
SECTION 5
SPECIFICATIONS

SECTION 011100 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 LOCATION OF THE PROJECT

- A. The project is located in the City of Barberton, Summit County, Ohio. The project site is the Sludge De-Watering Building, located within the Barberton Wastewater Treatment Plant (WWTP) located at 5987 South Van Buren Avenue, Barberton, Ohio 44203.

1.2 PROJECT DESCRIPTION

- A. The bid documents contain bid forms for one (1) Contract.
- B. The project consists of the following Scope of Work:
 - 1. General Requirements:
 - a. Full time project supervision.
 - b. Governmental safety requirements.
 - c. Structural engineering review and design for new anchor bolts into existing concrete piers.
 - d. Building permits.
 - e. Sanitary facilities.
 - f. Construction waste management & disposal.
 - g. All existing interior equipment and offices on the main building level will be protected by scaffolding covered in a plywood deck and reinforced poly.
 - h. Existing exterior conveyor immediately adjacent to and penetrating the existing building will be protected by scaffolding covered in a plywood deck.
 - 2. Existing Conditions:
 - a. Demo the entire existing Butler® steel building system including all structural steel frames, wall girts, roof purlins, wall sheathing, wall liner panels, interior Butler® walls including support columns and wall sub-structurals.
 - b. Remove all exterior man doors and roll-up doors.
 - c. Remove all interior plumbing (piping & fixtures) supported or attached to the existing building.
 - d. Remove all interior HVAC (piping & fixtures) supported or attached to the existing building.
 - e. Remove all interior electrical (lighting & wiring) supported or attached to the existing building.
 - f. Remove existing (2) mono-rail cranes and (1) bridge crane.
 - g. Existing small building addition on south side to remain as is (no work included).
 - 3. Concrete:
 - a. All existing foundations are assumed to be in adequate condition to accept a new building system. The new building system will utilize the existing concrete foundation piers.
 - b. New anchor bolts will be core drilled into the existing concrete piers and epoxied into place.

4. Openings:
 - a. Install (3) exterior man doors into existing locations.
 - 1) Welded 16GA. 316 #4 finish stainless steel frames.
 - 2) 16GA. 316 #4 finish stainless steel doors.
 - 3) Door hardware (Hinges, exit devices, closers, gasketing, sweeps & thresholds).
 - b. Install (4) exterior 12'x12' galvanized steel insulated rolling doors with motor operators.
 - c. Install (3) interior man doors into existing locations.
 - 1) Welded 16GA. 316 #4 finish stainless steel frames.
 - 2) 16GA. 316 #4 finish stainless steel doors.
 - 3) Door hardware (Hinges, exit devices, & closers).
5. Special Construction:
 - a. Erect pre-engineered steel building system.
 - 1) Galvanized steel frames.
 - 2) Galvanized & acrylic coated 8 1/2" steel wall girts and roof purlins.
 - 3) Galvanized & acrylic coated 24GA. roof panel system.
 - a) R25.2 rigid insulation.
 - b) 24GA roof liner panel.
 - 4) 26GA. Shadowwall exterior KYNAR wall panels
 - a) R19 fiberglass insulation w/ vinyl scrim vapor barrier
 - b) 26GA full height wall liner panels.
 - 5) Trims, & gutter/downspout system.
 - a) Downspouts tie into the existing storm system.
6. Plumbing:
 - a. Demo all piping necessary to remove the existing building in its entirety.
 - b. Re-install all piping that was removed during the demo phase.
7. Material Processing & Handling Equipment:
 - a. Re-install (3) existing cranes.
8. HVAC:
 - a. Modify, improve and/or replace the HVAC system, per the sketches M-1 thru M-6 located at the end of this specification section.
9. Electrical:
 - a. Electrical installations attached to the structure are to be detached from the building shell to accommodate full building demolition.
 - b. Existing light fixtures (interior & exterior) attached to the building are to be removed and new similar LED fixtures are to be re-installed in equal quantities.
 - c. Re-install all existing electrical circuits and equipment removed for demo in a manner consistent with current code requirements.
 - d. Provide interlocks for all new exhaust and intake fans.
 - e. Install new exit lighting and emergency egress lighting (interior & exterior as required by current code).

10. Temporary Sludge De-Watering – Refer to Specification Section 012100.

1.3 SPECIFICATIONS

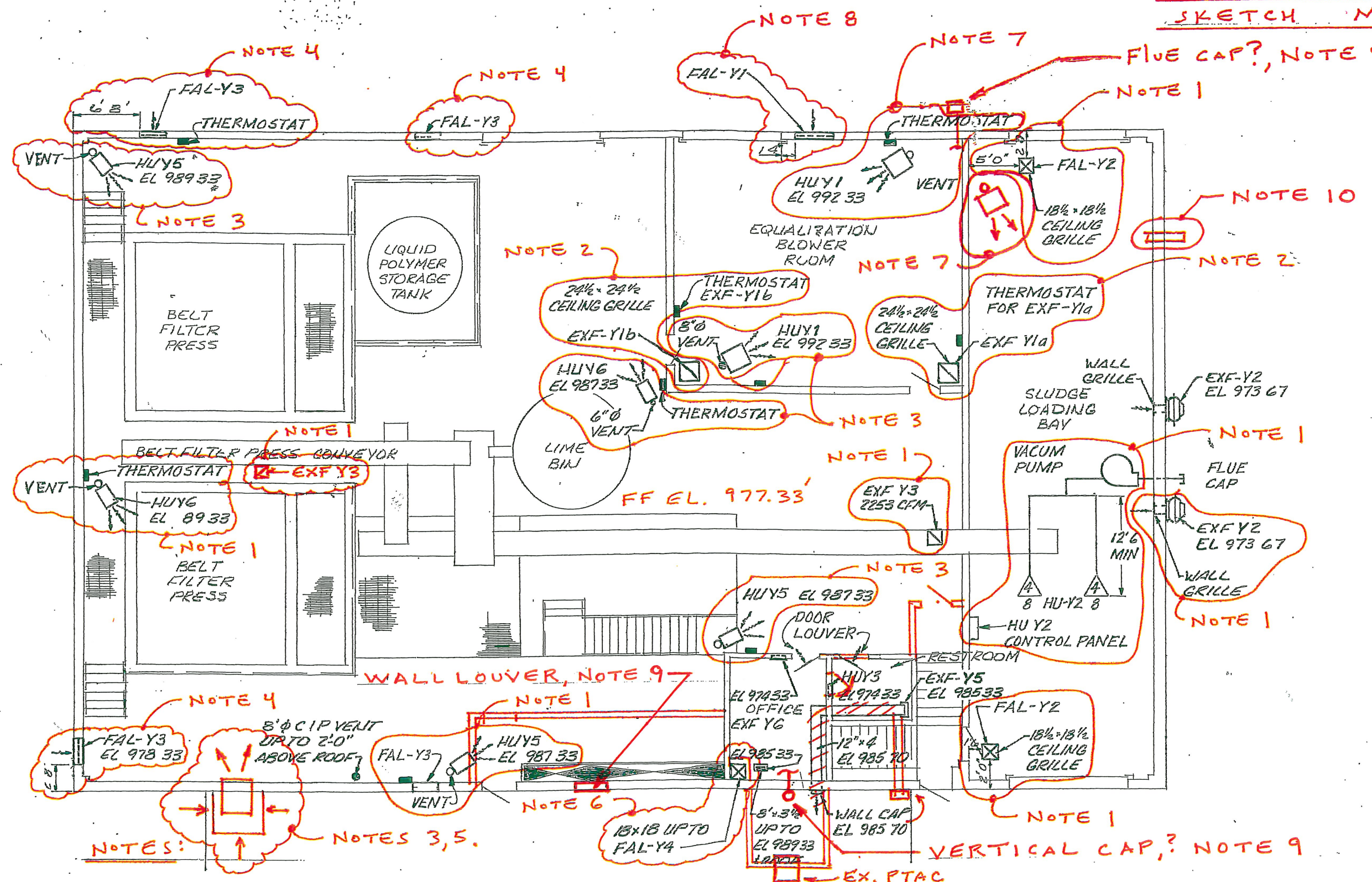
- A. In general, these Specifications describe the work to be performed by the various trades, other than work specifically excluded. It shall be the responsibility of the Contractor and Subcontractors to perform all work incidental to their trade, whether or not specific mention is made of each item, unless such incidentals are included under another Item.
- B. It is advised that the Contractor and all Subcontractors familiarize themselves with the contents of the complete Specifications, particularly for the trades preceding, following, related or adjacent to their work.

END OF SECTION 011100

HVAC DEMOLITION PLAN

SCALE: 3/32" = 1'-0" ±

SKETCH M-1



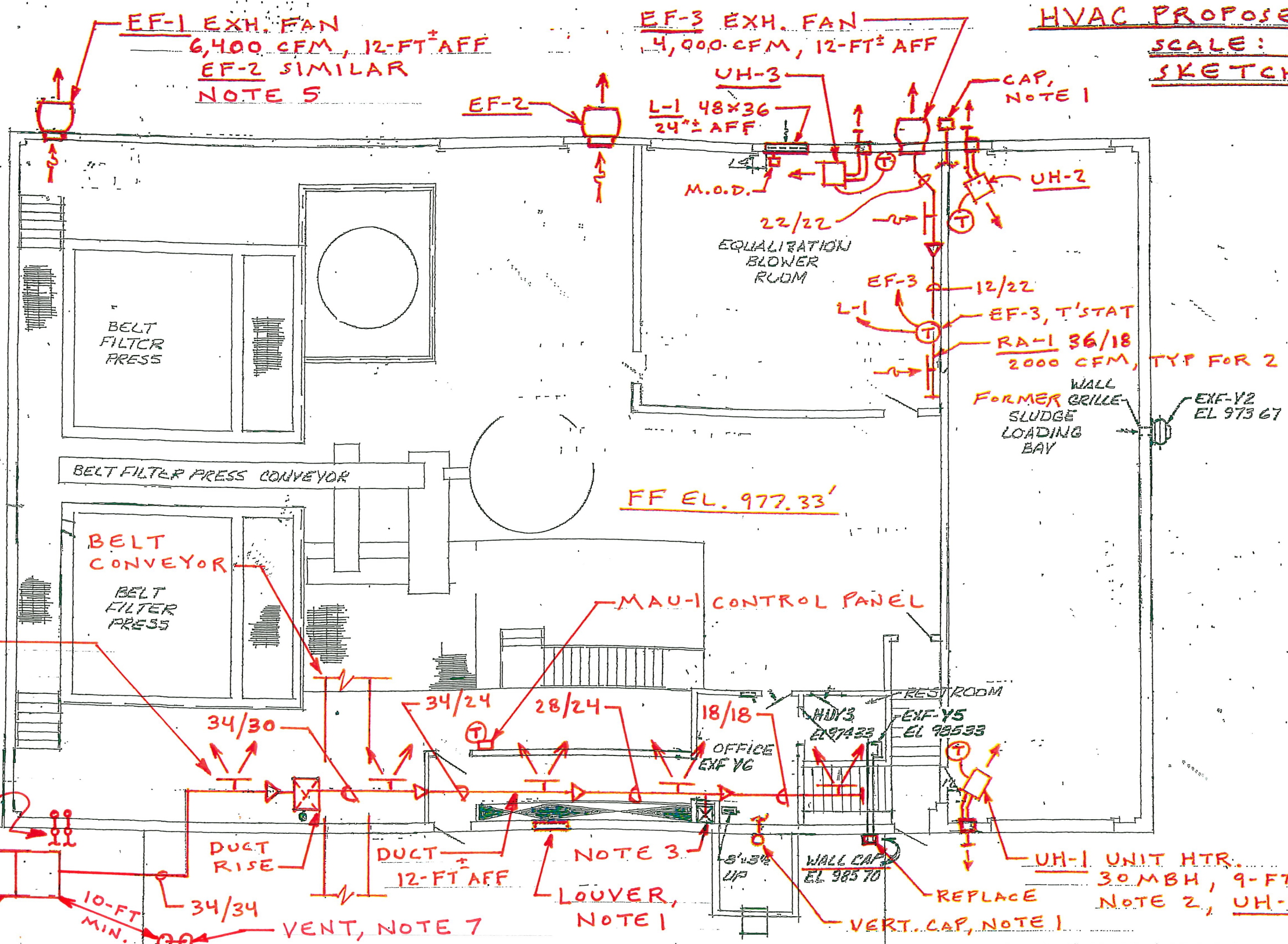
NOTES: NOTES 3, 5.

1. EQUIP PREVIOUSLY DEMOLISHED. CONFIRM.
2. REMOVE ROOF MTD EXHAUST FAN SYSTEM.
3. REMOVE GAS-FIRED UNIT HEATER SYSTEM.
4. REMOVE WALL MTD LOUVER SYSTEM.
5. REMOVE HEATER ENCLOSURE SYSTEM.
6. REMOVE ROOF MTD INTAKE HOOD, & DAMPER, DUCT TO LOWER LEVEL TO BE REPLACED.
7. REMOVE & REPLACE GAS-FIRED UNIT HEATER SYSTEM.
8. REMOVE & REPLACE WALL MTD LOUVER SYSTEM.
9. CONFIRM WHETHER OR NOT FUNCTIONING? NEEDED?
10. REMOVE ABANDONED FLUE.

HVAC PROPOSED PLAN

SCALE: 3/32" = 1'-0" ±

SKETCH M-2



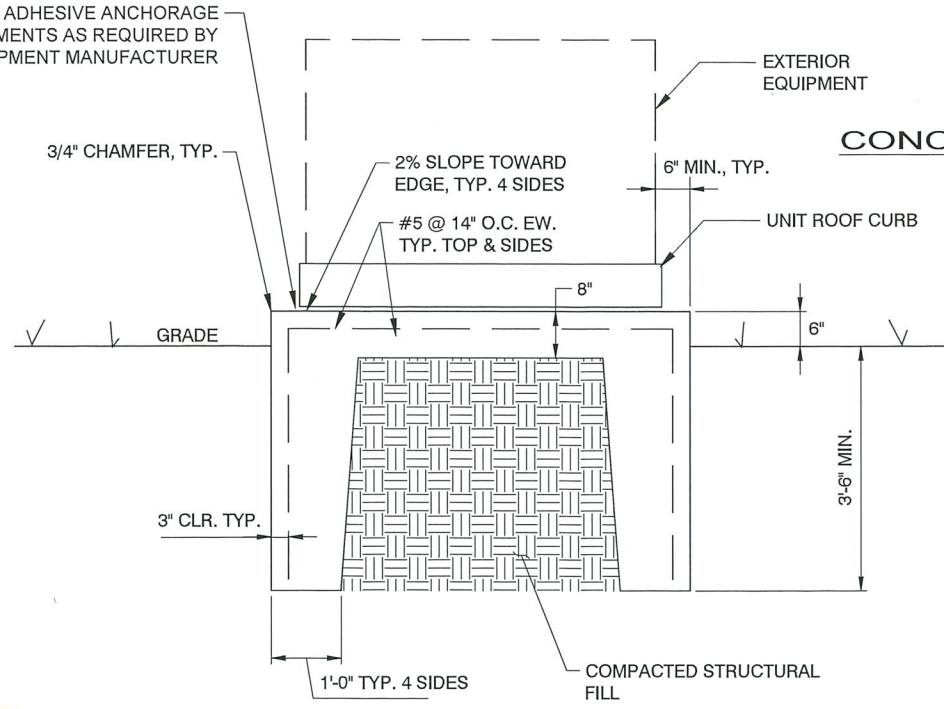
SA-1 36x16
2,560 CFM
TYP. FOR 5
NOTE 6

CONFIRM EX.
ELEC. THIS AREA

MAU-1
MAKEUP AIR UNIT
15,200 CFM
NOTE 4

- NOTES:**
1. CONFIRM IF FUNCTIONING; NEEDED?
 2. SUSPEND HEATER SIMILAR TO EXISTING. PROVIDE VENT + COMB. AIR TO SIDEWALL TERMINAL.
 3. CONNECT NEW DUCT TO EX. 18/18 SERVING LOWER LEVEL, 2400 CFM. SEE SKETCH M-3.
 4. INSTALL MAU-1 ON CONCRETE PAD. SEE SKETCH M-3 FOR CONCRETE PAD DETAIL AND NATURAL GAS PIPING SYSTEM MODIFICATIONS.
 5. PROVIDE 3/4" STAINLESS STEEL FRAMED SCREEN AT FAN INLET.
 6. SPACE THE (5) SA-1 REGISTERS EQUALLY APART: 14.5-FT ±.
 7. MAINTAIN 10-FT MIN. CLEARANCE FROM SLUDGE TANK OPEN VENT.

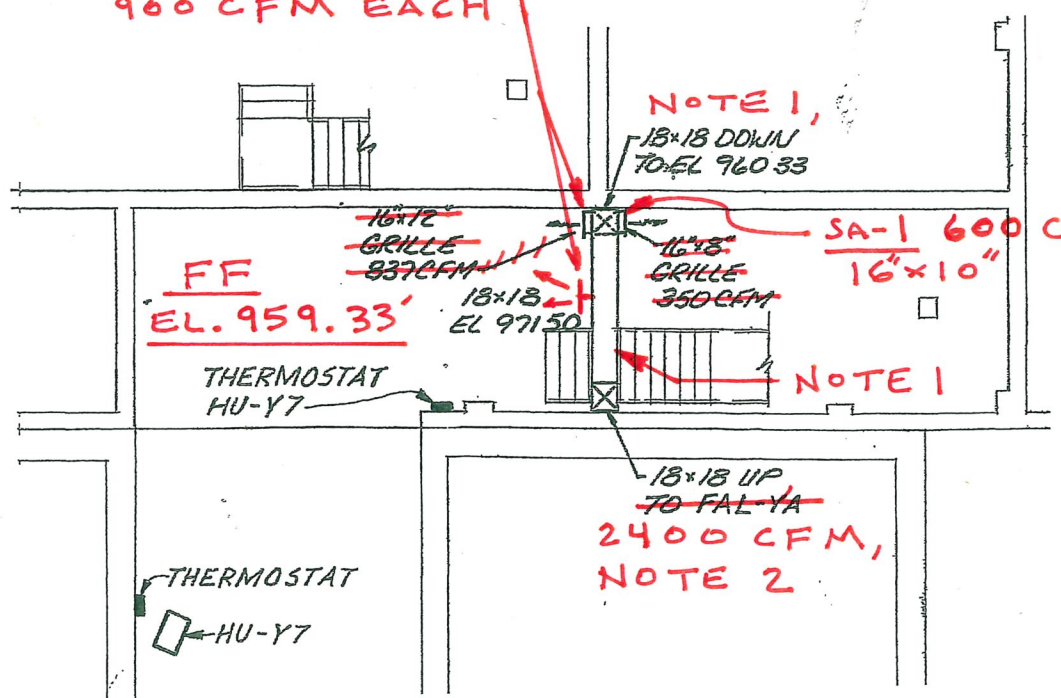
PROVIDE ADHESIVE ANCHORAGE EMBEDMENTS AS REQUIRED BY EQUIPMENT MANUFACTURER



**MAU-1 MAKEUP AIR UNIT:
CONCRETE PAD/FOUNDATION DETAIL**
NOT TO SCALE

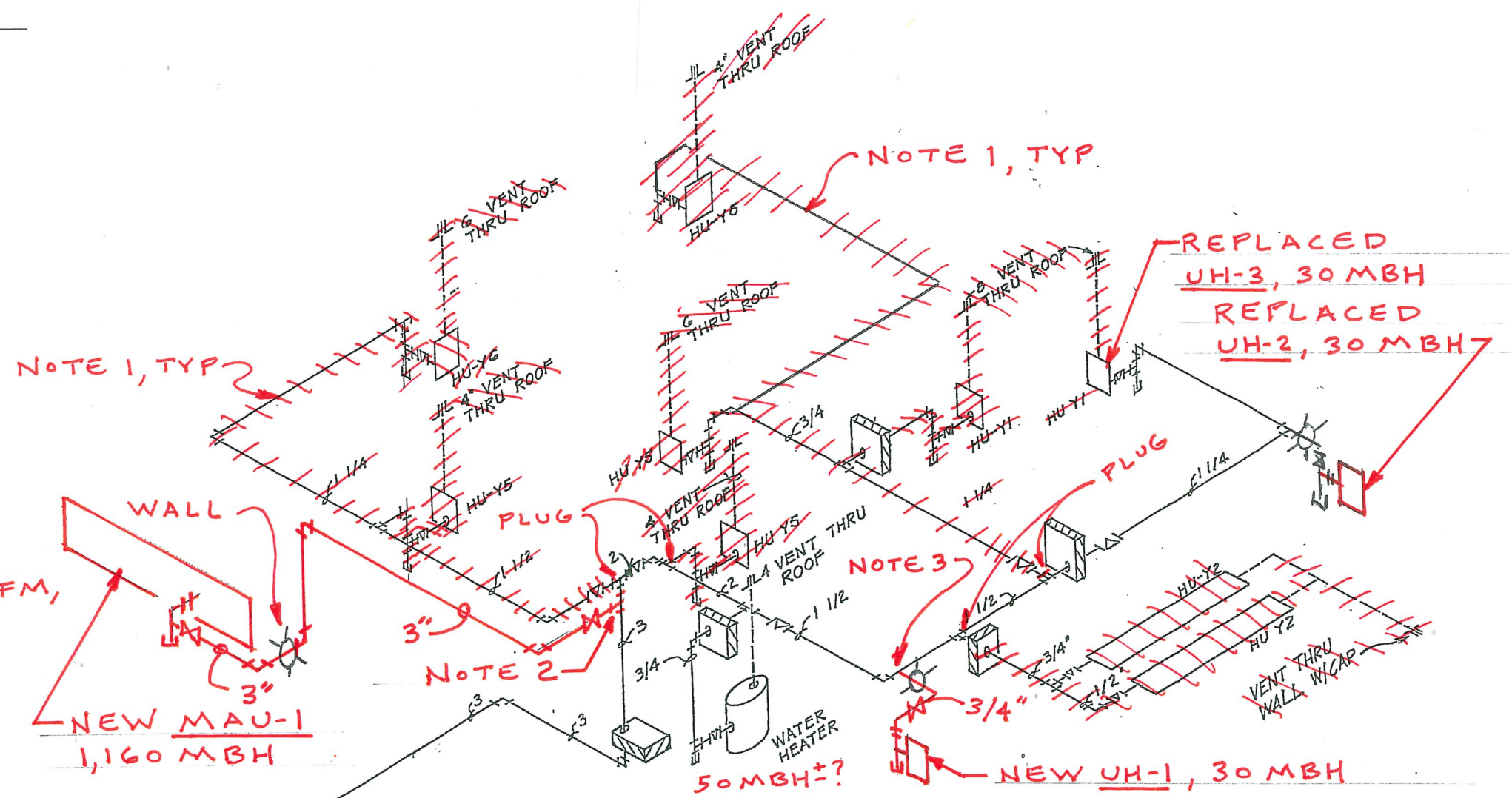
DETAILS
SKETCH M-3

SA-1 16" x 16"
900 CFM EACH



PARTIAL LOWER LEVEL PLAN 3/32" = 1'-0" ±

1. REPLACE EXPOSED DUCTS + GRILLES.
2. REPLACE DUCT IN CHASE, IF FEASIBLE.



NATURAL GAS DIAGRAM
SLUDGE DEWATERING BUILDING

NOTES:

1. DEMO ALL GAS PIPING NOT BEING USED/RE-USED.
2. CONNECT TO EX. 3", + EXTEND NEW 3" GAS TO MAU-1.
3. CONNECT TO EX. 1.5", + EXTEND NEW 3/4" GAS TO UH-1.

VENTILATION SCHEDULE																								
LOCATION	MARK	MOUNTING	SPEED		CFM	S.P. INCHES	MAX. RPM	HORSEPOWER	VOLTAGE	PHASE	MAKE AND MODEL			LOUVER	BIRDSCREEN	GRAVITY	MOTOR OPER	SHUTTER	FINISH	SWITCH	SPEED CONTROLLER	DETAIL NUMBER	QUANTITY	REMARKS
			CONSTANT	VARIABLE							MANUFACTURER	MODEL	SIZE											
SLUDGE DEWATERING BUILDING "Y"																								
BLOWER ROOM	EXF-Y1	ROOF	⊙		5000	0.5	900	1	460	3	COOK	ACRU-B	225R7B		⊙	⊙				⊙			2	THERMOSTATICALLY CONTROLLED
	FAL-Y1	WALL	⊙		10000	0.16	-	-	120	1	AIROLITE	K6776/T663E	48x60	⊙	⊙	⊙	⊙						1	INTERCONNECT TO EXFY1
SLUDGE LOADING BAY	EXF-Y2	WALL	⊙		900	1/4	1200	1/6	120	1	COOK	ACW-D	120W10D		⊙	⊙	⊙			⊙			2	INTERCONNECT TO FALY2
	FAL-Y2	ROOF	⊙		900	0.02	-	-	120	1	COOK	VI	18x18*		⊙	⊙	⊙						2	*THROAT DIMENSION
DEWATERING AREA	EXF-Y3	ROOF	⊙		2100	1/8	1200	1/3	120	1	COOK	ACE-D	150C10D		⊙	⊙	⊙			⊙			2	INTERCONNECT TO FALY3
	FAL-Y3	WALL	⊙		1100	0.12	-	-	120	1	AIROLITE	K6776/T663E	32x20	⊙	⊙	⊙	⊙						4	
PUMP & GALLERY	EXF-Y4	ROOF	⊙		1300	1/8	1200	1/6	120	1	COOK	ACE-D	135C17D		⊙	⊙	⊙			⊙			1	INTERCONNECT TO FALY4
	FAL-Y4	ROOF	⊙		1300	0.06	-	-	120	1	COOK	VI	18x18		⊙	⊙	⊙						1	*THROAT DIMENSION
TOILET	EXF-Y5	CEIL	⊙		100	0.2	1600	35W	120	1	COOK	GEMINI	4-15			⊙			⊙				1	DUCT TO WALL CAP
OFFICE	EXF-Y6	CEIL	⊙		100	0.2	1600	35W	120	1	COOK	GEMINI	4-15			⊙			⊙				1	DUCT TO ROOF CAP

NOTE: THESE SCHEDULES ARE FROM 1986, & FOR REFERENCE ONLY; TO GENERALLY INDICATE WHAT WAS, OR WHAT IS THERE.

HEATING UNIT SCHEDULE																
LOCATION	MARK	TYPE	QUANTITY	MANUFACTURER	MODEL	CAPACITY		FAN DATA			ELECTRICAL		DISCONNECT SWITCH	OVER-PLAT SWITCH	REMOTE THERMOSTAT	REMARKS
						MIN BTU INPUT	MIN BTU OUTPUT	MIN CFM	MAX RPM	MAX HP	VOLTS	PHASE				
SLUDGE DEWATERING BUILDING "Y"																
BLOWER ROOM	HUY1	GAS	2	HASTING	F50	50000	37500	500	1200	1/40	120	1	⊙	⊙	⊙	
SLUDGE LOAD'G BAY	UY2	GAS	2	CO RAY VAC	CRV A4	40000	37500	-	-	-	120	1	⊙	⊙	⊙	W/ STANDARD REFLECTORS
TOILET	HUY3	ELEC	1	CHROMALOX	AWH4204	5120	5120	170	-	-	240	1	⊙	⊙	⊙	INTEGRAL THERMOSTAT
OFFICE	HUY4	ELEC	1	CHROMALOX	AWH4204	5120	5120	170	-	-	240	1	⊙	⊙	⊙	INTEGRAL THERMOSTAT
DEWATERING AREA	HUY5	GAS	3	HASTING	F50	50000	37500	500	1200	1/40	120	1	⊙	⊙	⊙	
	HUY6	GAS	2	HASTING	F100	100000	76000	1230	1200	1/15	120	1	⊙	⊙	⊙	
PUMP ROOM	HUY7	ELEC	1	CHROMALOX	MUH10 4	34100	34100	650	1600	1/30	460	3	⊙	⊙	⊙	
PIPE GALLERY	HUY8	ELEC	1	CHROMALOX	MUH10 4	34100	34100	650	1600	1/30	460	3	⊙	⊙	⊙	

HVAC EQUIPMENT SCHEDULE

SYMBOL	QUANT.	AREA SERVED	DESCRIPTION	ACCESSORIES	ELECTRICAL REQUIREMENTS
MAU-1	1	SLUDGE DEWATERING AREA	<p>GREENHECK #DGX-P127-H32-MF3 MAKEUP AIR UNIT DIRECT-FIRED, NATURAL GAS, OUTDOOR, HORIZONTAL DISCHARGE, RIGHT HAND ACCESS AND CONNECTIONS, DIRECT-DRIVE, MIXED-FLOW FAN WITH VARIABLE FREQUENCY DRIVE (VFD), SECTIONS: FAN, BURNER, FILTERS, INTAKE HOOD. APPROX. DIM'S: 171"L x 52"W x 49"H, APPROX. WEIGHT: 1,690#±</p> <p>15,200 CFM @ 0.75" EXTERNAL STATIC PRESSURE, 2.54" TOTAL S.P., 10.88 BHP, **1,160 MBH INPUT, 1,067 MBH OUTPUT, 65°F ΔT AT 92% EFF., **7" BURNER OPERATING PRESSURE, 30:1 TURNDOWN RATIO, 32 SONES, 82 dBA, 93 Lwa</p> <p>**NOTE: INPUT/OUTPUT ARE ACTUAL AMOUNTS BASED UPON 7" BURNER OPERATING PRESSURE. BURNER CAPACITY MAY NEED TO BE INCREASED ACCORDINGLY (APPROX. 1,606 MBH INPUT, 1,477 MBH OUPUT) FOR A BURNER NORMALLY INTENDED TO RUN ON 14" GAS PRESSURE (DE-RATED).</p>	<p>DOUBLE WALL CONSTRUCTION (1" INSULATION): FAN AND HEAT SECTIONS HINGED ACCESS DOORS HI-PRO POLYESTER COATING: ENTIRE UNIT AND ALL ACCESSORIES INLET HOOD WITH BIRDSCREEN V-BANK FILTER SECTION WITH: 2" THICK, PLEATED, MERV-13 DISP. FILTERS INLET DAMPER, WITH END SWITCH CUSTOM REMOTE CONTROL PANEL, NEMA 4X, SEE NOTE 3. DISCHARGE AIR TEMPERATURE CONTROLS, WITH ROOM OVERRIDE THERMOSTAT FREEZE PROTECTION HEATING INLET AIR SENSOR DIRTY FILTER SENSOR/SWITCH EXHAUST FAN STARTERS (EF-1,2 480/3, 1.5 HP) WITH CURRENT SENSING RELAYS SUPPLY FAN CURRENT SENSING RELAY HIGH/LOW GAS PRESSURE SWITCHES FM COMPLIANT GAS TRAIN FLAME FAILURE ALARM LIGHT TEFC MOTOR, PREMIUM EFFICIENCY 12" ROOF CURB</p>	<p>460/3/60 15 HP 34.6 MCA</p>
EF-1,2	2	SLUDGE DEWATERING AREA	<p>GREENHECK #CUBE-220 EXHAUST FAN SPUN ALUMINUM, SIDE-WALL MOUNTED, 22"Ø CENTR. IMPELLER, BELT DRIVE, APPROX. WEIGHT 171 LBS, 6,400 CFM @ 0.125" S.P., 833 RPM, 1.34 BHP, 19 SONES, 70 dBA, 82 Lwa</p>	<p>TYPE-B SPARK RESISTANT ALUMINUM RUB RING TEFC MOTOR HI-PRO POLYESTER COATING DISCONNECT SWITCH, NEMA 4X STAINLESS STEEL BIRDSCREEN GALVANIZED WALL BRACKET, COATED</p>	<p>460/3/60 1.5 HP</p>
EF-3	1	BLOWER ROOM	<p>GREENHECK #CUBE-180 EXHAUST FAN SPUN ALUMINUM, SIDE-WALL MOUNTED, 18"Ø CENTR. IMPELLER, BELT DRIVE, APPROX. WEIGHT 128 LBS, 4,000 CFM @ 0.30" S.P., 1,143 RPM, 0.94 BHP, 16.8 SONES, 68 dBA, 80 Lwa</p>	<p>HI-PRO POLYESTER COATING DISCONNECT SWITCH, NEMA 3R TEFC MOTOR STAINLESS STEEL BIRDSCREEN GALVANIZED WALL BRACKET, COATED</p>	<p>460/3/60 1 HP</p>
UH-1	1	BLOWER ROOM	<p>REZNOR #UDZ-30 UNIT HEATER NATURAL GAS, SEPARATED COMBUSTION, 7" WC BURNERS, APPROX. WEIGHT 58 LBS, 30,000 BTH INPUT, 24,600 BTH OUTPUT, 456 CFM</p>	<p>HORIZONTAL COMBUSTION AIR-VENT KIT 24V WALL THERMOSTAT TOTALLY ENCLOSED FAN MOTOR</p>	<p>115/1/60 1.9 FLA 15A MOC</p>

PROPOSED HVAC SCHEDULES SKETCH M-5

- NOTES:**
1. QUANTITIES ARE SHOWN FOR GENERAL REFERENCE ONLY. CONTRACTOR IS RESPONSIBLE TO PROVIDE ALL EQUIPMENT SHOWN ON PLANS AND DETAILS.
 2. CHARACTERISTICS (RPM, HP, IMPELLERØ, PRESSURE DROP) SHALL NOT VARY BY MORE THAN 10% OF SPEC'D UNITS. SOUND VALUES SHALL NOT EXCEED THE VALUES INDICATED.
 3. SURFACE MOUNTED REMOTE CONTROL PANEL, WITH NEMA 4X ENCLOSURE, AND ENGRAVED IDENTIFICATION COVER, SHALL INCLUDE BUT NOT BE LIMITED TO THE FOLLOWING COMPONENTS:
 - A. SYSTEM ENABLE SWITCH AND INDICATING LIGHT.
 - B. SUPPLY FAN OPERATION INDICATING LIGHT.
 - C. HEAT OPERATION INDICATING LIGHT.
 - D. DIRTY FILTER INDICATING LIGHT.
 - E. SAFETY-LOCKOUT (FLAME FAILURE) INDICATING LIGHT.
 - F. SUPPLY AIR TEMPERATURE SETPOINT DIAL.
 - G. ROOM OVERRIDE THERMOSTAT.

LOUVER AND AIR GRILLE SCHEDULE

SYMBOL	DESCRIPTION
L-1: BLOWER ROOM	<p>GREENHECK #ESD-635 EXTRUDED ALUMINUM WALL LOUVER, STATIONARY, DRAINABLE, ALL WELDED CONSTRUCTION, 6" CHANNEL FRAME, .081" THICK FRAME, AND .081" DRAINABLE BLADES, WITH 3/4" ALUM. BIRDSCREEN, 70% KYNAR COATING (COLOR BY OWNER).</p> <p>WITH #ICD-44 INSULATED CONTROL DAMPER: ALUMINUM, 5" FRAME, INSULATED AIRFOIL BLADES, LOW LEAKAGE CLASS 1A, BLADE & JAMB SEALS, SINGLE FLANGE, WITH 120-VOLT 2-POSITION ELECTRIC OPERATOR.</p>
SA-1	<p>PRICE #620-L ALUMINUM SUPPLY REGISTER, TYPE #F SURFACE MOUNT FRAME, DOUBLE DEFLECTION, 3/4" BLADE SPACING, ALUMINUM DAMPER, ALUMINUM COLOR PAINT</p>
RA-1	<p>PRICE #630-L ALUMINUM RETURN REGISTER, TYPE #F SURFACE MOUNT FRAME, SINGLE DEFLECTION, 3/4" BLADE SPACING, ALUMINUM DAMPER, ALUMINUM COLOR PAINT</p>

HVAC SPECIFICATIONS

1. GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 1 SPECIFICATION SECTIONS OF THE CONTRACT APPLY TO ALL WORK ON THIS DIVISION.
PROVIDE ALL EQUIPMENT INDICATED, LABOR, MATERIALS, TOOLS, ETC. REQUIRED FOR COMPLETE, FULLY ADJUSTED AND READY-TO-USE MECHANICAL SYSTEMS IN ACCORDANCE WITH THE INTENT OF THE PLANS. ALL MECHANICAL WORK SHALL COMPLY WITH THE OHIO BUILDING CODE, OHIO MECHANICAL AND PLUMBING CODES, LOCAL DEPARTMENT OF HEALTH REGULATIONS, FUEL GAS CODE, ALL APPLICABLE LOCAL CODES, NFPA STANDARDS NO. 90A, 54 AND 70, THE PLANS PROVIDED AND ACCEPTED ENGINEERING PRACTICES.
THE MOST STRINGENT CODE OR STANDARD SHALL APPLY. THE CONTRACTOR SHALL ENSURE THAT ALL WORK IS PERFORMED IN ACCORDANCE WITH OSHA SAFETY RULES AND REGULATIONS. DRAWINGS INDICATE SIZE AND APPROXIMATE LOCATION OF VARIOUS WORK AND ARE TO BE USED AS GENERAL GUIDE FOR INSTALLATION. THE CONTRACTOR IS RESPONSIBLE FOR INSPECTING PROPOSED CONSTRUCTION SITE AND BECOMING AWARE OF ALL CONDITIONS AFFECTING THIS WORK, REGARDLESS OF THE DETAILS SHOWN ON THE PLANS, PRIOR TO BIDDING THE JOB. CONTACT THE ENGINEER WHEREVER ANY CLARIFICATION OF THE PLANS OR SPECIFICATIONS IS REQUIRED.
2. NATURAL GAS PIPING SHALL BE SCHEDULE 40, BLACK STEEL, SEAMLESS PIPE PER ASTM A53, INSTALLED IN ACCORDANCE WITH THE INTERNATIONAL FUEL GAS CODE.
PIPE SIZES 3" AND LARGER SHALL HAVE WELDED CONNECTIONS WITH WROUGHT IRON FITTINGS. PIPE SIZES 2" AND LESS SHALL HAVE THREADED MALLEABLE IRON FITTINGS.
PROVIDE A GAS VALVE, UNION, AND DIRT LEG AT EQUIPMENT CONNECTIONS.
ALL PIPING SYSTEMS SHALL BE TESTED IN ACCORDANCE WITH THE INTERNATIONAL FUEL GAS CODE.
 - A. GAS VALVES: EXTERIOR VALVES SHALL BE ASME B16.33, 125 PSI, BRONZE PLUG VALVE WITH THREADED CONNECTIONS, WITH CORROSION RESISTANT COATING.
INTERIOR VALVES: AGA APPROVED FULL PORT BALL VALVES, CONFORMING TO ASME B16.44 ARE ACCEPTABLE FOR 2 PSI OR LESS. METAL LEVER HANDLES SHALL BE PROTECTED WITH VINYL GRIP.
 - B. IDENTIFICATION: ALL GAS PIPING SHALL BE PAINTED (RED PER 10 STATES STANDARDS), WITH 2 COATS OF RUST INHIBITIVE EPOXY COATING. ALL GAS PIPING SHALL BE PROVIDED WITH PIPE LABELS OVER THE PAINTING. LABELS SHALL BE PRECOILED SEMIRIGID PLASTIC, FORMED TO FULLY COVER CIRCUMFERENCE OF PIPE.
3. PROVIDE ALL HVAC EQUIPMENT INDICATED ON THE PLANS AND SCHEDULES. ALL EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
4. ALL DUCTWORK SHALL BE ALUMINUM SHEETS, ASTM B209, ALLOY 3003, TEMPER H14, WITH MILL FINISH, CONSTRUCTED AND INSTALLED PER ASHRAE AND SMACNA STANDARDS.
ALL ELBOWS SHALL HAVE RADIUS/HEIGHT RATIO OF 1.5 MINIMUM OR CONTAIN TURNING VANES. TAKE-OFF FITTINGS SHALL BE 1.5 TIMES THE BRANCH AREA.
 - A. ALL DUCTS TO HAVE JOINTS SEALED WITH UNITED DUCT SEALER AS MANUFACTURED BY UNITED MCGILL CORP. WITH U.L. CLASSIFICATION #15 FLAME SPREAD AND #20 SMOKE RATING OR APPROVED EQUAL. STATIC PRESSURE CLASS TO BE 1.0" OR AS INDICATED. DUCT SEAL CLASS FOR SUPPLY AND EXHAUST DUCTS TO BE TYPE "A", ALL TRANSVERSE JOINTS LONGITUDINAL SEAMS, AND DUCT WALL PENETRATIONS.
 - B. PROVIDE DUCT ACCESSORIES AS INDICATED ON THE PLAN AND IN ACCORDANCE WITH OMC. CONNECT ALL SHEET METAL DUCT WORK TO MOTOR DRIVEN DEVICES WITH FLEXIBLE NEOPRENE COLLARS. FASTEN WITH STEEL ANGLES TO ACHIEVE AIRTIGHT JOINTS.
 - C. DUCT INSULATION: ALL EXTERIOR SUPPLY AIR DUCTS TO BE INSULATED WITH 2" THICK RIGID FIBERGLASS BOARD INSULATION WITH ALL SERVICE JACKET. INSULATION TO INCLUDE AN ADDITIONAL FIELD APPLIED ALUMINUM JACKET; ASTM B209, 0.024" THICK, WITH PAINTED CORRUGATED (CROSS-CRIMPED) FINISH.
5. BALANCING SHALL BE PERFORMED ON ALL HVAC AIR SYSTEMS.
BALANCING SHALL BE PERFORMED BY CERTIFIED BALANCING CONTRACTOR. SUBMIT TWO COPIES OF BALANCE REPORT UPON COMPLETION. INCLUDE A COPY OF BALANCE REPORT IN OPERATION AND MAINTENANCE MANUALS.
6. FLUES AND VENTS: ALL WORK SHALL COMPLY WITH THE INTERNATIONAL FUEL GAS CODE.
SINGLE WALL VENTS SHALL BE GALVANIZED STEEL, AND SEALED FOR POSITIVE PRESSURE. DOUBLE WALL VENTS SHALL BE TYPE-B, WITH ALUMINUM ALLOY INNER WALL, MINIMUM 1/4" AIRSPACE, AND GALVANIZED STEEL OUTER WALL, AS MANUFACTURED BY SELKIRK, METAL-FAB, HEAT-FAB, OR EQUAL. INSTALLATION SHALL BE COMPLETE WITH ACCESSORY FITTINGS, ELBOWS, FLASHINGS, STORM COLLARS, SUPPORT ASSEMBLIES, THIMBLES, BIRDPROOF TOP, ETC.
7. HANGERS AND SUPPORTS: ALL HANGERS, SUPPORTS, HARDWARE, ETC. SHALL BE CORROSION RESISTANT; HOT-DIPPED GALVANIZED STEEL OR GREEN EPOXY COATED.
PROVIDE ALL DUCTS, PIPES, EQUIPMENT, ETC., WITH APPROPRIATE HANGERS, SUPPORTS, CURBS, ETC., AS REQUIRED TO ENSURE A SAFE AND PERMANENT INSTALLATION IN ACCORDANCE WITH ACCEPTED ENGINEERING PRACTICES. INSTALL EQUIPMENT LEVEL WITHIN THE MANUFACTURER'S TOLERANCES.

8. PROVIDE APPROPRIATE WALL SLEEVES, THIMBLES, PLATES, ETC., WHEREVER WALLS, FLOORS, ROOFS, ARE PIERCED FOR THE INSTALLATION OF MECHANICAL SYSTEMS. CUTTING AND PATCHING FOR THE INSTALLATION OF MECHANICAL SYSTEMS IS THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR. COORDINATE ALL WORK WITH OTHER TRADES TO AVOID DUPLICATION OF EFFORTS.
9. PROVIDE COMPLETE ELECTRIC AUTOMATIC TEMPERATURE CONTROLS FOR ALL HVAC UNITS AS RECOMMENDED BY THE UNIT MANUFACTURERS. PROVIDE ALL TEMPERATURE CONTROL WIRING. PROVIDE ALL REQUIRED THERMOSTATS, TRANSFORMERS, RELAYS, ETC., AND PERFORM LOW VOLTAGE CONTROL WIRING. ALL WIRING SHALL BE IN CONDUITS. ALL WORK SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE (N.E.C.).
10. CLOSEOUT PROCEDURES:
 - A. ENGAGE A FACTORY AUTHORIZED SERVICE REPRESENTATIVE TO PERFORM START-UP SERVICES FOR MAKE-UP AIR UNIT AND EXHAUST FANS. PROVIDE START-UP SERVICES FOR UNIT HEATERS PER THE MANUFACTURER'S INSTRUCTIONS.
 - B. ENGAGE A FACTORY AUTHORIZED SERVICE REPRESENTATIVE TO TRAIN OWNER'S MAINTENANCE PERSONNEL, OR HIS REPRESENTATIVE, TO ADJUST, OPERATE, AND MAINTAIN DIRECT-FIRED MAKE-UP AIR UNITS AND EXHAUST FANS. TRAIN OWNER'S MAINTENANCE PERSONNEL, OR HIS REPRESENTATIVE, TO ADJUST, OPERATE, AND MAINTAIN UNIT HEATERS.
FURNISH TYPEWRITTEN INSTRUCTIONS FOR OPERATING AND MAINTAINING ALL SYSTEMS AND EQUIPMENT INCLUDED IN THIS CONTRACT IN ACCORDANCE WITH DIVISION 1 SPECIFICATIONS.
 - C. CONTRACTOR SHALL KEEP AN ACCURATE RECORD OF ALL DEVIATIONS FROM CONTRACT DRAWINGS AND SPECIFICATIONS. AT COMPLETION OF JOB AND BEFORE FINAL APPROVAL, MAKE ANY FINAL CORRECTIONS TO DRAWINGS AND SUBMIT "AS-BUILT" DRAWINGS IN ACCORDANCE WITH DIVISION 1 SPECIFICATIONS.

HVAC GENERAL NOTES, SEQUENCE OF OPERATION, AND SPECIFICATIONS SKETCH M-6

HVAC GENERAL NOTES:

1. DEMOLITION OF HVAC EQUIPMENT AND PIPING TO INCLUDE ALL ANCILLARY HANGERS, SUPPORTS, FLUE SYSTEMS, AND CONTROLS INCLUDING THERMOSTATS, SWITCHES, WIRING/CONDUITS, ETC.
2. COORDINATE EXACT LOCATIONS OF ALL PIPES, DUCTS AND EQUIPMENT, SO AS TO NOT INTERFERE WITH LIGHTS, OVERHEAD DOORS, PROCESS EQUIPMENT, PROCESS PIPING, ETC.
2. ALL INTERIOR AND EXTERIOR HANGERS, RODS, SUPPORTS, CLAMPS, ETC. TO BE CORROSION RESISTANT. SEE SPECIFICATIONS FOR ADDITIONAL INFORMATION.
3. MAKE FINAL GAS CONNECTIONS WITH GAS VALVE, UNION, AND DIRT LEG.
4. ALL MOUNTING HEIGHTS ARE REFERENCED TO THE BOTTOM OF EQUIPMENT, UNLESS NOTED OTHERWISE.
5. PROVIDE TEMPERATURE CONTROL WIRING IN CONDUITS IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE (NEC).
6. FOR ELECTRIC POWER DESIGN, SEE ALLOWANCE IN BASE BID DOCUMENTS FOR ADDITIONAL INFORMATION.

SEQUENCE OF OPERATION

1. MAU-1 MAKEUP AIR UNIT (SLUDGE DEWATERING AREA):
VENTILATION SHALL BE CONTINUOUS, 24 HOURS/DAY, 365 DAYS/YEAR.
MAU-1 SHALL BE INTERLOCKED, CONTINGENT UPON THE OPERATION OF EF-1,2 EXHAUST FANS.
VENTILATION SYSTEM PROVIDES 6 AIR CHANGES PER HOUR, PER 10 STATES STANDARDS AND NFPA 820.

MAU-1 SHALL BE PROVIDED WITH A REMOTE CONTROL PANEL.
REMOTE PANEL SHALL INCLUDE A ROOM OVERRIDE THERMOSTAT, TO INCREASE THE SUPPLY AIR TEMPERATURE UPON A CALL FOR HEAT.

AN ALARM SIGNAL SHALL BE INITIATED SHOULD MAU-1 OR EF-1,2 NOT BE OPERATING (VIA CURRENT SENSING RELAY, ETC).
2. EF-1,2 EXHAUST FANS (SLUDGE DEWATERING AREA):
VENTILATION SHALL BE CONTINUOUS, 24 HOURS/DAY, 365 DAYS/YEAR.
MAU-1 MAKEUP AIR UNIT SHALL BE INTERLOCKED WITH EF-1,2, AS DESCRIBED ABOVE.
3. EF-3 EXHAUST FAN (BLOWER ROOM):
SHALL BE PROVIDED WITH A STARTER (H-O-A) CONTROLS.
IN THE "HAND" POSITION, THE FAN SHALL BE ENERGIZED. IN THE "AUTO" POSITION, THE FAN SHALL BE CONTROLLED VIA A 120V COOLING THERMOSTAT. IN THE "OFF" POSITION, THE FAN IS DE-ENERGIZED.
MOTOR OPERATED DAMPER AT L-1 INTAKE LOUVER SHALL BE INTERLOCKED TO BE OPEN WHEN EF-3 IS ENERGIZED, AND CLOSED WHEN EF-3 IS DE-ENERGIZED.
4. UH-1 UNIT HEATER (BLOWER ROOM):
SHALL BE CONTROLLED VIA A 24V WALL MOUNTED HEATING THERMOSTAT, TO ENERGIZE THE FAN AND GAS-FIRED BURNERS UPON A CALL FOR HEAT.
5. UH-2,3 UNIT HEATERS (FORMER SLUDGE LOADING BAY):
SHALL BE CONTROLLED VIA INDIVIDUAL 24V WALL MOUNTED HEATING THERMOSTAT, TO ENERGIZE THE FAN AND GAS-FIRED BURNERS UPON A CALL FOR HEAT.

SECTION 011419 – USE OF SITE

PART 1 - GENERAL

1.1 GENERAL

- A. The Contractor will be allowed the use of as much of the site designated for the improvements as is necessary for his operation.

1.2 USE OF STREETS

- A. The Contractor shall repair at no cost to the Owner, all existing roads, parking areas, grassed areas that are damaged due to the execution of his work. The Contractor shall remove daily all mud, soil and debris that may be tracked onto existing streets, drives, or walks by his equipment or that of subcontractors or suppliers.

1.3 CLOSING STREETS TO TRAFFIC

The Contractor may with the approval of the Engineer, close streets, or parts of streets, to vehicular traffic. The streets are to remain closed as long as the construction work or the condition of the finished work requires or as determined by the Engineer. The Engineer shall be the judge of how many streets or parts of streets it is necessary for the Contractor to close at any time, and may refuse to permit the closing of additional streets to traffic until the majority of the work on the closed streets is completed and they are opened to traffic.

1.4 RIGHTS-OF-WAY

- A. Whenever it is required to perform work within the limits of public or private property or in rights-of-way, such work shall be done in conformity with all agreements between the Owner and the owners of such. Care shall be taken to avoid injury to the premises entered, which premises shall be left in a neat and orderly condition by the removal of rubbish and the grading of surplus materials, and the restoration of said public or private property to the same general conditions as pertained at the time of entry for work to be performed under this contract.
- B. When the Contractor performs construction within 10 ft. of a right-of-way or easement line, he shall place tall stakes properly identified at points of change in width or direction of the right-of-way or easement line and at points along the line so that at least two stakes can be seen distinctly from any point on the line.

1.5 PROTECTING EXISTING BUILDINGS, STRUCTURES AND ROADWAYS

- A. The Contractor shall, at his own expense, shore up and protect any buildings, roadways, utilities or other public or private structures which may be encountered or endangered in the prosecution of the work, and that may not be otherwise provided for, and he shall repair and make good any damages caused to any such property by reason of his operations. All existing fences removed due to the prosecution of the work shall be replaced by the Contractor. No extra payment will be made for said work or material, but the cost of this work must be included in the price stipulated for the work to be done under this contract.

1.7 SITE FACILITIES

- A. The Contractor shall furnish and place sufficient quantities of portable toilet facilities at locations convenient for use by the Contractor's personnel, Subcontractors, the Engineer, and the Owner.

1.8 RESTORATION

- A. The contractor shall restore all areas per the plans and specifications and if not specified, at least to the condition existing prior to the start of work.

END OF SECTION 011419

SECTION 011423 - ADDITIONAL WORK, OVERTIME

PART 1 - GENERAL

1.1 NIGHT, SUNDAY AND HOLIDAY WORK

- A. No work will be permitted at night, Sunday or legal holidays except as noted on the plans or in the case of emergency and then only upon written authorization of the Engineer. Where no emergency exists, but the Contractor feels it advantageous to work at night, Sunday or legal holidays, the Contractor shall notify the Engineer at least two (2) days in advance, requesting written permission. Any work performed during the absence of the Engineer will be done at the Contractor's risk and responsibility and may be subject to rejection upon later inspection.

END OF SECTION 011423

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements governing allowances.
 - 1. Selected materials and equipment are specified in the Contract Documents by allowances. In some cases, these allowances include installation. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.
- B. Types of allowances include the following:
 - 1. Contingency allowances.

1.3 SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.
- B. Submit invoices or delivery slips to show the actual quantities of materials delivered to the site for use in fulfillment of each allowance.

1.4 CONTINGENCY ALLOWANCES

- A. Use the contingency allowance only as directed for the Owner's purposes and only by Work Change Directive that indicate amounts to be charged to the allowance.
- B. The Contractor's related costs for products and equipment ordered by the Owner under the contingency allowance are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.
- C. Work Change Directive authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins.
- D. At Project closeout, credit unused amounts remaining in the contingency allowance to the Owner by Change Order.

1.5 UNUSED MATERIALS

- A. Return unused materials to the manufacturer or supplier for credit to the Owner, after installation has been completed and accepted.
 - 1. When requested by the Owner or Engineer, prepare unused material for storage by Owner where it is not economically practical to return the material for credit. When directed by the Architect, deliver unused material to the Owner's storage space. Otherwise, disposal of unused material is the Contractor's responsibility.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly upon delivery for damage or defects.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: \$330,000.00 for work associated with the temporary sludge management and/or temporary sludge dewatering work during the outage of the normal sludge dewatering facilities. Means and methods shall be approved by the Owner and Engineer.

END OF SECTION 012100

SECTION 012513 – PRODUCT SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 MATERIALS AND EQUIPMENT

- A. In the specifications, is specified and shown certain pieces of equipment and materials deemed most suitable for the service anticipated. This is not done to eliminate other equipment and materials equally as good and efficient. The Contractor shall prepare his bid on the particular materials and equipment specified. Following the award of the contract, should the Contractor desire to use other equipment and materials, he shall submit to the Owner a written request for such change and state the advantage to the Owner and the savings or additional cost involved by the proposed substitution. The determination as to whether or not such change will be permitted rests with the Owner and the Engineer.
- B. Each major item of equipment shall be inspected by a manufacturer's representative during installation and upon completion of the work. The Contractor shall supply the Engineer with a certificate of such inspection.

END OF SECTION 012513

SECTION 013119 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 PRECONSTRUCTION MEETING

- A. Prior to the Contractor beginning any work on the project, the Owner will schedule and hold a preconstruction meeting to discuss all aspects of the contract work.
- B. The Contractor shall be present and be prepared to comment in detail on all aspects of his work.
- C. The Contractor shall bring to the preconstruction meeting a proposed construction progress schedule, erosion control plan, quality control program, concrete mix designs, asphalt mix designs (JMF), etc. Approval of each by the Engineer is required prior to the start of any work.
- D. Included in the construction progress schedule shall be an implementation sequence of the proposed erosion control efforts required by the contract.

1.2 PROGRESS MEETINGS

- A. Progress meetings will be held at a location to be determined by the Owner on a schedule mutually convenient to the Owner, Contractor, and Engineer.
- B. The Contractor shall provide an updated construction progress schedule and be prepared to comment in detail on all aspects of his work.

END OF SECTION 013119

SECTION 013216 – CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.1 PROGRESS SCHEDULE

- A. Immediately after signing the Contract, the General Construction Contractor shall prepare a graphic progress schedule, indicating the work to be executed during each month and the rate of expected progress to secure completion on the agreed-upon completion date. The progress schedule shall be approved by the Engineer and Owner prior to starting work on the site. Copies of such graphic progress charts, upon which has been indicated the actual progress, shall be furnished to the Engineer with each requisition for payment.
- B. Should the rate of progress fall materially behind the scheduled rate of progress, and unless the delay is authorized by the Engineer, each offending Contractor shall furnish additional labor, work overtime, or take other necessary means required for completion of the work on the scheduled date. No additional compensation beyond the set Contract price shall be paid for action taken or overtime expense incurred in maintaining scheduled progress.

END OF SECTION 013216

SECTION 013223 –LAYOUT DATA

PART 1 - GENERAL

1.1 LAYOUT OF WORK

- A. The Contractor shall lay out his work and be responsible for correct locations, elevations and dimensions of all work executed by him under this Contract. The Contractor must exercise proper precautions to verify the figures shown on the Drawings before laying out the work and will be held responsible for any error resulting from his failure to exercise such precaution. The Contractor shall insure the new construction aligns with any existing work.

END OF SECTION 013223

SECTION 013323 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 - GENERAL

1.1 GENERAL

- A. The Contractor shall submit detailed drawings, acceptable catalog data, specifications and material certifications for all equipment and materials specified or required for the proper completion of the work.
- B. The intent of these items is to demonstrate compliance with the design concept of the work and to provide the detailed information necessary for the fabrication, assembly and installation of the work specified. It is not intended that every detail of all parts of manufactured equipment be submitted, however sufficient detail will be required to ascertain compliance with the specifications and establish the quality of the equipment proposed.

Shop Drawings shall be sufficiently clear and complete to enable the Engineer and Owner to determine that items proposed to be furnished conform to the specifications and that items delivered to the site are actually those that have been reviewed.

- C. It is emphasized that the Engineer's review of Contractor's submitted data is for general conformance to the contract drawings and specifications but subject to the detailed requirements of drawings and specifications. Although the Engineer may review submitted data in detail, such review is an effort to discover errors and omissions in Contractor's drawings. The Engineer's review shall in no way relieve the Contractor of his obligation to properly coordinate the work and to Engineer the details of the work in such manner that the purposes and intent of the contract will be achieved. Such review by the Engineer shall not be construed as placing on him or on the Owner any responsibility for the accuracy and for proper fit, functioning or performance of any phase of the work included in the contract.
- D. Shop Drawings shall be submitted in proper sequence and with due regard to the time required for checking, transmittal and review so as to cause no delay in the work. The Contractor's failure to transmit appropriate submittals to the Engineer sufficiently in advance of the work shall not be grounds for time extension.
- E. The Contractor shall submit Shop Drawings for all fabricated work and for all manufactured items required to be furnished in the Contract in accordance with the General Provisions and as specified herein. Shop Drawings shall be submitted in sufficient time to allow at least twenty-one (21) calendar days after receipt of the Shop Drawings from the Contractor for checking and processing by the Engineer.
- F. It is the responsibility of each Prime Contractor to furnish to all other Prime Contractors and especially the General Construction Contractor reviewed Shop Drawings for guidance in interfacing the various trades; i.e., sleeves, inserts, anchor bolts, terminations, and space requirements.
- G. No work shall be performed requiring Shop Drawings until same have been reviewed by Engineer.

- H. Accepted and reviewed Shop Drawings shall not be construed as approval of changes from Contract plan and specification requirements.
- I. The Engineer/Architect will review the first and second Shop Drawing item submittals at no cost to the Contractor. Review of the third submittal and any subsequent submittal will be at the Contractor's expense. Payment will be deducted from the Contract amount at a rate of 2.8 times direct labor cost plus expenses.

1.2 SUBMITTAL PROCEDURE

- A. All required submissions shall be made to the Engineer/Architect by the Prime Contractor(s) only. Any data prepared by subcontractors and suppliers and all correspondence originating with subcontractors, suppliers, etc., shall be submitted through the Contractor.
- B. Contractor shall review and approve all Shop Drawings prior to submission. Contractor's approval shall constitute a representation to Owner and Engineer that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data or assumes full responsibility for doing so, and that Contractor has reviewed or coordinated each Shop Drawing or sample with the requirements of the work and the Contract Documents.
- C. Submittal Preparation: Mark each submittal with a permanent label or page for identification. Provide the following information on the label for proper processing and recording of action taken:
 - 1. Location
 - 2. Project Name
 - 3. Contract
 - 4. Name and Address of Engineer
 - 5. Name and Address of Contractor
 - 6. Name and Address of Subcontractor
 - 7. Name and Address of Supplier
 - 8. Name of Manufacturer
 - 9. Number and Title of appropriate Specification Section
 - 10. Drawing Number and Detail References, as appropriate.
 - 11. Submittal Sequence or Log Reference Number.
 - a. Provide a space on the label for the Contractor's review and approval markings and a space for the Engineer's "Action Stamp".
- D. Each Shop Drawing, sample and product data submitted by the Contractor shall have affixed to it the following Certification Statement including the Contractor's Company name and signed by the Contractor:

Certification Statement: By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements.

Signature

Date

Company

- E. Shop Drawings shall be submitted in not less than six (6) copies to the Engineer/Architect at the address specified at the Preconstruction Conference. Single mylar or sepia reproducible copies of simple Shop Drawings may be submitted with prior approval of the Engineer/Architect.
- F. At the time of each submission, Contractor shall in writing identify any deviations that the Shop Drawings or samples may have from the requirements of the Contract Documents.
- G. Drawings shall be clean, legible and shall show necessary working dimensions, arrangement, material finish, erection data, and like information needed to define what is to be furnished and to establish its suitability for the intended use. Specifications may be required for equipment or materials to establish any characteristics of performance where such are pertinent. Suitable catalog data sheets showing all options and marked with complete model numbers may, in certain instances, be sufficient to define the articles which it is proposed to furnish.
- H. SAMPLES: For product which require submittal of samples, furnish samples so as not to delay fabrication, allowing the Engineer reasonable time for the consideration of the samples submitted. Properly label samples, indicating the material or product represented, its place of origin, the names of the vendor and Contractor and the name of the project for which it is intended. Ship samples prepaid. Accompany samples with pertinent data required to judge the quality and acceptability of the sample, such as certified test records and, where required for proper evaluation, certified chemical analyses.

1.3 REVIEW PROCEDURE

- A. Engineer/Architect will review with reasonable promptness all properly submitted Shop Drawings. Such review shall be only for conformance with the design concept of the Project and for compliance with the information given in the plans and specifications and shall not extend to means, methods, sequences, techniques or procedures of construction or to safety precautions or programs incident thereto.
- B. The review of a separate item as such will not constitute the review of the assembly in which the item functions. The Contractor shall submit entire systems as a package.
- C. All Shop Drawings submitted for review shall be stamped with the Engineer's action and associated comments.
- D. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Engineer will review each submittal, mark to indicate action taken, and return accordingly. Compliance with specified characteristics is the Contractor's responsibility.

Action Stamp: The Engineer will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:

1. If Shop Drawings are found to be in general compliance, such review will be indicated by marking the first statement.
 2. If only minor notes in reasonable number are needed, the Engineer will make same on all copies and mark the second statement. Shop Drawings so marked need not be resubmitted.
 3. If the submitted Shop Drawings are incomplete or inadequate, the Engineer will mark the third statement, request such additional information as required, and explain the reasons for revision. The Contractor shall be responsible for revisions, and/or providing needed information, without undue delay, until such Shop Drawings are acceptable. Shop Drawings marked with No. 3 shall be completed resubmitted.
 4. If the submitted Shop Drawings are not in compliance with the Contract Documents, the Engineer will mark the fourth statement. The Contractor will be responsible to submit a new offering conforming to specific products specified herein and/or as directed per review citations.
- E. No submittal requiring a Change Order for either value or substitution or both, will be returned until the Change Order is approved or otherwise directed by the Owner.

APPLICATION FOR USE OF SUBSTITUTE ITEM

TO: _____

PROJECT: _____

SPECIFIED ITEM:

Page	Paragraph	Description
A.		The undersigned requests consideration of the following as a substitute item in accordance with Article 6.05 of the General Conditions.
B.		Change in Contract Price (indicate + or -) \$ _____
C.		Attached data includes product description, specifications, drawings, photographs, references, past problems and remedies, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified. For consideration of the attached data as SHOP DRAWINGS, submittal shall be in accordance with requirements of Section 013323.
D.		Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments are correct:

1. The proposed substitute does not affect dimensions shown on Drawings.
2. The undersigned will pay for changes to the building design, including engineering design, detailing, and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse affect on other contractors, the construction schedule, or specified warranty requirements. (If proposed substitution affects construction schedule, indicate below using + or -)

_____ CONSECUTIVE CALENDAR DAYS

4. Maintenance and service parts will be locally available for the proposed substitution.

The undersigned further states that the function, appearance, and quality of the proposed substitution are equivalent or superior to the specified item, and agrees to reimburse the OWNER for the charges of the ENGINEER for evaluating this proposed substitute item.

E. Signature:

Firm:

Address:

Telephone:

Date:

Attachments:

For use by ENGINEER:

_____ Accepted as evidenced by affixed SHOP DRAWING REVIEW stamp.

_____ Accepted as evidenced by included CHANGE ORDER.

_____ Not accepted as submitted. See Remarks.

_____ Acceptance requires completion of submittal as required for SHOP DRAWINGS.

_____ Not accepted. Do not resubmit.

By:

Date:

Remarks:

APPLICATION FOR USE OF "OR-EQUAL" ITEM

TO: _____

PROJECT: _____

SPECIFIED ITEM:

Page	Paragraph	Description
------	-----------	-------------

A. The undersigned requests consideration of the following as an "or-equal" item in accordance with Article 6.05 of the General Conditions.

B. Change in Contract Price (indicate + or -) \$ _____

C. Attached data includes product description, specifications, drawings, photographs, references, past problems and remedies, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified. For consideration of the attached data as SHOP DRAWINGS, submittal shall be in accordance with requirements of Section 013323.

D. Signature:

Firm: _____

Address: _____

Telephone: _____ Date: _____

Attachments: _____

For use by ENGINEER:

_____ Accepted as evidenced by affixed SHOP DRAWING REVIEW stamp.

_____ Accepted as evidenced by included CHANGE ORDER.

_____ Not accepted as submitted. See Remarks.

_____ Acceptance requires completion of submittal as required for SHOP DRAWINGS.

_____ Not accepted. Do not resubmit.

By: _____ Date: _____

Remarks: _____

END OF SECTION 013323

SECTION 013326 – PRODUCT TESTING AND CERTIFYING

PART 1 - GENERAL

1.1 QUALITY OF MATERIALS

- A. Where the specifications call for mill or shop tests, the Contractor shall furnish duplicate copies of attested manufacturer's certificates showing details of quality or performance sufficient to demonstrate conformity to contract requirements. Mill, shop or witness tests shall be subject to view by the Engineer's representative, but the Engineer's representation shall not relieve the Contractor from the necessity of furnishing certificates specified. The Engineer shall be notified by the Contractor in writing, sufficiently in advance of the time of making tests, so that proper arrangements may be made. Waiving of witness of tests by the Engineer may be in writing only by the Engineer. All costs for travel, lodging, food and transportation that are necessary for the Engineer's representative and the Owner's representative to attend witness tests shall be included in the Contractor's bid for those item(s) specifically designated as being subject to witness testing.
- B. Unless otherwise specified, all materials, equipment and articles shall be erected, installed, applied, or connected, used, cleaned and conditioned in accordance with the printed instructions and directions of the manufacturer.
- C. The installation shall be so made that its several component parts will function together as a workable system. It shall be complete with all accessories necessary for its operation and shall be left with all equipment properly adjusted and in working order.
- D. The work shall be executed in conformity with the best practice and so as to contribute to efficiency of operation, minimum maintenance, accessibility and sightliness. It shall also be executed so that the installation will conform and accommodate itself to the building structure, its equipment and usage.
- E. Whenever in the contract documents a particular brand, make of material, device or equipment is shown or specified, such brand, make of material, device or equipment is to be regarded merely as a standard and such trade name shall be followed by "or equal".

1.2 QUALITY ASSURANCE

- A. The equipment and materials to be furnished under this Contract shall be the products of well established and reliable firms which have had ample experience for at least five (5) years in the manufacture of equipment or materials similar in design and of equal quality to that specified. If required, the manufacturer shall submit a list of installations of similar equipment which have been in successful operation for at least five (5) years.

1.3 EXPERIENCE CLAUSE REQUIREMENT AND PERFORMANCE BONDS FOR MANUFACTURER

- A. For every piece of equipment furnished under this Contract, the manufacturer will be required to have a minimum of five (5) years of experience in providing this specific type of equipment. In lieu of this experience requirement, the manufacturer will be required to provide performance bond(s) for the faithful performance of the equipment and guarantee payment in a sum of not less than one hundred and fifty percent (150%) of the total equipment price for the completed work for that item. In the absence of verifiable experience, the manufacturer will be required to provide the performance bond(s) for the same number of years that the manufacturer was found lacking in experience from the specified five (5) year period. The performance bond(s) shall be from an approved surety company, to the satisfaction of the Owner's Law Director.
- B. Agents of bonding companies which write bonds for the performance and payment of the contract shall furnish power of attorney bearing the seal of the company, evidencing such agent's authority to execute the particular type of bond to be furnished, and evidencing also the right of the surety company to do business in the State of Ohio. Copy of this proof shall be attached to each copy of the contract.
- C. The bond shall be purchased through a surety company with a local agent upon whom service of process can be made.
- D. In event of failure of surety or co-surety, the manufacturer shall immediately furnish a new bond, as required herein. The manufacturer's bond will not be released until all provisions of the contract have been fulfilled.
- E. The surety used for the bid bond and performance bond shall be listed in the latest U.S. Treasury Circular 570 and the Penal Sums shall be within the maximum specified for such company in said Circular 570.

END OF SECTION 013326

SECTION 013543 - ENVIRONMENTAL PROTECTION

PART 1 - GENERAL

1.1 UNNECESSARY NOISE, DUST AND ODORS

- A. The Contractor's performance of this contract shall be conducted so as to eliminate all unnecessary noise, dust and odors.

1.2 SEWAGE, SURFACE AND FLOOD FLOWS

- A. The Contractor shall take whatever action is necessary to provide all necessary tools, equipment and machinery to adequately handle all sewage, surface flows and flood flows which may be encountered during the performance of the work. The entire cost of and liability for handling such flows is the responsibility of the Contractor and shall be included in the price for the appropriate item.

1.3 WORK IN FREEZING WEATHER

- A. Written permission from the Engineer shall be obtained before any work is performed which, in the judgment of the Engineer, may be affected by frost, cold, or snow. When work is performed under such conditions, the Contractor shall provide facilities for heating the materials and for protecting the finished work.

1.4 POLLUTION CONTROL

- A. It shall be the responsibility of the Contractor to prevent or limit pollution of air and water resulting from his operations.
- B. The Contractor shall perform work required to prevent soil from eroding or otherwise entering onto all paved areas and into natural watercourses, ditches, and public sewer systems. This work shall conform to all local ordinances and/or regulations, if any, and if not otherwise regulated by local ordinances or regulations shall at a minimum conform to the Ohio EPA General Storm Water NPDES Permit for Construction Activities and the Ohio Department of Natural Resources Rainwater and Land Development manual. This work may consist of but not be limited to construction and continual maintenance of silt fence, bio bag filters, sedimentation traps, stilling basins, check dams, temporary seeding, temporary mulching, erosion mats and other means to clarify waters containing suspended materials from excavations, embankments, cleared and grubbed or stripped areas, stockpiles, well points, and disposal sites and shall be commensurate with the contractor's schedule, sequence of work, means and methods. If a SWPPP plan is not required for the project, the contractor shall at a minimum submit a plan of his proposed erosion control prevention methods for approval by the Owner and/or other regulatory authorities having jurisdiction prior to starting any construction activities which may cause erosion.

- C. The Contractor shall perform work required to prevent dust attributable to his operations from entering the atmosphere. Dust on unsurfaced streets or parking areas and any remaining dust on surfaced streets shall be controlled with water and/or calcium chloride dust palliative as needed.
- D. Any material removed from sanitary or storm sewers shall be disposed in accordance with all applicable regulations.

END OF SECTION 013543

SECTION 014126 - GENERAL REGULATIONS AND PERMITS

PART 1 - GENERAL

1.1 REGISTRATION

All Contractors and subcontractors shall be registered with the Building Department having jurisdiction. Contact the Building Department for additional registration information.

1.2 PERMITS

The Contractor shall apply for and pay for all permits from the Owner and/or other authorities having jurisdiction.

1.3 ARCHAEOLOGICAL DISCOVERIES

Contractors and subcontractors are required under Ohio Revised Code (O.R.C.) Section 149.53, to notify Ohio's State Historic Preservation Office (SHPO), and to cooperate with that office in archaeological and historic surveys and mitigation efforts if such discoveries are uncovered within the project area.

Contact: Ohio's State Historic Preservation Office
Diana Welling, Resource Protection & Review Department Manager
Phone: 1-614-298-2000
Email: dwelling@ohiohistory.org

Should archaeological discoveries or other activities delay progress of the work, an adjustment in contract time will be made.

END OF SECTION 014126

SECTION 014223 - INDUSTRY STANDARDS

PART 1 - GENERAL

1.1 ABBREVIATIONS

- A. Abbreviations, as used, designate the following:

AASHTO	-	American Association of State Highway and Transportation Officials
ACI	-	American Concrete Institute
AIEE	-	American Institute of Electrical Engineers
AISC	-	American Institute of Steel Construction
ANSI	-	American National Standards Institute
ASTM	-	American Society of Testing and Materials
AWWA	-	American Water Works Association
CMS	-	Construction and Material Specifications
NEMA	-	National Electrical Manufacturers Association
ODOT	-	Ohio Department of Transportation
ORC	-	Ohio Revised Code
UL	-	Underwriters Laboratories, Inc.

1.2 REFERENCE TO OTHER SPECIFICATIONS

- A. Where reference is made to specifications such as ASTM, AWWA or AASHTO, the latest edition shall be used, unless otherwise noted on the plans or in the specifications.

1.3 CODES AND STANDARDS

- A. All work provided for by these specifications must be installed according to the provisions of the State and local building codes, subject to inspection and acceptance by the State and local inspectors.

END OF SECTION 014223

SECTION 014323 – QUALIFICATIONS OF TRADESMEN

PART 1 - GENERAL

1.1 CHARACTER OF WORKMEN AND EQUIPMENT

- A. The Contractor shall employ competent and efficient workmen for every kind of work. Any person employed on the work who shall refuse or neglect to obey directions of the Owner or his representative, or who shall be deemed incompetent or disorderly, or who shall commit trespass upon public or private property in the vicinity of the work, shall be dismissed when the Owner so orders, and shall not be re-employed unless express permission be given by the Owner. The methods, equipment and appliances used on the work and the labor employed shall be such as will produce a satisfactory quality of work and shall be adequate to complete the contract within the specified time limit.

- B. In hiring of employees for the performance of work under this Contract, or any Subcontract hereunder, no Contractor or Subcontractor, nor any person acting on behalf of such Contractor or Subcontractor, shall, by reason of race, sex, creed or color, discriminate against any citizen of the State of Ohio in the work to which the employment relates. No Contractor, Subcontractor, nor any person on his behalf shall, in any manner, discriminate against or intimidate any employee hired for the performance of work under this contract on account of race, creed, sex or color.

END OF SECTION 014323

SECTION 015100 - TEMPORARY POWER SERVICE

PART 1 - GENERAL

1.1 ELECTRICAL POWER

- A. The Contractor shall furnish at his own expense all electrical power which may be required for the project. All temporary lines shall be furnished and installed by the Contractor at his own expense in a manner which meets the approval of the Engineer and shall be removed by the Contractor at the completion of the construction.

END OF SECTION 015100

SECTION 015136 - TEMPORARY WATER AND DISTRIBUTION

PART 1 - GENERAL

1.1 WATER

- A. The Contractor shall be responsible for an adequate supply of water suitable for his use for construction and drinking. At his own expense, he shall provide and maintain adequate supplies and supply lines in such locations and installed in such a manner as may be satisfactory to the Engineer.

END OF SECTION 015136

SECTION 015213 - FIELD OFFICES

PART 1 - GENERAL

1.1 CONTRACTOR'S OFFICE

Each Contractor shall provide and maintain an office on the site of the work during the construction period of the contract, at which he or his authorized agent shall be present at all times while the work is in progress.

END OF SECTION 015213

SECTION 015713 - TEMPORARY EROSION CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Furnishing all labor, materials, tools, equipment and services for the temporary soil erosion and sediment control work as indicated.
- B. Coordinating the temporary pollution and erosion control with work of all other trades.
- C. Reducing to the greatest extent practicable the area and duration of exposure of readily erodible soils.
- D. Protecting the soils by use of temporary vegetation or mulch or by accelerating the establishment of permanent vegetation.
- E. Mechanically retarding the rate of runoff from the construction site and control disposal of runoff.
- F. Trapping all sediment resulting from construction in temporary or permanent debris basins.
- G. Using temporary measures to keep erosion under control if construction is suspended for any appreciable length of time.
- H. Providing protection against chemical, fuel, or lubricant spills, and sewage pollutants.
- I. Protecting project and existing structures from surface water damage due to utility line excavations.
- J. Controlling soil erosion and sedimentation by use of silt fences, dikes, ditches, slope protection, sediment pits, basins, dams, slope drains, coarse aggregate, mulches, sod, grasses, filter fabrics, and other erosion control devices or methods.

1.2 SUBMITTALS

- A. Product Data
 - 1. Filter fabric
- B. Quality Control Submittals
 - 1. Design Data
 - 2. Test Reports
 - 3. Certificates
 - a. Seed
 - b. Fertilizer
 - c. Limestone
 - 4. Manufacturers Instructions

- C. Contract Closeout Submittals
 - 1. Project Record Documents

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping
 - 1. Deliver grass seed, fertilizer and limestone in original containers labeled with content analysis.

1.4 SEQUENCING AND SCHEDULING

- A. All temporary control measures as shown on the Drawings, called for in these Specifications or ordered by the Engineer shall remain in effect during the life of the contract to control soil erosion, sedimentation and water pollution.

PART 2 - PRODUCTS

2.1 SEED

- A. Provide fresh, clean, new crop seed complying with tolerance for purity and germination established by Official Seed Analysts of North America.
- B. All areas of temporary seeding shall be seeded with grass as shown in the following table:

March 1 - August 15	Per 1000	
	Square Feet	Per Acre
Oats	3 lbs.	4 bu.
Perennial Ryegrass	1 lb.	40 lbs.
Tall Fescue	1 lb.	40 lbs.

August 16 - November 1*	Per 1000	
	Square Feet	Per Acre
Rye	3 lbs.	2 bu.
Wheat	3 lbs.	2 bu.
Perennial Ryegrass	1 lb.	40 lbs.
Tall Fescue	1 lb.	40 lbs.

* After November 1, use mulch only

2.2 ORGANIC MULCH

- A. Select mulch material based on site requirements, availability of materials and availability of labor and equipment. The following are the minimum rates:

Mulch	Rates		Notes
	Per Acre	Per 1000 ft ²	
Straw (temporary only)	2 tons	90 lbs.	Free from weeds and coarse matter. Must be anchored. Spread with mulch blower or by hand.
Wood Chips (permanent or temporary)	400 yds. ³	9 - 10 yds. ³	Apply approx. 3" deep. Treat with 12 lbs. of nitrogen per ton. Do not use on firm turf areas. Apply with mulch blower, chip handler, or by hand.
Bark Chips or Shredded Bark (temporary mulch only)	70 yds. ³	1½ - 2 yds. ³	Do not use in fine turf areas. Apply about ½" thick. Apply with a mulch blower or by hand.

2.3 FERTILIZER

- A. All fertilizer shall be manufactured from cured stock and organic sources. Chemical elements shall be accurately proportioned, uniformly mixed, and delivered to the site in factory-sealed containers fully labeled, bearing the name or trademark and warranty of the manufacturer. Commercial fertilizer for lawn sodding shall be dry or liquid compounds of 12-12- 12 analysis, meeting applicable requirements of State and Federal laws.

2.4 LIMESTONE

- A. All limestone shall be ground agricultural grade dolomitic limestone containing at least 10 percent magnesium oxide with a minimum total neutralizing power of 90, with at least 40 percent passing a No. 100 sieve and at least 95 percent passing a No. 8 sieve.

2.5 WATER

- A. All irrigation water shall be clean and free from injurious amounts of oil, acid, alkali, or other deleterious substances.

2.6 DITCH CHECKS

- A. Temporary ditch checks shall consist of coarse aggregate dikes.

2.7 INLET FILTERS

- A. Temporary inlet filters and silt fences shall be adequately supported as detailed on the drawings.

2.8 SLOPE DRAINS

- A. Temporary slope drains shall consist of pipe, coarse aggregate, riprap, rock channel protection, mats, plastic sheets or other materials approved by the Engineer. Sediment pits may be included as part of slope drain protection.

2.9 FILTER FABRIC

- A. Synthetic filter fabric shall be a pervious sheet of propylene, nylon, polyester or ethylene yarn and shall be certified by the manufacturer or supplier as conforming to the following requirements:

<u>Physical Property</u>	<u>Requirements</u>
Filtering Efficiency	75% (min.)
Tensile Strength	at Extra Strength - 20% (max.)
Elongation	50 lbs./lin. in. (min.)
	* Standard Strength - 30 lbs./lin. in. (min.)
Flow Rate	0.3 gal./sq.ft./min. (min.)

*Requirements reduced by 50 percent after 6 months of installation.

- B. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of 6 months of expected usable construction life at a temperature range of 0° F to 120° F.

2.10 BURLAP

- A. Burlap shall be 10 ounce per square yard fabric.

2.11 FILTER SUPPORTS AND REINFORCING

- A. Posts for silt fences shall be either 4" diameter wood or 1.33 pounds per linear foot steel with a minimum length of 5 feet. Steel posts shall have projections for fastening wire to them.
- B. Stakes for filter barriers shall be 1" x 2" wood (preferred) or equivalent metal with a minimum length of 3 feet.

- C. Wire fence reinforcement for silt fences using standard strength filter cloth shall be a minimum of 42 inches in height, a minimum of 14 gauge and shall have a maximum mesh spacing of 6 inches.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. The Contractor shall limit the surface area of erodible earth material exposed by clearing and grubbing; the surface area of erodible earth material exposed by excavation; borrow; and fill operations; and provide immediate permanent or temporary control measures to prevent contamination of adjacent streams or other areas of water impoundment. Such work will involve the construction of temporary ditch checks, filters, benches, dikes, slope drains, and use of temporary mulches, mats, seeding or other control devices or methods necessary to control erosion and sedimentation.
- B. The Contractor shall incorporate all permanent erosion control features into the Work at the earliest practicable time. Except where future construction operations will damage slopes, the Contractor shall perform the permanent seeding and mulching and other specified slope protection work in stages, as soon as substantial areas of exposed slopes can be made available. This will require the establishing of final grades as shown on the Drawings and application of agricultural limestone, commercial fertilizer, seeding and mulching or sodding . When directed by the Engineer, temporary fertilizer, seeding and mulching materials shall be used. In general, the Contractor shall temporarily seed all disturbed areas within seven (7) days if they are to remain dormant for more than forty- five (45) days. Permanent soil stabilization shall be applied to disturbed areas within seven (7) days after final grade is reached on any portion of the site.. Temporary control measures will be used when and as directed by the Engineer to correct conditions that develop during construction that were not foreseen during the design stage; that are needed prior to installation of permanent control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.
- C. Where erosion is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise temporary erosion control measures will be required between successive construction stages.
- D. The Engineer will limit the area of excavation, borrow and embankment operations in progress commensurate with the Contractor's capability and progress in keeping the finished grading, mulching, seeding, and other such permanent control measures current in accordance with the accepted schedule. Mulching, seeding, and other such permanent control measures shall be applied after completion of a vertical eight (8) feet of embankment or cut, unless otherwise directed by the Engineer. Should seasonal limitations or embankment make such coordination unrealistic, temporary erosion control measures shall be taken immediately.

- E. The Engineer may increase or decrease the allowable amount of surface area or erodible earth material to be exposed at one time by clearing and grubbing, excavation, borrow and fill operations as determined by his analysis of project conditions. Factors such as soil erodibility, slope, cut or fill height, exposed area contributing to a watercourse and weather will be considered in this determination.
- F. In the event of conflict between these requirements and pollution control laws, rules, or regulations or other Federal, State or local agencies, the more restrictive laws, rules or regulations shall apply.
- G. Temporary seeding areas shall be fertilized at a rate of 12-15 pounds per 1000 square feet of 10-10-10 or 12-12-12 analysis or equal.
- H. When directed by the Engineer, the seed bed shall be thoroughly watered to maintain adequate moisture in the upper four (4) inches of soil, necessary to promote proper root growth.
- I. When directed by the Engineer, temporary seeded areas shall be mowed when grass exceeds four (4) inches in height.
- J. Temporary erosion control features shall be acceptably maintained and shall subsequently be removed or replaced when directed by the Engineer.
- K. Removed materials shall become the property of the Contractor and shall be disposed of off the site at the Contractor's expense.

3.2 PERFORMANCE

- A. If, in the opinion of the Engineer and Owner, proper control of soil erosion and sedimentation is not being provided by the Contractor, the Owner may take all necessary steps to provide corrective measures and the cost of such services will be deducted from any money which may be due or become due the Contractor.
- B. Control work performed for protection of construction areas outside the construction site, such as borrow and waste areas, haul roads, equipment and material storage sites, and temporary plant sites shall be considered as a subsidiary obligation of the Contractor, with all necessary control costs included in the contract price.
- C. In the event that temporary erosion and sediment control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled, and are ordered by the Engineer, such temporary work shall be performed by the Contractor at his expense.

3.3 SILT FENCE

- A. The height of a silt fence shall not exceed 36 inches (higher fences may impound volumes of water sufficient to cause failure of the structure).
- B. The filter fabric shall be purchased in a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are necessary, filter cloth shall be

spliced together only at a support post, with a minimum six (6) inches overlap and securely sealed.

- C. Posts shall be spaced a maximum of ten (10) feet apart at the barrier location and driven securely into the ground (minimum of 12 inches). When extra strength fabric is used without the wire support fence, post spacing shall not exceed six (6) feet.
- D. A trench shall be excavated approximately four (4) inches wide and four (4) inches deep along the line of posts and upslope from the barrier.
- E. When standard strength filter fabric is used, a wire mesh support fence shall be fastened securely to the upslope side of the posts using heavy duty wire staples at least one (1) inch long, tie wires or hog rings. The wire shall extend into the trench a minimum of two (2) inches and shall not extend more than 36 inches above the original ground surface.
- F. The standard strength filter fabric shall be stapled or wired to the fence, and eight (8) inches of the fabric shall be extended into the trench. The fabric shall not extend more than 36 inches above the original ground surface. Filter fabric shall not be stapled to existing trees.
- G. When extra strength filter fabric and closer post spacing are used, the wire mesh support fence may be eliminated. In such a case, the filter fabric is stapled or wired directly to the posts with all other provisions of Subparagraph F above applying.
- H. The trench shall be backfilled and soil compacted over the filter fabric.
- I. Silt fences shall be removed when they have served their purpose, but not before the upslope area has been permanently stabilized.
- J. Silt fences and filter barriers shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.
- K. Should the fabric on a silt fence or filter barrier decompose or become ineffective prior to the end of the expected usable life and the barrier is still necessary, the fabric shall be replaced promptly.
- L. Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.
- M. Any sediment deposits remaining in place after the silt fence or filter barrier is no longer required shall be dressed to conform with the existing grade, prepared and seeded.

3.4 TEMPORARY MULCHING

- A. Application
 - 1. Mulch materials shall be spread uniformly, by hand or machine.

- a. When spreading straw mulch by hand, divide the areas to be mulched into approx. 1000 sq. ft. sections and place approx. 90 lbs. of straw in each section to facilitate uniform distribution.

B. Mulch Anchoring

1. Straw mulch shall be anchored immediately after spreading to prevent windblow. One of the following methods of anchoring straw shall be used:
 - a. Mulch anchoring tool
 1. This is a tractor-drawn implement (mulch crimper, serrated straight disk or dull farm disk) designed to punch mulch approximately two(2) inches into the soil surface. This method provides maximum erosion control with straw. It is limited to use on slopes no steeper than 3:1, where equipment can operate safely. Machinery shall be operated on the contour.
 - b. Liquid mulch binders
 1. Application of liquid mulch binders and tackifiers should be heaviest at edges of areas and at crests of ridges and banks, to prevent windblow. The remainder of the area should have binder applied uniformly. Binders may be applied after mulch is spread; however, it is recommended to be sprayed into the mulch as it is being blown onto the soil. Applying straw and binder together is the most effective method.
 2. The following type of binder may be used:
 - a.) Asphalt - any type of asphalt thin enough to be blown from spray equipment is satisfactory. Recommended for use are rapid curing (RC-80, RC-250, RC-800), medium curing (MC-250, MC-800) and emulsified asphalt (SS-1, MS-2, RS-1 and RS-2). Apply asphalt at 4 gal./1000 ft.², 600 gal./acre. Do not use heavier applications as it may cause the straw to "perch" over rills.
 - b.) Wood Fiber - wood fiber hydroseeder slurries may be used to tack straw mulch.
 - c. Mulch nettings
 1. Lightweight plastic, cotton or paper nets may be stapled over the mulch according to manufacturer's recommendations.

C. Chemical Mulches

1. Chemical mulches may be used alone only in the following situations:
 - a. Where no other mulching material is available.
 - b. In conjunction with temporary seeding during the times when mulch is not required for that practice.
2. Chemical mulches may be used to bind other mulches or with wood fiber in a hydroseeded slurry at any time. Manufacturer's recommendations for application of chemical mulches shall be followed.

D. Nets and Mats

1. Nets may be used alone on level areas, on slopes no steeper than 3:1, and in waterways.
2. When mulching is done in late fall or during June, July and August, or where soil is highly erodible, net should only be used in conjunction with an organic mulch such as straw.
3. When net and organic mulch are used together, the net should be installed over the mulch except when the mulch is wood fiber. Wood fiber may be sprayed on top of the installed net.
4. Excelsior blankets are considered protective mulches and may be used alone on erodible soils and during all times of the year.
5. Other products designed to control erosion shall conform to manufacturer's specification and should be applied in accordance with manufacturer's instructions provided those instruction are at least as stringent as this specification.
6. Staples will be made of plain iron wire, No. 8 gauge or heavier, and will be six (6) inches or more in length.
7. Prior to installation:
 - a. Shape and grade as required the waterway, channel, slope or other area to be protected.
 - b. Remove all rocks, clods or debris larger than two (2) inches in diameter that will prevent contact between the net and the soil surface.
 - c. When open-weave nets are used, lime, fertilizer and seed may be applied either before or after laying the net. When excelsior matting is used, they must be applied before the mat is laid.
8. Laying the Net:
 - a. Start laying the net from top of channel or top of slope and unroll down-grade.
 - b. Allow to lay loosely on soil - do not stretch.
 - c. To secure net: Upslope ends of net should be buried in a slot or trench no less than six (6) inches deep. Tamp earth firmly over net. Staple the net every twelve (12) inches across the top end.
 - d. Edges of net shall be stapled every three (3) feet. Where two strips of net are laid side by side, the adjacent edges shall be overlapped three (3) inches and stapled together.
 - e. Staples shall be placed down the center of net strips at 3-foot intervals. Do not stretch net when applying staples.
9. Joining strips
 - a. Insert new roll of net in trench, as with upslope ends of net. Overlap the end of the previous roll eighteen (18) inches, turn under six (6) inches and staple across end of roll just below anchor slot and at the end of the turned-under net every twelve (12) inches.
10. At bottom of slopes
 - a. Lead net out onto a level area before anchoring. Turn ends under six (6) inches and staple across end every twelve (12) inches.

11. Check slots
 - a. On highly erodible soils and on slopes steeper than 4:1, erosion check slots should be made every fifteen (15) feet. Insert a fold of net into a six (6) inch trench and tamp firmly. Staple at twelve (12) inch intervals across the downstream portion of the net.
12. Rolling
 - a. After installation, stapling and seeding, net should be rolled to ensure firm contact between net and soil.
13. All mulches should be inspected periodically, in particular after rainstorms, to check for rill erosion. Where erosion is observed, additional mulch should be applied. Net should be inspected after rainstorms for dislocation or failure. If washouts or breakage occur, re- install net as necessary after repairing damage to the slope. Inspections should take place up until grasses are firmly established. Where mulch is used in conjunction with ornamental plantings, inspect periodically throughout the year to determine if mulch is maintaining coverage of the soil surface; repair as needed.

3.5 TEMPORARY SEEDING

A. Site Preparation

1. Grade as needed and feasible to permit the use of conventional equipment for seedbed preparation, seeding, mulch application and anchoring.
2. Install the needed erosion control practices prior to seeding such as diversions, temporary waterways for diversion outlets and sediment basins.

B. Seedbed Preparation

1. Lime (in lieu of a soil test recommendation) shall be applied on acid soil (pH 5.5 or lower) and subsoil at a rate of 100 pounds per 1000 square feet or two tons per acre of agricultural ground limestone. For best results, make a soil test.
2. Fertilizer (in lieu of a soil test recommendation) shall be applied at a rate of 12-15 pounds per 1000 square feet or 500-600 pounds per acre of 10-10-10 or 12-12-12 analysis or equivalent.
3. Work the lime and fertilizer into the soil with a disk harrow, springtooth harrow or similar tools to as depth of two inches. On sloping areas, the final operation shall be on the contour.

C. Seeding

1. Apply the seed uniformly with a cyclone seeder, drill, cultipacker seeder or hydroseeder (slurry may include seed and fertilizer) preferably on a firm, moist seedbed. Seed wheat or rye no deeper than one (1) inch. Seed ryegrass no deeper than one-fourth ($\frac{1}{4}$) inch.

2. When feasible, except where a cultipacker type seeder is used, the seedbed should be firmed following seeding operations with a cultipacker, roller or light drag. On sloping land, seeding operations should be on the contour wherever possible.

D. Mulching

1. Mulch shall be applied to protect the soil and provide a better environment for plant growth.
2. Mulch shall consist of small grain straw (preferably wheat or rye) and shall be applied at the rate of two tons per acre or 100 pounds (two to three bales) per 1000 square feet.
3. Spread the mulch uniformly by hand or mechanically so the soil surface is covered.
4. Mulch Anchoring Methods
 - a. Mechanical - use a disk, crimper or similar type tool set straight to punch or anchor the mulch material into the soil.
 - b. Asphalt Emulsion - apply at the rate of 160 gallons per acre into the mulch as it is being applied.
 - c. Mulch Nettings - use according to the manufacturer's recommendations. Use in areas of water concentration to hold mulch in place.

E. Irrigation

1. If soil moisture is deficient, supply new seedings with adequate water for plant growth until they are firmly established. This is especially true when seedings are made late in the planting season, in abnormally dry or hot seasons, or on adverse sites.

END OF SECTION 015713

SECTION 016600 - PRODUCT HANDLING AND PROTECTION

PART 1 - GENERAL

1.1 DELIVERY AND STORAGE OF MATERIALS

- A. The Contractor shall be responsible for delivery and storage of all materials.
- B. The Contractor shall coordinate with the Engineer on the arrangement for storing construction materials and equipment. Deliveries of all construction materials and equipment should be made at suitable times.
- C. The Contractor shall store all materials required for the performance of this contract at sites designated by the Engineer.
- D. All stockpiles shall be neat, compact, completely safe, and barricaded with warning lights if necessary.
- E. Precautions shall be taken so that no shade trees, shrubs, flowers, sidewalks, driveways or other facilities will be damaged by the storage of materials. The Contractor shall be responsible for the restoration of all stockpile sites to their original condition.
- F. Materials, tools and machinery shall not be piled or placed against shade trees, unless they shall be amply protected against injury therefrom. All materials, tools, machinery, etc. stored upon public thoroughfares must be provided with red lights at night time so as to warn the traffic of such obstruction.
- G. Materials shall be so stored as to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, shall again be inspected prior to their use in the work. Stored materials shall be located so as to facilitate their prompt inspection. Approved portions of the construction site may be used for storage purposes and for the placing of the Contractor's plant and equipment, but any additional space required therefore must be provided by the Contractor at his expense. Private property shall not be used for storage purposes without written permission of the property owner or lessee, and copies of such written permission shall be furnished the Engineer. All storage sites shall be restored to their original condition by the Contractor at his expense.

END OF SECTION 016600

SECTION 016617 - MAINTENANCE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section provides general requirements for the maintenance of equipment in the field. Storage maintenance requirements are provided by Section 016600, Product Handling and Protection. Specific maintenance requirements are provided by manufacturers per individual Sections in the Project Manual.
- B. Maintenance is performed to ensure delivery to the Owner of equipment in an undeteriorated and fully serviceable condition.
- C. This Section also includes requirements for preventive and corrective maintenance during operation of the equipment prior to the commencement of the Warranty period.

1.2 RELATED SECTIONS

- A. Section 016600, Product Handling and Protection.

1.3 DEFINITIONS

- A. Storage maintenance consists of establishing and maintaining the environment required by the stored materials and performing periodic servicing.
- B. Preventive maintenance consists of activities performed on a periodic basis to maintain operating or operational items or equipment.
- C. Corrective maintenance consists of correcting faults or failures in an item or equipment. This may include adjustments or replacement of defective parts.

1.4 SUBMITTALS

- A. The Maintenance Log shall be submitted to the Owner upon completion of the Operational Demonstration and before the start of the Warranty period.
- B. No submittals are required by this Section, except as noted above. Maintenance schedules and practices shall conform to approved submittals required by individual Sections in the Project Manual.

PART 2 – PRODUCTS

2.1 COMPONENTS, ACCESSORIES AND REPAIR PARTS

- A. All components, accessories and repair parts used in maintenance shall be supplied by or approved by the equipment manufacturer for use on the equipment.

2.2 SOURCE QUALITY CONTROL

- A. All parts and materials used in maintenance shall meet the quality control requirements provided for the item or equipment. These are specified in individual Sections of the Project Manual.

PART 3 – EXECUTION

3.1 EXAMINATION AND VERIFICATION OF CONDITION

- A. The Contractor shall prepare a Maintenance Log for all equipment.
 - 1. This log shall include a list of required maintenance services and inspections, as provided by the manufacturer and submitted under individual Sections of the Project Manual.
 - 2. The Maintenance Log shall include checklists for the periodic services and inspections required.
 - 3. The Contractor shall initial and date the requisite log entries upon completion of the individual servicing or inspection.
 - 4. The Maintenance Log shall be located in the Contractor's Field Office and shall be available for review by the Owner until it is submitted for record purposes upon completion of the Operational Demonstration and the start of the Warranty period.

3.2 PREPARATION

- A. Before removing an item from storage per Section 016600, the Contractor shall review the installed location. Protection and services at the installed location must meet the equipment storage requirements.
- B. Before moving equipment to the installed location, the Contractor shall have available materials for temporary shelter or services required to establish the proper storage environment after the equipment is installed until it is placed in service in its final operating environment.

3.3 PERFORMANCE OF MAINTENANCE

- A. The Contractor shall perform all storage and preventive maintenance and inspections required by the manufacturer at the specified intervals.
- B. When notified by the Owner, the Contractor will perform corrective maintenance. This will be performed at no cost to the Owner. Corrective maintenance will be performed per manufacturer's written instructions or by direction of the approved representative of the manufacturer.

- C. The Contractor shall restore equipment to its operating condition before start-up.
- D. The Contractor shall re-establish storage maintenance in the event an item or equipment is removed from service.
- E. When the equipment warranty becomes effective, the Owner will assume responsibility for its maintenance.

END OF SECTION 016617

SECTION 017517 - STARTING OF SYSTEMS/COMMISSIONING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. This Section includes general requirements for the commissioning of the Work and start-up and operation of systems and equipment.

1.2 SUMMARY

- A. Starting, testing, and operating the completed Work including systems and equipment until Substantial Completion is achieved and operation of the completed Work including systems or equipment are accepted by the Owner. Contractor shall cooperate and coordinate with the Owner in the operation, maintenance, and adjustment of the Work.

1.3 RELATED SECTIONS

- A. Section 013323, Shop Drawings, Product Data and Samples
- B. Section 016617, Maintenance

1.4 DEFINITIONS

- A. Commissioning: Commissioning is the series of activities, or process, necessary to ensure that systems and equipment are designed, installed, functionally tested, started up and capable of being operated and maintained to perform in conformity with the design intent for the facility improvements. Commissioning includes, but is not limited to factory testing, field testing, dry testing, wet testing, performance testing, manufacturer's checkout, start-up, and Operational Demonstration.
- B. Factory Testing: Factory Testing is performance testing, operation testing, or documentation verification conducted in the production facilities, or specialized test facilities, of the equipment supplier. Such testing shall conform to the requirements of the individual sections of the Contract Documents.

"Witnessed" Factory Testing shall mean that the testing is witnessed by the Owner or his designated representative.
- C. Field Testing: Field Testing is performance testing, operation testing, or documentation verification conducted in the field after installation, to provide comparison with the results obtained in the Factory Testing.

- D. Dry Testing: Dry Testing is performed by the Contractor without introducing either process material or other test material into the component, system, or unit process.
- E. Wet Testing: Wet Testing is testing performed by the Contractor utilizing test material in the component, system, or unit process. Tankage shall be filled with test material to operating level.
- F. Performance Testing: Performance Testing is performed by the Contractor to demonstrate system performance in accordance with the Project Manual requirements.
- G. Manufacturer's Check-Out: Field inspection, testing, adjustments, and sign off by the approved representative of the Manufacturer, indicating that the component, system, or unit process meets the manufacturer's requirements.
- H. Start-Up: Narrowly defined as placing a component, system, or unit process on-line. Start-up can be a commissioning activity or a normal operating activity.
- I. Operational Demonstration: A commissioning activity performed by the Contractor wherein the Contractor operates and maintains a fully functional component, system, or unit process for a period of time after stable operation has been achieved.

1.5 SUBMITTALS

- A. Quality Control Submittals:
 - 1. Field Installation Reports – Submit reports by Manufacturer's Representative in accordance with Paragraph 3.4 of this Section.
- B. Commissioning Documentation: Contractor shall prepare and submit all documentation for review and approval. The documentation shall include, but not be limited to, the following:
 - 1. Certification by the preparer that he/she is the person responsible for the data, and that the data is authentic and accurate.
 - 2. Certification by the Contractor or equipment or unit process systems supplier that the equipment or the unit process systems were operated continuously for the specified period and that the equipment or unit process systems operated in compliance with the specified operating conditions, parameters and performance; and that the equipment or unit process systems are suitable for Performance Testing.
 - 3. Pertinent background information shall include, but not be limited to, the following:
 - a. Equipment or unit process systems Started-Up and Commissioned

- b. Start-Up and Commissioning dates
- c. Items or performance criteria tested clearly showing requirements and field data that verify requirements were met.
- d. Names of witnesses for Start-Up and Commissioning.
- e. Any repairs, corrections, or modifications required for the equipment or unit process systems to successfully complete Start-Up and Commissioning.
- f. Loop diagrams accurately depicting the installed condition of instrumentation and controls.
- g. Any other important background information.

4. Appendix

- a. A summary of all data used in the calculation, including source, formulas with all terms defined.
- b. Calculations for all data submitted, fully defined.
- c. Copies of all raw field data sheets, including those indicating sampling point locations, and notes.
- d. Production and/or operational data.
- e. Calibration procedures and worksheets for sampling equipment.
- f. Copies of calibration records for instrumentation.
- g. PLC Ladder logic documented with comments.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION AND VERIFICATION OF CONDITION

- A. The Contractor shall inspect systems and equipment prior to each start-up and verify their readiness for start-up. Conditions hazardous to equipment or personnel shall be corrected by the Contractor prior to start-up of equipment.
 - 1. Start-up operations shall not proceed using temporary power or temporary instrumentation and control wiring. All electrical and control connections shall be permanent and complete, and all such electrical components and equipment fully functional.
 - 2. Use of repair parts during start-up operations shall not be permitted, except in such situations where the actual on-site verification of such repair parts' operability is specified.
 - 3. The Contractor shall verify that all initial copies of the Maintenance and Operating Instructions have received an acceptable disposition as defined in Section 013323, and the only outstanding item is the field verification of the Instructions.

- B. On successful completion of Start-up, process flows and solids shall be used for commissioning the equipment and unit process systems to show the equipment and unit process systems function properly. Commissioning shall confirm the proper operation of the equipment and unit process systems with process fluids and process solids, adjustment shall be made, and the equipment or unit process systems shall be optimized and brought into compliance with design criteria in preparation for Operational Demonstration.
- C. The Contractor shall coordinate all Start-up and Commissioning activities for equipment and unit processes. The Contractor shall develop a detailed start-up and commissioning plan that includes the following as a minimum:
 - 1. Description of the overall general start-up and commissioning process.
 - 2. List of equipment and unit process systems included for start-up and commissioning activities.
 - 3. Detailed start-up and commissioning sequence of activities.
 - 4. Listing of staff and responsibilities for activities.
 - 5. Contractor shall use a form that will be provided by the Owner.

3.2 PREPARATION

- A. Prior to start-up of equipment or systems, all necessary test equipment shall be in place and operable.
- B. Approved representative(s) of the Manufacturer and Contractor shall be present for the initial start-up of systems or equipment.
- C. The Contractor shall request permission to start-up equipment, including electrical gear, and notify the Owner using a standard Start-Up Request form.
 - 1. The Start-Up Request shall be submitted to the Owner a minimum of 72 hours before the scheduled start-up. Requests shall be made during normal working hours.
 - 2. The Contractor shall provide all information in the first Section of the Start-Up Request form.
 - 3. The Owner will indicate approval or disapproval of the request.
 - 4. Approval of the request is based solely on impact on plant operations. Approval does not relieve the Contractor of any responsibility for plant and personnel safety.
 - 5. The Contractor shall obtain the approved Start-Up Request prior to the system or equipment start-up.

6. If training is to be conducted in conjunction with the start-up this should be indicated on the Start-Up Request form. All requirements of Section 019215, Instruction of Owner's Personnel must be met for training sessions.
 7. Start-ups performed at the direction of the Contractor, per paragraph 3.3(G) of this Section, do not require advance notification to the Engineer.
- D. Normal installation checks, such as for rotation, are not considered start-ups and do not normally require start-up notification. For all equipment and systems so designated in the Contract Documents, or so designated by the Engineer, such checks shall be under the supervision of the approved representative of the manufacturer, and shall be reviewed by the Engineer.
1. All electrical apparatus which is energized shall be clearly marked.

3.3 CONDUCT OF START-UP AND COMMISSIONING

A. Start-up:

1. All initial start-ups of equipment or systems shall be performed under the technical direction of the approved representative of the manufacturer.
 2. Any lack of readiness of associated systems or failure of a system or equipment previously started prior to the date of Final Completion of the Project shall require additional initial start-up service to be performed, under the direction of the approved representative of the manufacturer.
 3. The Contractor shall repair, replace or modify any equipment or system which fails to perform as specified in the Contract Documents. Such repair, replacement or modification of deficient work shall be performed under the terms of the General Conditions.
 4. During the Operational Demonstration period per Section 019214, Operational Demonstration and at other times when the system is on-line and an integral part of the Wastewater Treatment Plant operations and process, start-ups shall be performed as required by the Contractor.
- B. The Contractor shall be responsible for commissioning all work. Final acceptance shall be by the Owner.
- C. The Contractor is responsible for the performance and operation of the systems and equipment during commissioning.

When Owner personnel are operating systems or equipment, the Contractor shall make available, at all times, persons knowledgeable about the systems or equipment to direct the Owner personnel in its operation.

- D. The Contractor shall make all adjustments and corrections necessary to achieve normal, stable operation of systems. Adjustment and corrections shall be in accordance with Section 016617, Maintenance.
- E. Any failures of equipment or systems operated under the direction of the Contractor shall be considered deficiencies and shall be corrected in accordance with the General Conditions.
- F. During the Operational Demonstration period as defined in Section 019214, Operational Demonstration and at other times, the work will be on-line and an integral part of the Wastewater Treatment Plant operations and process. The Owner maintains control of Wastewater Treatment Plant operations and processes at all times. Therefore:
 - 1. The Contractor shall not commence, resume, terminate, or suspend the operations without the permission of the Owner and only in a sequence and manner suitable to the Owner.
 - 2. The Contractor shall immediately, on a 24-hour per day, 7-day per week basis, adjust or repair any malfunction in the work which in the opinion of the Owner jeopardizes or may jeopardize the proper operation of the Wastewater Treatment Plant.
 - 3. The Contractor shall not start-up, shut down, adjust, or otherwise alter the operation of any component, system, or unit process without the permission of the Owner except in the case of an emergency and in accordance with the General Conditions.

3.4 QUALITY CONTROL

- A. Reports of the Approved Representative of the Manufacturer:
 - 1. The approved representative of the manufacturer shall prepare a daily report on each site visit for each system or item of equipment inspected, adjusted, started-up, or worked on.
 - 2. The report shall state the purpose of the visit, the representative's observations and conclusions, and recommendations for further visits or action.
 - 3. The reports shall be submitted in accordance with Section 013323, Shop Drawings, Product Data and Samples within three (3) days of the visit.

END OF SECTION 017517

SECTION 017800 - FINAL COMPLIANCE AND SUBMITTALS

PART 1 - GENERAL

- 1.1 The following forms and related sign-offs shall be documented in accordance with provisions of the contract. These forms shall be completed by the Contractor and approved by the Owner before final retainer is approved for release. Forms for Items A to E will be attached to the Contractor's executed copy of the contract.
- A. Certificate of Substantial Completion (To be submitted at time of Substantial Completion).
 - B. Contractor's Certification of Completion.
 - C. Contractor's Affidavit of Prevailing Wage.
 - D. Consent of Surety Company for Final Payment.
 - E. Affidavit of Final Acceptance Date and Correction Period.
 - F. Before the OWNER will approve and accept the work and release the retainer, the CONTRACTOR will furnish the OWNER a written report indicating the resolution of any and all property damage claims filed with the CONTRACTOR by any party during the construction period. The information to be supplied shall include, but not be limited to, name of claimant, date filed with CONTRACTOR, name of insurance company and/or adjuster handling claim, how claim was resolved and if claim was not resolved for the full amount, a statement indicating the reason for such action.
 - G. DBE Subcontractor Participation Forms SR-EPA.7-8 (Applicable for WPCLF & WSRLA funded projects only).

END OF SECTION 017800

SECTION 017821 - CLEANING AND PROTECTION

PART 1 - GENERAL

1.1 GENERAL

- A. On or before the completion date for the work, the Contractor shall tear down and remove all temporary structures built by him, all construction plant used by him, and shall repair and replace all parts of existing embankments, fences or other structures which were removed or injured by his operations or by the employees of the Contractor. The Contractor shall thoroughly clean out all buildings, sewers, drains, pipes, manholes, inlets and miscellaneous and appurtenant structures, and shall remove all rubbish leaving the grounds in a neat and satisfactory condition.
- B. As circumstances require and when ordered by the Engineer, the Contractor shall clean the road, driveway, and/or sidewalk on which construction activity under this contract has resulted in dirt or any other foreign material being deposited with an automatic self-contained mechanical sweeper with integral water spray, vacuum and on-board or supplementary containment.
- C. Failure to comply with this requirement when ordered by the Engineer or his representative, may serve as cause for the Engineer to stop the work and to withhold any monies due the Contractor until such order has been complied with to the satisfaction of the Engineer.
- D. As the work progresses, and as may be directed, the Contractor shall remove from the site and dispose of debris and waste material resulting from his work. Particular attention shall be given to minimizing any fire and safety hazard from form materials or from other combustibles as may be used in connection with the work, which should be removed daily.
- E. The Contractor shall wash all windows and other glass surfaces, leaving all areas free from putty marks, paint, etc.
- F. During and after installation, the Contractor shall furnish and maintain satisfactory protection to all equipment against injury by weather, flooding or breakage thereby permitting all work to be left in a new condition at the completion of the contract.

END OF SECTION 017821

SECTION 017823 – MAINTENANCE MANUALS

PART 1 - GENERAL

1.1 OPERATION AND MAINTENANCE MANUALS

- A. Operation and maintenance information shall be submitted for all manufactured items, i.e. equipment, hardware, pumps, valves, motors, etc.
- B. This manual will either contain or make reference to all information that has been issued during the construction and start-up periods, as well as information necessary for the proper operation and maintenance of equipment.
- C. It shall be the responsibility of the Contractor who supplies such equipment to obtain from his vendors the required information and submit to the Engineer. This information will be accepted only if properly identified and only after it has been revised, where necessary, to conform to previous transmittals of the same material that have been "approved as noted" by the Engineer. All submittals shall be on 8-1/2" X 11" size paper or folded to that size.
- D. In general and where applicable, the information shall consist of, but not be limited to, six (6) sets of the following:
 - 1. Descriptive literature, bulletins or other data covering equipment or system.
 - 2. Complete list of equipment and appurtenances included with system, complete with manufacturer and model number.
 - 3. Utility requirements.
 - 4. General arrangement drawing.
 - 5. Sectional assembly.
 - 6. Dimension print.
 - 7. Materials of construction.
 - 8. Certified performance curve.
 - 9. Performance guarantee.
 - 10. Parts list.
 - 11. Recommended spare parts list with part and catalog number.
 - 12. Lubrication recommendations and instructions.
 - 13. Schematic wiring diagrams.
 - 14. Schematic piping diagrams.
 - 15. Instrumentation data.
 - 16. Drive dimensions and data.
 - 17. Control data.
 - 18. Operating instructions.
 - 19. Maintenance instructions including troubleshooting guidelines and preventative maintenance instructions with task schedule.
 - 20. Required tools and equipment for operation and maintenance.
 - 21. Safety considerations for O & M procedures.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORDS, DRAWINGS

PART 1 - GENERAL

1.1 RECORD DRAWINGS

- A. The Contractor shall furnish an authentic set of marked-up drawings showing the installation insofar as the installation shall have differed from the Engineer's drawings. The drawings shall be delivered to the Engineer for making revisions to the original drawings immediately after final acceptance by the Owner.
- B. The Contractor shall furnish dimensioned drawings indicating locations of all underground mechanical and electrical facilities.

END OF SECTION 017839

SECTION 133419

METAL BUILDING SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal Building System:
 - 1. Structural steel framing system.
 - 2. Metal roof system.
 - 3. Metal wall system.
 - 4. Roof and wall insulation systems.

1.2 RELATED REQUIREMENTS

- A. Section 011100 – Summary of Work.
- B. Section 012100 – Allowances.

1.3 REFERENCE STANDARDS

- A. American Institute of Steel Construction (AISC):
 - 1. AISC 360 - Specification for Structural Steel Buildings.
 - 2. AISC 341 – Seismic Provisions for Structural Steel Buildings (when appropriate).
 - 3. AISC Design Guide 3 – Serviceability for Steel Buildings
- B. American Iron and Steel Institute (AISI):
 - 1. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members.
- C. American Welding Society (AWS):
 - 1. AWS D1.1 / D1.1M – Structural Welding Code – Steel.
 - 2. AWS D1.3 / D1.3M – Structural Welding Code – Sheet Steel.
- D. Association for Iron & Steel Technology (AISE):
 - 1. AISE 13 – Specifications for Design and Construction of Mill Buildings.
- E. ASTM International (ASTM):
 - 1. ASTM A 325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - 2. ASTM A 653 / A 653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 3. ASTM A 792 / A 792M – Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - 4. ASTM B 117 – Standard Practice for Operating Salt Spray (Fog) Apparatus.

5. ASTM C 518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 6. ASTM C 1363 – Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus.
 7. ASTM D 522 – Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings.
 8. ASTM D 523 – Standard Test Method for Specular Gloss.
 9. ASTM D 968 – Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive.
 10. ASTM D 1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
 11. ASTM D 2244 – Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
 12. ASTM D 2247 – Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
 13. ASTM D 2794 – Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
 14. ASTM D 3361 – Standard Practice for Unfiltered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
 15. ASTM D 4214 – Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.
 16. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
 17. ASTM E 96 / E 96M – Standard Test Methods for Water Vapor Transmission of Materials.
 18. ASTM E 1592 – Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
 19. ASTM G 87 – Standard Practice for Conducting Moist SO₂ Tests.
- F. FM Global:
1. NOT APPLICABLE TO THIS PROJECT
- G. Metal Building Manufacturers Association (MBMA):
1. MBMA Metal Building Systems Manual.
 2. Seismic Design Guide for Metal Building Systems.
- H. North American Insulation Manufacturers Association (NAIMA):
1. NAIMA 202 – Standard For Flexible Fiber Glass Insulation to be Laminated for Use in Metal Buildings.
- I. The Society for Protective Coatings (SSPC):
1. SSPC-Paint 15 - Primer for Use Over Hand Cleaned Steel performs to SSPC-Paint 15 standards.
 2. SSPC-SP2 – Hand Tool Cleaning.
- J. Underwriters Laboratories (UL):
1. UL 580 – Standard for Tests for Uplift Resistance of Roof Assemblies.
 2. UL 723 – Standard for Test for Surface Burning Characteristics of Building Materials.
- K. US Army Corps of Engineers (COE):
1. COE Unified Facilities Guide Specification Section 07 61 13.

1.4 PREINSTALLATION MEETINGS

- A. Convene preinstallation meeting 2 weeks before start of installation of metal building system.
- B. Require attendance of parties directly affecting work of this section, including Contractor, Engineer, and installer.
- C. Review materials, installation, protection, and coordination with other work.

1.5 SUBMITTALS

- A. Comply with Section 013323 – Shop Drawings, Product Data And Samples.
- B. Product Data: Submit metal building system manufacturer’s product information, specifications, and installation instructions for building components and accessories.
- C. Erection Drawings: Submit metal building system manufacturer’s erection drawings, including plans, elevations, sections, and details, indicating roof framing, transverse cross-sections, covering and trim details, and accessory installation details to clearly indicate proper assembly of building components.
- D. Certification: Submit written “Certificate of design and manufacturing conformance” prepared and signed by a Professional Engineer, registered to practice in **OHIO** verifying that the metal building system design and metal roof system design (including panels, clips, and support system components) meet indicated loading requirements and codes of authorities having jurisdiction.
 - 1. Certification shall reference specific dead loads, live loads, snow loads, wind loads/speeds, tributary area load reductions (if applicable), concentrated loads, collateral loads, seismic loads, end-use categories, governing code bodies, including year, and load applications.
 - 2. Submit certification 1 week before bid date on the metal building system manufacturer’s letterhead.
- E. Submit certification verifying that the metal roof system has been tested and approved by Underwriter’s Laboratory as Class 90.
- F. Dealer Certification: Submit certification 1 week before bid date that the metal building system supplier or metal roof system supplier is a manufacturer’s authorized and franchised dealer of the system to be furnished.
 - 1. Certification shall state date on which authorization was granted.
- G. Installer Certification: Submit certification 1 week before bid date that the metal building system or roof system installer has been regularly engaged in the installation of building systems of the same or equal construction to the system specified.
- H. Warranty Documentation: Submit manufacturer’s standard warranty.

1.6 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
 - 1. Manufacturer regularly engaged, for past 10 years, in manufacture of metal building systems of similar type to that specified.
 - 2. Accredited based on IAS Accreditation Criteria AC472 and requirements in International Building Code (IBC), Chapter 17.
- B. Installer's Qualifications:
 - 1. Installer regularly engaged, for past 5 years, in installation of metal building systems of similar type to that specified.
 - 2. Installer shall be certified by the metal building system manufacturer.
 - 3. Metal building system erector shall be IAS AC478 accredited.
 - 4. Employ persons trained for installation of metal building systems.
- C. Certificate of design and manufacturing conformance:
 - 1. Metal building system manufacturer shall submit written certification prepared and signed by a Professional Engineer, registered to practice in **OHIO** verifying that building system design and metal roof system design (including panels, clips, and support system components) meet indicated loading requirements and codes of authorities having jurisdiction.
 - 2. Certification shall reference specific dead loads, live loads, snow loads, wind loads/speeds, tributary area load reductions (if applicable), concentrated loads, collateral loads, seismic loads, end-use categories, governing code bodies, including year, and load applications.
 - 3. Certificate shall be on metal building system manufacturer's letterhead.
 - 4. Refer to Submittals article of this specification section.
- D. Material Testing:
 - 1. In addition to material certifications of structural steel, metal building system manufacturer shall provide, upon request at time of order, evidence of compliance with specifications through testing.
 - 2. This quality assurance testing shall include testing of structural bolts, nuts, screw fasteners, mastics, and metal coatings (primers, metallic coated products, and painted coil products).

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage and Handling Requirements:
 - 1. Store and handle materials in accordance with manufacturer's instructions.
 - 2. Keep materials in manufacturer's original, unopened containers and packaging until installation.
 - 3. Do not store materials directly on ground.
 - 4. Store materials on flat, level surface, raised above ground, with adequate support to prevent sagging.
 - 5. Protect materials and finish during storage, handling, and installation to prevent damage.

1.8 WARRANTY

- A. Metal building system manufacturer shall provide a paint film written warranty for 25 years against cracking, peeling, chalking, and fading of exterior coating on painted roof and wall panels.
 - 1. Warranty shall be signed by metal building system or roof system manufacturer and state that the coating contains 70 percent "Kynar 500" or "Hylar 5000" resin.
 - 2. Metal building system manufacturer shall warrant that the coating shall not peel, crack, or chip for 25 years.
 - 3. For a period of 25 years, chalking shall not exceed ASTM D 4214, #8 rating and shall not fade more than 5 color difference units in accordance with ASTM D 2244.

- B. Metal Building System Manufacturer's Certification: Metal building system manufacturer shall submit a signed written Certification 1 week before bid date, stating that the metal roof system manufacturer or approved representative will provide warranties and Inspection and Report Service specified in this specification section.
 - 1. Warranty terms shall be submitted with bid.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Metal Building System Manufacturer: Butler Manufacturing, PO Box 419917, Kansas City, Missouri 64141. Phone 816-968-3000. Website www.butlermfg.com.

2.2 BUILDING DESCRIPTION

- A. Building Dimensions: Indicated on the Drawings.
 - 1. Horizontal Dimensions: Measure to inside face of wall sheets.
 - 2. Eave Height: Measure from top of finished floor to intersection of insides of roof and sidewall sheets.
 - 3. Clear Height Between Finished Floor and Bottom of Roof Beams: Indicated on the Drawings.

- B. Primary Structural Members:
 - 1. Primary Framing System: Butler Manufacturing framing system as specified in this specification section.
 - 2. Frames: Welded-up plate section columns and roof beams, complete with necessary splice plates for bolted field assembly as specified in this specification section.
 - 3. Bolts for Field Assembly of Primary Steel: High-strength bolts as indicated on erection drawings of metal building system manufacturer.
 - 4. Beam and Post Endwall Frames: Endwall corner posts, endwall roof beams, and endwall posts as required by design criteria.
 - 5. Exterior Columns: Welded-up "H" sections or cold-formed "C" sections.
 - 6. Interior Columns: "H" sections or tube columns.
 - 7. Connection of Primary Structural Members: ASTM A 325 bolts through factory-punched holes.
 - 8. Primary Structural Members: Paint with metal building system manufacturer's standard primer with surface preparation as specified in this specification section.

- C. Secondary Structural Members:
 1. Secondary Framing System: Butler Manufacturing framing system as specified in this specification section.
 2. C/Z Purlins and Girts: **Acrylic-coated G30 galvanized finish.**
- D. Metal Roof System: Butler Manufacturing metal roof system as specified in this specification section.
- E. Metal Wall System: Butler Manufacturing metal wall system as specified in this specification section.
- F. Where metal panels are required to be painted, use coating system as specified in this specification section.

2.3 DESIGN REQUIREMENTS

- A. Governing Design Code:
 1. Structural design for the building structural system shall be provided by the metal building system manufacturer for the following design criteria:
 - a. Governing Building Code: **OBC17**
 - b. Occupancy Category: **IV – Essential Facility**
 2. Insulation requirements for the building system shall be provided by for the following energy code or energy standard criteria:
 - a. Governing Energy Code (IECC) or Energy Standard (ASHRAE 90.1)
 - b. Climatic Zone: **5**

COMcheck may be used to show code compliance using the envelope performance trade-off method.
- B. Roof Live Load: **30psf – Non-Reducible**
 1. Roof live loads are loads produced during the life of the structure by moveable objects.
 2. Wind, snow, seismic, or dead loads are not live loads.
 3. Roof live loads are applied based on the Tributary Area as stated in code
- C. Roof Snow Load:
 1. Roof snow load used for designing the structure shall not be reduced and shall be the product of the following criteria:
 - a. Thermal Factor (C_t): **Heated**
 - b. Snow Importance Factor (I): **1.20**
 - c. Ground Snow Load (P_g): **20psf**
 2. Design snow load shall include the effects of minimum flat roof load limits, rain on snow, drifting snow, and unbalanced snow load as defined in the governing building code specified above.
- D. Wind Load: **120MPH**
 1. Wind load used for designing the structure shall be the product of the following criteria:
 - a. Wind Exposure Category: **B**
 2. Wind Pressure Coefficients and the design pressures shall be applied in accordance with the governing code.

- E. Seismic Load:
1. Seismic load used for designing the structure shall be based on the following criteria:
 - a. Spectral response acceleration for short periods (S_s): **15.0**
 - b. Spectral response acceleration for 1-sec. period (S_1): **6.0**
 - c. Site Class: **D**
 - d. Seismic Importance Factor (I): **1.5**
 2. Seismic loads shall be applied in accordance with the governing code.
- F. Dead Load: Dead load shall consist of the weight of building system construction, such as roof, framing, and covering members.
- G. Collateral Load: **5PSF**
1. Collateral load in pounds per square foot shall be applied to the entire structure to account for the weight of additional permanent materials other than the building system, such as sprinklers, mechanical systems, electrical systems, hung partitions, and ceilings.
 2. This allowance does not include the weight of hung equipment weighing 50 pounds or more.
 3. Equipment loads of 50 pounds or more shall be indicated on the Drawings and the structure shall be strengthened as required.
 4. Architect will provide the metal building system manufacturer with the magnitude and approximate location of concentrated loads greater than 50 pounds before design of the building starts.
- H. Auxiliary Loads: Auxiliary loads shall include dynamic loads, such as cranes and material handling systems, and will be defined in the Contract Documents.
- I. Crane Loads:
1. Crane loads shall be a function of the Service Class as defined by the governing code and Crane Manufacturers Association of America (CMAA) and the rated tonnage (A- Standby or Infrequent service, B- Light service, C- Moderate service, D- Heavy Service, E- Severe Service, F- Continuous Severe Service).
 2. Cranes in Service Class E or F shall be in accordance with AISE 13.
 - a. Service Class of Crane: **C**
 - b. Deflection Criterion for Crane: **H/100**
 3. Crane loads will be obtained from the crane manufacturer and supplied by the Architect to the metal building system manufacturer at the time of bid.
 4. Building structure shall be designed for the crane loads in accordance with the governing code.
 5. Multiple cranes in the same bay or aisle shall be designed in accordance with the governing code.
 6. If the governing code does not address multiple crane design practices, MBMA Metal Building Systems Manual shall be used.
- J. Load Combinations: Load combinations used to design primary and secondary structural members shall be in accordance with the governing code.

2.4 DEFLECTIONS

- A. Structural Members:
 - 1. Maximum deflection of main framing members shall not exceed **1/180** of their respective spans.
 - 2. Maximum deflection due to snow load in roof panels and purlins shall not exceed **1/180** of their respective spans.
 - 3. Maximum deflection due to wind load in wall panels and girts shall not exceed **1/180** of their respective spans.
- B. Lateral deflections, or drift, at the roof level of the structure in relation to the floor or slab on grade, caused by deflection of horizontal force resisting elements, shall not exceed **H/100**.
- C. Calculations for deflections shall be done using only the bare frame method.
 - 1. Reductions based on engineering judgment using the assumed composite stiffness of the building envelope shall not be allowed.
 - 2. Drift shall be in accordance with AISC Serviceability Design Considerations for Low-Rise Buildings.
 - 3. Use of composite stiffness for deflection calculations is permitted only when actual calculations for the stiffness are included with the design for the specific project.
 - 4. When maximum deflections are specified, calculations shall be included in the design data.

2.5 STRUCTURAL STEEL FRAMING SYSTEM

- A. General:
 - 1. Design of Structural System: Clear or multi-span rigid frame with tapered or straight columns and roof beams, with gable or single-slope roof.
 - 2. Actual Building Length:
 - a. Structural line to structural line.
 - b. Same as nominal; i.e., number of bays times length of bays.
 - c. Structural Line: Defined as inside face of wall sheets.
 - 3. Actual Building Width:
 - a. Structural line to structural line.
 - b. Nominal building width.
 - 4. Minimum Roof Slope: **1 inch in 12 inches**.
 - 5. Maximum Roof Slope: **1 inch in 12 inches**.
 - 6. Components and Parts of Structural System:
 - a. Indicated on the Drawings or the Specifications.
 - b. Clearly marked.
 - c. Erection Drawings: Supply for identification and assembly of parts.
 - d. Drawings: Carry stamp of a registered professional engineer.
 - 7. Foundations:
 - a. Foundations, Including Anchor Bolt Embedment Length: Properly designed by qualified engineer, retained by other than metal building system manufacturer, in accordance with specific soil conditions for building site.
 - b. Reactions for Proper Design of Foundations: Supplied by metal building system manufacturer.
 - c. Anchor Bolts:
 - 1) Anchor Bolt Diameter: Indicated on anchor bolt layout drawings furnished by metal building system manufacturer.

- 2) Anchor Bolts: Supplied by Contractor, not metal building system manufacturer.
- 3) Anchor Bolts on Moment-Resisting Column Bases: Nuts above and below base plates.

B. Structural Steel Design:

1. Structural Mill Sections or Welded-up Plate Sections: Design in accordance with AISC Specification for Structural Steel Buildings.
2. Cold-Formed Steel Structural Members: Design in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
3. Structural System: Design in accordance with specified building code (Refer to Design Loads and Building Codes).

C. Primary Framing:

1. Rigid Frames:
 - a. Frames: Welded-up plate section columns and roof beams, complete with necessary splice plates for bolted field assembly.
 - 1) Base Plates, Cap Plates, Compression Splice Plates, and Stiffener Plates: Factory welded into place and connection holes factory fabricated.
 - 2) Columns and Roof Beams: Fabricated complete with holes in webs and flanges for attachment of secondary structural members and bracing, except for fieldwork as noted on erection drawings furnished by metal building system manufacturer.
 - b. Bolts for Field Assembly of Frame Members: ASTM A 325 high-strength bolts as indicated on erection drawings furnished by metal building system manufacturer.
2. Endwall Structural Members: Cold-formed channel members designed in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members or welded-up plate sections designed in accordance with AISC Specification for Structural Steel Buildings.
 - a. Endwall Frames: Endwall corner posts, endwall roof beams, and endwall posts as required by design criteria.
 - 1) Splice Plates and Base Clips: Shop fabricated complete with bolt connection holes.
 - 2) Base Plates, Cap Plates, Compression Splice Plates, and Stiffener Plates: Factory welded into place and connection holes shop fabricated.
 - 3) Beams and Posts: Factory fabricated complete with holes for attachment of secondary structural members, except for field work as noted on erection drawings furnished by metal building system manufacturer.
 - b. Intermediate Frames: Substituted for end-wall roof beams, when specified.
 - 1) Factory fabricate necessary endwall posts and holes for connection to intermediate frame used in endwall.

D. Secondary Structural Members:

1. Purlins:
 - a. Purlins:
 - 1) "Z"-shaped, precision-roll-formed, acrylic-coated G30 galvanized steel in different gauges to meet specified loading conditions.
 - 2) 7-inch, 8-1/2-inch, 10-inch, or 11-1/2-inch-deep "Z" sections.
 - b. Outer Flange of Purlins: Factory-punched holes for panel connections.
 - c. Attach purlins to main frames and endwalls with 1/2-inch-diameter bolts.

- d. Brace purlins at intervals indicated on erection drawings furnished by metal building system manufacturer.
 - e. Concentrated Loads: Hung at purlin panel points.
2. Eave Members:
 - a. Eave Struts: Factory punched 7-inch, 8-1/2-inch, 10-inch, or 11-1/2-inch-deep "C" sections, precision-roll-formed, acrylic-coated G30 galvanized steel in different gauges to meet specified loading conditions.
 3. Girts:
 - a. "Z" or "C"-shaped, precision-roll-formed, acrylic-coated G30 galvanized steel in different gauges to meet specified loading conditions.
 - b. 7-inch, 8-1/2-inch, 10-inch, or 11-1/2-inch-deep "Z" or "C" sections.
 - c. Outer Flange of Girts: Factory-punched holes for panel connections.
 4. Bracing:
 - a. Locate bracing as indicated on the Drawings.
 - b. Diagonal Bracing:
 - 1) Hot-rolled rods of sizes indicated on the Drawings.
 - 2) Attach to columns and roof beams as indicated on the Drawings.
 - c. Optional fixed-base wind posts or pinned-base portal frames may be substituted for wall rod bracing on buildings as required.
 - d. Flange Braces and Purlin Braces: Cold formed and installed as indicated on the Drawings.
- E. Welding:
1. Welding Procedures, Operator Qualifications, and Welding Quality Standards: AWS D1.1 - Structural Welding Code – Steel and AWS D1.3 - Structural Welding Code – Sheet Steel.
 2. Welding inspection, other than visual inspection as defined by AWS D1.1, paragraph 6.9, shall be identified and negotiated before bidding.
 3. Certification of Welder Qualification: Supply when requested.
- F. Painting of Structural Steel Framing System:
1. General:
 - a. Structural Steel: Prime paint as temporary protection against ordinary atmospheric conditions.
 - b. Perform subsequent finish painting, if required, in field as specified in the painting section.
 - c. Before painting, clean steel of loose rust, loose mill scale, dirt, and other foreign materials.
 - d. Steel Fabricator: Not required to sand blast, flame clean, or pickle steel before painting, unless otherwise specified.
 2. Primary Frames:
 - a. Clean steel in accordance with SSPC-SP2.
 - b. Factory cover steel with 1 coat of gray water-reducible alkyd primer paint formulated to equal or exceed performance requirements SSPC-Paint 15.
 - c. Minimum Coating Thickness: 1.0 mil.
 3. Secondary Structural Members – Roll-Formed:
 - a. Hot-dipped zinc coating, ASTM A 653, G30; followed by 1 coat of clear acrylic finish.
 - b. Acrylic-Coated G30 Galvanized Steel: Equal or exceed performance requirements of SSPC Paint-15.

2.6 METAL ROOF SYSTEM

- A. Metal Roof System: Butler Manufacturing “CMR-24[®]” roof system.
- B. Roof System Design:
 - 1. Design roof panels and liner panels in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
 - 2. Design roof paneling system to support design live, snow, and wind loads.
 - 3. Endwall Trim and Roof Transition Flashings: Allow roof panels to move relative to wall panels and/or parapets as roof expands and contracts with temperature changes.
- C. Roof System Performance Testing:
 - 1. UL Wind Uplift Classification Rating, UL 580: Class 90.
 - 2. Structural Performance Under Uniform Static Air Pressure Difference: Test roof system in accordance with ASTM E 1592.
 - 3. Roof system has been tested in accordance with U.S. Army Corps of Engineers Unified Facilities Guide Specification Section 07 61 13.
- D. Roof Panels:
 - 1. Factory roll-formed, 24 inches wide, with 2 major corrugations, 2 inches high (2-3/4 inches including seam), 24 inches on center.
 - 2. Flat of the Panel: Cross flutes 6 inches on center, perpendicular to major corrugations in entire length of panel to reduce wind noise.
 - 3. Variable Width Panels:
 - a. For roof lengths not evenly divisible by the 2'-0" panel width, factory-manufactured variable-width (9-inch, 12-inch, 15-inch, 18-inch, and 21-inch-wide) panels shall be used to ensure modular, weathertight roof installation.
 - b. Minimum Length: 15 feet.
 - c. Supply maximum possible panel lengths.
 - 4. Panel Material and Finish:
 - a. 24-gauge steel coated both sides with layer of Galvalume aluminum-zinc alloy (approximately 55 percent aluminum, 45 percent zinc) applied by continuous hot-dip method.
 - b. Minimum 0.55-ounce coated weight per square foot as determined by triple-spot test, ASTM A 792.
 - 5. Use panels of maximum possible lengths to minimize end laps.
 - 6. Extend eave panels beyond structural line of sidewalls.
 - 7. Factory punch panels at panel end to match factory-punched holes in eave structural member.
 - 8. Panel End Splices: Factory punched and factory notched.
 - 9. Panel End Laps: Locate directly over, but not fastened to, a supporting secondary roof structural member and be staggered, to avoid 4-panel lap-splice condition.
 - 10. End Laps: Floating. Allows roof panels to expand and contract with roof panel temperature changes.
 - 11. Self-Drilling Fasteners: Not permitted in weathering membrane of roof system.
 - 12. Ridge Assembly:
 - a. Design ridge assembly to allow roof panels to move lengthwise with expansion and contraction as roof panel temperature changes.
 - b. Factory punch parts for correct field assembly.
 - c. Install panel closures and interior reinforcing straps to seal panel ends at ridge.

- d. Do not expose attachment fasteners on weather side.
- e. Use lock seam plug to seal lock seam portion of panel.
- f. High-Tensile Steel Ridge Cover: Span from panel closure to panel closure and flex as roof system expands and contracts.

E. Insulation Board:

1. Rigid "Thermax" Metal Building Board glass-fiber-reinforced, polyisocyanurate foam plastic core.
2. Width: 4 feet.
3. Maintain Class A fire rating.
4. Approved for use without thermal barrier.
5. Maximum Thickness: 4 inches.
6. Covered with embossed aluminum facing - Metal Building Board.

F. Vapor Retarder:

1. WMP-50, 0.0015-inch minimum thickness, UV-stabilized, white polypropylene, laminated to 30-pound Kraft paper / metalized polyester and reinforced with glass fiber and polyester scrim.
2. Perm Rating: 0.02.

G. Interior Liner Panels:

1. Butler® MOD36 liner panel.
2. Form panels from 0.0149 - inch minimum total coated thickness coated steel with minimum yield strength of 80,000 psi.
3. Painted Panel Finish:
 - a. Exposed Side: 0.15-mil min primer and 0.70-mil minimum interior white polyester paint.
 - b. Unexposed Side: 0.1-mil minimum primer and 0.40 minimum polyester backer
 - c. Panel Dimensions: Nominal 36 inches wide with corrugations 1/2 inches high, 3 inches on center.
4. Factory cut panels to lengths required.

H. Provision for Expansion and Contraction:

1. Provision for Thermal Expansion Movement of Roof Panels: Clips with movable tab.
 - a. Stainless Steel Tabs: Factory centered on roof clip to ensure full movement in either direction.
 - b. Maximum Force of 8 Pounds: Required to initiate tab movement.
 - c. Each Clip: Accommodates a minimum of 1.25-inch movement in either direction.
2. Roof: Provide for thermal expansion and contraction without detrimental effects on roof panels, with plus or minus 100-degree F temperature difference between interior structural framework of building and of roof panels.

I. Fasteners:

1. Make connections of roof panels to structural members, except at eaves, with clips with movable stainless steel tabs, seamed into standing seam side lap.
2. Fasten insulation board, bearing plates, and panel clips to structural members with "Scrubolt™" fasteners in accordance with erection drawings furnished by metal building system manufacturer, using factory-punched or field-drilled holes in structural members.
 - a. Fasteners: Metal-backed rubber washer to serve as torque indicator.
3. Fasteners penetrating metal membrane at the following locations do not exceed the frequency listed:

- a. Basic Panel System: 0 per square foot.
- b. High Eave Trim, No Parapet: 2 per linear foot.
- c. Exterior Eave Gutter: 2 per linear foot.
- d. Panel Splices: 2 per linear foot.
- e. Gable Trim: 0 per linear foot.
- f. High Eave with Parapet: 0 per linear foot.
- g. Ridge: 0 per linear foot.
- h. Low Eave Structural: 1.5 per linear foot.

J. Accessories:

- 1. Accessories (i.e., ventilators, skylights, gutters, fascia): Standard with metal building system manufacturer, unless otherwise noted and furnished as specified.
- 2. Metal Coating on Gutters, Downspouts, Gable Trim, and Eave Trim: "Butler-Cote™" finish system, full-strength, 70 percent "Kynar 500" or "Hylar 5000" fluoropolymer (PVDF) coating.
- 3. Location of Standard Accessories: Indicated on erection drawings furnished by metal building system manufacturer.
- 4. Material used in flashing and transition parts and furnished as standard by metal building system manufacturer may or may not match roof panel material.
 - a. Parts: Compatible and not cause corrosive condition.
 - b. Copper and Lead Materials: Do not use with Galvalume or optional aluminum-coated panels.

K. Thermal Performance:

- 1. Determine thermal performance in accordance with ASTM C 1363 and test U-factors for composite roof section.
- 2. "Thermax" Insulation Thicknesses: Maximum 4 inches.

L. Physical Properties:

- 1. WMP-VR Vapor Retarder:
 - a. Water Vapor Permeance (perm) Rating, ASTM E 96: 0.09.
 - b. Minimum Workability Temperature: 40 degrees F.
- 2. WMP-50 Vapor Retarder:
 - a. For conditions of high interior humidity, UV-stabilized, white polypropylene film.
 - b. Water Vapor Permeance (perm) Rating, ASTM E 96: 0.02.
 - c. Minimum Workability Temperature: 20 degrees F.
- 3. Vapor Retarder UL Fire Hazard Classification Ratings, UL 723:
 - a. WMP-VR Vapor Retarder:
 - 1) Flame Spread: 10.
 - 2) Smoke Development: 10.
 - b. WMP-50 Vapor Retarder:
 - 1) Flame Spread: 5.
 - 2) Smoke Development: 30.
- 4. Insulation Board Facing:
 - a. Water Vapor Permeance (perm) Rating, ASTM E 96: 0.03.
- 5. "Thermax" Metal Building Board Insulation:
 - a. Class I Factory Mutual Approval and UL Fire Hazard Classification Ratings, UL 723:
 - 1) Flame Spread: 25 or less.

2.7 METAL WALL SYSTEM

- A. Exterior Metal Wall System: Butler Manufacturing™ “Shadowall™” wall system.
- B. Wall System Design: Design wall panels in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
- C. Wall Panels:
 - 1. Roll-formed panels, 3 feet wide with 4 major corrugations, 1-7/16 inches high, 12 inches on center, with 2 minor corrugations between each of the major corrugations entire length of panel.
 - 2. One piece from base to building eave.
 - 3. Each Panel Corrugation: Fastener alignment groove to center fastener within corrugation.
 - 4. Exposed Panel Side Laps: Hemmed to eliminate raw cut panel edge.
 - 5. Factory punch or field drill wall panels at panel ends and match factory-punched or field-drilled holes in structural members for proper alignment.
 - 6. Panel Material and Finish:
 - a. Paint with exterior colors of “Butler-Cote™” finish system, full-strength, 70 percent “Kynar 500” or “Hylar 5000” fluoropolymer (PVDF) coating.
 - b. PVDF Coating Warranty: Metal building system manufacturer shall warrant coating for 25 years for the following.
 - 1) Not to peel, crack, or chip.
 - 2) Chalking: Not to exceed ASTM D 4214, #8 rating.
 - 3) Fading: Not more than 5 color-difference units, ASTM D 2244.
- D. Fasteners:
 - 1. Wall Panel-to-Structural Connections: Torx-head “Scrubolt™” or Torx-head self-drilling screws.
 - 2. Wall Panel-to-Panel Connections: Torx-head self-drilling screws.
 - 3. Fastener Locations: Indicated on erection drawings furnished by metal building system manufacturer.
 - 4. Exposed Fasteners: Factory painted to match wall color.
- E. Accessories:
 - 1. Accessories (i.e., doors, windows, louvers): Standard with metal building system manufacturer, unless otherwise noted and furnished as specified.
 - 2. Location of Standard Accessories: Indicated on erection drawings furnished by metal building system manufacturer.
- F. Energy Conservation:
 - 1. Insulate secondary structurals (optional) to eliminate "thermal short circuits" between structurals and wall panels.
 - 2. Minimize heat loss (thermal short circuit) caused by compression of blanket insulation between structural members and wall panels by use of thermal block at each structural location.

2.8 INSULATION

- A. Laminated Fiberglass: Owens-Corning Fiberglas, NAIMA 202, “Certified R” metal building insulation.
 - 1. TIMA Insignia and Insulation Thickness: Ink-jet printed on fiberglass.
- B. Back-Fill Insulation: Owens-Corning Fiberglas unfaced “Pink Metal Building Insulation Plus”.
- C. Roof Insulation:
 - 1. Nominal Thickness: **4 inches**.
 - 2. Certified R-Value: **R25.2**.
- D. Wall Insulation:
 - 1. Nominal Thickness: **6 inches**.
 - 2. Certified R-Value: **R19**.
- E. Wall Insulation Facing: WMP-VR-R.
 - 1. 0.0015-inch-thick, UV-stabilized, white polypropylene laminated to metalized polyester film, reinforced with glass-fiber scrim.
 - 2. Adhere facing to Owens-Corning Fiberglas “Certified R”, NAIMA 202, fiberglass blanket.
 - 3. Assembly of Insulation Blanket and Facing:
 - a. Flame Spread Rating: Less than 25.
 - b. UL Label: Submit as specified in Submittals article of this section.
 - c. Perm Rating: 0.02.
- F. Roof Insulation Facing: WMP-50.

2.9 METAL COATING SYSTEM

- A. Metal Coating System: Butler Manufacturing™ “Butler-Cote™” finish system a factory-applied, exterior metal coating system
- B. Substrate Preparation:
 - 1. G90 Hot-Dipped Galvanized Steel or AZ50 Galvalume: Factory-controlled chemical-conversion treatment.
- C. Coating:
 - 1. Material: Full-strength, 70 percent, “Kynar 500” or “Hylar 5000” fluoropolymer (PVDF) color coating.
 - 2. After steel preparation, coat exterior exposed surface with primer and PVDF
 - a. Nominal Total Dry Film Thickness: 1.0 mil.
 - 3. Interior Exposed Surfaces: Coat with polyester color coat.
 - 4. Apply coatings to entire material dimensions of steel sheets before forming of panels.
- D. Physical Characteristics of Exterior Coating:
 - 1. Resistance to failure through cracking, checking, peeling, and loss of adhesion.
 - 2. Measure by the following laboratory weather-simulating tests to obtain test results justifying metal building system manufacturer's 25-year warranty:

- a. Humidity resistance at 100 degrees F and 100 percent relative humidity, ASTM D 2247.
- b. Salt-spray resistance at 5 percent salt fog, ASTM B 117.
- c. Reverse impact resistance, ASTM D 2794.
- d. Resistance to accelerated weathering, Atlas Model XW-R Dew Cycle Weather-O-Meter, ASTM D 3361.
- e. Resistance to dry heat.
- f. Abrasion resistance, ASTM D 968.
- g. Chemical/acid/pollution resistance, ASTM D 1308 and G 87.
- h. Maintain gloss of finish evenly over entire surface, ASTM D 523

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine area to receive metal building system.
- B. Notify Architect of conditions that would adversely affect installation or subsequent use.
- C. Do not begin installation until unacceptable conditions are corrected.

3.2 ERECTION – STRUCTURAL STEEL FRAMING SYSTEM

- A. Erect structural steel framing system in accordance with the Drawings and metal building system manufacturer's erection drawings.
- B. Field Modifications:
 - 1. Require approval of metal building system manufacturer.
 - 2. Responsibility of building erector.
 - 3. Field Modifications to Truss Purlins: Not allowed, unless indicated on erection drawings furnished by metal building system manufacturer.
- C. Fixed Column Bases: Grout flush with floor line after structural steel erection is complete.

3.3 INSTALLATION – METAL ROOF SYSTEM

- A. Metal Roof System Installation: Butler Manufacturing™ “CMR-24®” roof system.
 - 1. Install roof system in accordance with metal building system manufacturer's instructions at locations indicated on the Drawings.
 - 2. Install roof system weathertight.
 - 3. Position and align liner panels and insulation board by installing starting panels against endwall trim clips and sidewall eave structural.
 - 4. Place liner panels with edges up and corrugations perpendicular to secondary structural members and with end laps over secondary structural members.
 - 5. Attach liner panels to roof secondary structural members with self-drilling screws in accordance with erection drawings furnished by metal building system manufacturer.
 - 6. Install vapor retarder over liner panels with 6-inch minimum side laps and end laps.
 - 7. Position panel clips and bearing plates by matching hole in clip with factory-punched or field-drilled holes in secondary structural members.

8. Position and properly align panels by matching factory-punched holes in panel end with factory-punched holes in eave structural member and by aligning panel with panel clip.
9. Field seam panel side laps by self-propelled and portable electrical lock-seaming machine.
 - a. Machine field forms the final 180 degrees of a 360-degree Pittsburgh double-lock standing seam.
 - b. Factory apply side lap sealant.
10. Panel End Laps: Minimum of 6 inches, sealed with “Butler Panlastic” sealant, and fastened together by clamping plates.
 - a. Sealants: Contain hard nylon beads, which prevent mastic from flowing out due to clamping actions.
 - b. Join panel laps by 2-piece clamped connection consisting of a bottom reinforcing plate and a top panel strap.
 - c. Locate panel end laps directly over, but not fastened to, supporting secondary roof structural member and stagger, to avoid 4-panel lap-splice condition.

3.4 INSTALLATION – METAL WALL SYSTEM

- A. Metal Wall System Installation: Butler Manufacturing™ “Shadowall™” wall system.
 1. Install wall system in accordance with metal building system manufacturer’s instructions at locations indicated on the Drawings.
 2. Install wall system weathertight.
 3. Verify structural system is plumb before wall panels are attached.
 4. Align and attach wall panels in accordance with erection drawings furnished by metal building system manufacturer.
 5. Install side laps with minimum of 1 full corrugation.
 6. Seal wall panels at base with metal trim and foam or rubber closures.
 7. Exterior Trim: Apply same finish as exterior color of wall panels, except the following:
 - a. Gutters, Downspouts, Eave Trim, Gable Trim, Door-Side Flashings, and Header Flashings: Paint with exterior colors of “Butler-Cote™” finish system, full-strength, 70 percent “Kynar 500” or “Hylar 5000” fluoropolymer (PVDF) coating in standard color of metal building system manufacturer.
 - b. Windows: Factory paint aluminum extrusions (thermally broken).
 8. Flashings, Trim, Closures, and Similar Items: Install as indicated on erection drawings furnished by metal building system manufacturer.

3.5 INSTALLATION – INSULATION

- A. Insulation Installation: Install insulation in accordance with metal building system manufacturer’s instructions at locations indicated on the Drawings.

3.6 PROTECTION

- A. Protect installed metal building system to ensure that, except for normal weathering, metal building system will be without damage or deterioration at time of Substantial Completion.

END OF SECTION