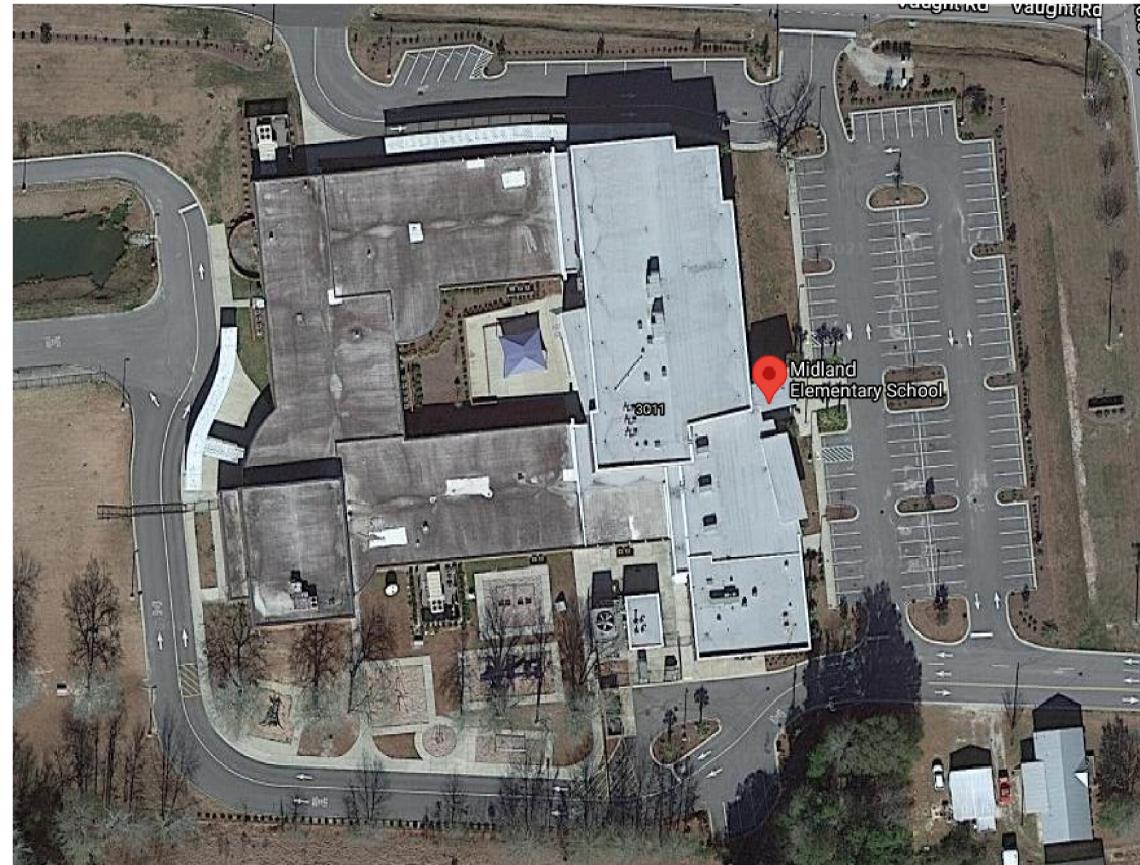


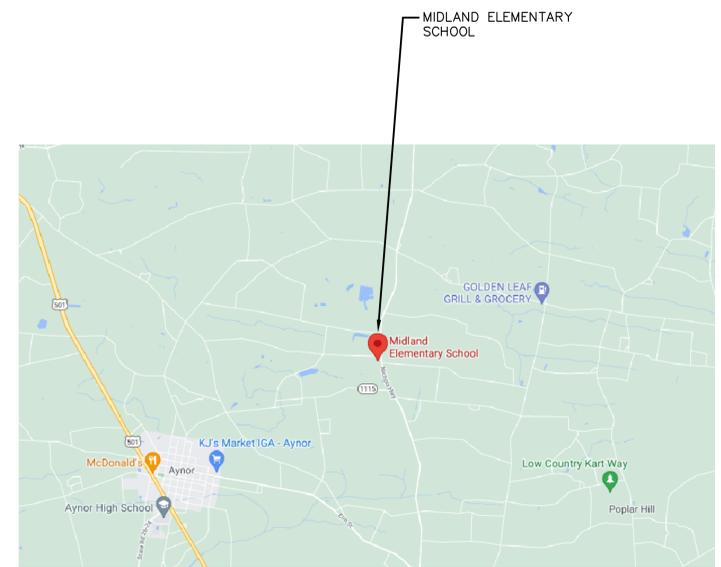
MIDLAND ELEMENTARY HVAC RENEWAL HORRY COUNTY SCHOOLS GALIVANTS FERRY, SOUTH CAROLINA



SITE PLAN
N.T.S.

SHEET LIST

- CS-1 COVER SHEET
- MECHANICAL PLANS**
 - M1.0 MECHANICAL FLOOR PLAN UNIT B
 - M1.1 MECHANICAL FLOOR PLAN UNIT C
 - M1.2 MECHANICAL FLOOR PLAN ALT #1 - LP GAS PLAN
 - M2.0 MECHANICAL DETAILS AND SCHEDULES
 - M2.1 MECHANICAL SEISMIC DETAILS
 - M3.0 MECHANICAL COMCHECK
- ELECTRICAL PLANS**
 - E1.0 ELECTRICAL FLOOR PLAN - UNIT B
 - E1.1 ELECTRICAL FLOOR PLAN - UNIT C
 - E2.0 SYMBOLS AND SCHEDULES
 - E2.1 SPECIFICATIONS



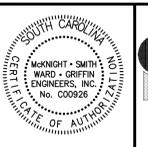
VICINITY MAP
N.T.S.

JOB NUMBER	21-098	REVISION DATES	REVISION DESCRIPTION
DRAWN BY	LMS		
CHECKED BY	JJC		
DATE	11/17/2021		

JOB TITLE
MIDLAND ELEMENTARY
3011 NICHOLS HWY
GALIVANTS FERRY, SC, 29544
HVAC RENEWAL

SHEET TITLE
COVER SHEET

SHEET
CS1.0
1 OF 1



**MCKNIGHT • SMITH
WARD • GRIFFIN
ENGINEERS, INCORPORATED**
4223 South Boulevard
Charlotte, NC 28209
704/527-2112



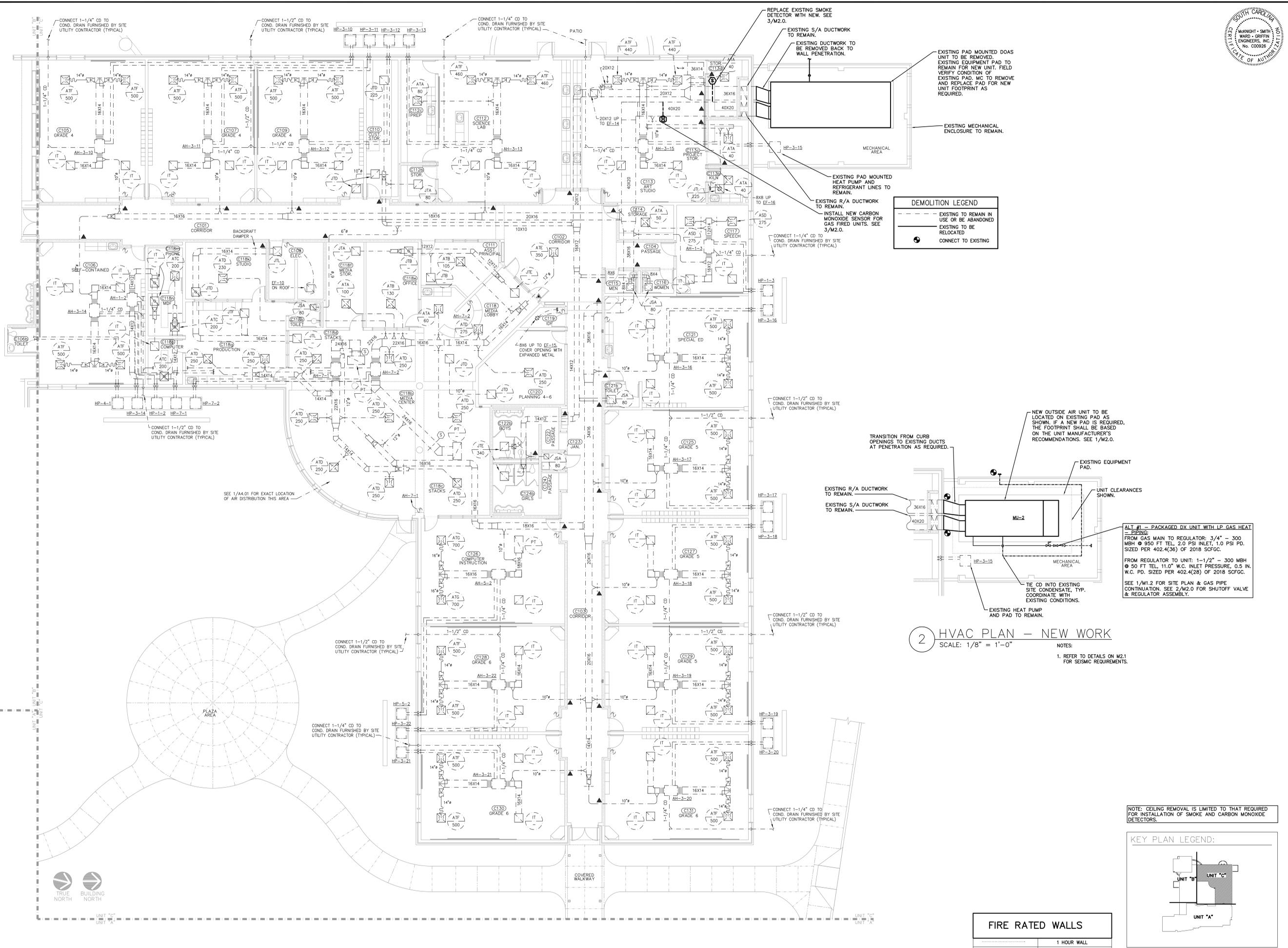
**MIDLAND ELEMENTARY
3011 NICHOLS HWY
GALIVANTS FERRY, SC, 29544
HVAC RENEWAL**

REVISION NUMBER	REVISION DESCRIPTION
21-098	US
	JOC
	DATE
	11/07/2021

**MIDLAND ELEMENTARY
3011 NICHOLS HWY
GALIVANTS FERRY, SC, 29544
HVAC RENEWAL**

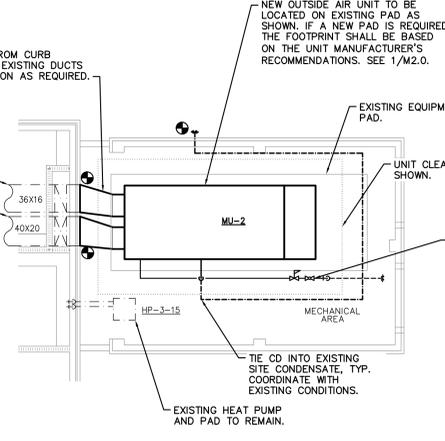
**MECHANICAL FLOOR PLAN
UNIT C**

SHEET
M1.1
2 OF 6



DEMOLITION LEGEND

(---)	EXISTING TO REMAIN IN USE OR BE ABANDONED
(---)	EXISTING TO BE RELOCATED
(---)	CONNECT TO EXISTING

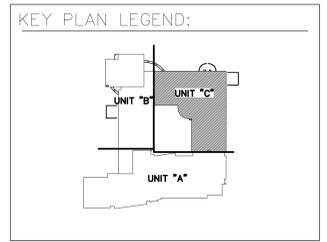


2 HVAC PLAN - NEW WORK
SCALE: 1/8" = 1'-0"

NOTES:
1. REFER TO DETAILS ON M2.1 FOR SEISMIC REQUIREMENTS.

ALT #1 - PACKAGED DX UNIT WITH LP GAS HEAT PIPING:
FROM GAS MAIN TO REGULATOR: 3/4" - 300 MGH @ 950 FT TEL, 2.0 PSI INLET, 1.0 PSI PD, SIZED PER 402.4(36) OF 2018 SCFGC.
FROM REGULATOR TO UNIT: 1-1/2" - 300 MGH @ 90 FT TEL, 11.0" W.C. INLET PRESSURE, 0.5 IN. W.C. PD. SIZED PER 402.4(28) OF 2018 SCFGC.
SEE 1/A1.2 FOR SITE PLAN & GAS PIPE CONTINUATION. SEE 2/M2.0 FOR SHUTOFF VALVE & REGULATOR ASSEMBLY.

NOTE: CEILING REMOVAL IS LIMITED TO THAT REQUIRED FOR INSTALLATION OF SMOKE AND CARBON MONOXIDE DETECTORS.



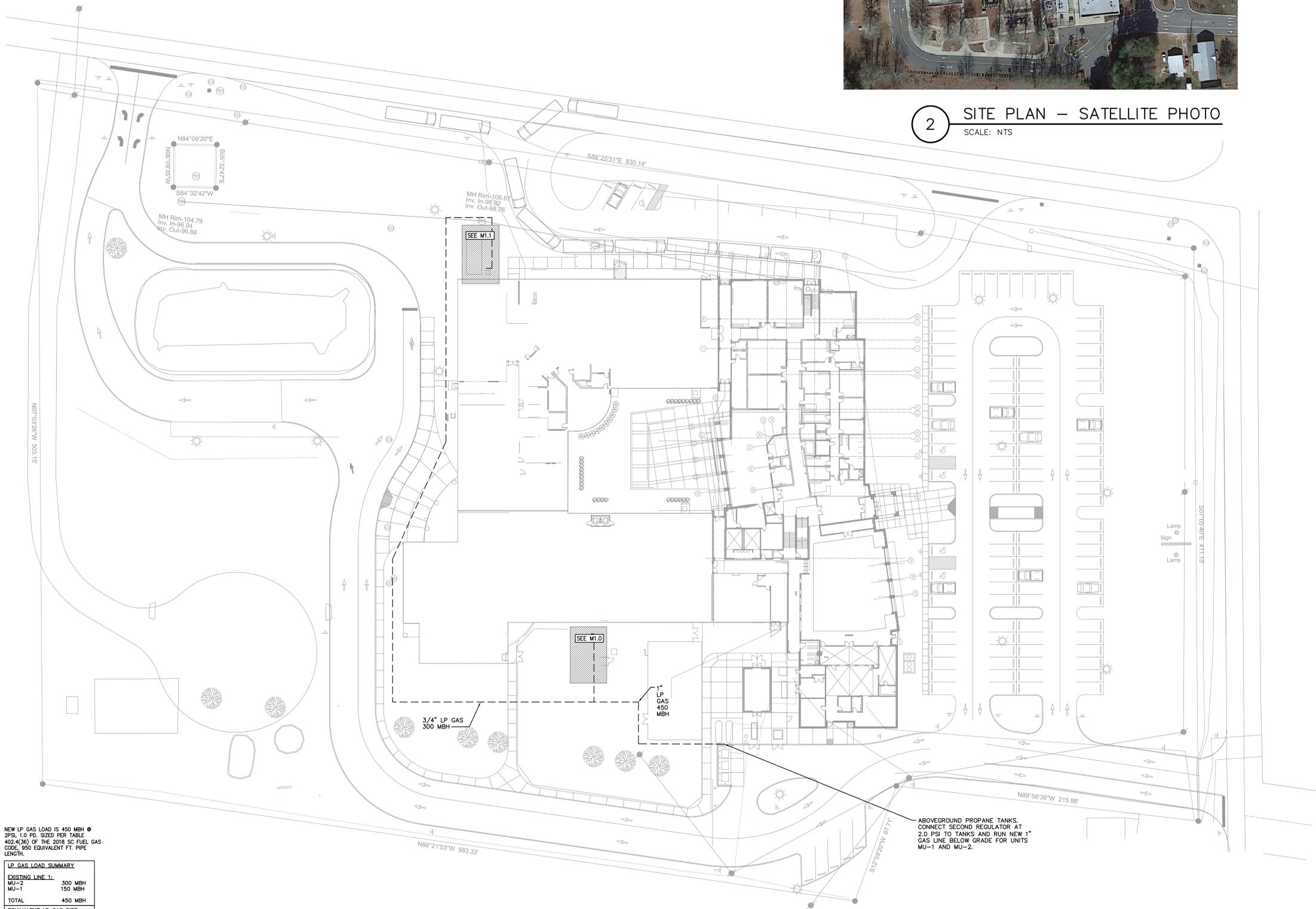
FIRE RATED WALLS

(---)	1 HOUR WALL
(---)	2 HOUR WALL
(---)	4 HOUR WALL

IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO APPLY THE PROPER FIRE-SAFING DETAIL FOR ALL DUCT AND PIPE PENETRATIONS THRU FIRE-RATED WALLS AND SMOKE PARTITIONS.

1 HVAC PLAN - UNIT C - DEMO
SCALE: 1/8" = 1'-0"

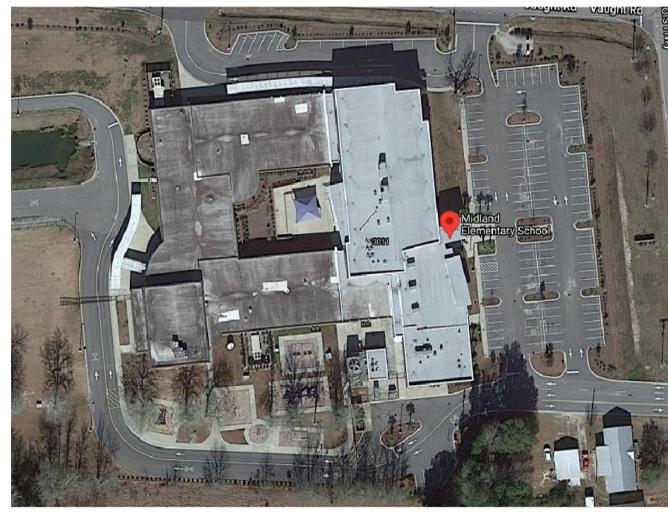




NEW LP GAS LOAD IS 450 MBH @ 2PSI, 1.0 PD. SIZED PER TABLE 402.4(36) OF THE 2018 SC FUEL GAS CODE, 950 EQUIVALENT FT. PIPE LENGTH.

LP GAS LOAD SUMMARY	
EXISTING LINE 1:	
MU-2	300 MBH
MU-1	150 MBH
TOTAL	450 MBH
EQUIVALENT LP GAS PIPE LENGTH TO UNIT	
MU-1	250 FT.
MU-2	950 FT.

1 SITE PLAN - LP GAS LAYOUT
SCALE: 1" = 30'-0"



2 SITE PLAN - SATELLITE PHOTO
SCALE: NTS



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Charlotte, NC 28209
704/527-2112



JOB NUMBER	REVISION DATES	REVISION DESCRIPTION
21-098	1/17/2021	1/17/2021
DESIGNED BY	DATE	
CHECKED BY	DATE	
DRAWN BY	DATE	

JOB TITLE
MIDLAND ELEMENTARY
3011 NICHOLS HWY
GALIVANTS FERRY, SC, 29544
HVAC RENEWAL

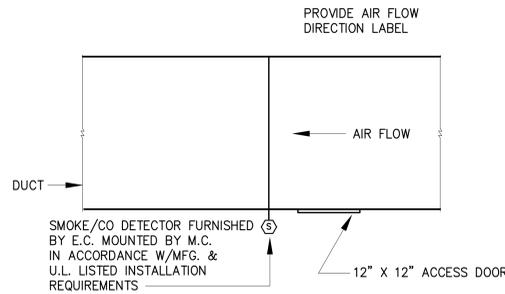
SHEET TITLE
MECHANICAL FLOOR PLAN
ALT #1 - LP GAS PLAN



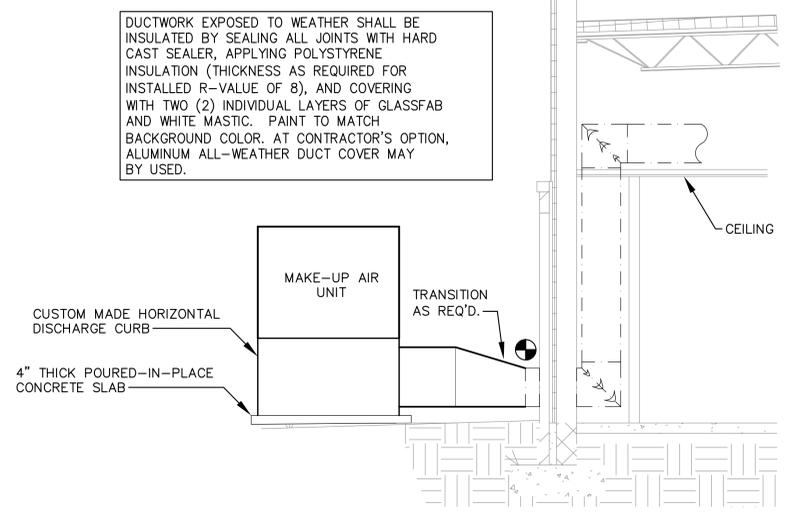
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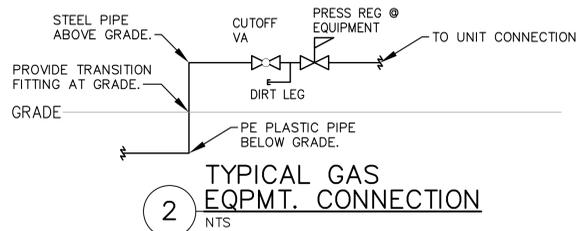
REVISION NUMBER	REVISION DESCRIPTION
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3	ISSUED FOR PERMIT
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49	ISSUED FOR PERMIT
50	ISSUED FOR PERMIT



3 SMOKE/CO DETECTOR MOUNTING DETAIL
SCALE: NTS
NOTE: M.C. TO WIRE FOR UNIT SHUTDOWN, E.C. TO WIRE TO FIRE ALARM SYSTEM.



1 GRADE LEVEL MAKE-UP AIR UNIT DETAIL
SCALE: NTS



2 TYPICAL GAS EQPMT. CONNECTION
NTS

MECHANICAL EQUIPMENT LEGEND		DESCRIPTION
SYMBOL	SINGLE LINE	DOUBLE LINE
LOW PRESSURE DUCTWORK		
10 x 12	10 x 12	DUCT SECTION - 1ST FIGURE WIDTH, 2ND DEPTH
[Symbol]	[Symbol]	SQUARE TO ROUND TRANS.
[Symbol]	[Symbol]	FLEX DUCTWORK
[Symbol]	[Symbol]	ELBOW W/TURNING VANES
[Symbol]	[Symbol]	LONG RADIUS ELBOW
EXH	[Symbol]	EXHAUST DUCT SECTION
SA	[Symbol]	SUPPLY DUCT SECTION
OA	[Symbol]	OUTSIDE AIR DUCT SECTION
RA	[Symbol]	RETURN/RELIEF AIR DUCT SECTION
TA	[Symbol]	TRANSFER AIR DUCT SECTION
N/A	[Symbol]	EXPOSED DUCT
[Symbol]	[Symbol]	SHORT RADIUS VANED ELBOW
[Symbol]	[Symbol]	CONICAL DUCT TAKE-OFF
[Symbol]	[Symbol]	RECTANGULAR-TO-ROUND TAKE-OFF WITH DAMPER
[Symbol]	[Symbol]	RECTANGULAR-TO-ROUND TAKE-OFF WITHOUT DAMPER
[Symbol]	[Symbol]	RECTANGULAR TAKE-OFF
[Symbol]	[Symbol]	LONG RADIUS TEE
[Symbol]	[Symbol]	TEE W/TURNING VANES
[Symbol]	[Symbol]	"Y" TAKE-OFF WITH SPLITTER DAMPER
[Symbol]	[Symbol]	FIRE DAMPER "A" OR "B"
[Symbol]	[Symbol]	COMBINATION FIRE/SMOKE DAMPER
[Symbol]	[Symbol]	VOLUME EXTRACTOR
MISCELLANEOUS		
[Symbol]	[Symbol]	THERMOSTAT
[Symbol]	[Symbol]	THERMOSTAT W/ABUSE PROOF COVER, CAST ALUMINUM
[Symbol]	[Symbol]	HUMIDISTAT
[Symbol]	[Symbol]	CARBON DIOXIDE SENSOR
[Symbol]	[Symbol]	SMOKE DAMPER
[Symbol]	[Symbol]	SMOKE DETECTOR
[Symbol]	[Symbol]	CONDENSATE DRAIN
[Symbol]	[Symbol]	BACKDRAFT DAMPER
[Symbol]	[Symbol]	MOTOR OPERATED DAMPER
[Symbol]	[Symbol]	DAMPER
[Symbol]	[Symbol]	MANUAL SWITCH
[Symbol]	[Symbol]	SUMMER/WINTER SWITCH
[Symbol]	[Symbol]	ABOVE FINISHED FLOOR
[Symbol]	[Symbol]	TIE INTO EXISTING AT THIS POINT
[Symbol]	[Symbol]	CAST IRON
[Symbol]	[Symbol]	UNLESS NOTED OTHERWISE

MECHANICAL SYSTEMS, SERVICE SYSTEMS AND EQUIPMENT METHOD OF COMPLIANCE	
Prescriptive	Energy Cost Budget
Thermal Zone:	Horry County (3A)
Exterior Design Conditions	
Winter Dry Bulb:	25
Summer Dry Bulb:	96
Interior Design Conditions	
Winter Dry Bulb:	70
Summer Dry Bulb:	75
Relative Humidity:	50%
Building Heating Load:	2559.5 MBH
Building Cooling Load:	1938 MBH
Mechanical Space Conditioning System	
Unitary:	
Description of Unit:	Packaged DOAS Heat Pump w/Energy Recovery
Heating Efficiency:	Refer to HVAC Equipment Schedules
Cooling Efficiency:	Refer to HVAC Equipment Schedules
Heat Output of Unit:	Refer to HVAC Equipment Schedules
Cooling Output of Unit:	Refer to HVAC Equipment Schedules
List Equipment Efficiencies:	
Equipment Schedules with Motors (Mechanical Systems)	
Motor Horsepower:	Comply w/ 2009 International Energy Code
Number of Phases:	Comply w/ 2009 International Energy Code
Minimum Efficiency:	Comply w/ 2009 International Energy Code
Motor Type:	Comply w/ 2009 International Energy Code
Number of Poles:	Comply w/ 2009 International Energy Code
Designer Statement:	
To the best of my knowledge and belief, the design of this building complies with the 2009 International Energy Conservation code.	

APPROVED MANUFACTURER LISTING	
THE FOLLOWING MANUFACTURER'S LISTING (ALPHABETICALLY ORDERED) IS PROVIDED FOR BIDDING PURPOSES AND DOES NOT IMPLY OR PROVIDE A GUARANTEE OF SUBMITTAL APPROVAL. ALL ITEMS SUBMITTED SHALL MEET OR EXCEED THE MINIMUM SPECIFIED DESIGN AND QUALITY CRITERIA IN THIS SET OF CONSTRUCTION DOCUMENTS. ANY BIDDER THAT INTENDS TO SUBMIT USING A MANUFACTURER NOT LISTED BELOW MAY REQUEST A PRIOR APPROVAL IN ACCORDANCE WITH THE ENTIRETY OF THE PROJECT BID DOCUMENTS, REFER TO THE ARCHITECT'S GENERAL CONDITIONS AND BIDDING REQUIREMENTS.	
THE BIDDER IS RESPONSIBLE FOR INCLUDING ALL COSTS ASSOCIATED WITH SUBSTITUTED EQUIPMENT, INCLUDING BUT NOT LIMITED TO, CODE AND MANUFACTURER'S REQUIRED MAINTENANCE AND ACCESS CLEARANCE, COORDINATION WITH ALL OTHER BUILDING TRADES, AND INSTALLATION OF DUCTWORK, PIPING, ETC. BIDDER SHALL BEAR RESPONSIBILITY FOR ALL ASSOCIATED COSTS AND ADDITIONAL COSTS RESULTING FROM SUBSTITUTED ITEMS SHALL NOT BE CONSIDERED FOR APPROVAL AFTER BIDS ARE AWARDED.	
ITEM	MANUFACTURER'S
100% OUTSIDE AIR MAKE-UP UNITS	TRANE, GREENHECK

BASE BID - PACKAGED ENERGY RECOVERY UNIT - ELECTRIC HEAT																																																				
Unit Tag	Area Served	EER	Supply Fan					Exhaust Fan					Condenser Fan					Cooling Performance					Electric Heating Performance					Compressor					Energy Recovery Wheel					Winter Performance					Electrical Data					Controls		Approx. Weight w/out Curb (lb.)	Model	Remarks
			Qty	CFM	ESP	HP	FLA Ea.	Qty	CFM	ESP	HP	FLA Ea.	Qty	HP	FLA Ea.	Gross Total MBH	Entering Coil (F) DB/WB	Leaving Coil (F) DB/WB	Leaving Reheat (F) DB/WB	Leaving Unit (F) DB (T3)	Gross Total KW	Entering Coil (F) DB	Leaving Coil (F) DB	Qty	RLA Ea.	LRA Ea.	Outside (F) DB/WB	Supply (F) DB/WB	Return (F) DB/WB	Exhaust (F) DB/WB	Total Cap. MBH	Sensible Cap. MBH	Outside (F) DB/WB	Supply (F) DB/WB	Return (F) DB/WB	Exhaust (F) DB/WB	Total Cap. MBH	Sensible Cap. MBH	ERV Wheel Size	Electrical HP	FLA	Volts	Phase	FLA	MCA	MOCP	FLA					
MU-1	UNIT B	15.1	2	4550	0.5	6	7	1	4042	0.5	6	7	3	1	2.1	303.2	83.6/72.0	51.3/51.1	81.7/62.93	84.4/63.9	150	120	8:1	50.4	74.7	2	18.6	125	91/79	83.7/72.0	78.0/65.0	85.4/73.1	129.23	37.48	25/21	50.4/41.1	72.0/55.0	44.9/37.9	170.47	129.58	ERC-4136C	0.17	0.44	460	3	65.9	78.3	80	1	4690	OAGD300	1-31
MU-2	UNIT C	14.9	2	6630	1.0	6	7	2	5958	0.5	6	7	3	1	2.1	382.2	82.1/70.3	52.3/52.0	79.6/62.58	82.1/63.5	32	56.2	71.4	2	26.9	173	91/79	82.1/70.4	78.0/65.0	87.1/74.8	229.82	66.86	25/21	56.2/45.1	72.0/55.0	38.6/33.2	303.52	234.34	ERC-5856C	0.5	1.5	460	3	90.6	97.3	110	1	4940	OAGD360	1-31		

ALTERNATE # 1 - PACKAGED ENERGY RECOVERY UNIT - GAS HEAT																																																				
Unit Tag	Area Served	EER	Supply Fan					Exhaust Fan					Condenser Fan					Cooling Performance					LP Gas Heating Performance					Compressor					Energy Recovery Wheel					Winter Performance					Electrical Data					Controls		Approx. Weight w/out Curb (lb.)	Model	Remarks
			Qty	CFM	ESP	HP	FLA Ea.	Qty	CFM	ESP	HP	FLA Ea.	Qty	HP	FLA Ea.	Gross Total MBH	Entering Coil (F) DB/WB	Leaving Coil (F) DB/WB	Leaving Reheat (F) DB/WB	Leaving Unit (F) DB (T3)	Input Total MBH	Output Total MBH	Min. Turndown	Entering Coil (F)	Leaving Coil (F)	Qty	RLA Ea.	LRA Ea.	Outside (F) DB/WB	Supply (F) DB/WB	Return (F) DB/WB	Exhaust (F) DB/WB	Total Cap. MBH	Sensible Cap. MBH	Outside (F) DB/WB	Supply (F) DB/WB	Return (F) DB/WB	Exhaust (F) DB/WB	Total Cap. MBH	Sensible Cap. MBH	ERV Wheel Size	Electrical HP	FLA	Volts	Phase	FLA	MCA	MOCP	FLA			
MU-1	UNIT B	14.5	2	4550	0.5	6	7	1	4042	0.5	6	7	3	1	2.1	303.2	83.6/72.0	51.3/51.1	81.7/62.93	84.4/63.9	150	120	8:1	50.4	74.7	2	18.6	125	91/79	83.7/72.0	78.0/65.0	85.4/73.1	129.23	37.48	25/21	50.4/41.1	72.0/55.0	44.9/37.9	170.47	129.58	ERC-4136C	0.17	0.44	460	3	65.9	70.6	80	1	4670	OAGD300	1-31, 33-34
MU-2	UNIT C	16.9	1	6630	1.0	7.5	10	1	5958	0.5	5	6.3	4	1	2.1	399	82.1/70.3	51.6/51.1	78.1/61.56	80.2/62.3	300	240	8:1	56.2	89.6	3	16	140	91/79	82.1/70.4	78.0/65.0	87.1/74.8	229.82	66.86	25/21	56.2/45.1	72.0/55.0	38.6/33.2	303.52	234.34	ERC-5856C	0.5	1.5	460	3	75.2	79.2	90	1	7890	OAND420	1-32

MIDLAND ELEMENTARY
3011 NICHOLS HWY
GALIVANTS FERRY, SC, 29544
HVAC RENEWAL

MECHANICAL DETAILS & SCHEDULES

SHEET
M2.0
4 OF 6



Section 1: Project Information

Energy Code: 2008 IECC
Project Title: 21-098 Midland Elementary
Project Type: Alteration

Construction Site: 3011 Nichols Hwy, Galivants Ferry, South Carolina 29544
Owner/Agent: MSWG Engineers, Inc., 4223 South Blvd, Charlotte, North Carolina 28209, 704-527-2112, cohampion@mswg.com
Designer/Contractor: Craig Champion, MSWG Engineers, Inc., 4223 South Blvd, Charlotte, North Carolina 28209, 704-527-2112, cohampion@mswg.com

Section 2: General Information

Building Location (for weather data): Conway, South Carolina
Climate Zone: 3A

Section 3: Mechanical Systems List

Quantity: 1
System Type & Description:
1 MU-1 (Single Zone):
Heating: 1 each - Central Furnace, Electric, Capacity = 109 kBtu/h
No minimum efficiency requirement applies
Cooling: 1 each - Single Package DX Unit, Capacity = 303 kBtu/h, Air-Cooled Condenser, Air Economizer
Proposed Efficiency = 15.10 EER, Required Efficiency: 10.00 EER + 9.7 IPLV
Fan System: FAN SYSTEM MU-1 - Compliance (Brake HP and fan efficiency method) : Passes
Fans:
EF-1 Exhaust, Constant Volume, 4550 CFM, 6.0 motor nameplate hp, 2.1 design brake hp (2.1 max. BHP)
SF-1 Supply, Constant Volume, 4550 CFM, 5.0 motor nameplate hp, 3.2 design brake hp (3.2 max. BHP)
Pressure Drop Credits:
Heat recovery device, 1.2666 credit
1 MU-2 (Single Zone):
Heating: 1 each - Central Furnace, Electric, Capacity = 109 kBtu/h
No minimum efficiency requirement applies
Cooling: 1 each - Single Package DX Unit, Capacity = 303 kBtu/h, Air-Cooled Condenser, Air Economizer
Proposed Efficiency = 14.90 EER, Required Efficiency: 10.00 EER + 9.7 IPLV
Fan System: FAN SYSTEM MU-2 - Compliance (Brake HP and fan efficiency method) : Passes
Fans:
EF-2 Exhaust, Constant Volume, 5955 CFM, 5.0 motor nameplate hp, 2.7 design brake hp (2.7 max. BHP)
SF-2 Supply, Constant Volume, 6630 CFM, 6.0 motor nameplate hp, 6.0 design brake hp (6.0 max. BHP)
Pressure Drop Credits:
Fully ducted return and/or exhaust air systems, 0.8025 credit
Return and/or exhaust airflow control devices, 0.7211 credit
Heat recovery device, 1.4136 credit
Particulate filtration credit: MERV 13 through 15, 1.4444 credit
1 MU-1 ALT (Single Zone):
Heating: 1 each - Central Furnace, Propane, Capacity = 120 kBtu/h
No minimum efficiency requirement applies
Cooling: 1 each - Single Package DX Unit, Capacity = 303 kBtu/h, Air-Cooled Condenser, Air Economizer
Proposed Efficiency = 14.90 EER, Required Efficiency: 9.80 EER + 9.5 IPLV
Fan System: FAN SYSTEM MU-1 ALT - Compliance (Brake HP and fan efficiency method) : Passes
Fans:

Project Title: 21-098 Midland Elementary
Data Filename: Report date: 11/09/21
Page 1 of 4

SF-1 ALT Supply, Constant Volume, 4550 CFM, 6.0 motor nameplate hp, 4.5 design brake hp (4.5 max. BHP)
EF-1 ALT Exhaust, Constant Volume, 4542 CFM, 5.0 motor nameplate hp, 2.1 design brake hp (2.1 max. BHP)
Pressure Drop Credits:
Heat recovery device, 1.2666 credit
Fully ducted return and/or exhaust air systems, 0.5507 credit
Particulate filtration credit: MERV 13 through 15, 0.9913 credit
1 MU-2 ALT (Single Zone):
Heating: 1 each - Central Furnace, Propane, Capacity = 240 kBtu/h
No minimum efficiency requirement applies
Cooling: 1 each - Single Package DX Unit, Capacity = 399 kBtu/h, Air-Cooled Condenser, Air Economizer
Proposed Efficiency = 16.80 EER, Required Efficiency: 9.80 EER + 9.5 IPLV
Fan System: FAN SYSTEM MU-2 ALT - Compliance (Brake HP and fan efficiency method) : Passes
Fans:
EF-2 ALT Exhaust, Constant Volume, 5955 CFM, 5.0 motor nameplate hp, 2.7 design brake hp (2.7 max. BHP)
SF-2 ALT Supply, Constant Volume, 6630 CFM, 7.5 motor nameplate hp, 5.0 design brake hp (5.0 max. BHP)
Pressure Drop Credits:
Return and/or exhaust airflow control devices, 0.8025 credit
Heat recovery device, 1.8136 credit
Fully ducted return and/or exhaust air systems, 0.8025 credit
Particulate filtration credit: MERV 13 through 15, 1.4444 credit
Exhaust filters, scrubbers, or other exhaust treatment, 0.3461 credit

Section 4: Requirements Checklist

Requirements Specific To: MU-1 :

- 1. Equipment minimum efficiency: Single Package Unit: 10.00 EER + 9.7 IPLV
- 2. Newly purchased equipment meets the efficiency requirements
- 3. Integrated economizer is required for this location and system.
- 4. Cooling system provides a means to relieve excess outdoor air during economizer operation.
- 5. Hot gas bypass prohibited unless system has multiple steps of unloading or continuous capacity modulation
- 6. Hot gas bypass limited to 25% of total cooling capacity

Requirements Specific To: MU-2 :

- 1. Equipment minimum efficiency: Single Package Unit: 10.00 EER + 9.7 IPLV
- 2. Newly purchased equipment meets the efficiency requirements
- 3. Integrated economizer is required for this location and system.
- 4. Cooling system provides a means to relieve excess outdoor air during economizer operation.
- 5. Hot gas bypass prohibited unless system has multiple steps of unloading or continuous capacity modulation
- 6. Hot gas bypass limited to 25% of total cooling capacity

Requirements Specific To: MU-1 ALT :

- 1. Equipment minimum efficiency: Single Package Unit: 9.80 EER + 9.5 IPLV
- 2. Newly purchased equipment meets the efficiency requirements
- 3. Integrated economizer is required for this location and system.
- 4. Cooling system provides a means to relieve excess outdoor air during economizer operation.
- 5. Hot gas bypass prohibited unless system has multiple steps of unloading or continuous capacity modulation
- 6. Hot gas bypass limited to 25% of total cooling capacity

Requirements Specific To: MU-2 ALT :

- 1. Equipment minimum efficiency: Single Package Unit: 9.80 EER + 9.5 IPLV
- 2. Newly purchased equipment meets the efficiency requirements
- 3. Integrated economizer is required for this location and system.
- 4. Cooling system provides a means to relieve excess outdoor air during economizer operation.
- 5. Hot gas bypass prohibited unless system has multiple steps of unloading or continuous capacity modulation
- 6. Hot gas bypass limited to 25% of total cooling capacity

Generic Requirements: Must be met by all systems to which the requirement is applicable:

- 1. Plant equipment and system capacity no greater than needed to meet loads
Exception(s):
 Standby equipment automatically off when primary system is operating
- Multiple units controlled to sequence operation as a function of load
- 2. Minimum one temperature control device per system

Project Title: 21-098 Midland Elementary
Data Filename: Report date: 11/09/21
Page 2 of 4

- 3. Minimum one humidity control device per installed humidification/dehumidification system
- 4. Load calculations per ASHRAE/ACCA Standard 183.
- 5. Automatic Controls: Setback to 55°F (heat) and 65°F (cool); 7-day clock, 2-hour occupant override, 10-hour backup
Exception(s):
 Continuously operating zones
- 6. Outside-air source for ventilation; system capable of reducing OSA to required minimum
- 7. R-5 supply and return air duct insulation in unconditioned spaces
R-8 supply and return air duct insulation outside the building
R-8 insulation between ducts and the building exterior when ducts are part of a building assembly
Exception(s):
 Ducts located within equipment
 Ducts with interior and exterior temperature difference not exceeding 15°F.
- 8. Mechanical fasteners and sealants used to connect ducts and air distribution equipment
- 9. Ducts sealed - longitudinal seams on rigid ducts; transverse seams on all ducts; UL 181A or 181B tapes and mastic
- 10. Hot water pipe insulation: 1.5 in. for pipes <= 1.9 in. and 2 in. for pipes > 1.9 in.
Cold water/retrofit pipe insulation: 1.5 in. for pipes <= 1.5 in. and 1.5 in. for pipes > 1.5 in.
Steam pipe insulation: 1.5 in. for pipes <= 1.5 in. and 3 in. for pipes > 1.5 in.
Exception(s):
 Piping within HVAC equipment.
 Fluid temperatures between 55 and 105°F.
 Fluid not heated or cooled with renewable energy.
 Piping within room fan-coil (with AHR440 rating) and unit ventilators (with AHR940 rating).
 Runouts < 4 ft in length.
- 11. Operation and maintenance manual provided to building owner
- 12. Thermostatic controls have 5°F deadband
Exception(s):
 Thermostats requiring manual changeover between heating and cooling
 Special occupancy or special applications where wide temperature ranges are not acceptable and are approved by the authority having jurisdiction.
- 13. Balancing devices provided in accordance with IMC 603.17
- 14. Demand control ventilation (DCV) present for high design occupancy areas (>40 person/1000 ft² in spaces >500 ft²) and served by systems with any one of 1) an air-side economizer, 2) automatic modulating control of the outdoor air damper, or 3) a design outdoor airflow greater than 3000 cfm.
Exception(s):
 Systems with heat recovery.
 Multiple-zone systems without DDC of individual zones communicating with a central control panel.
 Systems with a design outdoor airflow less than 1200 cfm.
- Spaces where the supply airflow rate minus any makeup or outgoing transfer air requirement is less than 1200 cfm.
- 15. Motorized, automatic shutoff dampers required on exhaust and outdoor air supply openings
Exception(s):
 Gravity dampers acceptable in buildings < 3 stories
- 16. Automatic controls for freeze protection systems present
- 17. Exhaust air heat recovery included for systems 6,000 cfm or greater with more than 70% outside air fraction or specifically exempted
Exception(s):
 Hazardous exhaust systems, commercial kitchen and clothes dryer exhaust systems that the International Mechanical Code prohibits the use of energy recovery systems.
 Systems serving spaces that are heated and not cooled to less than 60°F.
 Where more than 60 percent of the outdoor heating energy is provided from site-recovered or site solar energy.
 Heating systems in climates with less than 3800 HDD.
 Cooling systems in climates with a 1 percent cooling design wet-bulb temperature less than 64°F.
 Systems requiring dehumidification that employ energy recovery in series with the cooling coil.
 Laboratory time hood exhaust systems that have either a variable air volume system capable of reducing exhaust and makeup air volume to 50 percent or less of design value or a separate make up air supply meeting the following makeup air requirements: a) at least 75 percent of exhaust flow rate, b) heated to no more than 2°F below room setpoint temperature, c) cooled to no lower than 3°F above room setpoint temperature, d) no humidification added, e) no simultaneous heating and cooling.

Section 5: Compliance Statement

Project Title: 21-098 Midland Elementary
Data Filename: Report date: 11/09/21
Page 3 of 4

Compliance Statement: The proposed mechanical alteration project represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed mechanical alteration project has been designed to meet the 2008 IECC, Chapter 8, requirements in COMcheck-Web and to comply with the mandatory requirements in the Requirements Checklist.

Craig Champion P.E.
Name - Title Signature Date 11/10/2021

Section 6: Post Construction Compliance Statement

- HVAC record drawings of the actual installation, system capacities, calibration information, and performance data for each equipment provided to the owner.
- HVAC O&M documents for all mechanical equipment and system provided to the owner by the mechanical contractor.
- Written HVAC balancing and operations report provided to the owner.

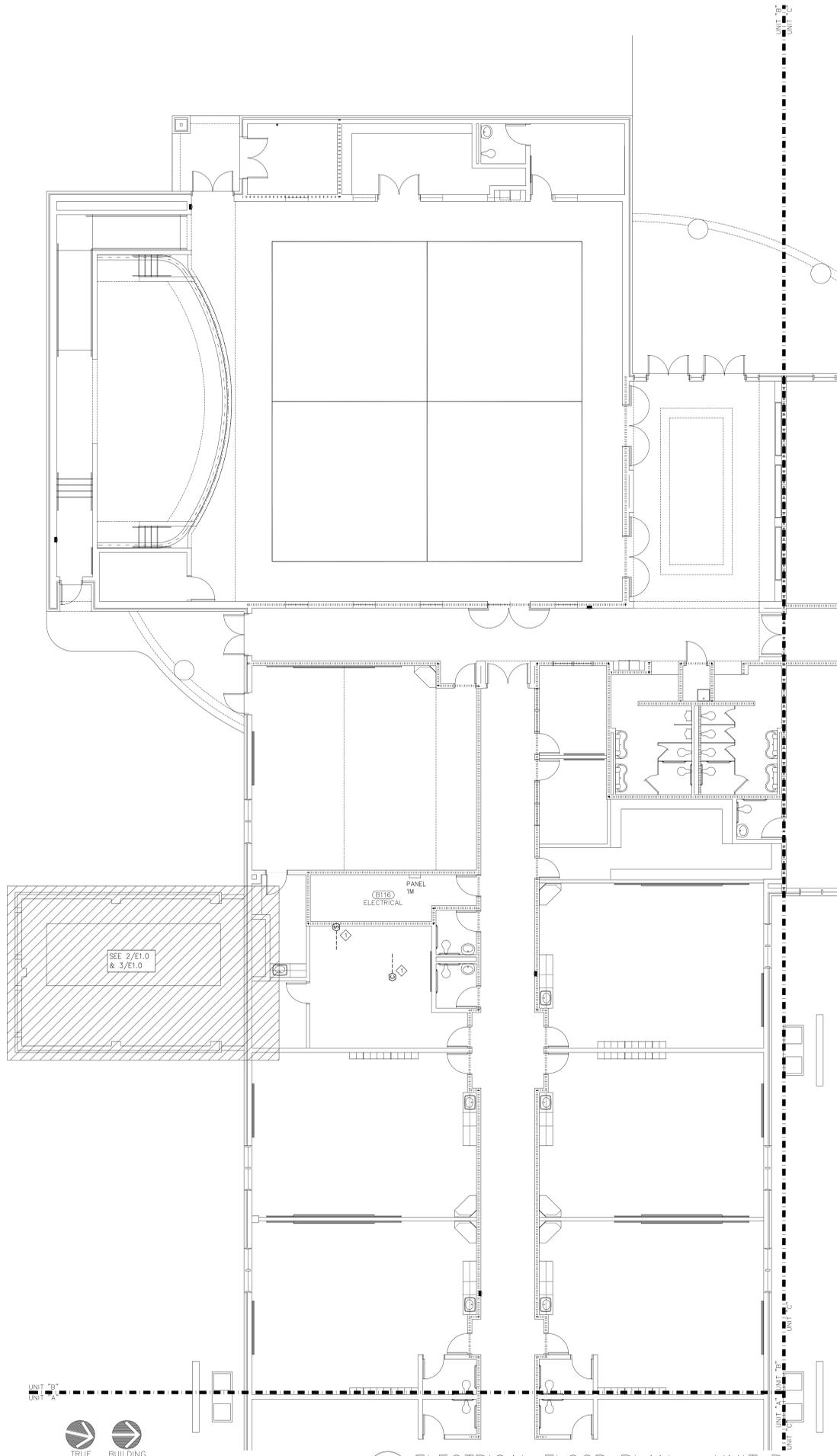
The above post construction requirements have been completed.

Principal Mechanical Designer-Name Signature Date

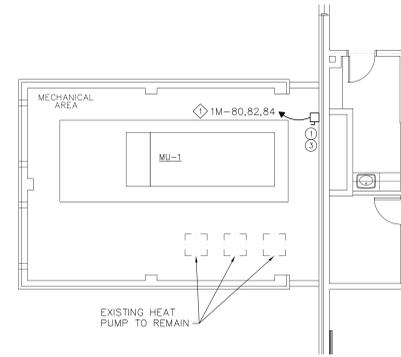
JOB NUMBER	21-098	DATE	11/17/2021
DESIGNED BY	US	CHECKED BY	JOC
DATE		DATE	

MIDLAND ELEMENTARY
3011 NICHOLS HWY
GALIVANTS FERRY, SC, 29544
HVAC RENEWAL

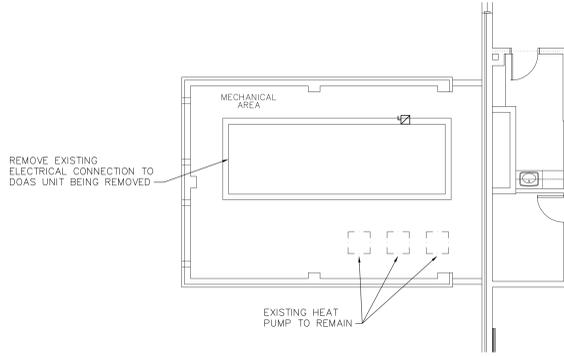
JOB TITLE
SHEET TITLE
MECHANICAL
COMCHECK



1 ELECTRICAL FLOOR PLAN – UNIT B
 SCALE: 1/8" = 1'-0"
 NOTES:
 ◇ CONNECT TO EXISTING ADDRESSABLE FIRE ALARM CIRCUIT.



3 ELECTRICAL PLAN – RENO
 SCALE: 1/8" = 1'-0"
 NOTES:
 ◇ BASE BID: CONNECT WITH 3#4, 1#8G, 1-1/4" TO CIRCUIT AS INDICATED. REPLACE EXISTING 90/3 CIRCUIT BREAKER WITH NEW 90/3 BREAKER AS REQUIRED.
 ALTERNATE BID: CONNECT WITH 3#4, 1#8G, 1-1/4" TO CIRCUIT AS INDICATED. REPLACE EXISTING 90/3 CIRCUIT BREAKER WITH NEW 80/3 BREAKER AS REQUIRED.



2 ELECTRICAL PLAN – DEMO
 SCALE: 1/8" = 1'-0"

FIRE RATED WALLS	
.....	1 HOUR WALL
-----	2 HOUR WALL
-----	4 HOUR WALL

IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO APPLY THE PROPER FIRE-SAFING DETAIL FOR ALL DUCT AND PIPE PENETRATIONS THRU FIRE-RATED WALLS AND SMOKE PARTITIONS.

KEY PLAN LEGEND:

NOTE: THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS. SUBMISSION OF BIDS IS CONSIDERED VERIFICATION THAT THE CONTRACTOR HAS VISITED THE SITE. NO EXTRAS WILL BE ALLOWED DUE TO LACK OF KNOWLEDGE OF THE EXISTING CONDITIONS.



**McKNIGHT • SMITH
 WARD • GRIFFIN**
 ENGINEERS, INCORPORATED
 4223 South Boulevard
 Charlotte, NC 28209
 704/527-2112



JOB NUMBER	21-098	REVISION DESCRIPTION
DESIGNED BY	SMG	
CHECKED BY	WFA	
DATE	11/17/2021	

**MIDLAND ELEMENTARY
 3011 NICHOLS HWY
 GALIVANTS FERRY, SC, 29544
 HVAC RENEWAL**

**ELECTRICAL FLOOR PLAN –
 UNIT B**



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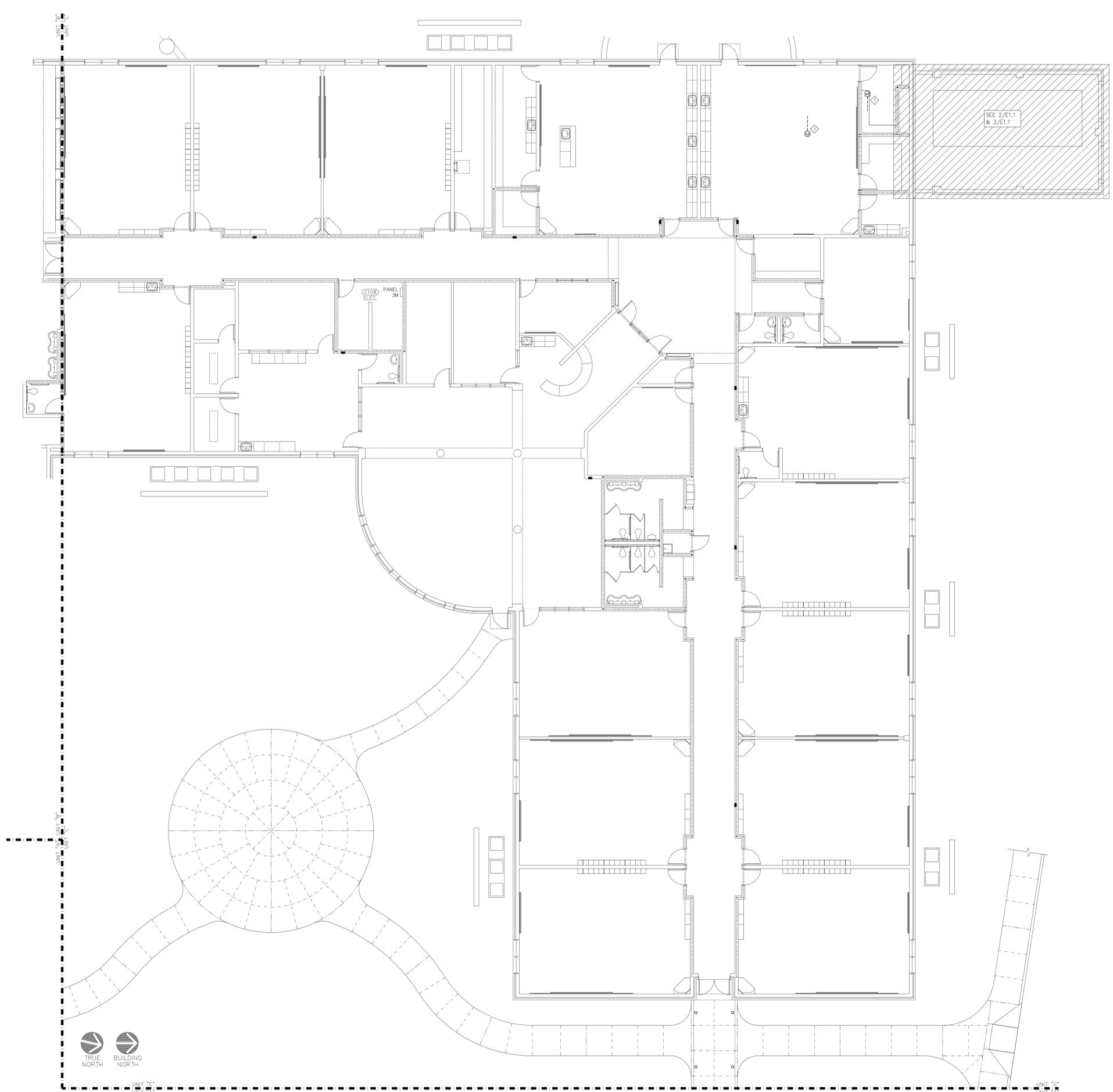


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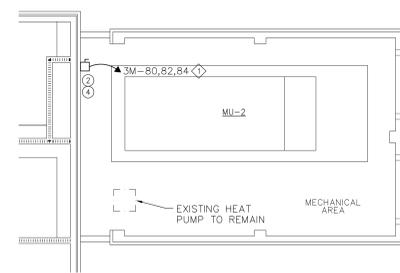
**ELECTRICAL FLOOR PLAN -
UNIT C**

SHEET
E1.1
2 OF 4



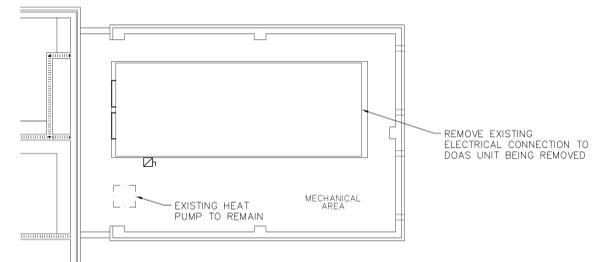
1 ELECTRICAL FLOOR PLAN - UNIT C
SCALE: 1/8" = 1'-0"

NOTES:
◇ CONNECT TO EXISTING ADDRESSABLE FIRE ALARM CIRCUIT.



3 ELECTRICAL PLAN - RENO
SCALE: 1/8" = 1'-0"

NOTES:
◇ BASE BID: CONNECT WITH 3#3, 1#86, 1-1/4" TO CIRCUIT AS INDICATED.
ALTERNATE BID: CONNECT WITH 3#3, 1#86, 1-1/4" TO CIRCUIT AS INDICATED.
REPLACE EXISTING 110/3 CIRCUIT BREAKER WITH NEW 90/3 BREAKER AS REQUIRED.



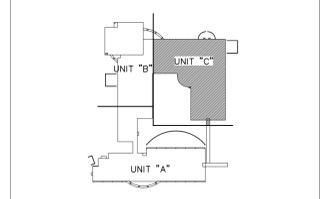
2 ELECTRICAL PLAN - DEMO
SCALE: 1/8" = 1'-0"



FIRE RATED WALLS

.....	1 HOUR WALL
-----	2 HOUR WALL
-----	4 HOUR WALL

KEY PLAN LEGEND:



NOTE: THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS. SUBMISSION OF BIDS IS CONSIDERED VERIFICATION THAT THE CONTRACTOR HAS VISITED THE SITE. NO EXTRAS WILL BE ALLOWED DUE TO LACK OF KNOWLEDGE OF THE EXISTING CONDITIONS.



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JOB NUMBER	21-098	REVISION DATES	REVISION DESCRIPTION
CREATED BY	SMG		
CHECKED BY	WFA		
DATE	11/17/2021		

JOB TITLE
**MIDLAND ELEMENTARY
3011 NICHOLS HWY
GALIVANTS FERRY, SC, 29544
HVAC RENEWAL**

SHEET TITLE
**SYMBOLS AND
SCHEDULES**

SYMBOL SCHEDULE	
SYMBOL	DESCRIPTION
—	CONDUIT RUN CONCEALED ABOVE CEILINGS OR IN WALLS.
—→	HOMERUN TO PANEL AND CIRCUIT(S) DESIGNATED. ARROW(S) INDICATE QUANTITY OF CIRCUITS.
◇	SPECIAL NOTE, NUMERALS IDENTIFY, SEE SCHEDULE.
⊙	SPECIAL CONNECTION TO A SPECIFIC ITEM OF EQUIPMENT. SEE CONNECTION SCHEDULE.
DISTRIBUTION	
SYMBOL	DESCRIPTION
■	ELECTRICAL PANELBOARD, SURFACE MOUNTED.
□	DISCONNECT SWITCH, NON-FUSIBLE.
□	DISCONNECT SWITCH, FUSIBLE.
—	GROUND CONNECTION.
△▽	DRY-TYPE TRANSFORMER, 480-120/208V 3-PHASE OR 208-120/208V 3-PHASE.
FIRE ALARM SYSTEM	
SYMBOL	DESCRIPTION
⊙---	FIRE ALARM SYSTEM DUCT MOUNTED PHOTOELECTRIC TYPE SMOKE DETECTOR.
⊙---	FIRE ALARM SYSTEM DUCT MOUNTED CARBON MONOXIDE DETECTOR.

EQUIPMENT CONNECTION SCHEDULE											
SYM.	EQUIPMENT	LOAD	VOLT/ PHASE	DISCONNECT				CONDUCTORS	RACEWAY		NOTES
				TYPE	RATING	POLES	TRIP/FUSE		ENCL.	TYPE	
①	MU-1 (BASE BID)	206, 6HP; 32KW	480/3	NFS	100A	3	--	3R	3#4, 1#8G	LFMC	1-1/4"
②	MU-2 (BASE BID)	206, 6HP; 32KW	480/3	NFS	200A	3	--	3R	3#2, 1#8G	LFMC	1-1/4"
③	MU-1 (ALTERNATE BID)	206, 6HP	480/3	NFS	100A	3	--	3R	3#4, 1#8G	LFMC	1-1/4"
④	MU-2 (ALTERNATE BID)	7.5, 5HP	480/3	NFS	100A	3	--	3R	3#3, 1#10G	LFMC	1-1/4"

LEGEND

DISCONNECT TYPES	DISCONNECT ENCLOSURE TYPES	RACEWAY TYPES	STARTER TYPES
ETCB = ELECTRONIC-TRIP CIRCUIT BREAKER	1 = NEMA 1 ENCLOSURE	EMT = ELECTRIC METALLIC TUBING	CFWR = COMBINATION FULL VOLTAGE, NONREVERSING
FDS = FUSIBLE DISCONNECT SWITCH	3R = NEMA 3R ENCLOSURE	FMC = FLEXIBLE METAL CONDUIT	
MCP = MOTOR CIRCUIT PROTECTOR	4 = NEMA 4 ENCLOSURE	IMC = INTERMEDIATE METAL CONDUIT	CONTROL DEVICES
NFDS = NON-FUSIBLE DISCONNECT SWITCH	4X = NEMA 4X ENCLOSURE	LFMC = LIQUID-TIGHT FLEXIBLE METAL CONDUIT	HDA = HAND-OFF-AUTO
ST/DS = COMBINATION STARTER/DISCONNECT SWITCH		PVC = NON-METALLIC PVC CONDUIT	RPL = RED PILOT LIGHT
TMCB = THERMAL-MAGNETIC CIRCUIT BREAKER	FPN = FUSE PER NAMEPLATE	RMC = RIGID METAL CONDUIT	AUX = AUXILIARY CONTACTS (2 N.O., 1 N.C.)
TOG = HP RATED TOGGLE SWITCH			CT50 = 50 VA CONTROL TRANSFORMER

NOTES

ALL ELECTRICAL CHARACTERISTICS SCHEDULED ABOVE ARE BASED ON INFORMATION AVAILABLE AT THE TIME OF DESIGN. ELECTRICAL CONTRACTOR SHALL VERIFY ELECTRICAL CHARACTERISTICS OF ALL EQUIPMENT WITH EQUIPMENT SUPPLIER(S) PRIOR TO ROUGHING, AND SHALL VERIFY EXACT LOCATION AND EXACT TYPE OF CONNECTION. ALL EQUIPMENT SHALL BE PROPERLY AND SECURELY GROUNDED. ANY SIGNIFICANT CHANGES IN LOCATION, ELECTRICAL REQUIREMENTS, OR TYPE OF CONNECTION REQUIRED FOR ANY EQUIPMENT SCHEDULED ABOVE SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER IN WRITING PRIOR TO PROCEEDING.

CONDUCTORS AND RACEWAY SPECIFIED IN THE ABOVE SCHEDULE ARE FOR FINAL CONNECTION TO UNIT AND SHALL BE EXTENDED FROM THE DISCONNECT SHOWN ON THE FLOOR PLANS TO THE EQUIPMENT TERMINATION BOX.

CONDUIT AND BOXES REQUIRED FOR EQUIPMENT CONNECTIONS SHALL BE INSTALLED IN SUCH A WAY AS TO NOT COVER UP EQUIPMENT NAMEPLATES, SERVICE AREAS, AIR FLOW AREAS, ETC.

ELECTRICAL GENERAL REQUIREMENTS

1.1 SCOPE:

- a. Applicable requirements of the General Conditions of the Contract, Amendments, Supplementary General Conditions, and Special Conditions govern work under this Division.
- b. Work covered by this Division consists of providing all labor, equipment, supplies, and materials; and performing all operations, including trenching, backfilling, cutting, patching, and chasing necessary for the installation of complete electrical systems in strict accordance with these specifications and the applicable drawings.
- c. Minor details not usually shown or specified, but necessary for the proper installation and operation, shall be included in the work, the same as if herein specified or shown.
- d. This Contractor is referred to the General and Special Conditions of the contract which shall form a part and be included in this section of the specification and shall be binding on this Contractor.
- e. Some items of equipment are specified in the singular; however, the Contractor shall provide and install the number of items or equipment as indicated on the drawings, and as required for complete systems.

1.2 RECORD DRAWINGS:

- a. During construction of this project, the Contractor shall maintain one complete set of electrical contract drawings, on which shall be recorded all significant changes. This set of drawings shall be used for no other purpose. The Contractor shall submit these drawings to the Architect/Engineer for approval and presentation to the Owner.

1.3 REGULATIONS AND COMPLIANCE:

- a. The requirements of the International Building Code which includes the National Electrical Code, and of all other State and Local codes, ordinances, regulations and interpretations by authorities having jurisdiction are binding upon this Contractor, and nothing contained in, or inferred by, these specifications or the applicable drawings may be construed as waiving those requirements. The latest edition of the National Electrical Code, referred to herein and on the drawings as "N.E.C.", forms a part of these specifications; and under no circumstances may the installation fail to meet the minimum requirements therein.
- b. This Contractor shall secure and pay for all permits, fees, inspections and licenses required. It is the responsibility of the Contractor to notify the Local Electrical Inspector to schedule the required inspections. Upon completion of the project and prior to his request for final payment he shall present to the Architect/Engineer a certificate of inspection and approval from the inspection authorities.
- c. All materials and equipment shall bear the approval label, and shall be listed by the Underwriters' Laboratories, Inc.

2.1 GENERAL:

- a. Except where reuse of existing items are specifically indicated or permitted, all materials and equipment shall be new and shall conform with the standards of the National Electrical Manufacturers' Association or Underwriter's Laboratories, Inc. in every instance where such a standard has been established for the item involved.
- b. Materials shall be inspected by the Contractor upon their arrival at the site to be sure they are correct. Material and equipment stored on the site shall be protected against physical damage, dirt and damage caused by precipitation, wind, condensation, excessive humidity, and extremes of temperature. Materials shall be stored in their original cartons within substantial, clean and dry storage facilities provided under this Contract. Conduit, large galvanized boxes, and lighting poles may be stored outdoors on suitable blocks or racks clear of the earth and undergrowth, and pitched to drain. Large electrical equipment intended for ultimate installation outdoors may be stored in the weather on suitable blocks or platforms clear of the earth and undergrowth, and with interior lamps or space heaters continuously energized to prevent condensation. Alternate storage provisions may be submitted to the Architect/Engineer for approval prior to the arrival of the material. Under no circumstances shall equipment be stored in the weather under a cover of polyethylene or tarpaulin. The Architect/Engineer will be the sole judge as to the acceptability of storage facilities, and when directed by the Architect/Engineer, improperly stored or damaged material shall be removed from the site and replaced with new material.
- c. The Contractor shall coordinate the work and equipment of this Division with the work and equipment specified elsewhere in order to assure a complete and satisfactory installation. Work such as excavation, backfill, concrete, flashing, wiring, etc., which is required by the work of this section shall be performed in accordance with the requirements of the applicable section of the specifications.
- d. It is the intention of these specifications and drawings to call for finished work, tested and ready for operation. Whenever the work "provide" is used, it shall mean "furnish and install complete and ready for use".

3.1 COORDINATION:

- a. This Contractor coordinate the work of all subs and shall furnish any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.
- b. Where the work will be installed in close proximity to, or may interfere with the work of other trades, the Contractor shall assist in working out space conditions to make a satisfactory adjustment. If so directed by the Engineer, the Contractor shall prepare composite working drawings and sections at a suitable scale not less than 3/8" = 1'-0", clearly showing how his work is to be installed in relation to the work of other trades. If the Contractor installs his work before coordination, or so as to cause any interference with work of any subs, he shall make the necessary changes in his work to correct the condition without extra charge.
- c. The Contractor shall furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

3.2 SLEEVES, CUTTING, AND PATCHING:

- a. Contractor shall place his own sleeves and advise other trades of required chases and openings so they can be properly built in. Where any raceway supports installed under this Contract pierce the roof, suitable pitch pockets shall be provided and coordinated with the roofing contractor as necessary to be acceptable to the Architect. Provide suitable fittings where any raceways or equipment cross expansion joints.
- b. Permitted cutting or patching necessary shall be done by Contractor. Structural members shall not be cut except by written permission of Architect/Engineer.

3.4 PROTECTION AND CLEAN-UP:

- a. Protect all material and work from damage during construction. Equipment installed in the building prior to its being closed in and dried out shall be protected from the elements in the same manner as previously specified for stored materials. Protect finished surfaces from splattering of mortar, paint, dirt, plaster, etc. Do not install device plates, face plates, covers, flush cabinet trims, or fixtures on walls or ceilings until after painting or cleaning of the surface has been completed, and arrange for such items that are required to be field painted to be painted before being mounted. Repair, clean and touch-up or replace all damaged material. At the completion of the project, remove all dust from finished surfaces, including lighting fixtures, lenses and lamps.
- b. The Contractor shall keep premises free of debris resulting from his work.

3.5 PAINTING AND FINISHING:

- a. Suitable finishes shall be provided on all items of electrical equipment and materials which are exposed. This shall consist of either an acceptable finish as manufactured and supplied to the job or application of suitable finishes after installation.
- b. Where installed in finished areas, exposed equipment and materials shall be supplied with prime coat, and shall be professionally painted or enameled as directed to match or blend with adjacent surfaces.
- c. In unfinished areas such as equipment rooms, exposed equipment shall be furnished with suitable factory applied finishes (e.g. standard gray enamel finish for panelboards, etc.).

3.6 OBSERVATION:

- a. The project will be observed periodically as construction progresses. The Contractor will be responsible for notifying the Architect at least 72 hours in advance when any work to be covered up is ready for inspection. No work will be covered up until after observation has been completed on such items as piping and insulation, etc.

EQUIPMENT CONNECTIONS AND COORDINATION

1.1 GENERAL:

- a. Heating, Ventilating, Air Conditioning, Refrigeration and Plumbing Equipment: Unless otherwise indicated, provide all power wiring, including feeders and branch circuits, to the terminals of the equipment, including mounting of motor starters, feeder and branch circuit over-current protection; disconnecting means within sight of each motor and each starter, whether or not specifically indicated on drawings; and Motor Control Centers indicated, complete as scheduled and specified.

BASIC MATERIALS AND METHODS

1.1 WIRING METHOD:

- a. Unless otherwise indicated or specified, the Wiring Method for this project shall consist of copper conductors with 600 volt insulation installed in metal raceways.
- b. The word "Raceway" and the word "Conduit" (or abbreviation "C") used herein or on the drawings indicate Rigid Metal Conduit, and where permitted, Intermediate Metal Conduit, Electrical Metallic Tubing, Rigid Nonmetallic Conduit, Flexible Metal Conduit, or Liquidtight Flexible Metal Conduit.
- c. Reference to "MC" indicates Intermediate Metal Conduit.
- d. Reference to "EMT" or "Tubing" indicates Electrical Metallic Tubing.
- e. Reference to "Flex" or "Flexible Conduit" indicates Flexible Metal Conduit, or, where required, Liquidtight Flexible Metal Conduit.

1.2 FASTENINGS METHODS:

- a. Acceptable fastening methods include wood screws and nails on wood construction, toggle bolts on hollow masonry, expansion bolts and lead anchors on brick and concrete, and machine screws on metal surfaces.
- b. Explosive fasteners may be used in steel and concrete in accordance with the manufacturer's recommendations.
- c. Wire, perforated metal strap, and wooden plugs are not acceptable as fastening material.
- d. Materials used shall be good quality, made of zinc or cadmium coated steel or other non-corroding material.
- e. Materials, whether exposed or concealed, shall be firmly and adequately held in place. Fastening and support shall afford safety factor of three or higher, and shall be in full compliance with the seismic protection requirements of the N.C. State Building Code.
- f. Fixtures, raceways, and equipment shall be supported from the structure. Nothing may be supported on suspended ceiling unless definitely noted so on the Drawings or specifically permitted by the Architect/Engineer.
- g. Equipment and raceways attached to outside walls, or interior walls subject to permanent moisture, shall be shimmed out with non-corrodible material so as to provide 1/4" air space between wall and equipment or raceway.

RACEWAYS AND FITTINGS

1.1 MATERIALS AND APPLICATIONS:

- a. Intermediate Metal Conduit (IMC) with threaded couplings and fittings may be used for exposed and concealed work in lieu of rigid metal conduit except underground outside the building foundation, or where supporting lighting fixtures, or in hazardous locations, or where exposed to severe impact or injury. Termination at sheet metal enclosures shall consist of double locknuts and insulating bushings.
- b. Electrical Metallic Tubing (EMT) of 2" maximum size may be used for exposed work in lieu of Rigid Metal Conduit except underground or in poured concrete. EMT of 2" maximum size may be used for concealed work in lieu of Rigid Metal Conduit except

outdoors, or above a roof, or where supporting lighting fixtures, or where exposed to severe impact or injury, or in hazardous locations, or less than 10 feet above a floor or platform in other than in electrical, mechanical, or communications closets or equipment rooms.

- j. Flexible Metal Conduit shall be of zinc coated steel of minimum length, and shall be used in lieu of Rigid Metal Conduit for connections to moving or vibrating apparatus, recessed lighting fixtures, dry-type transformers, and motors. Flexible Metal Conduit may be used where rigid connections are impractical due to obstructions or space limitations. Flexible Metal Conduit used in wet, damp, or corrosive location shall be PVC jacketed liquid-tight complete with liquid-tight connectors.

- k. Fittings for steel conduit and tubing shall be of zinc coated steel or malleable iron. Insulating bushings of plastic provided for Rigid and Intermediate Metal Conduits shall be rated for 150°C. Bonding bushings shall be steel or malleable iron with non-removable plastic throats rated 150°C. EMT fittings shall be of the compression type. Set-screw, indentor, pressure cast, and die cast fittings are not acceptable. Connectors for EMT, Flexible Metal Conduit and Liquid-tight Flexible Metal Conduit shall be the insulated throat type. Connectors for Flexible Metal Conduits shall be of the "Tite-Bite" design.

- l. Conduit expansion fittings shall be of zinc coated cast or malleable iron and steel conduit, complete with flexible bonding straps. Expansion fittings shall allow longitudinal conduit movement of 4 inches.

- m. Minimum raceway size shall be 1/2". Other raceway sizes, unless indicated on the drawings, shall be determined by the Contractor in accordance with NEC requirements for type THW insulated conductors, or the actual insulation used if it is thicker than type THW.

2.1 INSTALLATION:

- a. Rigid and Intermediate Metal Conduits shall be made up with full threads, to which a conductive pipe compound (T & B Kapr-Shield or equal) has been applied, and butted in coupling. Terminations at sheet metal enclosures in indoor dry locations shall be made with double locknuts and an insulating bushing. Terminations at sheet metal enclosures in outdoor, damp, and wet locations shall be made with threaded conduit hubs of zinc coated malleable iron.
- b. Conduits shall be rigidly supported not more than 8 feet on center and shall be concealed within walls, ceilings, and floors, except as indicated or specifically approved by the Architect/Engineer; kept at least 6" from flues and steam or hot water pipes; and protected against the entry of dirt, plaster, or trash. Raceways shall be supported independently of suspended ceiling members and suspension wires.
- c. Suspended EMT shall be provided with additional hangers at elbows and bends, and where necessary to avoid strain at couplings and connectors.
- d. Exposed conduits, where permitted, shall be run parallel or perpendicular to walls, structural members and ceilings; with right-angle turns consisting of symmetrical bends or cast metal fittings with threaded hubs. Offsets may be used where necessary provided that they are of minimum length.
- e. Conduits crossing expansion and contraction joints shall cross perpendicular to the joint and shall be provided with expansion fittings. Conduits shall not be embedded in the concrete slabs at the expansion and contraction joints.

CONDUCTORS

1.1 MATERIALS:

- a. Unless otherwise indicated, all wire and cable conductors shall be copper.
- b. Conductors shall be not smaller than #12 AWG except that #10 AWG minimum is required for the entire length of 120 volt branch circuits whose distance to the center of the load exceeds 75 feet. #14 AWG may be used for signal and remote control circuits. #16 AWG may be used for taps to individual recessed lighting fixtures on circuits protected by over-current devices rated at 20 amperes or less and contained within flexible metal conduits that do not exceed 6 feet in length. Other conductors smaller than #14 AWG may be used only where specifically indicated on the drawings or specified herein.
- c. Conductors #10 AWG and smaller shall be solid, dual rated type THWN/THHN.
- d. Conductors #8 AWG and larger shall be stranded, dual rated type THWN/THHN.
- e. Each conductor shall bear easily readable markings along entire length, indicating size and insulation type.
- f. Insulation on conductors #10 AWG and smaller shall be suitably colored in manufacture.
- g. Conductors in any location subject to abnormal temperature shall be furnished with an insulation type suitable for temperature encountered.
- h. Where no indication is made of wire size, the conductor shall be of N.E.C. size to match its overcurrent protective device, but in no case smaller than #12 AWG.

2.1 SPLICES, TAPS, AND CONNECTIONS:

- a. Splices in conductors #10 AWG and smaller shall be made with twist-on spring steel devices UL listed as Pressure Cable Connectors, with integral insulating covers rated 75°C at 600 volts.
- b. Splices in copper conductors #8 AWG and larger shall be made with mechanical devices UL listed as Pressure Cable Connectors and insulated with thermoplastic tape UL listed for use as sole insulation. Taps may be omitted from connectors supplied with securely fastened insulating covers which completely enclose the connector and the conductors. Insulating covers shall be rated 75°C at 600 volts.

2.2 COLOR CODING:

- a. All wiring shall be color coded.
- b. On 120/208V, 3 phase, 4 wire power systems, conductors shall be color coded Black (Phase A), Red (Phase B), Blue (Phase C), and White (Neutral). On 277/480V, 3 phase, 4 wire systems, conductors shall be color coded Brown (Phase A), Orange (Phase B), Yellow (Phase C), and Gray (Neutral).
- c. Insulation for grounding conductors on all systems shall be Green.
- d. Conductors #8 AWG and larger may be identified with two or more bands of proper color plastic tape applied near each splice and termination. Pointing of wire will not be acceptable.
- e. Phase sequence shall be "A", "B" and "C" from left to right, top to bottom or front to back when facing equipment.

2.3 BRANCH CIRCUIT RACEWAY WIRING:

- a. Three-phase circuits shall be limited to one such circuit per raceway. They shall consist of three different phase wires, and a neutral where required.
- b. A neutral shall not serve more than one circuit. The neutral carrying all or any part of the current of any specific load shall be contained in the same raceway or enclosure with the phase wire or wires also carrying that current.
- c. Circuits shall be connected to panels as shown in the panel schedules.
- d. Under the above requirements and with required color coding system no raceway shall contain more than one wire of the same color, except for switch legs and control conductors.
- e. Conductors supplying lighting outlets may be combined in the same raceways with conductors supplying receptacles; but lighting outlets and receptacle outlets shall not be connected to the same circuits unless specifically indicated on the drawings.

GROUNDING AND BONDING

1.1 SCOPE:

- a. The electric system neutral, the neutral of each separately derived system, and all non-current-carrying metal parts, raceways, and enclosures shall be permanently and effectively grounded.
- b. Grounding and bonding shall be provided in strict accordance with the National Electrical Code, and as specified herein and on the drawings.
- c. The Contractor shall note that required grounding conductors and connections are not all shown on the drawings. NEC requirements apply.

2.1 MATERIALS AND APPLICATIONS:

- a. Grounding conductors shall be of THWN insulated copper, unless otherwise indicated.

3.1 EQUIPMENT GROUNDING:

- a. All non-current-carrying metal parts, raceways, and enclosures of the electrical system and of equipment supplied through the electrical system shall be permanently and effectively grounded.
- b. Equipment grounding conductors shall be provided for each feeder and for each branch circuit and shall be contained within the same raceways as the feeder and branch circuit conductors. The equipment grounding conductor shall be THWN insulated copper, not smaller than #12 AWG.
- c. Copper bonding strips normally included in small sizes of liquid-tight flexible metal conduit and dependent upon the terminal connectors for bonding continuity will not be accepted in lieu of the equipment grounding conductors specified herein.
- d. Where metal raceways enter sheet metal enclosures through knockouts provide bonding bushings and jumpers to the enclosure under any of the following conditions:
 1. Voltage exceeds 250 volts to ground.
 2. Branch circuit conduit exceeds 1" in size.
 3. Feeder conduit regardless of voltage and size.

SECONDARY DISTRIBUTION EQUIPMENT

1.1 OVERCURRENT PROTECTION DEVICES:

- a. Unless otherwise indicated, circuit breakers shall be provided as the overcurrent protection devices for services, separately derived systems, feeders, and branch circuits. Fuses may be used only where indicated on the drawings, or required by the manufacturer for equipment connected, or specified herein.
- b. Molded-case and insulated-case circuit breakers shall be the static or thermal-magnetic type, quick-make and quick-break for manual and automatic operation. Multiple breakers shall be common trip. Circuit breakers shall be bolted in place where possible. Thermal-magnetic breakers shall be calibrated at 40°C or ambient compensated. Ampere ratings, frame sizes, and short circuit ratings shall be as indicated on the drawings. Series ratings may be applied only where specifically indicated on the drawings. Individual enclosures shall be NEMA 1 indoors, 3R outdoors, unless otherwise indicated. Other circuit breakers shall be suitable for installation in Switchboards, Panelboards, and Motor Control Centers as hereinafter specified.
- c. Single-pole 15 and 20 amp circuit breakers shall be SWD rated.
- d. Fuses shall be the non-renewable, time delay, cartridge type, UL Class RK5 unless otherwise indicated; for installation in Safety

Switches, Panelboards, Switchboards, and/or Motor Control Centers as hereinafter specified.

1.2 SWITCHING EQUIPMENT:

- a. Fusible switches shall be incorporated into Safety Switches, as hereinafter specified. Manual operation shall be quick-make and quick-break. Fuse holders shall be the Class R rejection type unless otherwise indicated.
- b. Safety Switches shall be the NEMA heavy duty type, horsepower rated, with interlocked covers, non-fusible except where fused switches are indicated or fuses are required. Switch mechanisms shall be quick-make and quick-break. Enclosures shall be NEMA 1 indoors, NEMA 3R outdoors unless otherwise indicated. Fuse holders, where required, shall be as specified above for fusible switches.
- c. Switches for disconnecting small single-phase motors and appliances shall comply with SECTION 16150. WIRING DEVICES.

2.1 INSTALLATION:

- a. Distribution Equipment shall be installed in strict accordance with the manufacturer's instructions for handling, support, connections, assembly, protection, energization, adjustment, and similar procedures.
- b. Fastening methods shall comply with SECTION 16100. BASIC MATERIALS AND METHODS.
- c. Floor mounted equipment such as Switchboards, Motor Control Centers, and Dry-Type Transformers shall be provided with 4" high concrete pads and shall be secured to the concrete pad. Pads shall have a 3/4 inch chamber on each accessible side.
- d. Equipment interiors shall be thoroughly cleaned of dust, dirt, trash, and other foreign material prior to energization of the equipment.
- e. Exterior Safety Switches that are readily accessible to unauthorized persons shall have their covers padlocked closed by the Contractor. Keys shall be identified and delivered to the Owner.
- f. Upon completion of the project, furnish to the Owner one complete set of replacement fuses, consisting of three fuses of each type and rating used.
- g. Directory cards for Panelboards and for group mounted Switchboard sections shall be neatly filed-in with a typewriter to indicate the type and location of the load on each circuit or feeder.



**MCKNIGHT • SMITH
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JOB NUMBER	REVISION DATES	REVISION DESCRIPTION
21-098		
DESIGNED BY		
CHECKED BY		
DATE		

**MIDLAND ELEMENTARY
3011 NICHOLS HWY
GALIVANTS FERRY, SC, 29544
HVAC RENEWAL**

SPECIFICATIONS