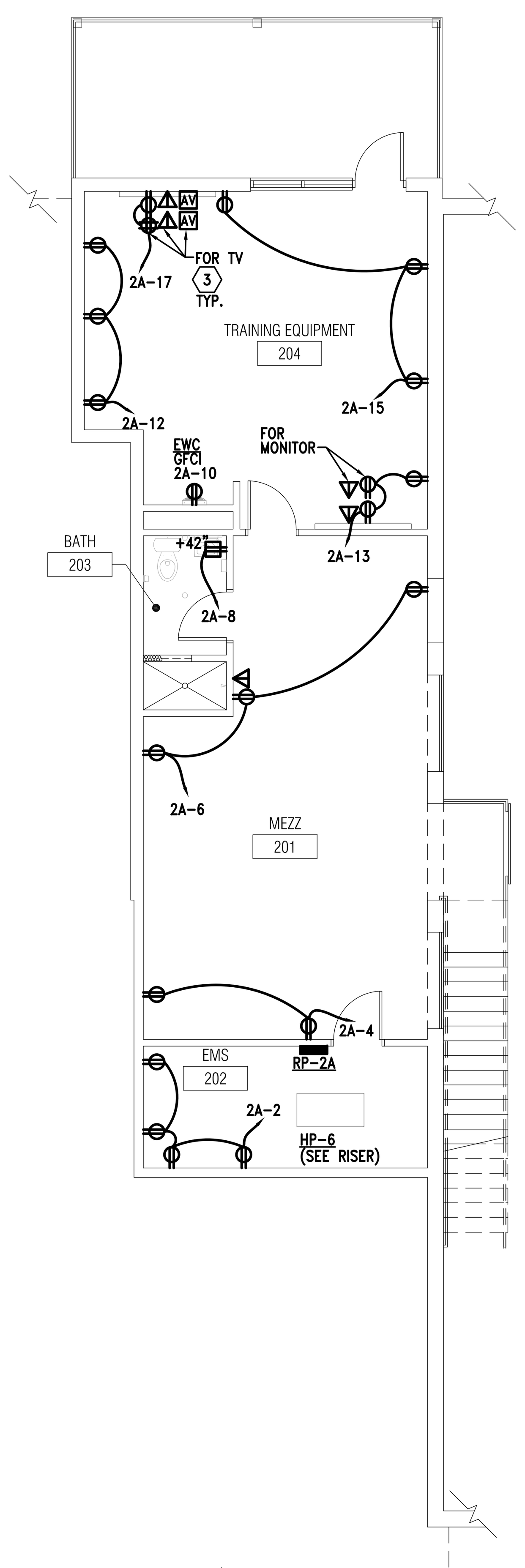
SHEET NO.
E0-04

KEYED POWER NOTES:

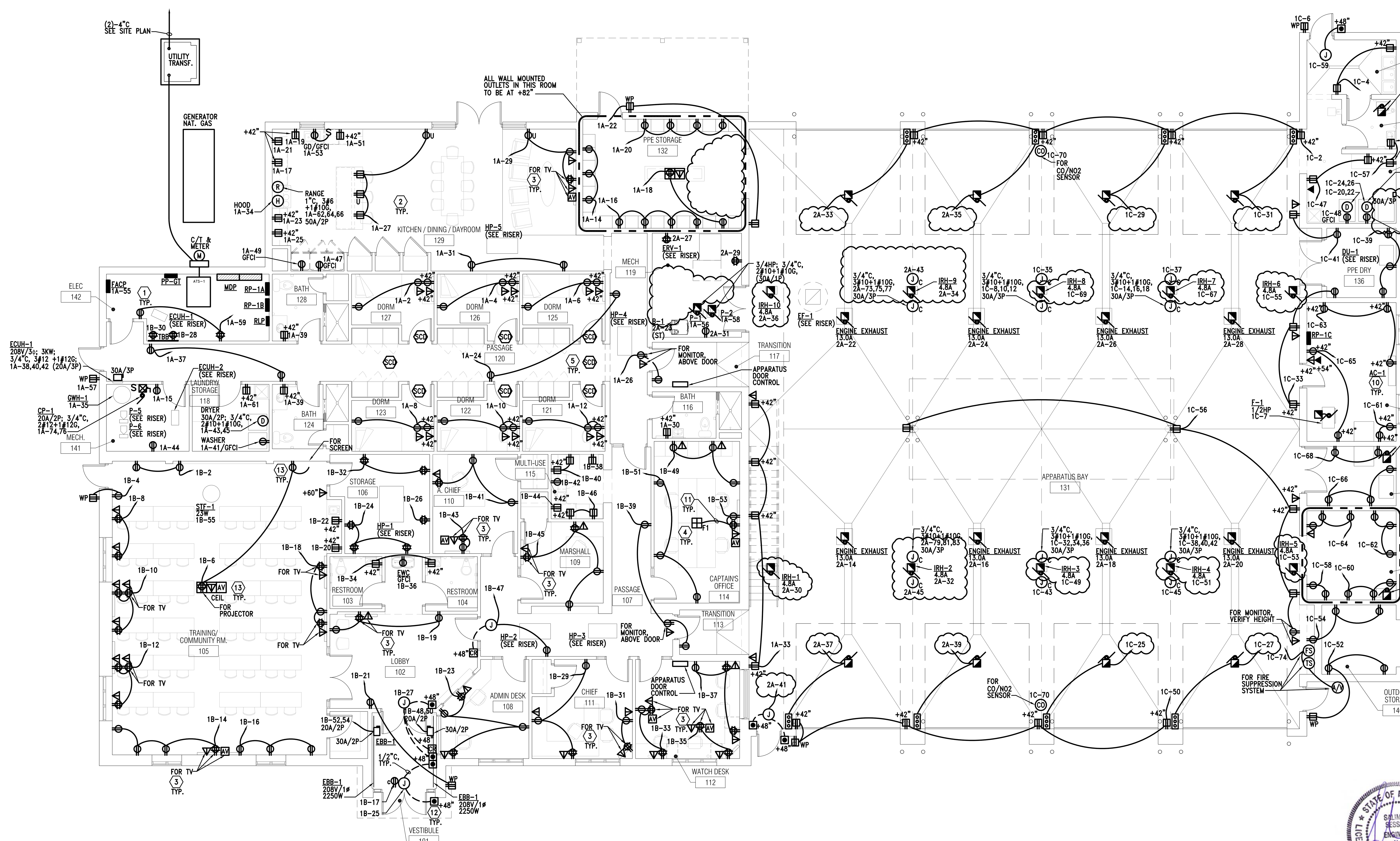
1. EXACT LOCATION AND REQUIREMENTS FOR EQUIPMENT TO BE COORDINATED WITH EQUIPMENT VENDOR, APPROVED SUBMITTALS AND NAMEPLATE DATA. INFORMATION INDICATED ON THESE PLANS IS FOR REFERENCE ONLY.
2. ALL RECEPTACLES LOCATED WITHIN 6'-0" OF A WATER SOURCE AND ALL IN THE KITCHENS SHALL BE GFR TYPE. PROVIDE GFR RECEPTACLES REGARDLESS OF SYMBOL USED ON PLAN FOR THESE LOCATIONS. FOR LOCATIONS THAT ARE NOT ACCESSIBLE, LOCATE BLANK PLATE GFR ABOVE THE RECEPTACLE AT +44"AFF OR NEAR ROOM WALL SWITCH(ES) OR PROVIDE GFCI BRANCH BREAKERS IN PANELBOARDS AS DIRECTED BY OWNER TO COMPLY WITH NEC 210.8.
3. DUPLEX RECEPTACLES AND DATA OUTLETS FOR FLAT SCREEN TV SHALL BE MOUNTED AT 5'-0"AFF UNLESS OTHERWISE NOTED, COORDINATE WITH ARCHITECT/OWNER FOR EXACT QUANTITIES, LOCATIONS AND MOUNTING HEIGHTS.
4. EXACT LOCATIONS FOR ALL FLOOR OUTLETS TO BE COORDINATED WITH ARCHITECT/OWNER.
5. PROVIDE (2)-20A/1P, 120V DEDICATED BRANCH CIRCUITS FOR ALL FIRE/SMOKE DAMPERS, WIRE TO RP-1A-** REFER TO PANEL SCHEDULES, COORDINATE AND REFER TO MECHANICAL DRAWINGS FOR EXACT LOCATIONS AND QUANTITIES. NOT ALL FIRE/SMOKE DAMPERS ARE INDICATED ON THESE PLANS.
6. COORDINATE WITH MECHANICAL FOR EXACT REQUIREMENTS FOR FIRE PROTECTION SYSTEM, INCLUDING NUMBER OF FLOW/TAMPER SWITCHES.
7. PROVIDE POWER FOR DRY PIPE SYSTEM COMPRESSOR, COORDINATE EXACT LOCATION AND REQUIREMENTS WITH FIRE SUPPRESSION CONTRACTOR. LOCATION INDICATED ON PLAN IS FOR REFERENCE ONLY.
8. EXACT LOCATIONS FOR FIRE ALARM CONTROL AND ANNUNCIATOR PANELS AND SECURITY SYSTEM PANELS TO BE COORDINATED WITH ARCHITECT/OWNER. PROVIDE FLUSH MOUNTING FOR ALL, UNLESS LOCATED IN UNFINISHED SPACES.
9. EXACT LOCATIONS FOR ALL ELECTRICAL EQUIPMENT TO BE COORDINATED, REFER TO GENERAL NOTE-F.
10. INDOOR AC UNIT IS FED FROM THE OUTDOOR ACCU UNIT, COORDINATE WITH MECHANICAL FOR COMPLETE INSTALLATION REQUIREMENTS, INCLUDING INTERWIRING OF THE UNIT.
11. RUN 1 1/4"C FROM LOW VOLTAGE COMPARTMENT BETWEEN FLOOR BOX AND MONITOR BOX, RUN CONCEALED IN CEILING AND WALL. COORDINATE WORK WITH SUITE BELOW.
12. PROVIDE DOUBLE GANG J-BOX WITH SINGLE MUD RING @48" AFF FOR CARD READER AND DOOR PUSH BUTTON, RUN 1/2"C FROM CARD READER/PUSH BUTTON TO DOOR OPERATOR OR STRIKE ACTUATOR FOR LOW VOLTAGE WIRING. PROVIDE 120V POWER IN THE CEILING FOR DOOR OPERATOR OR STRIKE AS INDICATED, FOR MORE DETAILS REFER TO SHEET E5-01. ALSO PROVIDE REQUIRED WIRING FOR INTERCOM REMOTE UNLOCK SYSTEM COORDINATE WITH DOOR INSTALLER.
13. PROVIDE POWER, DATA/AV AND CONTROLS FOR PROJECTOR AND PROJECTION SCREEN. EXACT LOCATIONS AND REQUIREMENTS TO BE COORDINATED WITH ARCHITECT/OWNER.

GENERAL POWER NOTES:

A. REFER TO SHEET E.001 FOR ELECTRICAL LEGEND.
B. PROVIDE COMPLETE ADDRESSABLE FIRE ALARM SYSTEM FOR THE BUILDING. FIRE ALARM SYSTEM SHALL INCLUDE ALL CONTROL, MONITORING, POWER SUPPLIES, INITIATING DEVICES, INDICATING APPLIANCES, CONTROL MODULES AND WIRING AS REQUIRED BY AUTHORITIES HAVING JURISDICTION FOR AN APPROVED INSTALLATION, REFER TO SPECIFICATIONS. SYSTEM SHALL BE LAYED OUT ON A PERFORMANCE BASIS, DEVICES INDICATED ON PLANS ARE FOR REFERENCE ONLY.
C. PROVIDE FIRE STOPPING SYSTEM WHERE REQUIRED TO MAINTAIN THE FIRE RESISTANCE RATING OF THE ASSEMBLIES.
D. EXACT LOCATIONS AND REQUIREMENTS FOR ALL EQUIPMENT SHALL BE VERIFIED WITH ARCHITECT/OWNER AND EQUIPMENT SUPPLIER PRIOR TO INSTALLATION.
E. COORDINATE EXACT LOCATIONS, MOUNTING HEIGHTS & REQUIREMENTS FOR ALL DEVICES WITH LATEST ARCHITECTURAL FURNITURE & EQUIPMENT LAYOUTS & ELEVATIONS.
F. COORDINATE EXACT LOCATIONS FOR ALL ELECTRICAL EQUIPMENT, PANELBOARDS, DISCONNECTS, STARTERS, CONTROL PANELS, ETC. WITH ARCHITECTURAL PLANS AND ALL OTHER TRADES INCLUDING MECHANICAL TO MAINTAIN REQUIRED WORKING CLEARANCES AND DEDICATED EQUIPMENT SPACE. DETERMINE EXACT LOCATIONS AND VERIFY WITH ALL OTHER TRADES PRIOR TO BEGINNING OF CONSTRUCTION TO AVOID INTERFERENCES WITH MECHANICAL, STRUCTURAL, ETC.
G. MAINTAIN A MINUMUM OF 24" HORIZONTAL SEPARATION BETWEEN BOXES INSTALLED ON OPPOSITE SIDES OF FIRE RATED WALLS TO COMPLY WITH NEC 300.21.
H. ALL WIRING DEVICES SHALL BE OF TAMPER RESISTANT CONSTRUCTION AND WITH AFCI PROTECTION.
I. ALL DEVICES AT COUNTER LOCATIONS TO BE MOUNTED ABOVE THE COUNTER AT +42"AFF OR AS NOTED ON THESE PLANS. COORDINATE WITH ARCHITECT/OWNER AND MILLWORK CONTRACTOR FOR EXACT LOCATIONS.
J. LOCATE DISCONNECT SWITCHES FOR MECHANICAL AND BUILDING EQUIPMENT TO MAINTAIN WORKING CLEARANCES. LOCATIONS ON THESE PLANS ARE FOR REFERENCE ONLY.
K. GROUND FAULT PROTECTION FOR DEVICES INSTALLED AT LOCATIONS NOT READILY ACCESSIBLE, PROVIDE GROUND FAULT BLANK FACE DEVICE AT ACCESSIBLE LOCATION OR PROVIDE GFCI BRANCH BREAKER IN PANELBOARD.
L. ALL ROOF MOUNTED EQUIPMENT TO BE NEMA 3R WEATHERPROOF RATED, INCLUDING STARTERS, DISCONNECTS, ETC.



2 Mezzanine Level Floor Plan - Power
1/8" = 1'-0"



1 Main Level Floor Plan - Power
1/8" = 1'-0"

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KEY PLAN

OWNER
Highland Township Fire Department

PROJECT NAME
Highland Township Fire Station No. 1

1600 W. Highland Rd.
Highland, MI 48357

PROJECT NO.
18-122A

ISSUES / REVISIONS

SCHEMATIC DESIGN	01-28-2020
BIDDING-CONSTRUCTION	03-27-2020
ADDENDUM # 1	04-20-2020
CONSTRUCTION	05-04-2020
CCD #1	06-03-2020

DRAWN BY
NH

CHECKED BY
EK

APPROVED BY
EK

SHEET NAME
FLOOR PLANS - POWER

SHEET NO.
E3-00