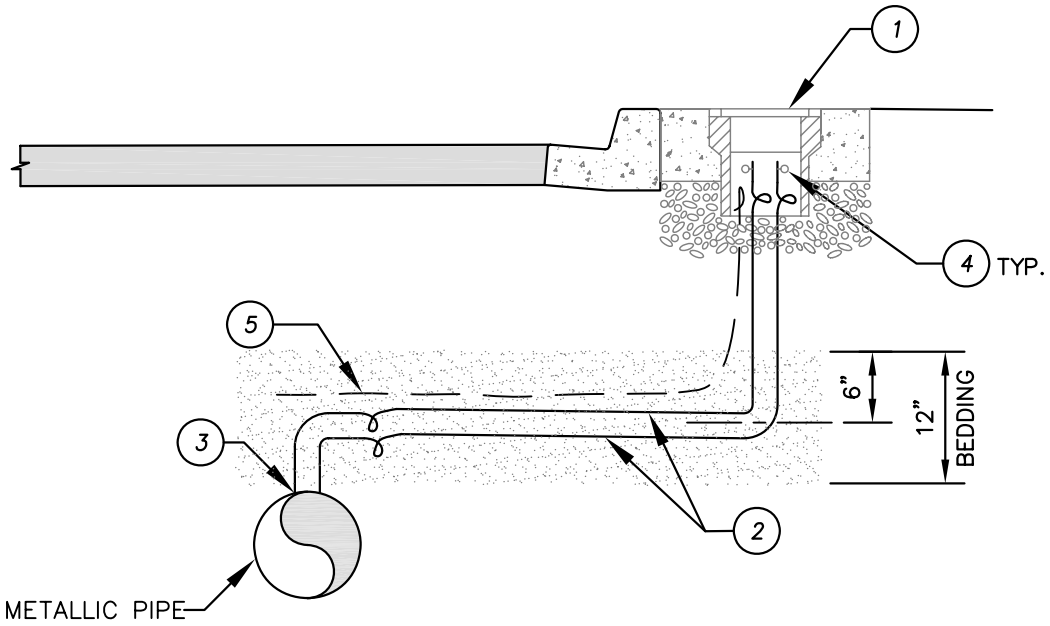
# CATHODIC PROTECTION STANDARD DRAWINGS
# TABLE OF CONTENTS




| ITEM | MATERIALS |
|---|---|
| 1 | TEST BOX AND CONCRETE PAD PER STD. DWG. CP–6. |
| 2 | NO. 8 STRANDED COPPER WIRE WITH BLACK INSULATION PER IRWD SPEC. SECTION 16640. COIL BOTH ENDS PER NOTE 1. |
| 3 | ALUMINO–THERMIC WELD PER IRWD SPEC. SECTION 16640 AND STD. DWG. CP–8. |
| 4 | IDENTIFICATION TAGS PER STD. DWG. CP–6. |
| 5 | PLASTIC WARNING TAPE. |

NOTES:

1. PROVIDE 3 FEET OF COILED SLACK IN EACH WIRE AT EACH END (I.E. AT PIPE AND AT BOX). PUT THE SLACK AT THE BOX END INSIDE THE BOX.
2. FOR TEST STATIONS ON PIPES IN STREETS SEE IRWD STD. DWG. CP–7.

# TWO WIRE TEST STATION

| REVISION | | | |
|---|---|---|---|
| NO. | DATE | APPROVED | DATE |
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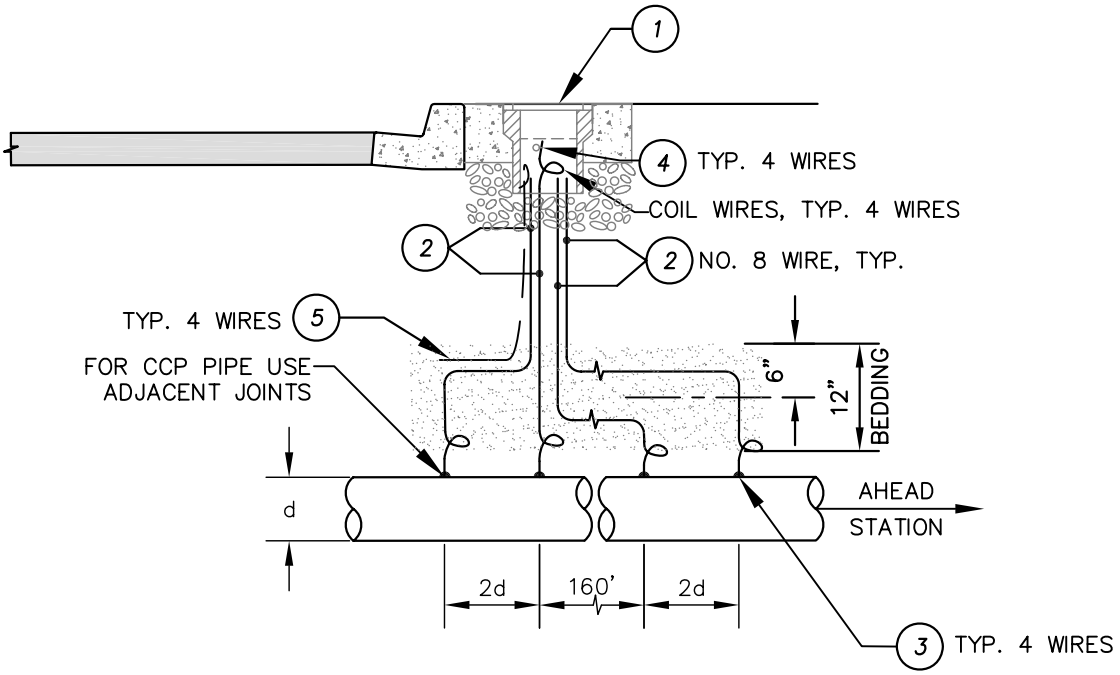
IRVINE RANCH WATER DISTRICT

IRWD STD.DWG. CP-1

SHEET 1 OF 1




| ITEM | MATERIALS |
|---|---|
| 1 | TEST BOX AND CONCRETE PAD PER STD. DWG. CP-6. |
| 2 | NO. 8 STRANDED COPPER WIRE WITH BLACK INSULATION PER IRWD SPEC. SECTION 16640. COIL BOTH ENDS PER NOTE 5. |
| 3 | ALUMINO-THERMIC WELD PER IRWD SPEC. SECTION 16640 AND STD. DWG. CP-8. |
| 4 | IDENTIFICATION TAGS PER STD. DWG. CP-6. |
| 5 | PLASTIC WARNING TAPE. |

NOTES:

1. FOR TEST STATIONS INSTALLED CROSS COUNTRY OR IN UNPAVED AREAS, A UTILITY MARKER SHALL BE INSTALLED ADJACENT TO TEST STATION AND APPURTENANCES PER IRWD STD. DWG. G-2.
2. FOR TEST STATION BOX LOCATIONS SEE IRWD STD. DWG. CP-7.
3. THE TEST STATION SHALL EXTEND PERPENDICULAR TO THE CENTERLINE OF THE STREET FROM THE WATER MAIN TO THE TEST STATION BOX.
4. THE TEST STATION BOX SHALL BE SET BEHIND SIDEWALK WHERE SIDEWALK IS ADJACENT TO CURB OR IN PARKWAY BETWEEN CURB AND SIDEWALK.
5. PROVIDE 3 FEET OF COILED SLACK IN EACH WIRE AT EACH END (I.E. AT PIPE AND AT BOX). PUT THE SLACK AT THE BOX END INSIDE THE BOX.

# FOUR WIRE TEST STATION

| REVISION | | | |
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| NO. | DATE | APPROVED | DATE |
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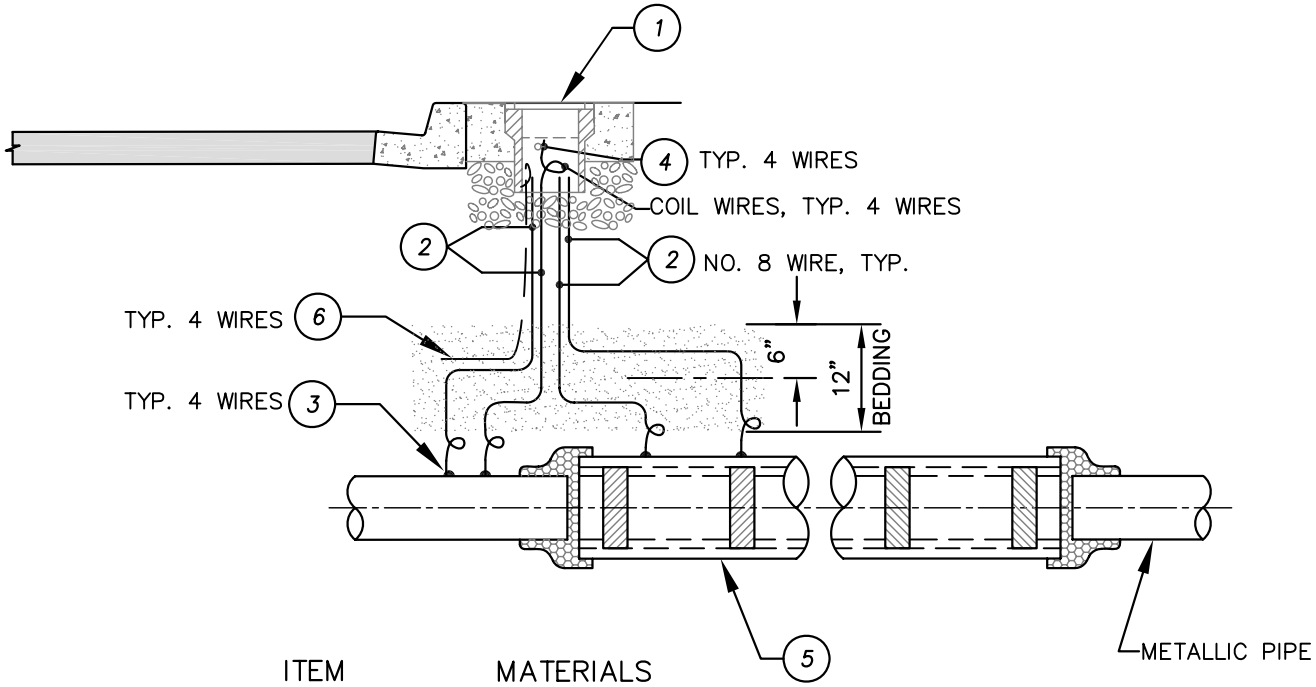
IRVINE RANCH WATER DISTRICT

IRWD STD.DWG. CP-2

SHEET 1 OF 1




| ITEM | MATERIALS |
|---|---|
| 1 | TEST BOX AND CONCRETE PAD PER STD. DWG. CP–6. |
| 2 | NO. 8 STRANDED COPPER WIRE WITH BLACK INSULATION PER IRWD SPEC. SECTION 16640. COIL BOTH ENDS PER NOTE 5. CONNECT WIRES WITHIN 5 FEET OF END OF CASING. |
| 3 | ALUMINO–THERMIC WELD PER IRWD SPEC. SECTION 16640 AND STD. DWG. CP–8. |
| 4 | IDENTIFICATION TAGS PER STD. DWG. CP–6. |
| 5 | STEEL CASING PER IRWD STD. DWG. W–21. |
| 6 | PLASTIC WARNING TAPE. |

NOTES:

1. FOR TEST STATIONS INSTALLED CROSS COUNTRY OR IN UNPAVED AREAS, A UTILITY MARKER SHALL BE INSTALLED ADJACENT TO TEST STATION AND APPURTENANCES PER IRWD STD. DWG. G–2.
2. FOR TEST STATION BOX LOCATIONS SEE IRWD STD. DWG. CP–7.
3. THE TEST STATION SHALL EXTEND PERPENDICULAR TO THE CENTERLINE OF THE STREET FROM THE WATER MAIN TO THE TEST STATION BOX.
4. THE TEST STATION BOX SHALL BE SET BEHIND SIDEWALK WHERE SIDEWALK IS ADJACENT TO CURB OR IN PARKWAY BETWEEN CURB AND SIDEWALK.
5. PROVIDE 3 FEET OF COILED SLACK IN EACH WIRE AT EACH END (I.E. AT PIPE AND AT BOX). PUT THE SLACK AT THE BOX END INSIDE THE BOX.

# CASING TEST STATION

| REVISION | | | |
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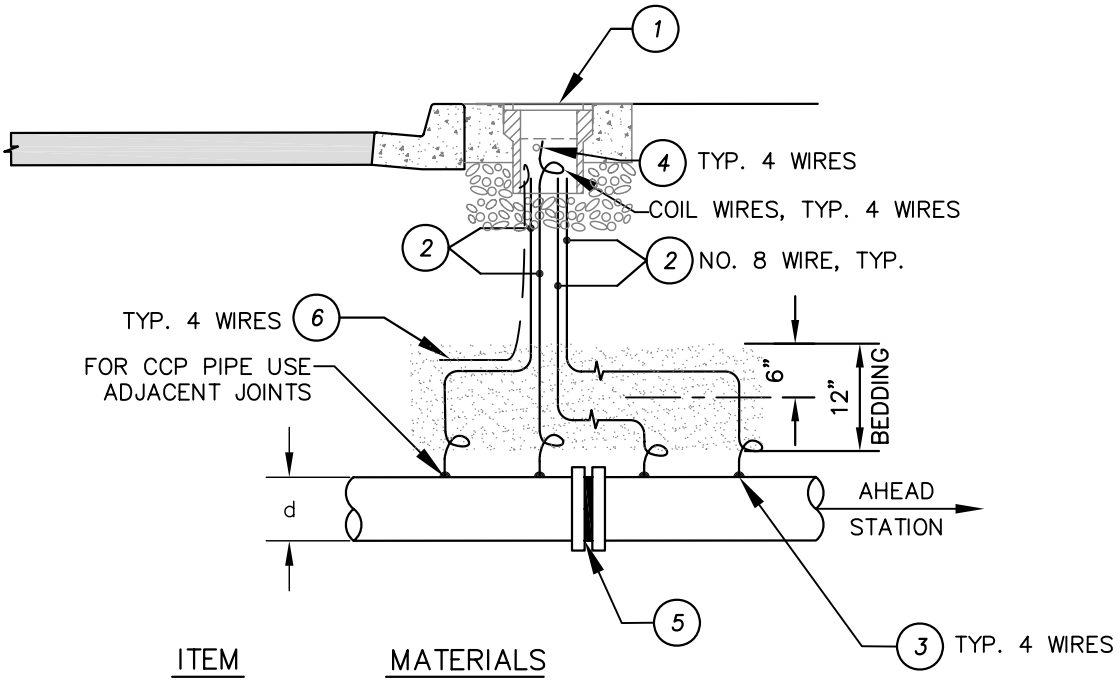
IRWD STD.DWG. CP-3

SHEET 1 OF 1




| ITEM | MATERIALS |
|---|---|
| 1 | TEST BOX AND CONCRETE PAD PER STD. DWG. CP–6. |
| 2 | NO. 8 STRANDED COPPER WIRE WITH BLACK INSULATION PER IRWD SPEC. SECTION 16640. COIL BOTH ENDS PER NOTE 5. |
| 3 | ALUMINO–THERMIC WELD PER IRWD SPEC. SECTION 16640 AND STD. DWG. CP–8. |
| 4 | IDENTIFICATION TAGS PER STD. DWG. CP–6. |
| 5 | INSULATING TEST KIT PER IRWD STD. DWG. CP–11. |
| 6 | PLASTIC WARNING TAPE. |

NOTES:

1. FOR TEST STATIONS INSTALLED CROSS COUNTRY OR IN UNPAVED AREAS, A UTILITY MARKER SHALL BE INSTALLED ADJACENT TO TEST STATION AND APPURTENANCES PER IRWD STD. DWG. G–2.
2. FOR TEST STATION BOX LOCATIONS SEE IRWD STD. DWG. CP–7.
3. THE TEST STATION SHALL EXTEND PERPENDICULAR TO THE CENTERLINE OF THE STREET FROM THE WATER MAIN TO THE TEST STATION BOX.
4. THE TEST STATION BOX SHALL BE SET BEHIND SIDEWALK WHERE SIDEWALK IS ADJACENT TO CURB OR IN PARKWAY BETWEEN CURB AND SIDEWALK.
5. PROVIDE 3 FEET OF COILED SLACK IN EACH WIRE AT EACH END (I.E. AT PIPE AND AT BOX). PUT THE SLACK AT THE BOX END INSIDE THE BOX.

# INSULATOR TEST STATION

| REVISION | | | |
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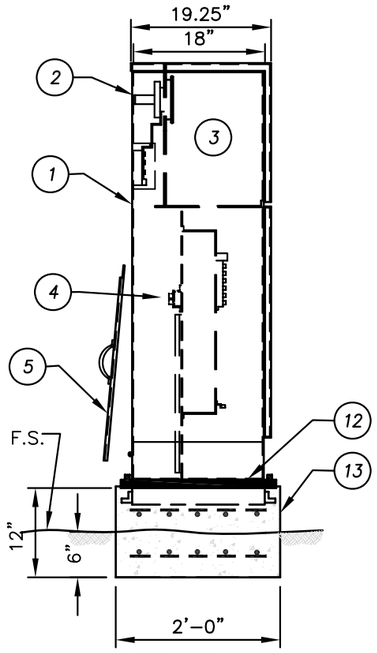
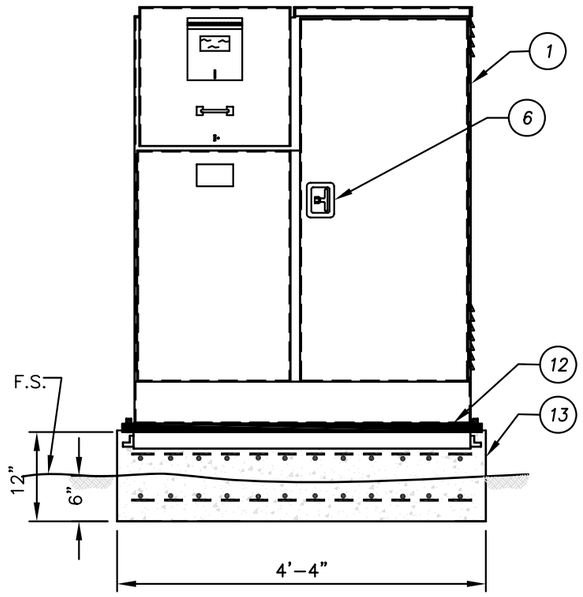
IRVINE RANCH WATER DISTRICT

IRWD STD.DWG. CP-4

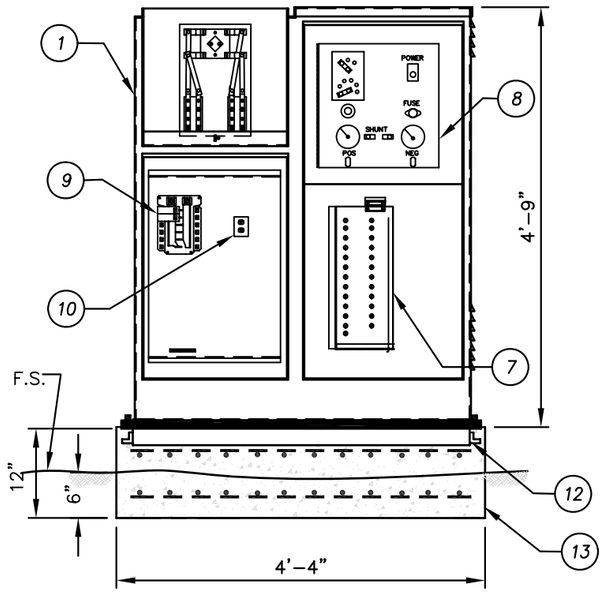
SHEET 1 OF 1




SIDE VIEW

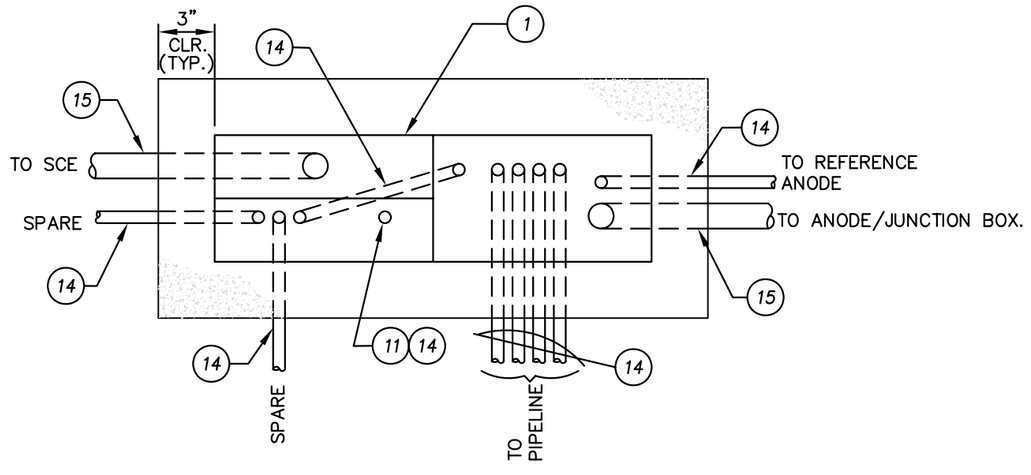



BACK VIEW




FRONT VIEW

| ITEM | MATERIALS |
|---|---|
| 1 | COMBINATION ELECTRIC SERVICE AND RECTIFIER CABINET. MYERS POWER PEDESTAL PRODUCT NO. MEUG46IX–M–100. |
| 2 | SCE METER SOCKET |
| 3 | SCE METER SECTION |
| 4 | UTILITY LANDING |
| 5 | REMOVABLE UTILITY ACCESS COVER W/PADLOCK |
| 6 | T–HANDLE W/PADLOCK HASP |
| 7 | SHUNT PANEL. SEE SHT. 2 OF 2. |
| 8 | RECTIFIER. SEE SHT. 2 OF 2. MOUNT IN CABINET WITH "SLIDE–OUT" RACK. |
| 9 | 12 CIRCUIT LOAD CENTER. |
| 10 | GFI RECEPTACLE, 20 AMP. |
| 11 | COPPER CLAD GROUND ROD W/NO. 6 AWG BARE SOLID COPPER CONDUCTOR. CADWELD TO GROUND ROD AND PEDESTAL. |
| 12 | PADMOUNT SLEEVE, MYERS |
| 13 | CONCRETE PAD WITH NO. 4'S @ 12" O.C. BOTH WAYS TOP AND BOTTOM. |
| 14 | 1" SCH. 40 CONDUIT. |
| 15 | 3" SCH. 40 CONDUIT. |




BASE PLAN

# CATHODIC PROTECTION RECTIFIER AND SHUNT PANEL

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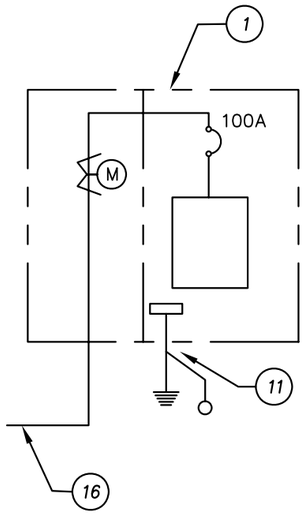
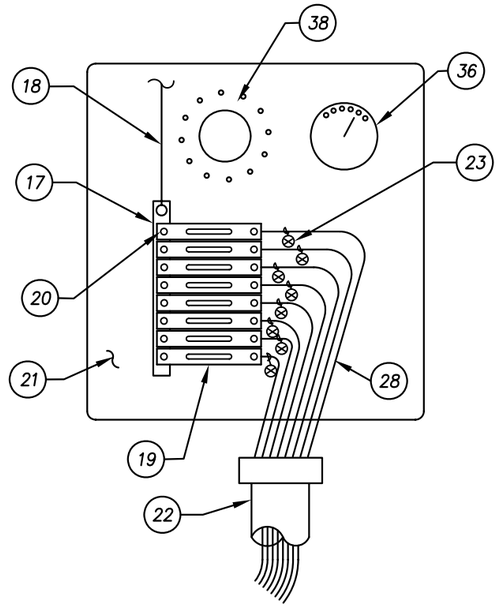
IRVINE RANCH WATER DISTRICT

IRWD STD.DWG. CP-5

SHEET 1 OF 2

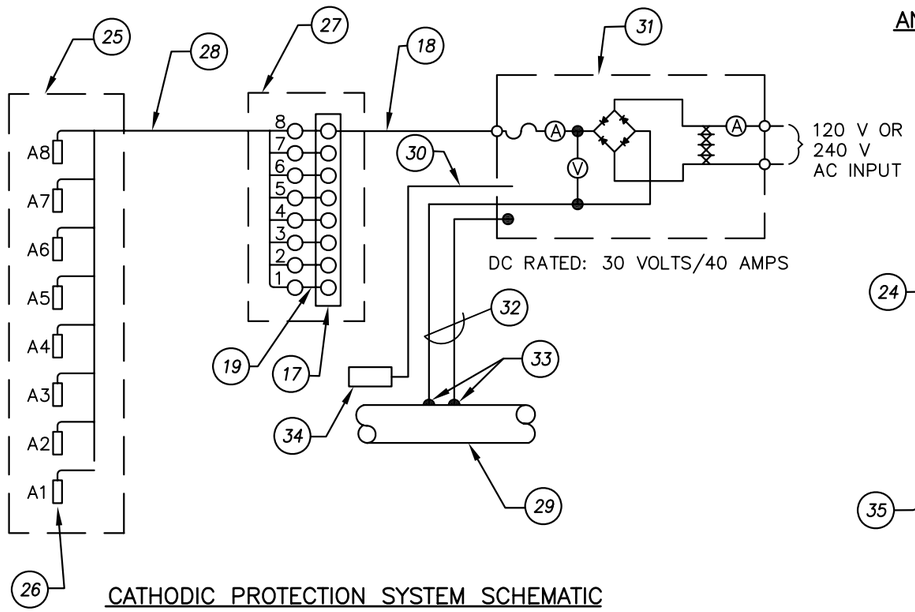



SINGLE LINE DIAGRAM

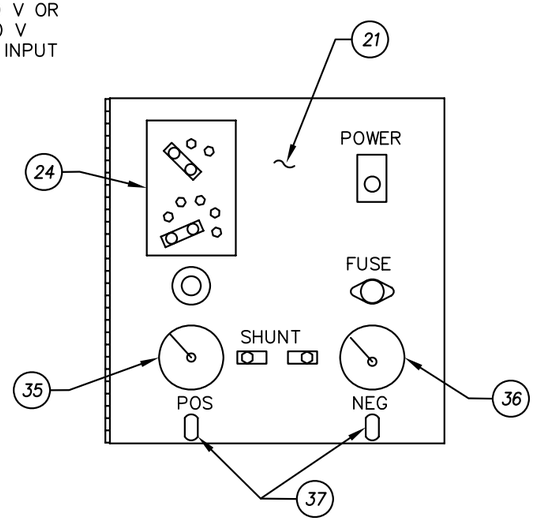



TO ANODE/JUNCTION BOX

ANODE SHUNT PANEL




CATHODIC PROTECTION SYSTEM SCHEMATIC




RECTIFIER

| ITEM | MATERIALS |
|---|---|
| 1 | COMBINATION ELECTRIC SERVICE AND RECTIFIER CABINET. MYERS POWER PEDESTAL PRODUCT NO. MEUG46IX–M–100. |
| 8 | RECTIFIER. AIR–COOLED WITH MANUAL TAP ADJUSTMENT. MOUNT IN CABINET WITH SLIDE–OUT RACK. UNIVERSAL BRAND OR AS OTHERWISE SPECIFIED IN PROJECT SPECIFICATIONS. |
| 11 | COPPER CLAD GROUND ROD W/NO. 6 AWG BARE SOLID COPPER CONDUCTOR. CADWELD TO GROUND ROD AND PEDESTAL. |
| 16 | (1) 3" C TO ELECTRIC UTILITY MANHOLE. |
| 17 | COPPER BUS BAR (1' x 1/8"). |
| 18 | ANODE HEADER WIRE. 1 – NO. 4 AWG STRD COPPER WIRE WITH HMWPE INSULATION TO RECTIFIER. |
| 19 | 0.001 OHM SHUNT (TYP. OF 8). REFER TO PROJECT SPECIFICATIONS. |
| 20 | SCREW TERMINALS. |
| 21 | BAKELITE PANEL MATERIAL, ENGRAVED. |
| 22 | 3" SCH. 40 PVC CONDUIT TO ANODE BED 3"ø CASING. INSTALL WEATHERPROOF SEALING MASTIC INSIDE CONDUIT TO SEAL OUT GASSES FROM ANODE BED. |
| 23 | BRASS I.D. TAG WITH ANODE NO. (TYP. OF 8). |
| 24 | COARSE AND FINE STEP VOLTAGE CONTROL TAPS. |
| 25 | DEEP ANODE SYSTEM. REFER TO PROJECT SPECIFICATIONS. |
| 26 | ANODES (TYP. OF 8). REFER TO PROJECT SPECIFICATIONS. |
| 27 | ANODE SHUNT PANEL WITH SHUNT SELECT SWITCH AND AMMETER. |
| 28 | ANODE LEAD WIRES 8 – NO. 8 AWG STRD COPPER WIRES WITH HMWPE INSULATION PER IRWD STD. SPECIFICATIONS. |
| 29 | PIPELINE BEING PROTECTED. |
| 30 | ANODE HEADER WIRE. 1 – NO. 8 AWG STRD COPPER WIRE WITH THWN INSULATION. |
| 31 | RECTIFIER UNIT. REFER TO PROJECT SPECIFICATIONS. |
| 32 | PIPE LEAD WIRE. 2 – NO. 8 AWG STRD COPPER WIRE WITH HMWPE INSULATION. |
| 33 | ALUMINO–THERMIC WELD. SEE CP–8. |
| 34 | REFERENCE ELECTRODE. SEE SECTION 16640 OF IRWD STD. SPECIFICATIONS. |
| 35 | PANEL–MOUNT DC VOLT METER. |
| 36 | PANEL–MOUNT DC AMMETER. |
| 37 | DC OUTPUT TERMINALS WITH SOLDERLESS LUG. |
| 38 | INDIVIDUAL SHUNT OUTPUT SELECTOR SWITCH. |

NOTES:

1. SERIES CONNECTED RATING OF BREAKERS MAY BE USED. ALL BREAKERS MUST BE OF SAME MANUFACTURER AND U.L. LISTED. SERIES CONNECTED SHORT CIRCUIT RATING FOR THAT VOLTAGE.
2. FIELD MARKED ON ALL EQUIPMENT SHALL READ: CAUTION SERIES RATED SYSTEM 42,000A AVAILABLE IDENTIFIED REPLACEMENT COMPONENT REQUIRED.

# CATHODIC PROTECTION RECTIFIER AND SHUNT PANEL

| REVISION NO. | DATE | APPROVED | DATE |
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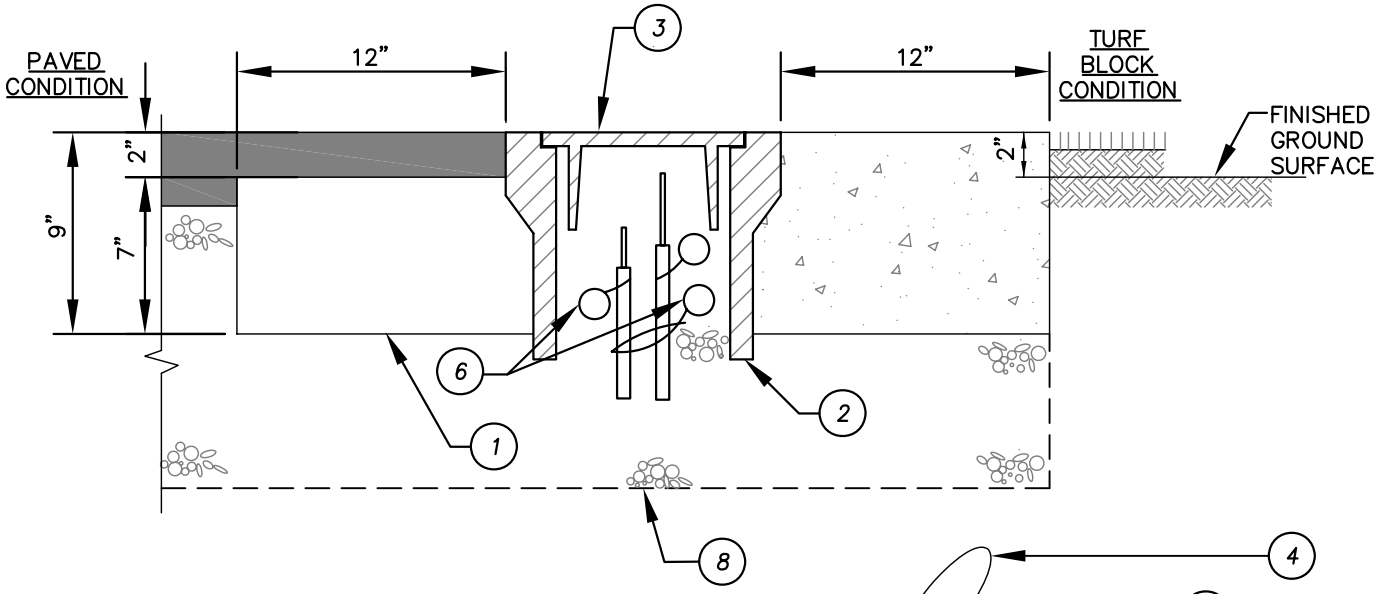
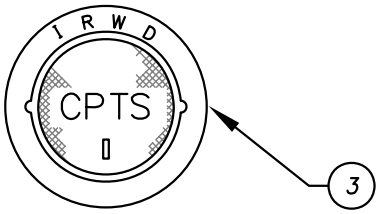
IRVINE RANCH WATER DISTRICT

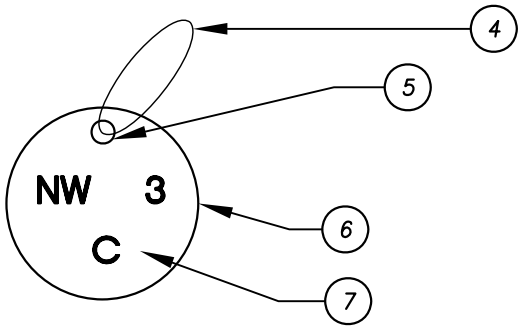
IRWD STD.DWG. CP-5

SHEET 2 OF 2




COVER




IDENTIFICATION TAG

| ITEM | MATERIALS |
|---|---|
| 1 | SQUARE CLASS "B" CONCRETE PAD. |
| 2 | TEST BOX AND FRAME PER IRWD STD. SPEC. SECTION 03462. |
| 3 | TEST BOX COVER PER DETAIL HEREON. USE 6" LONG–SKIRTED CAST IRON LID PER IRWD SPECIFICATIONS. |
| 4 | NYLON WIRE. |
| 5 | 3/16 INCH DIA. HOLE. |
| 6 | 2 INCH DIA. TAG PER IRWD STD. SPEC. SECTION 16640 AND DETAIL HEREON. SEE SHEET 2 FOR STATION IDENTIFICATION TAG AND WIRE IDENTIFICATION TAG LABELING STANDARDS. |
| 7 | 1/4 INCH HIGH LETTERS AND NUMBERS. |
| 8 | 6" OF 3/4 INCH CRUSHED ROCK BEDDING. BRING ADDITIONAL 2" OF BEDDING INTO BOX. |

NOTES:

1. INSTALLATION TYPICAL FOR TWO WIRE, FOUR WIRE, INSULATING JOINT AND CASING TEST STATIONS. SEE SHEET 2 FOR LABELING STANDARDS.
2. PROVIDE 3 FEET OF COILED SLACK IN EACH WIRE AT EACH END (I.E. AT PIPE AND AT BOX). PUT THE SLACK AT THE BOX END INSIDE THE BOX.
3. STRIP INSULATION FROM END OF EACH TEST LEAD. MIN 1/4 INCH, MAX. 1/2 INCH. INSTALL WIRE NUTS AND ANTI–ARC COMPOUND TO PROTECT BARE WIRE ENDS.

# TEST BOX AND WIRING

| REVISION NO. | DATE | APPROVED | DATE |
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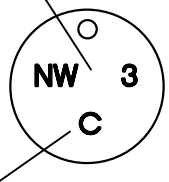
IRVINE RANCH WATER DISTRICT

IRWD STD.DWG. CP-6

## WIRE NUMBER AND DIRECTION

**NW** = COMPASS DIRECTION THAT WIRE RUNS ON PIPE. ONE OF THE EIGHT PRIMARY DIRECTIONALS; N, E, S, W, NW, NE, SW, SE. USE ALPHA CHARACTER "X" FOR CPTS CONNECTIONS RIGHT AT OR NEAREST TO THE CPTS BOX.

**3** = SEQUENTIAL, 1 DIGIT NUMBER ASSIGNED TO EACH TEST STATION WIRE; UNIQUE TO EACH TEST WIRE. LOWEST NUMBERS (1 & 2) ARE TO BE CLOSEST TO THE JOINT OR TEST BOX SITE.




## FACILITY IDENTIFYER

**P** = PIPELINE
**C** = CASING
**A** = ANODE
**RC** = REFERENCE COUPON
**IJ** = INSULATING JOINT

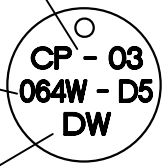
## WIRE IDENTIFICATION LABELING STANDARDS

## STATION NUMBER = CP - __ __

**CP** = CATHODIC PROTECTION TEST STATION

**3** = SEQUENTIAL, 2 DIGIT NUMBER ASSIGNED TO EACH TEST STATION; UNIQUE TO THE ATLAS PAGE. (I.E. START NUMBERING OVER AT 01 ON EACH ATLAS PAGE)

## ATLAS PAGE AND QUADRANT CO-ORDINATES




## SYSTEM TYPE

**DW** = DOMESTIC
**RW** = RECLAIM
**UT** = UNTREATED
**FM** = FORCE MAIN

## STATION IDENTIFICATION LABELING STANDARDS

# TYPICAL CONCRETE TEST BOX AND WIRING DIAGRAM

| REVISION | | | |
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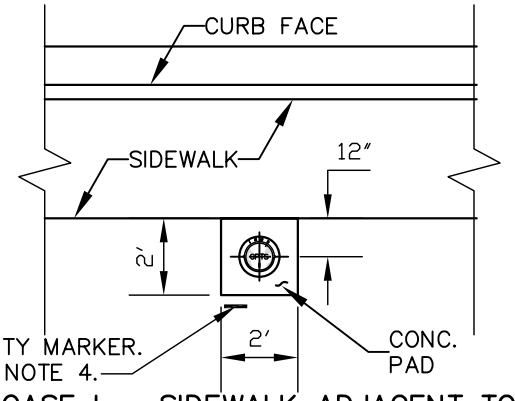
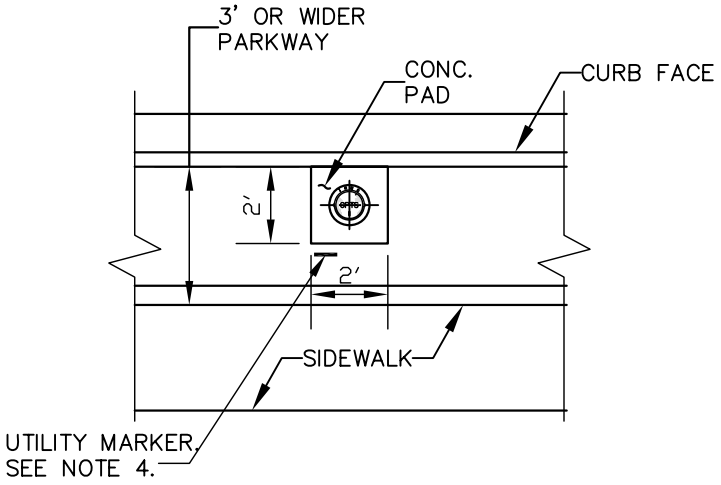
IRVINE RANCH WATER DISTRICT

IRWD STD.DWG. CP-6

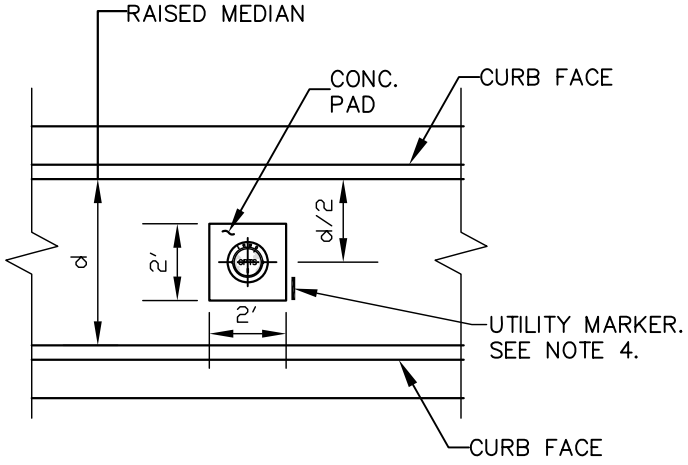
SHEET 2 OF 2




CASE I – SIDEWALK ADJACENT TO CURB




CASE II – SIDEWALK NOT ADJACENT TO CURB




CASE III – CENTER MEDIAN

NOTES:

1. USE CASE I OR II FOR PIPE CLOSE TO THE CURB.
2. USE CASE III FOR PIPE CLOSE TO THE CENTER MEDIAN WHERE MEDIAN IS RAISED AND d > 10'–0".
3. IF DIFFERENT FROM THESE THREE CASES, DISTRICT'S REPRESENTATIVE SHALL DETERMINE THE TEST STATION LOCATION.
4. INSTALL UTILITY MARKER PER IRWD STD. DWG. G–2.

# TEST STATION LOCATIONS

| REVISION | | | |
|---|---|---|---|
| NO. | DATE | APPROVED | DATE |
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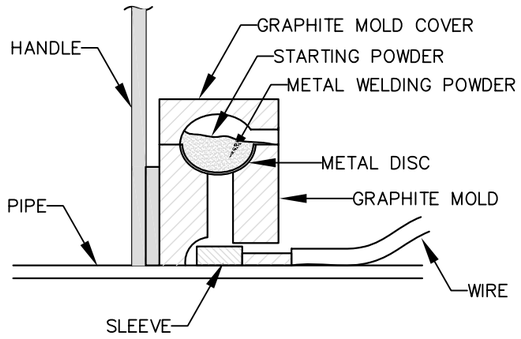
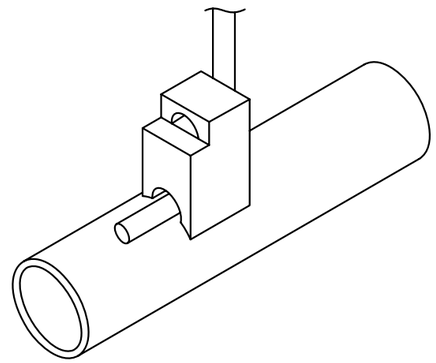
IRWD STD.DWG. CP-7

SHEET 1 OF 1



NOTES:

1. ALL WIRE WELDS SHALL BE MINIMUM 6 INCHES APART.
2. CAD–WELD MOLD SHOWN IS FOR HORIZONTAL SURFACES. FOR VERTICAL SURFACES SIDE WELD MOLD IS REQUIRED.

| TABLE A | | | |
|---|---|---|---|
| PIPE MATERIAL | WIRE SIZE | MOLD SIZE | SHOT MIX |
| STEEL CML&C | #8 AWG STRANDED | CAHAA–1G | CA–15 |
| STEEL CYLINDER PIPE | #8 AWG STRANDED | CAHAA–1G | CA–15 |
| DUCTILE IRON PIPE | #8 AWG STRANDED | CA 32X–F19 | XF–19 |

STEP 1: REMOVE COATING OR ENCASEMENT FROM PIPE.

STEP 2: FILE OR GRIND PIPE SURFACE TO BARE SHINY METAL (EQUIVALENT TO SSPC–10 "NEAR WHITE METAL") TO A MINIMUM SIZE OF AN AREA OF 3"X3".

STEP 3: PREHEAT THE AREA TO BE CAD–WELDED WITH A PROPANE TORCH TO REMOVE ANY SURFACE MOISTURE. DO NOT OVER HEAT)

STEP 4: STRIP 1" OF INSULATION FROM END OF CP TEST WIRE.

STEP 5: WRAP TEST LEAD WIRE ONCE AROUND OUTSIDE CIRCUMFERENCE OF PIPE THEN TIE WIRE INTO A "HALF HITCH" KNOT APPROXIMATELY 12" AWAY FROM CAD–WELD AREA. LEAVE 12" OR MORE OF WIRE (SLACK) BETWEEN KNOT AND CAD–WELD, (THIS WILL HELP PREVENT FUTURE DAMAGE TO CAD–WELD.)

STEP 6: INSTALL APPROPRIATE CAD–WELD PROTECTIVE SLEEVE ONTO SPECIFIC AWG WIRE SIZE. (REFER TO TABLE A.)

STEP 7: SELECT CORRECT CAD–WELD GRAPHITE MOLD AND APPROPRIATE WELDING POWDER FOR THE SIZE AND TYPE OF ARE AND METALLIC PIPE THAT IS TO BE WELDED. (REFER TO TABLE A.)

STEP 8: INSPECT AND CLEAN THE GRAPHITE MOLD.

STEP 9: INSERT CAD – WELD DISC IN BOTTOM OF GRAPHITE MOLD, POUR ENTIRE CONTENTS OF SHOT (ALUMINO–THERMIC WELD POWDER AND STARTER) INTO GRAPHITE MOLD.

STEP 10: PLACE WIRE IN THE CENTER OF THE CLEANED AREA SO THAT ALL OF THE STRIPPED WIRE IS IN CONTACT WITH THE PIPE SURFACE.

STEP 11: PLACE LOADED GRAPHITE MOLD OVER WIRE AND HOLD FIRMLY IN PLACE.

STEP 12: POSITION YOURSELF (AND ANY OTHER PERSONNEL) AT LEAST 90 DEGREES AWAY FROM IGNITION PORT OPENING.

STEP 13: HOLD FLINT GUN AT IGNITION PORT AND IGNITE STARTING POWDER.

STEP 14: REMOVE GRAPHITE MOLD FROM PIPE AFTER CAD–WELD COMBUSTION HAS STOPPED.

STEP 15: REMOVE SLAG FROM WELD AREA USING A WELDING PEEN HAMMER.

STEP 16: GRASP WIRE AND APPLY TENSION TO WIRE WHILE STRIKING WELD WITH A 2 LBS. HAMMER TO CHECK SOUNDNESS OF WELD. (BE CAUTIOUS OF DAMAGE TO INTERIOR OF PIPE LINING.)

STEP 17: COAT WIRE, CAD–WELD AND EXPOSED PIPE SURFACE WITH APPROVED "ELASTOMERIC COMPOUND" OR "MASTIC FILLED DOME". BE SURE TO USE MANUFACTURER'S SPECIFIED PRIMER MATERIAL.

STEP 18: REPLACE PIPE COATING AND PLASTIC WRAP OR TAPE IF REQUIRED.

# ALUMINO-THERMIC (CAD) WELDING

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IRVINE RANCH WATER DISTRICT

IRWD STD.DWG. CP-8

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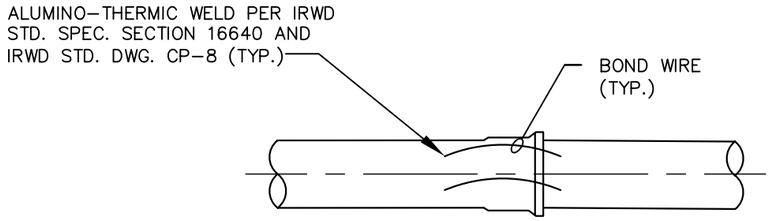
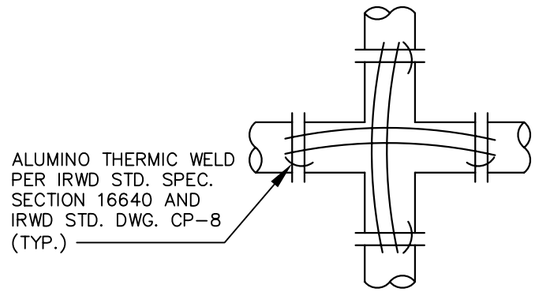



BELL AND SPIGOT PIPE JOINT

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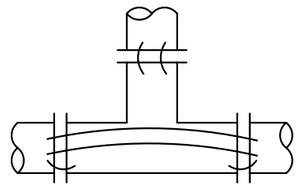

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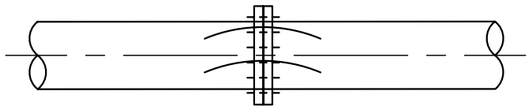
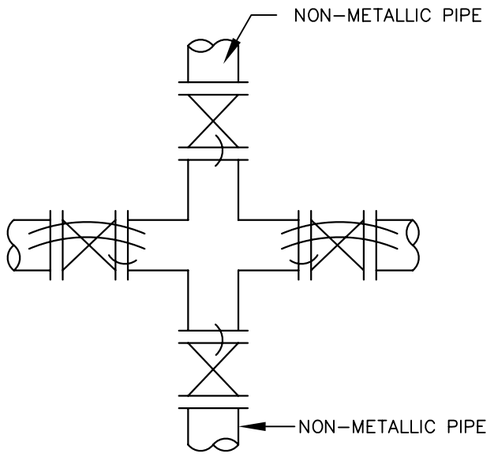
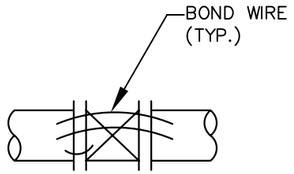


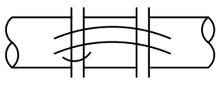
FLANGED OR MECHANICAL PIPE JOINT



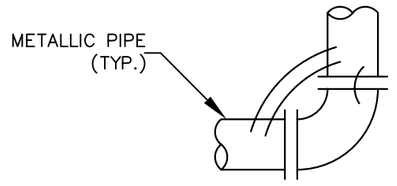

VALVE CROSSING




VALVE



ADAPTER AND FLEXIBLE COUPLING




BEND

NOTES:

1. ALL WIRE WELDS SHALL BE 6" APART MIN.
2. BOND WIRES SHALL NOT BE INSTALLED ACROSS INSULATING JOINTS.
3. COAT WELD PER IRWD STD. SPEC. SECTION 16640
4. THREE BOND WIRES ARE REQUIRED FOR PIPE DIAMETERS 18" OR LARGER.
5. ALL BOND WIRES SHALL BE AS SPECIFIED IN IRWD SPEC. SECTION 16640.

# BONDING FOR PIPE JOINTS AND FITTINGS

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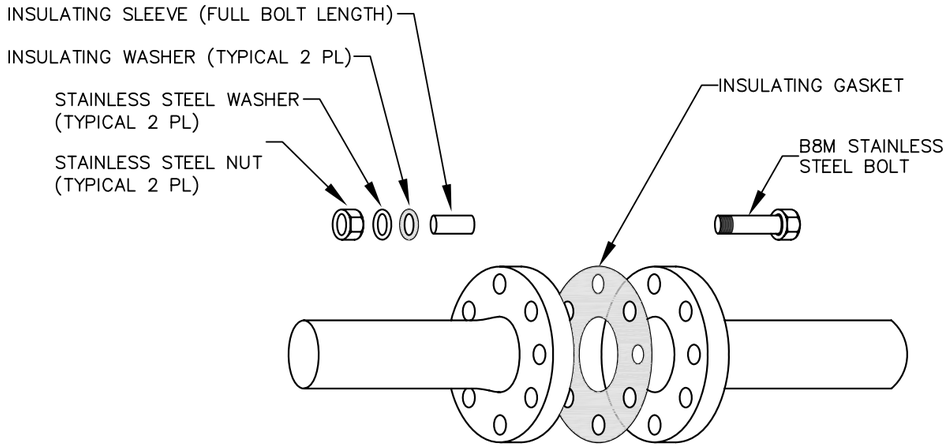
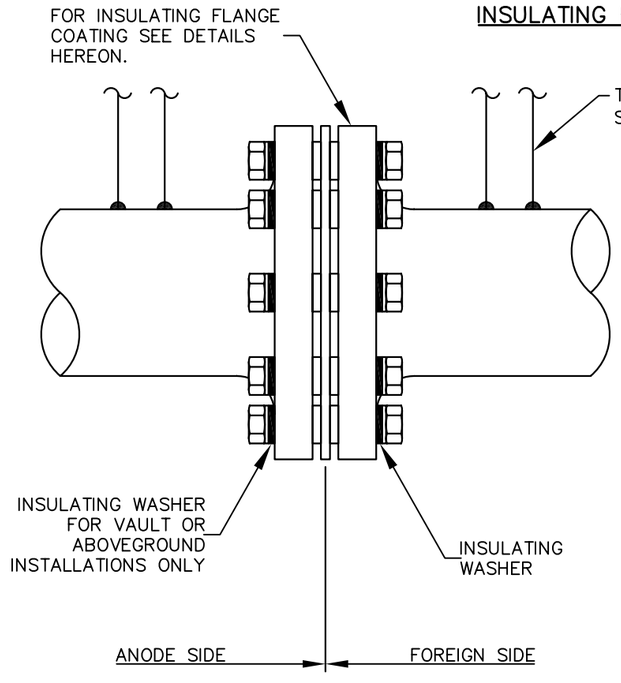
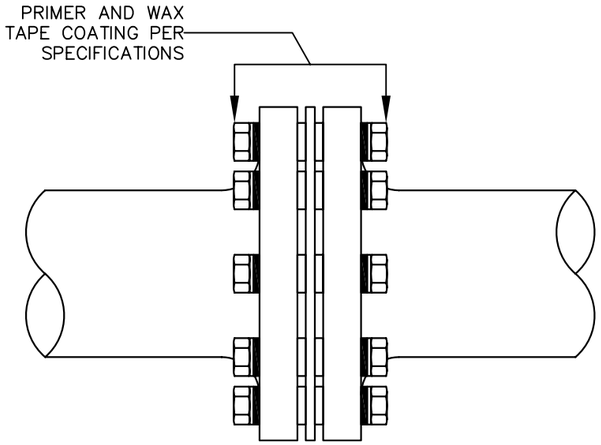



## INSULATING FLANGE KIT

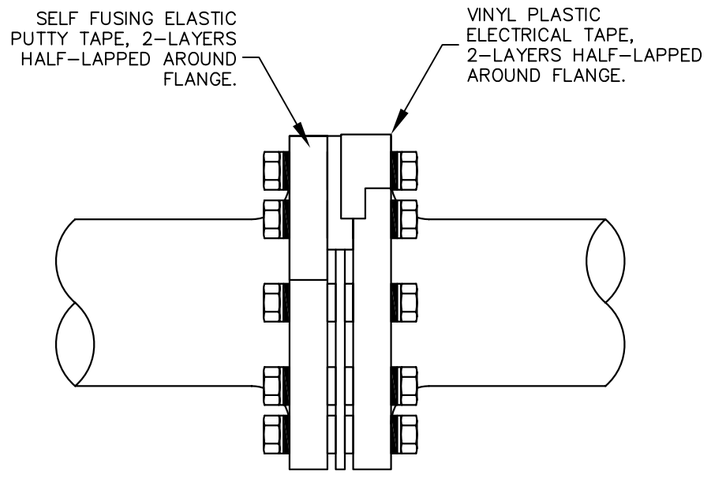



NOTES:

1. HARDWARE QUANTITIES IN INSULATING FLANGE KIT WILL VARY BASED ON GASKET PATTERN AND PIPE SIZE.
2. FOR BELOW GROUND INSTALLATIONS, INSTALL SINGLE-WASHER KITS WITH THE INSULATING WASHERS ONLY ON THE FOREIGN SIDE OF THE FLANGES.
3. THREADED STUD STYLE KITS ARE NOT PERMITTED.




## BURIED INSULATING FLANGE COATING




## ABOVE GROUND INSULATING FLANGE COATING

# INSULATING JOINT

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