ELECTRICAL SPECIFICATIONS

CONDUIT SUPPORTS

1. EXPOSED CONDUITS ARE TO BE SECURELY FASTENED IN PLACE ON A MAXIMUM FIVE (5) FOOT INTERVALS. HANGERS, SUPPORTS OR FASTENINGS ARE TO BE PROVIDED AT EACH ELBOW AND AT THE END OF EACH STRAIGHT RUN TERMINATING AT A BOX OR CABINET.
2. HORIZONTAL AND VERTICAL RUNS ARE TO BE SUPPORTED BY ONE HOLE MALLEABLE STRAPS, CLAMP-BACKS OR OTHER APPROVED DEVICES WITH SUITABLE BOLTS, EXPANSION SHIELDS (WHERE NEEDED BEAM CLAMPS FOR MOUNTING TO BUILDING STRUCTURE OF SPECIAL BRACKETS.
3. ADJUSTABLE HANGERS MAY BE USED TO SUSPEND CONDUITS TWO (2) INCHES AND LARGER WHEN SEPARATELY LOCATED.
4. IF ADJUSTABLE TRAPEZE HANGERS ARE USED TO SUPPORT GROUPS OF PARALLEL CONDUITS, U-BOLTS OR SIMILAR TYPE CLAMPS ARE TO BE USED AT THE END OF EACH ELBOW J-BOLT OR APPROVED CLAMPS ARE TO BE INSTALLED ON EACH THIRD INTERMEDIATE TRAPEZE HANGER TO FASTEN EACH CONDUIT.
5. HANGERS ARE TO BE MADE OF DURABLE METALLIC MATERIALS SUITABLE FOR APPLICATION AND BE CORROSION PROTECTED SUITABLE FOR THIS AREA.
6. THE USE OF PERFORATED IRON STRAPS FOR SUPPORT WILL NOT BE PERMITTED REGARDLESS OF CONDUIT SIZE.
7. STRENGTH OF THE SUPPORTING EQUIPMENT IS TO BE OF SIZE AND TYPE TO SUPPORT TWO AND ONE HALF (2-1/2) TIMES THE COMBINED WEIGHT OF THE CONDUIT HANGER, CABLES, ETC., BEING SUPPORTED.

BUSHINGS AND LOCKNUTS

1. BUSHINGS FOR CONDUITS 1" AND SMALLER MAY BE TYPE A. THOSE FOR CONDUITS 1¼" AND LARGER ARE TO BE INSULATING MALLEABLE IRON, TYPE B. USE O.Z., STEEL CITY OR EQUAL.
2. LOCKNUTS UP TO AND INCLUDING 2" SIZE ARE TO BE THE GALVANIZED STANDARD WEIGHT TYPE. LOCKNUTS 2½" AND LARGER ARE TO BE THE HEAVY DUTY CAST TYPE. USE STEEL CITY, RACO OR EQUAL.
3. CONNECTORS ARE TO INSURE POSITIVE GROUND CONTINUITY.

WIRE AND CABLE

1. WIRE AND CABLE FOR FEEDERS, BRANCH CIRCUIT, CONTROL, ETC., ARE TO BE SOFT DRAWN COPPER CONDUCTORS, 600 VOLT, HEAT RESISTANT THERMOPLASTIC INSULATED, TYPE "THW", "THWN" OR "THHN" CONFORMING TO THE LATEST REQUIREMENTS O THE HEREIN SPECIFIED CODES.

A. ALUMINUM CONDUCTORS OR COPPER-CLAD ALUMINUM CONDUCTORS WILL NOT BE PERMITTED.

2. EVERY COIL OR REEL OF WIRE IS TO BEAR THE MANUFACTURER'S NAME, UNDERWRITERS" LABEL, TYPE, VOLTAGE, SIZE LENGTH AND MANUFACTURING DATE AND BE DELIVERED TO THE JOB IN ORIGINAL CONTAINERS FOR INSPECTION.
3. WIRE AND CABLE ARE TO BE AS MANUFACTURED BY NARRAGNSETT, CIRCLE, GENERAL WIRE AND CABLE, PARANITE, ROME OR EQUAL.
4. THE MINIMUM WIRE SIZE FOR FEEDERS IS NOT TO BE LESS THAN INDICATED ON THE DRAWINGS.
5. UNLESS NOTED OTHERWISE ON THE DRAWINGS, THE MINIMUM WIRE SIZE FOR BRANCH CIRCUITS IS TO BE NO. 12 AWG, EXCEPT NO. 10 AWG MINIMUM SIZE IS TO BE USED IN RUNS WHERE DISTANCE FROM THE PANELBOARD TO FIRST OUTLET EXCEEDS 75 FEET DUE TO CONDUIT ROUTING.
6. NEUTRAL CONDUCTORS ARE TO BE INSTALLED FOR SINGLE PHASE AND 3-PHASE CIRCUITS AS REQUIRED FOR SINGLE PHASE ELEMENTS AND CONTROL CIRCUITS.
7. SPLICES AND CONNECTIONS ON NO. 8 AWG OR LARGER ARE TO BE MADE WITH APPROVED SOLDERLESS TYPE CONNECTORS.
8. WIRE NO. 8 AWG AND LARGER IS TO BE STRANDED. WIRE NO. 10 AND SMALLER MAY BE SOLID.
9. BRANCH CIRCUIT CONDUCTORS ARE TO BE COLOR-CODED WITH A SEPARATE COLOR FOR EACH PHASE AND NEUTRAL USED CONSISTENTLY THROUGHOUT THE ENTIRE INSTALLATION.
10. NO CONDUCTORS ARE TO BE PULLED IN CONDUIT OR EMT SYSTEM UNTIL WORK WHICH MAY CAUSE DAMAGE TO THE CABLE HAS BEEN COMPLETED.
11. WIRE AND CABLE ARE TO BE INSTALLED IN CONDUIT IN A MANNER NOT TO DAMAGE THE INSULATION. ONLY U.L. APPROVED WIRE PULLING COMPOUNDS ARE TO BE USED TO DECREASE THE FRICTION WHEN PULLING IN WIRES, SUCH AS "WIRE LUBE" BY IDEAL.
12. THE INSTALLATION OF WIRE AND CABLE IS TO BE DONE IN SUCH A MANNER TO PROVIDE A MINIMUM INSULATION RESISTANCE BETWEEN CONDUCTORS AND BETWEEN CONDUCTORS AND GROUND AS REQUIRED BY THE NATIONAL ELECTRICAL CODE.
13. WHERE OPEN CABLE IS INSTALLED IN RETURN AIR PLENUM ABOVE CEILINGS, FIRE RATED CABLE IS TO BE USED.

WEATHERPROOF LOCATIONS

1. ELECTRICAL APPARATUS INSTALLED OUTSIDE OF THE BUILDING OR IN ANY MANNER EXPOSED TO THE WEATHER IS TO BE OF WEATHERPROOF CONSTRUCTION.
2. OUTLET BOXES FOR WEATHERPROOF CONSTRUCTION ARE TO BE OF THE CAST CONDUIT TYPE, ZINC OR CADMIUM PLATED WITH MATCHING GASKET COVERS.
3. THE ENDS OF CONDUIT ARE TO BE SEALED WITH DUCT SEAL AT TERMINAL POINTS IN WEATHERPROOF LOCATIONS.

MOVING OUTLETS

1. THE OWNER, THROUGH HIS REPRESENTATIVE, RESERVES THE RIGHT TO MOVE ANY OUTLET A DISTANCE OF TEN (10) FEET BEFORE ROUGHING IN WITHOUT ADDITIONAL COST.

CONVENIENCE OUTLETS

1. PLUG RECEPTACLES (DUPLEX), UNLESS INDICATED AND/OR SPECIFIED OTHERWISE ARE TO BE FLUSH TYPE SPECIFICATION GRADE, 20 AMPERE, 125 VOLT, DUPLEX GROUNDING TYPE, DESIGNED TO ACCEPT STANDARD 2-WIRE, PARALLEL BLADE CAPS OR 3-WIRE GROUNDING CAPS, SIMILAR TO HUBBELL, INC. #5252AI, PASS AND SEYMOUR, LEVITON OR APPROVED EQUIVALENT. RECEPTACLES ARE TO BE IVORY.
2. AT EACH CONVENIENCE OUTLET INDICATED AT THE EXTERIOR OF THE BUILDING, AND OTHER LOCATIONS NOTED, FURNISH AND INSTALL A FLUSH 20 AMPERE DUPLEX GROUNDING TYPE WALL RECEPTACLE, SIMILAR TO HUBBELL, INC., GFTR20I, PASS AND SEYMOUR, LEVITON OR APPROVED EQUIVALENT. COVERPLATE OVER RECEPTACLE IS TO BE A WEATHERPROOF, WHILE-IN-USE TYPE. RECEPTACLES ARE TO BE IVORY.
3. RECEPTACLES AT LOCATIONS SHOWN ARE TO BE OF THE GROUND FAULT INTERRUPTER TYPE. RECEPTACLES ARE TO BE OF THE TERMINAL OR FEED-THROUGH TYPE AS REQUIRED, RATED 20 AMPERES AT 120 VOLTS, WITH SPECIAL COVERPLATE AND SIMILAR TO THE HUBBELL, INC., GFST20I, PASS AND SEYMOUR, LEVITON OR APPROVED EQUIVALENT. THE CONSTRUCTION AND INSTALLATION IS TO CONFORM WITH THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE. RECEPTACLES ARE TO BE IVORY.
4. RECEPTACLES INSTALLED IN WET OR DAMP LOCATIONS TO BE LABELED "WEATHER-RESISTANT".
5. RECEPTACLE COLOR TO MATCH EXISTING.

PLATES

1. FURNISH AND INSTALL WALL PLATES FOR WIRING DEVICES. BOTH THE WIRING DEVICES AND THE COVERPLATES SHALL BE THE SAME MANUFACTURE. PLATES ARE TO BE HUBBELL OR APPROVED EQUAL.
2. PLATES TO MATCH EXISTING.
3. PLATES ON EXPOSED CONDUIT INSTALLATION ARE TO BE OF TYPE DESIGNED FOR USE WITH THE FITTINGS OR OUTLET INSTALLED. PLATES ARE TO BE CADMIUM PLATED AND NEATLY FIT OUTLET ON FOUR SIDES.

SAFETY SWITCHES

1. SAFETY SWITCHES ARE TO BE 240 OR 600 VOLT, AS REQUIRED, SINGLE THROW, FUSIBLE HEAVY DUTY WITH COVER INTERLOCK, QUICK-MAKE, QUICK-BREAK, INDEPENDENT OF HANDLE, TYPE HD IN NEMA TYPE I ENCLOSURE, AS MANUFACTURED BY SQUARE D, CUTLER HAMMER OR GENERAL ELECTRIC COMPANY OR APPROVED EQUIVALENT.
2. FUSES FOR SAFETY SWITCHES ARE TO BE AS SPECIFIED UNDER "FUSES".

IDENTIFICATION OF SWITCHES, PANELBOARDS AND CONTROLS

1. FURNISH AND INSTALL NAME TAGS AS OUTLINED HEREWITHIN THESE SPECIFICATIONS.

A. SWITCHES (FURNISHED UNDER THIS CONTRACT MOUNTED REMOTE FROM EQUIPMENT)

1. EQUIPMENT NAME
2. VOLTAGE (EX. 1ø-3W-120/240 VOLTS)

B. PANELBOARDS

1. PANELBOARD DESIGNATION
2. VOLTAGE (EX. 1ø-3W-120/240 VOLTS)

PERMITS AND INSPECTIONS

1. THE CONTRACTOR IS TO PAY CHARGES, SECURE PERMITS AND OBTAIN INSPECTIONS AND APPROVALS REQUIRED FOR THE COMPLETE SERVICE AND SYSTEM INSTALLATION. CERTIFICATION OF INSPECTION IS TO BE SUBMITTED TO THE ENGINEER AT THE COMPLETION OF CONTRACT.

FUSES

1. FUSES ARE TO BE OF THE AMPERE RATINGS INDICATED ON THE DRAWINGS AND HAVE A VOLTAGE RATING EQUAL TO OR GREATER THAN THE VOLTAGE AT THEIR POINT OF APPLICATION.
2. FUSES, FOR USE IN SYSTEMS RATED 600 VOLTS OR LESS ARE TO BE OF THE SAME MANUFACTURER TO FACILITATE POSITIVE SELECTIVE COORDINATION OF THE PROTECTIVE DEVCES.
3. FUSES, AS SPECIFIED ABOVE, ARE TO BE STORED IN A MOISTURE FREE LOCATION AND BE INSTALLED IN THE FUSE HOLDERS IMMEDIATELY PRIOR TO ENERGIZATION OF THE CIRCUIT IN WHICH THE FUSE IS APPLIED. IN NO CASE ARE FUSES TO BE INSTALLED AND SHIPPED WITH EQUIPMENT TO ASSURE COMPLIANCE WITH THE REQUIREMENT FOR MOISTURE-FREE STORAGE.
4. FURNISH ONE (1) SPARE SET OF THREE (3) FUSES FOR EACH SPECIFIED SIZE OF FUSES INSTALLED. THESE SPARE FUSES ARE TO BE DELIVERED TO THE OWNER AT THE TIME OF ACCEPTANCE OF THE PROJECT, NEATLY ENCASED IN SUITABLE CONTAINERS OR CABINETS AS APPROVED BY THE ARCHITECT, FOR LOCATION NEAR POINTS OF USE.
5. FUSES FOR SAFETY SWITCHES AND DISTRIBUTION SWITCHES IN DISTRIBUTION SWITCHBOARD WILL BE CLASS R WITH AMPERE RATINGS OF 1/10 AMPERE TO 600 AMPERES AND BE OF A DUAL-ELEMENT CONSTRUCTION, INCORPORATING A SPRING ASSISTED THERMAL OVERLOAD ELEMENT USING A 280°F MELTING POINT ALLOY TO PROVIDE THERMAL PROTECTION FOR THE FUSE AND FUSEHOLDER, AND A SEPARATE SHORT-CIRCUIT ELEMENT. THE DESIGN IS TO PROVIDE TIME-DELAY OF NOT LESS THAN 10 SECONDS AT 500 PERCENT OF AMPERE RATING. THE INTERRUPTING RATING IS TO BE ALUMINUM OF 200,000 AMPERES RMS SYMMETRICAL AS LISTED BY UNDERWRITERS' LABORATORIES. PEAK LET-THRU CURRENT (LP) AND ENERGY LET-THRU VALVES (12T) ARE NOT TO EXCEED THE VALUES ESTABLISHED BY UNDERWRITERS' LABORATORIES STANDARD FOR CLASS K-5 FUSES. FUSES ARE TO BE BUSSMAN MANUFACTURING DIVISION OF MCGRAW EDISON COMPANY "LOW PEAK", CLASS K-5, TYPE "LPN-RKSP" 250 VOLT.

GROUNDING

1. THE CONTRACTOR IS TO FURNISH AND INSTALL THE ELECTRICAL GROUNDING SYSTEM AS REQUIRED AND IN COMPLIANCE WITH THE MOST RECENT ISSUE OF THE NATIONAL ELECTRICAL CODE, POWER COMPANY POLICY AND RECOMMENDATIONS, APPLICABLE REGULATIONS, AND IN ACCORDANCE WITH THE SPECIFICATIONS AND CONTRACT DRAWINGS.
2. GROUND WIRING IS NOT NECESSARILY SHOWN ON THE DRAWINGS AND IS THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR. IT IS ESSENTIAL AND EXTREMELY IMPORTANT THAT THE CONTRACTOR THOROUGHLY FAMILIARIZE HIM/HERSELF WITH THE APPLICABLE CODES AND REGULATIONS PRIOR TO INSTALLATION OF THE GROUNDING SYSTEM.
3. FURNISH AND INSTALL NECESSARY MATERIALS AND ACCESSORIES TO SOLIDLY GROUND NON-CURRENT CARRYING METAL PARTS OF THE ELECTRICAL SYSTEM, INCLUDING WHERE APPLICABLE, BUT NOT LIMITED TO:

TRANSFORMER CASES, ENCLOSURES AND STRUCTURES
PANELBOARDS AND SWITCHBOARDS, ENCLOSURES AND STRUCTURE
CONDUIT SYSTEMS, PULLBOXES, ETC.
MOTOR FRAMES
DISCONNECT SWITCH ENCLOSURES
LIGHTING SYSTEM FIXTURES

A. LIGHTING AND POWER PANELS ARE TO BE COMPLETE WITH ADEQUATE SIZE GROUND BUS WITH SUFFICIENT CLAMPS FOR TERMINATING CIRCUITS WITHIN THE CAPACITY OF THE PANEL.

B. THE LIGHTING SYSTEM MAY BE GROUNDED THROUGH THE BRANCH CIRCUIT CONDUITS, EXCEPT AS OTHERWISE PROHIBITED BY THE NATIONAL ELECTRICAL CODE.

C. RECEPTACLES ARE TO BE GROUNDED BY CONNECTING AN INSULATED GROUND CONDUCTOR FROM THE RECEPTACLE GROUNDING TERMINAL TO A CLAMP ON THE PANELBOARD EQUIPMENT GROUND BUS. THE GROUND CONDUCTOR IS TO BE RUN IN THE SAME CONDUIT AS THE CIRCUIT CONDUCTORS.

D. THE ENCLOSURES OF MOTOR STARTERS AND CONTROLLERS, WIREWAYS, LIGHTING AND POWER DISTRIBUTION PANELS, AND DRY TYPE TRANSFORMERS MAY UTILIZE THE CONNECTING CONDUIT AS THE EQUIPMENT GROUNDING CONDUCTOR, UNLESS A SEPARATE EQUIPMENT GROUNDING CONDUCTOR IS FURNISHED WITH THE MAIN FEEDER (UNLESS SHOWN OTHERWISE ON THE DRAWINGS). PROVIDE DOUBLE LOCK NUTS WITH GROUNDING BUSHINGS AND BONDING JUMPERS AT METAL ENCLOSURES.

E. THE FRAMES OF MOTORS ARE TO BE GROUNDED WITH A SEPARATE EQUIPMENT GROUNDING CONDUCTOR RUN IN THE SAME CONDUIT AS THE PHASE CONDUCTORS AND CONNECTED TO THE EQUIPMENT GROUND BUS OR GROUND STUD IN CASE OF SMALL MOTOR STARTERS.

4. FURNISH AND INSTALL GROUND CONDUCTORS AND CONNECTIONS AS FOLLOWS:

A. GROUND CONDUCTORS ARE TO BE COPPER AND SIZED BY THE ELECTRICAL CONTRACTOR UNLESS SHOWN OTHERWISE ON THE DRAWINGS.

B. USE APPROVED PRESSURE TYPE BOLT-ON CLAMP FITTINGS THROUGHOUT, EXCEPT UNDERGROUND AND WHERE IT IS NOT PRACTICAL, IN WHICH CASE THERMITE WELDING IS TO BE USED.

C. THE WATER PIPE CONNECTION IS TO BE MADE WITH A CLAMP TYPE GROUND FITTING THAT BONDS BOTH THE CONDUIT AND CABLE TO THE WATER PIPE AND A BONDING JUMPER IS TO BE INSTALLED AROUND THE WATER METER.

D. GROUND CONDUCTORS ARE TO BE CONTINUOUS IN THEIR LENGTH WITH A MINIMUM OF JOINTS OR SPLICES INSTALLED IN EXPOSED RIGID STEEL CONDUIT AND SECURELY CLAMPED AT EACH END WHERE THE CONDUCTOR ENTERS AND LEAVES THE CONDUIT.

E. CONNECTIONS ARE TO BE TIGHT AND SOLID, SECURELY BOLTED TO THE EQUIPMENT. CONTACT SURFACES ARE TO BE THOROUGHLY CLEANED AND BRIGHT BEFORE CONNECTIONS ARE MADE TO INSURE GOOD METAL-TO-METAL CONTACT.

F. CONNECTIONS ARE TO BE MADE ACCESSIBLE FOR VISUAL INSPECTION; PARTICULARLY UNDERGROUND CONNECTIONS SHOULD NOT BE COVERED UNTIL THEY HAVE BEEN INSPECTED BY THE OWNER'S REPRESENTATIVES.

G. USE COPPER CABLE AND CLAMPS AT UNDERGROUND MECHANICAL JOINTS OF THE CAST IRON WATER SERVICE LINE.

H. GROUND CONDUCTORS FROM PROTECTIVE DEVICES SUCH AS LIGHTING ARRESTORS AND GRADING RINGS ARE TO BE KEPT AS STRAIGHT AND SHORT AS POSSIBLE. WHERE BENDS ARE NECESSARY, THEY ARE TO BE OF LARGE RADII TO MINIMIZE SURGE IMPEDANCE. THE ENTIRE DISTRIBUTION SYSTEM IS TO BE EFFECTIVELY AND SOLIDLY GROUNDED.

I. COPPER GROUND BUS BAR IS TO BE PROVIDED WHERE SHOWN OR REQUIRED.

J. PROVIDE BONDING JUMPERS ACROSS CONDUIT WHERE THE GROUNDING CONTINUITY MAY OTHERWISE BE BROKEN, SUCH AS FLEXIBLE AND EXPANSION JOINTS.

K. EQUIPMENT GROUNDING CONDUCTORS INSTALLED IN CONDUIT WITH OTHER INSULATED PHASE CONDUCTORS ARE ALSO TO BE INSULATED.

L. GROUNDING CONDUCTORS ARE TO BE LOCATED AND INSTALLED IN SUCH A MANNER TO PROVIDE THE SHORTEST AND MOST DIRECT PATH BETWEEN EQUIPMENT AND GROUND.

GAS DETECTION AND CONTROL SYSTEM

1.0 SUPPLY AND INSTALL AS SHOWN ON DRAWINGS AN ACME CEL SERIES MULTIPOINT & MULTIGAS CENTRALIZED DETECTION AND CONTROL SYSTEM CONSISTING OF THE FOLLOWING:

A QUANTITY OF 1 CONTROL PANEL AND A QUANTITY OF 2 REMOTE SENSOR/TRANSMITTER STATIONS. THE SYSTEM SHALL HAVE A QUANTITY OF 1 OXYGEN (O2) DEPLETION GAS SENSORS.

NOTE: PANELS AND REMOTE SENSOR/TRANSMITTER STATIONS SHALL BE BY THE SAME MANUFACTURE.

1.1 DESCRIPTION
THE SYSTEM SHALL USE AN ADDRESSABLE RS485 COMMUNICATION PROTOCOL. EACH SENSOR SHALL BE SEQUENTIALLY POLLED BY THE CONTROL PANEL. SENSOR DATA SHALL BE ACQUIRED AND STORED IN THE CONTROL PANEL MEMORY.

1.2 THE ACME CEL SERIES MULTIPOINT SYSTEM SHALL USE 14 GAUGE COLOR CODED (ORANGE AND YELLOW) SHIELDED TWISTED PAIR RS-485 SIGNAL WIRES FOR COMMUNICATION AND 14 GAUGE COLOR CODED (RED BLACK) LOW VOLTAGE MULTISTRAND CABLE FOR POWER.

1.3 THE CONTROL PANEL SHALL HAVE AN LED DISPLAY WITH AN INDICATING LIGHT FOR EACH SENSOR LOCATION. THIS LIGHT SHALL BLINK SLOWLY FOR LOW-LEVEL INDICATION, BLINK QUICKLY FOR HIGH-LEVEL INDICATION AND BE SOLID ON FOR ALARM LEVEL INDICATION. A LIQUID-CRYSTAL ALPHANUMERIC 4-LINE DISPLAY SHALL PROVIDE PPM LEVELS FOR EACH SENSOR STATION, SHALL INDICATE THE GAS BEING SAMPLED AT THAT LOCATION AND ITS ALARM STATUS.

1.4 THE CONTROL PANEL SHALL HAVE A REMOVABLE KEYPAD FOR PROGRAMMING PURPOSES AND THE PROGRAMMING SHALL BE PASSWORD PROTECTED. SYSTEMS WITH PANEL-MOUNTED KEYPADS ARE NOT ACCEPTABLE.

1.5 THE SYSTEM SHALL HAVE ALL OF ITS COMPONENTS, INCLUDING THE CONTROLLER, RS-485 COMMUNICATION MODULE AND RELAY OUTPUTS BOARDS IN A SINGLE ENCLOSURE. MULTIPLE ENCLOSURES REQUIRING INTER-WIRING ARE NOT ACCEPTABLE.

1.6 THE EQUIPMENT SHALL BE CSA AND/OR ETL CERTIFIED.

2.0 OUTPUTS

2.1 "ON - OFF"
THE CONTROL PANEL SHALL INCORPORATE THE NECESSARY LOGIC CIRCUITS TO OPERATE THE EXHAUST FAN AND THE MOTORIZED DAMPER FOR FRESH AIR AND/OR EXHAUST ACCORDING TO THE SPECIFIED LOGIC OF VENTILATION. PANEL SHALL BE CAPABLE OF PROVIDING FOUR RELAYS TO ACTIVATE AT THE FOLLOWING ALARM LEVELS:

- LOW: 19.5 %
- HIGH: 18.0 %
- ALARM: 17.0 %

THE PANEL SHALL PROVIDE A 4-20 MA OR 0-10V DC ANALOG OUTPUT SIGNAL BASED ON THE HIGHEST CONDITION OR ON THE AVERAGE OF CONDITIONS DETECTED.

2.2 CONSTRUCTION
THE CEL CONTROL PANEL SHALL BE OF SOLID VENTILATED 16 GAUGE STEEL CONSTRUCTION. ALL ELECTRONIC COMPONENTS SHALL BE BEHIND A LOCKED DOOR. THERE SHALL BE NO ACCESSIBLE SWITCHES OR KNOBS ON FRONT OF PANEL (EXCEPT FOR OVERRIDE IF SPECIFIED). ALL ELECTRICAL CONNECTIONS SHOULD BE MADE TO CLEARLY IDENTIFIED TERMINALS.

2.3 SELF-CHECKING
INTEGRITY OF THE SYSTEM SHALL BE UNDER CONSTANT CHECKING. SHOULD A REMOTE STATION NOT CONFIRM A RESPONSE, A FAULT CONDITION WILL BE DISPLAYED AT THE CONTROL PANEL WITH INDICATION OF FAULTY STATION LOCATION. A COMMON ALARM SHALL BE LOCKED IN.

2.4 TIME DELAY
THE CONTROL PANEL SHALL INCLUDE A TIME DELAY OF APPROXIMATELY 30 MINUTES SCHEDULED BETWEEN THE TIME A HIGH LEVEL IS DETECTED AND THE TIME VISUAL DISPLAY ON UNIT COVER OR PANEL, AUDIBLE ALARM AND CLOSURE OF ALARM CONTACTS. THIS TIME DELAY IS INTRODUCED IN ORDER TO AVOID NUISANCE ALARMS PRODUCED BY SHORT TEMPORARY CONDITIONS. THE TIME DELAY ALSO ALLOWS THE VENTILATION EQUIPMENT, PREVIOUSLY STARTED AT A LOWER GAS LEVEL BELOW ALARM CONDITIONS, A REASONABLE LENGTH OF TIME TO REVERSE THE GAS TREND.

3.0 SENSOR STATIONS

3.1 THE WALL OR COLUMN MOUNTED METAL OR PVC GASKETED ENCLOSURE WITH VANDAL-PROOF COVER SCREWS OR A LOCKABLE CLASP AND SHALL NOT HAVE ANY PARTS ACCESSIBLE FROM OUTSIDE.

3.2 RESPONSE
THE LOCAL REACTION TIME OF THE ACME ST REMOTE STATIONS SHALL BE IN THE ORDER OF A FEW SECONDS.

3.3 THE SENSOR'S RESPONSE TO AMBIENT CONDITIONS SHALL BE INTERPRETED BY THE DETECTION CIRCUITRY ACCORDING TO SELECTED LEVELS. INFORMATION IS CONVERTED FOR TRANSMITTAL TO CONTROL PANEL AT SCANNING TIME.

3.4 OXYGEN (O2) DEPLETION SENSOR/TRANSMITTER STATIONS SHALL HAVE LED'S FOR VISUAL INDICATION OF "POWER-ON", AND AN LED BAR GRAPH INDICATING CONCENTRATION LEVELS.

3.5 REMOVING OR DISCONNECTING A LOCAL SENSOR STATION FROM THE SYSTEM SHALL NOT AFFECT ITS OPERATION AS LONG AS THE "DAISY-CHAIN" CONNECTION TO THE OTHER SENSOR STATIONS IS MAINTAINED.

3.6 THERE SHALL BE NO MAINTENANCE REQUIRED EXCEPT FOR PERIODIC SIMPLE CALIBRATION CHECKS PERFORMED BY INTRODUCING A KNOWN GAS MIXTURE INTO THE SENSOR AND VERIFYING OR ADJUSTING THE ELECTRONIC RESPONSE AT THE SENSOR LOCATION.

4.0 INSTALLATIONS

4.1 WIRING : THE INTERCONNECTIONS BETWEEN THE CONTROL PANEL AND SENSORS SHALL BE MADE BY 14 GAUGE COLOR CODED (ORANGE AND YELLOW) SHIELDED TWISTED PAIR RS-485 SIGNAL WIRES FOR COMMUNICATION AND 14 GAUGE COLOR CODED (RED BLACK) LOW VOLTAGE MULTISTRAND CABLE FOR POWER. EACH BRANCH SHALL SUPPORT A TOTAL LENGTH OF 800FT AND A MAXIMUM OF FOUR (4) SENSORS.

FOR OXYGEN (O2) DEPLETION GAS VAPOURS: REMOTE SENSOR STATIONS MUST BE MOUNTED VERTICALLY ACCORDING TO THE ARROW ON THE SENSOR. INSTALLATION HEIGHT IS APPROXIMATELY 4' AFF.

4.2 CEL SYSTEMS SHOULD BE ENERGIZED AT ALL TIMES. SUPPLY 120/1/50 – 15A FROM DEDICATED CIRCUIT. IT SHOULD BE IMPOSSIBLE TO DISCONNECT POWER TO A CEL SYSTEM IN ORDER TO SERVICE OTHER EQUIPMENT.

4.3 ALL EQUIPMENT SHALL BE INTERCONNECTED AT THE FACTORY AND SHIPPED FACTORY CALIBRATED AFTER A 7-DAY OPERATIONAL TEST. THE LOGIC OF THE SYSTEM SHALL BE FACTORY TESTED BY SIMULATED FIELD CONDITIONS AS SPECIFIED. A REPORT SHALL BE FURNISHED WITH THE EQUIPMENT.

4.4 ALL ELECTRICAL CONNECTIONS SHALL BE MADE BY THE ELECTRICAL CONTRACTOR ACCORDING TO DIAGRAMS SHOWN ON DRAWINGS FURNISHED WITH THE EQUIPMENT BY THE MANUFACTURER. USE 4-WIRE CODED CABLE FROM STATION TO STATION, MAINTAINING COLOR CODE. ALL WIRING IS LOW VOLTAGE (24V).

4.5 PROVIDE ON CONTROL PANEL SELECTOR SWITCHES WITH PILOT LIGHTS TO MANUALLY OVERRIDE ALL OF THE FANS CONTROLLED BY THE SYSTEM.

4.6 PROVIDE IN CEL CONTROL PANEL A BATTERY BACK-UP TO MAINTAIN THE SYSTEM IN OPERATION DURING A POWER FAILURE. A COMPACT RECHARGEABLE BATTERY SHALL BE USED BECAUSE OF THE REDUCED POWER REQUIREMENT OF THE CEL SYSTEM.

4.7 PROVIDE TWO REMOTE ALARM STATION FURNISHED WITH AUDIBLE/VISUAL ALARM WITH SILENCING BUTTON.

5.0 TESTING

5.1 THE CONTRACTOR SHALL TEST SYSTEM TO ENSURE SYSTEM OPERATES CORRECTLY.

TESTING, ADJUSTING, AND BALANCING FOR HVAC

REFERENCE STANDARDS

AABC (NSTSB) – AABC NATIONAL STANDARDS FOR TOTAL SYSTEM BALANCE, 7TH EDITION 2016.

ASHRAE STD 111 – MEASUREMENT, TESTING, ADJUSTING, AND BALANCING OF BUILDING HVAC SYSTEMS 2008 (REAFFIRMED 2017).

NEBB (TAB) – PROCEDURAL STANDARDS FOR TESTING ADJUSTING AND BALANCING OF ENVIRONMENTAL SYSTEMS 2015, WITH ERRATA (2017).

SMACNA (TAB) – HVAC SYSTEMS TESTING, ADJUSTING AND BALANCING 2002.

SUBMITTALS

SEE ABOVE FOR SUBMITTAL PROCEDURES.

TAB PLAN: SUBMIT A WRITTEN PLAN INDICATING THE TESTING, ADJUSTING, AND BALANCING STANDARD TO BE FOLLOWED AND THE SPECIFIC APPROACH FOR EACH SYSTEM AND COMPONENT.

INCLUDE AT LEAST THE FOLLOWING IN THE PLAN:

LIST OF ALL AIR FLOW, SOUND LEVEL, SYSTEM CAPACITY AND EFFICIENCY MEASUREMENTS TO BE PERFORMED AND A DESCRIPTION OF SPECIFIC TEST PROCEDURES, PARAMETERS, FORMULAS TO BE USED.

COPY OF FIELD CHECKOUT SHEETS AND LOGS TO BE USED, LISTING EACH PIECE OF EQUIPMENT TO BE TESTED, ADJUSTED AND BALANCED WITH THE DATA CELLS TO BE GATHERED FOR EACH.

DISCUSSION OF WHAT NOTATIONS AND MARKINGS WILL BE MADE ON THE DUCT AND PIPING DRAWINGS DURING THE PROCESS.

FINAL TEST REPORT FORMS TO BE USED.

PROCEDURES FOR FORMAL DEFICIENCY REPORTS, INCLUDING SCOPE, FREQUENCY AND DISTRIBUTION.

FINAL REPORT: INDICATE DEFICIENCIES IN SYSTEMS THAT WOULD PREVENT PROPER TESTING, ADJUSTING, AND BALANCING OF SYSTEMS AND EQUIPMENT TO ACHIEVE SPECIFIED PERFORMANCE.

REVISE TAB PLAN TO REFLECT ACTUAL PROCEDURES AND SUBMIT AS PART OF FINAL REPORT.

SUBMIT DRAFT COPIES OF REPORT FOR REVIEW PRIOR TO FINAL ACCEPTANCE OF PROJECT. PROVIDE FINAL COPIES FOR ARCHITECT AND FOR INCLUSION IN OPERATING AND MAINTENANCE MANUALS.

INCLUDE ACTUAL INSTRUMENT LIST, WITH MANUFACTURER NAME, SERIAL NUMBER, AND DATE OF CALIBRATION.

FORM OF TEST REPORTS: WHERE THE TAB STANDARD BEING FOLLOWED RECOMMENDS A REPORT FORMAT USE THAT; OTHERWISE, FOLLOW ASHRAE STD 111.

UNITS OF MEASURE: REPORT DATA IN BOTH I-P (INCH-POUND) AND SI (METRIC) UNITS.

GENERAL REQUIREMENTS

PERFORM TOTAL SYSTEM BALANCE IN ACCORDANCE WITH ONE OF THE FOLLOWING:

ASHRAE STD 111, PRACTICES FOR MEASUREMENT, TESTING, ADJUSTING AND BALANCING OF BUILDING HEATING, VENTILATION, AIR-CONDITIONING, AND REFRIGERATION SYSTEMS.

AABC (NSTSB), AABC NATIONAL STANDARDS FOR TOTAL SYSTEM BALANCE.

SMACNA (TAB).

BEGIN WORK AFTER COMPLETION OF SYSTEMS TO BE TESTED, ADJUSTED, OR BALANCED AND COMPLETE WORK PRIOR TO SUBSTANTIAL COMPLETION OF THE PROJECT.

TAB AGENCY CERTIFIED BY ONE OF THE FOLLOWING:

AABC, ASSOCIATED AIR BALANCE COUNCIL.

NEBB, NATIONAL ENVIRONMENTAL BALANCING BUREAU.

TABB, THE TESTING, ADJUSTING, AND BALANCING BUREAU OF NATIONAL ENERGY MANAGEMENT INSTITUTE.

NBC, NATIONAL BALANCE COUNCIL

TAB SUPERVISOR AND TECHNICIAN CERTIFIED BY SAME ORGANIZATION AS TAB AGENCY.

PROFESSIONAL CERTIFICATION

I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 50053, EXPIRATION DATE: 10-13-2024

BRETT NICHOLAS YONISH DATE 12-06-2023

STATE OF MARYLAND — BRETT N. YONISH — 50053 — PROFESSIONAL ENGINEER

ELECTRICAL SPECIFICATIONS

BUILDING REVISIONS
FOR THE
ALLEGANY COUNTY
LAVALLE BUILDING
37 LANE AVENUE, LAVALE, MARYLAND, 21502

East Hills Engineering Associates
A LIMITED LIABILITY COMPANY
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REVISIONS

MARK	BY	DATE

DATE: 12-06-2023
DRAWN BY: J.L.L.
CHECKED BY: B.N.Y.
PROJECT NO. EHEA 23023
DRAWING NO. E-5

December 07, 2023 - 2:59pm T:\Projects\2023\23-023 - ACM WWW - Equipment Relocation-Additions & Paint Booth\Drawings\23023-E5.dwg

ORIGINAL DRAWING SIZE = 24"x36"

NOTE: DO NOT SCALE DRAWING - EACH CONTRACTOR IS TO VERIFY ALL EXISTING CONDITIONS AND ALL DIMENSIONS BEFORE BEGINNING ANY WORK. EACH CONTRACTOR IS TO FULLY COORDINATE THEIR WORK WITH THAT OF OTHERS. REFER TO THE CONTRACT AND SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.