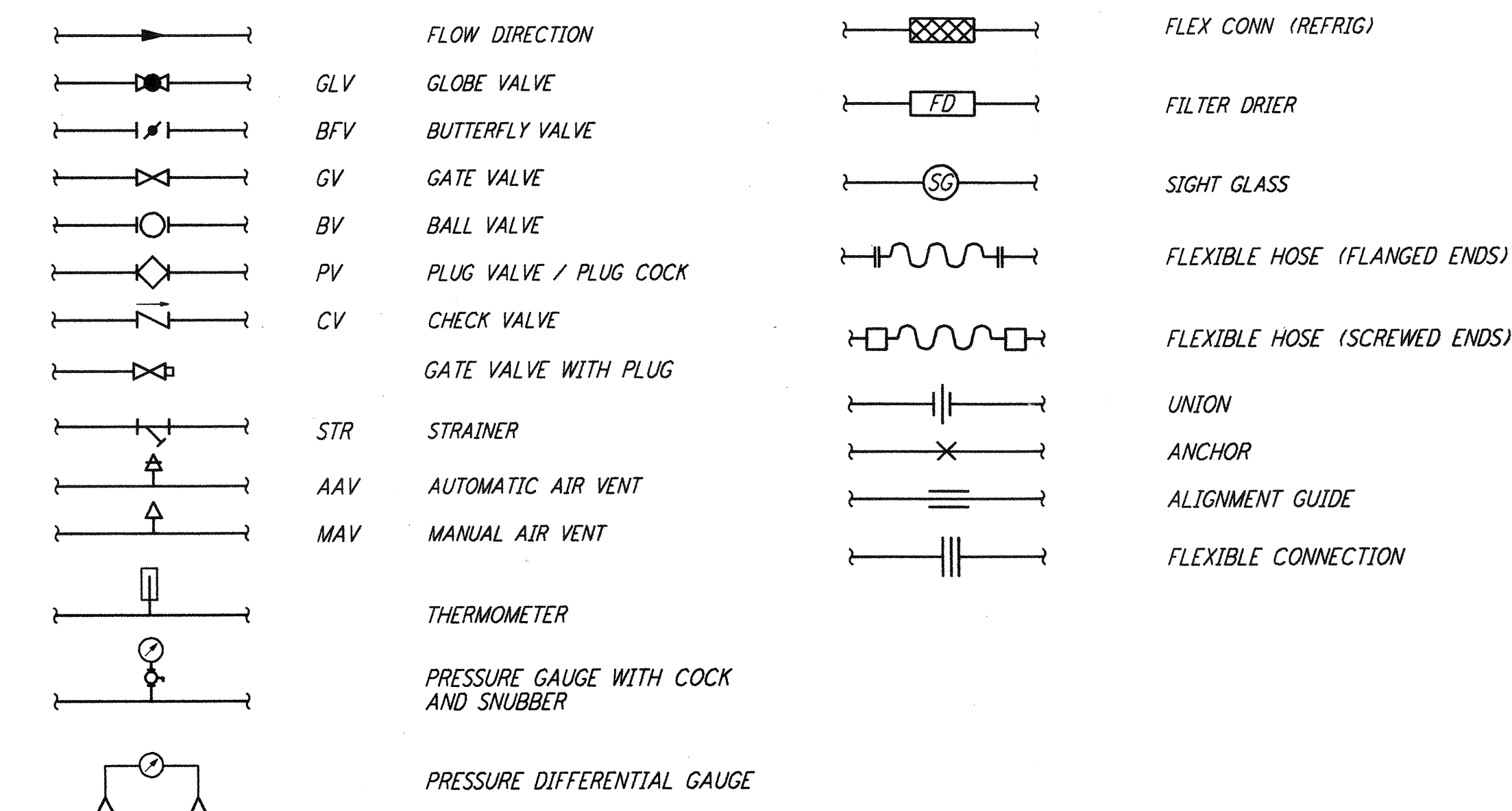
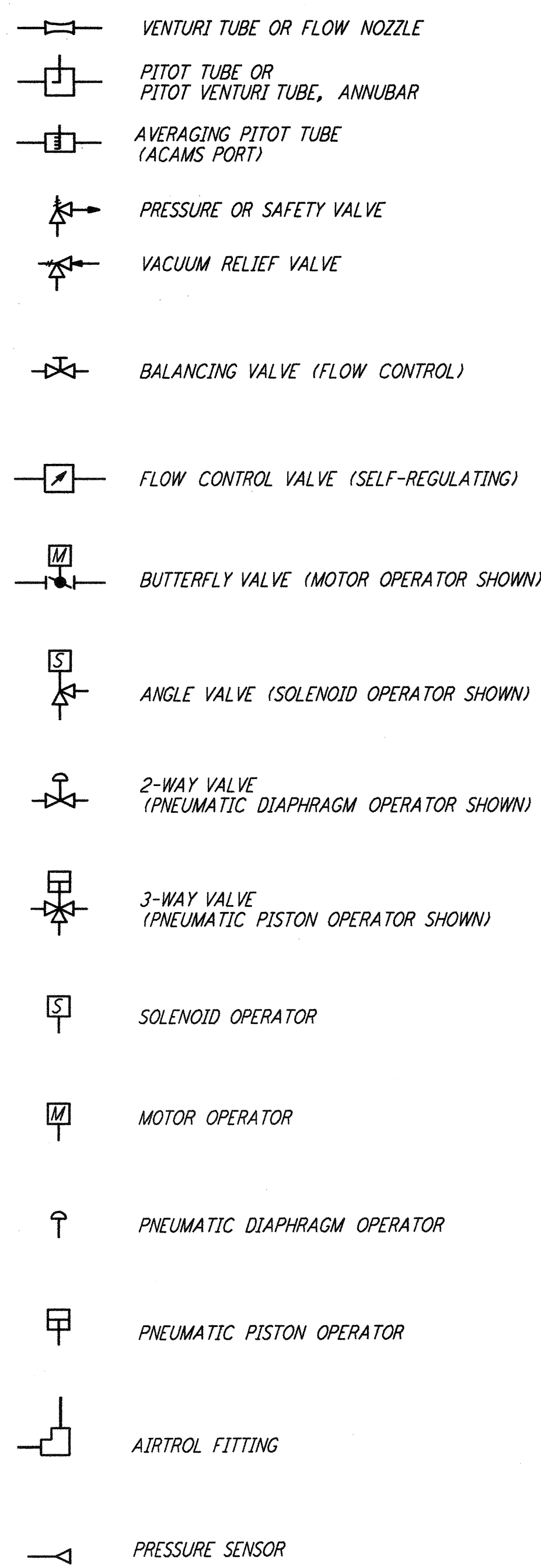


HVAC PIPING AND INSTRUMENTATION LEGEND AND SYMBOLS

PIPING AND INSTRUMENTATION LEGEND AND SYMBOLS

INSTRUMENT IDENTIFICATION

GENERAL NOTES



| FIRST LETTER | | SUCCEEDING LETTERS | | |
|----------------------------------|---------------------|-----------------------------|--|------------------------|
| MEASURED OR INITIATING VARIABLE | MODIFIER | READOUT OR PASSIVE FUNCTION | OUTPUT FUNCTION | MODIFIER |
| A ANALYSIS | | ALARM | | |
| B BURNER, COMBUSTION | | USER'S CHOICE | USER'S CHOICE | USER'S CHOICE |
| C USER'S CHOICE | | | CONTROL | |
| D USER'S CHOICE | DIFFERENTIAL | | | DETECTOR |
| E VOLTAGE | | SENSOR (PRIMARY ELEMENT) | | |
| F FLOW RATE | RATIO (FRACTION) | | | |
| G USER'S CHOICE | | GLASS, VIEWING DEVICE | | |
| H RELATIVE HUMIDITY | | | | HIGH |
| I CURRENT (ELECTRICAL) | | INDICATE | | |
| J POWER | SCAN | | | |
| K TIME, TIME SCHEDULE | | TIME RATE OF CHANGE | CONTROL STATION | |
| L LEVEL | | LIGHT | | LOW |
| M USER'S CHOICE | MOMENTARY | | | MIDDLE OR INTERMEDIATE |
| N USER'S CHOICE | | USER'S CHOICE | USER'S CHOICE | USER'S CHOICE |
| O USER'S CHOICE | | ORIFICE (RESTRICTION) | | |
| P PRESSURE, VACUUM | | POINT (TEST CONNECTION) | | |
| Q USER'S CHOICE | INTEGRATE, TOTALIZE | | | |
| R RADIATION | | RECORD | | |
| S SPEED, FREQUENCY, SMOKE | SAFETY | | SWITCH | |
| T TEMPERATURE | | | TRANSMIT | |
| U MULTIVARIABLE | | MULTIFUNCTION | MULTIFUNCTION | MULTIFUNCTION |
| V VIBRATION, MECHANICAL ANALYSIS | | | VALVE, DAMPER, LOUVER | |
| W WEIGHT, FORCE | | WELL | | |
| X UNCLASSIFIED | X AXIS | UNCLASSIFIED | UNCLASSIFIED | UNCLASSIFIED |
| Y EVENT, STATE OR PRESENCE | Y AXIS | | RELAY COMPUTE, CONVERT | |
| Z POSITION, DIMENSION | Z AXIS | | DRIVER, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT | |

- BEFORE STARTING WORK, VERIFY LOCATIONS, ELEVATIONS AND SIZES OF ALL DUCTWORK AND EQUIPMENT REQUIRING CONNECTIONS.
- COORDINATE ALL DUCTWORK AND PIPING WORK WITH ALL OTHER WORK TO AVOID CONFLICTS. RUN ALL DUCTS AND PIPES TO AVOID ARCHITECTURAL OPENINGS, STRUCTURAL MEMBERS, OR OTHER OBSTRUCTIONS. RUN DUCTS TIGHT TO BOTTOM OF STRUCTURAL MEMBERS UNLESS OTHERWISE NOTED. OFFSET DUCTS WHERE REQUIRED. INSTALL ALL DUCTWORK AND PIPING TO BEST SUIT FIELD CONDITIONS AND COORDINATE WITH THE INSTALLATION WORK OF OTHER TRADES. THE DRAWINGS ARE DIAGRAMMATIC AND SHALL NOT BE SCALED TO DETERMINE EXACT LOCATION OF MECHANICAL WORK. REVISE ALL WORK AS NEEDED WITHOUT ANY ADDITIONAL CHARGE TO THE OWNER.
- ALL EQUIPMENT SUPPORTS, FOUNDATIONS, PADS, WALL OPENINGS OR PENETRATIONS SHALL BE VERIFIED WITH ACTUAL PURCHASED EQUIPMENT FOR SIZE AND FIT. THE EQUIPMENT SIZES INDICATED ON THE DRAWINGS WERE SELECTED FOR ENGINEERING DESIGN AND SPACE ALLOCATION PURPOSES. THE ACTUAL SIZE MAY VARY DEPENDING ON THE PURCHASED EQUIPMENT TO BE INSTALLED. CONTRACTOR SHALL MAKE THE NECESSARY CHANGES, COORDINATE THE WORK AND REVISE THE CONSTRUCTION DOCUMENTS ACCORDING TO THE ACTUAL CONDITIONS WITHOUT ANY ADDITIONAL CHARGE TO THE OWNER.
- ALL DIFFUSER SIZES AND DUCT SIZES SHOWN ARE NET DIMENSIONS UNLESS OTHERWISE INDICATED.
- PROVIDE AND INSTALL ALL NECESSARY DAMPERS TO BALANCE THE AIR DISTRIBUTION SYSTEM TO WITHIN +/- 5% OF THE AIR QUANTITIES SHOWN ON CONSTRUCTION DOCUMENTS. ALL DUCT BRANCHES TO AIR OUTLETS SHALL BE PROVIDED WITH VOLUME DAMPERS EXCEPT HEPA FILTER OUTLETS (HF-1 & HF-2).
- MOUNT ALL ROOM TEMPERATURE SENSORS AT A HEIGHT APPROVED BY APPLICABLE CODE OF REGULATIONS.
- PROVIDE AND INSTALL ALL THREAOLETS AND OTHER NECESSARY FITTINGS IN PIPING AND DUCTWORK REQUIRED FOR CONTROL AND MEASURING DEVICES.
- CONTRACTOR MAY USE AT MOST 6-FEET OF FLEXIBLE DUCT RUN TO THE AIR TERMINAL.
- PROVIDE 1/4" WIRE MESH SCREENS AT ALL INTAKE AND EXHAUST OPENINGS INSIDE. PROVIDE 1/4" STAINLESS STEEL WIRE FOR OUTDOOR INSTALLATION.
- ALL VISIBLE INTERIOR PORTIONS OF DUCTWORK AND AIR TERMINALS SHALL BE PAINTED FLAT BLACK UNLESS OTHERWISE NOTED.
- COORDINATE WITH OTHER TRADES TO INSURE THAT PROPER ACCESS PANELS OR AS INDICATED ARE PROVIDED FOR ALL CONCEALED COILS, VAV BOXES, FIRE DAMPERS, CONTROL VALVES AND VOLUME DAMPERS.
- ALL POWER AND INTERLOCK WIRING SHALL BE INSTALLED UNDER DIVISION 16. LINE VOLTAGE CONTROL WIRING AND LOW VOLTAGE (24 VOLT) CONTROL WIRING SHALL BE INSTALLED UNDER DIVISION 15, OR AS SPECIFIED.
- ALL FLOOR MOUNTED EQUIPMENT SHALL BE INSTALLED ON 4" CONCRETE PADS UNLESS OTHERWISE INDICATED. PAD SHALL BE 3" WIDER (IN EACH DIRECTION) THAN EQUIPMENT FOOT PRINT.
- IMMEDIATELY REPORT TO THE OWNER'S REPRESENTATIVE ANY OBSERVATIONS OF EXISTING CONDITIONS WHICH ARE DISCOVERED IN THE BUILDING AND WHICH MAY PREVENT THE CORRECT INSTALLATION OF THE HVAC SYSTEM.
- ALL NOTED DUCT DIMENSIONS ARE CLEAR INSIDE DIMENSIONS UNLESS INDICATED OTHERWISE.
- RECTANGULAR DUCTWORK ELEVATIONS ARE BOTTOM OF DUCT, ROUND DUCTWORK ELEVATIONS ARE CENTERLINE UNLESS NOTED OTHERWISE.
- DIFFERENTIAL AIR PRESSURES INDICATED ON DRAWINGS ARE IN INCHES OF WATER.
- AIR FLOWS SHOWN IN CUBIC FEET PER MINUTE (CFM) ARE ACTUAL FLOWS (ACFM) AT THE SITE ELEVATION ABOVE SEA LEVEL.
- THE CONTROL SYSTEM DIAGRAMS SHOWN ON THE DRAWINGS ARE SCHEMATIC REPRESENTATIONS ONLY. ALL ADDITIONAL CONTROL ITEMS NECESSARY TO SATISFY THE FUNCTIONAL REQUIREMENTS OF THE SEQUENCE OF OPERATION AND SPECIFICATIONS SHALL BE PROVIDED AS PART OF THIS WORK. THE SYSTEM SHALL BE COMPLETE IN ALL RESPECTS. COMMISSIONED INTO OPERATION AND CALIBRATED UNDER OPERATING CONDITIONS.
- THE DRAWINGS INDICATE THE OVERALL ARRANGEMENT OF THE BUILT-UP AIR HANDLING UNITS. THE CONTRACTOR SHALL SUBMIT THE SHOP DRAWING FOR APPROVAL. THE SHOP DRAWINGS SHALL INDICATE THE CONSTRUCTION DETAILS OF AIR FILTERS, COOLING COILS, HEATING COILS, HUMIDIFIERS, FANS AND DAMPERS. CONTRACTOR WILL REVIEW THE DRAWING PRIOR TO BIDDING AND ASSUME ALL THE NECESSARY ADJUSTMENTS AT NO ADDITIONAL COST TO THE OWNER.
- ALL MATERIALS USED FOR FRAMING, EQUIPMENT SUPPORT AND BLANK OFF SHALL BE GALVANIZED STEEL. ALL CUT EDGES SHALL BE TREATED AND REGALVANIZED. ALL INSTALLATIONS INSIDE THE AIR HANDLING UNITS SHALL BE SEALED AND AIR TIGHT. ALL BLANK OFF SHEET METAL SHALL BE 14 GAUGE MINIMUM. ALL WELDED SURFACES SHALL BE SANDED, CLEANED AND REGALVANIZED.
- FOR FIRE DAMPER, FLEXIBLE CONNECTION, RETURN REGISTER AND PIPING DETAILS SEE SHEET WA-H-411. FOR PIPE SUPPORT DETAILS SEE SHEET WA-H-412.

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| REFERENCES | REVISIONS | NO. | DATE | BY | CHKD | ENGR | PROJ | DESCRIPTION |
|------------|-----------|-----|---------|----|------|------|------|---------------------|
| | | 1 | 5-15-98 | CP | AA | AA | PP | ISSUED FOR AS-BUILT |

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|-------------------------|-----|---------|
| ISSUED FOR CONSTRUCTION | | |
| DRAWN | CLP | 6-24-98 |
| CHECKED | ME | 7/2/98 |
| ENGINEER | AA | 7/3/98 |
| PROJ | MDW | 7/8/98 |

AS-BUILT DRAWINGS

100 WEST WALNUT STREET
PASADENA, CALIFORNIA

CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

LIGO-D960344-01-0

LASER INTERFEROMETER
GRAVITATIONAL-WAVE OBSERVATORY
SITE NO. 1 - HANFORD, WASHINGTON

| | | | |
|-----------------------------|-----------|-----------------|----------------|
| TITLE | SCALE | CONTRACT NUMBER | PROJECT NUMBER |
| HVAC LEGEND & GENERAL NOTES | NONE | PP150969 | 8094 |
| SHEET NUMBER | REVISIONS | | |
| WA-H-002 | ▲ | | |