## Capital Projects Construction Standards
### Volume 3 of 3 – 4th Edition

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KO  KNOCKOUT  MISCELLANEOUS
KP  KEY PAD  MECHANICAL JOINT
KPS PER SQUARE INCH  ML  MOTORIZED LOUVER
KSF  KIPS PER SQUARE FOOT  MLO  MAIN LUGS ONLY
KIL Vol  MO  MASONRY OPENING, MOTOR OPERATOR
KVA  KILOVOLT  MOA  MACHINED ALL
KILOVOLT AMPERES  MOC  MECHANISM OPERATED CONTACT
KVAR  KILOVAR, KILOVOLT AMPERES REACTIVE  MOV  METAL OXIDE VARISTOR
KW  KILOWATT  MPC  MANUFACTURER PROVIDED CABLE
KWH  KILOWATT-HOUR  MPR  MOTOR PROTECTIVE RELAY
L  LENGTH, LINE, LOUVER, LOCAL, LOW SPEED INDUCER,  MPT  MALE PIPE THREAD, MAIN POWER TRANSFORMER
LIGHTING CONTACTOR, LOW SPEED, ARC LENGTH  MPN  MIN-O-Power Zone
LA  LIGHTNING ARRESTERS  MS  WILD STEEL MOTOR STARTER
LAB  LABORATORY  MSS  MANUFACTURERS STANDARDIZATION SOCIETY OF THE
LAN  LEVEL ALARM HIGH  N  MANUFACTURER SUPPLIED CABLE
LANL  LOCAL AREA NETWORK  MSK  MANKIN
LAT  LEAVING AIR TEMPERATURE, LATITUDE  N/A  NOT APPlicable
LAV  LAVATORY  NAO  NOT AVAILABLE
LB  POUND  NAOCl  SODIUM CHLORIDE
LBS  POUNDS  NAOH  SODIUM HYDROXIDE
LC  LIGHTING CONTACTOR  NAC  NOTIFICATION ALARM CIRCUIT
LCC  LIGHTING CONTROL CABINET  NAH  TORQUE ALARM HIGH
LCR  LOCAL CONTROL PANEL  NAHH  TORQUE ALARM HIGH-HIGH
LCS  LOCAL CONTROL STATION  NC  NORMALLY CLOSED
LED  LIGHT EMITTING DIODE  NCCT  NORMALLY CLOSED TIME CLOSED
LF  LINEAR FEET, LINEAR FOOT  NCTO  NORMALLY CLOSED TIME OPEN
LINEAR LOW DENSITY POLYETHYLENE  NCTO  NORMALLY CLOSED TIME CLOSED
LINEAR LOW DENSITY POLYETHYLENE  NCE  NATIONAL ELECTRICAL CODE
LNE  LIQUID DRAUGHTABLE  NEMA  NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
LNEH  LIQUID TIGHT FLEXIBLE METAL CONDUIT  NE  NEUTRAL
LP  LEFT HAND  LLP  NEAR FACE
LT  LEVEL TRANSMITTER (INDICATING)  NFDS  NONE FUSED DISCONNECT SWITCH
LTV  LONG LEG VERTICAL  NFPA  NATIONAL FIRE PROTECTION ASSOCIATION
LLDPE  LINEAR LOW DENSITY POLYETHYLENE  NFPS  NATIONAL FOREST SERVICE
LUMEN  NG  NATURAL GAS
LM  LINE  NH3  AMMONIA
LMTL  LIMIT  NOT IN CONTRACT
LO  LOW  NO  NUMBER, NORMALLY OPEN
LOA  LOAD-OUT ACCEPTED  NOS  NUMBERS
LOCALITY, LOAD-OUT COMPLETE  NOM  NOMINAL
LOAD-OUT INITIATED  NORT  NORMALLY OPEN TIME OPEN
LONGITUDE, LONGITUDINAL  NP  NAME PLATE
LOP  LOSS OF POWER  NPT  NATIONAL PIPE THREAD
LOR  LOCAL-OFF-REMOTE  NSF  NATIONAL SANITATION FOUNDATION
LORP  LOAD-OUT SET-POINT  NTS  NOT TO SCALE
LOX  LIQUID OXYGEN  NGS  NORMAL WATER SURFACE
LP  LIGHT PANELBOARD, LEGEND PLATE,  O  OVER
LOW PRESSURE, LIGHT PANEL  O2  OXYGEN
LPG  LIQUEFIED PETROLEUM GAS  OA  OVERALL OUTSIDE AIR
LPS  LIGHTING PROTECTION SYSTEM  OBD  OPPOSED BLADE DAMPER
LPT  LOW POINT  OC  ON CENTER, OPEN-CLOSE, OVERCURRENT
LR  LONG RADIUS, LATCHING RELAY, LOCAL-REMOTE  OD  OUTSIDE DIAMETER, OVERFLOW DRAIN
LRB  LOCKED ROTOR AMPERES  OEE  OPPOSITE DRIVE END
LS  LIMIT SWITCH, LEVEL SWITCH, LIME SLURRY  OF  OUTSIDE FACE
LSC  LIMIT SWITCH CLOSE  OH  OVERHEAD
LSDG  LONG TIME, SHORT TIME, INSTANTANEOUS, GROUND  OHP  OVERHEAD POWER
FAULT TRIP FUNCTION  OHLW  OVERHEAD WIRE
LSO  LIMIT SWITCH OPEN  OHPW  OVERHEAD WIRE
LT  LEFT, LEFT, LEVEL TRANSMITTER  OIL  OIL OVERFLOW
LTG  LIGHTING  OMAO  OFF-MANUAL-AUTO-DCTS
LV  LINEAR VARIABLE DIFFERENTIAL TRANSFORMER  OOG  ON-OFF (MAINTAINED CONTROL)
LVT  LOUVER  OGA  ON-OFF-AUTO
LVDT  LEAVING WATER TEMPERATURE  OCR  ON-OFF-AUTO-REMOTE
M  MAGNETIC CONTACTOR, MOTOR, STARTER, MANUFACTURED  OCRC  ON-OFF-AUTO-DCTS
MANUAL, MECHANICAL EQUIPMENT  OCRD  ON-OFF-AUTO-REMOTE
MA  MILLIAMPERE  OCCR  ON-OFF-COMPUTER
MATL  MATERIAL MATERIALS  OCRF  ON-OFF-DUCT
MAU  MAKE-UP AIR UNIT  OCRG  ON-OFF-REMOTE
MAX  MAXIMUM  OCHG  OPENING
MC  METAL-CLAD CABLE, METAL-CLAD, MOTOR  OPG  OPENING
CONTROLLER  OPP  OPEN PRESSURE
MD  MOTOR CONTROL CENTER  OR  OVERCURRENT PROTECTION SYSTEM
MDM  THOUSAND circular WINDS  ORG  ORANGE
MCP  MOTOR CIRCUIT PROTECTOR, MAIN CONTROL PANEL  OS  OPEN SOLENOID
MDP  MOTORIZED DAMPER, MOTION DETECTOR  OSA  OUTSIDE AIR
MDPM  MAIN DISTRIBUTION PANEL  OSC  OPEN-STOP-CLOSE
ME  METAL-ENCLOSED  OSD  OPEN SITE DRAIN
MECH  MECHANICAL  OSHA  OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
MEEME  MACHINE EACH END  OSV  OPEN VALVE
MELM  MINIATURE EMBEDDED LIGHT MODULE  OVL  OVERLAY
MERC  MERCURY VAPOR  OVL  OVERLAY
MF  MANUFACTURED  OVF  OVERFLOW
MFU  MANUFACTURER  OVE  OUTSIDE AIR
MG  MOTOR GENERATOR  OSC  OPEN-STOP-CLOSE
MGP  MILLION CALORIES PER DAY  OSHA  OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
MH  MANHOLE, METAL HALEDE  OVS  OPEN SITE DRAIN
MIN  MINIMUM, MINUTE  OVT  OUTSIDE AIR
MIP  MALE IRON PIPE  P  POLE, PHASE, PUMP, PIPE CONNECTION (CP)
MIPF  MALE IRON PIPE THREAD  P  POLE, PHASE, PUMP, PIPE CONNECTION (CP)
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<tr>
<th>Abbreviation</th>
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<td>POSITION TRANSMITTER (INDICATING TYPE)</td>
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<td>POSITION (LIMIT) SWITCH</td>
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DETAIL & SECTION DESIGNATION

CPCS DETAIL DESIGNATION (NUMERAL)

12345

STANDARD DETAIL DESIGNATION

NON-CPCS DETAIL DESIGNATION (NUMERAL)

12345

NON-STANDARD DETAIL DESIGNATION

ELEVATION DESIGNATION

ON DRAWING WHERE ELEVATION IS SHOWN

STANDARD ELEVATION DESIGNATOR

01012
DRAWING SYMBOL
LEGEND
GENERAL PIPING NOTES:
1. LAY PIPE TO UNIFORM GRADE BETWEEN INDICATED ELEVATION POINTS.
2. SIZE OF FITTINGS SHOWN ON DRAWINGS SHALL CORRESPOND TO ADJACENT STRAIGHT RUN OF PIPE. TYPE OF JOINT AND FITTING MATERIAL SHALL BE THE SAME AS SHOWN FOR ADJACENT STRAIGHT RUN OF PIPE.
3. LOCATION AND NUMBER OF PIPE HANGERS AND PIPE SUPPORTS SHOWN ARE ONLY APPROXIMATE. FINAL SUPPORT REQUIREMENTS SHALL BE DETERMINED IN THE FIELD AND APPROVED BY THE ENGINEER PRIOR TO INSTALLATION.
4. JOINTS SHALL BE WATERTIGHT. PENETRATION TYPE DETAIL SHALL BE USED WHEREVER PIPING PASSES FROM A STRUCTURE TO BACKFILL.
5. FLEXIBLE CONNECTORS OR FLANGED COUPLING ADAPTERS SHALL BE PROVIDED WITH THRUST TIES, BLOCKS, OR ANCHORS. THRUST PROTECTION SHALL BE ADEQUATE FOR PRESSURES SPECIFIED.
6. SYMBOLS, LEGENDS, AND PIPE USE IDENTIFICATIONS SHOWN SHALL BE FOLLOWED THROUGHOUT THE PLANS, WHEREVER APPLICABLE. ALL OF THE VARIOUS PIPING APPLICATIONS ARE NOT NECESSARILY USED IN THE PROJECT.
7. BURIED PIPING SPECIFIED TO BE PRESSURE TESTED AND SHALL BE PROVIDED WITH THRUST RESTRAINT. SEE DRAWINGS AND SPECIFICATIONS FOR MORE INFORMATION.
8. NUMBER AND LOCATION OF UNIONS SHOWN ON DRAWINGS ARE APPROXIMATE. PROVIDE UNIONS NECESSARY TO FACILITATE CONVENIENT REMOVAL OF VALVES AND MECHANICAL EQUIPMENT.
9. WHERE A GROOVED END COUPLING IS SHOWN, IT SHALL BE THE RIGID JOINT TYPE. WHERE A FLANGED COUPLING ADAPTER IS SHOWN, A STANDARD FLANGE SHALL BE USED TO JOIN THE COUPLING ADAPTER.
10. SYMBOLS SHOWN ARE GENERIC. REFER TO THE CONTRACT DOCUMENTS FOR SPECIFIC END CONNECTIONS FOR PIPE AND FITTINGS.

**VALVE DESIGNATIONS**

**PIPE AND FITTING END PATTERNS**

**PIPING DESIGNATION**

**PLUMBING FIXTURE IDENTIFICATION**

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**01030 MECHANICAL NOTES AND LEGENDS**
NOTES:

1. SEE DRAWINGS FOR ADDITIONAL LEGENDS, SYMBOLS, AND ABBREVIATIONS USED.

2. DEVICES SHOWN IN LOCAL CONTROL PANEL, MOTOR CONTROL CENTER, AND ENVIRONMENTAL CONTROL PANEL SHALL BE MOUNTED IN THE ENCLOSURE INTERIOR.

3. RELAYS AND CONTACTORS SHALL BE PROVIDED AND INSTALLED WITH SURGE PROTECTION ACROSS THE COILS.

4. THE NUMBER OF AUXILIARY CONTACTS INDICATED FOR RELAYS, CONTACTORS, SWITCHES, AND DEVICES ARE THE MINIMUM ACCEPTABLE NUMBER.

5. INDICATING LIGHTS SHALL BE PUSH-TO-TEST TYPE. CONSTANT POWER SHALL BE CONNECTED TO THE PUSH-TO-TEST TERMINAL WHETHER INDICATED OR NOT.

6. PROVIDE AND INSTALL ELECTRICAL INSTRUMENTATION AND CONTROLS COMPLETE WITH DEVICES AND ASSOCIATED CIRCUITRY NECESSARY TO PERFORM THE INTENDED FUNCTIONS OF THE CONTRACT DOCUMENTS. PROVIDE AND INSTALL ANY MATERIALS, DEVICES, AND CIRCUITRY NOT SPECIFICALLY INDICATED BUT NECESSARY TO PERFORM INTENDED FUNCTIONS AND CORRECT OPERATION.

7. EQUIPMENT, DEVICE, GROUND AND RACEWAY SYSTEM LOCATIONS, DIMENSIONS, PLANS, AND ELEVATIONS INDICATED ARE APPROXIMATE. USE ACTUAL EQUIPMENT FOR INSTALLATION. COORDINATE EXACT LOCATIONS WITH THE CIVIL, STRUCTURAL, AND MECHANICAL WORK, AS WELL AS THE EQUIPMENT MANUFACTURERS, ENGINEER, AND OTHER TRADES.

8. NOT ALL INTERFERENCES AND UNDERGROUND UTILITIES ARE SHOWN ON THE DRAWINGS. LOCATE ALL INTERFERENCES AND UNDERGROUND UTILITIES TO ROUTE RACEWAYS ACCORDINGLY.

9. PACKAGE PROVIDED EQUIPMENT MAY REQUIRE ADDITIONAL DEVICES, CONDUITS, AND CONDUCTORS FOR PROPER OPERATION. PROVIDE AND INSTALL ADDITIONAL CONDUITS, CONDUCTORS, AND CABLES REQUIRED BY THE EQUIPMENT MANUFACTURERS TO COMPLETE THE INSTALLATION.

10. OVERCURRENT DEVICE SIZES INDICATED ARE ESTIMATED. PROVIDE AND INSTALL OVERCURRENT DEVICES SIZED AS REQUIRED FOR THE ACTUAL EQUIPMENT RATING. OVERCURRENT DEVICES SIZES SHALL BE APPROVED BY THE ENGINEER.

11. INSTALLATION DRAWING DETAILS AND SPECIFICATION REQUIREMENTS ARE REQUIRED WHETHER SPECIFICALLY REFERENCED BY A DETAIL NUMBER OR NOT.

12. CONDUIT TERMINATIONS SHALL BE PROVIDED AND INSTALLED WITH GROUND BUSHINGS AND SHALL BE BONDED TO THE GROUND GRID. THE BONDING CONDUCTOR SHALL BE SOLID #10 AWG, MINIMUM.

13. CONDUIT, RACEWAY, CONDUCTOR, AND CABLE SIZES ARE THE MINIMUM ACCEPTABLE SIZE, CONDUITS SHALL BE CONCEALED.

14. WHERE ONLY HOMERUNS AND CIRCUIT NUMBERS OR SCHEMATIC CONNECTION DIAGRAMS ARE SHOWN, PROVIDE AND INSTALL THE COMPLETE RACEWAY SYSTEM.

15. CONTROLS ARE SHOWN DE-ENERGIZED, CONTROL DIAGRAMS SHOW INTENDED CONTROL FUNCTION. INCORPORATE OTHER NECESSARY FUNCTIONS AND DEVICES FOR PROPER OPERATIONS AND PROTECTION OF THE SYSTEMS.

16. COMPONENTS AND PANELS SHOWN WITH A DOUBLE ASTERISK (**) WILL BE PROVIDED BY OTHERS.
<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>20A3P</td>
<td>LOW VOLTAGE CIRCUIT BREAKER - 20 AMPERE, 3 POLE (THERMAL MAGNETIC UNLESS INDICATED OTHERWISE)</td>
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<tr>
<td>225</td>
<td>FUSE - RATING INDICATED</td>
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<tr>
<td>225</td>
<td>DISCONNECT SWITCH - RATING INDICATED</td>
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<tr>
<td>OR 225</td>
<td>FUSED DISCONNECT SWITCH (3 POLE UNLESS INDICATED OTHERWISE)</td>
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<tr>
<td></td>
<td>POLE MOUNTED CUTOUT WITH FUSIBLE LINK</td>
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<td>FUSED OR NONFUSED DISCONNECT SWITCH 3 POLE FUSED UNLESS INDICATED OTHERWISE</td>
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<td>POWER CIRCUIT BREAKER</td>
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<td>52</td>
<td>DRAWOUT POWER CIRCUIT BREAKER</td>
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<td>KIRK KEY INTERLOCK</td>
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<td>DISCONNECT (ROLLOUT, ETC)</td>
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<td>TERMINAL POINT (TERMINAL BLOCK OR DEVICE TERMINAL)</td>
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<td>TERMINAL BLOCK/POINT TO INTERFACE WITH &quot;FIELD DEVICES&quot;</td>
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<td>KNIFE-CONNECT TERMINAL BLOCK</td>
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<tr>
<td>C153</td>
<td>DENOTES CABLE NUMBER FOR INTERCONNECTION WIRING</td>
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<td>POWER</td>
</tr>
<tr>
<td>C</td>
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<td>SIGNAL</td>
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<td>CONNECTED</td>
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<tr>
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<td>PANEL, TERMINAL BOX, PULL BOX, JUNCTION BOX, ETC</td>
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<td>EQUIPMENT, DEVICE, METER, PROTECTIVE RELAY, ETC</td>
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<td>5 HP</td>
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<td>LUMINAIRE, SEE SCHEDULE</td>
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<td>GROUND CABLE</td>
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<td>GROUND ROO</td>
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<td>GROUND PIGTAIL OR LOOP</td>
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<td>EXOTHERMIC WELD CONNECTION</td>
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<td>WALL SWITCH: 2 - DOUBLE POLE  P - PILOT LIGHT 3 - THREE WAY  K - KEY OPERATED 4 - FOUR WAY  D - DIMMER  WP - WEATHERPROOF</td>
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<td>MANUAL MOTOR STARTER SWITCH, WITH HEATERS</td>
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<td>CONVENIENCE RECEPTACLE - DUPLEX UNLESS SPECIFIED OTHERWISE</td>
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<td>RECEPTACLE - 240V, 1φ, AMPERAGE INDICATED</td>
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<td>JUNCTION BOX OR PULL BOX</td>
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<td>THERMOSTAT</td>
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<td>INDICATING LIGHT - LETTER INDICATES COLOR A - AMBER  R - RED  B - BLUE  W - WHITE  C - CLEAR  Y - YELLOW  G - GREEN  SL - SYNCHRONIZING LIGHT</td>
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<td>INDICATING LIGHT, PUSH-TO-TEST, LETTER INDICATES COLOR</td>
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<td>POWER POLE</td>
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<td>GUY WIRE</td>
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<td>LIGHT POLE</td>
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**LEVEL SWITCH INDICATOR**

| LSHH  | LEVEL SWITCH HIGH HIGH |
| LSH   | LEVEL SWITCH HIGH |
| LSL   | LEVEL SWITCH LOW |
| LSSL  | LEVEL SWITCH LOW LOW |
**ELECTRICAL AND CATHODIC PROTECTION LEGEND**

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<tr>
<td><img src="image1.png" alt="Symbol" /></td>
<td>ON TIME DELAY SWITCH (NORMALLY OPEN WITH TIME DELAY CLOSING AFTER COIL IS ENERGIZED) NTC</td>
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<tr>
<td><img src="image2.png" alt="Symbol" /></td>
<td>OFF TIME DELAY SWITCH (NORMALLY OPEN WITH TIME DELAY OPENING AFTER COIL IS DE-ENERGIZED) NTO</td>
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<tr>
<td><img src="image3.png" alt="Symbol" /></td>
<td>ON TIME DELAY SWITCH (NORMALLY CLOSED WITH TIME DELAY OPENING AFTER COIL IS ENERGIZED) NCT</td>
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<tr>
<td><img src="image4.png" alt="Symbol" /></td>
<td>OFF TIME DELAY SWITCH (NORMALLY CLOSED WITH TIME DELAY CLOSING AFTER COIL IS DE-ENERGIZED) NCTC</td>
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<td><img src="image5.png" alt="Symbol" /></td>
<td>FLOAT SWITCH (OPENING ON RISING LEVEL)</td>
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<td><img src="image6.png" alt="Symbol" /></td>
<td>FLOAT SWITCH (CLOSED ON RISING LEVEL)</td>
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<tr>
<td><img src="image7.png" alt="Symbol" /></td>
<td>PRESSURE SWITCH (OPENING ON RISING PRESSURE)</td>
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<td><img src="image8.png" alt="Symbol" /></td>
<td>PRESSURE SWITCH (CLOSED ON RISING PRESSURE)</td>
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<tr>
<td><img src="image9.png" alt="Symbol" /></td>
<td>VACUUM SWITCH (OPENING ON RISING PRESSURE)</td>
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<td><img src="image10.png" alt="Symbol" /></td>
<td>VACUUM SWITCH (CLOSED ON RISING PRESSURE)</td>
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<td><img src="image11.png" alt="Symbol" /></td>
<td>TEMPERATURE SWITCH (OPENING ON RISING TEMPERATURE)</td>
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<td>TEMPERATURE SWITCH (CLOSED ON RISING TEMPERATURE)</td>
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<td><img src="image13.png" alt="Symbol" /></td>
<td>FLOW ACTUATED SWITCH (OPENING ON INCREASE OF FLOW)</td>
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<tr>
<td><img src="image14.png" alt="Symbol" /></td>
<td>FLOW ACTUATED SWITCH (CLOSING ON INCREASE OF FLOW)</td>
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<td><img src="image15.png" alt="Symbol" /></td>
<td>TORQUE SWITCH (NORMALLY OPEN)</td>
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<td><img src="image16.png" alt="Symbol" /></td>
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<td><img src="image17.png" alt="Symbol" /></td>
<td>LIMIT SWITCH (NORMALLY OPEN)</td>
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<td><img src="image18.png" alt="Symbol" /></td>
<td>LIMIT SWITCH (NORMALLY CLOSED)</td>
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<tr>
<td><img src="image19.png" alt="Symbol" /></td>
<td>PUSH-BUTTON SWITCH, MOMENTARY CONTACT, NORMALLY OPEN</td>
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<td><img src="image20.png" alt="Symbol" /></td>
<td>PUSH-BUTTON SWITCH, MOMENTARY CONTACT, NORMALLY CLOSED</td>
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<td><img src="image21.png" alt="Symbol" /></td>
<td>EMERGENCY STOP PULL CORD</td>
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<tr>
<td><img src="image22.png" alt="Symbol" /></td>
<td>PUSH BUTTON, MAINTAINED CONTACT, MUSHROOM HEAD, NORMALLY CLOSED</td>
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<tr>
<td><img src="image23.png" alt="Symbol" /></td>
<td>PUSH BUTTON, MAINTAINED CONTACT, MUSHROOM HEAD, NORMALLY OPEN</td>
</tr>
<tr>
<td><img src="image24.png" alt="Symbol" /></td>
<td>3 POSITION SELECTOR SWITCH SPRING RETURN TO CENTER</td>
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<tr>
<td><img src="image25.png" alt="Symbol" /></td>
<td>REMOTE OR FIELD DEVICE</td>
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<tr>
<td><img src="image26.png" alt="Symbol" /></td>
<td>SELECTOR SWITCH – MAINTAINED CONTACT – CHART IDENTIFIES OPERATION:</td>
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</table>

<table>
<thead>
<tr>
<th>POSITION</th>
<th>CIRCUIT</th>
<th>HAND</th>
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<th>AUTO</th>
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<tr>
<td>1</td>
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<tr>
<td>2</td>
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</tbody>
</table>

X = CLOSED CONTACT
0 = OPEN CONTACT

---

**Drawn By:** MCMILLEN
**Checked By:** K ROSS/KLR
**Appr By:**
**Origination Date:** JULY 2021

---

**01051**

**DENVER WATER**
1500 West 12th Ave
Denver, Colorado 80204-3412
Tel: 303.928.6000
Fax: 303.928.6199
denverwater.org
<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>✖️</td>
<td>PRESSURE SENSING LOOP</td>
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<tr>
<td>📣</td>
<td>TURBINE</td>
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<tr>
<td>🌍</td>
<td>GENERATOR</td>
</tr>
<tr>
<td>🟢</td>
<td>TEST BLOCK OR SHORTING TEST BLOCK</td>
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<tr>
<td>🟧</td>
<td>KEYPAD</td>
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<td>SECURITY DOOR INTER LOCK (DETECTION)</td>
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<td>🧙‍♂️</td>
<td>PHOTOELECTRIC SMOKE DETECTOR</td>
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<td>🧐</td>
<td>HEAT DETECTOR</td>
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<td>🏨</td>
<td>ION DUCT DETECTOR</td>
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<tr>
<td>🏨</td>
<td>PHOTO DUCT DETECTOR</td>
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<td>🏨</td>
<td>MANUAL PULL STATION</td>
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<td>HORN/STROBE (WALL MOUNT)</td>
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<td>HORN/STROBE (CEILING MOUNT)</td>
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<td>RESISTOR</td>
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<td>LIGHT EMITTING DIODE</td>
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<td>METAL OXIDE VARISTOR</td>
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<td>BATTERY</td>
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<td>⚠️</td>
<td>HORN</td>
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<td>INDICATES EQUIPMENT LOCATED ON THE ROOF</td>
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<td>MECHANICAL EQUIPMENT TAG, REFER TO SCHEDULE</td>
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<td>CONDUIT INDICATOR IDENTIFICATION NUMBER</td>
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<tr>
<td>🕒</td>
<td>[PXXX] CONDUIT WITH CONDUCTORS</td>
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<td>[PXXX] EXISTING CONDUIT WITH NEW CONDUCTORS INSTALLED</td>
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<td>R</td>
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<td>COUPON</td>
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<td>CATHODIC PROTECTION</td>
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</table>

**01052**

**ELECTRICAL AND CATHODIC PROTECTION LEGEND**
INTERFACE SYMBOLS

- I-S: PROCESS INTERFACE
- X-D: SIGNAL INTERFACE
- INTERFACES TO OR FROM AN EXISTING OR EXTERNAL ITEM TO THIS PROJECT
  - D: DESTINATION DRAWING NUMBER
  - S: SOURCE DRAWING NUMBER
  - W: INTERFACE LETTER
  - X: INTERFACE NO OR RANGE GIVEN BY X-Y

LINE LEGEND

- MAIN PROCESS
- SECONDARY PROCESS
- BYPASS PROCESS
- DISCRETE SIGNAL (ON/OFF)
- MODULATED SIGNAL (4-20 MILLIAMPS DIRECT CURRENT)
- PNEUMATIC SIGNAL
- FILLED SYSTEM SIGNAL
- HYDRAULIC SYSTEM SIGNAL
- BUILDING, FACILITY OR SYSTEM BOUNDARY
- CONNECTING LINES
- NON-CONNECTING LINES

PARALLEL SIGNAL LINES (PARENTHEtical numbers indicate number of signals)

SIGNAL LINE CONTINUATION POINT WITHIN A DRAWING
ACTUATOR SYMBOLS

XX DENOTES:
F0 = FAIL OPEN
FC = FAIL CLOSED
FLP = FAIL TO LAST POSITION

P  XX  PNEUMATIC  E  XX  ELECTRIC
H  XX  HYDRAULIC  S  XX  SOLENOID

DRAWING LOCATION INDICATOR

IF IN "E" DRAWINGS
DRAWING NUMBER
HORIZONTAL LETTER
VERTICAL NUMBER

[E2(Q3)]
[E223]

LINE NUMBER
DRAWING NUMBER
IF IN "E" DRAWINGS

WIRE NUMBERING INDICATOR

(SHEET # LINE #) - (WIRE #)

EXAMPLE: E223-1

WIRE NUMBER 1
LINE NUMBER 23
SHEET NUMBER 2
IF IN "E" DRAWINGS

1049
WIRING CONTINUATION
LINE NUMBER
DRAWING NUMBER

CR223
INDICATES DEVICE OR FUNCTION

4G2 (745) OR [745(Q3)]
REFERENCE LOCATIONS INDICATORS

P1-TR3-7
DENOTES CABLE NUMBER FOR INTERCONNECTION WIRING
TERMINAL POINT

P = POWER
C = CONTROL/COMMUNICATIONS
A = SIGNAL

DEVICE NUMBERING CONVENTION

DEVICE DESIGNATION CONTROL RELAY
SHEET NUMBER 2
LINE NUMBER 23

223-1 14
201-3

CONTROL RELAY INDICATES DEVICE OR FUNCTION

E223 OR E223

E223 OR [E2(Q3)]

NORMAL CONTACT LOCATION

NORMAL CONTACT LOCATION

DENVER WATER
1600 West 12th Ave
Denver, Colorado 80204-3412
T: 303.892.6500
F: 303.892.6199
denverwater.org

01062 INSTRUMENTATION AND CONTROL LEGEND

DRAWN BY: MCMILLEN
CHECKED BY: K ROSS/KLR
APPROVED: 
ORIGINATED: JULY 2021
REVISION DATE:
**P&ID/I&C IDENTIFICATION**

- First Letter(s)
- Succeeding Letters
- Type, Action or Control
- Auxiliary Processor Functions
- Train/Unit Number
- Multiple Unit Numbers
- Total Number of Multiple Units
- Total Number of Units
- Control Loop Number
- Unit Process Number
- Instrument Location Indication
- Field Mounted Instrument
- Rear-of-Panel Mounted Instrument
- Panel Mounted Instrument
- Hard-wired Control Logic
- Interlock & Permissives
- Logic Control Integral to the Software (Not Accessible to the Operator)
- Logic Control Integral to the Software (Function Operator Accessible)
- Control or Display Function via Software (Function Not Normally Accessible to the Operator)
- Control or Display Function via Software (Function Operator Accessible)

---

**INTERNATIONAL SOCIETY OF AUTOMATION (ISA) TABLE**

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<thead>
<tr>
<th>LETTER</th>
<th>FIRST LETTER(S)</th>
<th>PROCESS OR INITIATING VARIABLE</th>
<th>MODIFIER</th>
<th>READOUT OR PASSIVE FUNCTION</th>
<th>OUTPUT FUNCTION MODIFIER</th>
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<td>ORIFICE</td>
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<tr>
<td>P</td>
<td>PRESSURE (OR VACUUM)</td>
<td>POINT (TEST CONNECTION)</td>
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<tr>
<td>Q</td>
<td>QUANTITY OR EVENT (*)</td>
<td>INTEGRATE</td>
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<td>R</td>
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<td>S</td>
<td>SPEED OR FREQUENCY</td>
<td>SAFETY</td>
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<td>SWITCH</td>
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<td>T</td>
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<td>TRANSMIT</td>
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<tr>
<td>U</td>
<td>MULTIVARIABLE (*)</td>
<td>MULTIFUNCTION (*)</td>
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<td>V</td>
<td>VISCOSITY</td>
<td>VALVE</td>
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<td>WEIGHT OR FORCE</td>
<td>WELL</td>
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<td>X</td>
<td>UNCLASSIFIED (*)</td>
<td>UNCLASSIFIED (*)</td>
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<td>Y</td>
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<td>RELAY OR COMPUTE (*)</td>
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<td>DRIVE, ACTUATE, OR UNCLASSIFIED FINAL CONTROL ELEMENT</td>
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(*) When used, explanation may be shown adjacent to instrument symbol. See abbreviations and letter symbols.
<table>
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<th>FUNCTION</th>
<th>DEVICE NUMBER</th>
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<td>52</td>
<td>ALTERNATING CURRENT CIRCUIT BREAKER</td>
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<tr>
<td>2</td>
<td>TIME-DELAY STARTING OR CLOSING RELAY</td>
<td>53</td>
<td>EXCITER OR DIRECT CURRENT GENERATOR RELAY</td>
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<td>CHECKING OR INTERLOCKING RELAY</td>
<td>54</td>
<td>TURNING GEAR ENGAGING DEVICE</td>
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<td>55</td>
<td>POWER FACTOR RELAY</td>
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<td>STOPPING DEVICE</td>
<td>56</td>
<td>FIELD APPLICATION RELAY</td>
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<td>SHORT-CIRCUITING OR GROUNDING DEVICE</td>
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<td>RATE-OF-RISE RELAY</td>
<td>58</td>
<td>RECTIFICATION FAILURE RELAY</td>
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<td>59</td>
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<td>REVERSING DEVICE</td>
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<td>UNIT SEQUENCE SWITCH</td>
<td>61</td>
<td>DENSITY SWITCH OR SENSOR</td>
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<td>TIME-DELAY STOPPING OR OPENING RELAY</td>
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<td>OVERSPEED DEVICE</td>
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<td>GROUND PROTECTIVE RELAY</td>
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<td>GOVERNOR</td>
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<td>SPEED OR FREQUENCY MATCHING DEVICE</td>
<td>66</td>
<td>NOTCHING OR JOGGING DEVICE</td>
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<td>16</td>
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<td>ALTERNATING CURRENT DIRECTIONAL OVERCURRENT RELAY</td>
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<td>17</td>
<td>SHUNTING OR DISCHARGE SWITCH</td>
<td>68</td>
<td>BLOCKING RELAY</td>
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<td>18</td>
<td>ACCELERATING OR DECELERATING DEVICE</td>
<td>69</td>
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<td>19</td>
<td>STARTING-TO-RUNNING TRANSITION CONTACTOR</td>
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<td>RHEOSTAT</td>
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<td>ELECTRICALLY OPERATED VALVE</td>
<td>71</td>
<td>LEVEL SWITCH</td>
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<td>DISTANCE RELAY</td>
<td>72</td>
<td>DIRECT CURRENT CIRCUIT BREAKER</td>
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<td>22</td>
<td>EQUALIZER CIRCUIT BREAKER</td>
<td>73</td>
<td>LOAD-RESISTOR CONTACOR</td>
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<td>TEMPERATURE CONTROL DEVICE</td>
<td>74</td>
<td>ALARM RELAY</td>
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<td>24</td>
<td>VOLTS PER HERTZ RELAY</td>
<td>75</td>
<td>POSITION CHANGING MECHANISM</td>
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<td>25</td>
<td>SYNCHRONIZING OR SYNCHRONISM CHECK DEUCE</td>
<td>76</td>
<td>DIRECT CURRENT OVERCURRENT RELAY</td>
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<td>26</td>
<td>APPARATUS THERMAL DEVICE</td>
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<td>TELEMETERING DEVICE</td>
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<td>27</td>
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<td>FLAME DETECTOR</td>
<td>79</td>
<td>OUT-OF-STEP PROTECTIVE RELAY</td>
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<td>ISOLATING CONTACOR</td>
<td>80</td>
<td>ALTERNATING CURRENT RE-CLOSING RELAY</td>
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<td>ANNUNCIATOR RELAY</td>
<td>81</td>
<td>FLOW SWITCH</td>
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<td>31</td>
<td>SEPARATE EXCITATION DEVICE</td>
<td>82</td>
<td>DIRECT CURRENT LOAD-MEASURING RE-CLOSING RELAY</td>
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<td>32</td>
<td>DIRECTIONAL POWER RELAY</td>
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<td>AUTOMATIC SELECTIVE CONTROL</td>
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<td>33</td>
<td>POSITION SWITCH</td>
<td>84</td>
<td>TRANFER RELAY</td>
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<td>MASTER SEQUENCE DEVICE</td>
<td>85</td>
<td>OPERATING MECHANISM</td>
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<tr>
<td>35</td>
<td>BRUSH-OPERATING OR SLIP-RING</td>
<td>86</td>
<td>CARRIER OR PILOT-WIRE RECEIVER RELAY</td>
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<tr>
<td>36</td>
<td>SHORT-CIRCUITING DEVICE</td>
<td>87</td>
<td>LOCKOUT RELAY</td>
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<td>37</td>
<td>POLARITY OR POLARIZING VOLTAGE DEVICE</td>
<td>88</td>
<td>DIFFERENTIAL PROTECTIVE RELAY</td>
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<td>38</td>
<td>UNDERCURRENT OR UNDERPOWER RELAY</td>
<td>89</td>
<td>AUXILIARY MOTOR OR MOTOR GENERATOR</td>
</tr>
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<td>39</td>
<td>BEARING PROTECTIVE DEVICE - THERMAL</td>
<td>90</td>
<td>LINE SWITCH</td>
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<td>40</td>
<td>MECHANICAL CONDITION MONITOR - VIBRATION</td>
<td>91</td>
<td>REGULATING DEVICE</td>
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<tr>
<td>41</td>
<td>FIELD RELAY - LOSS OF EXCITATION</td>
<td>92</td>
<td>VOLTAGE DIRECTIONAL RELAY</td>
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<td>42</td>
<td>FIELD CIRCUIT BREAKER</td>
<td>93</td>
<td>VOLTAGE AND POWER DIRECTIONAL RELAY</td>
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<td>43</td>
<td>RUNNING CIRCUIT BREAKER - GENERATOR BREAKER</td>
<td>94</td>
<td>FIELD-CHANGING CONTACOR</td>
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<td>44</td>
<td>MANUAL TRANSFER OR SELECTOR DEVICE</td>
<td>95</td>
<td>TRIPPING OR TRIP-FREE RELAY (NON-LOCKOUT)</td>
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<td>45</td>
<td>UNIT SEQUENCE STARTING RELAY</td>
<td>96</td>
<td>USED ONLY FOR SPECIFIC APPLICATIONS IN</td>
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<td>46</td>
<td>ATMOSPHERIC CONDITION MONITOR</td>
<td>97</td>
<td>INDIVIDUAL INSTALLATIONS WHERE NONE</td>
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<td>47</td>
<td>REVERSE-PHASE OR PHASE-BALANCE CURRENT RELAY (NEGATIVE SEQUENCE)</td>
<td>98</td>
<td>OF THE ASSIGNED NUMBER FUNCTIONS</td>
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<td>48</td>
<td>FIELD RELAY - LOSS OF EXCITATION</td>
<td>99</td>
<td>FROM 1 TO 94 ARE SUITABLE</td>
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<tr>
<td>49</td>
<td>INCOMPLETE SEQUENCE RELAY</td>
<td></td>
<td></td>
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<td>50</td>
<td>MACHINE OR TRANSFORMER THERMAL DEVICE</td>
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<td>51</td>
<td>INCOMPLETE SEQUENCE RELAY</td>
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</tr>
</tbody>
</table>

**DEVICE SUFFIX LETTERS**

- **A**: AUXILIARY OR AUTOMATIC
- **BK**: BRAKE
- **C**: CONTROLLER
- **D**: DRIVE END
- **DC**: DIRECT CURRENT
- **F**: FIELD GENERATOR
- **G**: GENERATOR
- **L**: LINE
- **N**: NEUTRAL
- **O**: OVER
- **ODE**: OPPOSITE DRIVE END
- **Q**: OIL
- **SC**: SYNC CHECK
- **T**: TRANSFORMER
- **U**: UNDER
- **V**: VOLTAGE
MINIMUM BEARING SURFACE AREA
(IN SQUARE FEET)

<table>
<thead>
<tr>
<th>NOMINAL PIPE Ø</th>
<th>BENDS</th>
<th>TEE OR DEAD END</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>11/4°</td>
<td>22 1/2°</td>
</tr>
<tr>
<td>4&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8&quot;</td>
<td>2.25</td>
<td>4.25</td>
</tr>
<tr>
<td>12&quot;</td>
<td>3.25</td>
<td>7.50</td>
</tr>
<tr>
<td>16&quot;</td>
<td>5.00</td>
<td>9.75</td>
</tr>
</tbody>
</table>

24" & LARGER—SEE DRAWINGS FOR DIMENSIONS TABLE

NOTE:
The minimum bearing surface areas shown in the table are based on 150 pounds per square inch internal pipe pressure plus water hammer and 3000 pounds per square foot allowable soil bearing capacity.

A. Water hammer = 110 pounds per square inch for 4 inch, 6 inch, 8 inch, 12 inch, and 16 inch.
B. Water hammer = 70 pounds per square inch for 20 inch.
TRENCH WIDTH (PIPE Ø + 1'-6")

PLAN
(SEE 03003 FOR ELEVATION & TYPICAL SECTION)

<table>
<thead>
<tr>
<th>CONCRETE WALL DIMENSIONS</th>
<th>CONCRETE WALL REINFORCEMENT</th>
<th>THICKENED STEEL PIPE AT THRUST WALL (NOTE 1)</th>
<th>STEEL ANCHOR RING</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIPE Ø (NOMINAL)</td>
<td>WIDTH A</td>
<td>DEPTH B</td>
<td>THK C</td>
</tr>
<tr>
<td>24&quot;</td>
<td>12'-0&quot;</td>
<td>6'-0&quot;</td>
<td>1'-10&quot;</td>
</tr>
<tr>
<td>30&quot;</td>
<td>18'-0&quot;</td>
<td>7'-6&quot;</td>
<td>5'-0&quot;</td>
</tr>
<tr>
<td>36&quot;</td>
<td>21'-0&quot;</td>
<td>9'-0&quot;</td>
<td>3'-9&quot;</td>
</tr>
</tbody>
</table>

NOTES:

1. THE MINIMUM WRAPPER PLATE THICKNESS (TR) SHALL BE DIMENSION (M) LESS THE BASE PIPE THICKNESS (TS). THE FILLET WELD SIZE SHALL BE EQUAL TO THE THINNEST OF THE WRAPPER PLATE (TR) OR (TS).

2. CONCRETE SHALL BE CLASS D STRUCTURAL CONCRETE IN ACCORDANCE WITH SPECIFICATION SECTION 03 30 00.

3. SEE SPECIFICATION 33 05 24.23 FOR STEEL MATERIAL AND WELDING REQUIREMENTS FOR THICKENED PIPE WALLS AND ANCHOR RINGS.

4. DESIGN THRUST PRESSURES = 150 POUNDS PER SQUARE INCH + 70 POUNDS PER SQUARE INCH WATER HAMMER = 220 POUNDS PER SQUARE INCH FOR THE LARGEST PIPE DIAMETER INFLUENCING THE VALVE ADJACENT TO THE THRUST WALL.

5. DESIGN ALLOWABLE PASSIVE BEARING PRESSURES ARE LOCATION SPECIFIC AS PROVIDED IN THE PROJECT GEOTECHNICAL AND ENVIRONMENTAL EVALUATION.

6. FIELD COORDINATE ALL EXISTING UTILITIES AND OBSTRUCTIONS PRIOR TO THRUST WALL EXCAVATION.

DRAWN BY: ALVARADO
CHECKED BY: K ROSS/KLR
APPROVED BY: JY
ORIGINATION DATE: JULY 2021

1500 West 12th Ave
Denver, Colorado 80204-3412
T: 303.958.6000
F: 303.958.6190
denewater.org
# PIPE ENCASEMENT TABLE

<table>
<thead>
<tr>
<th>PIPE Ø (IN)</th>
<th>H=10 FEET</th>
<th>H=20 FEET</th>
<th>H=30 FEET</th>
<th>H=40 FEET</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>T (IN)</td>
<td>REINF</td>
<td>T (IN)</td>
<td>REINF</td>
</tr>
<tr>
<td>20 THRU 30</td>
<td>8</td>
<td>#5@12&quot;</td>
<td>10</td>
<td>#5@12&quot;</td>
</tr>
<tr>
<td>36 THRU 42</td>
<td>10</td>
<td>#5@12&quot;</td>
<td>10</td>
<td>#6@12&quot;</td>
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<tr>
<td>48 THRU 54</td>
<td>10</td>
<td>#5@12&quot;</td>
<td>10</td>
<td>#7@12&quot;</td>
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<tr>
<td>60 THRU 78</td>
<td>12</td>
<td>#5@12&quot;</td>
<td>12</td>
<td>#6@6&quot;</td>
</tr>
</tbody>
</table>

Heavy dark line indicates break between one layer of reinforcement and two. See Note 2.

## NOTES:

1. Detail applies to pipe diameter of 20 inch and larger.
2. For T=8 inch, reinforcement shall be one layer and centered in slabs or walls.
3. "H" is fill height or water depth or combination above crown of pipe.
4. When pipe encasement is closer than 4 inches to slab above, tie slab & encasement together by providing roughened contact surface of 1/4 inch amplitude.
5. Hyrophilic waterstop shall be continuous all around at all construction joints.
6. Longitudinal construction joints are optional. Extend longitudinal reinforcement class "B" lap splice length beyond face of joint.
7. For metallic pipe, verify pipe and wall reinforcement bars are not electrically continuous prior to concrete placement.

03004
PIPE ENCASEMENT
WATER MAIN AND TAP SIZE COMBINATIONS WHICH REQUIRE A CONC KB BEHIND THE MAIN AT THE TAPPING SLV, SADDLE, OR TEE

<table>
<thead>
<tr>
<th>TAP SIZE (IN)</th>
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<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
<th>18</th>
<th>20</th>
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</tbody>
</table>

**LEGEND:**

- CONCRETE KICKBLOCK REQUIRED

**NOTE:**

KICKBLOCK REQUIREMENTS FOR WATER MAIN AND TAP SIZE COMBINATIONS OTHER THAN THOSE SHOWN WILL REQUIRE SPECIAL DESIGN APPROVAL BY DENVER WATER.
FLAT STL BAR RESTRAINT
1/4"x4" ID < 36"
3/8"x6" 36" ≤ ID ≤ 60"
1/2"x8" ID > 60"

PIPE #
8" - ID < 60"
10" - ID ≥ 60"
1 1/2" CLR

3/4" CHFR (TYP)

#5@12" MAX VERT SPA

#4 BARS

3/4" THK 60 DUROMETER
NEOPRENE PAD
(ASSTM D 2000; 1BC010)

#5@12" MAX EXT TO 1 1/2" CLR
FROM TOP OF CONC

NOTE 3
CONC SLAB

SAME CLR AS BOT. CONCRETE COLUMNS

4" < 36" ID
6" ≥ 36" ID

NOTES:

1. B = 8 INCHES WHEN ID < 24 INCHES
B = 10 INCHES WHEN 24 INCHES ≤ ID ≤ 42 INCHES
B = 12 INCHES WHEN ID > 42 INCHES
PLACE REINFORCEMENT EACH FACE WHEN B = 12 INCHES

2. TURN HORIZONTAL BARS 90 DEGREES TO HOOK AROUND VERTICALS.

3. ADHESIVE ANCHORED DOWELS MAY BE USED IN EXISTING SLABS.
NOTES:

1. STEEL FLAT BAR AND STEEL ANGLE SHALL BE ASTM A 36.

2. COAT FLAT BAR AND ANGLE WITH LIQUID EPOXY, 16 MILS DRY FILM THICKNESS IN ACCORDANCE WITH AWWA C210. COLOR AND SHEEN TO MATCH PIPE COATING.

<table>
<thead>
<tr>
<th>PIPE ID</th>
<th>ANCHOR BOLT ø, d</th>
<th>ANGLE SIZE, ( \angle )</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID \leq 36&quot;</td>
<td>3/4&quot;</td>
<td>4&quot; x 4&quot; x 1/2&quot; x 0°-5&quot;</td>
</tr>
<tr>
<td>36&quot; &lt; ID \leq 60&quot;</td>
<td>1&quot;</td>
<td>4&quot; x 4&quot; x 3/4&quot; x 0°-8&quot;</td>
</tr>
<tr>
<td>ID &gt; 60&quot;</td>
<td>1 1/4&quot;</td>
<td>6&quot; x 6&quot; x 1&quot; x 0°-8&quot;</td>
</tr>
</tbody>
</table>

03010
FLAT BAR RESTRAINT CONNECTION

DRAWN BY: McMillen
CHKO BY: K Ross/KUR
APPOD BY:
NOTE:

3d WHERE EQUIPMENT MANUFACTURER VERIFIES NO BOLT PULLOUT RESISTANCE IS REQUIRED.
18-8 SST THD ROD
NUT TORQUED TO MFR SPEC
WASHER
STL BASE PL

NON-SHRINK GROUT

PROTECTIVE WRAPPER
MFR RECOMMENDED BOLT SLV
NON-BINDING FILL
1 1/2"
MFR RECOMMENDED

CONC FDTN
EPOXY GROUT

IN ACCORDANCE W/ MFR

JACK BOLT
NUT
1/4"

STL BASE PL
PROTECTIVE SLV
STL PL
EQUIP PAD

NOTE:
REMOVE JACK BOLT AFTER NON-SHRINK GROUT SETS.

EQUIPMENT ANCHOR BOLT
JACK BOLT

03012 EQUIPMENT MOUNT INSTALLATION
NOTES:

1. AFTER CONCRETE EQUIPMENT PAD HAS BEEN BUILT TO SIZE, FINISH ROUGH, OR ROUGHEN UP EXISTING CONCRETE SURFACE WITH SMALL, HAND-HELD PNEUMATIC CHIPPER TO PROVIDE BONDING SURFACE FOR NON-SHRINK GROUT. THOROUGHLY CLEAN BEFORE GROUT APPLICATION.

2. CORE DRILL OR BLOCK OUT CONCRETE IN PROPER LOCATIONS FOR ANCHOR BOLTS IN ACCORDANCE WITH MANUFACTURER INSTRUCTIONS. SET ANCHOR BOLTS IN NON-SHRINK GROUT AS SHOWN ON THE DRAWINGS. PROVIDE RIGID BOLT SLEEVE WITH 1/4 INCH ANNUAL CLEARANCE AROUND BOLT TO PREVENT LEVELING GROUT FROM STICKING TO BOLT AND TO ALLOW FOR PROPER STRETCH OF BOLT DURING TIGHTENING.

3. MOUNT AND LEVEL EQUIPMENT BASE WITH JACKING BOLTS.
   A. ENSURE THAT PUMP SUCTION AND DISCHARGE LINE UP VERTICALLY AND ANGULARLY WITH PIPING. DOWELS OR BOLTS MAY BE USED FOR INITIAL ALIGNMENT, BUT MUST BE IMMEDIATELY REMOVED AFTER ALIGNMENT TO ALLEVIATE STRESS.
   B. LEVEL EQUIPMENT BASE WITH A STARRETT 98 MACHINIST'S LEVEL UNTIL A LEVEL OF 0.0005 INCH/FEET IS OBTAINED ON MACHINE SURFACES IN TWO DIRECTIONS 90 DEGREES APART.
   C. ANCHOR BOLTS CAN BE TEMPORARILY SNUGGED DOWN TO HOLD BASE IN POSITION FOR NON-SHRINK GROUT PLACEMENT.
   D. PROVIDE DUXSEAL OR CAULKING COMPOUND AND DUCT TAPE AROUND JACKING BOLTS SO THAT REMOVAL CAN BE ATTAINED AFTER NON-SHRINK GROUT SETS.

4. INSTALL REBAR AND BUILD FORMS FOR GROUT PLACEMENT. NON-SHRINK GROUT PLACEMENT SHALL BE A SINGLE CONTINUOUS PLACEMENT. PROVIDE GROUT APPLICATION AND VENT HOLES. ENSURE THAT GROUT WILL FLOW CONTINUOUSLY THROUGH ALL AREAS BY PROVIDING 2 INCH MINIMUM FLOW HOLES THROUGH ANY OBSTRUCTING FRAMEWORK.

5. FILL AREA BETWEEN STEEL BASE AND CONCRETE EQUIPMENT PAD WITH NON-SHRINK GROUT TO JUST BELOW THE LEVEL OF THE HOLD-DOWN BOLTS ON BOTH THE PUMP AND THE MOTOR.

6. TORQUE DOWN ANCHOR BOLTS AND HOLD-DOWN BOLTS TO MANUFACTURER SPECIFICATIONS.

7. PERFORM FINAL LASER ALIGNING TO FACTORY SPECIFICATIONS.
NOTE:
ACCESS HATCH SHALL BE PRE-DRILLED FOR CONCRETE ANCHOR INSTALLATION.
NOTE:
FLOOR STAND IS REPRESENTATIVE ONLY.
END OVERLAP

PIPE PENETRATION

TYPICAL SECTION

NOTE:
APPLY BEAD OF ADHESIVE TO ENSURE SMOOTH SURFACE. ATTACH HYDROPHILIC WATERSTOP USING CONCRETE NAIL AND WASHER AT INTERVALS OF 10 INCHES TO 12 INCHES.

03030
HYDROPHILIC WATERSTOP
NOTES:
1. FIELD WELDS SHALL BE MADE IN ACCORDANCE WITH WATERSTOP MANUFACTURER RECOMMENDATIONS.
2. THE INDICATED 3-D WATERSTOP JOINTS SHALL BE PRE-FABRICATED BY WATERSTOP MANUFACTURER.
3. WATERSTOPS SHALL BE MADE CONTINUOUS BY SPLICING AND CONNECTING TO OTHER WATERSTOPS AS SHOWN ON THE DRAWINGS.
4. SEE JOINT NOTES AND SPECIFICATIONS FOR REQUIRED LOCATIONS.
5. NON-ROUND CENTER BULBS SHALL HAVE A MINIMUM OUTSIDE DIMENSION OF 7/8 INCH.
6. BULB TYPE WATERSTOP SHOWN IS REQUIRED FOR EXPANSION AND CONTROL JOINTS. SIMILAR WATERSTOPS WITHOUT CENTER BULB MAY BE SUBSTITUTED AT CONSTRUCTION JOINTS.
7. USE 6-INCH WATERSTOPS IN ALL CONSTRUCTION JOINTS UNLESS SPECIFICALLY SHOWN OTHERWISE.
NOTES:

FORM 1/2 INCH WIDE BY 1 1/2 INCH DEEP SLOT WITH PREFORMED JOINT FILLER SECURED TO FACE OF EXISTING CONCRETE SLAB. REMOVE FILLER TO INSTALL BACKER ROD AND SEALANT.

EXIST SLAB

PRE-FORMED JT
SEE NOTE

BACKER ROD

3/8" THK SEALANT

1/2" THK SEALANT

#4@12" x 2'-4" ADH AHR INTO WALL W/ 4" CONC EMBED

CONC SLAB

03032

SEALANT AT JOINT
NOTES:

1. WHERE SHOWN ON PLANS, ALTERNATE ADDITIONAL HORIZONTAL WALL CORNER AND INTERSECTION REINFORCEMENT WITH THE TYPICAL HORIZONTAL REINFORCEMENT SHOWN IN THIS DETAIL.

2. CORNER BARS SHALL MATCH SIZE OF TYPICAL HORIZONTAL REINFORCEMENT SHOWN IN SECTIONS.

3. EXCEPT WHERE OTHERWISE SHOWN ON THE DRAWINGS, THE LENGTH INDICATED AS "NOTE 3" SHALL BE THE LESSEVER OF "L"/4, 10 FEET, OR 1.0 TIMES THE HEIGHT OF THE WALL, EXCEPT THAT IN NO CASE SHALL IT BE LESS THAN 2 FEET.

4. TYPICAL HORIZONTAL REINFORCEMENT SHALL BE LAPED WHERE SHOWN OR AS INDICATED IN THE GENERAL STRUCTURAL NOTES.

5. WHERE LAPPED BARS ARE DIFFERENT SIZE, USE THE LAP LENGTH REQUIRED FOR THE SMALLER OF THE TWO REINFORCEMENT BARS BEING SPliced.
LEGEND:

- REMOVE UNSOUND CONCRETE.

NOTES:

1. PRIOR TO WORK, PROVIDE SHORING AS REQUIRED.

2. REMOVE CONCRETE TO PROVIDE 3/4 INCH MINIMUM CLEARANCE BEHIND EXPOSED AND CORRODED REINFORCING STEEL.

3. REMOVE ALL OXIDATION AND SCALE FROM THE EXPOSED REINFORCING STEEL.

4. SAWCUT THE PERIMETER OF THE AREA TO BE REPAIRED TO A DEPTH OF 1/2 INCH. SAWCUT PERIMETER SHALL USE 90-DEGREE CORNERS, EXCEPT PROVIDE 45 DEGREE ANGLES WHEN NECESSARY TO AVOID RE-ENTRANT CORNERS.

5. DO NOT CUT OR DAMAGE EXISTING REINFORCEMENT.

6. ASSUME REPAIR DEPTH OF 2 INCHES FOR QUANTITY PURPOSES ONLY.
REPAIR FOR REINFORCEMENT W/ MORE THAN 15% DEGRADATION OF THICKNESS

LEGEND:

- REMOVE UNSOUND AND ENOUGH SOUND CONCRETE TO PROVIDE 3/4 INCH MINIMUM CLEARANCE BEHIND REBAR AND TO PROVIDE A SQUARE REPAIR
- CONCRETE REPAIR MORTAR

SURFACE PREPARATION NOTES:

1. AFTER CONCRETE REMOVAL AND BEFORE PLACEMENT, MECHANICALLY ABRIDE THE CONCRETE SURFACE TO REMOVE ALL BOND-INHIBITING MATERIALS.

2. PRIOR TO CONCRETE PLACEMENT, WIPE WITH SOLVENT CLEANING SOLUTION AND CLEAN SURFACE WITH COMPRESSED AIR. ENSURE CONCRETE IS PROPERLY ROUGHENED AFTER REMOVING DELAMINATION. KEEP CONCRETE MOIST FOR AT LEAST 36 HOURS PRIOR TO PLACING REPAIR MORTAR TO ACHIEVE A SOUND, CLEAN, AND OPEN PORE SURFACE.

CONCRETE REPAIR NOTES:

1. PROVIDE SCRUB COAT IN ACCORDANCE WITH MANUFACTURER’S RECOMMENDATIONS.

2. FOR REPAIR DEPTHS GREATER THAN 1 INCH, REPAIR WITH FORMED FLOWABLE REPAIR CONCRETE OR POLYMER MODIFIED CONCRETE. POLYMER MODIFIED CONCRETE REQUIRES MULTIPLE LIFTS IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS. REPAIR IN ACCORDANCE WITH SPECIFICATION SECTION 03 93 00.

3. FOR REPAIR DEPTHS LESS THAN 1 INCH, REPAIR WITH HAND APPLIED POLYMER MODIFIED MORTAR IN ACCORDANCE WITH SPECIFICATION SECTION 03 93 00.

4. NOTIFY ENGINEER IF REINFORCEMENT WITH GREATER THAN 15 PERCENT DEGRADATION OF THICKNESS IS ENCOUNTERED. PROVIDE SUPPLEMENTAL REINFORCEMENT AS REQUIRED BY ENGINEER.

5. AFTER CONCRETE REPAIR IS COMPLETED, SOUND THE CONCRETE REPAIR AREA. REMOVE AND REPLACE DELAMINATED AND UNSOUND CONCRETE REPAIRS AT CONTRACTOR’S EXPENSE.
REPAIR FOR REINFORCEMENT W/ LESS THAN 15% DEGRADATION OF THICKNESS

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5. AFTER CONCRETE REPAIR IS COMPLETED, SOUND THE CONCRETE REPAIR AREA. REMOVE AND REPLACE DELAMINATED AND UNSOUND CONCRETE REPAIRS AT CONTRACTOR’S EXPENSE.
NOTE:
COORDINATE SLIDE GATE BLOCKOUT WITH SLIDE GATE MANUFACTURER REQUIREMENTS.

03044
SLIDE GATE BLOCKOUT IN WALL
NOTE:

THE SPACING OF FORM TIES ON EXPOSED PORTIONS OF WALLS SHALL BE APPROXIMATELY EQUAL HORIZONTALLY AND VERTICALLY AND SHALL BE UNIFORM IN EACH DIRECTION.
NOTE:
ALL REINFORCEMENT CONTINUOUS ACROSS JOINT.
PIECE BLOCKOUT

NOTES:

1. PIPE BLOCKOUT NOT TO BE USED WITHOUT ENGINEER'S WRITTEN APPROVAL.

2. PIPE BLOCKOUT TO BE USED WITH SPECIFIED CONCRETING SYSTEM.

3. REINFORCE WALL BLOCKOUT OPENING BEFORE BLOCKOUT FIELD CUT REINFORCING ONLY AS REQUIRED.

4. FIELD BLOCKOUT CUT REINFORCING BARS ARE ELECTRICALLY CONTINUOUS PRIOR TO CONCRETE PLACEMENT.

5. PIPE AND WALL BLOCKOUT ARE ELECTRICALLY CONTINUOUS PRIOR TO CONCRETE PLACEMENT.
NOTE:

MINIMUM HOLE DIAMETER AT EXTERIOR FACE = 1 INCH. TAPER HOLE SO THAT MINIMUM HOLE DIAMETER AT INTERIOR FACE = 1 1/4 INCHES.

CONSTRUCTION STEPS:

1. SANDBLAST OR MECHANICALLY ROUGHEN WITH ELECTRIC EQUIPMENT.
2. DRIVE IN VINYL PLUG.
3. COAT HOLE ON DRY SIDE OF PLUG AND DRYPACK WHILE BONDING AGENT IS TACKY.
4. COAT HOLE ON WATER SIDE OF PLUG AND DRYPACK WHILE BONDING AGENT IS TACKY.
5. USE CATEGORY II, NON-SHRINK GROUT AS SPECIFIED.
ELEVATION

NOTES:

1. PROVIDE MINIMUM LAP.

2. TYPICAL FOR ALL OPENINGS IN ABOVE GROUND BUILDING CONCRETE WALLS UNLESS INDICATED OTHERWISE ON PLANS.

3. DO NOT WELD REINFORCEMENT TO PIPE SLEEVES AND INSERTS.
PLAN

1/2" PFJ
SIDEWALK (TYP)
12" 12" TREAD (TYP)

#4@12" EW CTRD
CAST STAIRS AGAINST FIRM UNDISTURBED EARTH OR COMPACTED FILL AS SPEC

SECTION A

1/2" PFJ
SIDEWALK (TYP)

1' - 0"

SECTION B

THICKEN EDGE TO 8" MIN. BELOW FIN. GR.

3/4" CHFR ON CORNER (TYP)

DENVER WATER
03052
CONCRETE STAIR ON GRADE

DRAWN BY JERRY
CHG BY K ROSS/KLR
APPROVED [Signature]
ORIGINATION DATE: JULY 2021
REVISION DATE
NOTES:

1. TYPICAL FOR ALL OPENINGS IN CONCRETE WALLS OF BELOW GRADE AND HYDRAULIC STRUCTURES AND ALL STRUCTURAL CONCRETE SLABS UNLESS INDICATED OTHERWISE ON PLANS.

2. EXTEND CLASS 'B' LAP SPlice BEYOND OPENING.

3. DO NOT WELD REINFORCEMENT TO PIPE SLEEVES AND INSERTS.

4. FOR OPENINGS LARGER THAN 8 FEET, REINFORCE SAME AS FOR 8 FEET OPENINGS.

5. SPACE AT 3 BAR DIAMETERS (OR 3 INCH MINIMUM) ON CENTER. LOCATE HALF OF TOTAL AREA ON EACH SIDE OF OPENING, 2 BARS MINIMUM.

6. AT OPENINGS WITHIN 12 INCH OF AN INTERSECTING WALL OR SLAB, PROVIDE ONLY THE EXTRA REINFORCEMENT WHICH WILL FIT, AT THE BAR SPACING IN NOTE 6.
03070
CONCRETE EQUIPMENT
PAD – TYPE 'D'
NOTES:

1. WHEN ANCHORAGE OF EQUIPMENT TO PAD IS REQUIRED, USE CONCRETE ANCHORS SPECIFIED.

2. CONCRETE PADS FOR ELECTRICAL EQUIPMENT SHALL BE 3 1/2 INCHES UNLESS NOTED OTHERWISE.
NOTE:

STRAIGHT DOWEL BARS MAY BE ADHESIVE ANCHORED INTO THE SLAB WITH 8 INCH MINIMUM CONCRETE EMBEDMENT.
NOTE:

WHEN ANCHORAGE OF EQUIPMENT TO PAD IS REQUIRED, USE CONCRETE ANCHORS SPECIFIED.
NOTE:
WHEN ANCHORAGE OF EQUIPMENT TO PAD IS REQUIRED, USE CONCRETE ANCHORS SPECIFIED.
NOTES:

1. STRAIGHT DOWEL BARS MAY BE ADHESIVE ANCHORED INTO THE SLAB WITH 8 INCH MINIMUM CONCRETE EMBEDMENT.

2. ANCHORS SHALL PROJECT AT LEAST 2 BOLT DIAMETERS ABOVE THE TOP OF THE VALVE BEARING PLATE.

3. CAST-IN ANCHORS SHALL BE IN ACCORDANCE WITH 03010. SIMILAR ADHESIVE ANCHORS MAY BE USED WITH 9x ANCHOR DIAMETER MINIMUM CONCRETE EMBEDMENT (6 INCHES MINIMUM).
NOTES:

1. DO NOT USE FOR VIBRATORY EQUIPMENT OR FOR EQUIPMENT THAT WEIGHS MORE THAN 2000 POUNDS.

2. STRAIGHT DOWEL BARS MAY BE ADHESIVE ANCHORED INTO THE SLAB WITH 8 INCH MINIMUM CONCRETE EMBEDMENT.
NOTES:

1. STRAIGHT DOWEL BARS MAY BE ADHESIVE ANCHORED INTO THE SLAB WITH 8 INCH MINIMUM CONCRETE EMBEDMENT.

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ANCHOR BOLT RETROFIT

MACHINERY ANCHOR BOLT

ANCHOR BOLT BLOCKOUT

NOTE:
MATERIAL TO MATCH BOLT.
2-#5 top & #5@12" when curb ht exceeds 12" min
2 bars for curb ht < 12" loc ef when
width exceeds 9"

#5@12" ef when curb
width is larger than 9"
NOTE:
ANCHOR IN PLACE WITH STAINLESS STEEL STRAPPING AND ADHESIVE ANCHORS AS REQUIRED.
SECTION

NOTE:
VALLEY GUTTER CROSS-PAN REQUIRES FIBERMESH
REINFORCEMENT AT MINIMUM 1.5 POUNDS PER CUBIC YARD.
SECTION

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NOTE:
GUTTER CROSS SLOPE SHALL BE 1/2 INCH PER FOOT.
SECTION

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NOTE:

GUTTER CROSS SLOPE SHALL BE 1/2 INCH PER FOOT.
ELEVATION

NOTES:

1. PROVIDE 30 INCH LAP SPlice FOR VERTiCAL BARS AS REQUIRED.

2. MINIMUM 12 INCH BELOW LOCAL JURISDICTIONAL FROST DEPTH.

3. IF A BOULDER OR BEDROCK IS ENCOUNTERED, ADHESIVE ANCHOR VERTICAL REINFORCEMENT WITH 8 INCH MINIMUM EMBEDMENT INTO ROCK.

4. CLASS D CONCRETE.

5. COLUMN PLATE: SECO PART# 1 510 001 – COLUMN PLATE.
1" MIN GROUT ALL AROUND BOLT

AHR BOLT (SEE PLANS)

SPRT MEMBER

EMBED

LE' MIN

1/2" CLR

#5x4"-0" MIN UNO

NOTE:
Db=DIAmeter OF BOLT.
R SHALL MATCH SUPPORTED COMPONENT

1/4" NEOPRENE PAD
(ASME D 2000; 1BC010)

SST BAR 2 1/2"x5/8" x 0"–6"

1 1/4" SST THD ROD
(ASME A 193 GRADE B8 OR B8M)

1 1/4" SST HEX NUT
(ASME A 194 GRADE 8 OR B8M)

SST BAR 2 1/2"x1/2" x 0"–2 1/2"

1 1/2" SCH 40 SST PIPE
(ASME A 312 TYPE 304 OR 316)

SST BAR 5"x1/2" x 0"–5"

NOTE:
BAR MATERIAL SHALL BE ASME A 240
TYPE 304 OR TYPE 316 (F_y = 30 KSI MINIMUM).
NOTE:

BAR MATERIAL SHALL BE ASTM A 240 TYPE 304 OR TYPE 316 (F_y = 30 KSI MINIMUM).
PIPE Ø | SADDLE PL THK (t) | SADDLE PL WIDTH (w) | GUSSET PL HEIGHT (H) | THD ROD Ø | SPRT PIPE Ø | BASE PL DIM
--- | --- | --- | --- | --- | --- | ---
≤ 12" | 1/2" | 2 1/2" | N/A | 1 1/4" | 1 1/2" | 1/2"x5" x 5"
12" < Ø ≤ 20" | 5/8" | 4" | 4" | 2" | 3" | 5/8"x9" x 9"
20" < Ø ≤ 30" | 5/8" | 6" | 6" | 2" | 3" | 5/8"x9" x 9"

NOTE:
BAR AND PLATE MATERIAL SHALL BE ASTM A 240 TYPE 304 OR TYPE 316 (Fy = 30 KSI MINIMUM).
VALVE BOX SUPPORT PLATE PLAN

SECTION A

NOTES:

1. PLATE SHALL BE ASTM A 36.

2. PLATE SHALL BE COATED WITH LIQUID EPOXY, 16 MILS DRY FILM THICKNESS IN ACCORDANCE WITH AWWA C210. COLOR: BLACK SHEEN: FLAT.
NOTES:

1. BAR SHALL BE ASTM A 36.

2. BAR SHALL BE COATED WITH LIQUID EPOXY, 16 MILS DRY FILM THICKNESS IN ACCORDANCE WITH AWWA C210. COLOR: BLACK SHEEN: FLAT.
RANGE PLATE

CENTERING WASHER

VALVE OPERATOR EXTENSION

NOTES:

1. BAR AND PLATE SHALL BE ASTM A 36.

2. HOLLOW STRUCTURAL SECTION SHALL BE ASTM A 500 GRADE B.

3. ASSEMBLY SHALL BE COATED WITH LIQUID EPOXY, 16 MILS DRY FILM THICKNESS IN ACCORDANCE WITH AWWA C210. COLOR: BLACK SHEEN: FLAT

DENVER WATER

05012

VALVE OPERATOR EXTENSION

1500 West 12th Ave
Denver, Colorado 80204-3412
T: 303.928.6000
F: 303.928.6199
denverwater.org
6" BSP-40 - FILL SOLID W/ CONC, ROUND TOP SMOOTH.
(PAINT DW FH YELLOW, FEDERAL COLOR NO 13538)

GROUND LINE

1/2" EXP JT MATL

1/2:12

ASPHALT OR CONC SURFACE

24" CONC BASE
(CLASS B)
REMOVABLE 4" SCH 80 STL PIPE
(PAINT OW FH YELLOW,
FEDERAL COLOR NO 13538)

5/8" STL ROD (TYP)

3" SO STL PL
W/ 1/2" MOLLE
FOR LOCK
(TYP OF 2)

GROUND LINE

3/4" MAX CRUSHED ROCK-12" DEPTH

24" CONC BASE

5/8" x 1'-6" STL ROD THRU
CTR OF SLV TACK WELD TO
OUTSIDE OF SLV

5" SCH 80 STL PIPE SLV

DRAWN BY: MC MILLEN
CHECKED BY: K ROSS/KLR
APPROVED BY: D.
ORIGINATION DATE: JULY 2021
REVISION DATE:

DENVER WATER
1600 West 12th Ave
Denver, Colorado 80204-3412
T: 303.928.6000
F: 303.928.6199
denverwater.org
NOTE:
IDENTIFICATION MARKS ON POSTS SHALL BE 3-INCH DIAMETER CIRCLES BROKEN IN VERTICAL CENTER ( ) POINTING TO APPURTENANCE, WITH 1-INCH STENCILS INSIDE CIRCLE INDICATING TYPE OF APPURTENANCE (MANHOLE, 12-INCH GATE VALVE, 6-INCH BLOW OFF, AIR VALVE, ETC) AND THE DISTANCE IN FEET AND INCHES FROM THE POST.
NOTES:

1. 500 POUND MINIMUM RATED SECURITY CHAIN WITH A 1/2 INCH MINIMUM LINK DIAMETER.

2. HEAVY DUTY TYPE PADLOCK AS SPECIFIED, KEY SHALL BE DW KEY A-436.

3. PROVIDE SEPARATE HOT DIP GALVANIZED STEEL PLUG AS SHOWN.
VENT SCREEN ASSEMBLY

METAL SCREEN

BREAK AWAY COUPLING

VENT PIPE ELEVATION

NOTES:
1. VENT PIPES SHALL BE LOCATED IN THE FIELD.
2. TOUCH UP AREAS DAMAGED BY WELDING WITH SILVER COLORED ZINC RICH PAINT.
### BASE PLAN

- SST BAR 1"x3/16"
- 1'
- W1
- D1
- SCHED 40 PVC VENT PIPE
- 1/2" HOLE (TYP)
- CONC PAD
- 1' - 6"
- D3

### SECTIONAL VIEW

- SST HEMISPHERICAL DOME (14 GA ASTM A 240 TYPE 409)
- 1/2" EXP JT MATL
- 3/8" # 18-8 SST EXP AMR EO SPA (4 REQD)
- SCHED 10 SST PIPE
- D2
- VARES
- D3

### Table: VENT PIPE

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### NOTE:

COAT ASSEMBLY WITH EPOXY, 8 MILS MINIMUM. COLOR: BLACK SHEEN: FLAT.
SECTION AT GATE

SECTION

PLAN

NOTE:
HOT DIP GALVANIZE HANDRAIL AND APPURTENANCES AFTER FABRICATION.

05040
HANDRAIL ASSEMBLY
FOR ACCESS DOOR
NOTES:

1. FIELD VERIFY DIMENSIONS AND CONFIGURATIONS OF EXISTING RAILING. NEW RAILING SHALL MATCH CONFIGURATION OF EXISTING RAILING.

2. NOTIFY THE ENGINEER OF ANY DISCREPANCIES. RAILING SYSTEM SHALL MATCH EXISTING SYSTEM TO REMAIN WHERE APPLICABLE.
NOTES:
1. PROVIDE TOE BOARD AT LANDING WHERE REQUIRED.
2. RETURN ENDS OF HANDRAIL TO GUARD AT BOTH ENDS.

05042
RAILING – 2 RAIL STAIR – ALUMINUM (IBC)
NOTES:

1. DETAIL SHOWN AT CURBED OPENING. WHERE NO CURB, PROVIDE 6-INCH EDGE DISTANCE AND STIFFENED KICK PLATE ATTACHED TO REMOVABLE RAILING.

2. FABRICATE REMOVABLE RAILING IN MAXIMUM 8-FEET SECTIONS WITH TWO POSTS EACH SECTION.
NOTES:

1. FASTEN RAIL TO WALL FLANGE IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS.

2. WALL FLANGE SHALL BE MOUNTED TO WALL WITH TWO 3/8-INCH DIAMETER STAINLESS STEEL WEDGE ANCHORS.

3. FABRICATE HINGES OR PROVIDE OTHER HINGES IN ACCORDANCE WITH SPECIFICATIONS. ANODIZE FINISH AFTER ALL WELDING IN ACCORDANCE WITH SPECIFICATIONS.
NOTES:

1. ALL STEEL COMPONENTS SHALL BE HOT DIP GALVANIZED AFTER FABRICATION.

2. PROVIDE TWO 3/8-INCH GALVANIZED STEEL CHAINS BETWEEN 1/2-INCH GALVANIZED STEEL EYE BOLTS THRU-BOLTED TO POSTS. CONNECT CHAINS TO EYE BOLTS WITH 1/4-INCH BY 2 1/4-INCH GALVANIZED STEEL EYE-SNAPS AT EACH END.
HINGE PIN
2 REQD

HINGE INSTALLATION
PLACED AS SHOWN

NOTE:
HOT DIP GALVANIZE ASSEMBLY
AFTER FABRICATION.

05050
GATE HINGE ASSEMBLY
05051
GATE LOCK ASSEMBLY

NOTE:
HOT DIP GALVANIZE ASSEMBLY
AFTER FABRICATION.

DRAWN BY: MC MILLEN
CHECKED BY: K ROSS/ KLR
APPROVED BY: 
ORIGIN DATE: JULY 2021
REVISION DATE:
PLAN

NOTES:

1. HOT DIP GALVANIZE PLATE AFTER FABRICATION.

2. VERIFY HOLE LOCATIONS FOR ACCESS DOOR PRIOR TO DRILLING.
NOTE:
MOUNTING HARDWARE SHALL BE 18-8 STAINLESS STEEL.
NOTE:
COAT ALUMINUM SURFACES IN CONTACT WITH CONCRETE OR DISSIMILAR METALS AS SPECIFIED.
TEMP WOOD PLUG COVER SHALL BE SET FLUSH W/ TOP OF CONC (REMOVE AFTER CONC HAS CURED & FILL W/ SEALANT)

1 1/2" SCHED 40 ALUM GUARDRAIL

1/2"

3" STL PPE SLV

2" PVC PPE SLV

CROUT

STL PL 1/8" WELD TO PIPE SLV

2-#4x2'-0" LONG WELD TO SLV

FILL LOWER 4 1/2" OF POST W/ STyrofoAM

05058
REMOVABLE GUARDRAIL
POST SETTING
1/2" # 18-8 SST EXP ANR x 3" @ 1'-6" CTR

\( \Delta \) 3" x 1/4" ALUM. FRP OR SST, USE ONLY FOR FT TRAFFIC GRATIN

SECTION

05060
SUM GRATE SUPPORT

DRAWN BY: MC MILLEN
CHECKED BY: K. ROSS/KLR
APPROVED BY: 
ORIGNATION DATE: JULY 2021
REVISION DATE:

DENVER WATER
1600 West 12th Ave
Denver, Colorado 80204-3412
T: 303.928.6000
F: 303.928.6199
denverwater.org
NOTES:

1. GRATING SHALL BE LIGHT DUTY GRATING UNLESS OTHERWISE NOTED ON DRAWINGS.

2. GRATING SPAN IS INDICATED BY ←→ ON PLANS.

3. INDIVIDUAL GRATING SECTIONS SHALL NOT EXCEED 3 FEET IN WIDTH OR WEIGH MORE THAN 150 POUNDS, UNLESS INDICATED OTHERWISE, FOR TYPES 'A' AND 'B' GRATING.

4. SHOP DRAWINGS BASED ON FIELD DIMENSIONS SHALL BE SUBMITTED TO THE ENGINEER PRIOR TO FABRICATION.

5. MATERIAL FOR SUPPORTS OF STEEL AND ALUMINUM GRATING SHALL BE SAME AS GRATING, EXCEPT METAL SUPPORTS THAT ARE TO BE EMBEDDED IN CONCRETE SHALL BE TYPE 316 STAINLESS STEEL.

6. UNLESS NOTED OTHERWISE ON PLANS, GRATING THICKNESS SHALL BE AS TABULATED IN "GRATING THICKNESS TABLE" FOR APPLICABLE GRATING TYPE.

7. FOR SERRATED BEARING BARS, INCREASE GRATING THICKNESS SHOWN IN TABLES BY 1/4 INCH.

8. BEARING BAR THICKNESS FOR GRATING TO BE 3/16 INCH MINIMUM. SEE SPECIFICATIONS FOR SPACING OF BEARING AND CROSS BARS.

9. BAND ALL EDGES. MATCH DEPTH OF BEARING BAR.

10. TYPE OF MATERIAL USED SHALL BE AS SHOWN ON PLANS OR AS SPECIFIED. THIS STANDARD DETAIL INCLUDES TWO TYPES, ALTHOUGH BOTH MAY NOT BE INCLUDED IN PROJECT.

11. THE HORIZONTAL CLEARANCE BETWEEN THE GRATING AND GRATING SUPPORTS SHALL NOT BE LESS THAN 1/4 INCH NOR GREATER THAN 1/2 INCH AND AS SPECIFIED.

12. MINIMUM BEARING HORIZONTAL DIMENSION EQUALS 1 INCH FOR GRATING DEPTH 2 1/4 INCHES OR LESS. MINIMUM BEARING HORIZONTAL DIMENSION EQUALS 2 INCH FOR GRATING DEPTH GREATER THAN 2 1/4 INCHES.
GS-3

EQUIPMENT OPENING

NOTES:
1. USE GS-3 ONLY FOR LIGHT DUTY GRATING, TYPE 'A'.
2. INSTALL ANCHORS MAXIMUM 4 INCHES FROM EACH END.
3. WHEN ANCHOR IS WITHIN 4 INCHES OF A CONCRETE EDGE, UTILIZE MANUFACTURER LOW-TORQUE INSTALLATION PROCEDURES.
HANGER ROD
CONNECTION FOR BEAMS

HANGER ROD CONNECTION
FOR OVERHEAD CONC SLABS

HANGER ROD AND CLEVIS

NOTE:
EXPANSION ANCHORS SHALL BE DESIGNED FOR OVERHEAD USE.

05070
PIPE HANGER
1/2"x4" SST HAS (4 REOD)

EMBED SST PL 3/4"x8"x 0'-8"

WELD-ON SST LASHING RING W/ 500 LB
MIN ALLOWABLE TENSION LOAD CAPACITY
CTR ON PL (SUNCOR STAINLESS, INC
MODEL S3722-0020)

1 1/2" (TYP)

5"

8"

1/2"x4" SST HAS (4 REOD)

EMBED SST PL 3/4"x8"x 0'-8"

05071
LASHING RING
NOTE:
APPLY BITUMINOUS COATING TO ALUMINUM SURFACES IN CONTACT WITH CONCRETE.
NOTES:

1. PROVIDE 2 INCHES CLEAR FROM LADDER RAIL TO EDGE OF ADJACENT HANDRAIL.

2. LOCATE LADDER TO ALLOW 4 INCHES FROM CENTER OF BRACKET ANCHOR TO EDGE OF WALL.

3. ANCHOR BRACKETS TO WALL WITH TWO 1/2-INCH DIAMETER STAINLESS STEEL EXPANSION ANCHORS WITH 3 1/2 INCH CONCRETE EMBEDMENT.
RUNG

COMPLETE JT PENETRATION (TYP)

ALUM STIF PL 1/2" x 2 1/2"

LADDER RAIL

ALUM ST 5/32"x3/4"x1/4"

ALUM GRATING

BRG BAR TO Φ 4 CNR

1/8"

3/16"

3/16"

GRATE CONNECTION

05083
FLAT BAR LADDER DETAILS—ALUMINUM
NOTES:

1. HOT DIP GALVANIZED STEEL AFTER FABRICATION, UNLESS NOTED OTHERWISE.

2. AT INTERIOR DRY AREAS, EXTEND RAILS AND BEND 3 INCHES AT FLOOR. SECURE WITH 5/8-INCH STAINLESS STEEL CONCRETE ANCHORS. DIAGONAL BRACKET NOT REQUIRED IF BASE OF LADDER EXTENDS TO SLAB BELOW.
SELF-CLOSING GATE

RAILING W/ TOE BD

PLAN

WALL MOUNT

NO EXTENDABLE SAFETY POST REQD

EL OF RUNG SHALL MATCH EL OF PLATFORM

SST LADDER TO MATCH 05084
W/ EXT AS NOTED IN LIEU OF CROSS THROUGH

SECTION A

NOTE:
FOR NOTES AND DIMENSIONS NOT SHOWN, SEE 05084.

05085
FLATBAR LADDER TYPE 'A'
PLAN AND SECTION
2.1/2" x 1/2" ALUM STIF PL
REMOVE SHARP EDGE AT TOP (TYP)

ALUM FLAT BAR 2 1/2" x 1/2" LADDER RAILS, PUNCH TO RECEIVE RUNGS

FLARE LADDER RAIL

BAR 1" ALUM RUNGS

BAR 3" x 1/2" x 2 1/2" ALUM BRACKETS TOP & BOT & @ 3'-0" OC MAX (TYP EA RAIL)

5/8" SST EXP ANCHORS W/ 4 1/2" MIN EMBED AT CONN TO CONC OR CMU (NOTE 3)

FOR ALT SPRT (NOTE 4)

3/16" TYP

7" MIN
10" MAX

5" UNQ

COMPLETE JT PENETRATION (TYP)

BEND 3" AT FLR & SECURE W/ 5/8" CONC AHR

DIAG BRACKET AT TOP CONN TYP EA RAIL (NOTE 4)

NOTES:

1. PROVIDE PROTECTION FOR ALUMINUM IN CONTACT WITH CONCRETE IN ACCORDANCE WITH SPECIFICATIONS.

2. PRE-ENGINEERED PIPE LADDER AS SPECIFIED MAY BE USED IN LIEU OF FLAT BAR LADDERS.

3. PROVIDE STAINLESS STEEL EXPANSION ANCHORS LOCATED BELOW MAXIMUM WATER SURFACE.

4. FOR INTERIOR, DRY AREAS, EXTEND RAILS AND BEND 3 INCHES AT FLOOR, SECURE WITH 5/8-INCH CONCRETE ANCHORS. DIAGONAL BRACKET NOT REQUIRED IF ALTERNATE SUPPORT PROVIDED.
NOTES:

1. PROVIDE PROTECTION FOR ALUMINUM IN CONTACT WITH CONCRETE IN ACCORDANCE WITH SPECIFICATIONS.

2. AT CONTRACTOR’S OPTION, PRE-ENGINEERED PIPE LADDER AS SPECIFIED MAY BE USED IN LIEU OF FLAT BAR LADDERS.

3. PROVIDE STAINLESS STEEL EXPANSION ANCHORS LOCATED BELOW MAXIMUM WATER SURFACE.

4. FOR INTERIOR, DRY AREAS, EXTEND RAILS AND BEND 3 INCHES AT FLOOR. SECURE WITH 5/8-INCH CONCRETE ANCHORS. DIAGONAL BRACKET NOT REQUIRED IF ALTERNATE SUPPORT PROVIDED.
ANCHOR BOLTS SHALL BE STAINLESS STEEL 3/4 INCH DIAMETER IF REQUIRED WITH LEVELING NUTS AND 6 INCH MINIMUM EMBEDMENT AND BASEPLATES SHALL BE CENTERED ON COLUMN.
PARTIAL RISER PLATE

FULL RISER PLATE

05100
STAIR DETAILS—ALUMINUM
NOTE:
HANDRAIL AND GUARDRAIL NOT SHOWN FOR CLARITY.
BENT STRINGER UP

GS-2 (SIM)

EDGE OF PLATFORM LANDING

GRATING

BENT STRINGER DOWN

NOTE:
HANDRAIL AND GUARDRAIL NOT SHOWN FOR CLARITY.

05102
STAIR CONNECTION AT
LANDING—BENT STRINGERS
WALL BRACKET

ATTACH WALL BRACKET TO WALL IN ACCORDANCE W/ SPEC (NOTE 1)

PLAN

RET END OF HNDRL TO WALL AT BOTH ENDS

NOTES:

1. FOR ANCHORAGE TO WOOD OR METAL STUD FRAMING, PROVIDE SOLID BLOCKING.

2. PROVIDE PROTECTION FOR DISSIMILAR METALS AND FOR ALUMINUM IN CONTACT WITH CONCRETE IN ACCORDANCE WITH SPECIFICATIONS.
NOTE:

PROVIDE PROTECTION FOR DISSIMILAR METALS AND FOR ALUMINUM IN CONTACT WITH CONCRETE IN ACCORDANCE WITH SPECIFICATIONS.

RAILING POST ANCHORAGE

TYPE "A" – ALUMINUM

05111
NOTES:

1. PROVIDE PROTECTION FOR DISSIMILAR METALS AND FOR ALUMINUM IN CONTACT WITH CONCRETE IN ACCORDANCE WITH SPECIFICATIONS.

2. USE SIDE MOUNTED POST BRACKET AS A TEMPLATE FOR THE ANCHOR BOLTS.
NOTE:

PROVIDE PROTECTION FOR DISSIMILAR METALS IN ACCORDANCE WITH SPECIFICATIONS.
NOTE:

PROVIDE PROTECTION FOR DISSIMILAR METALS IN ACCORDANCE WITH SPECIFICATIONS.
### OPENINGS 2'–1" TO 6'–0"

<table>
<thead>
<tr>
<th>OPENING</th>
<th>CLOSURE</th>
<th>DECK SPAN</th>
<th>SUPPORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2'–0&quot; &lt; W ≤ 4'–0&quot;</td>
<td>( \frac{\text{L}}{\text{N/A}} ) ( \leq ) 6'–0&quot;</td>
<td>( \frac{\text{L}}{\text{N/A}} ) ( \leq ) 6'–0&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>4'–0&quot; &lt; W ≤ 6'–0&quot;</td>
<td>( \frac{\text{L}}{\text{N/A}} ) ( \leq ) 6'–0&quot;</td>
<td>( \frac{\text{L}}{\text{N/A}} ) ( \leq ) 6'–0&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>6'–0&quot; &lt; W</td>
<td>( \frac{\text{L}}{\text{N/A}} ) ( \leq ) 6'–0&quot;</td>
<td>( \frac{\text{L}}{\text{N/A}} ) ( \leq ) 6'–0&quot;</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### JOIST OR BEAM SUPPORT

- **Cope L as rec'd**
- **Top chord of mtl joist or bm**
- **Sppt L, see sched**
- **Sppt L, see sche**

### FRAMING CONNECTIONS

**PLAN**

- **2'–0"**
- **3/16"**
- **3/16"**
- **TYP EA END**
- **3/16"**
- **5/8"**
- **2 1/2"**
- **L5" x 3\(1/4" \times 0'-8"**
- **W/ 2 - 5/8" @ CONC AHR**
- **O 5" GA**

### WALL SUPPORT

- **L5\(1/4" \times 3\(1/4" \times 3\(1/16"**

### SECTION

**NOTES:**

1. **OPENINGS 1'–0" TO 2'–0"**

   - ATTACH METAL DECKING TO ALL SUPPORTS PERPENDICULAR TO DECKING SPAN WITH SPECIFIED FASTENERS AT EACH VALLEY OF DECKING. ATTACH METAL DECKING TO SUPPORTS PARALLEL TO SPAN AT 6 INCHES ON CENTER. WHERE VALLEY OF DECKING DOES NOT FALL AT SUPPORTS PARALLEL TO DECK SPAN, PROVIDE FILLER PIECES FOR EQUAL ATTACHMENTS.

2. **REFER TO SPECIFICATIONS FOR SMALLER DECK OPENING REINFORCEMENT.**
ELEVATION

SECTION

NOTES:

1. RUNG TO BE HOT DIP GALVANIZED UNLESS OTHERWISE NOTED AND SHALL HAVE CORRUGATED, KNURED, OR DIMPLED SURFACE ON TOP OF RUNG.

2. ALL STEEL SHALL BE HOT DIP GALVANIZED UNLESS OTHERWISE NOTED.
PARALLEL TO WALL

FILL VOID W/ GROUT AFTER PLACING BM

PERPENDICULAR TO WALL

05141
BEAM SEAT — STEEL
NOTE:
PROVIDE SHIM PLATES AS REQUIRED.

05142
BEAM SPLICE – STEEL
NOTE:
HOT DIPPED GALVANIZE AFTER FABRICATION.
FIELD INSTALLATION – POLYETHYLENE WRAP

STEP 1. PLACE THE TUBE OF POLYETHYLENE MATERIAL AROUND THE PIPE PRIOR TO LOWERING IT INTO THE TRENCH.

STEP 2. PULL THE TUBE OVER THE LENGTH OF THE PIPE. TAPE THE TUBE TO THE PIPE AT THE JOINT. FOLD MATERIAL AROUND THE ADJACENT SPIGOT END AND WRAP WITH THREE CIRCUMFERENTIAL TURNS OF 2 INCH WIDE PLASTIC TAPE TO HOLD PLASTIC TUBE AROUND SPIGOT END.

STEP 3. ADJACENT TUBE OVERLAPS FIRST TUBE AND SECURED WITH PLASTIC ADHESIVE TAPE. THE POLYETHYLENE TUBE MATERIAL COVERING THE PIPE WILL BE LOOSE. EXCESS MATERIAL SHALL BE NEATLY DRAWN UP AROUND THE PIPE BARREL, FOLDED INTO AN OVERLAP ON TOP OF THE PIPE, AND HELD IN PLACE BY MEANS OF PIECES OF PLASTIC TAPE AT APPROXIMATELY 3 FOOT INTERVALS.

NOTES:

1. AT LOCATION OF TAP, APPLY FOUR WRAPS OF PLASTIC TAPE AROUND THE PIPE FOR A WIDTH THAT WILL PROVIDE PROTECTION OF THE POLYETHYLENE WRAP FROM THE TAPPING MACHINE.

2. APPLIES TO STANDARD AND V-BIO POLYETHYLENE WRAP INSTALLATIONS.
STEP-1
CLEAN TO REMOVE ALL FOREIGN MATTER AND EXCESS MOISTURE. ACHIEVE SSPC-SP2. APPLY 3 MILS OF PRIMER TO FLANGED JOINT AND VALVE.

STEP-2
CUT, FIT, FORM, AND WRAP WAX TAPE AROUND FLANGED JOINT AND VALVE TO PROVIDE MINIMUM THICKNESS OF 70 MILS. OVERLAPS SHALL BE 1 INCH MINIMUM. OVERLAP ON PIPE COATING SHALL BE 2 INCH MINIMUM.

STEP-3
CIRCUMFERENTIALLY INSTALL PROTECTIVE PLASTIC WRAP 1.5 MILS MINIMUM THICKNESS OVER WAX TAPE. OVERLAPS SHALL BE 1 INCH MINIMUM.

NOTES:
1. FOR GATE VALVES, INSTALL WAX TAPE SYSTEM UP TO VALVE STEM. FOR BUTTERFLY VALVES, INSTALL WAX TAPE SYSTEM ON ACTUATOR TO MANHOLE PENETRATION.
2. INSULATED VALVE FLANGE CONNECTION SHOWN. DETAIL APPLIES TO ANY FLANGE CONNECTION.
STEP-1
CLEAN TO REMOVE ALL FOREIGN MATTER AND EXCESS MOISTURE. ACHIEVE SSPC-SP2. APPLY 3 MILS OF PRIMER TO UNCOATED PIPE, COUPLING SURFACES, AND PIPE COATING WHERE WAX TAPE AND WRAP WILL LAP.

STEP-2
APPLY FILL MASTIC IN SHADED AREA TO PROVIDE A UNIFORM SURFACE TO WHICH WAX TAPE CAN BE APPLIED WITHOUT BRIDGING OR VOIDS.

STEP-3
CIRCUMFERENTIALLY INSTALL WAX TAPE AROUND PIPE AND COUPLING TO PROVIDE A MINIMUM THICKNESS OF 70 MILS. OVERLAPS SHALL BE 1 INCH MINIMUM. OVERLAP ON PIPE COATING SHALL BE 2 INCH MINIMUM.

STEP-4
CIRCUMFERENTIALLY INSTALL PROTECTIVE PLASTIC WRAP 1.5 MILS MINIMUM THICKNESS OVER WAX TAPE. OVERLAPS SHALL BE 1 INCH MINIMUM.

NOTE:
NON-INSULATED BOLTED SLEEVE TYPE COUPLING CONNECTION SHOWN. DETAIL APPLIES TO ANY BURIED BOLTED SLEEVE TYPE COUPLING CONNECTION.
NOTE:
INSULATING HARNESS LUGS SHALL HAVE BOLT HOLES
1/4 INCH DIAMETER LARGER THAN ROD DIAMETER.
NOTE:

NUMBER OF ANODES, MATERIAL, AND SIZE MAY VARY.
NOTES:

1. OBTAIN PERMISSION FROM OTHER UTILITY OWNER PRIOR TO INSTALLING TEST LEAD ON THEIR LINE.

2. COORDINATE CONNECTION OF WIRE F1 FOR STRAY CURRENT MITIGATION WITH OTHER UTILITY.

3. INSTALLATION MAY NOT CONTAIN ANODES. MULTIPLE ANODES ARE POSSIBLE.

4. ANODE MATERIAL MAY VARY.
RESTRAINED SINGLE NON-INSULATED COUPLING

NON-RESTRAINED SINGLE NON-INSULATED COUPLING

NOTE:
FOR BURIED LOCATIONS OR LOCATIONS SUSCEPTIBLE TO SUBMERSION, SEE 13022.
RESTRAINED SINGLE INSULATED COUPLING

NOTE:
FOR BURIED LOCATIONS OR LOCATIONS SUSCEPTIBLE TO SUBMERSION. SEE 13022.

NON-RESTRAINED SINGLE INSULATED COUPLING

13032
BOLTED SLEEVE TYPE
COUPLING BONDING
INSULATED
SINGLE NON-INSULATED COUPLING
SINGLE INSULATED COUPLING

NOTES:

1. INSULATED SLEEVES AND WASHERS SHALL BE INSTALLED FROM THE SAME SIDE OF UNPROTECTED FLANGE.

2. BOLT HOLES SHALL BE 1⁄4 INCH DIAMETER LARGER THAN BOLT DIAMETER AT INSULATED SLEEVES.
ELEC BOX, AASHTO H-20 LOAD RATED
GROUND LINE

3/4" MAX CRUSHED ROCK
4" MIN DEPTH

5'-0" HORIZONTAL PLUG

10" SCH 40 PVC PIPE

ALL-VENT SYSTEM 1" PVC W/ VERT SLITS,
1 1/2" LONG x 0.008" WIDE, 6" OC

TOP OF FIRST ANODE 10'-0" BELOW THE END OF THE
10" PVC CASING, EA ANODE THEREAFTER SPA 10'-0"
TO 15'-0" FROM THE TOP OF THE FIRST TO THE TOP
OF THE NEXT ANODE

1/2" TO 1" AGGR

75'-0" MIN ACTIVE CIL

COKE BREEZE TO DEPTH 10'-0"
ABOVE SHALLOWEST ANODE

ANODE CONDUCTORS

ANODE CTR CONN MAX OF 1
CENTRALIZE INSTL ON EA ANODE

DEEPEST ANODE STRAPPED W/ TIE
WRAPS OR TAPE TO THE VENT PIPE

EL VARIES

10'-0"

DENVER WATER
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F: 303.839.6199
denverwater.org

DRAWN BY: BERKNESS
CHG BY: K ROSS/ KLK
APPROVE: }
ORIGIN DATE: JULY 2021
REVISION DATE: 

13050
DEEP WELL GROUND BED
NOTE:

SIZE OF RECTIFIER, JUNCTION BOX, AND NUMBER OF TERMINALS MAY VARY.
ENGRAVE T_#### ON TESTOX 900 LID.
NOTE:
ENGRAVE T-#### ON TESTOX 900 LID.

13061
TEST STATION ABOVE
GRADE WITH CONDUIT
NOTE:

AT GRADE TEST STATION SHALL BE USED WHERE 13061 IS NOT POSSIBLE.
13063
TYPICAL CATHODIC PROTECTION TEST STATION

LEAVE 2'-0" OF SLACK CONDUCTOR IN TEST STA

12" MIN 24" MAX
5'-0" MIN AT PIPE INV

BURIED CuSO4 REF ELECTRODE
COUPON

ANODE
P1

TEST STA TERMINAL BD

PLAN

SHUNT 0.010–6A

BURIED CuSO4 REF ELECTRODE
P1
C
P2
A#
P# & A#
A#
R

ELEVATION

NOTE:

NUMBER OF ANODES MAY VARY.
**PLAN**

Insulated stranded Cu wire (size in accordance w/ Table) exothermic weld to bare metal across Jt-Coat w/ applied exothermic weld patch.

**SECTION**

<table>
<thead>
<tr>
<th>Nominal Pipe Ø</th>
<th>Wire Size and Type (AWG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot; - 12&quot;</td>
<td>#8 HWVPE</td>
</tr>
<tr>
<td>16&quot; - 20&quot;</td>
<td>#4 HWVPE</td>
</tr>
<tr>
<td>24&quot; ≤ 36&quot;</td>
<td>#4 HWVPE</td>
</tr>
<tr>
<td>36&quot; ≤ 60&quot;</td>
<td>#2 HWVPE</td>
</tr>
<tr>
<td>60&quot; or Larger</td>
<td>2x #2 HWVPE</td>
</tr>
</tbody>
</table>

**NOTES:**

1. PROVIDE AND INSTALL REDUNDANT BOND WIRES, EVENLY SPACED AROUND THE PIPE.
2. REMOVE A 2 1/2 INCH SQUARE (MAXIMUM) OF PIPE COATING FOR EXOTHERMIC WELD CONNECTION.
3. WELD CAP SHALL EXTEND AT LEAST 3/4 INCH OVER PIPE COATING.
4. EXOTHERMIC WELDS SHALL BE CLEANED AND COATED. SIZE EXOTHERMIC WELD CHARGE BASED ON PIPE MATERIAL.
5. JOINT TYPE MAY VARY.
SUBMERGED STL SURFACE

1/2" x 2 1/2" CARBON STL STUD

2.5 LB MAGNESIUM, TYPE 2R5 RND CONDENSER ANODE MFG W/ TAPPED HOLE FOR 1/2" STD

13090
CONDENSER ANODE INSTALLATION
NOTE:
COVER SHALL BE MARKED "CO".

22002
4" INLINE CLEANOUT
NOTES:

1. PIPE AND FITTINGS SHALL BE ASTM AND APPROVED BY THE AUTHORITY HAVING JURISDICTION.

2. DIAMETER OF THE PIPE SHALL NOT BE LESS THAN MAIN LINE PIPE DIAMETER.

3. THE APPROPRIATE MANHOLE SEAL, ADAPTER, OR CONNECTOR SHALL BE USED FOR THE SPECIFIED PIPE MATERIAL, AND SHALL BE APPROVED BY THE AUTHORITY HAVING JURISDICTION.

4. OUTSIDE DROP SHALL BE ALL OF ONE MATERIAL.

5. CONCRETE ENCASEMENT SHALL BE A MINIMUM OF 8 INCHES THICK ALL AROUND. FOR DROPS OVER 4 FEET PLACE #4@18 INCHES ON CENTER HORIZONTAL AND VERTICAL REINFORCEMENT ON EACH SIDE OF THE PIPE.

6. PIPE DIMENSIONS ARE APPROXIMATE AND MAY VARY FROM ONE MANUFACTURER TO ANOTHER.

7. ALL REQUIRED WALL OPENINGS SHALL BE PRECAST BLOCK-OUTS OR CORE DRILLED. JACK HAMMERING OF OPENINGS IS NOT ALLOWED.

8. CUT TOP HALF OF PIPE TO CREATE 4 INCH LONG SHELF.
22005
TRACER WIRE INSTALLATION
FOR PVC SUMP PUMP DRAIN

TOP SECT OF 6" VB & LID MARKED "TRACER"
GROUND LINE

LEAVE 3' OF SLACK WIRE IN VB
WIRE INSIDE VB

ELEVATION

2" WIDE INDUSTRIAL DUCT TAPE AT 5'-0" CENTERS (TYP)
12 GA SINGLE STRAND TRACER WIRE
4" SCHED 40 PVC

SPlice TRACER Wires W/ 3M TYPE DJBY-6 LOW VOLTAGE DIRECT BURY SPLICE

TOP SECT OF 6" VB & LID MARKED "TRACER" 100'-0" MAX SPA

PLAN

DRAWN BY: MITCHELL
CHKO BY: K ROSS/KLR
APPRD BY: )
ORIGINATION DATE: JULY 2021
REVISION DATE:
NOTES:

1. CRUSHED ROCK BED SHALL BE LINED WITH GEOTEXTILE FABRIC ON ALL SIDES.

2. CRUSHED ROCK SHALL BE ASTM C33 SIZE NO 4 COURSE AGGREGATE.
22007
SUMP PUMP DISCHARGE
TO EXISTING SANITARY SEWER

SAN TAPPING SADDLE

EXIST SAN MAIN

24" OD MIN
36" ID MAX

SAN SEWER PIPE BEDDING
AS REQD BY AHJ

6" MIN

4" SCHED 40 PVC PIPE

COMPACTED BACKFILL

GROUND LINE

DEPTH AS REQD BY AHJ
NOTE:
ROUTE COPPER PIPE BELOW ELECTRICAL PANELS AND CONDUIT IF NECESSARY.

22010
WASHDOWN PIPING
SCHEMATIC
NOTES:

1. USC FCCCHR APPROVED DOUBLE CHECK VALVE OR REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY SHALL BE DETERMINED BY THE DEGREE OF HAZARD POSED BY INTERNAL PLUMBING USE.

2. PLACEMENT OF BACKFLOW PREVENTION ASSEMBLY SHALL BE A MAXIMUM OF 5 FEET FROM THE INSIDE WALL OF BUILDING.

3. REFER TO LOCAL CODES AND MANUFACTURER REQUIREMENTS FOR INSTALLATION INSTRUCTIONS.

4. INSTALL STANDARD ADJUSTABLE SUPPORTS WITHIN 12 INCHES OF INLET AND OUTLET ISOLATION VALVES.
NOTES:
1. NEW INSIDE METER INSTALLATIONS ARE PERMITTED ONLY BY WRITTEN APPROVAL BY DENVER WATER. EXISTING INSIDE METER INSTALLATIONS SHALL COMPLY WITH THIS DRAWING.
2. INSTALLATION SHALL ALLOW FOR ACCESS FROM PUBLIC RIGHT-OF-WAY OR EASEMENT TO METER AND VALVES, AND PROVIDE PROTECTION FROM FREEZING.
3. A FLOOR DRAIN SHALL BE PLACED WITHIN 10 FEET OF THE METER INSTALLATION IN THE SAME ROOM.
4. METER SUPPORT MAY BE EITHER CONCRETE OR STRUCTURAL CHANNEL ATTACHED TO WALL.
5. WALL PENETRATIONS SHALL BE GROUTED WITH CONCRETE.
6. USC FCCCHR APPROVED DOUBLE CHECK VALVE OR REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY DETERMINED BY DEGREE OF HAZARDPOSED BY INTERNAL PLUMBING USE.
7. REFER TO LOCAL CODES AND MANUFACTURER REQUIREMENTS FOR SPECIFIC INSTALLATION INSTRUCTIONS.

CURB STOP
TYPE "K" Cu TUBING
2" COPPERSETTER/METER YOKE
METER W/ ENCODER REGISTER
3" NIPPLE BTWN COPPERSETTER & CHKV (IF REQD)

1"x 18" BSP—40
MIP TO FLARE CPLG FROM INLET SIDE OF COPPERSETTER & OUTLET SIDE OF CHKV
BY—PASS W/ VLV WILL BE 1" FOR 1 1/2" COPPERSETTERS & 1 1/2" OR 1 1/4" FOR 2" COPPERSETTERS

CHKV — NOT REQD WHERE A BFP ASSY IS INSTALLED. BUT MAY BE REQD IF DIST TO BFP ASSY IS MORE THAN 150' & ALLOWS EXCESSIVE WTR TO DR DURING METER MAINTENANCE

SIGNAL WIRE TO AMR DEVICE
FD

DENVER WATER
1500 West 12th Ave
Denver, Colorado 80204–3412
T: 303.828.6000
F: 303.828.6199
denverwater.org
NOTES:

1. NEW INSIDE METER INSTALLATIONS ARE PERMITTED ONLY BY WRITTEN APPROVAL BY DENVER WATER. EXISTING INSIDE METER INSTALLATIONS SHALL COMPLY WITH THIS DRAWING.

2. PIPING FOR 3-INCH AND LARGER METERS SHALL BE FLANGED DUCTILE IRON FROM THE METER THROUGH THE BACKFLOW PREVENTION ASSEMBLY.

3. INSTALLATION SHALL ALLOW FOR FULL ACCESS TO THE METER AND VALVES AND PROVIDE PROTECTION FROM FREEZING WITH A MINIMUM 2 FEET CLEARANCE TO WALL.

4. GATE VALVES SHALL BE NON-RISING STEM, RIGHT HAND OPEN, WITH HAND WHEEL OPERATORS.

5. FOR INSIDE SETTINGS, THE PROPERTY OWNER SHALL PROVIDE A DETAILED DRAWING SHOWING DIMENSIONS OF THE METER ROOM INCLUDING PIPING AND EQUIPMENT WITH APPROPRIATE DIMENSIONS FOR DENVER WATER APPROVAL PRIOR TO CONSTRUCTION.

6. THE TURBINE METER REQUIRES A STRAINER BEFORE THE METER.

7. WALL PENETRATIONS SHALL BE GROUTED WITH CONCRETE.

22017
INSIDE SETTING FOR
3” & LARGER METER
NOTES:

1. THE METER SHALL BE PROTECTED FROM FREEZING AND DAMAGE.

2. NO BENDS, FITTINGS, CONNECTIONS, OR CHANGES IN PIPE SIZE ARE PERMITTED ON THE SERVICE LINE FROM THE CORPORATION STOP AT THE WATER MAIN TO THE METER OUTLET VALVES EXCEPT AS SHOWN.

3. IF THE METER IS BOXED IN OR PLACED BEHIND A WALL, PROVIDE AN ACCESS OPENING 36 INCHES WIDE FROM ABOVE THE OUTLET VALVE TO THE FLOOR.

4. VALVES SHALL BE ACCESSIBLE FROM THE OPENING.

5. METER SHALL BE CENTERED IN THE OPENING.

22018

INSIDE SETTING FOR EXISTING

3/4" & 1" METER WITH AUTOMATIC METER READING
NOTES:

1. EXHAUST FAN DIMENSIONS ARE APPROXIMATE, SEE MANUFACTURER DRAWINGS.

2. SEAL PIPE CONNECTIONS WITH POLYVINYL CHLORIDE PIPE SEALER AND ADHESIVE, AND/OR GASKET AT FLANGE CONNECTIONS.

3. PIPE AND FITTINGS SHALL BE SCHEDULE 40 POLYVINYL CHLORIDE.

23001

TYPICAL EXHAUST FAN
NOTES:
1. SEAL PIPE CONNECTIONS WITH POLYVINYL CHLORIDE PIPE SEALER AND ADHESIVE.
2. PIPE AND FITTINGS SHALL BE SCHEDULE 40 POLYVINYL CHLORIDE.
NOTES:

1. SEE SPECIFIC VAULT DRAWINGS FOR PROPER ORIENTATION.

2. 8-INCH x 6-INCH REDUCER CAN BE MOUNTED ON EITHER SIDE OF FILTER BOX TO OBTAIN CORRECT ORIENTATION OF BOX.

3. MATERIAL: ASTM A 240 TYPE 304 OR TYPE 316 STAINLESS STEEL.
NOTE:
SEAL PIPE CONNECTIONS WITH POLYVINYL CHLORIDE PIPE SEALER AND ADHESIVE.
KEYED NOTES:

1. DAMPER BLADE DIAMETER SHALL BE 1/4" LESS THAN DUCT DIAMETER. BLADE SHALL BE 16 GAUGE GALVANIZED STEEL

2. 3/8" ROD

3. 1" WIDE x 16 GAUGE GALVANIZED STRAP (2 REQUIRED)

4. INDICATING HANDLE AND LOCKING QUADRANT

5. 3/8" SQ. ROD W/ SET SCREWS (2 REQUIRED)

6. LOCKNUT

7. REGULATOR

8. GASKET

9. END BEARING

23014
ROUND VOLUME DAMPER (UP TO 14")
WALL MOUNTED

NOTES:
1. INTERIOR UNITS SHALL BE FABRICATED FROM 1/8-INCH ASTM A 36 STEEL PLATE AND HOT DIP GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A 153.

2. EXTERIOR UNITS SHALL BE FABRICATED FROM 3/16-INCH 6061-T6 ALUMINUM ALLOY PLATE.

3. ATTACH TO CONCRETE WALL WITH FOUR 1/4-INCH 18-8 STAINLESS STEEL EXPANSION ANCHORS.

4. MOUNT HOSE RACK 3 FEET ABOVE FINISHED FLOOR OR GROUND ELEVATION.

DENVER WATER
1600 West 12th Ave
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T: 303.828.6200
F: 303.828.6199
denverwater.org
NOTE:

DETAIL GIVES REQUIRED SEQUENCE OF EQUIPMENT AND VALVES. PIPING ARRANGEMENT MAY VARY TO SUIT FIELD REQUIREMENTS. PIPE COIL FOR COUNTER FLOW WITH AIR.
NOTES:

1. PUMP SUPPORT SHALL BE TYPE 316 STAINLESS STEEL, FIBERGLASS REINFORCED PLASTIC, OR GALVANIZED STEEL IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS.

2. HOT DIP GALVANIZE ENTIRE ASSEMBLY AFTER FABRICATION.
NOTE:
SIZE AS REQUIRED FOR PIPE DIAMETER, NUMBER, AND LOAD.

23040
WALL BRACKET
NOTES:

1. CLAMP MATERIAL SHALL BE THE SAME AS CHANNEL MATERIAL.

2. WHERE INSULATED, PIPE SHALL BE FITTED WITH RIGID POLYVINYL CHLORIDE JACKET FOR PROTECTION.

3. PROVIDE STAINLESS STEEL CLAMPS, FASTENERS, INSERTS, AND CHANNEL FOR SUBMERGED OR WETTED AREAS. PROVIDE GALVANIZED MATERIALS FOR ALL OTHER LOCATIONS.
FOR CONC APPLICATIONS USE UNIVERSAL CONC INSERT OR STRUT. FOR STL BM APPLICATION USE BM CLAMPS.

STRUCT FLR SLAB OR CLG
1-#4x3'-0"'

STL BM

BM CLAMP

GALV HANGER ROD

RIGID SECT OF INSUL AT EA HANGER LOC

INSUL

GALV CLEVIS HANGER

PROCESS PIPE

10" 16 GA GALV STL INSUL

PROTECTOR SLD

16"
NOTE:
TOTAL LOADING ON EACH CONCRETE INSERT OR OTHER TYPE HANGER ROD ANCHOR SHALL NOT EXCEED MANUFACTURER RECOMMENDED LOADING.
NOTES:

1. HOT DIP GALVANIZE ASSEMBLY AFTER FABRICATION.

2. FOR INSULATED PIPING, CLAMP INSIDE DIAMETER SHALL BE SUITABLE FOR OUTSIDE DIAMETER OF INSERT.

3. MAXIMUM PIPING DIAMETER 6 INCH.

4. EXPANSION ANCHORS SHALL BE APPROVED BY MANUFACTURER FOR OVERHEAD USE.
<table>
<thead>
<tr>
<th>PENETRATION</th>
<th>CONDITION</th>
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<td>WATER HOLDING STRUCTURE</td>
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<td>BELOW WATER SURFACE</td>
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<tr>
<td>INTERIOR WALL</td>
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<td>PIPE &gt; 4”</td>
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<td></td>
<td>BLOCK</td>
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<tr>
<td>FOUNDATION WALL</td>
<td>ALL</td>
<td>E</td>
<td>PIPE &gt; 4”</td>
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<td></td>
<td></td>
<td>F,G,M,S</td>
<td>REINFORCED CONCRETE PIPE</td>
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<tr>
<td>EXTERIOR WALL</td>
<td>ALL</td>
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<td>ROOF</td>
<td>ALL</td>
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<td>FOUNDATION FLOOR</td>
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<td>A,B</td>
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<td></td>
<td>INTERIOR WALLS</td>
<td>C,N,P,Q,R,S</td>
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<tr>
<td></td>
<td>EXTERIOR FOUNDATION FLOORS, SLABS AND EQUIPMENT PADS</td>
<td>R,S,T,U</td>
<td></td>
</tr>
</tbody>
</table>

NOTES:

1. PENETRATIONS CONFORM TO THE PENETRATION TABLE FOR THE CONDITION INDICATED UNLESS OTHERWISE NOTED ON THE DRAWINGS.

2. TABLE TERMINOLOGY:
   A. WATER HOLDING STRUCTURE – ANY PART OF A STRUCTURE CONTAINING WATER
   B. WATER SURFACE – AN ELEVATION 9 INCHES ABOVE MAXIMUM WATER SURFACE SHOWN ON THE DRAWINGS

3. COAT EMBEDDED WALL AND FLOOR PIPES AND SLEEVES WITH SPECIFIED PAINT SYSTEM PRIOR TO CONCRETE PLACEMENT.

4. PENETRATION DETAILS ARE NOT SHOWN FOR ABOVE GRADE EXTERIOR WALLS AND ROOFS. DETAILS SHALL BE AS SPECIFIED OR SHOWN ON THE DRAWINGS.

5. SLEEVES IN FOUNDATION WALLS AND TANK WALLS SHALL HAVE 5/16 INCH MINIMUM THICKNESS WALL COLLARS. COLLARS ARE NOT REQUIRED ON ALL OTHER WALL SLEEVES.
NOTE:
FOR PIPE PENETRATION TABLE AND NOTES, SEE 23050.

23051
TYPE A PENETRATION
NOTE:
FOR PIPE PENETRATION TABLE AND NOTES, SEE 23050
23053
TYPE C PENETRATION

NOTE:
FOR PIPE PENETRATION TABLE AND NOTES, SEE (23050).
NOTE:
FOR PIPE PENETRATION TABLE AND NOTES, SEE 23050
NOTES:
1. ONE NOMINAL PIPE DIAMETER BUT NOT LESS THAN 2 FEET.
2. FOR PIPE PENETRATION TABLE AND NOTES, SEE 23050

23055
TYPE E PENETRATION
NOTES:

1. INSIDE DIAMETER OF PIPE SLEEVE AS REQUIRED BY THE MODULAR MECHANICAL SEAL ASSEMBLY MANUFACTURER, FOR THE PASSING PIPE SEAL.

2. FOR EXISTING WALL OMIT PIPE SLEEVE, CORE DRILL AS REQUIRED FOR PASSING PIPE AND MECHANICAL SEAL ASSEMBLY.

3. FOR PIPE PENETRATION TABLE AND NOTES, SEE (23050).

23056
TYPE F PENETRATION
NOTES:

1. INSIDE DIAMETER OF PIPE SLEEVE AS REQUIRED BY THE MODULAR MECHANICAL SEAL ASSEMBLY MANUFACTURER, FOR THE PASSING PIPE SEAL.

2. FOR EXISTING WALL OMIT PIPE SLEEVE. CORE DRILL AS REQUIRED FOR PASSING PIPE AND MECHANICAL SEAL ASSEMBLY.

3. USE THIS DETAIL FOR ELECTRICAL CONDUIT WHEN APPROVED FOR WALLS TOO NARROW FOR TYPE F PENETRATION, (23056). FILL VOIDS WITH OAKUM.

4. FOR PIPE PENETRATION TABLE AND NOTES, SEE (23050).

23057
TYPE G PENETRATION
NOTES:

1. ANNULAR SPACES BETWEEN PASSING PIPE AND SLEEVES SHALL BE SEALED AS FOLLOWS:

   A. ANNULAR SPACES IN PENETRATIONS OF FIRE RATED WALLS SHALL MEET FIRE CODE REQUIREMENTS OF AUTHORITY HAVING JURISDICTION.

   B. SEAL FOUNDATION FLOOR SLEEVES WITH NON-SHRINK GROUT. WRAP PIPE WITH POLYETHYLENE BAGGING INSIDE SLEEVE.

   C. SEAL INTERIOR WALLS AND SLABS WITH ELASTOMERIC SEALANT AND BACKER ROD.

2. FOR CONCRETE MASONRY UNIT PENETRATIONS, GROUT SLEEVE IN PLACE AND PROVIDE GALVANIZED PIPE COLLAR BOTH SIDES.

3. FOR PIPE PENETRATION TABLE AND NOTES, SEE 23050.

23058
TYPE H PENETRATION
NOTES:

1. ANNULAR SPACES BETWEEN PASSING PIPE AND SLEEVES SHALL BE SEALED AS FOLLOWS:

   A. ANNULAR SPACES IN PENETRATIONS OF FIRE RATED WALLS SHALL MEET FIRE CODE REQUIREMENTS OF AUTHORITY HAVING JURISDICTION.

   B. SEAL FOUNDATION FLOOR SLEEVES WITH NON-SHRINK GROUT. WRAP PIPE WITH POLYETHYLENE BAGGING INSIDE SLEEVE.

   C. SEAL INTERIOR WALLS AND SLABS WITH ELASTOMERIC SEALANT AND BACKER ROD.

2. PROVIDE A MINIMUM OF 3 HEADED ANCHOR STUDS PER SLEEVE, EQUALLY SPACED.

3. INSIDE DIAMETER OF SLEEVE SHALL BE A MINIMUM OF THE DIAMETER REQUIRED TO REMOVE THE PASSING PIPE PLUS LARGE ENOUGH TO INSTALL THE INDICATED ANNULAR PIPE SEAL.

4. FOR PIPE PENETRATION TABLE AND NOTES, SEE 23050.
NOTES:

1. FOR DUCT PENETRATIONS IN FLOOR AREAS 3 1/2 INCH x 3 1/2 INCH. PROVIDE CURB ALL AROUND. CURB NOT REQUIRED FOR WALL PENETRATIONS.

2. TYPE K PENETRATION FOR DRY AREAS – CURB NOT REQUIRED.

3. FOR PIPE PENETRATION TABLE AND NOTES, SEE (23050)

[Diagram of duct penetration with labels: 2" ANGLE CLOSURE COLLAR OF SAME MATL AS DUCT, BACKER ROD & SEALANT, 1/2" MAX CLR, SHT MTL OR ALUM DUCT, SEALANT TYPE 5, PACK OPNG AROUND DUCT W/ FIBERGLASS]
NOTES:

1. REINFORCED CONCRETE SPOOL OR SPECIAL WALL THIMBLE WITH BELL TYPE GASKETED JOINT AS SPECIFIED, PROVIDE SECOND JOINT WITHIN ONE PIPE DIAMETER OF WALL.

2. FOR PIPE PENETRATION TABLE AND NOTES, SEE 23050.

23061
TYPE L PENETRATION
NOTE:
FOR PIPE PENETRATION TABLE AND NOTES, SEE 23050

23064
TYPE O PENETRATION
NOTES:

1. CONDUITS WHICH INDIVIDUALLY PASS THROUGH AN INTERIOR WALL SHALL BE INSTALLED IN ACCORDANCE WITH THIS DETAIL.

2. IF THE WALL IS A FIRE WALL, FILL CAVITY WITH FIRE STOP SEALANT MEETING FIRE RATING REQUIREMENTS.

3. FOR PIPE PENETRATION TABLE AND NOTES, SEE 23050.

23065
TYPE P PENETRATION
NOTES:
1. NOT FOR USE IN CONCRETE MASONRY UNIT WALLS.
2. FOR PIPE PENETRATION TABLE AND NOTES, SEE 23050

23066
TYPE Q PENETRATION
NOTES:

1. When single-ended seals are approved, seal shall be on the outside of the wall or on the top of the floor.

2. For pipe penetration table and notes, see 23050.
NOTES:

1. FOR EXTERIOR SLABS AND EQUIPMENT PADS OR WHEN APPROVED FOR PIPES TOO DENSE FOR TYPE R PENETRATIONS.

2. FOR PIPE PENETRATION TABLE AND NOTES, SEE 23050
NOTE:
FOR PIPE PENETRATION TABLE AND NOTES, SEE (23050).

23069
TYPE T PENETRATION
NOTES:

1. INSIDE DIAMETER OF PIPE SLEEVE AS REQUIRED BY THE MODULAR MECHANICAL SEAL ASSEMBLY MANUFACTURER, FOR THE PASSING PIPE SEAL.

2. FOR EXISTING WALL OMIT PIPE SLEEVE, CORE DRILL AS REQUIRED FOR PASSING PIPE AND MECHANICAL SEAL ASSEMBLY.

3. FOR PIPE PENETRATION TABLE AND NOTES, SEE 23050.

23071
TYPE V PENETRATION
NOTES:
1. COAT FLOOR PIPE WITH SPECIFIED PAINT SYSTEM PRIOR TO CONCRETE PLACEMENT.
2. VERIFY REINFORCING BAR IS NOT ELECTRICALLY CONTINUOUS WITH PIPE PRIOR TO CONCRETE PLACEMENT.
NOTES:
1. SATIN FINISH BRONZE.
2. SAME SIZE AS DOWNSPOUT PIPING.
23080
PRESSURE GAUGE
INSTALLATION
NOTES:

1. FOR STEEL, GALVANIZED STEEL, COPPER, AND POLYVINYL CHLORIDE 2 1/2 INCH AND SMALLER, USE A 3/4 INCH BUSHING IN TEE.

2. FOR DUCTILE IRON AND FIBERGLASS REINFORCED PLASTIC PIPE, ALL SIZES, USE A 3/4 INCH TAPPING SADDLE.

3. FOR STEEL AND STAINLESS STEEL PIPES 3 INCHES AND LARGER, AND PRESSURE VESSELS, USE 3/4 INCH THREADED OUTLET AS SHOWN.
KEYED NOTES:
1. PRESSURE-RATED FEEDER
2. PRESSURE GAUGE & COCK
3. SIGHT GLASS OR FLOW INDICATOR
4. FUNNEL
5. 3/4" FILL & VENT BALL VALVE (V300)
6. SHUTOFF BALL VALVE (V300)
7. UNION
8. 3/4" HOSE COCK (V201)
9. ONE-HALF MAIN PIPE SIZE
10. SYSTEM MAIN TO BE TREATED W/ CHEMICAL
11. BALL VALVE (V300)

23090
CHEMICAL SHOT FEEDER
NOTE:

D = 2-INCH MINIMUM FOR 1 1/2 INCH AND SMALLER CONDUIT.
D = 3-INCH MINIMUM FOR 2 INCH AND LARGER CONDUIT.
NOTE:

TRENCH SHALL CONFORM TO APPLICABLE OSHA REQUIREMENTS.
NOTES:

1. MOUNTING HARDWARE SHALL BE 18-8 STAINLESS STEEL.

2. USE WASHERS AND SPLIT-LOCK WASHERS UNDER ALL NUTS AND BOLTS.

3. DIMENSIONS SHALL BE AS SHOWN ON THE DRAWINGS OR AS REQUIRED.

4. STEEL BASE PLATE MAY BE ATTACHED DIRECTLY TO CONCRETE SLAB.
NOTES:

1. MOUNTING HARDWARE SHALL BE 18-8 STAINLESS STEEL.

2. USE WASHERS AND SPLIT-LOCK WASHERS UNDER ALL NUTS AND BOLTS.

3. DIMENSIONS SHALL BE AS SHOWN ON THE DRAWINGS OR AS REQUIRED.

4. STEEL BASE PLATE MAY BE ATTACHED DIRECTLY TO CONCRETE SLAB.
NOTE:

MOUNTING HARDWARE SHALL BE 18–8 STAINLESS STEEL.
RAIN HOOD REO FOR OUTDOOR APPLICATION

TO SUIT EQUIP

SECURE INST TO STRUT C W/ SST BOLTS, NUTS, & WASHERS

TOP HNDRL

MIDDLE HNDRL

BOT HNDRL

HNDRL POST

2 - 1 5/8" x 1 5/8" SST STRUT C, LAS REO. SPA TO SUIT INST MTO REQMTS.
SECURE TO HNDRL W/ 4 SST PIPE CLAMPS; 1/4" SST STRUT C BOLTS & NUTS

GRIND SHARP EDGES OFF EXPOSED CNR OF STRUT C (TYP)

SPA AS REQD FOR COND, 6 MIN

DEVELOPED FOR COND. JULY 2021

DENVER WATER
1500 West 12th Ave
Denver, Colorado 80204-3412
T: 303.828.6200
F: 303.828.6199
denverwater.org

DRAWN BY: BERKNESS
CHECK BY: K. ROSS/KLR
APPROVED: D. DENVER WATER
ORIgINATION DATE: JULY 2021

26015
HANDRAIL MOUNTING FOR EQUIPMENT
NOTE:

TRANSITION FROM POLYVINYL CHLORIDE TO POLYVINYL CHLORIDE–COATED RIGID GALVANIZED STEEL BEFORE EXITING DUCTBANK.
IN SLAB
TYPE A

UNDER SLAB
TYPE B

NOTES:
1. D = 2 INCH MINIMUM FOR 1 1/2 INCH AND SMALLER CONDUITS
   D = 3 INCH MINIMUM FOR 2 INCH AND LARGER CONDUITS.
2. SUPPORT CONDUITS ON ADDED REINFORCEMENT CHAIRS OR
   BOLSTERS. TIE CONDUITS TO SUPPORTS AND ANCHOR TO
   PREVENT FLOTATION.
3. CENTER LARGEST DIAMETER CONDUIT BETWEEN TOP AND BOTTOM
   REINFORCEMENT MATS.
ENCASED CONDUITS

EXPOSED CONDUITS

NOTE:
PROVIDE 2 INCH MIN CLEAR BETWEEN ADJACENT CONDUITS.

26046
SPARE CONDUIT
NOTES:

1. DETAIL APPLIES TO ELECTRICAL CONDUIT EMBEDDED IN STRUCTURAL CONCRETE AT CONCRETE WALL OR FOUNDATION INTERFACES AND AT STRUCTURAL EXPANSION JOINTS.

2. DETAIL APPLIES TO ALL EXPANSION JOINTS FOR THE UNDERGROUND CONCRETE ENCASED ELECTRICAL CONDUITS.

3. TERMINATE DUCTBANK REINFORCEMENT 3 INCHES EACH SIDE OF JOINT.

4. THIS DETAIL APPLIES TO HANDHOLES AND MANHOLES WHEN INDICATED.

5. SEAL WALL ALL AROUND DUCTBANK WITH HYDROPHILIC WATERSTOP. INSTALL IN ACCORDANCE WITH MANUFACTURER INSTRUCTIONS.
SINGLE ROW CONDUIT

TWO OR MORE ROWS CONDUIT

NOTES:

1. SEE 26006 FOR TRENCH REQUIREMENTS.

2. D = 2 INCH MINIMUM FOR 1 1/2 INCH AND SMALLER CONDUITS.
   D = 3 INCH MINIMUM FOR 2 INCH AND LARGER CONDUITS.

3. REFERENCE COLORADO DEPARTMENT OF TRANSPORTATION ROAD AND BRIDGE SPECIFICATIONS FOR CLASS 6 AGGREGATE BASE REQUIREMENTS.
NOTES:

1. CONTINUATION OF ELECTRICAL CONDUITS IN THE INTERIOR SHALL BE RIGID GALVANIZED STEEL OR POLYVINYL CHLORIDE–COATED RIGID GALVANIZED STEEL.

2. THIS DETAIL APPLIES TO ALL DUCTBANK CONCRETE WALL OR FOUNDATION PENETRATIONS INCLUDING BUILDING AND VAULTS. THIS DETAIL APPLIES TO HANDHOLES AND MANHOLES WHEN INDICATED.
NOTE:

SEE MANUFACTURER TABLES FOR RECOMMENDED QUANTITY OF FOAM TO INSTALL BASED ON OUTER DIAMETER OF CONDUIT USED.
ELEVATION

NOTES:

1. REMOVE EXISTING CONCRETE FROM DUCTBANK WITHOUT DAMAGING ELECTRICAL CONDUITS, AND REINFORCING STEEL. LOWER ELECTRICAL CONDUIT SHALL EXTEND A MINIMUM OF 18 INCHES BEYOND UPPER ELECTRICAL CONDUIT.

2. CONNECT NEW REINFORCING STEEL TO EXISTING REINFORCING STEEL BY OVERLAPPING STEEL A MINIMUM OF 29 INCHES AND SECURING WITH TIE WIRE.

3. EXTEND EXISTING ELECTRICAL CONDUIT WITH ELECTRICAL CONDUIT OF LIKE MATERIAL (POLYVINYL CHLORIDE–COATED RIGID STEEL CONDUIT, RIGID STEEL CONDUIT, OR SCHEDULE 80 POLYVINYL CHLORIDE). FOR STEEL ELECTRICAL CONDUIT, PROVIDE CONCRETE RATED TYPE THREADLESS COUPLING TO CONNECT EXISTING RIGID ELECTRICAL STEEL CONDUIT TO NEW ELECTRICAL CONDUIT. FOR POLYVINYL CHLORIDE–COATED RIGID STEEL CONDUIT, RE–COAT ANY DAMAGED POLYVINYL CHLORIDE COATING AND THREADLESS COUPLING WITH NEW POLYVINYL CHLORIDE COATING TOUCH UP MATERIAL. FOR SCHEDULE 80 POLYVINYL CHLORIDE ELECTRICAL CONDUIT, CONNECT EXPOSED UNDAMAGED SCHEDULE 80 POLYVINYL CHLORIDE ELECTRICAL CONDUIT TO NEW ELECTRICAL CONDUIT WITH POLYVINYL CHLORIDE COUPLING AND APPROPRIATE CEMENT.
FROM DUCTBANK
TYPE A

FROM DIRECT BURIED
TYPE B

NOTE:

THIS DETAIL APPLIES TO RISER FROM UNDERGROUND ELECTRIC CONDUIT BENEATH CONCRETE SLABS, CONCRETE FLOORS, AND EQUIPMENT.
NOTES:

1. X-RAY AND CORE DRILL HOLE THROUGH WALL TO AVOID REINFORCING STEEL.

2. FOR PIPE PENETRATION TABLE AND NOTES, SEE 23050.

26060
BUILDING UNDERGROUND CONDUIT ENTRANCE

DENVER WATER
1500 West 12th Ave
Denver, Colorado 80204-3412
T: 303.928.6000
F: 303.928.6199
denverwater.org
NOTE:
PLACE CONTROLLED LOW-STRENGTH MATERIAL BETWEEN TOP OF DUCTBANK AND BOTTOM OF CONCRETE SLAB.

SIDE VIEW

NO SCALE

THIS DWG
NOTES:

1. PROVIDE BLOCKOUTS FOR DUCTBANK AND ELECTRICAL CONDUIT PENETRATIONS INTO THE HANDBOLES IN ACCORDANCE WITH 26049.

2. PROVIDE CABLE RACKS AT A MAXIMUM SPACING OF 2 FEET. ALL SUPPORT MATERIALS AND INSTALLATION SHALL BE APPROVED BY THE ENGINEER.

3. DESIGN PRECAST CONCRETE ELECTRICAL HANDBOLES IN ACCORDANCE WITH ASTM C 857 AND ASTM C 858. VAULT AND LID DESIGN LOADING SHALL BE AASHTO H-20, WITH IMPACT.

4. VAULTS SHALL BE PROVIDED WITH 1.25-INCH PULLING EYES (REMOVABLE STYLE).
1. ELECTRICAL CONDUITS SHOWN IN DUCTBANKS DO NOT NECESSARILY REFLECT NUMBER OF ELECTRICAL CONDUITS REQUIRED.

2. VAULT AND LID DESIGN LOADING SHALL BE AASHTO H-20, WITH IMPACT.


4. VAULTS SHALL BE PROVIDED WITH 1 1/4 INCH ID PULLING EYES (REMOVAL STYLE).

5. PROVIDE ENGINEER APPROVED LOCK CORE WITH BRASS PLUG ENGRAVED WITH ELECTRICAL HANDHOLE NUMBER.

6. SUBJECT TO ENGINEER APPROVAL, ROUTE VAULT LID DRAIN PIPING AND GRAVEL DRAIN SYSTEM TO THE CORNER OF THE VAULT TO SUIT THE FIELD CONDITIONS.
NOTE:

ELECTRICAL HANDHOLE DIMENSIONS ARE 18 INCH BY 12 INCH BY 12 INCH MINIMUM.
The image contains a diagram of a small electrical handhole with a conduit. The diagram includes labels such as "PVC-coated RGS ELEC COND," "PVC-coated "BUB" CONDULET," and "3/4" CRUSHED ROCK, 6" MIN THK." A table is also present with the heading "LARGEST SIZE MIN INT EHH LENGTH" and entries for sizes such as "1" with a minimum of 30", "1 1/4" with 36", and so on.

The diagram includes notes such as "PRECAST EHH W/ RECESSED LIFTING HANDLES," "SEE TABLE FOR MIN INT L," and "1" (TYP)."

The text at the bottom of the image states: "NOTE: DESIGN PRECAST CONCRETE ELECTRICAL HANDHOLE IN ACCORDANCE WITH ASTM C 857 AND ASTM C 858. VAULT AND LID DESIGN LOADING SHALL BE AASHTO H-20, WITH IMPACT."
ISO VIEW

SST CONC AHR
3/8" x 3 1/2" LG
OR ENGR APPD EQ
(TYP)

90° / FTG
STRUT C W/
NUT W/ SPRING
STRUT C (TYP)

PIPE CLAMP W/UNICUSHION
ISOLATION MATL STRUT C
(TYP)

HEX HEAD BOLT, NUT, &
LOCK WASHER, HOT DIPPED
(TYP)

COND

CHANNEL STRUT C W/
END CAP (TYP)

CHANNEL STRUT C
W/ END CAP

LENGTH AS REQD

STRUT C
CHANNEL

CHANNEL STRUT C W/
END CAP

ANGULAR STRUT C
FTG (TYP)

CHANNEL NUT W/ SPRING
HOT DIPPED GALV (TYP)

26089
STRUT CHANNEL WALL
BRACKET CONDUIT RACKING
SYSTEM

DRAWN BY: ROMERO
CHECK BY: K ROSS/ KLR
APPROVED BY: 
ORI GINATION DATE: JULY 2021
REVISION DATE:
NOTES:

1. LENGTH VARIES WITH NUMBER OF ELECTRICAL CONDUITS TO BE SUPPORTED AND SPACING BETWEEN ELECTRICAL CONDUITS.

2. SIZE HANGER RODS FOR LOADS AND SPACING. SUBMIT CALCULATIONS FOR APPROVAL.

3. ALLOWABLE SPAN, NUMBER AND SIZE OF SUPPORT RODS AND ALLOWABLE LOADING IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS.

4. FOR HANGER ROD SUPPORT IN CONCRETE APPLICATIONS, USE SWIVEL CONCRETE INSERTS. FOR STEEL BEAM APPLICATIONS, USE SWIVEL BEAM CLAMPS.

5. ALL MATERIALS INCLUDING HARDWARE SHALL BE STAINLESS STEEL IN WET AND CORROSIVE AREAS.

6. SPACE ELECTRICAL CONDUIT SUFFICIENTLY TO ALLOW REMOVAL OF ONE CONDUIT WITHOUT DISTURBING ADJACENT ELECTRICAL CONDUITS.

7. INSTALL RACK MOUNTED ELECTRICAL CONDUIT IN ACCORDANCE WITH THIS DETAIL.
NOTES:

1. PLACE HORIZONTAL PIPES ABOUT THE SUPPORTS AS SYMMETRICALLY AS POSSIBLE.

2. PLACE EXPANSION ANCHORS ON 12 INCH CENTERS AS NECESSARY, BUT IN NO CASE SHALL THERE BE FEWER THAN 3 EXPANSION ANCHORS PER SECTION OF STRUT CHANNEL (ONE AT EACH END AND ONE IN THE CENTER). CAP OPEN ENDS OF STRUT CHANNELS.
NOTE:

PROVIDE AND INSTALL CONCRETE INSERT STRUT CHANNEL CAPABLE OF HANDLING THE LOADING OF TWICE ALL CONDUITS, CONDUCTORS, AND CLAMPS. SUBMIT CALCULATIONS FOR APPROVAL.

26092
STRUT CHANNEL
CONCRETE INSERT
NOTE:
MOUNTING HARDWARE SHALL BE 18-8 STAINLESS STEEL.
NOTES:

1. HANGER RODS SHALL BE SIZED FOR LOADS AND SPACING. CALCULATIONS SHALL BE SUBMITTED FOR APPROVAL.

2. ALLOWABLE SPAN, NUMBER AND SIZE OF SUPPORT RODS, AND ALLOWABLE LOADING SHALL BE IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS.

3. ALL HARDWARE SHALL BE STAINLESS STEEL.

26095
STRUT CHANNEL
ATTACHMENT TO PRECAST TEES
ACROSS

STL JOIST (TYP)

DECK - SEE STRUCT

STL JOIST (TYP)

SQ U-BOLT W/ TOP WASHER PL (TYP)

STRUT C

4" MIN 6" MAX (TYP)

1

TACK WASHER PL TO CHORD C

ALONG

DECK - SEE STRUCT

STL JOIST

4" MAX

JOIST PNL POINTS

4" MAX

SQ U-BOLT AROUND STRUT C W/ TOP WASHER PL (TYP)

STRUT C

KEYED NOTES:

1. WHERE CHANNEL IS OFFSET FROM JOIST PANEL POINT BY MORE THAN 4 INCHES ADD LOAD POINT BRACE.

2. LOCATE U-BOLTS MAXIMUM 4 INCHES PAST JOIST PANEL POINTS NEAREST EACH END OF LUMINAIRES AND MAXIMUM 48 INCHES ALONG STRUT CHANNEL.
NOTE:
SLOPE CONTAINMENT SLAB TO DRAIN (1/4 INCH PER FOOT).

26120
TRANSFORMER PAD WITH
CONTAINMENT CURB
NOTE:
ELECTRICAL CONDUIT 90 DEGREE ELBOWS AND RISER ELECTRICAL CONDUITS SHALL BE POLYVINYL CHLORIDE COATED RIGID GALVANIZED STEEL.
NOTES:
1. ALL ELECTRICAL CONDUITS SHALL BE POLYVINYL CHLORIDE COATED.
2. INSTALL 2 INCHES OF INSULATION ON PIPE AND VALVES.
3. INSTALL 2 INCHES OF INSULATION MINIMUM BELOW SURFACE OF SLAB.
4. INSTALL HEAT TAPE 3 INCHES FROM CONCRETE EDGE.
NOTES:

1. ELECTRIC UTILITY (HEAVY DUTY) APPROVED SERVICE METER PEDESTAL. INCLUDE PAD MOUNTING KIT, 24 INCH MINIMUM WIDTH.

2. PEDESTAL SHALL MEET REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE AND ELECTRICAL UTILITY HAVING JURISDICTION.
NOTES:

1. ELECTRIC UTILITY (HEAVY DUTY) APPROVED SERVICE METER PEDESTAL. INCLUDE PAD MOUNTING KIT, 24 INCH MINIMUM WIDTH.

2. PEDESTAL SHALL MEET REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE AND ELECTRICAL UTILITY HAVING JURISDICTION.
ATTACH TO WALL USING 1/8-8 SST EXP AHR (TYP)

WALL MTC HOLE
(TYP 4 PL)

STOP FOR LIMITING ROTATION

SWIVEL BOLT PERMITS HTR TO BE
ROTATED TO FACE DESIRED DIRECTION,
4 BOLTS ARE PROVIDED FOR FLG
ATTACHMENT OF SWIVEL BRACKET TO
WELDED FASTENERS ON TOP OF UNIT

NOTE:
MINIMUM MOUNTING HEIGHT SHALL BE APPROVED BY THE ENGINEER.

26230
ELECTRIC UNIT HEATER
MOUNTING
#4/0 AWG Stranded Bare Cu (Typ)

#4/0 AWG Stranded Bare Cu

#1 AWG Stranded Bare Cu

#6 AWG Solid Bare Cu

26263
GROUND GRID CABLE
TEE AND TEE REDUCER

DRAWN BY: ROMER
CHECKED BY: K ROSS/ KLR
APPROVED BY: 
ORIGINAL DATE: JULY 2021
REVISION DATE:
NOTE:
ONLY INSERTION BRIDGES SHALL BE USED TO CONNECT MULTIPLE TERMINAL BLOCKS.

26265
CONTROL PANEL TERMINAL BLOCK GROUNDING
FRAME
TYPE A

COLUMN
TYPE B

1/4" x 2" BUS BAR MIN
BOLT (TYP)

WIDE FLG STL COL
NUT
1/4" x 2" BUS BAR MIN
BOLT

2-HOLE SPADE;
IEEE 837 RATED
SPLIT WASHER
BELLEVILLE WASHER

2-HOLE SPADE;
IEEE 837 RATED
SPLIT WASHER
BELLEVILLE WASHER

TAPPED THD HOLE

2-HOLE SPADE;
IEEE 837 RATED
SPLIT WASHER
BELLEVILLE WASHER

TAP & THD 3/8"
18-8 SST BOLTS
W/18-8 SST WASHERS

#8 AWG GND

26266
COLUMN AND FENCE GROUNDING
NOTE:

PROVIDE EQUIPOTENTIAL PLANE MEETING THE REQUIREMENTS OF NATIONAL ELECTRICAL CODE 682.33.
NOTES:

1. PAD SIZE SHALL BE MINIMUM INDICATED OR AS SHOWN ON THE DRAWINGS OR AS INDICATED BY THE MANUFACTURER.

2. THE SIZE, NUMBER, TYPE, LOCATION, AND THREAD PROJECTION OF THE ANCHOR BOLTS SHALL BE DETERMINED BY THE EQUIPMENT MANUFACTURER, AND SHALL BE AS APPROVED BY THE ENGINEER. ANCHOR BOLTS SHALL BE HELD IN POSITION WITH A ONE-PIECE TEMPLATE, MATCHING THE BASE PLATE, WHILE PAD IS BEING POURED.

3. ANCHOR BOLT SLEEVES SHALL BE USED TO PROVIDE THE ANCHOR BOLT A MINIMUM MOVEMENT OF 1/2 INCH IN ALL DIRECTIONS.

4. EQUIPMENT BASES SHALL BE INSTALLED LEVEL.

5. WEDGES OR SHIMS SHALL BE USED TO SUPPORT THE BASE WHILE THE NON-SHRINK GROUT IS PLACED. TEMPORARY LEVELING NUTS SHALL BE BACKED OFF. IF LEFT IN, THE WEDGES OR SHIMS SHALL NOT BE EXPOSED TO VIEW.

6. HEIGHT OF PADS SHALL BE THE MINIMUM REQUIRED FOR ANCHOR BOLT CLEARANCE. PROVIDE PROPER ANCHOR BOLT PROJECTION OUT OF SLAB (SEE TABLE BELOW). WHERE EQUIPMENT OR PIPING ELEVATION REQUIRE A PAD HEIGHT LESS THAN THE MINIMUM SHOWN, USE TYPE B WITH BLOCKOUT.

<table>
<thead>
<tr>
<th>AB Ø</th>
<th>1/2&quot;</th>
<th>5/8&quot;</th>
<th>3/4&quot;</th>
<th>7/8&quot;</th>
<th>1&quot;</th>
<th>1 1/4&quot;</th>
<th>1 3/8&quot;</th>
<th>1 1/2&quot;</th>
<th>1 3/4&quot;</th>
<th>2&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIN PAD HT</td>
<td>7&quot;</td>
<td>8 1/2&quot;</td>
<td>10&quot;</td>
<td>11&quot;</td>
<td>12 1/2&quot;</td>
<td>15&quot;</td>
<td>16 1/2&quot;</td>
<td>18&quot;</td>
<td>21&quot;</td>
<td>24&quot;</td>
</tr>
</tbody>
</table>

26300
CONCRETE
EQUIPMENT PADS
OPEN BOTTOM PANEL

ENCLOSED BOTTOM PANEL

CONCRETE PAD

26301
FREESTANDING EQUIPMENT MOUNTING ON CONCRETE PAD
**FLOAT SWITCH**

<table>
<thead>
<tr>
<th>FLOAT SWITCH</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLOAT SW #4</td>
<td>LSHA HIGH WATER ALARM</td>
</tr>
<tr>
<td>FLOAT SW #3</td>
<td>LSHH LAG PUMP ON, HIGH WATER ALARM</td>
</tr>
<tr>
<td>FLOAT SW #2</td>
<td>LSH LEAD PUMP ON</td>
</tr>
<tr>
<td>FLOAT SW #1</td>
<td>LSL PUMP OFF</td>
</tr>
</tbody>
</table>

**GROUND LINE**
PVC-COATED WATERTIGHT JB W/ CORD GRIPS, INSTL 12" (MAX) BELOW RISER LID
EXP/DEFL CPLG, WATERTIGHT, CORROSION RESISTANT, W/ GND STRAP ON ALL RACeways
PVC-COATED ELEC COND
#4/0 Cu GND BONDED TO JB
SEAL W/ ENGR APPD METHODS & MTL
NOTE:

EXIT OUT OF THE CONCRETE ENCASED DUCTBANK IN THE RESERVOIR.
NOTE:

REMOVE CEMENT MORTAR LINING AS REQUIRED TO INSTALL WELDED STUDS TO STEEL LINER PLATE. REPAIR LINING TO MATCH EXISTING IN ACCORDANCE WITH SPECIFICATION SECTION 09 97 13.03 PRIOR TO INSTALLING FIBERGLASS STRUT CHANNELS.
NOTE:

REMOVE CEMENT MORTAR LINING AS REQUIRED TO INSTALL WELDED STUDS TO STEEL LINER PLATE. REPAIR LINING TO MATCH EXISTING IN ACCORDANCE WITH SPECIFICATION SECTION 09 97 13.03 PRIOR TO INSTALLING FIBERGLASS STRUT CHANNELS.
NOTES:

1. THE LIGHTNING PROTECTION INSTALLATION DETAILS ARE THE MINIMUM ESTIMATED REQUIREMENTS.

2. CALCULATIONS FOR CONCRETE BASE DIMENSIONS, REINFORCING STEEL SIZES, AND ANCHOR BOLT SIZES SHALL BE APPROVED BY ENGINEER, AUTHORITY HAVING JURISDICTION, AND MANUFACTURER. CALCULATIONS FOR CONCRETE BASE SHALL BE BASED ON 110–MILES PER HOUR WIND SPEED OR AS REQUIRED BY AUTHORITY HAVING JURISDICTION.
PREVECTRON 3 "SELF-TEST" ELECTRONICALLY ACTIVATED STREAMER EMISSION (EASE) AIR TERMINAL

Cu CONDUCTOR INSIDE POLE TO CONN W/ CONDUCTORS AT TOP OF CAISSON

HINGEPOINT (EXTERN. WILL NOT INTERFERE W/ INTERNAL CONDUCTOR)

HEAVY DUTY FLEX WIRE PROTECTOR

Cu CONDUCTOR INSIDE POLE

Cu CONDUCTOR INSIDE POLE

HINGE POINT (EXTERN. WILL NOT INTERFERE W/ INTERNAL CONDUCTOR)

CALV STL EXTERNAL HINGED LIGHTNING PROTECTION MAST

26411
NOTE:

A minimum of 7 ground rods per down conductor shall be installed at 7 feet spacing minimum.
NOTES:

1. PLACE MOUNTING AND LEVELING BOLTS IN ACCORDANCE WITH MANUFACTURERS TEMPLATE. PROVIDE BOLT COVERS. FILL MOUNTING PLATE VOID WITH NON-SHRINK GROUT AFTER LEVELING.

2. CALCULATIONS FOR CONCRETE BASE DIMENSIONS, REINFORCING STEEL SIZES, AND ANCHOR BOLT SIZES SHALL BE APPROVED BY ENGINEER, AUTHORITY HAVING JURISDICTION, AND MANUFACTURER. CALCULATIONS FOR CONCRETE BASE SHALL BE BASED ON 110-MILES PER HOUR WIND SPEED OR AS REQUIRED BY AUTHORITY HAVING JURISDICTION.

DENVER WATER

1600 West 12th Ave
Denver, Colorado 80204-3412
T: 303.928.6000
F: 303.928.6199
denverwater.org
NOTES:

1. TYPE 3R ENCLOSURE, POWDER COATED ANSI 61 GREY, 12 GAUGE COLD ROLLED STEEL.

2. 5KVA RATED, 600A COPPER SILVER PLATED 1/4-INCH BY 4-INCHES COPPER BUS TYPICAL.

3. ADD BOTTOM ACCESS PANELS FOR POWER AND CONTROL HOOKUPS.
26509
LOW-HIGH BAY LIGHT
FIXTURE INSTALLATION

DIECAST RCPT HOOK/BOX
ELEC COND AS INDICATED
ON THE DWG
MALE LOOP &
PLUG ASSY
SAFETY CHAIN
ROOF DECK
ROOF JOIST OR BM

CONC INSERT
CONC SLAB
OR BEAM
1/2" RGS ELEC COND STEM
SPACER OR CLAMP
(TYP)
VAPORTIGHT BALL TYPE HANGER
CROUSE-HINDS GS TYPE
LTG FIXTURE TYPE AS
INDICATED IN SCHD

AS APPO
NOTES:

1. MOUNT LUMINAIRE NEAR LINE OF BUILDING.

2. DETAILS ARE TYPICAL. ACTUAL CONDITIONS MAY VARY. CONTRACTOR IS REQUIRED TO SUBMIT ALL DRAWINGS FOR APPROVAL BEFORE CONSTRUCTION.

3. JUNCTION BOX IN WALL MUST PROVIDE ADEQUATE FIXTURE SUPPORT.
Non-shrink grout

SST AHR bolts, nuts, lock washers, & leveling nuts in accordance w/ pole MFR reqmts

One-piece pole

Non-shrink grout

SST AHR bolts, nuts, lock washers, & leveling nuts in accordance w/ pole MFR reqmts

Hinged pole
NOTES:

1. COAT ALUMINUM SURFACES IN CONTACT WITH CONCRETE IN ACCORDANCE WITH SPECIFICATIONS.

2. "L" = LARGER OF EITHER OUTSIDE DIAMETER OF LIGHT POLE BASE (BASE COVER IF USED) PLUS 1 INCH OR 12 INCHES.

3. SEE ELECTRICAL DRAWING FOR CONDUIT ROUTING. PROVIDE HOLE IN BRACKET TOP PLATE WITH HOLE DIAMETER EQUAL TO CONDUIT OUTSIDE DIAMETER PLUS 1/2 INCH.
NOTE:

IN TRAFFIC AREAS CONCRETE PIER SHALL BE 3 FEET ABOVE GRADE MINIMUM.
WARNING

Arc Flash and Shock Hazard
Appropriate PPE Required

0'-5"
0.2 cal/cm²
Incident Energy Arc Flash Hazard at 18 Inches

Recommended Protection
Protective clothing, nonmelting or untreated fiber; Long-sleeve shirt and pants or coverall;
Face shield for projectile protection (AN); Safety glasses or safety goggles (SR);
Heavy-duty leather gloves, or rubber insulating gloves with leather protectors (AN);
AN: As needed, SR: Selection required.
Reference NFPA 70E 2018 Table 130.5(G) for Additional Details.

0.48 kV Shock Hazard when cover is removed - Class 0 Voltage Gloves
3'-6"
Limited Approach
1'-0"
Restricted Approach

Equipment Name and Label Number: SPLICE 1 AF TO COME
Fed by: DP5 MAIN
WARNING: Changes in the system configuration or equipment
settings may invalidate the label values and PPE requirements.

NOTES:

1. LABEL VALUES, EQUIPMENT NAME, AF####, AND SOURCE
FEED NAME SHALL BE AS DETERMINED BY THE ELECTRICAL
SYSTEMS ANALYSIS AND ENGINEER.

2. LABELS SHALL MEET ANSI Z535 REQUIREMENTS INCLUDING
ORANGE COLOR IN WARNING RECTANGLE, AND YELLOW
COLOR IN TRIANGLE.
WARNING

Arc Flash and Shock Hazard
Appropriate PPE Required

<table>
<thead>
<tr>
<th>3'-11&quot;</th>
<th>Arc Flash Boundary</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.9 cal/cm²</td>
<td>Incident Energy Arc Flash Hazard at 18 Inches</td>
</tr>
</tbody>
</table>

Recommended Protection

Arc-rated clothing with an arc rating equal to or greater than the estimated incident energy; Long-sleeve shirt and pants or coverall or arc flash suit (SR); Arc-rated face shield and arc-rated balaclava or arc flash suit hood (SR); Arc-rated outerwear (e.g., jacket, parka, rainwear, hard hat liner) (AN); Heavy-duty leather gloves, arc-rated gloves, or rubber insulating gloves with leather protectors (SR); Hard hat; Safety glasses or safety goggles (SR); Hearing protection; Leather footwear.

AN: As needed, SR: Selection required.
Reference NFPA 70E 2018 Table 130.5(G) for Additional Details.

<table>
<thead>
<tr>
<th>0.48 kV</th>
<th>Shock Hazard when cover is removed - Class 0 Voltage Gloves</th>
</tr>
</thead>
<tbody>
<tr>
<td>3'-6&quot;</td>
<td>Limited Approach</td>
</tr>
<tr>
<td>1'-0&quot;</td>
<td>Restricted Approach</td>
</tr>
</tbody>
</table>

Equipment Name and Label Number: RVS #1 AF1294
Fed by: F5-1L
WARNING: Changes in the system configuration or equipment settings may invalidate the label values and PPE requirements. Sept-18

NOTES:

1. LABEL VALUES, EQUIPMENT NAME, AF####, AND SOURCE FEED NAME SHALL BE AS DETERMINED BY THE ELECTRICAL SYSTEMS ANALYSIS AND ENGINEER.

2. LABELS SHALL MEET ANSI Z535 REQUIREMENTS INCLUDING ORANGE COLOR IN WARNING RECTANGLE, AND YELLOW COLOR IN TRIANGLE.
WARNING

Arc Flash and Shock Hazard
Appropriate PPE Required

39'-3"
28.8 cal/cm²
Arc Flash Boundary
Incident Energy Arc Flash Hazard at 18 Inches

Recommended Protection
Arc-rated clothing with an arc rating equal to or greater than the estimated incident energy;
Long-sleeve shirt and pants or coverall or arc flash suit (SR); Arc-rated arc flash suit hood;
Arc-rated outerwear (e.g., jacket, parka, rainwear, hard hat liner) (AN); Arc-rated gloves or
rubber insulating gloves with leather protectors (SR); Hard hat; Safety glasses or safety
goggles (SR); Hearing protection; Leather footwear.
AN: As needed, SR: Selection required.
Reference NFPA 70E 2018 Table 130.5(G) for Additional Details.

13.2
5'-0"
2'-2"
Arc Flash Boundary
Limited Approach
Restricted Approach

Equipment Name and Label Number: DS-4 AF1285
Fed by: DP-3 AF1219
WARNING: Changes in the system configuration or equipment
settings may invalidate the label values and PPE requirements.

NOTES:

1. LABEL VALUES, EQUIPMENT NAME, AF####, AND SOURCE
   FEED NAME SHALL BE AS DETERMINED BY THE ELECTRICAL
   SYSTEMS ANALYSIS AND ENGINEER.

2. LABELS SHALL MEET ANSI Z535 REQUIREMENTS INCLUDING
   ORANGE COLOR IN WARNING RECTANGLE, AND YELLOW
   COLOR IN TRIANGLE.
WARNING

Arc Flash and Shock Hazard
Appropriate PPE Required

39'-11"  Arc Flash Boundary
150.5 cal/cm²  Incident Energy Arc Flash Hazard at 18 Inches

Recommended Protection

Do Not Work on Energized Equipment

0.48  kV Shock Hazard when cover is removed

Do Not Remove Cover if Equipment is Energized

Equipment Name and Label Number: SWGR1 S2 AF1276
Fed by: 52-G1 AF1441
WARNING: Changes in the system configuration or equipment settings may invalidate the label values and PPE requirements.  Sep-18

NOTES:

1. LABEL VALUES, EQUIPMENT NAME, AF####, AND SOURCE FEED NAME SHALL BE AS DETERMINED BY THE ELECTRICAL SYSTEMS ANALYSIS AND ENGINEER.

2. LABELS SHALL MEET ANSI Z535 REQUIREMENTS INCLUDING ORANGE COLOR IN WARNING RECTANGLE, AND YELLOW COLOR IN TRIANGLE.

26703
ARC FLASH ABOVE
40 cal/cm² LABEL
CONDUIT ID

TEST STATION ID

NOTES:

TEXT: 0.188 INCH HEADER
0.11 INCH TEXT
TEXT CENTERED ON TAG

TAG: 0.125 INCH THICKNESS
LASER ENGRAVED STAINLESS STEEL
1.5 INCH DIAMETER
KEYED NOTES:

1. VICKERS DG4S4-012C-BB-60 DIRECTIONAL CONTROL VALVE, 3-POSITION, 4-WAY, DOUBLE SOLENOID SPRING-CENTERED 120V/1Φ/60Hz

2. ASCO 8210B059 SOLENOID VALVE, NORMALLY OPEN, 120V/1Φ, 60Hz
NOTES:

1. THIS DETAIL APPLIES TO OUTSIDE METER SETTINGS AS SHOWN AND TO INSIDE METER SETTINGS.

2. FOR COMPOUND METERS, INSTALL 2 ELECTRICAL BOXES SIDE-BY-SIDE. RUN 2 SIGNAL CABLES IN A SINGLE CONDUIT TO THE METER LOCATION.

3. THE AUTOMATIC METER READING DEVICE MAY BE MOUNTED ON A POST ADJACENT TO THE METER PIT/VAULT WITH DENVER WATER APPROVAL.

26850
REMOTE AUTOMATIC METER READING DEVICE INSTALLATION
### PROFIBUS DP CABLE SPECIFICATION TABLE:

<table>
<thead>
<tr>
<th>Baud Rate (kb/aud)</th>
<th>9.6</th>
<th>19.2</th>
<th>93.75</th>
<th>187.5</th>
<th>500</th>
<th>1500</th>
<th>12000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Segment Length (Metered)</td>
<td>1200m</td>
<td>1200m</td>
<td>1200m</td>
<td>1000m</td>
<td>400m</td>
<td>200m</td>
<td>100m</td>
</tr>
<tr>
<td>Maximum Spur Length (Metered)</td>
<td>500m</td>
<td>500m</td>
<td>100m</td>
<td>33m</td>
<td>20m</td>
<td>6.6m</td>
<td>0m</td>
</tr>
</tbody>
</table>

### PIN ASSIGNMENT FOR DB9 (9-PIN SUB-D) CONNECTOR:

<table>
<thead>
<tr>
<th>Pin No</th>
<th>Signal</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shield</td>
<td>Ground for +24V output voltage</td>
</tr>
<tr>
<td>2</td>
<td>M24</td>
<td>Shield/functional ground</td>
</tr>
<tr>
<td>3</td>
<td>RxD/RxD-P</td>
<td>Receive/Transmit Data – Plus (B wire, red)</td>
</tr>
<tr>
<td>4</td>
<td>CNTR-P</td>
<td>Repeater Control Signal (Direction Control), RTS signal</td>
</tr>
<tr>
<td>5</td>
<td>DOND</td>
<td>Data Ground (Reference Potential for VP)</td>
</tr>
<tr>
<td>6</td>
<td>VP*</td>
<td>Supply Voltage – Plus (5V)</td>
</tr>
<tr>
<td>7</td>
<td>P24</td>
<td>Output Voltage +24V</td>
</tr>
<tr>
<td>8</td>
<td>RxD/RxD-N</td>
<td>Receive/Transmit Data – Minus (A wire, green)</td>
</tr>
<tr>
<td>9</td>
<td>CNTR-N</td>
<td>Repeater Control Signal (Direction Control)</td>
</tr>
</tbody>
</table>

*Signals are mandatory and must be provided. Other signals are optional.*

### PROFIBUS PA CABLE SPECIFICATION TABLE: 31.25 kbaud

<table>
<thead>
<tr>
<th>Maximum Segment Length</th>
<th>Maximum Spur Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900m</td>
<td># of Devices in Segment</td>
</tr>
<tr>
<td>25–32</td>
<td>1m</td>
</tr>
<tr>
<td>19–24</td>
<td>30m</td>
</tr>
<tr>
<td>15–18</td>
<td>60m</td>
</tr>
<tr>
<td>13–14</td>
<td>90m</td>
</tr>
<tr>
<td>1–12</td>
<td>120m</td>
</tr>
</tbody>
</table>

1900m (Intrinsically Safe) N/A N/A N/A N/A
860m (Intrinsically Safe) N/A N/A N/A N/A

### PROFIBUS DP 2C CABLE: 0.335" OVERALL DIAMETER

Jacket: Purple

### PROFIBUS DP 4C CABLE: 0.38" OVERALL DIAMETER

Jacket: Orange or Blue (Intrinsically Safe)

---

27015
PROFIBUS CABLE CONFIGURATION

DENVER WATER
1600 West 12th Ave
Denver, Colorado 80220—3412
T: 303-628-6500
F: 303-628-6199
denverwater.org

DRAWN BY: ROMERO
CHECKED BY: K ROSS/KLR
APPROVED BY: 
ORIGINATION DATE: JULY 2021
REVISION DATE: 
NOTES:
1. MOUNTED AT TOP OF WALL.
2. USE ANGLE BRACKET IF MOUNTED ON CORNER.

CAMERA POO

MTG BRACKET

EXT WALL

28112
SECURITY CAMERA
WALL MOUNT
NOTE:
INSTALL ETHERNET SURGE PROTECTOR INSIDE MOGUL CONDULET. CONNECT THE GROUND STRAP FROM SURGE PROTECTOR TO THE LIGHT POLE GROUND.
NOTE:
INSTALL ETHERNET SURGE PROTECTOR INSIDE MOGUL CONDULET. CONNECT THE GROUND STRAP FROM SURGE PROTECTOR TO THE LIGHT POLE GROUND.
NOTES:

1. INLINE ETHERNET SURGE PROTECTOR CONNECTORS SHALL BE RJ45 10 BASE-T/100 BASE-TX PoE.

2. INLINE ETHERNET SURGE PROTECTOR AND RJ45 SHIELDS SHALL BE GROUNDED THROUGH RACEWAY SYSTEM AND FD BOX BY #14 AMERICAN WIRE GAUGE STRAND GROUND WITH COMPRESSION TERMINAL CONNECTOR.
OUTDOOR WALL MOUNTED CAMERA

NOTES:

1. INLINE ETHERNET SURGE PROTECTOR CONNECTORS SHALL BE RJ45 10 BASE-T/100 BASE-TX PoE.

2. INLINE ETHERNET SURGE PROTECTOR AND RJ45 SHIELDS SHALL BE GROUNDED THROUGH RACEWAY SYSTEM AND FD BOX BY #14 AMERICAN WIRE GAUGE STRAND GROUND WITH COMPRESSION TERMINAL CONNECTOR.
NOTE:

INSTALL ETHERNET SURGE PROTECTOR INSIDE MOGUL CONDULET. CONNECT THE GROUND STRAP FROM SURGE PROTECTOR TO THE EXISTING BUILDING GROUND.
NOTES:

1. TRENCH SHALL CONFORM TO APPLICABLE OSHA REQUIREMENTS.

2. ADDITIONAL CATHODIC PROTECTION MAY BE REQUIRED ALONG THE PIPE IF THERE IS A TRANSITION FROM CONTROLLED LOW STRENGTH MATERIAL TO GRANULAR PIPE ZONE MATERIAL.

31001
TYPICAL TRENCH SECTION FOR PIPE 24"Ø AND LARGER
NOTES:

1. MINIMUM COVER SHALL BE 4 FEET 6 INCHES BELOW THE GROUND LINE.

2. TRENCH SHALL CONFORM TO APPLICABLE OSHA REQUIREMENTS.
NOTES:

1. TRENCH SHALL CONFORM TO APPLICABLE OSHA REQUIREMENTS.

2. ENGINEER APPROVAL IS REQUIRED PRIOR TO BACKFILL.
NOTES:

1. TRENCH SHALL CONFORM TO APPLICABLE OSHA REQUIREMENTS.

2. ADDITIONAL CATHODIC PROTECTION MAY BE REQUIRED ALONG THE PIPE AT THE TRANSITION FROM CONTROLLED LOW STRENGTH MATERIAL TO GRANULAR PIPE ZONE MATERIAL.
31005
VACUUM EXCAVATION HOLE PAVEMENT REPAIR

NOTES:
1. DIMENSIONS ARE NOMINAL.
2. EDGES SHALL BE CUT TO A NEAT VERTICAL FACE.
TYPICAL SHALLOW CROSSING

TYPICAL DEEP CROSSING

NOTE:
USE **31009** IN CONJUNCTION WITH THIS DETAIL.
LEGEND

BACKFILL MATERIAL SPECIFICATION:
- NON–GRANULAR
- PLASTICITY INDEX: GREATER THAN 7
- GRADATION: 100% PASSING NUMBER 4 SIEVE
  50% MINIMUM PASSING NUMBER 200 SIEVE
CLSM ALLOWED IF APPROVED BY DENVER WATER

SIEVE:
- 95% COMPACTION DRY DENSITY AS DETERMINED BY ASTM D 698 WITH MOISTURE CONTENT FROM OPTIMUM TO 2% ABOVE OPTIMUM.
- WRITTEN PROOF FROM A CERTIFIED SOILS LAB IS REQUIRED PRIOR TO ANY MATERIAL INSTALLATION AT THE SITE.
- NO ORGANIC FILL IS ALLOWED.
- CLAY MATERIAL MUST ADHERE TO THE ABOVE REFERENCED SPECIFICATIONS & MUST BE INSTALLED THE ENTIRE LENGTH & WIDTH OF EXCAVATION.

PIPE BEDDING PER CPSCS SECTION 31.23.33

CLSM – FLOW FIL: IN ACCORDANCE WITH DENVER WATER CPSCS SECTION 31.23.33 AS SUMMARIZED BELOW. SEE CPSCS SECTION 31.23.33 AND CPSCS SECTION. 31.23.16 FOR ADDITIONAL EXCAVATION AN BACKFILL REQUIREMENTS.

1. GENERAL:
   A. COMPRESSIVE STRENGTH BETWEEN 50 PSI AND 150 PSI AT 28 DAYS WHEN TESTED IN ACCORDANCE WITH ASTM D 4832.
   B. CLSM PLACED IN PIPE ZONE OR IN AREAS THAT MAY REQUIRE FUTURE EXCAVATION SHALL HAVE RE LESS THAN 1.5, AS CALCULATED BY RE = W^0.6\times10^4\times0.5
   C. THE MAXIMUM LIFT THICKNESS SHALL BE 3–FEET UNLESS OTHERWISE APPROVED BY THE ENGINEER.
   D. PROVIDE ADEQUATE CURE TIME FOR FLOW FIL LIFTS BEFORE PLACING SUBSEQUENT LIFTS ABOVE.
   E. ANY DAMAGE TO PIPES, STRUCTURES, OR SOIL FAILURES CAUSED BY TOO THICK OF LIFTS OR INADEQUATE CURE TIMES SHALL BE REPAIRED AT THE CONTRACTOR’S EXPENSE.

2. CEMENTITIOUS MATERIALS:
   A. CEMENT: TYPE II PORTLAND CEMENT IN ACCORDANCE WITH ASTM C 150.
   B. FLY ASH: CLASS C OR CLASS F, IN ACCORDANCE WITH ASTM C 618.

3. AGGREGATES: GRADING AND QUALITY REQUIREMENTS IN ACCORDANCE WITH ASTM C 33.

4. WATER: IN ACCORDANCE WITH ASTM C 94.

5. ADMIXTURES:
   A. CHEMICAL ADMIXTURES THAT DO NOT CONTAIN CALCIUM CHLORIDE AND ARE IN ACCORDANCE WITH ASTM C 494 FOR CONCRETE MAY BE USED IN CLSM MIX.
   B. COMPATIBLE WITH CEMENT AND OTHER ADMIXTURES IN BATCH.

6. PIPE ZONE:
   A. BEFORE PLACING CLSM, VERIFY WITH THE ENGINEER THAT CP IS ADEQUATE AT TRANSITION AREAS FROM CLSM TO SOIL.
   B. MAXIMUM AIR CONTENT OF 8%.
NOTE:

6-INCH CRUSHED FINES TRAIL PATH CUT AND TREADED WITH PRE-EMERGENT GRANULAR HERBICIDE CONTAINING 4% DICHLOROBENIL, SUCH AS: OHP INC’S CASORON 4G, PBI GORDON CORP’S BARRIER, OR APPROVED EQUAL.
ELEVATION

RIPRAP DETAILS

<table>
<thead>
<tr>
<th>RIPRAP TYPE</th>
<th>D_{50}</th>
<th>RIPRAP DEPTH (2*D_{50})</th>
<th>BEDDING</th>
</tr>
</thead>
<tbody>
<tr>
<td>'L'</td>
<td>9&quot;</td>
<td>18&quot;</td>
<td>4&quot; TYPE II BEDDING OVER 4&quot; OF TYPE I BEDDING OR 12&quot; OF TYPE II BEDDING</td>
</tr>
<tr>
<td>'M'</td>
<td>12&quot;</td>
<td>24&quot;</td>
<td>4&quot; TYPE II BEDDING OVER 4&quot; OF TYPE I BEDDING OR 12&quot; OF TYPE II BEDDING</td>
</tr>
<tr>
<td>'H'</td>
<td>18&quot;</td>
<td>36&quot;</td>
<td>6&quot; TYPE II BEDDING OVER 4&quot; OF TYPE I BEDDING OR 12&quot; OF TYPE II BEDDING</td>
</tr>
</tbody>
</table>

NOTES:

1. REFERENCE GRADING PLANS FOR EXTENTS OF SOIL AND SOIL RIPRAP.

2. REFERENCE DETAIL 31021 FOR TYPICAL SOIL RIPRAP DETAILS.

3. RIPRAP LENGTH SPECIFIED ON PLANS AT CULVERT END SECTIONS IS FOR LENGTH FROM INVERT OUT OF THE END SECTION TO THE END OF RIPRAP. RIPRAP SHALL BE INSTALLED UPSTREAM TO THE START OF THE END SECTION.
ONE-INCH THICK WOOD STAKE DETAIL

TYPICAL SECTION
SOIL RIPRAP WITH MULCH

NOTES:
1. SOIL RIPRAP DETAILS ARE APPLICABLE TO SLOPED AREAS. REFER TO THE SITE PLAN ACTUAL LOCATIONS AND LIMITS.

2. MIX UNIFORMLY 65% RIPRAP BY VOLUME WITH 35% OF APPROVED SOIL BY VOLUME PRIOR TO PLACEMENT.

3. PLACE STONES—SOIL MIX TO RESULT IN SECURELY INTERLOCKED ROCK AT THE DESIGN THICKNESS AND GRADE. COMPACT AND LEVEL TO ELIMINATE ALL VOIDS AND ROCKS PROJECTING ABOVE DESIGN RIPRAP TOP GRADE.

4. CRIMP OR TACKIFY MULCH OR USE APPROVED HYDROMULCH AS CALLED FOR IN THE PLANS AND SPECIFICATIONS.
32001
AMERISTAR
AEGIS II GENESIS 2–RAIL
FENCE INSTALLATION
ELEVATION

32002
AMERISTAR
AEGIS II GENESIS 2–RAIL
SINGLE GATE INSTALLATION

DENVER WATER
1500 West 12th Ave
Denver, Colorado 80204–3412
T: 303.828.6200
F: 303.828.6199
denverwater.org
ELEVATION

RAKING DIRECTIONAL ARROW, WELDED
PNL CAN BE RAKED 2'-6" OVER
8'-0" W/ ARROW POINTING ON OR

MONTAGE II RAIL 1 3/4"x 1 3/4"x 14 GA

CLASS B CONC BASE (TYP)

GROUND LINE

QUAD-FLARE FINIAL

MONTAGE II RAIL (TYP)

PICKET-1" SQ x 14 GA

SQ POST

BRACKET W/ SECURITY FASTENER

PROFUSION WELDING PROCESS

INDUSTRIAL SWIVEL BRACKET

INDUSTRIAL FLAT MOUNT BRACKET

32004
AMERISTAR
MONTAGE II GENESIS
2-RAIL PANEL
AS REQD FOR LOCK ASSY

32004 (TYP)

QUAD-FRAME FINIAL

WELDED BOX HINGE

PICTET—1" SQ x 14 GA

GATE END—2" SQ x 11 GA (TYP)

GATE POST

GUSSET

GROUND LINE

LOCK BOX AND LATCH

CLASS B CONC BASE (TYP)

4" POST WIDTH (TYP)

8'-0"

15'-0"

VARES

ELEVATION
### FENCE MATERIAL

<table>
<thead>
<tr>
<th>H</th>
<th>ROUND PIPE ID</th>
<th>ROLL-FORMED STL</th>
<th>ROUND PIPE ID</th>
<th>ROLL-FORMED STL</th>
<th>ROUND PIPE ID</th>
<th>ROLL-FORMED STL</th>
</tr>
</thead>
<tbody>
<tr>
<td>3' THRU 6'</td>
<td>2.5&quot;</td>
<td>3.5&quot; x 3.5&quot;</td>
<td>1.5&quot;</td>
<td>1.875&quot; x 1.625&quot;</td>
<td>1.25&quot;</td>
<td>1.25&quot; x 1.625&quot;</td>
</tr>
<tr>
<td>&gt; 6' THRU 8'</td>
<td>2.5&quot;</td>
<td>3.5&quot; x 3.5&quot;</td>
<td>2.0&quot;</td>
<td>1.875&quot; x 1.625&quot;</td>
<td>1.25&quot;</td>
<td>1.25&quot; x 1.625&quot;</td>
</tr>
<tr>
<td>&gt; 8' THRU 12'</td>
<td>2.5&quot;</td>
<td>3.5&quot; x 3.5&quot;</td>
<td>2.0&quot;</td>
<td>2.250&quot; x 1.625&quot;</td>
<td>1.25&quot;</td>
<td>1.25&quot; x 1.625&quot;</td>
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### ORDINARY PIPE

<table>
<thead>
<tr>
<th>NOMINAL ID</th>
<th>OD</th>
<th>WALL THK</th>
<th>WT (LB/FT)</th>
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<tr>
<td>1.25&quot;</td>
<td>1.660&quot;</td>
<td>0.140&quot;</td>
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<tr>
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<tr>
<td>3.00&quot;</td>
<td>3.500&quot;</td>
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<tr>
<td>3.50&quot;</td>
<td>4.000&quot;</td>
<td>0.226&quot;</td>
<td>9.11</td>
</tr>
<tr>
<td>4.00&quot;</td>
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<td>6.00&quot;</td>
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<td>0.280&quot;</td>
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<tr>
<td>8.00&quot;</td>
<td>8.625&quot;</td>
<td>0.322&quot;</td>
<td>28.55</td>
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### GATE MATERIAL

<table>
<thead>
<tr>
<th>GATE FRAME WIDTH</th>
<th>STRAIN POST</th>
<th>CONC BASE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROUND ID</td>
<td>ROLL-FORMED</td>
<td>DEPTH</td>
</tr>
<tr>
<td>3' THRU 6'</td>
<td>2.5&quot;</td>
<td>3.5&quot; x 3.5&quot;</td>
</tr>
<tr>
<td>&gt; 6' THRU 8'</td>
<td>3.5&quot;</td>
<td>----</td>
</tr>
<tr>
<td>&gt; 8' THRU 12'</td>
<td>6.0&quot;</td>
<td>----</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GATE FRAME</th>
<th>FRAME PIPE ID</th>
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</thead>
<tbody>
<tr>
<td>WIDTH</td>
<td>HT</td>
</tr>
<tr>
<td>3' THRU 6'</td>
<td>3' THRU 6'</td>
</tr>
<tr>
<td>&gt; 8' THRU 23'</td>
<td>8'</td>
</tr>
<tr>
<td>&gt; 8' THRU 23'</td>
<td>&gt; 8' THRU 12'</td>
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</table>

### ROLL-FORMED STEEL

<table>
<thead>
<tr>
<th>PART</th>
<th>SIZE</th>
<th>THK (GAUGE)</th>
<th>WT (LB/FT)</th>
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<tbody>
<tr>
<td>TOP &amp; BRACE RAILS</td>
<td>1.250&quot; x 1.625&quot;</td>
<td>14</td>
<td>2.08</td>
</tr>
<tr>
<td>LINE POST (H: 3' - 6')</td>
<td>1.875&quot; x 1.625&quot;</td>
<td>12</td>
<td>2.75</td>
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<tr>
<td>LINE POST (H: &gt; 6' - 8')</td>
<td>1.875&quot; x 1.625&quot;</td>
<td>11</td>
<td>3.36</td>
</tr>
<tr>
<td>LINE POST (H: &gt; 8' - 12')</td>
<td>2.250&quot; x 1.625&quot;</td>
<td>11</td>
<td>4.02</td>
</tr>
<tr>
<td>END, CORNER, &amp; LINE BRACE POSTS</td>
<td>3.50&quot; x 3.5&quot;</td>
<td>10</td>
<td>7.59</td>
</tr>
</tbody>
</table>
LEGEND:

* ATTACH FABRIC TO ALL FENCE AND GATE STRUCTURES AT 1'-0" INTERVALS VERTICAL AND AT 1'-8" HORIZONTAL.

\(\checkmark\) TIGHTENER OR TURNBUCKLE SYMBOL.

NOTES:

1. CHAIN LINK FENCE, GATE, AND HARDWARE SHALL MEET CDOT STANDARD PLAN NUMBER M-607-2 FOR ROUND PIPE FRAMING.

2. POST AND FRAME SIZES IN ACCORDANCE WITH 32010.
NOTE:
SLOPE TOP OUT 45 DEGREES.
BARBED WIRE TOP

LEGEND:
* ATTACH FABRIC TO ALL FENCE AND GATE STRUCTURES AT 1'-0" INTERVALS VERTICAL AND AT 1'-8" HORIZONTAL.
\* TIGHTENER OR TURNBUCKLE SYMBOL.

NOTES:
1. CHAIN LINK FENCE, GATE, AND HARDWARE SHALL MEET CDOT STANDARD PLAN NUMBER M-607-2 FOR ROUND PIPE FRAMING.
2. POST AND FRAME SIZES IN ACCORDANCE WITH 32010.

32012
8' CHAIN LINK FENCE
WITH BARBED WIRE
NOTE:

POST, FRAME, AND CONCRETE BASE SIZES IN ACCORDANCE WITH 32010.

32013
DOUBLE SWING GATE
NOTE:
POST, FRAME, AND CONCRETE BASE SIZES IN ACCORDANCE WITH 32010 (TYP).
NOTE:
POST, FRAME, AND CONCRETE BASE SIZES IN ACCORDANCE WITH 32010.
NOTE:

POST, FRAME, AND CONCRETE BASE SIZES IN ACCORDANCE WITH 32010.

32016
SINGLE SWING GATE
WITH BARBED WIRE
LEGEND:

* ATTACH FABRIC TO ALL FENCE AND GATE STRUCTURES AT 1'-0" INTERVALS VERTICALLY AND AT 1'-8" HORIZONTALLY

TIGHTENER OR TURNBUCKLE SYMBOL

+ BRACE RAIL IS NOT REQUIRED FOR 36", 42", OR 48" FABRIC HEIGHTS. BRACE RAIL FOR FENCE WITH ROLL-FORMED STEEL ELEMENTS IS 1'-0" BELOW THE TOP RAIL

NOTES:

1. CHAIN LINK FENCE, GATE, AND HARDWARE SHALL MEET CDOT STANDARD PLAN NUMBER M-607-2 FOR ROUND PIPE FRAMING.

2. POST AND FRAME SIZES IN ACCORDANCE WITH 32010.
NOTES:

1. GATE AND POSTS SHALL BE PAINTED WITH PITTSBURGH PAINT, TWO PART EPOXY, PART NUMBERS B95–249 AND A95–2402 IN AVOCADO GREEN.

2. HINGES ARE 1/2-INCH BY 1 1/2-INCH FLAT BAR 3 INCHES LONG WITH 5/8-INCH ROUND PIN.

3. 12-FOOT GATE OUTSIDE TO OUTSIDE 11-FOOT 7 5/8-INCH DIAGONAL PIECES AT 3-FOOT 11 5/8-INCH DIAGONAL PIECES CUT AT 48 DEGREES.

4. PLUG WELD INSIDE DIAMETER AFTER PLACING BAR INTO DRILLED HOLE.

5. LOCATE AFTER GATE ASSEMBLY HINGES HAVE BEEN WELDED KEEPING GATE ASSEMBLY LEVEL.
3 STRAND BARBED WIRE & POST BRACKETS OPTIONAL

6 GA WELDED WIRE MESH PNL (TYP)

REINF V-FOLD (4/PNL)

2.5" MIN LINE OR END POST (TYP)

LINE OR END BRACKETS 7 MIN/POST (TYP)

GROUND LINE

SIDE

ELEVATION

12" Ø CLASS B CONC BASE (TYP)

NOTE:
APPROXIMATE WELDED WIRE MESH GRID PATTERN – 2" x 6".

END/GATE BRACKET ASSEMBLY LINE BRACKET ASSEMBLY

DENVER WATER
1600 West 12th Ave
Denver, Colorado 80204-3412
T: 303.828.6000
F: 303.828.6109
denverwater.org

DRAWN BY: BERKNESS
CHK'D BY: K ROSS/KUR
APPROVED BY: 
DATE: JULY 2021
REVISED DATE:

ARCHITECTURAL WELDED WIRE FENCE PANEL

32019
HARD EDGE FABRIC

STEEL EDGING AND FABRIC

DENVER WATER
1600 West 12th Ave
Denver, Colorado 80204-3412
T: 303.938.6200
F: 303.938.6199
denverwater.org

32025
LANDSCAPE EDGING

DRAWN BY: MCMILLEN
CHECKED BY: K ROSS/KLR
APPROVED BY: 
ORIGINATION DATE: JULY 2021
REVISION DATE:
NOTE:

TREE WRAP ONLY REQUIRED IF EXCAVATION IS WITHIN CRITICAL ROOT ZONE.

32026
TREE PROTECTION FENCE
DO NOT PRUNE OR DAMAGE MAIN LEADER; PRUNING OF OTHER BRANCHES IS ONLY ALLOWED W/ APPROVAL

PROTECT TREE CANOPY WHEN IN TRANSIT; HEEL-IN & MULCH TREES TO BE STORED IN STAGING AREA

INSTL TWO 6' T-POSTS ON E/W ORIENTATION; PLUMB POSTS IN LOC TO AVOID CONTACT W/ ANY BRANCHES (MIN 3' FROM EXCAVATION)

MULCH TO A DEPTH OF 3"

CREATE 4" HIGH RAISED WATERING BERM AROUND EDGE OF TREE PLANTING EXCAVATION

BACKFILL MIX = 1/2 COMPOST & 1/2 EXCAVATED MTRL; MIX THOROUGHLY; COMPACT BACKFILL MIX IN BOT OF EXCAVATION BEFORE ROOT BALL INSTL; COMPACT IN LIFTS; WTR AFTET TREE INSTL

USE FABRIC TREE STRAPS W/ 12 GA WIRE; LOC JUST BELOW FIRST SET OF BRANCHES OR WHERE WIRE WILL NOT RUB AGAINST BRANCHES

TREE WRAP FROM BOT TO TOP & SECURE TIGHTLY

PLANT W/ TOP OF ROOT BALL 2" ABOVE GROUND LINE

GROUND LINE

EXCAVATE HOLE # 16" LARGER THAN ROOT BALL; EXCAVATION WIDTH SAME AT TOP OF HOLE

REMOVE PLASTIC OR WIRE BASKET MTRL; REMOVE BURLAP FROM TOP 1/2 OF ROOT BALL; ROLL ON REMAINDER INTO BOT OF EXCAVATION HOLE

DECIDUOUS TREE PLANTING

32027
DO NOT PRUNE OR DAMAGE MAIN LEADER. PRUNING OF OTHER BRANCHES IS ONLY ALLOWED WITH APPROVAL.

ATTACH TO TREE AT 1/2 TREE HT WITH FABRIC STRAP.

GUY TREE TO PLUMB POSITION W/ 12 GA WIRE. POSITION WIRES NOT TO RUB AGAINST BRANCHES.

MULCH TO A DEPTH OF 3".

PLANT W/ TOP OF ROOT BALL 2" ABOVE GROUND LINE.

GROUND LINE

EXCAVATE HOLE 18" LARGER THAN ROOT BALL. EXCAVATION WIDTH SAME AT T&B OF HOLE.

REMOVE PLASTIC OR WIRE BASKET MATERIAL. REMOVE BURLAP FROM TOP 1/2 OF ROOT BALL ROLL ON REMAINDER INTO BOTTOM OF EXCAVATION HOLE.

BACKFILL MIX 1/2 COMPOST & 1/2 EXCAVATED MATERIAL. MIX THOROUGHLY. COMPACT BACKFILL MIX AT BOTTOM OF EXCAVATION BEFORE PLANTING. ROOT BALL INSTALLED COMPACTED IN LIFTS. WATER AFTER EACH TREE INSTALLED.

DETAIL

18" TEE POST

12" MIN

GUY WIRE

TEE POST CAP

GROUND LINE

GUY WIRE

TEE POST CAP

GROUND LINE

(3 Req)

THIS SHEET

32028

EVERGREEN TREE PLANTING
PLANT SPA MEASURED FROM CTR OF SPREAD; PLANT EVERGREENS PERPENDICULAR TO S IN TRIANGULAR PATTERN

USE FABRIC TREE STRAPS W/ 12 GA WIRE W/ 2" x 2" WOOD STAKES IF PLANT HT EXCEEDS 6'-0"

PLANT 1" ABOVE FG; LOOSEN SURFACE OF ROOT BALL & SCORE

MULCH TO A DEPTH OF 3"

GROUND LINE (TYP)

EXCAVATE HOLE @ 12" WIDER THAN ROOT BALL; EXCAVATION WIDTH SAME AT TOP & BOT OF HOLE

BACKFILL MIX - 1/2 COMPOST & 1/2 EXCAVATED MATL; MIX THOROUGHLY, COMPACT BACKFILL MIX AT BOT OF EXCAVATION BEFORE ROOT BALL INSTL; COMPACT IN LIFTS, WTR AFTER PLANT INSTL

REMOVE PLASTIC OR WIRE BASKET MATL; REMOVE BURLAP FROM TOP 1/2 OF ROOT BALL; ROLL ON REMAINDER INTO BOT OF EXCAVATION HOLE

CTR SPA

MULCH; AVOID SMOTHERING CROWNS OR RUNNERS

EXCAVATE PLANTING PIT 2" BELOW ROOT BALL; MAINTAIN 1/2 COMPOST TO 1/2 EXIST SOIL MIX; COMPACT AREA BELOW ROOT BALL; PLANT USING ON CTR MEASUREMENTS; WTR THOROUGHLY

32029
SHRUB AND PERENNIAL PLANTING
GROUND LINE
HDPE VB
3/4" CRUSHED ROCK – 3" DEPTH
BRICK SPRT (TYP)
FLTR FABRIC
PVC ACS SLV – NOTCH TO ALLOW SLV TO REST ON BRICK
RESILIENT WEDGE ISOLATION VLV W/ SQ OPERATING NUT
PVC MAINLINE
24"
NOTE:

USE TWO HDPE VALVE BOXES FOR SCHEDULE 80 PVC PIPE DIAMETER LARGER THAN 3 INCH.
MALE ADAPTER, NETAIRM TL075 MA

SCHED 40 PVC TEE (SLIP x SLIP x FPT)

SCHED 40 PVC TEE (SLIP x SLIP x FPT)

SCHED 80 PVC NIPPLE - L AS REQD, CTR ON SPLT HEADER

INSERT x FPT ELB

1'-0" SPA

NETAIRM TECHLINE CV DRIPPERLINE - TL09-12 INSTL ON TOP OF LANDSCAPE FABRIC & COVER W/MULCH

SOIL STAPLE - TECHLINE TLS5 INSTL EVERY 4'-0" OF TBC & 2 EA ON TEES, ELB, & CROSS

GEAR CLAMP 18-8 SST (TYP)

PE PIPE FROM CTRL VLV INSTL 2 GEAR CLAMPS, 18-8 SST, AT THIS CONN
NOTES:

1. CONCRETE PAD PENETRATIONS SHALL BE 1 INCH LARGER THAN PIPE DIAMETER.

2. DIAMETER OF FITTINGS, NIPPLE, AND TUBING SHALL BE EQUAL IN DIAMETER TO THE BACKFLOW PREVENTER.

3. REFER TO LOCAL CODES AND MANUFACTURER REQUIREMENTS FOR SPECIFIC INSTALLATION INSTRUCTIONS.

DENVER WATER

IRRIGATION OUTSIDE SETTING
FOR 2" & SMALLER REDUCED PRESSURE PRINCIPLE ASSEMBLY IN ENCLOSURE
STREAM OR ADJ BUBBLER

1/2" PVC NIPPLE (L AS REQD)

MULCH
FILTER FABRIC
GROUND LINE

DBL GEAR CLAMP, 18-8 SST (TYP)

PVC INSERT TEE
(INsert x insert x insert)

PVC INSERT REDUCING ELB
(INsert x 1/2" FIPT)

PE PIPE (L AS REQD)
NOTE:
THRUST BLOCKS SHALL BE SIZED AND PLACED IN ACCORDANCE WITH SPECIFICATION SECTION 32 80 00.
SOLID BARE Cu WIRE (#10 AWG) FROM GROUNDING ROD TO CONTROLLER. MAKE WIRE AS SHORT & STRAIGHT AS POSSIBLE.

BARE Cu WIRE (#10 AWG) BTWN GROUNDING RODS

COVER GROUNDING ROD W/ 10” RND HDPE VB

5/8” x 8’-0” Cu CLAD GROUNDING ROD

GROUND ROD LAYOUT

Cu CLAD RND BAR 5/8” x 8’-0” GROUNDING ROD. INSTL RODS IN SOIL IN A TRIANGULAR PATTERN SPACED A MIN OF 8’-0” APART FROM EA OTHER. GROUNDING GRID TO HAVE A RESISTANCE OF 10 OHMS OR LESS.

GROUND ROD ASSEMBLY

NOTE:
USE ONLY WHERE FACILITY GROUNDING GRID IS NOT AVAILABLE FOR CONNECTION.
KEYED NOTES:
1. WEATHERTRAK ET PRO3 SERIES CONTROLLER
2. LOW PROFILE ANTENNA
3. WEATHERTRAK ENCLOSURE PEDESTAL
4. APPROVED ELECTRICAL JUNCTION BOX OR CONDULET
5. 1" PVC OR RIGID CONDUIT & CONDUIT SWEEP FOR 120VAC WIRING
6. PVC CONDUIT & CONDUIT SWEEP FOR VALVE WIRING
7. Poured-in-place concrete base with sloped edges for drainage away from pedestal
8. 1" PVC CONDUIT & CONDUIT SWEEP FOR FLOW SENSOR WIRING AND MASTER VALVE WIRING
9. 1" PVC CONDUIT & CONDUIT SWEEP FOR #6 BARE COPPER GROUND WIRE
10. RAIN SENSOR PER SPECS (WIRELESS SHOWN)

NOTES:

1. MINIMUM CONCRETE BASE REQUIREMENTS:

   VERIFY NUMBER & SIZE OF CONDUITS REQUIRED FOR EACH ENCLOSURE. USE MOUNTING TEMPLATE TO LOCATE "J" BOLT FASTENERS.

2. SEE IRRIGATION DRAWINGS FOR ENCLOSURE DIMENSIONS & FINISH.
KEYED NOTES:

1. STAINLESS STEEL AUTOMATIC CONTROLLER ENCLOSURE ASSEMBLY. SEE IRRIGATION LEGEND FOR MAKE AND MODEL.
2. LOW PROFILE ANTENNA
3. WEATHERTRAK ET PRO3 SERIES CONTROLLER. SEE DRAWINGS AND SPECS FOR ADDITIONAL INFORMATION.
4. CONTROLLER TRANSFORMER.
5. GFI ON/OFF POWER SWITCH RECEPTACLE (OPTIONAL).
6. FLOW SENSOR CABLE AND MASTER VALVE WIRES PER SPECIFICATIONS.
7. 3" PVC SWEEP ELL AND CONDUIT FOR CONTROL WIRES.
8. 1" PVC SWEEP ELL AND CONDUIT FOR 120VAC FROM METERED POWER SUPPLY.
9. 2" PVC SWEEP ELL AND CONDUIT FOR FLOW SENSOR CABLE AND MASTER VALVE WIRES.
10. 1" PVC SWEEP ELL AND CONDUIT FOR GROUNDING WIRE. WIRE SHALL BE AS STRAIGHT AS POSSIBLE. GROUND CONTROLLER PER ASIC GUIDELINES.
11. POUR CONCRETE BASE. SLOPE TO DRAIN.
12. FINISH GRADE. 2" BELOW TOP OF CONCRETE BASE.
13. FILL VOIDS WITH CONCRETE SLURRY MIX.
14. UNIVERSAL RADIO REMOTE INTERFACE (TYPICAL).
15. NEATLY BUNDLE WIRES AND SECURE WITH WIRE TIES (TYPICAL).
16. RAIN SENSOR WITHIN VIT RAIN SENSOR ENCLOSURE (PT# RGRRSS) PER SPEC.

NOTE:

MINIMUM CONCRETE BASE REQUIREMENTS:

VERIFY NUMBER AND SIZE OF CONDUITS REQUIRED FOR EACH ENCLOSURE INSTALLATION. USE ENCLOSURE MANUFACTURER'S TEMPLATE FOR PROPER LAG BOLT PLACEMENT. PROVIDE A MINIMUM OF 2" OF CONCRETE FROM LAG BOLT TO OPENING IN CONCRETE BASE FOR CONDUITS.
KEYED NOTES:

1. WEATHERTRAK LC+ CENTRAL AUTOMATIC IRRIGATION CONTROLLER SECURED TO WALL WITH APPROPRIATE FASTENERS.
2. 120 VOLT ELECTRICAL POWER WIRES WITH GROUND WITHIN CONDUIT FOR AUTOMATIC CONTROLLER. SIZE AND INSTALL PER CODE.
3. 1", 1-1/2" AND 2" PVC CONDUIT—SIZE AS REQUIRED.
4. CONTROL WIRING TO ELECTRIC CONTROL VALVES.
5. PVC ELECTRICAL SWEEP ELL—SAME SIZE AS CONTROL WIRE CONDUIT.
6. FINISH GRADE.
7. WALL
8. SECURE CONDUIT TO WALL WITH 'C' OR 'U' CLAMP. SIZE AS REQUIRED.
9. 3/4" CONDUIT WITH #6 BARE COPPER WIRE TO GROUND ROD OR GROUND PLATE.
10. RAIN SENSOR PER SPECS. (WIRELESS SHOWN)

NOTE:
INSTALL ALL WIRING PER LOCAL CODE.

32090
WEATHERTRAK LC+ WALL MOUNT OUTDOOR
CONCRETE WASHOUT AREA INSTALLATION NOTES:

1. SEE PLAN VIEW FOR LOCATIONS OF CONCRETE WASHOUT AREA.

2. THE CONCRETE WASHOUT AREA SHALL BE INSTALLED PRIOR TO ANY CONCRETE PLACEMENT ON SITE.

3. VEHICLE TRACKING CONTROL (VTC) IS REQUIRED AT THE ACCESS POINT.

4. PLACE SIGNS AT THE WASHOUT AREA, AND ELSEWHERE AS NECESSARY TO CLEARLY INDICATE THE LOCATION OF THE CONCRETE WASHOUT AREA TO OPERATORS OF CONCRETE TRUCKS AND PUMP RIGS.

5. UTILIZE EXCAVATED MATERIAL IN PERIMETER BERM CONSTRUCTION.

6. CONCRETE WASHOUT SHALL BE LINED IN AREAS WITH HIGH GROUNDWATER. LINERS SHALL BE 30 MIL OR GREATER.

CONCRETE WASHOUT AREA MAINTENANCE NOTES:

1. THE CONCRETE WASHOUT AREA SHALL BE REPAIRED AND ENLARGED OR CLEANED OUT AS NECESSARY TO MAINTAIN CAPACITY FOR WASTED CONCRETE.

2. AT THE END OF CONSTRUCTION, REMOVE ALL CONCRETE FROM THE SITE AND DISPOSE OF AT AN APPROVED WASTE SITE.

3. WHEN THE CONCRETE WASHOUT AREA IS REMOVED, THE DISTURBED AREA SHALL BE DRILL SEEDED AND CRIMP MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE ENGINEER.

4. INSPECT WEEKLY, DURING AND AFTER ANY STORM EVENT.
NOTE:

MAINTAIN EROSION CONTROL MEASURES UNTIL CONSTRUCTION IS COMPLETED, OR AS DIRECTED BY THE LOCAL JURISDICTION.
FLTR FABRIC ATTACHED TO POST

A MIN OF 6" x 4" AHR TRENCH (MIN 11" FLTR FABRIC BURIED)

GROUND LINE

ELEVATION

JOINTING AT FABRIC LAPS

NOTES:

1. INDICATED ON PLAN AS __________SF__________

2. THICKNESS OF MATERIAL HAS BEEN EXAGGERATED FOR CLARITY.

3. INSTALL AND MAINTAIN IN ACCORDANCE WITH SPECIFICATION SECTION 31 05 19.

32102
SILT FENCE
NOTES:

1. CONCRETE PAD PENETRATIONS SHALL BE 1 INCH LARGER THAN PIPE OUTSIDE DIAMETER.
2. DOUBLE CHECK BACKFLOW PREVENTION ASSEMBLY SHALL BE LOCATED IN LANDSCAPED AREAS.
3. TOTAL COPPER TUBING LENGTH MEASURED FROM MAIN TO METER TO DOUBLE CHECK BACKFLOW PREVENTION ASSEMBLY TO DRINKING FOUNTAIN SHALL HAVE A MAXIMUM LENGTH OF 250 FEET.
4. REFER TO LOCAL CODES AND MANUFACTURER REQUIREMENTS FOR INSTALLATION INSTRUCTIONS.

3/4" TYPE "K" Cu

3/4" CRUSHED ROCK (TYP)

1 1/2" Cu FT

1/2" TYPE "K" Cu

3/4"x 1/2" RDCR

BRASS ELEC WTR PIPE GND CLAMP W/ #8 AWG BARE Cu

1/2" USC FCCCHR APPD DBL CHKV BFP ASSY

SPEC ENCLOSURE (HEATED/NON-HEATED)

6" CLR ALL SIDES

DF

WTR MAIN W/ TAPPING SADDLE

CORP STOP

CURB STOP

GND CHNG RECF W/ METALLIC WTR MAIN

INSUL CPLG RECF W/ ELASTOMERIC SEALANT (TYP)

4" THK REINF CONC PAD-L AS RECF 30" MIN WIDTH, TOP OF SLAB TO BE 1" ABOVE FIN GROUND LINE

ALL EXPOSED CONC EDGES TO HAVE A 3/4" CHFR

60'-0" MAX L

190'-0" MAX L

250'-0" MAX L

(NOTE 4)
NOTES:

1. VAULT PENETRATIONS SHALL BE 1 INCH LARGER THAN PIPE OUTSIDE DIAMETER.

2. DOUBLE CHECK BACKFLOW PREVENTION ASSEMBLY SHALL BE LOCATED IN LANDSCAPED AREAS.

3. TOTAL COPPER TUBING LENGTH MEASURED FROM MAIN TO METER TO DOUBLE CHECK BACKFLOW PREVENTION ASSEMBLY TO DRINKING FOUNTAIN SHALL HAVE A MAXIMUM LENGTH OF 250 FEET.

4. REFER TO LOCAL CODES AND MANUFACTURER REQUIREMENTS FOR INSTALLATION INSTRUCTIONS.
NOTES:

1. FOR ACCESS, PITOT, AND AIR VALVE MANHOLES.

2. CONCRETE EXTENSION COLLARS, MANHOLE RINGS, AND 6 INCH VALVE BOXES SHALL BE FIELD MORTAR. MORTAR: 1 PART PORTLAND CEMENT TO 3 PARTS SAND CONFORMING TO ASTM C 35.
NOTE:

COAT PIPE, VALVES, AND FITTINGS WITHIN MANHOLE IN ACCORDANCE WITH SPECIFICATION SECTION 09 97 13.04.

33004
2" AIR VALVE ASSEMBLY WITH 20" ACCESS MANHOLE (STEEL PIPE)
NOTES:

1. WELD-ON OUTLETS ARE PERMISSIBLE IF QUALIFIED WELDERS AND PROCEDURES ARE USED IN ACCORDANCE WITH ANSI/AWS D11.2.

2. ALSO FOR USE ON 24 INCH POLYVINYL CHLORIDE PIPE.

3. COAT PIPE, VALVES, AND FITTINGS WITHIN MANHOLE IN ACCORDANCE WITH SPECIFICATION SECTION 09 97 13.04.

33005
2" AIR VALVE ASSEMBLY
WITH 20" ACCESS MANHOLE
(DUCTILE IRON PIPE)
NOTE:

COAT PIPE, VALVES, AND FITTINGS WITHIN MANHOLE IN ACCORDANCE WITH SPECIFICATION SECTION 09 97 13.04.

33006

4” AIR VALVE ASSEMBLY
WITH 20” ACCESS MANHOLE
(STEEL PIPE)
NOTES:

1. WELD-ON OUTLETS ARE PERMISSIBLE IF QUALIFIED WELDERS AND PROCEDURES ARE USED IN ACCORDANCE WITH ANSI/AWS D11.2.

2. COAT PIPE, VALVES, AND FITTINGS WITHIN MANHOLE IN ACCORDANCE WITH SPECIFICATION SECTION 09 97 13.04.
NOTE:

COAT PIPE, VALVES, AND FITTINGS WITHIN MANHOLE IN ACCORDANCE WITH SPECIFICATION SECTION 09 97 13.04.

33008
4" AIR VALVE ASSEMBLY
WITH 24" ACCESS MANHOLE
(STEEL PIPE)
NOTE:

COAT PIPE, VALVES, AND FITTINGS WITHIN MANHOLE IN ACCORDANCE WITH SPECIFICATION SECTION 09 97 13.04.

33009

6" AIR VALVE ASSEMBLY
WITH 24" ACCESS MANHOLE
(STEEL PIPE)
NOTE:

COAT PIPE, VALVES, AND FITTINGS WITHIN MANHOLE IN ACCORDANCE WITH SPECIFICATION SECTION 09 97 13.04.

33010
2" AIR VALVE ASSEMBLY
(STEEL PIPE)
NOTES:

1. WELD-ON OUTLETS ARE PERMISSIBLE IF A QUALIFIED WELDER AND PROCEDURES ARE USED BY THE PIPE MANUFACTURER IN ACCORDANCE WITH ANSI/AWS D11.2.

2. COAT PIPE, VALVE, AND FITTINGS WITHIN MANHOLE IN ACCORDANCE WITH SPECIFICATION SECTION 09 97 13.04.
NOTES:

1. WELD-ON OUTLETS ARE PERMISSIBLE IF QUALIFIED WELDERS AND PROCEDURES ARE USED IN ACCORDANCE WITH ANSI/AWS D11.2.

2. ALSO FOR USE ON 24 INCH POLYVINYL CHLORIDE PIPE.

3. COAT PIPE, VALVES, AND FITTINGS WITHIN MANHOLE IN ACCORDANCE WITH SPECIFICATION SECTION 09 97 13.04.
NOTE:
COAT PIPE, VALVES, AND FITTINGS WITHIN MANHOLE IN ACCORDANCE WITH SPECIFICATION SECTION 09 97 13.04.
NOTE:
COAT PIPE, VALVES, AND FITTINGS WITHIN MANHOLE IN ACCORDANCE WITH SPECIFICATION SECTION 09 97 13.04.
NOTES:

1. FOR PIPE DIAMETER GREATER THAN OR EQUAL TO 24 INCHES AND LESS THAN OR EQUAL TO 42 INCHES.

2. PIPE LINING AND COATING NOT SHOWN FOR CLARITY.

3. COAT PIPE, VALVES, AND FITTINGS WITHIN MANHOLE IN ACCORDANCE WITH SPECIFICATION SECTION 09 97 13.04.
NOTES:

1. FOR PIPE DIAMETER GREATER THAN OR EQUAL TO 24 INCHES AND LESS THAN OR EQUAL TO 42 INCHES.

2. WELD-ON OUTLETS ARE PERMISSIBLE IF QUALIFIED WELDERS AND PROCEDURES ARE USED IN ACCORDANCE WITH ANSI/AWS D11.2.

3. COAT PIPE, VALVES, AND FITTINGS WITHIN MANHOLE IN ACCORDANCE WITH SPECIFICATION SECTION 09 97 13.04.

33021
20" ACCESS
MANHOLE ASSEMBLY
(DUCTILE IRON PIPE)
NOTES:

1. FOR PIPE DIAMETERS GREATER THAN 42 INCHES.

2. PIPE LINING AND COATING NOT SHOWN FOR CLARITY.

3. COAT PIPE, VALVES, AND FITTINGS WITHIN MANHOLE IN ACCORDANCE WITH SPECIFICATION SECTION 09 97 13.04.
NOTE:
PIPE LINING AND COATING NOT SHOWN FOR CLARITY.
NOTE:
PIPE LINING AND COATING NOT SHOWN FOR CLARITY.

33032
24" ACCESS ASSEMBLY
(STEEL PIPE)
NOTES:

1. LINING AND COATING NOT SHOWN FOR CLARITY.

2. REPAIR LINING AND COATING.

3. REINFORCING PLATE WIDTH AND THICKNESS AND OUTLET NOZZLE THICKNESS SHALL BE DESIGNED IN ACCORDANCE WITH AWWA M11.
33042
BUTTERFLY VALVE ASSEMBLY
(DUCTILE IRON PIPE)

NOTE:
SEE 33045 FOR DIMENSION TABLE.
ELEVATION

NOTES:

1. WELD—ON OUTLETS ARE PERMISSIBLE IF QUALIFIED WELDERS AND PROCEDURES ARE USED IN ACCORDANCE WITH ANSI/AWS D11.2.

2. SEE (33045) FOR DIMENSION TABLE.

33043
BUTTERFLY VALVE ASSEMBLY WITH BYPASS (DUCTILE IRON PIPE)
### 33040 × 33042 DIMENSION TABLE

<table>
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<th>M</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
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<td>2'-0&quot;</td>
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<td>2'-0&quot;</td>
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<tr>
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### 33041 × 33043 DIMENSION TABLE

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</tbody>
</table>
NOTES:

1. MANHOLE AND PENETRATION NOT SHOWN FOR CLARITY.

2. TAPPING SLEEVE WITH THREADED OUTLET IS AN ALLOWABLE ALTERNATIVE TO A DIRECT TAP.

33047
CHLORINATION TAP
(DUCTILE IRON PIPE)

DENVER WATER
1500 West 12th Ave
Denver, Colorado 80204-3412
T: 303.828.6000
F: 303.828.6199
denverwater.org
NOTE:

COAT PIPE, VALVES, AND FITTINGS WITHIN MANHOLE IN ACCORDANCE WITH SPECIFICATION SECTION 09 97 13.04.
NOTES:

1. WELD-ON OUTLETS ARE PERMISSIBLE IF QUALIFIED WELDERS AND PROCEDURES ARE USED IN ACCORDANCE WITH ANSI/AWS D11.2.

2. COAT PIPE, VALVES, AND FITTINGS WITHIN MANHOLE IN ACCORDANCE WITH SPECIFICATION SECTION 09 97 13.04.

3. THIS INSTALLATION MAY BE REPLACED BY A FIRE HYDRANT WHERE APPROVED BY DENVER WATER FOR 16-INCH AND 20-INCH MAINS.

DENVER WATER
1600 West 12th Ave
Denver, Colorado 80204-3412
T: 303.828.6200
F: 303.828.6199
denverwater.org
NOTE:

24-INCH GATE VALVE LAID LENGTH IS 23.50 INCHES.
NOTE:

2-INCH INSIDE DIAMETER FLEX MAY NOT BE REQUIRED FOR SOME LOCATIONS. VERIFY FLEX REQUIREMENT PRIOR TO INSTALLATION.
NOTES:

1. ACCESS STAIRS WITH A DOOR OUTSIDE OF THE PAVEMENT MAY BE REQUIRED ON STREETS WITH HEAVY TRAFFIC.

2. SEE (33056) FOR TYPICAL SECTION.

3. DO NOT PLACE SUMP DIRECTLY UNDER A VAULT ACCESS OPENING.

4. WHEN INSTALLING AN 8 INCH OR SMALLER PRESSURE REGULATING VALVE ON A 20 INCH OR SMALLER MAIN, PIPING SHALL BE THE SAME SIZE AS THE PRESSURE REGULATING VALVE AND ONE PIPE SIZE SMALLER THAN THE MAIN. (LARGER SIZE CONDUIT AND PRESSURE REGULATING VALVES REQUIRE APPROVAL OF LINE SIZE).

5. FOR PIPE SIZES LESS THAN 12 INCHES, CORP STOPS SHALL BE 1 INCH. FOR PIPE SIZES 16 INCH AND 20 INCH, CORP STOPS SHALL BE 2 INCH.

6. IF SUPERVISORY CONTROL AND DATA ACQUISITION IS REQUIRED VAULT SIZE SHALL BE 9 FEET BY 18 FEET.
NOTES:

1. A RECTANGULAR VAULT IS REQUIRED WHEN TELEMETRY OR ELECTRICAL EQUIPMENT IS TO BE INSTALLED INSIDE THE VAULT, SEE 33055.

2. SEE 33058 FOR TYPICAL SECTION.

3. DO NOT PLACE SUMP DIRECTLY UNDER THE MANHOLE ACCESS OPENING.

4. WHEN INSTALLING AN 8 INCH OR SMALLER PRESSURE REGULATING VALVE ON A 20 INCH OR SMALLER MAIN, PIPING SHALL BE THE SAME SIZE AS THE PRESSURE REGULATING VALVE AND ONE PIPE SIZE SMALLER THAN THE MAIN. (LARGER SIZE CONDUIT AND PRESSURE REGULATING VALVES REQUIRE APPROVAL OF LINE SIZE).

5. FOR PIPE SIZES LESS THAN 12 INCHES, CORP STOPS SHALL BE 1 INCH. FOR PIPE SIZES 16 INCH AND 20 INCH, CORP STOPS SHALL BE 2 INCH.
NOTE:
SEE 33057 FOR TYPICAL PLAN AND ADDITIONAL NOTES.

33058
PRESSURE REGULATING VALVE
MANHOLE INSTALLATION
TYPICAL SECTION
NOTES:

1. SEE 33060 FOR TYPICAL SECTION.

2. DO NOT PLACE SUMP DIRECTLY UNDER A MANHOLE ACCESS OPENING.

3. FOR PIPE SIZES LESS THAN 12 INCHES, CORP STOPS SHALL BE 1 INCH, FOR PIPE SIZES 16 INCH AND 20 INCH, CORP STOPS SHALL BE 2 INCH.
OPTIONAL RESTRAINED DISMANTLING JOINT

**NOTE:**

SEE (33059) FOR TYPICAL PLAN AND ADDITIONAL NOTES.
CAP OR PLUG SHALL BE MECHANICALLY RESTRAINED.
(SHOWN AS A CAP WITH A RESTRAINT GLAND).
ELEVATION

NOTES:

1. CAP OR PLUG SHALL BE MECHANICALLY RESTRAINED (SHOWN AS A SPIGOT WITH A CAP).

2. FOR USE WITH FUTURE STUB-OUT INSTALLATIONS ONLY.
NOTES:

1. HYDRANT SHALL BE A KUPERLE FOUNDRY CO TRUFLO MODEL TF 500.

2. THE NORMAL POSITION OF THE TOP OF THE OPERATING NUT IS APPROXIMATELY 6 INCHES BELOW THE TOP OF THE VALVE BOX.

3. INSURE THAT THE HYDRANT IS FREE TO MOVE VERTICALLY WITHIN THE VALVE BOX IN ORDER TO PREVENT TRANSMISSION OF TRAFFIC LOADS TO THE HYDRANT.

33063
2" BLOWOFF HYDRANT
TREATED/POTABLE

VALVE OPENING & CLOSING DIRECTION

RECYCLED

VALVE OPENING & CLOSING DIRECTION

1. VALVES WITH A RED SQUARE OPERATING NUT NORMALLY INDICATE A STANDARD DENVER WATER VALVE (OPEN RIGHT).

2. VALVES WITH A PURPLE PENTAGON OPERATING NUT NORMALLY INDICATE A RECYCLED DENVER WATER VALVE (OPEN LEFT).

33064

VALVE OPERATION
33071
16"ø AND LARGER OUTLET
(DUCTILE IRON PIPE)

NOTE:
WELD-ON OUTLETS ARE PERMISSIBLE IF QUALIFIED WELDERS AND PROCEDURES ARE USED IN ACCORDANCE WITH ANSI/AWS D11.2.
STEEL OUTLET

DUCTILE IRON & PVC OUTLETS

33072
20"Ø AND SMALLER OUTLET
NOTES:

1. FOR CONNECTION TO STEEL PIPE, WELD THREADED TO PIPE; FOR DUCTILE IRON PIPE, USE DOUBLE STRAP SADDLE.

2. FOR CONNECTION TO SAMPLE LINE, OMIT DISCHARGE ELBOW AND PROVIDE CONNECTING ADAPTER TO SAMPLE LINE.
NOTES:

1. TAPPING SLEEVE SHALL BE APPROVED FOR AWWA C303, CONCRETE BAR-WRAPPED CYLINDER PIPE.

2. SUPPORT TAPPING VALVE, DO NOT ALLOW VALVE TO HANG ON TAPPING SLEEVE.

3. PRESSURE TEST THE GLAND SEAL, FLANGE GASKETS, AND TAPPING VALVE TO 150 POUNDS PER SQUARE INCH TO ASSURE THAT ALL JOINTS ARE TIGHT AND GASKETS ARE SEATED.

4. TAP PIPE AFTER ALL GROUT HAS SET.

5. AFTER TAP IS COMPLETE, PROTECT SLEEVE AND STRAPS BY ENCASING WITH 1-INCH COATING OF CEMENT MORTAR (2 PARTS SAND AND 1 PART CEMENT).
NOTES:

1. USE AWWA NATIONAL PIPE THREADS ON STEEL PIPE OUTLETS.

2. USE DOUBLE BRONZE STRAPPED TAPPING SADDLE FOR DUCTILE IRON PIPE, IN ACCORDANCE WITH SPECIFICATION SECTION 33.14.17. DIRECT TAP IS ALSO ALLOWED WITH ENGINEER APPROVAL ON DUCTILE IRON FOR TAPS 1 INCH DIAMETER OR SMALLER.

3. PIT CONNECTIONS AND OTHER PERMANENT CONNECTIONS REQUIRE BRASS OR BRONZE DIELECTRIC UNIONS INSTALLED AFTER THE CORP STOP.

33076
THREADED OUTLET
WITH CORP STOP
SECTION A

NOTE:
\( \sqrt{ } \) = MACHINED SURFACE

33080
24" Ø MANHOLE RING
DENVER WATER

TOP PLAN

BOTTOM PLAN

SECTION A

NOTE:
√ = MACHINED SURFACE

33081
24" Ø MANHOLE COVER

DENVER WATER
3/4" x 3/4" x 1/8"

1 1/2" x 1" PICKSLOT CORNERS 1/8"R

TOP PLAN

SECTION A

THIS SHT

36" Ø

24" Ø

22" Ø

1/8"

1"

BOTTOM PLAN

NOTE:

√ = MACHINED SURFACE

33083

36" x 24" Ø MANHOLE COVER
NOTES:

1. BENDING COPPER RISERS FOR GRADE ADJUSTMENT OF THE METER YOKE IS NOT PERMITTED.

2. SERVICE LINES SHALL NOT CROSS IN THE METER PIT.

3. COPPER RISERS SHALL BE NEW, DAMAGED OR BENT COPPER RISERS ARE NOT PERMITTED.

4. CONCRETE METER PIT REQUIRED.

5. USE OF THIS DETAIL REQUIRES WRITTEN APPROVAL BY DENVER WATER AND IS ONLY FOR INSTALLATIONS SUBJECT TO TRAFFIC LOADING.
NOTES:

1. ASTM SPECIFICATIONS:
   A. ASTM C 478
   B. ASTM A 615 GRADE 60 STL REBAR
   C. ASTM D 4101 CLASSIFICATION PP0311 POLYPROPYLENE

2. STEPS SHALL HAVE A PENETRATION DEPTH INTO THE WALL OF 3 3/8 INCH.

3. STEP SHALL BE INSTALLED BY THE "PRESS-FIT" METHOD UTILIZING A SPECIALY TAPERED PIN TO FORM THE INSERT HOLE AS SHOWN, FOLLOWING MANUFACTURER RECOMMENDED PROCEDURE AND SHALL NOT BE GROUTED IN PLACE.

4. INSTALLED STEPS SHALL BE CAPABLE OF WITHSTANDING A PULL OUT FORCE OF 2500 POUNDS PER LEG FOR A MINIMUM PERIOD OF TWO MINUTES.

5. STEP SHALL BE SMOOTH AND CONTINUOUSLY TAPERED. DIMENSIONS OF THE PIN AND THE INSERTED PORTION OF THE MANHOLE STEPS ARE TYPICAL ONLY. INSTALLATIONS REQUIRE A MATCHED COMBINATION OF A TAPERED INSERT PIN AND MANHOLE STEPS, AS RECOMMENDED OR REQUIRED BY SPECIFIC MANUFACTURER OF THE STEP TO BE USED.
DETAIL

PIPE CASING

INSUL SKID AT 10'-0" OC

BAR 5"x1/4" x CONT

BAR 1/2"x3/4" x CONT & PIPE & CASING

2" GROUT NIPPLE 4'-0" OC (TYP)

PIPE CASING

ROUGH EXCAVATION

SAND FILL

CARRIER PIPE

1 THIS SHEET

CROSS SECTION

25" TYP

50"

ELEVATION

CARRIER PIPE

SANDBAGS OR MOLDED END SEAL

PIPE CASING

33101
INSULATED SKID AND PIPE CASING (24"Ø AND LARGER)
NOTE:
AFTER INSTALLATION, CLOSURE ASSEMBLY SHALL BE FIELD COATED AND LINED WITH SAME BASIC COATING AND LININGS AS MAIN PIPELINE.
CORRECTION PIECE

NOTES:

1. AFTER INSTALLATION, CORRECTION PIECE SHALL BE FIELD COATED AND LINED WITH SAME COATING AND LINING AS MAIN PIPELINE.

2. CORRECTION PIECES SHALL BE PLACED AT APPROXIMATE INTERVALS OF 2000 FEET AND JUST PRIOR TO 45-DEGREE AND 90-DEGREE BENDS, AND AT END OF CONTRACT. CORRECTION PIECES ARE LOCATED IN TIED JOINT REACHES.

3. THIS SECTION OF PIPE IS FOR FIELD TRIM. BARE OUTSIDE, LINED INSIDE. LENGTH SHALL NOT TO BE INCLUDED IN LAYING SCHEDULE.
TIED JOINT BUTTSTRAP

LOOSE BUTTSTRAP

LONGITUDINAL WELD

NOTE:
SEE 33122 TO 33129 FOR COATING AND LINING.

DENVER WATER
1600 West 12th Ave
Denver, Colorado 80204-3412
T: 303.928.6200
F: 303.928.6199
denverwater.org
DI OR STL PIPE
1/4" STD PIPE TAP & PLUG FOR FLO AIR TEST (TYP)

TAPE COATING OR POLYURETHANE COATING
CEMENT–MORTAR LINING

2" MIN VARIES

4 1/4" HOLDBACK

2 x 4–W0.5 x W0.5 MIN SELF–FURRING
WF LAF ENDS 4" MIN WIRE OR
WELD TOGETHER & TACK WELD WIRE
AT TWO POINTS MIN TO CYLINDER

FLO–APPLIED CEMENT MORTAR LINING &
FLO–APPLIED COATING

STA LOC (SAWOUT)
12"

2" MIN VARIES

1" (TYP)

EXIST STL PIPE
O-RING CARNEGIE JOINT

ROLLED SPIGOT JOINT

NOTE:
The dielectric coating shall be liquid-epoxy, polyurethane, or tape.
O-RING CARNEGIE JOINT

ROLLED SPIGOT JOINT

NOTE:

THE DIELECTRIC COATING SHALL BE LIQUID-EPOXY, POLYURETHANE, OR TAPE.
O-RING CARNEGIE JOINT

ROLLED SPIGOT JOINT
TYPE A
SINGLE WELDED LAP JOINT

TYPE B
SINGLE WITH SEAL WELDED LAP JOINT

NOTES:
1. THE DIELECTRIC COATING SHALL BE LIQUID-EPoxy, POLYURETHANE, OR TAPE.
2. THE FULL FILLET WELD MAY BE ON EITHER THE INTERIOR OR EXTERIOR OF THE PIPE.
TYPE A
SINGLE WELDED LAP JOINT

TYPE B
SINGLE WITH SEAL WELDED LAP JOINT

NOTES:
1. THE DIELECTRIC COATING SHALL BE LIQUID-EPOXY, POLYURETHANE, OR TAPE.
2. THE FULL FILLET WELD MAY BE ON EITHER THE INTERIOR OR EXTERIOR OF THE PIPE.
TYPE A
SINGLE WELDED LAP JOINT

TYPE B
SINGLE WITH SEAL WELDED LAP JOINT

NOTES:
1. THE DIELECTRIC COATING SHALL BE LIQUID-EPOXY, POLYURETHANE, OR TAPE.
2. THE FULL FILLET WELD MAY BE ON EITHER THE INTERIOR OR EXTERIOR OF THE PIPE.
33129
CEMENT—MORTAR COATED STEEL PIPE TIED JOINT—LAP JOINTS (CEMENT MORTAR LINING)

TYPE A
SINGLE WELDED LAP JOINT

NOTES:
1. THE DIELECTRIC COATING SHALL BE LIQUID—EPoxy, POLYURETHANE, OR TAPE.

2. THE FULL FILLET WELD MAY BE ON EITHER THE INTERIOR OR EXTERIOR OF THE PIPE.
KEYED NOTES:

1. ABRASIVE BLAST SSPC–SP–10 MINIMUM TO ANCHOR PROFILE SPECIFIED BY COATING MANUFACTURER.

2. BRUSH BLAST SSPC–SP–7 MORTAR 6 INCHES MINIMUM TO PROVIDE ANCHOR TO MORTAR.

3. APPLY LINING TO PROVIDE SMOOTH TRANSITION BETWEEN BARE STEEL AND MORTAR.

4. FEATHER POLYURETHANE TO EDGES OF BRUSH BLASTED LENGTH.

5. CUT 1/8 INCH KEYWAY IN MORTAR AROUND CIRCUMFERENCE. TAPE AT EDGE OF MORTAR CUT.
NOTES:
1. INSTALL 48# ZINC ANODE.
2. FIELD VERIFY EXISTING DIMENSIONS.

33131
CONCRETE TO STEEL ADAPTER
NOTES:
EXISTING REINFORCED CONCRETE CYLINDER PIPE
REINFORCEMENT NOT SHOWN FOR CLARITY.

GROUT COUPLING

DRAWN BY: VAICKIAUSKAS
CHECKED BY: K ROSS / KLR
APPROVED BY:
ORIGINATION DATE: JULY 2021

DENVER WATER
1600 West 12th Ave
Denver, Colorado 80204-3412
T: 303.828.6200
F: 303.828.6190
denverwater.org
NOTE:

JOINT HARNESS AND TIE RODS SHALL BE DESIGNED IN ACCORDANCE WITH AWWA M11.
RESTRAINED RING WELD

NOTE:

A DESIGN USING PAIRS OF FLEXIBLE, RESTRAINED BOLTED SPLIT SLEEVE COUPLINGS MAY BE SUBSTITUTED FOR HARNESSED BOLTED SLEEVE TYPE COUPLINGS WITH APPROVAL OF THE ENGINEER.
NOTE:

STEEL REINFORCEMENT SHOWN WITHIN CONCRETE PIPE IS NOT REPRESENTATIVE OF THE ACTUAL STEEL REINFORCEMENT IN ANY PARTICULAR PIPE.
## DIMENSION TABLE

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<th>N</th>
<th>O</th>
<th>P</th>
<th>ROD Ø</th>
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## NOTES:

1. EQUALLY SPACE RODS AND FLANGE LUGS AROUND FLANGE.

2. RODS ARE ASTM A 193 GRADE B7 WITH ASTM A 194 GRADE 2H NUTS.

3. LUGS ARE ASTM A 36 PLATE.

4. DESIGN PRESSURE:
   
   A. 3 INCH THROUGH 16 INCH – 260 POUNDS PER SQUARE INCH
   
   B. 20 INCH THROUGH 72 INCH – 220 POUNDS PER SQUARE INCH
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### NOTES:
1. EQUALLY SPACE RODS AND FLANGE LUGS AROUND FLANGE.
2. RODS ARE ASTM A 193 GRADE B7 WITH ASTM A 194 GRADE 2H NUTS.
3. LUGS ARE ASTM A 36 PLATE.
4. DESIGN PRESSURE:
   A. 3 INCH THROUGH 16 INCH – 260 POUNDS PER SQUARE INCH
   B. 20 INCH THROUGH 72 INCH – 220 POUNDS PER SQUARE INCH
16 STUD EXAMPLE

NOTES:

1. STUDS AND NUTS SHALL BE CLEAN AND DRY (UNLUBRICATED).
   A. HAND TIGHTEN ALL NUTS.
   B. CONSECUTIVELY NUMBER THE STUDS AROUND THE FLANGE.

2. TIGHTEN STUD NUTS TO ONE-THIRD OF TARGET TORQUE IN SEQUENCE GIVEN.

3. TIGHTEN STUD NUTS TO TWO-THIRDS OF TARGET TORQUE IN SEQUENCE GIVEN.

4. TIGHTEN STUD NUTS TO FULL TARGET TORQUE IN SEQUENCE GIVEN.

5. AFTER 24 HOURS, RE-TIGHTEN STUD NUTS TO FULL TARGET TORQUE IN SEQUENCE GIVEN.

6. TORQUE WRENCHES AND WRENCHES USED FOR STUD NUT TIGHTENING SHALL BE IN GOOD
   CONDITION AND CERTIFIED BY AN INDEPENDENT TESTING AGENCY WITHIN 6 MONTHS OF USE.

7. SEQUENCE GIVEN FOR AWWA C207 CLASS B, D, AND E AND ANSI CLASS 150 FLANGES.

**LENGTH OF RESTRAINED PIPE**

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<thead>
<tr>
<th>NOMINAL PIPE Ø</th>
<th>FITTING</th>
<th>90° BEND, TEE, DEAD END, VALVE</th>
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<td>116'</td>
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<tr>
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<td></td>
<td>141'</td>
<td>41'</td>
<td>11'</td>
<td>3'</td>
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</tbody>
</table>

**NOTES:**

1. LENGTH OF RESTRAINED PIPE IS MEASURED DISTANCE EACH WAY FROM VALVES AND BENDS.
2. MINIMUM 4 FEET 6 INCH BURY DEPTH REQUIRED.
3. BASED ON 150 POUNDS PER SQUARE INCH WORKING PRESSURE.
4. RESTRAIN CROSSES IN ALL DIRECTIONS.
5. WHEN REDUCERS ARE USED ON A VALVE INSTALLATION THE LENGTH OF RESTRAINT SHALL BE BASED ON THE SIZE OF THE PIPE NOT THE SIZE OF THE VALVE.
NOTEs:

1. STEEL SLIPLINE PIPES SHALL BE FABRICATED ACCORDING TO EXISTING REINFORCED CONCRETE CYLINDER PIPE LAYOUT DRAWINGS SO THAT JOINT NUMBERS, STATIONS, ELEVATIONS, DEFLECTIONS, AND ROTATIONS OF THE SLIPLINE PIPE JOINTS MATCH THOSE OF THE EXISTING PIPE JOINTS IN WHICH THEY ARE INSTALLED.

2. THE QUANTITY AND LOCATION OF THE GROUT COUPLINGS MAY BE MODIFIED AS NECESSARY.
EXIST RCPC PIPE

CEMENT-MORTAR LINING (FLD-APPLIED)

PRESS GROUT

CEMENT-MORTAR LINING (FLD-APPLIED OR SHOP-APPLIED)

2x4-W0.5xW0.5 MIN SELF FURRING
WWF LAP ENDS 4" MIN WIRE OR WELD TOGETHER & TACK WELD WWF AT MIN OF TWO POINTS TO CYLINDER

NOTE:
EXISTING REINFORCED CONCRETE CYLINDER PIPE
REINFORCEMENT NOT SHOWN FOR CLARITY.
NOTES:

1. SEE TYPICAL PUBLIC RIGHT-OF-WAY CROSS SECTION, (33025).

2. FIRE HYDRANTS LOCATED AT POINTS OTHER THAN CORNER INTERSECTIONS SHALL BE LOCATED AT A LOT LINE EXTENDED.

3. HYDRANT NUMBER WILL BE ASSIGNED BY DENVER WATER.

4. REFER TO DENVER WATER CAD STANDARDS FOR SYMBOLS AND LEGEND.

5. WATER LINE PLANS SHALL BE DRAFTED IN ACCORDANCE WITH THE DENVER WATER CAD STANDARDS.
STRAIGHT CUL-DE-SAC
LAY PIPE TO 18'-0" BEYOND THE CTR
(RADIUS POINT)
OF THE CUL-DE-SAC

OFFSET CUL-DE-SAC
LAY PIPE TO 5'-0" BEYOND THE
POINT OF TANGENCY THEN TO 18'-0"
BEYOND THE CTR (RADIUS POINT) OF
THE CUL-DE-SAC

NOTES:
1. SEE TYPICAL PUBLIC RIGHT-OF-WAY SECTION, 33205.
2. FIRE HYDRANTS LOCATED AT POINTS OTHER THAN CORNER INTERSECTIONS SHALL BE LOCATED AT A LOT LINE EXTENDED.
3. REFER TO DENVER WATER CAD STANDARDS FOR SYMBOLS AND LEGEND.

33201 WATER DISTRIBUTION SYSTEM TYPICAL LAYOUT FOR CUL-DE-SAC
NOTES:

1. SEE TYPICAL PUBLIC RIGHT-OF-WAY SECTION, 33205.

2. FIRE HYDRANTS LOCATED AT POINTS OTHER THAN CORNER INTERSECTIONS SHALL BE LOCATED AT A LOT LINE EXTENDED.

3. HYDRANT NUMBER WILL BE ASSIGNED BY DENVER WATER.

4. REFER TO DENVER WATER CAD STANDARDS FOR SYMBOLS AND LEGEND.

5. WATER LINE PLANS SHALL BE DRAFTED IN ACCORDANCE WITH THE DENVER WATER CAD STANDARDS.

33202
WATER DISTRIBUTION
SYSTEM TYPICAL LAYOUT
FOR CURVED STREETS
NOTES:

1. NO HORIZONTAL OR VERTICAL BENDS ARE ALLOWED IN FIRE HYDRANT BRANCH.

2. DO NOT COVER OR PLUG DRAIN HOLES WITH CONCRETE.

3. PROVIDE A 32 INCH BY 32 INCH BY 4 INCH CONCRETE PAD WITH CONSTRUCTION JOINT BOND BREAKERS WHEN FIRE HYDRANT IS INSTALLED IN SIDEWALK OR SIMILAR PAVED AREA.

4. FIRE HYDRANT SHALL NOT BE INSTALLED WITHIN CURB RAMP.
NOTES:

1. NO HORIZONTAL OR VERTICAL BENDS ARE ALLOWED IN THE FIRE HYDRANT BRANCH.

2. PROVIDE A 48-INCH DIAMETER SONOTUBE AROUND CIRCUMFERENCE OF FIRE HYDRANT.

3. COORDINATE CONSTRUCTION ACTIVITIES WITH DENVER INTERNATIONAL AIRPORT AND DENVER WATER CONSTRUCTION INSPECTION.
NOTES:

1. THE LOCATION RELATIVE TO THE DITCH OR CANAL, HEIGHT, AND WIDTH OF THE CONCRETE CUTOFF WALL WILL BE DETERMINED BY DENVER WATER AND OWNER.

2. THE PIPELINE CROSSING SHALL BE PERPENDICULAR TO THE DITCH OR CANAL.

3. DITCH/CANAL BACKFILL SPECIFICATIONS:
   A) MATERIAL
      • PLASTICITY INDEX: GREATER THAN 7
      • GRADATION: 100 PERCENT PASSING NUMBER 4 SIEVE
        50 PERCENT MINIMUM PASSING NUMBER 200 SIEVE
   B) COMPACTION
      • 95 PERCENT MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D 698 WITH MOISTURE CONTENT FROM OPTIMUM TO 2 PERCENT ABOVE OPTIMUM.
      • PROVIDE A COPY OF A SOILS TEST REPORT WITH REQUIRED FINAL DENSITY FROM A CERTIFIED SOILS LAB PRIOR TO ANY MATERIAL INSTALLATION AT THE SITE.
      • NO ORGANIC FILL IS ALLOWED.
      • 12 INCH MINIMUM CLAY MATERIAL SHALL BE PLACED AND COMPACTED UNDER THE INSTALLATION.
      • CLAY MATERIAL SHALL ADHERE TO THE ABOVE REFERENCED SPECIFICATIONS AND SHALL BE INSTALLED THE ENTIRE LENGTH AND WIDTH OF EXCAVATION.
NOTES:

1. ANY EXISTING SEWER DAMAGED DURING INSTALLATION SHALL BE REPLACED AS REQUIRED BY APPLICABLE SEWER JURISDICTION.

2. ANY SUBDRAIN UNDER THE SEWER SHALL BE REPLACED SUCH THAT NO FLOW SHALL ENTER THE WATER LINE TRENCH.

3. CONFIRM REQUIREMENTS OF THIS DETAIL WITH AUTHORITY HAVING JURISDICTION.
FORMULA FOR FINDING C: \[ C = B + (2)(1.5) \left( \frac{B}{2} + A + F \right) \]

- **PERPENDICULAR CROSSING**
  - CASING LENGTH
  - OD DW COND
  - CONSTANT
  - RATIO OF MIN SLOPE

FORMULA FOR FINDING L: \[ L = \frac{C}{\sin \theta} \]

NOTES:

1. THE BORING AND CASING METHOD AND MATERIALS SHALL BE APPROVED IN WRITING BY DENVER WATER PRIOR TO CONSTRUCTION.
2. SOIL AT ENDS OF CASING SHALL BE STABLE AT ALL TIMES.
3. CATHODIC PROTECTION SHALL BE PROVIDED FOR STEEL CASING AS REQUIRED BY DENVER WATER.
4. CASING PIPE SHALL BE STRAIGHT, ROUND, AND OF NEW MATERIAL.
CARRIER PIPE THRU CASING: 5'-0" OUTSIDE OF CASING

STL CASING SPACER

STL CASING PIPE (SEE TABLE BELOW FOR SIZE & WALL THK)

CASING END SEAL

OVERALL PIPE JT DIM

STL CASING PIPE

GLASS FILLED POLYMER RUNNER

STL CASING SPACER

PIPE CASING

<table>
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<tr>
<th>CARRIER PIPE NOMINAL Ø</th>
<th>CASING PIPE</th>
<th>CARRIER PIPE NOMINAL Ø</th>
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</table>

NOTE:
Casing length calculated according to (33217).

33218
BORE CASING DETAIL

DENVER WATER
1600 West 12th Ave
Denver, Colorado 80204-3412
T: 303.928.6000
F: 303.928.6199
denverwater.org
TOP SECT OF 6" VB & LID MARKED TRACER OR 3" TEST BOX LID MARKED TRACER

GROUND LINE

LEAVE 3'-0" OF SLACK WIRE IN BOX

TAPE

WIRE

ELEVATION

TAPE TRACER WIRE TO DIP W/2" INIDE PVC TAPE AROUND THE CIRCUMFERENCE OF PIPE MIN L (TYP 4 PLACES PER 20'-0" OF PIPE TYP)

RUN TRACER WIRE ALONG HYD BRANCH TO TEST STA TERMINAL LOC AT FH

MJ GV

MJ ANCHORING TEE / SWIVEL TEE

3LICE TRACER WIRES W/ 3M TYPE DRY-6 LOW VOLTAGE DIRECT BURY SPLICE

MJ GV

TOP SECT OF 6" VB & LID MARKED TRACER

FIRE HYDRANT PLAN

LINE VALVE

33225
TRACER WIRE INSTALLATION FOR PVC WATER MAIN

DENVER WATER
1600 West 12th Ave
Denver, Colorado 80204-3412
T: 303.828.6500
F: 303.828.6199
denverwater.org

DRAWN BY: BAIRES
CHKG BY: K ROSS / KLR
APPO BY: 
ORIGINATION DATE: JULY 2021
REVISION DATE: 
NOTES:

1. INSTALL MARKER BALLS AT 4 FEET MINIMUM, 5 FEET MAXIMUM DEPTH. IF PIPE OR APPURtenANCE IS MORE THAN 5 FEET DEEP, BACKFILL TO 4 FEET DEEP AND INSTALL MARKER BALLS.

2. INSTALL MARKER BALLS AFTER PIPE OR APPURtenANCE IS FULLY BEDDED.

3. COVER MARKER BALL WITH 6 INCHES OF BEDDING BY HAND TO KEEP THEM FROM MOVING. ACCOMPLISH THIS BY TWISTING THE MARKING BALL INTO THE BEDDING AND THEN COVERING IT UP.

4. BACKFILL THE TRENCH AFTER MARKER BALL HAS BEEN COVERED.

5. INSTALL THE FIRST MARKER BALL AT THE PROPERTY LINE VALVE RECORDING THE LOCATION WITH GPS COORDINATES.

6. INSTALL MARKER BALLS EVERY 40 FEET ALONG PIPE INSTALLATION.

7. INSTALL MARKER BALLS AT ALL HORIZONTAL BENDS.
NOTES:

1. NUT MATERIAL SHALL BE CAST IRON IN ACCORDANCE WITH ASTM A 126 CLASS B OR DUCTILE IRON IN ACCORDANCE WITH ASTM A 536.

2. HOLE THROUGH NUT TO MATCH VALVE ACTUATOR SHAFT OR VALVE STEM EXTENSION. HOLE SHOWN FITS VALVE OPERATOR EXTENSION ON 05012.

3. NUT SHALL BE COATED WITH FUSION–BONDED EPOXY, OR LIQUID EPOXY, MINIMUM 16 MIL DRY FILM THICKNESS IN ACCORDANCE WITH AWWA C210, FEDERAL COLOR NO 2577U.

4. AN ARROW AND THE WORD OPEN SHALL BE CAST ON THE FLANGE BASE TO INDICATE DIRECTION OF OPENING IN ACCORDANCE WITH AWWA C509.
NOTES:

1. NUT MATERIAL SHALL BE CAST IRON IN ACCORDANCE WITH ASTM A 126 CLASS B OR DUCTILE IRON IN ACCORDANCE WITH ASTM A 536.

2. HOLE THROUGH NUT TO MATCH VALVE ACTUATOR SHAFT OR VALVE STEM EXTENSION. HOLE SHOWN FITS VALVE OPERATOR EXTENSION ON (05012).

3. NUT SHALL BE COATED WITH FUSION-BONDED EPOXY, OR LIQUID EPOXY, MINIMUM 16 DRY FILM THICKNESS DFT IN ACCORDANCE WITH AWWA C210. FEDERAL COLOR NO 38913.

4. AN ARROW AND THE WORD OPEN SHALL BE CAST ON THE FLANGE BASE TO INDICATE DIRECTION OF OPENING IN ACCORDANCE WITH AWWA C509.
SECTION (A)

NOTE:
AFTER INSTALLATION, CLOSURE ASSEMBLY SHALL BE FIELD COATED WITH SAME BASIC COATING AS MAIN PIPELINE.

DRAWN BY: BAIRES
CHKO BY: K ROSS/ KLR
APPOD BY: 
ORIONATION DATE: JULY 2021
REVISION DATE: 

33254
ONE PIECE BUTTSTRAP
20" & SMALLER
OPEN POSITION

FIELD CUT 1/4" TO 1/2" SHORTER THAN DIM A

SHOP COAT END & OUTSIDE OF SPIGOT & INSIDE OF BELL W/ LIQUID EPOXY IN ACCORDANCE W/ AWWA C210 (TYP)

CLOSED POSITION

NOTE:
AFTER INSTALLATION, CLOSURE ASSEMBLY SHALL BE FIELD COATED WITH SAME COATING AS MAIN PIPELINE.
NOTES

1. AN ON-SITE PRECONSTRUCTION MEETING WITH DENVER WATER IS REQUIRED FOR TAPS AND SERVICE LINES 1-INCH AND LARGER AND PROJECTS INVOLVING MORE THAN ONE TAP AND SERVICE. PRECONSTRUCTION MEETINGS AND METER INSPECTIONS MAY BE SCHEDULED BY CALLING DENVER WATER AT 303-628-6145.

2. THE METER AND AMR/AMI DEVICE LOCATION SHALL BE APPROVED BY DENVER WATER METER INSPECTION. METER SETTINGS 1-INCH AND LARGER SHALL BE APPROVED IN THE FIELD BY DENVER WATER PRIOR TO THE INSTALLATION OF ANY SERVICE LINE OR TAP.

3. SERVICE LINES WILL NOT BE ACTIVATED UNLESS THE TAP, METER SETTING, AND SERVICE LINE ARE IN ACCORDANCE WITH THE CURRENT VERSION OF THE DENVER WATER ENGINEERING STANDARDS, APPROVED PROJECT DRAWINGS, AND WRITTEN METER INSPECTION INSTRUCTIONS, AS APPLICABLE. DEVIATIONS FROM THESE PLANS AND STANDARDS MUST BE APPROVED IN ADVANCE AND IN WRITING BY DENVER WATER.

4. METER PITS AND VAULTS SHALL BE FLUSH WITH THE FINAL GRADE OF THE LANDSCAPE, WHICH MUST INCLUDE PROPER DEPTH OF SOIL AMENDMENT. IF THE STREET OR GROUND IS NOT TO FINAL GRADE AT THE TIME OF THE METER INSTALLATION OR INSPECTION, THE OWNER MUST RAISE OR LOWER THE METER PIT/VAULT WHEN FINAL GRADE IS ESTABLISHED. THE METER SETTING MUST BE ADJUSTED TO THE ENGINEERING STANDARDS AFTER THE METER PIT/VAULT GRADE HAS BEEN ADJUSTED.

5. PROTECT CURB BOXES, METER PITS, METER VAULTS, AND AMR/AMI DEVICES THROUGHOUT CONSTRUCTION. NO METER MAY BE REMOVED FROM ITS INSTALLED LOCATION UNTIL THE EXISTING TAP HAS BEEN CUT AT THE MAIN.

6. BACKFLOW PREVENTION DEVICES MAY BE REQUIRED IN ACCORDANCE WITH THE DENVER WATER ENGINEERING STANDARDS AND STANDARD DRAWINGS. IF REQUIRED, THEY MUST BE IN PLACE BEFORE THE FINAL METER INSPECTION.

7. FURNISH METER PITS WITH A PLASTIC FROST LID IN ACCORDANCE WITH SPECIFICATION SECTION 33 14 17.

8. THE AMR/AMI DEVICE WILL MOUNT THROUGH THE CAST IRON LID OR UNDER THE COMPOSITE LID, OR A REMOTE AMR DEVICE WILL BE REQUIRED. FURNISH METERS WITH ELECTRONIC DIGITAL ENCODER REGISTERS OR MECHANICALLY ENCODED REGISTERS WITH A REMOTE AMR DEVICE FOR EACH REGISTER.

9. A REMOTE AMR DEVICE WILL BE INSTALLED AT A LOCATION DETERMINED BY DENVER WATER AT THE TIME OF METER INSPECTION. AMR DEVICES WILL TYPICALLY BE INSTALLED ON THE OUTSIDE OF THE BUILDING FACING A PUBLIC STREET. OWNER MUST PROVIDE CONDUIT AND SIGNAL WIRE FROM THE METER TO THE AMR DEVICE LOCATION.

10. MASTER METER AND READ AND BILL DISTRIBUTORS MAY IMPOSE ADDITIONAL STANDARDS NOT REQUIRED BY DENVER WATER.
2" & SMALLER DOMESTIC

3" DOMESTIC

KEYED NOTES:
1. EXIST WTR MAIN
2. TAPPING SLV OR ANCHORING TEE
3. TAPPING VLV OR MJ GV
4. DIP FULLY RESTRAINED
5. MJ GV
6. CONC KB
7. TAPPING SADDLE
8. CORP STOP
9. SERVICE INSULATOR
10. TYPE "K" Cu PIPE
11. CURB STOP
12. MJ TEE
13. 4"x 3" MJ RDOR
14. 90º MJ ELB
15. PE WRAPPED

NOTE:
The minimum line size ratio for fireline service line to domestic service line is 4:1, respectively.
NOTES:

1. CHEMICAL ADDITIVES REQUIRE THE INSTALLATION OF A REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER ON THE SPRINKLER SYSTEM BRANCH LINE.

2. OPTION 1 SYSTEM SHALL HAVE ALL BRANCH LINES TERMINATE AT A FIXTURE.

3. OPTION 2 SYSTEM SHALL HAVE NO DEAD-END LINES. SYSTEM PIPING SHALL BE CONSTRUCTED TO MOVE WATER THROUGH THE ENTIRE SYSTEM TO THE FIXTURE END POINT.

4. OPTIONS 3 AND 4 SHALL BE APPROVED BY DENVER WATER, THE LOCAL FIRE DEPARTMENT, AND IF APPLICABLE, THE DISTRIBUTOR PRIOR TO APPLICATION FOR WATER SUPPLY LICENSE.

5. OPTION 4 WILL REQUIRE AN AIR GAP IF THE WATER SUPPLY TO THE TANK IS HARD PIPED. A DC OR RP SHALL BE REQUIRED AT THE WATER ENTRY POINT DEPENDING ON THE HAZARD.
NOTES:


2. LOCATE THE STOP BOX IN A PUBLIC RIGHT-OF-WAY, 6 INCHES TO 12 INCHES FROM THE BACKSIDE OF THE CURB OR SIDEWALK, IN A LANDSCAPED AREA, 24 INCHES FROM THE INLET SIDE OF THE METER PIT UNLESS PRIOR APPROVAL IS OBTAINED FROM THE DENVER WATER METER INSPECTOR. FOR A CURB STOP LOCATED BENEATH PAVEMENT, USE A ROADWAY BOX OVER A STANDARD STOP BOX WITH A BOND BREAKER. THE CURB STOP CANNOT BE LOCATED BENEATH PARKING AREAS.

3. INSTALL METER PIT AND SERVICE LINE IN ACCORDANCE WITH SPECIFICATION SECTION 33 19 13.
NOTES:

1. LIMITS OF NON-COPPER SERVICE LINE REPLACEMENT EXTENDS FROM THE TAP TO THE FIRST BRASS FITTING INSIDE THE STRUCTURE.

2. INSTALL METER PIT AND SERVICE LINE IN ACCORDANCE WITH SPECIFICATION SECTION 33 19 13.

3. REPLACE ALL NON-COPPER COMPONENTS OF THE SERVICE LINE FROM THE MAIN TO THE FIRST COPPER OR BRASS FITTING WITHIN THE STRUCTURE.
EXISTING ELEVATION

RELOCATION ELEVATION

NOTES:
1. LIMITS OF REPLACEMENT OF NON–COPPER SERVICE LINE EXTENDS FROM THE TAP TO THE FIRST BRASS FITTING INSIDE THE STRUCTURE.
2. RELOCATE METER FROM AN INSIDE SETTING TO AN OUTSIDE SETTING IN ACCORDANCE WITH 33269.
3. INSTALL METER PIT AND SERVICE LINE IN ACCORDANCE WITH SPECIFICATION SECTION 33 19 13.
4. FOR REPLACEMENTS ON PVC MAINS, MAINTAIN THE EXISTING TAP LOCATION, REMOVE AND REPLACE THE TAPPING SADDLE WITH A NO–LEAD MODEL LISTED IN SPECIFICATION SECTION 33 14 17; OR, MAKE A NEW TAP 5’–0” MINIMUM FROM THE EXISTING TAP IN ACCORDANCE WITH SPECIFICATION SECTION 33 14 17.
5. ON EXISTING SERVICE LINES WITH COPPER FROM THE MAIN TO METER, REPLACE THE NON–COPPER SERVICE LINE FROM THE METER TO THE FIRST BRASS FITTING INSIDE THE STRUCTURE.

DENVER WATER

2" & SMALLER NON–COPPER SERVICE LINE REPLACEMENT & INSIDE METER RELOCATION
NOTES:

1. THIS STANDARD DRAWING APPLIES TO DEVELOPMENTS WITH 3 TO 6 UNITS PLUS A COMMON PROPERTY.

2. METER PITS SHALL BE IN ACCORDANCE WITH 33269.

3. IRRIGATION USE SHALL HAVE A DEDICATED IRRIGATION SERVICE LINE. IRRIGATION SERVICE IS NOT ALLOWED ON A MANIFOLD.

4. NFPA 13D DEMAND SHALL HAVE A DEDICATED SERVICE LINE. FIRE SERVICE IS NOT ALLOWED ON A MANIFOLD.

5. MANIFOLD SHALL BE INSPECTED BY DENVER WATER PRIOR TO BACKFILL.

6. IDENTIFICATION TAGS SHALL BE ATTACHED IN ACCORDANCE WITH SPECIFICATION SECTION 33 14 17.

7. RESIDENTIAL FIXTURE UNITS THAT DEMAND A 1 INCH SERVICE LINE SHALL HAVE A 2 INCH MANIFOLD TRUNK LINE AND A 1-INCH SERVICE LINE.

8. INSTALL METER PIT IN ACCORDANCE WITH SPECIFICATION SECTION 33 19 13.
NOTES:

1. THIS STANDARD DRAWING APPLIES TO DEVELOPMENTS WITH 3 TO 6 UNITS PLUS A COMMON PROPERTY.

2. METER PITS SHALL BE IN ACCORDANCE WITH 33269.

3. IRRIGATION USE SHALL HAVE A DEDICATED IRRIGATION SERVICE LINE. IRRIGATION SERVICE IS NOT ALLOWED ON A MANIFOLD.

4. NFPA 13D DEMAND SHALL HAVE A DEDICATED SERVICE LINE. FIRE SERVICE IS NOT ALLOWED ON A MANIFOLD.

5. MANIFOLD SHALL BE INSPECTED BY DENVER WATER PRIOR TO BACKFILL.

6. IDENTIFICATION TAGS SHALL BE ATTACHED IN ACCORDANCE WITH SPECIFICATION SECTION 33 14 17.


8. INSTALL METER PIT IN ACCORDANCE WITH SPECIFICATION SECTION 33 19 13.
NOTES:

1. BENDING COPPER RISERS FOR GRADE ADJUSTMENT OF THE METER YOKE IS NOT PERMITTED.
2. SERVICE LINES SHALL NOT CROSS IN THE METER PIT.
3. COPPER RISERS SHALL BE NEW. DAMAGED OR BENT COPPER RISERS ARE NOT PERMITTED.
4. INSTALL METER PIT AND SERVICE LINE IN ACCORDANCE WITH SPECIFICATION SECTION 33 19 13.
5. INSTALL IN LANDSCAPED AREAS ONLY.
**KEYED NOTES:**

1. CURB STOP
2. TYPE "K" Cu TUBING
3. 1 1/2" OR 2" COPPERSETER/METER YOKE W/ BYPASS
4. WTR METER W/ ENCODER REGISTER
5. 3" NIPPLE BTWN COPPERSETER & CHKV
6. 1" x 23" BSP-40
7. IRON PIPE TO FLARE CPLG FROM INLET SIDE OF COPPERSETER & OUTLET SIDE OF CHKV
8. BYPASS W/ VLV WILL BE 1" FOR 1 1/2" COPPERSETTERS & 1 1/2" OR 1 1/4" FOR 2" COPPERSETTERS; NO BYPASS FOR IRR METERS
9. CHKV (CHKV NOT REQD WHERE A BFP DEVICE IS INSTL) CHKV MAY BE REQD IF DIST TO BFP ASSY ALLOWS EXCESSIVE WTR TO DR DURING METER MAINTENANCE
10. 48"Ø PRECAST CONC MH
11. 4"x 30"x 6" (TYP OF 2) OR 8"x 8"x 8" (TYP OF 4) OR 8"x 16"x 4" (TYP OF 4) CONC BLOCK SPRT
12. SIGNAL WIRE TO AMR DEVICE
13. AMR DEVICE

**NOTES:**

1. CURB STOP SHALL BE 2 FEET MINIMUM FROM THE INLET SIDE OF THE METER MANHOLE.

2. THE COPPERSETER OR METER YOKE SHALL BE 12 INCH HIGH MAXIMUM.

3. GROUT DOGHOUSE BLOCKOUTS AFTER SERVICE LINE INSTALLATION.

4. INSTALL METER MANHOLE AND SERVICE LINE IN ACCORDANCE WITH SPECIFICATION SECTION 33 19 13.
NOTES:

1. VALVES INSIDE THE VAULT SHALL BE NON-RISING STEM, RIGHT HAND OPEN VALVES WITH HAND WHEEL OPERATORS.

2. A CHECK VALVE IS REQUIRED BETWEEN COUPLING AND GATE VALVE IF BACKFLOW PREVENTION ASSEMBLY IS MORE THAN 150 FEET FROM VAULT.

3. INSTALL METER VAULT AND SERVICE LINE IN ACCORDANCE WITH SPECIFICATION SECTION 33 19 13.

4. SERVICE LINES SHALL NOT CROSS INSIDE THE METER VAULT.
NOTEs:

1. TREATED/POTABLE WATER VALVES INSIDE THE VAULT SHALL BE NON-RISING STEM, RIGHT HAND OPEN VALVES WITH HAND WHEEL OPERATORS.

2. RECYCLED WATER VALVES INSIDE THE VAULT SHALL BE NON-RISING STEM, LEFT HAND OPEN VALVES WITH HAND WHEEL OPERATORS.

3. A CHECK VALVE IS REQUIRED BETWEEN COUPLING AND GATE VALVE IF BACKFLOW PREVENTION ASSEMBLY IS MORE THAN 150 FEET FROM VAULT.

4. INSTALL METER VAULT AND SERVICE LINE IN ACCORDANCE WITH SPECIFICATION SECTION 33.19.13.

5. SERVICE LINES SHALL NOT CROSS INSIDE THE METER VAULT.

---

**33272**

**LARGE METER IN VAULT**

(Irrigation Service Only)
OUTSIDE SETTING FOR 2" & SMALLER DOUBLE CHECK VALVE ASSEMBLY IN MANHOLE

1. DIAMETER OF FITTINGS, NIPPLE, AND TUBING SHALL BE EQUAL IN DIAMETER TO THE BACKFLOW PREVENTER.

2. REFER TO LOCAL CODES AND MANUFACTURER REQUIREMENTS FOR INSTALLATION INSTRUCTIONS.
# PLAN

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<tr>
<th>NOMINAL PIPE Ø</th>
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<td>B</td>
</tr>
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## NOTES:

1. THE DISTANCE BETWEEN RUNGS, CLEATS, AND STEPS SHALL BE UNIFORM THROUGHOUT THE LENGTH OF THE LADDER.

2. VALVES INSIDE THE VAULT SHALL BE NON-RISING STEM, RIGHT HAND OPEN VALVES WITH HAND WHEEL OPERATORS.

3. SERVICE LINES SHALL NOT CROSS INSIDE THE METER PIT.
NOTES:

1. CONCRETE PAD PENETRATIONS SHALL BE 1 INCH LARGER THAN PIPE DIAMETER.

2. DIAMETER OF FITTINGS, NIPPLE, AND TUBING SHALL BE EQUAL IN DIAMETER TO THE BACKFLOW PREVENTER.

3. HEATED ENCLOSURE SHALL HAVE SEPARATE APPROVED ELECTRICAL SERVICE AND SHALL BE SIZED TO ALLOW ADEQUATE ROOM FOR TESTING AND MAINTENANCE.

4. REFER TO LOCAL CODES AND MANUFACTURER REQUIREMENTS FOR INSTALLATION INSTRUCTIONS.
GENERAL NOTES:
1. CONCRETE PAD PENETRATIONS SHALL BE 1 INCH LARGER THAN PIPE DIAMETER.
2. REFER TO LOCAL CODES AND MANUFACTURER REQUIREMENTS FOR INSTALLATION INSTRUCTIONS.
3. HEATED ENCLOSURE SHALL HAVE SEPARATE APPROVED ELECTRICAL SERVICE AND SHALL BE SIZED TO ALLOW ADEQUATE ROOM FOR TESTING AND MAINTENANCE.
4. PIPING FOR 3 INCH AND LARGER SHALL BE DUCTILE IRON FROM THE METER TO THE BACKFLOW PREVENTION ASSEMBLY AND DOWNSTREAM FROM THE BACKFLOW PREVENTION ASSEMBLY TO THE MANUFACTURER’S SETTER OR 90 DEGREE BEND.

RECYCLED NOTES:
1. PIPING SHALL HAVE AN INTEGRAL PANTONE 2577U COLOR AND BE EMBOSSED OR INTEGRALLY STAMPED "CAUTION: RECYCLED WATER–DO NOT DRINK".
2. THE BACKFLOW ASSEMBLY OPERATING VALVE HANDLES SHALL BE PAINTED PANTONE 2577U IN COLOR AND TAGGED WITH AN INERT PLASTIC LABEL WITH BLACK PRINTING ON A WHITE FIELD READING "CAUTION: RECYCLED WATER–DO NOT DRINK".
3. ENCLOSURES SHALL BE IDENTIFIED WITH SIGNAGE "RECYCLED WATER USED FOR IRRIGATION–DO NOT DRINK" ON THE ACCESS DOOR.
NOTES:

1. USE OF A DENVER WATER HYDRANT REQUIRES A VALID HYDRANT USE PERMIT.

2. REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY SHALL BE APPROVED BY DENVER WATER AND FULLY SUPPORTED WHEN CONNECTED TO THE FIRE HYDRANT.

3. REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY SHALL BE UNIVERSITY OF SOUTHERN CALIFORNIA FOUNDATION FOR CROSS CONNECTION CONTROL AND HYDRAULIC RESEARCH APPROVED.

4. THE BACKFLOW PREVENTION ASSEMBLY SHALL BE TESTED ANNUALLY AND A COPY OF THE TEST SHALL BE SUBMITTED TO DENVER WATER.

5. THE CONTRACTOR IS RESPONSIBLE FOR ANY DAMAGE TO FIRE HYDRANT DURING USE.

6. SUPPORT OF BACKFLOW PREVENTION ASSEMBLY IN LIEU OF (05001) SHALL BE APPROVED IN WRITING BY DENVER WATER.

7. PROTECT HOSE IN TRAFFIC CONDITIONS WITH RAMP.
SHIELD NOT GROUNDED

SHIELD GROUNDED
RAISED TYPE B
NOTE:
TERMINAL BLOCKS FOR ANALOG CIRCUITS SHALL BE DISCONNECT TYPE.
NOTES:

1. GROUND SHIELD AT CLOSEST OPPORTUNITY TO THE LOOP POWER SOURCE.

2. NO PROTECTION OR DISCONNECTING MEANS ON (-) 24 VOLTS DIRECT CURRENT OF GROUND POWER SUPPLIES.
NOTES:

1. TYPICAL OF BRISTOL BABCOCK
   CONTROLWAVE MICRO

2. I/O ADDRESS FORMAT
   YW:XZZ
   W = I/O TYPE (I=INPUT, O=OUTPUT)
   X = SLOT NUMBER
   Y = CARD TYPE (D=DIGITAL, A=ANALOG)
   Z = TERMINAL NUMBER
NOTES:

1. GROUND PIGTAILS TO THE RECTIFIER ENCLOSURE SHALL BE #1/0 AWG BARE COPPER CONDUCTOR.

2. CONNECTIONS SHALL BE EXOTHERMIC TYPE.

3. GROUND ANTENNA MAST, ENCLOSURES, AND SURGE SUPPRESSOR TO GROUND GRID SYSTEM.

4. MOUNT RADIO, 12VDC POWER SUPPLY, AND 24VAC TRANSFORMER INSIDE RADIO COMMUNICATIONS BOX.

5. APPLY JOINT SEALER TYPE 2 IN ACCORDANCE WITH SPECIFICATION SECTION 07 92 00 TO RIGHT ANGLE EDGE BETWEEN ENCLOSURE AND CONCRETE PAD.

6. APPLY HYDROPHILIC WATERSTOP AROUND CONDUIT PENETRATIONS THROUGH THE CONCRETE PAD IN ACCORDANCE WITH (23068).

7. PROVIDE LOCKABLE SIDE ACCESS DOOR.

8. COORDINATE WITH CATHODIC PROTECTION SUBCONTRACTOR FOR GROUND BED PENETRATIONS INTO CABINET.

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40511
YAGI ANTENNA MOUNTING
NOTE:
SINGLE POLE DOUBLE THROW (SPDT) LIMIT SWITCH RATED 10A, 250V, NEMA 4 ENCLOSURE WITH UL AND CANADIAN STANDARDS ASSOCIATION (CSA) LISTINGS.
NOTES:

1. COORDINATE LOCATION OF PHOTO ELECTRIC SENSOR WITH THE ENGINEER BEFORE INSTALLATION.

2. THIS DETAIL IS INTENDED FOR PHOTO ELECTRIC SENSOR MOUNTING USE ONLY. REFER TO CIVIL DRAWINGS FOR INFORMATION ON STRUCTURAL COMPONENTS.
KEYED NOTES:

1. SIZE BASED ON PROTECTION NEEDS.

2. SIZE BASED ON PROTECTION NEEDS. PROVIDE SEPARATE CIRCUIT BREAKERS FOR EACH INSTRUMENT POWERED FROM THE PLC CABINET.

3. UPS AND WIRING TO BE FURNISHED WHEN THE PLC IS NOT FED FROM AN EXTERNAL UPS.

NOTES:

1. SCHEMATIC ILLUSTRATES DESIGN INTENT ONLY. PROVIDE ALL NECESSARY COMPONENTS TO MEET PROJECT REQUIREMENTS.

2. THIS DETAIL IS TO BE USED AS PART OF DETAILS 40523, 40524, AND 40525.

3. # = PAGE NUMBER
   AA = LINE NUMBER
KEYED NOTE:
1. SIZE BASED ON PROTECTION NEEDS.

NOTES:
1. SCHEMATIC ILLUSTRATES DESIGN INTENT ONLY. PROVIDE ALL NECESSARY COMPONENTS TO MEET PROJECT REQUIREMENTS.
2. THIS DETAIL IS TO BE USED AS PART OF DETAILS 40522, 40524, AND 40525.
3. ## = PAGE NUMBER
AA = LINE NUMBER

40523
TYPICAL PLC
SCHEMATIC NO 2
KEYED NOTES:

1. SIZE BASED ON PROTECTION NEEDS.
2. VERIFY LOADS BASED ON TEMPERATURE CALCULATIONS. PROVIDE ADDITIONAL CIRCUIT IF REQUIRED.
3. INTEGRAL SWITCH WITH LIGHT, PROVIDES DISCRETE INPUT TO THE PLC TO ALARM FOR INTRUSION.

NOTES:

1. SCHEMATIC ILLUSTRATES DESIGN INTENT ONLY. PROVIDE ALL NECESSARY COMPONENTS TO MEET PROJECT REQUIREMENTS.
2. THIS DETAIL IS TO BE USED AS PART OF DETAILS 40522, 40523, AND 40525.
3. ## = PAGE NUMBER
   AA = LINE NUMBER
NOTES:

1. APPLY THE LABELING PHILOSOPHY AS SHOWN.

2. LABELING IS SHOWN FOR DRAWING 01. FOR SUBSEQUENT DRAWINGS FOLLOW THE "##AA FORMAT"
   "## = PAGE NUMBER
   AA = LINE NUMBER
ELEVATION

NOTE:

SEE CONDUIT AND CONDUCTOR SCHEDULE FOR CONDUIT AND CONDUCTOR SIZE, TYPE, AND LABELS.

40532
WATER QUALITY MONITORING STATION PANEL
# Analog Terminal Table

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Four-wire transmitter with (grounded) 24VDC power supply schematic</td>
</tr>
<tr>
<td>B</td>
<td>Four-wire transmitter with (ungrounded) 24VDC power supply schematic</td>
</tr>
<tr>
<td>C</td>
<td>Four-wire (120VAC) transmitter schematic</td>
</tr>
<tr>
<td>D</td>
<td>24VDC three-wire analog transmitter schematic</td>
</tr>
<tr>
<td>E</td>
<td>24VDC two-wire transmitter schematic</td>
</tr>
</tbody>
</table>

**Notes:**

1. Analog terminals conform to the analog terminal table for the description indicated unless otherwise noted on the drawings.
2. Select the analog terminal type that applies to each application.
3. Ground shield at closest opportunity to the loop power device.
KEYED NOTES:

1. FUSED TERMINAL/DISCONNECT BLOCK
2. FEED THROUGH TERMINAL BLOCK
3. TEST BLOCK WITH KNIFE DISCONNECT SWITCH
4. GROUNDING TERMINAL BLOCK

NOTE:

(–)24VDC RETURNS OR COMMONS CANNOT BE PROTECTED OR HAVE A DISCONNECTING MEANS ON SYSTEMS WITH GROUNDED 24VDC POWER SUPPLIES.
KEYED NOTES:

1. FUSED TERMINAL/DISCONNECT BLOCK
2. FEED THROUGH TERMINAL BLOCK
3. TEST BLOCK WITH KNIFE DISCONNECT SWITCH
4. GROUNDING TERMINAL BLOCK
5. 120VAC CIRCUIT BREAKER

NOTE:

PROVIDE 120VAC CIRCUIT BREAKER FOR EACH INSTRUMENT.
KEYED NOTES:

1. FUSED TERMINAL/DISCONNECT BLOCK
2. FEED THROUGH TERMINAL BLOCK
3. TEST BLOCK WITH KNIFE DISCONNECT SWITCH
4. GROUNDING TERMINAL BLOCK
KEYED NOTES:

1. FUSED TERMINAL/DISCONNECT BLOCK
2. FEED THROUGH TERMINAL BLOCK
3. TEST BLOCK WITH KNIFE DISCONNECT SWITCH
4. GROUNDING TERMINAL BLOCK
<table>
<thead>
<tr>
<th>GAS</th>
<th>MOUNTING HEIGHT</th>
<th>TYP RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Monoxide</td>
<td>A = 60 IN</td>
<td>300 ppm</td>
</tr>
<tr>
<td>Carbon Dioxide</td>
<td>A = 60 IN</td>
<td>5000 ppm</td>
</tr>
<tr>
<td>Hydrogen Sulfide</td>
<td>A = 60 IN</td>
<td>100 ppm</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>A = 96 IN</td>
<td>0–100% LEL</td>
</tr>
<tr>
<td>Ammonia</td>
<td>A = 60 IN</td>
<td>75 ppm</td>
</tr>
<tr>
<td>Chlorine</td>
<td>A = 60 IN</td>
<td>10 ppm</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>A = 60 IN</td>
<td>0–100% LEL</td>
</tr>
</tbody>
</table>

40542
TOXIC GAS DETECTOR
INSTALLATION

DENVER WATER
1600 West 12th Ave
Denver, Colorado 80204-3412
T: 303.828.6200
F: 303.828.6199
denverwater.org
NOTE:
ELECTRODE DIMENSIONS FROM CENTER LINE ARE ESTIMATES. CONFIRM EXISTING AND REQUIRED ELECTRODE LENGTHS. ELECTRODE LENGTHS SHALL BE APPROVED BY ENGINEER.
CONC SUMP WALL

SECURE MTC BRACKET TO WALL W/ 18-8 SST EXP AHR (TYP)

SPRT INDIVIDUAL CABLES AT 5'-0" INTERVALS (MAX)

1" SCHD 40 SST PIPE (ASTM A 312 TYPE 304 OR 316)

SST HOSE CLAMP

ACTUATION LEVEL TBD

LEVEL FLOAT SW (TYP)

WRP SURFACE TBD

MOUNTING DETAIL

PVC-COATED COND HUB W/ GROUNDING BUSHING (TYP OF 2)

3/4" PVC-COATED RGS ELEC COND

PVC-COATED, SINGLE-GANG, DEEP, FEED-THRU DEVICE BOX

CABLE SEALING FITTINGS (TYP OF 3)

CTRL SW W/ INTEGRAL CORD

LSH SEE MTC DET

LSL

SP MTR W/ INTEGRAL CORD

40549
VAULT SUMP PUMP CONTROLLER INSTALLATION

DRAWN BY: AVARADO
CHECKED BY: K ROSS/KLR
APPROVED BY: 
ORDINATION DATE: JULY 2021
REVISION DATE:
TYPE A - EXTERIOR MOUNTED

TYPE B - INTERIOR MOUNTED

KEYED NOTE:

1. MINIMUM DISTANCE BETWEEN HIGHEST POSSIBLE LEVEL, INCLUDING OVERFLOW, AND PROBE FACE SHALL BE MANUFACTURER’S BLANKING ZONE PLUS 2-INCHES.
CONC WALL OR SLUMP WALL

TO JB, PROVIDE MIN OF 1'-0" SLACK IN CABLE TO ALLOW FOR ADJUSTMENT OF SW ACTUATION LEVEL

MTG BRACKET, SECURE TO WALL W/ 18-8 SST EXP AHR (TYP)

1" SCHED 40 SST PIPE (ASTM A 312 TYPE 304 OR 316)

SST HOSE CLAMP

WTR LEVEL

ACTUATION LEVEL DETERMINED IN FLD

LEVEL SW SEE (40552) FOR MULTIPLE FLOAT LEVEL SW INSTL

CABLE CLAMP

40551
SINGLE FLOAT LEVEL SWITCH INSTALLATION
SECURE MTG BRACKET TO WALL W/ 18-8 SST EXP AH (TYP)

CONC WALL OR SUMP WALL

ACTUATION LEVEL DETERMINED IN FLQ (TYP)

SST HOSE CLAMP (TYP)

LEVEL FLOAT SW (TYP)

WTR SURFACE TBD

MIN WTR SURFACE TBD

1" SCHED 40 SST PIPE (ASTM A 312 TYPE 304 OR 316)
NOTE:
ANGLE AND PLATE MATERIAL SHALL BE ASTM A240 TYPE 304 OR 316 (Fy = 30 KSI MINIMUM).
40560
SUBMERSIBLE LEVEL PRESSURE SENSOR

TYPE A

TYPE B

MTG BRACKET FOR PIPE & WALL MTG
TRANSMITTER
CABLE GLAND
STILLING WELL
18-8 SST EXP AHR (TYP)
NON-METALLIC COND CLAMP
CABLE
SNSR
HOLES FOR FILLING & DRAINING OF WELL
HOLES FOR AIR EQUALIZATION
STILLING WELL
CABLE
SNSR
STEEL AND STAINLESS STEEL TANK

FIBER REINFORCED POLYESTER TANK

NOTES:

1. SENSING LINE TO PRESSURE INSTRUMENT.

2. VALVES: SIZE AND MATERIAL SHALL MATCH DOWNSTREAM PIPE AND FLOW STREAM REQUIREMENTS FOR MATERIALS.

3. BUSHING (SIZE AS REQUIRED) SHALL MATCH DOWNSTREAM PIPE SIZE AND CONNECTION TYPE.

4. FOR LIQUID, STEAM OR VAPOR SERVICE INSTALL PROCESS TAP HORIZONTALLY INTO THE SIDE OF THE TANK.

5. FOR AIR OR GAS SERVICE, INSTALL PROCESS TAP VERTICALLY INTO THE TOP OF THE TANK.
PRESS Indicator & Transmitter
(OR PRESS SW)

PIT

CONC WALL

TEST TAP

V301

PIPE

1 1/4" V464 AT SPRINGLINE SHALL BE ISOLATED/INSUL FROM PIT SENSING LINE W/ AN ENGR APPD INSULATING/ISOLATING BUSHING

DENVER WATER
1600 West 12th Ave
Denver, Colorado 80204-3412
T: 303.828.6200
F: 303.828.6199
denverwater.org
NOTE:
INDICATOR AND SWITCH INSTALLATION SHOWN. FOR SINGLE INSTRUMENT INSTALLATIONS, MOUNT DEVICE DIRECTLY ABOVE TEST TAP.
NOTE:
INDICATOR AND SWITCH INSTALLATION SHOWN. FOR SINGLE INSTRUMENT INSTALLATIONS, MOUNT DEVICE DIRECTLY TO SEAL.

40565
PRESSURE INSTRUMENT INSTALLATION (ANNULAR SEAL)
NOTE:

INDICATOR AND SWITCH INSTALLATION SHOWN. FOR SINGLE INSTRUMENT INSTALLATIONS, MOUNT DEVICE DIRECTLY ABOVE DIAPHRAGM SEAL.

40566
PRESSURE INSTRUMENT INSTALLATION
(DIAPHRAGM SEAL)
DETAIL

CONC WALL

PRESS TRANSMITTER (MTD ON WALL)

TO TSIDR

TURBINE INLET PIPE

1/4" HVY WALL SST TUBING

KEYED NOTES:

TAG  QTY  DESCRIPTION
①  4   1/4" NPT FEMALE PORT (304 SST)
②  4   SST NIPPLE (BOTH SIDES OF NEEDLE VALVE)
③  2   SST MALE CONNECTOR
④  4   SST NEEDLE VALVE
⑤  1   SST ANGLED NEEDLE VALVE
⑥  1   SST BALL BLEED VALVE
⑦  1   SST BALL DRAIN VALVE
⑧  3   SST BRANCH TEE
⑨  4   SST UNION TEE

40569
PENSTOCK PRESSURE RING
GAS PIPE

ELEC COND

LIMIT SW CLOSED W/ GAS SHUT OFF SW IN OPEN POSITION

LIMIT SW

TO PLC

NO SW HELD CLOSED

GAS SHUT OFF VLV

(CLOSED)

(OPEN)
NOTES:

1. SEE CONDUIT AND CONDUCTOR SCHEDULE FOR ELECTRICAL CONDUIT NUMBERS.

2. DETAIL APPLIES TO FLOWMETERS WITH LOCAL OR REMOTE MOUNT TRANSMITTERS.
NOTE:
Spherical tip sensing element shall be used with liquid applications. Twin tip sensing element shall be used with air applications.
NOTE:

PROVIDE TRANSDUCER WITH A BRONZE CORPORATION STOP FEEDTHROUGH WITH BALL VALVE WHICH ALLOWS FOR THE COMPLETE REMOVAL OF THE TRANSDUCER FOR REPAIR, REPLACEMENT, OR CLEANING WITHOUT DEWATERING PIPE.
NOTES:

1. THE TRANSDUCER SHALL BE INSTALLED IN A DEWATERED PIPE FROM THE INSIDE OUT. THE TRANSDUCER ASSEMBLY IS SEALED ON THE PIPE USING AN O-RING INNER SEAL AND AN OUTER PACKING.

2. REPAIR LINING AND COATING AFTER DRILLING HOLE AND WELDING.
PIPE END VIEW
ANGLES SHOWN FOR REF ONLY
-NOT DRILL ANGLES-

ISOMETRIC

40587
ULTRASONIC FLOWMETER
(8 PATH)
PIPE END VIEW

ANGLES SHOWN FOR REF ONLY
—NOT DRILL ANGLES—

ISOMETRIC

40588
ULTRASONIC FLOWMETER
(4 PATH)
PIPE END VIEW
ANGLES SHOWN FOR REF ONLY
–NOT DRILL ANGLES–

ISOMETRIC

40589
ULTRASONIC FLOWMETER
(2 PATH)
FLOOR MOUNTED

TYPE B

WALL MOUNTED

TYPE A

NOTE:
MATERIAL: ASTM A 240/320, TYPE 304 OR 316

40590
INSTRUMENT MOUNTING