




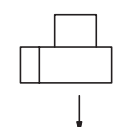

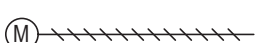



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## GENERAL HVAC NOTES

- CONTRACTOR(S) SHALL PROVIDE ALL ITEMS, ARTICLES, EQUIPMENT, TOOLS, APPLIANCES, MATERIALS AND METHODS REQUIRED FOR COMPLETED SYSTEMS.
- PROVIDE ALL LABOR, SCAFFOLDING, SUPPORTS, SUPERVISION AND INCIDENTALS REQUIRED TO MODIFY AND/OR INSTALL THE SYSTEMS COMPLETE.
- CONTRACTOR(S) SHALL LOCATE AND PROTECT THE OWNER'S EQUIPMENT, PIPING AND UTILITIES SCHEDULED TO REMAIN FROM DAMAGE DURING CONSTRUCTION.
- ALL WORK SHALL BE EXECUTED IN A THOROUGHLY SUBSTANTIAL AND CRAFTSMAN LIKE MANNER BY SKILLED MECHANICS IN THE VARIOUS TRADES INVOLVED. FOLLOW MANUFACTURERS' INSTRUCTIONS FOR INSTALLING, CONNECTING AND ADJUSTING ALL EQUIPMENT.
- CONTRACTOR(S) SHALL FIELD VERIFY ALL DIMENSIONS OF EXISTING ELEMENTS, EQUIPMENT, AND OTHER CONDITIONS HAVING A BEARING ON THE WORK. CONTRACTOR(S) SHALL COORDINATE WITH OTHER TRADES TO ELIMINATE ANY INTERFERENCES WITH LIGHTING FIXTURES, DUCTWORK, PIPING, ETC.
- CONTRACTOR(S) SHALL PERFORM ALL VERIFICATIONS, OBSERVATIONS, TESTS, AND EXAMINATIONS OF THE WORK PRIOR TO THE ORDERING OF ANY EQUIPMENT AND THE ACTUAL CONSTRUCTION.
- CONTRACTOR(S) SHALL BE SOLELY RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES AND FOR COORDINATING ALL PORTIONS OF THE WORK UNDER CONTRACT.
- CONTRACTOR(S) SHALL FURNISH AND INSTALL ALL MATERIALS AS REQUIRED FOR COMPLETE SYSTEMS, INCLUDING ALL PARTS OBVIOUSLY OR REASONABLY INCIDENTAL TO A COMPLETE INSTALLATION, WHETHER SPECIFICALLY INDICATED OR NOT.
- DRAWINGS ARE NOT TO BE SCALED. DRAWINGS ARE INTENDED TO BE A DIAGRAMMATIC OUTLINE ONLY.
- DIMENSIONS SHOWN ARE TO FINISH SURFACES UNLESS OTHERWISE NOTED. SPACING BETWEEN EQUIPMENT IS REQUIRED CLEARANCE. THEREFORE, IT IS CRITICAL TO FIELD VERIFY DIMENSIONS. SHOULD THERE BE ANY QUESTIONS REGARDING THE CONTRACT DOCUMENTS, EXISTING CONDITIONS AND/OR DESIGN INTENT, THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING A CLARIFICATION FROM THE OWNER PRIOR TO PROCEEDING WITH THE WORK.
- DETAILS ARE INTENDED TO SHOW END RESULT OF DESIGN. MINOR MODIFICATIONS MAY BE REQUIRED TO SUIT JOB DIMENSIONS OR CONDITIONS, AND SUCH MODIFICATIONS SHALL BE INCLUDED AS PART OF THE WORK.
- DRAWINGS ARE DIAGRAMMATIC ONLY, FINAL ROUTING OF DUCTWORK AND EQUIPMENT LOCATIONS SHALL BE DETERMINED IN THE FIELD. ADDITIONAL OFFSETS, ELBOWS, ETC., SHALL BE PROVIDED AND INSTALLED WITHOUT ADDITIONAL COST TO THE OWNER.
- THE MC SHALL FURNISH TO THE GC ALL INFORMATION REQUIRED FOR SETTING OF WALL OPENINGS FOR MECHANICAL WORK. THIS INFORMATION SHALL BE FURNISHED IN A TIMELY MANNER SUCH THAT CONSTRUCTION SCHEDULE IS NOT JEOPARDIZED.
- THE TEMPERATURE CONTROL CONTRACTOR SHALL COORDINATE THERMOSTAT/TEMPERATURE SENSOR LOCATIONS WITH ARCHITECTURAL PLANS AND/OR THE OWNER. THERMOSTATS SHALL BE INSTALLED 48-INCHES' ABOVE FINISHED FLOORS UNLESS OTHERWISE NOTED.

## HVAC LEGEND

		EXHAUST FAN
		LOUVER
		UNIT HEATER
		BACKDRAFT DAMPER
		MOTORIZED DAMPER
		THERMOSTAT

## TYPICAL ABBREVIATIONS

AFF	ABOVE FINISH FLOOR
BOD	BASIS OF DESIGN
EF	EXHAUST FAN
LV	LOUVER
MAX	MAXIMUM
MIN	MINIMUM
UH	UNIT HEATER

## HVAC DRAWING LIST

M-200	HVAC COVER SHEET AND SCHEDULES
M-201	HVAC NEW WORK PLAN
M-202	HVAC SPECIFICATIONS & SEQUENCES

### ELECTRIC UNIT HEATER SCHEDULE

TAG	CAPACITY [KW]	DESIGN AIRFLOW [CFM]	BOTTOM ELEVATION	ELECTRICAL CHARACTERISTICS		BASIS OF DESIGN	DIMENSIONS [L" x W" x H"]	WEIGHT [LBS]	NOTES
				V / $\phi$	FLA				
UH-1	30.0	3,850	±12' - 0"	460 / 3	37	INDEECO 233-FC-0306U	31 x 23 x 27.5	190	1,2,3,4,5
UH-2	30.0	3,850	±12' - 0"	460 / 3	37	INDEECO 233-FC-0306U	31 x 23 x 27.5	190	1,2,3,4,5
UH-3	30.0	3,850	±9' - 0"	460 / 3	37	INDEECO 233-FC-0306U	31 x 23 x 27.5	190	1,2,3,4,5
UH-4	30.0	3,850	±9' - 0"	460 / 3	37	INDEECO 233-FC-0306U	31 x 23 x 27.5	190	1,2,3,4,5

#### NOTES:

- SEE SEQUENCES OF OPERATIONS FOR UNIT HEATER OPERATION SEQUENCE.
- UNIT HEATER AND ALL ACCESSORIES SHALL BE SUITABLE FOR CLASS I, DIVISION 1, GROUP D LOCATIONS.
- PROVIDE UNIT WITH THE FOLLOWING OPTIONS:
  - 316 STAINLESS STEEL CORROSION-RESISTANT CONSTRUCTION
  - FACTORY INSTALLED DISCONNECT SWITCH
  - "WARNING" PILOT LIGHT
  - "HEATER ON" PILOT LIGHT
  - AUTO / FAN SELECTOR SWITCH
  - FACTORY INSTALLED ADJUSTABLE THERMOSTAT FOR WET LOCATIONS
- INTENT IS FOR EQUIPMENT TO BE CEILING MOUNTED TYPE. COORDINATE WITH FIELD CONDITIONS PRIOR TO ORDER. PROVIDE WITH MANUFACTURER CORROSION RESISTANT MOUNTING KIT.
- COORDINATE MOUNTING HEIGHT WITH FIELD CONDITIONS AND INTENDED EQUIPMENT INSTALLATION LOCATIONS IN FACILITY. MAINTAIN MINIMUM 6' DISTANCE FROM UNIT OUTLET TO WALL/ INSTALLED EQUIPMENT.

### LOUVER SCHEDULE

TAG	SERVICE	DESIGN AIRFLOW [CFM]	DESIGN VELOCITY [FPM]	DIMENSIONS [W X H]	DEPTH	NET FREE AREA		DESCRIPTION	BASIS OF DESIGN	NOTES
						%	FT²			
LV-1	EF-1 INTAKE	5,670	708	48" x 56"	4"	43	18.67	WIND-DRIVEN RAIN, SIGHTPROOF	RUSKIN EME420DD	1,2,3,4,5,6,7
LV-2	EF-2 INTAKE	5,670	708	48" x 56"	4"	43	18.67	WIND-DRIVEN RAIN, SIGHTPROOF	RUSKIN EME420DD	1,2,3,4,5,6,7
LV-3	EF-3 INTAKE	5,670	708	48" x 56"	4"	43	18.67	WIND-DRIVEN RAIN, SIGHTPROOF	RUSKIN EME420DD	1,2,3,4,5,6,7

#### NOTES:

- PROVIDE ALUMINUM LOUVER.
- MAXIMUM PRESSURE DROP ACROSS LOUVER SHALL BE 0.15" W.G.
- PROVIDE WITH 1/2" STAINLESS STEEL OR ANODIZED ALUMINUM BIRDSCREEN.
- PROVIDE WITH 70% PVDF FINISH. COORDINATE COLOR WITH FACILITY REPRESENTATIVE.
- PROVIDE MOTORIZED DAMPER WITH SPARK B OR SPARK A RESISTANCE CONSTRUCTION, OPPOSED BLADE WITH SEALS CONFIGURATION. ALL METALLIC COMPONENTS SHALL BE EITHER ANODIZED ALUMINUM OR STAINLESS STEEL. DAMPER SHALL HAVE HI PRO POLYESTER COATING. BLADE SEAL SHALL BE EPDM. BASIS OF DESIGN: GREENHECK HCD-140.
- PROVIDE MOTORIZED DAMPER ACTUATOR WITH MINIMUM TWO (2) END SWITCHES SUITABLE FOR CLASS I, DIVISION 1, GROUP D LOCATIONS WITH ON/OFF CONTROL, SPRING RETURN, MANUAL OVERRIDE, AND MAXIMUM 30 SECOND 90° RUNTIME. ACTUATOR HOUSING SHALL BE STAINLESS STEEL. BASIS OF DESIGN: SCHISECK ROTORK MODEL EXMAX-135-SF-A, 120V POWER INPUT.
- COORDINATE COMPATIBILITY OF SUBMITTED MOTORIZED DAMPER AND ACTUATOR PRIOR TO EQUIPMENT SUBMISSION FOR ENGINEER REVIEW. PROVIDE ALL ACCESSORIES NECESSARY FOR COMPATIBILITY. ALL EQUIPMENT AND ACCESSORIES SHALL BE SUITABLE FOR CLASS I, DIVISION I, GROUP D LOCATIONS.

### FAN SCHEDULE

TAG	DESCRIPTION	DESIGN AIRFLOW [CFM]	E.S.P. [in. w.g.]	ELECTRICAL CHARACTERISTICS		ACCESSORIES	BASIS OF DESIGN	WEIGHT [LBS]	NOTES
				V / $\phi$	HP				
EF-1	BD, BI, SW, SPRK	5,670	0.50	460 / 3	1-1/2	MS (NEMA 3R), VI	GREENHECK CUBE-240	250	1,2,3
EF-2	BD, BI, SW, SPRK	5,670	0.50	460 / 3	1-1/2	MS (NEMA 3R), VI	GREENHECK CUBE-240	250	1,2,3
EF-3	BD, BI, SW, SPRK	5,670	0.50	460 / 3	1-1/2	MS (NEMA 3R), VI	GREENHECK CUBE-240	250	1,2,3

#### NOTES:

- SEE SEQUENCES OF OPERATIONS FOR FAN OPERATION SEQUENCE.
- FAN SHALL HAVE SPARK RESISTANCE CONSTRUCTION OF EITHER TYPE A OR B.
- PROVIDE UNIT WITH NEMA 3R MOTOR STARTER WITH INTEGRAL DISCONNECT. MOTOR STARTER SHALL BE LOCKOUT READY, HAVE HAND/ OFF/ AUTO SELECTOR SWITCH, LED PILOT LIGHT, MINIMUM (2) CONTROL INPUTS, MOTOR STATUS AND FAULT ALARM OUTPUTS, AND A DAMPER CONTROL OUTPUT LIMIT SWITCH CLOSED LOOP SIGNAL. BASIS OF DESIGN: GREENHECK MSAC.
- PROVIDE WITH THE FOLLOWING OPTIONS:
  - SIDEWALL MOUNT
  - ALUMINUM BIRDSCREEN
  - AUTOMATIC BELT TENSIONER
  - HI-PRO POLYESTER COATING ON ALL PARTS. COORDINATE COLOR WITH FACILITY REPRESENTATIVE.
- PROVIDE BACKDRAFT DAMPER TO BE MOUNTED IN DUCTWORK UPSTREAM OF FAN. DAMPER SHALL HAVE SPARK B OR SPARK A RESISTANCE CONSTRUCTION. ALL METALLIC COMPONENTS SHALL BE EITHER ANODIZED ALUMINUM OR STAINLESS STEEL. DAMPER SHALL HAVE HI PRO POLYESTER COATING. BLADE SEAL SHALL BE VINYL. BASIS OF DESIGN: GREENHECK HB-110.

#### ABBREVIATIONS

BD	BELT DRIVE	SPRK	SPARK RESISTANCE CONSTRUCTION
BI	BACKWARD INCLINED	SW	SIDEWALL
MS	MOTOR STARTER	VI	VIBRATION ISOLATORS

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SCALE:	NONE
REVIEWED BY:	TJH
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FILE:	

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REVISIONS		DESCRIPTION	NO.	DATE

CONTRACT 1  
SUFFERN WWTP UPGRADES  
VILLAGE OF SUFFERN  
ROCKLAND COUNTY, NEW YORK

HVAC  
COVER SHEET &  
SCHEDULES

SHEET:

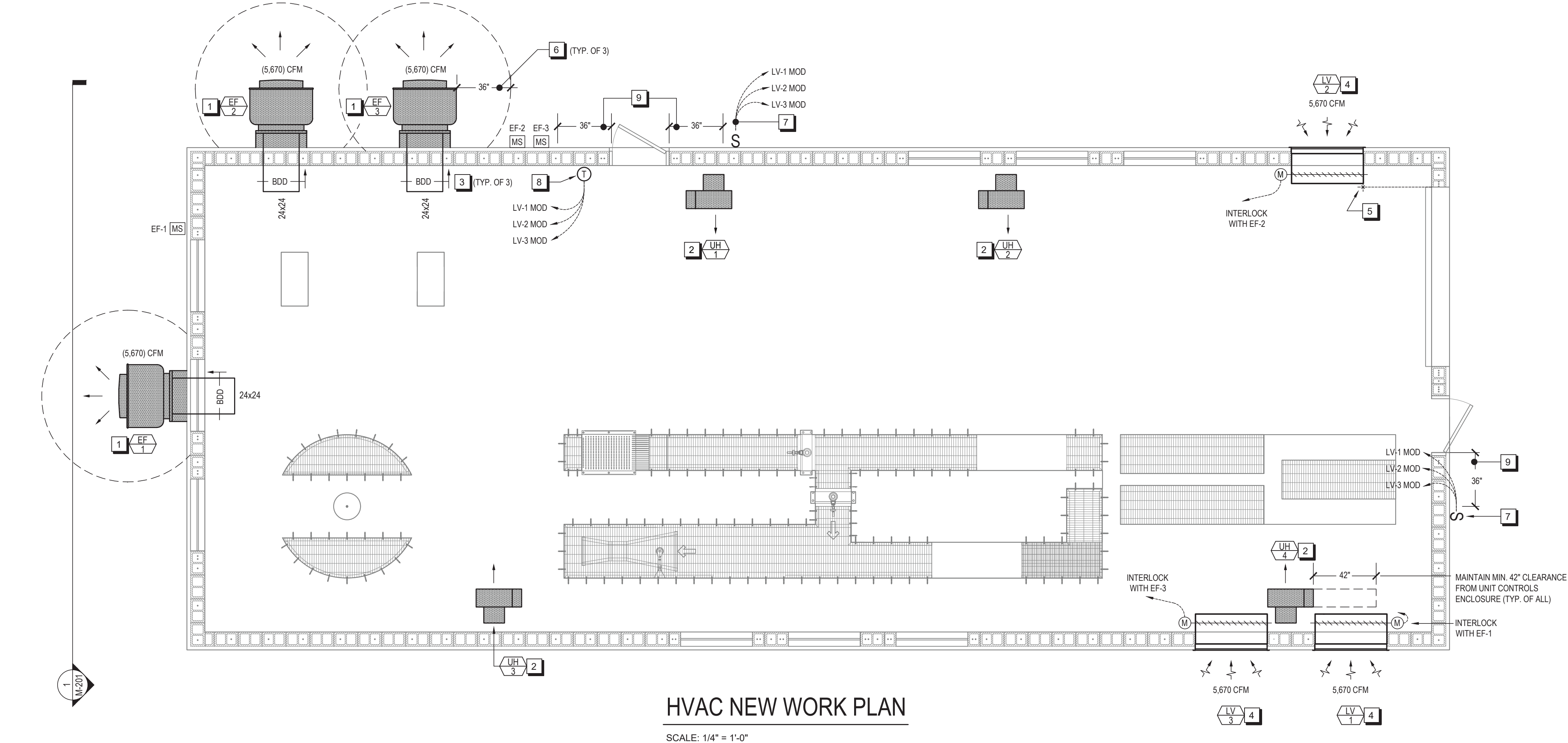
M-200

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BID PLANS

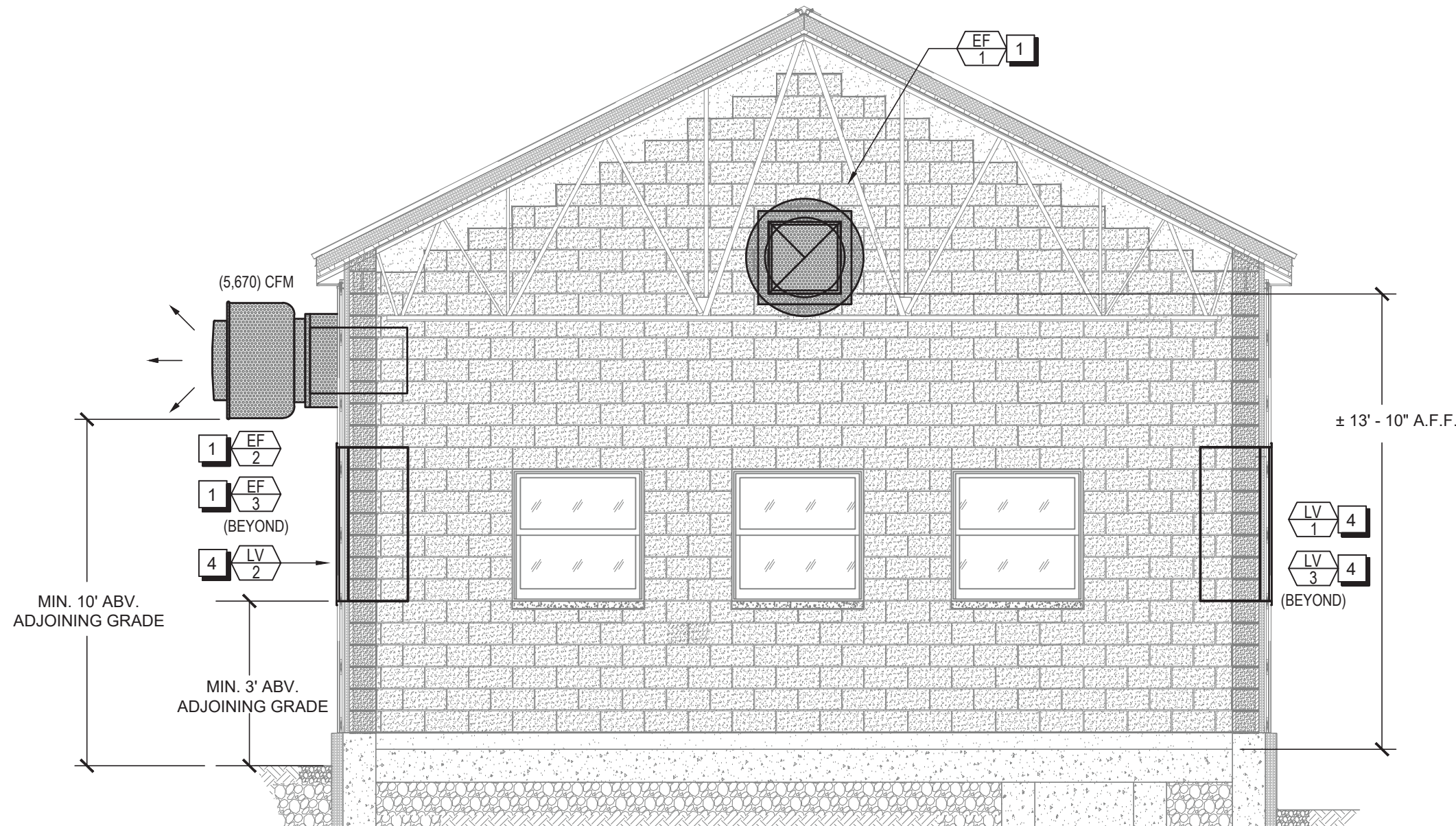


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### HVAC NEW WORK PLAN

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



### SECTION VIEW

1  
M-201

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

### GENERAL NOTES:

1. ALL MECHANICAL EQUIPMENT AND DEVICES INSTALLED WITHIN THE BUILDING SHALL BE RATED FOR USE IN A CLASS I, DIVISION 1, GROUP D LOCATION.
2. ALL DUCTWORK SHALL BE CONSTRUCTED OF STAINLESS STEEL. ALL DUCT HANGERS, FASTENERS, ETC. SHALL BE OF SIMILAR CONSTRUCTION.

### KEYED NOTES:

1. PROVIDE SIDE-WALL EXHAUST FAN. SEE MECHANICAL SCHEDULE SHEET FOR MORE INFORMATION. SEE SECTION VIEW ON THIS SHEET FOR MOUNTING HEIGHT INFORMATION. FAN DISCHARGE SHALL NOT BE WITHIN 10' OF ADJOINING GRADE. OPERABLE OPENING INTO BUILDING OR 30' FROM AN OPERABLE OPENING INTO A BUILDING IN THE DIRECTION OF THE FAN DISCHARGE. COORDINATE WITH SITE CONDITIONS.
2. PROVIDE ELECTRIC UNIT HEATER HUNG FROM STRUCTURE ABOVE. SEE MECHANICAL SCHEDULE SHEET FOR MORE INFORMATION. COORDINATE EXACT INSTALLATION LOCATION WITH FIELD CONDITIONS.
3. EXTEND DUCT INTO SPACE AS NECESSARY TO ALLOW FOR INSTALLATION OF BACKDRAFT DAMPER (TYPICAL OF 3). PROVIDE STAINLESS STEEL WIRE MESH SCREEN AT OPENING.
4. PROVIDE LOUVER IN EXTERIOR WALL. SEE MECHANICAL SCHEDULE SHEET FOR MORE INFORMATION. EXTEND DUCT FROM LOUVER TO ALLOW INSTALLATION OF MOTORIZED DAMPER. LOUVER SHALL BE INSTALLED WITH BOTTOM ELEVATION MINIMUM 36" ABOVE ADJOINING GRADE. SEE STRUCTURAL DRAWINGS FOR SUPPORT, LINTELS, ETC.
5. DUCT FROM LOUVER LV-1 SHALL NOT EXTEND INTO CLEAR PATH EXTENDED FROM GARAGE DOOR OPENING.
6. DO NOT INSTALL ELECTRICAL DEVICES WITHIN 3' OF EXHAUST DISCHARGE. PROVIDE REMOTE MOTOR STARTER DISCONNECTS FOR EXHAUST FAN. SEE EXHAUST FAN SCHEDULE FOR MORE INFORMATION.
7. FACILITY LIGHTING SHALL BE INTERLOCKED WITH EXHAUST FAN OPERATION. SEE SEQUENCE OF OPERATIONS FOR MORE INFORMATION.
8. PROVIDE REMOTE THERMOSTAT SUITABLE FOR CLASS I, DIVISION 1, GROUP D LOCATIONS. SEE SEQUENCE OF OPERATIONS FOR MORE INFORMATION. THERMOSTAT SHALL HAVE DUAL SET POINTS (HEATING AND COOLING) WITH A MINIMUM ADJUSTMENT RANGE OF 36°F TO 82°F. THE THERMOSTAT SHALL HAVE 120V POWER SUPPLY.
9. DO NOT INSTALL ELECTRICAL DEVICES WITHIN 3' OF OPERABLE OPENINGS TO THE BUILDING UNLESS THEY ARE SUITABLE FOR USE IN A CLASS I, DIVISION 2 ENVIRONMENT.

### VENTILATION COMPLIANCE:

THE VENTILATION FOR THIS BUILDING IS DESIGNED TO BE IN COMPLIANCE WITH THE REQUIREMENTS OF THE TEN STATES STANDARD. INTERMITTENT VENTILATION OF GREATER THAN 30 COMPLETE AIR CHANGES PER HOUR SHALL BE PROVIDED WHEN PERSONNEL ENTER THE AREA. BELOW IS A SUMMARY OF THE CALCULATIONS FOR COMPLIANCE:

BUILDING VOLUME:	32,812 FT <sup>3</sup>
MIN. AIRFLOW FOR COMPLIANCE (30ACH):	16,406 CFM
PROVIDED AIRFLOW:	17,010 CFM
PROVIDED ACH:	31.1

IN ADDITION, ALL VENTILATION EQUIPMENT WILL BE INTERCONNECTED WITH THE FACILITY LIGHTING AND ALL SWITCHES FOR OPERATION OF THE VENTILATION SYSTEM WILL BE MARKED AND CONVENIENTLY LOCATED.

DATE:	12/08/2020
DRAWN BY:	TNS
SCALE:	1/4" = 1'-0"
REVIEWED BY:	TJH
PROJECT NO.:	19-1612
FILE:	

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NO.	DATE	DESCRIPTION

CONTRACT 1  
SUFFERN WWTP UPGRADES  
VILLAGE OF SUFFERN  
ROCKLAND COUNTY, NEW YORK

HVAC  
NEW WORK PLAN

SHEET:	M-201
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BID PLANS

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HVAC SPECIFICATIONS

METAL DUCTS15-1

PART 1	GENERAL - SUMMARY
1.1.1.	FURNISH ALL LABOR, MATERIALS, EQUIPMENT AND SERVICES NECESSARY FOR, AND INCIDENTAL TO, THE INSTALLATION OF METAL DUCTS AS SHOWN ON THE DRAWINGS AND/OR AS SPECIFIED HEREIN.
1.1.2.	DUCT DIMENSIONS SHOWN ON DRAWINGS ARE CLEAR INSIDE DIMENSIONS.
1.2.	SUBMITTALS
1.2.1.	SUBMIT THE FOLLOWING:
1.2.1.1.	SHOP DRAWINGS FROM DUCT FABRICATION SHOP, DRAWN TO A SCALE NOT SMALLER THAN 3/8 INCH EQUALS 1 FOOT, ON DRAWING SHEETS SAME SIZE AS THE CONTRACT DRAWINGS, DETAILING:
1.2.1.1.1.	FABRICATION, ASSEMBLY, AND INSTALLATION DETAILS, INCLUDING PLANS, ELEVATIONS, SECTIONS, DETAILS OF COMPONENTS, AND ATTACHMENTS TO OTHER WORK.
1.3.	QUALITY ASSURANCE
1.3.1.	QUALIFY WELDING PROCESSES AND WELDING OPERATORS IN ACCORDANCE WITH AWS D1.1 "STRUCTURAL WELDING CODE - STEEL" FOR HANGERS AND SUPPORTS AND AWS D9.1 "SHEET METAL WELDING CODE."
1.3.2.	QUALIFY EACH WELDER IN ACCORDANCE WITH AWS QUALIFICATION TESTS FOR WELDING PROCESSES INVOLVED. CERTIFY THAT THEIR QUALIFICATION IS CURRENT.
1.3.3.	COMPLY WITH SECTION 603 "DUCT CONSTRUCTION AND INSTALLATION" OF THE MECHANICAL CODE OF NEW YORK STATE.
PART 2	PRODUCTS - SHEET METAL MATERIALS
2.1.	PROVIDE SHEET METAL IN THICKNESSES INDICATED, PACKAGED AND MARKED AS SPECIFIED IN ASTM A 700.
2.1.1.	STAINLESS STEEL SHEETS, TYPE 304 OR 316; COLD ROLLED, ANNEALED, SHEET, NO. 4 FINISH.
2.1.2.	RECTANGULAR DUCT FABRICATION
2.2.1.	EXCEPT AS OTHERWISE INDICATED, FABRICATE RECTANGULAR DUCTS WITH TYPE 304 OR 316 STAINLESS SHEET STEEL, IN ACCORDANCE WITH SMACNA "HVAC DUCT CONSTRUCTION STANDARDS"; DUCT SHALL BE WELDED AND THE MINIMUM THICKNESS SHALL BE 18 GAGE. DUCT PRESSURE CLASS SHALL BE POSITIVE OR NEGATIVE 2-INCH W.G.
2.2.1.1.	FABRICATE RECTANGULAR DUCTS IN LENGTHS APPROPRIATE TO REINFORCEMENT AND RIGIDITY CLASS REQUIRED FOR PRESSURE CLASSIFICATION.
2.2.1.2.	PROVIDE MATERIALS THAT ARE FREE FROM VISUAL IMPERFECTIONS SUCH AS PITTING, SEAM MARKS, ROLLER MARKS, STAINS, AND DISCOLORATIONS.
PART 3	EXECUTION - DUCT INSTALLATION, GENERAL
3.1.	DUCT SYSTEM PRESSURE CLASS: CONSTRUCT AND INSTALL EACH DUCT SYSTEM FOR THE SPECIFIC DUCT PRESSURE CLASSIFICATION INDICATED.
3.1.1.	LOCATE DUCTS, EXCEPT AS OTHERWISE INDICATED, VERTICALLY AND HORIZONTALLY, PARALLEL AND PERPENDICULAR TO BUILDING LINES; AVOID DIAGONAL RUNS. INSTALL DUCT SYSTEMS IN SHORTEST ROUTE THAT DOES NOT OBSTRUCT USEABLE SPACE OR BLOCK ACCESS FOR SERVICING BUILDING AND ITS EQUIPMENT.
3.1.2.	INSTALL DUCTS CLOSE TO WALLS, OVERHEAD CONSTRUCTION, COLUMNS, AND OTHER STRUCTURAL AND PERMANENT ENCLOSURE ELEMENTS OF BUILDING.
3.1.3.	COORDINATE LAYOUT WITH LIGHTING LAYOUTS AND SIMILAR FINISHED WORK.
3.1.4.	CONNECTIONS
3.2.	EQUIPMENT CONNECTIONS: CONNECT EQUIPMENT WITH FLEXIBLE CONNECTORS IN ACCORDANCE WITH THE SECTION "AIR DUCT ACCESSORIES".
3.2.1.	

AIR DUCT ACCESSORIES15-7

PART 1	GENERAL - INTRODUCTION
1.1.	FURNISH ALL LABOR, MATERIALS, EQUIPMENT, AND SERVICES NECESSARY FOR, AND INCIDENTAL FOR, THE INSTALLATION OF AIR DUCT ACCESSORIES AS SPECIFIED HEREIN.
1.2.	SUBMITTALS
1.2.1.	SUBMIT THE FOLLOWING:
1.2.2.	PRODUCT DATA INCLUDING DETAILS FOR MATERIALS, DIMENSIONS OF INDIVIDUAL COMPONENTS, PROFILES, AND FINISHES.
1.3.	QUALITY ASSURANCE
1.3.1.	COMPLY WITH THE REQUIREMENTS OF MECHANICAL AND BUILDING CODES OF NEW YORK STATE.
PART 2	PRODUCTS - FLEXIBLE CONNECTIONS
2.1.	GENERAL: FLAME-RETARDED OR NONCOMBUSTIBLE FABRICS, COATINGS, AND ADHESIVES COMPLYING WITH UL STANDARD 181, CLASS 1.
2.1.1.	EXTRA-WIDE METAL-EDGED CONNECTORS:
2.1.2.	FACTORY-FABRICATED WITH A STRIP OF FABRIC 5-3/4 INCHES WIDE ATTACHED TO 2 STRIPS OF 2-3/4-INCH-WIDE, 24-GAGE, GALVANIZED SHEET STEEL OR 0.032-GAGE ALUMINUM SHEETS.
2.1.2.1.	SELECT- METAL COMPATIBLE WITH CONNECTED DUCT SYSTEM.
2.1.2.1.1.	FOLD AND CRIMP METAL EDGE STRIPS ONTO FABRIC AS ILLUSTRATED IN SMACNA HVAC DUCT STANDARD, LST EDITION, FIGURE 2-19.
2.1.2.1.2.	
PART 3	EXECUTION - INSTALLATION
3.1.	INSTALL DUCT ACCESSORIES ACCORDING TO MANUFACTURER'S INSTALLATION INSTRUCTIONS AND APPLICABLE PORTIONS OF DETAILS OF CONSTRUCTION AS SHOWN IN SMACNA STANDARDS.
3.1.1.	
3.2.	ADJUSTING
3.2.1.	ADJUST DUCT ACCESSORIES FOR PROPER SETTINGS.
3.2.1.	

TESTING, ADJUSTING AND BALANCING FOR HVAC15-3

PART 1	GENERAL - DESCRIPTION
1.1.	FURNISH ALL LABOR, MATERIALS, EQUIPMENT, AND SERVICES NECESSARY FOR, AND INCIDENTAL FOR, THE TESTING, ADJUSTING AND BALANCING OF ALL SYSTEMS IDENTIFIED AS SHOWN ON THE DRAWINGS AND/OR AS SPECIFIED HEREIN.
1.1.1.	TEST, ADJUST, AND BALANCE THE FOLLOWING MECHANICAL SYSTEMS:
1.1.2.1.	EXHAUST AIR
1.2.	SUBMITTALS
1.2.1.	AGENCY DATA:
1.2.1.1.	SUBMIT PROOF THAT THE PROPOSED TESTING, ADJUSTING, AND BALANCING AGENCY MEETS THE QUALIFICATIONS SPECIFIED BELOW.
1.2.2.	ENGINEER AND TECHNICIANS DATA:
1.2.2.1.	SUBMIT PROOF THAT THE TEST AND BALANCE ENGINEER ASSIGNED TO SUPERVISE THE PROCEDURES, AND THE TECHNICIANS PROPOSED TO PERFORM THE PROCEDURES MEET THE QUALIFICATIONS SPECIFIED BELOW.
1.2.3.	MAINTENANCE DATA: SUBMIT MAINTENANCE AND OPERATING DATA THAT INCLUDE HOW TO TEST, ADJUST, AND BALANCE THE BUILDING SYSTEMS.
1.2.4.	CERTIFIED REPORTS: SUBMIT TESTING, ADJUSTING, AND BALANCING REPORTS BEARING THE SEAL AND SIGNATURE OF THE TEST AND BALANCE ENGINEER. THE REPORTS SHALL BE CERTIFIED PROOF THAT THE SYSTEMS HAVE BEEN TESTED, ADJUSTED, AND BALANCED IN ACCORDANCE WITH THE REFERENCED STANDARDS; ARE AN ACCURATE REPRESENTATION OF HOW THE SYSTEMS HAVE BEEN INSTALLED; ARE A TRUE REPRESENTATION OF HOW THE SYSTEMS ARE OPERATING AT THE COMPLETION OF THE TESTING, ADJUSTING, AND BALANCING PROCEDURES; AND ARE AN ACCURATE RECORD OF ALL FINAL QUANTITIES MEASURED, TO ESTABLISH NORMAL OPERATING VALUES OF THE SYSTEMS. FOLLOW THE PROCEDURES AND FORMAT SPECIFIED BELOW.
1.2.5.	CALIBRATION REPORTS: SUBMIT PROOF THAT ALL REQUIRED INSTRUMENTATION HAS BEEN CALIBRATED TO TOLERANCES SPECIFIED IN THE REFERENCED STANDARDS, WITHIN A PERIOD OF SIX MONTHS PRIOR TO STARTING THE PROJECT.
1.3.	QUALITY ASSURANCE
1.3.1.	TEST AND BALANCE ENGINEERS QUALIFICATIONS:
1.3.1.1.	A PROFESSIONAL ENGINEER (EITHER ON THE INSTALLERS STAFF OR AND INDEPENDENT CONSULTANT), REGISTERED IN THE STATE IN WHICH THE SERVICES ARE TO BE PERFORMED, AND HAVING AT LEAST 3-YEARS OF SUCCESSFUL TESTING, ADJUSTING, AND BALANCING EXPERIENCE ON PROJECTS WITH TESTING AND BALANCING REQUIREMENTS SIMILAR TO THOSE REQUIRED FOR THIS PROJECT. AGENCY SHALL BE NEBB OR AABC CERTIFIED.
1.3.2.	CODES AND STANDARDS:
1.3.2.1.	NEBB: "PROCEDURAL STANDARDS FOR TESTING, ADJUSTING, AND BALANCING OF ENVIRONMENTAL SYSTEMS."
1.3.2.2.	AABC: "NATIONAL STANDARDS FOR TOTAL SYSTEM BALANCE".
1.3.2.3.	ASHRAE: ASHRAE HANDBOOK, 1984 SYSTEMS VOLUME, CHAPTER 37, TESTING, ADJUSTING, AND BALANCING.

PART 2	EXECUTION - PRELIMINARY PROCEDURES FOR AIR SYSTEM BALANCING
2.1	BEFORE OPERATING THE SYSTEM, PERFORM THESE STEPS:
2.1.1	OBTAIN DESIGN DRAWINGS AND SPECIFICATIONS AND BECOME THOROUGHLY ACQUAINTED WITH THE DESIGN INTENT.
2.1.1.1	OBTAIN COPIES OF APPROVED SHOP DRAWINGS OF ALL AIR HANDLING EQUIPMENT AND TEMPERATURE CONTROL DIAGRAM.
2.1.1.2	COMPARE DESIGN TO INSTALLED EQUIPMENT AND FIELD INSTALLATIONS.
2.1.1.3	CHECK DAMPERS FOR CORRECT AND LOCKED POSITION, AND TEMPERATURE CONTROL FOR COMPLETENESS OF INSTALLATION BEFORE STARTING FANS.
2.1.1.4	DETERMINE BEST LOCATIONS IN MAIN AND BRANCH DUCTWORK FOR MOST ACCURATE DUCT TRAVERSES.
2.1.1.5	PREPARE SCHEMATIC DIAGRAMS OF SYSTEM *AS-BUILT, DUCTWORK AND PIPING LAYOUTS TO FACILITATE REPORTING.
2.1.6	
2.2	MEASUREMENTS
2.2.1	PROVIDE ALL REQUIRED INSTRUMENTATION TO OBTAIN PROPER MEASUREMENTS, CALIBRATED TO THE TOLERANCES SPECIFIED IN THE REFERENCED STANDARDS.
2.2.2	INSTRUMENTS SHALL BE PROPERLY MAINTAINED AND PROTECTED AGAINST DAMAGE.
2.2.3	PROVIDE INSTRUMENTS MEETING THE SPECIFICATIONS OF THE REFERENCED STANDARDS. USE ONLY THOSE INSTRUMENTS WHICH HAVE THE MAXIMUM FIELD MEASURING ACCURACY AND ARE BEST SUITED TO THE FUNCTION BEING MEASURED.
2.2.4	APPLY INSTRUMENT AS RECOMMENDED BY THE MANUFACTURER.
2.2.5	USE INSTRUMENTS WITH MINIMUM SCALE AND MAXIMUM SUBDIVISIONS AND WITH SCALE RANGES PROPER FOR THE VALUE BEING MEASURED.
2.2.6	WHEN AVERAGING VALUES, TAKE A SUFFICIENT QUANTITY OF READINGS WHICH WILL RESULT IN A REPEATABILITY ERROR OF LESS THAN 5 PERCENT. WHEN MEASURING A SINGLE POINT, REPEAT READINGS UNTIL 2 CONSECUTIVE IDENTICAL VALUES ARE OBTAINED.
2.2.7	TAKE ALL READINGS WITH THE EYE AT THE LEVEL OF THE INDICATED VALUE TO PREVENT PARALLAX.
2.2.8	USE PULSATION DAMPENERS WHERE NECESSARY TO ELIMINATE ERROR INVOLVED IN ESTIMATING AVERAGE OF RAPIDLY FLUCTUATION READINGS.
2.2.8.1	TAKE MEASUREMENTS IN THE SYSTEM WHERE BEST SUITED TO THE TASK.
2.3	PERFORMING TESTING, ADJUSTING AND BALANCING
2.3.1	PERFORM TESTING AND BALANCING PROCEDURES ON EACH SYSTEM IDENTIFIED, IN ACCORDANCE WITH THE DETAILED PROCEDURES OUTLINED IN THE REFERENCED STANDARDS.
2.3.2	MARK EQUIPMENT SETTINGS, INCLUDING DAMPER CONTROL POSITIONS, FAN SPEED CONTROL LEVERS, AND SIMILAR CONTROLS AND DEVICES, TO SHOW FINAL SETTINGS.
2.4	RECORD AND REPORT DATA
2.4.1	RECORD ALL DATA OBTAINED DURING TESTING, ADJUSTING, AND BALANCING IN ACCORDANCE WITH, AND ON THE FORMS RECOMMENDED BY THE REFERENCED STANDARDS, AND AS APPROVED ON THE SAMPLE REPORT FORMS.
2.4.2	PREPARE REPORT OF RECOMMENDATIONS FOR CORRECTING UNSATISFACTORY MECHANICAL PERFORMANCES WHEN SYSTEM CANNOT BE SUCCESSFULLY BALANCED.
2.5	DEMONSTRATION TRAINING:
2.5.1	TRAIN THE OWNER'S MAINTENANCE PERSONNEL ON TROUBLE SHOOTING PROCEDURES AND TESTING, ADJUSTING, AND BALANCING PROCEDURES. REVIEW WITH THE OWNER'S PERSONNEL, THE INFORMATION CONTAINED IN THE MAINTENANCE MANUAL.
2.5.1.1	SCHEDULE TRAINING WITH OWNER THROUGH THE OWNER'S REPRESENTATIVE WITH AT LEAST 7 DAYS PRIOR NOTICE.
2.5.1.2	

MECHANICAL IDENTIFICATION15-4

PART 1	GENERAL - DESCRIPTION
1.1.	FURNISH ALL LABOR, MATERIALS, EQUIPMENT, AND SERVICES NECESSARY FOR, AND INCIDENTAL TO, THE INSTALLATION OF MECHANICAL IDENTIFICATION AS SPECIFIED HEREIN.
1.1.1.	
PART 2	PRODUCTS - EQUIPMENT LABELS
2.1.	METAL LABELS FOR EQUIPMENT:
2.1.1.	MATERIAL AND THICKNESS: ALUMINUM, 0.032-INCH MINIMUM THICKNESS, AND HAVING PREDRILLED OR STAMPED HOLES FOR ATTACHMENT HARDWARE.
2.1.2.	MINIMUM LABEL SIZE: LENGTH AND WIDTH VARY FOR REQUIRED LABEL CONTENT, BUT NOT LESS THAN 2-1/2 BY 3/4 INCH.
2.1.2.1.	MINIMUM LETTER SIZE: 1/4 INCH FOR NAME OF UNITS IF VIEWING DISTANCE IS LESS THAN 24 INCHES, 1/2 INCH FOR VIEWING DISTANCES UP TO 72 INCHES, AND PROPORTIONATELY LARGER LETTERING FOR GREATER VIEWING DISTANCES. INCLUDE SECONDARY LETTERING TWO-THIRDS TO THREE-FOURTHS THE SIZE OF PRINCIPAL LETTERING.
2.1.2.2.	FASTENERS: STAINLESS-STEEL RIVETS OR SELF-TAPPING SCREWS.
2.1.2.3.	
PART 3	EXECUTION - PREPARATION
3.1.	CLEAN PIPING AND EQUIPMENT SURFACES OF SUBSTANCES THAT COULD IMPAIR BOND OF IDENTIFICATION DEVICES, INCLUDING DIRT, OIL, GREASE, RELEASE AGENTS, AND INCOMPATIBLE PRIMERS, PAINTS, AND ENCAPSULANTS.
3.1.1.	
3.2.	EQUIPMENT LABEL INSTALLATION
3.2.1.	INSTALL OR PERMANENTLY FASTEN LABELS ON EACH MAJOR ITEM OF MECHANICAL EQUIPMENT.
3.2.2.	LOCATE EQUIPMENT LABELS WHERE ACCESSIBLE AND APPLICABLE.
3.2.3.	FOR EACH PIECE OF EQUIPMENT, LABELS SHALL BE VISIBLE ON THE EQUIPMENT, ON THE DISCONNECT SWITCH AND AT THE SOURCE OF ELECTRICAL POWER.

PART 1 - GENERAL

- 1.01 DESCRIPTION OF WORK
- A. THE WORK REQUIRED UNDER THIS SCOPE INCLUDES ALL LABOR, MATERIALS AND RELATED ITEMS NECESSARY TO IMPLEMENT THE SPECIFIED EQUIPMENT OPERATING SEQUENCES AS SHOWN ON THE DRAWINGS OR INFERABLE THERE FROM AND AS SPECIFIED HEREIN.
- B. THE CONTRACTOR WHO COMPLETES THE WORK MUST INCLUDE A DEMONSTRATION TO THE OWNER OF EACH SPECIFIED SEQUENCE.

- 1.02 COMMISSIONING OF THE WORK
- A. PRIOR TO CONCEALMENT OF THE CONTROLLED DEVICES, THE CONTRACTOR MUST DEMONSTRATE THE AUTOMATIC CONTROL SYSTEM SPECIFIED HEREIN.

PART 2 - SEQUENCES OF OPERATIONS

- 3.01 OPERATING SEQUENCES - GENERAL
- A. GENERAL
1. PROVIDE END SWITCHES ON ALL DAMPERS THAT ARE INTERLOCKED WITH A FAN SYSTEM. DAMPERS SHALL FULLY OPEN PRIOR TO ENERGIZING THE FANS.
2. ALL AUTOMATIC START SEQUENCES SHALL ALSO HAVE MANUAL OVERRIDE CAPABILITY.
- B. THE CONTROLS CONTRACTOR SHALL BE RESPONSIBLE FOR STABLE OPERATION OF ALL CONTROL LOOPS.
- C. REFERENCES TO EQUIPMENT MONITORED AND CONTROLLED WITHIN THE OPERATING SEQUENCES MAY INDICATE SINGULAR QUANTITIES OF EQUIPMENT, SUCH AS FANS AND DAMPERS, WHICH ARE MULTIPLE IN THE PROJECT.
- D. ANY INFORMATION REQUIRED BY THE CONTROLS CONTRACTOR FOR THE IMPLEMENTATION OF THE SEQUENCES SHALL BE REQUESTED IN WRITING TO THE OWNER AT LEAST FOUR (4) WEEKS PRIOR TO THE TIME IT IS REQUIRED. SUBMIT THE REQUEST FOR INFORMATION IN THE FORM OF TABLES OR FORMS FOR THE OWNER'S PERSONNEL TO COMPLETE AND RETURN.
- E. ALL SET-POINTS SHALL BE ADJUSTABLE BY THE END USER.

- 3.02 BUILDING VENTILATION SYSTEM
- A. LIGHT SWITCHING CONTROL - NORMAL OPERATION
1. THE FACILITY LIGHTING SHALL BE INTERCONNECTED WITH THE FACILITY VENTILATION SYSTEM.
2. UPON FACILITY PERSONNEL SWITCHING THE LIGHTING TO THE 'ON' POSITION:
- a. A SIGNAL SHALL BE SENT TO THE MOTORIZED DAMPERS OF LOUVERS LV-1, LV-2, AND LV-3 TO MODULATE TO FULL-OPEN POSITION.
- b. WHEN THE MOTORIZED DAMPER IS AT THE FULL-OPEN POSITION, AS SENSED BY THE ACTUATOR END SWITCH, THE RESPECTIVE EXHAUST FAN (EF-1, EF-2, OR EF-3) SHALL BE ENABLED AND ENERGIZED.
- c. THE EXHAUST FAN MOTOR STARTER AND CONTROLLER SHALL MONITOR MOTOR STATUS AND FAULT ALARMS AT ALL TIMES.
3. UPON FACILITY PERSONNEL SWITCH THE LIGHTING TO THE 'OFF' POSITION:
- a. A SIGNAL SHALL BE SENT TO THE MOTORIZED DAMPERS OF LOUVERS LV-1, LV-2, AND LV-3 TO MODULATE TO FULL-CLOSED POSITION.
- b. WHEN THE MOTORIZED DAMPER IS NO LONGER AT THE FULL-OPEN POSITION, AS SENSED BY THE ACTUATOR END SWITCH, THE RESPECTIVE EXHAUST FAN (EF-1, EF-2, OR EF-3) SHALL BE DISABLED AND DE-ENERGIZED.
4. ALARMS - ALARMS SHALL BE GENERATED IF ANY OF THE FOLLOWING INSTANCES OCCUR.
- a. MOTORIZED DAMPERS ARE COMMANDED TO FULL-OPEN POSITIONS AND DO NOT DE-ACTIVE "CLOSED" END SWITCH AND ACTIVATE "OPEN" END SWITCH WITHIN 120 SECONDS (ADJ.).
- b. MOTORIZED DAMPERS ARE COMMANDED TO FULL-CLOSED POSITION AND DON NOT DE-ACTIVE "OPEN" END SWITCH AND ACTIVATE "CLOSED" END SWITCH WITHIN 120 SECONDS (ADJ.).
- c. A FAULT IS DETECTED BY THE EXHAUST FAN MOTOR CONTROLLER.
- B. GAS MONITORING SYSTEM CONTROL
1. THE VENTILATION SYSTEM SHALL BE INTERCONNECTED WITH THE FACILITY GAS MONITORING SYSTEM. THE GAS MONITORING CONTROL SEQUENCE SHALL TAKE PRECEDENT OVER THE LIGHT SWITCHING CONTROL SEQUENCE AT ALL TIMES. SEE ELECTRICAL DRAWINGS FOR GAS DETECTOR INFORMATION AND SET POINTS.
2. UPON THE GAS DETECTION SYSTEM SENSING A GAS CONCENTRATION ABOVE THE SET POINT:
- a. THE VENTILATION SYSTEM SHALL REACT IN AND IDENTICAL MANNER TO THE STEPS OUTLINED IN 3.02, A, 2.(a,b,c).
- b. THE VENTILATION SYSTEM SHALL REMAIN IN THIS OPERATIONAL STATE UNTIL THE GAS DETECTION SYSTEM IS NO LONGER IN ALARM.
3. UPON THE GAS DETECTION SYSTEM SENSING A GAS CONCENTRATION BELOW THE SET POINT:
- a. THE VENTILATION SYSTEM SHALL RETURN TO NORMAL OPERATION (LIGHT SWITCH CONTROL).

- 3.03 BUILDING TEMPERATURE CONTROL SYSTEM
- A. FAN COOLING
1. UPON THE REMOTE THERMOSTAT SENSING A SPACE TEMPERATURE ABOVE THE SPACE COOLING SET POINT (INITIALLY SET AT 85°F (ADJ.)), THE VENTILATION SYSTEM SHALL OPERATE AS DESCRIBED IN 3.02, A, 2.(a,b,c).
2. UPON THE REMOTE THERMOSTAT SENSING A SPACE TEMPERATURE COOLING SET POINT, THE VENTILATION SYSTEM SHALL RETURN TO NORMAL OPERATION (LIGHT SWITCH CONTROL).
- B. SPACE HEATING
1. UPON A UNIT HEATER SENSING A SPACE TEMPERATURE BELOW THE SPACE HEATING SET POINT (INITIALLY SET AT 50°F (ADJ.)), THE UNIT HEATER SHALL ENERGIZE AND USE INTERNAL LOGIC TO MAINTAIN THE SPACE TEMPERATURE SET POINT.
2. UPON A UNIT HEATER SENSING A SPACE TEMPERATURE ABOVE THE SPACE HEATING SET POINT, THE UNIT HEATER SHALL BE OFF.
- C. SAFETIES
1. UPON THE REMOTE THERMOSTAT SENSING A SPACE TEMPERATURE BELOW THE HEATING ALARM SET POINT (INITIALLY SET AT 36°F (ADJ.)), ALL HEATERS SHALL ENERGIZE TO FULL HEATING AND AN ALARM SHALL BE GENERATED WITHIN THE BUILDING. THE EXHAUST FANS SHALL DE-ENERGIZE AND THE LOUVER MOTORIZED DAMPERS SHALL CLOSE. THE SYSTEM SHALL STAY IN THIS MODE UNTIL THE SPACE TEMPERATURE IS ABOVE THE HEATING ALARM SET POINT. IF AT ANYTIME DURING THIS SAFETY SEQUENCE, A GAS DETECTOR GOES INTO ALARM MODE, THE GAS MONITORING SYSTEM CONTROL SHALL IMMEDIATELY BE IMPLEMENTED (GAS MONITORING CONTROL SHALL ALWAYS TAKE PRECEDENT).

SEQUENCE OF OPERATIONS

DATE:	12/08/2020
DRAWN BY:	TNS
SCALE:	NONE
REVIEWED BY:	TJH
PROJECT NO.:	19-1612
FILE:	

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ENGINEERING, D.P.C.

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REVISIONS		DESCRIPTION	
NO.	DATE		

CONTRACT 1  
SUFFERN WWTP UPGRADES  
VILLAGE OF SUFFERN  
ROCKLAND COUNTY, NEW YORK

HVAC  
SPECIFICATIONS &  
SEQUENCES