

**Notes:**

1. Copper adapter sleeve required for thermite welding of No. 2, No. 4, No. 10 and No. 12 AWG wires.
2. Welder and cartridge size varies according to surface shape, material, and horizontal or vertical surface. Consult welder manufacturer for recommended welder and cartridge.
3. For multiple wire connections to pipe, separate thermite weld connections by one pipe diameter minimum, 2'-0" maximum.
4. Wire connections to foreign pipelines shall be made by foreign pipeline representative.
5. Coat completed thermite weld connections with epoxy repair coating, thermite weld protector pad, or as owner specified.
6. Utilize insulated stranded copper wire only, size as specified. Color code wires according to wire color code, see **8B-902PRC**.
7. Connect bond and test wires to metallic fittings prior to assembly, as required to allow connections to be made to level flat (horizontal type) surfaces on top of fittings.
8. Attach thermite weld to stud or weld base plate, if provided, or to dry side of joint if approved by pipe manufacturer.

N.T.S.

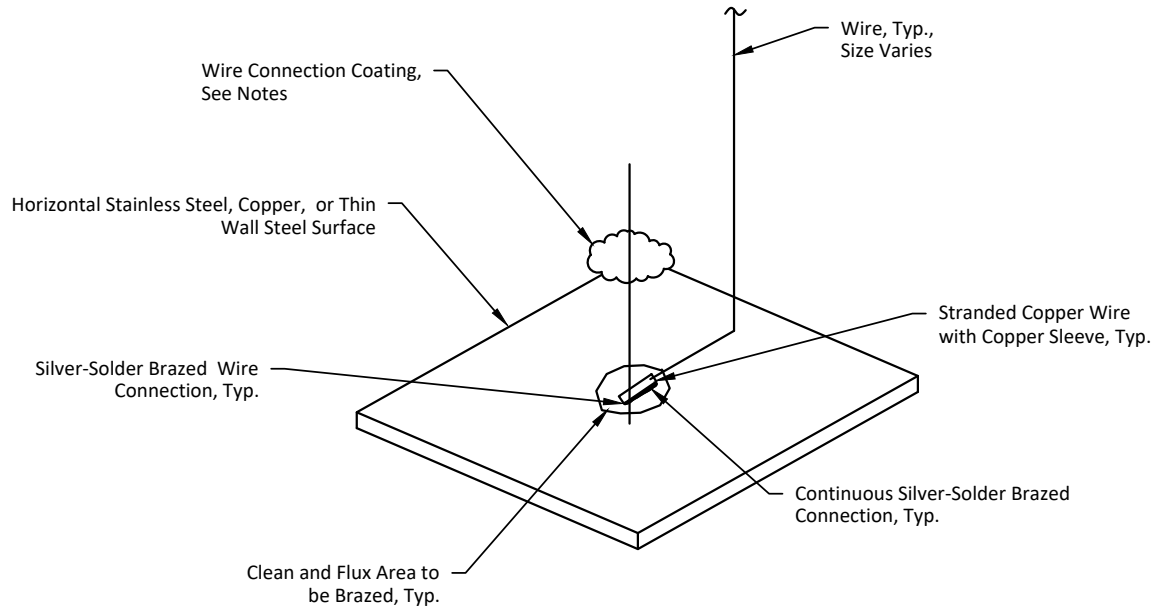
CITY OF RAPID CITY

PUBLIC WORKS DEPARTMENT

**VERTICAL AND HORIZONTAL WIRE  
THERMITE WELD CONNECTIONS**

DATE: 8-19-22

Sec. - Sht.  
8B-901A



**Notes:**

1. Braze (silver-solder) copper wire electrical connection to copper, stainless steel, and thin wall steel (0.035" or less) piping or tubing.
2. Select a location to braze on fitting edge or lip, so as to not damage internal coatings, rubber lining, or gaskets.
3. Clean and prepare surface for brazing. Flux surface with a suitable type flux for material types being soldered in accordance with the silver solder manufacturer's instructions.
4. Braze the sleeved copper wire with a suitable type silver brazing alloy for the materials being connected in accordance with braze material manufacturer's directions.
5. Silver-solder wire to properly prepared and fluxed area in a manner so as to not leave cracks or crevices in the completed brazed connection. Visually inspect and tap with hammer to test adhesion.
6. Allow to cool and remove remaining flux with (stainless steel) wire brush and solvent clean (SSPC SP-1).
7. Only coat wire connections to copper and thin wall steel piping or tubing in specified thermite weld coating method. Stainless steel wire connections do not need to be coated.
8. Utilize insulated stranded copper wire only, size as specified.

N.T.S.

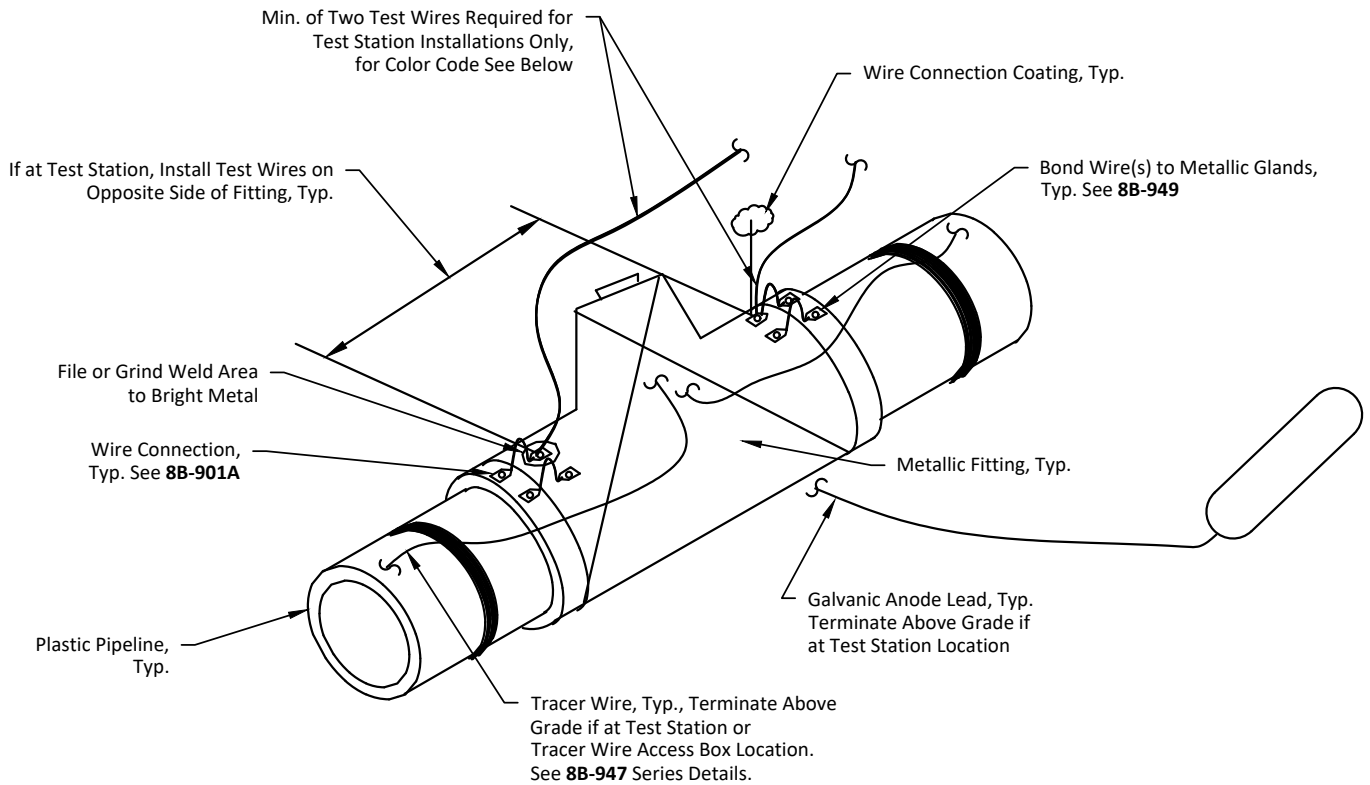
CITY OF RAPID CITY

PUBLIC WORKS DEPARTMENT

**BRAZED WIRE CONNECTIONS**

DATE: 8-19-22

Sec. - Sht.  
8B-901B



**Notes:**

1. Thermite or pin braze weld to metallic pipe, fittings, and structures only.
2. Standard location for anode placement is on east side of north-south main and north side of east-west main. Actual placement location will vary based upon other utility conflicts.
3. Utilize insulated stranded copper wire only, size as specified.
4. Utilize purple tape to identify north (1 strip) or west (2 strips) wire direction and gray tape to identify south (1 strip) or east (2 strips) wire direction, as required.

**Wire Color Code:**

1. Pipeline test wires:  
 Water - Blue  
 High level - Dark Blue with 1 strip of Blue tape  
 Low level - Light Blue with 1 strip of White tape
2. Unprotected pipeline (not cathodically protected - i.e. pump station side of metallic pipe) - Black
3. Anode leads - Black
4. Reference electrode wires - Yellow
5. Tracer wires on non-metallic pipe - Blue w/ 2 strips Black tape and strips of Purple or Gray tape per wire direction, see note above.

N.T.S.

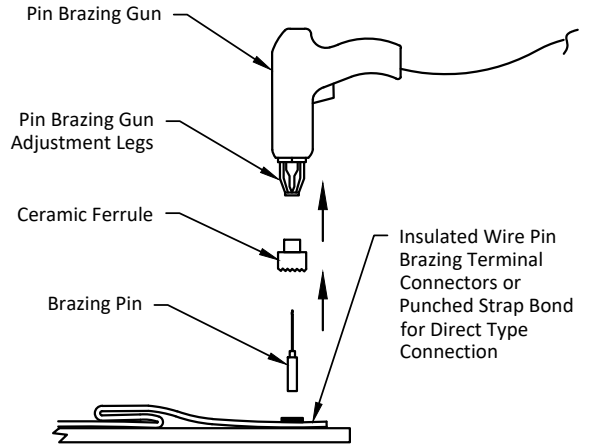
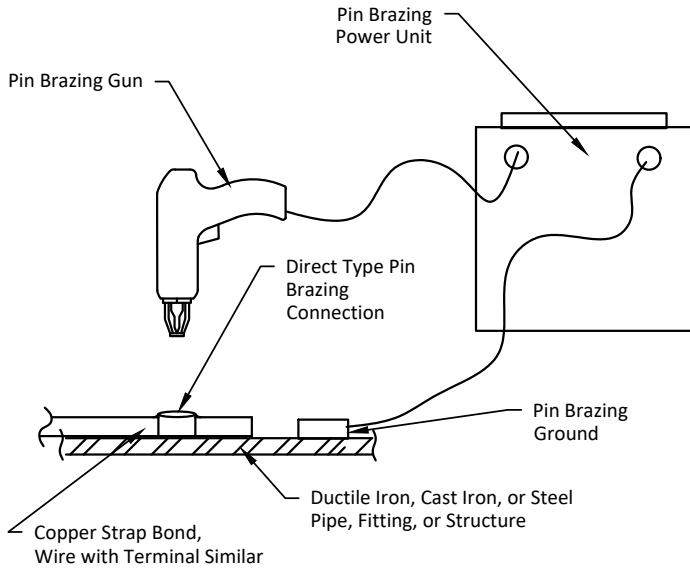
CITY OF RAPID CITY

PUBLIC WORKS DEPARTMENT

**PLASTIC PIPELINE METALLIC FITTING  
WIRE CONNECTION AND COLOR CODE**

DATE: 8-19-22

Sec. - Sht.  
8B-902PRC



**PIN BRAZING MATERIALS**

Provide pin brazing manufacturer's recommended consumables (ceramic ferrules, brazing pins, terminals, etc.) for direct type connections.

**PIN BRAZING DIRECT TYPE WELD**

Complete welds in accordance with pin brazing manufacturer's instructions.

**GENERAL PIN BRAZING AND COATING PROCEDURES**



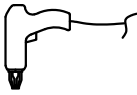
Step 1

File structure connection area (2"x2") to bare bright metal finish (white metal) and clean.



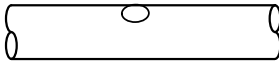
Step 2

Place specified type of terminal on end of insulated wire or in center of punched strap bond hole for direct type of pin brazing connections.



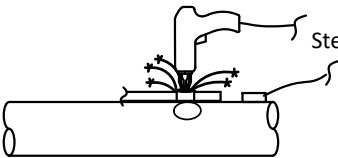
Step 3

Load gun by placing brazing pin and ceramic ferrule securely into front of gun. Adjust the pin holder legs as necessary to obtain the recommended pin brazing "lift height" with the gun resting firmly and flush on the structure surface.



Step 4

Attach the earth ground connection to a bright ground location on the structure, place the loaded pin brazing gun in the center of the strap bond punched hole or of the hole in the wire terminal and squeeze trigger until the brazing pin fuse burns into the ferrule. Hold gun firmly in place until brazing process is completed and the molten metal attached to the terminal and structure surface.



Step 5

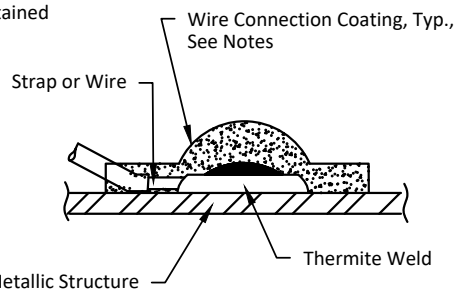
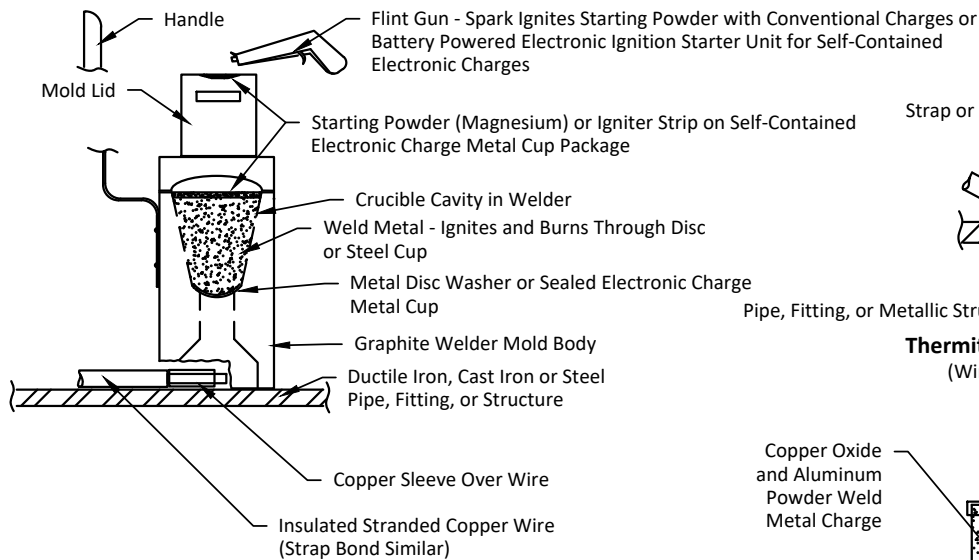
Remove slag from connection, visually inspect and tap weld with hammer to test for soundness and adhesion. Measure joint bond resistance as specified. Replace all poorly formed, unsightly, porous, high resistant, or defective welds. Install additional bond wire or strap, if required.



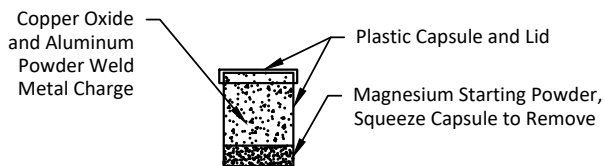
Step 6

Clean and coat connection and exposed structure surface with specified coating system, apply in accordance with coating manufacturer's recommendations.

N.T.S.



**Thermite Weld Connection Coating**  
(Wire brazed to structure, typ.)



**CONVENTIONAL WELD METAL CAPSULE**

Type & size varies (maximum 25 gram for steel, 32 gram for cast & ductile iron, & 15 gram size for oil & gas type pipelines)

**THERMITE WELD**

Use cast iron charges for ductile iron and cast iron structures. Use steel charges for steel structures.  
(similar size and type of conventional or electronic ignition type charges acceptable)  
Complete welds in accordance with manufacturer's instructions.



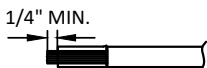
Step 1

File structure connection area (2"x2") to bare bright shiny metal & clean. All wire welds on pipe shall be a minimum of one pipe diameter apart up to a maximum of 2 feet separation distance.



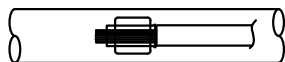
Step 2

Strip insulation from wire. Attach copper sleeve (required on No. 2, No. 4, No. 10 and No. 12 AWG wire)



Step 3

Attach copper sleeve to wire with correct hammer die or crimp tool. Factory sleeves shall be angled and field made bonds shall have wire extend 1/4" past sleeve so wire is exposed to thermite weld.



Step 4

Place washer in bottom of mold and fill crucible w/powder or insert prepacked electronic canister charge, close lid, hold firmly w/opening away from operator, and ignite w/flint gun or electronic ignition starter.



Step 5

Remove slag from connection, visually inspect and tap weld with hammer to test for soundness and adhesion. Measure joint bond resistance as specified. Replace all poorly formed, unsightly, porous, high resistant, or defective welds. Install additional bond wire or strap if required.

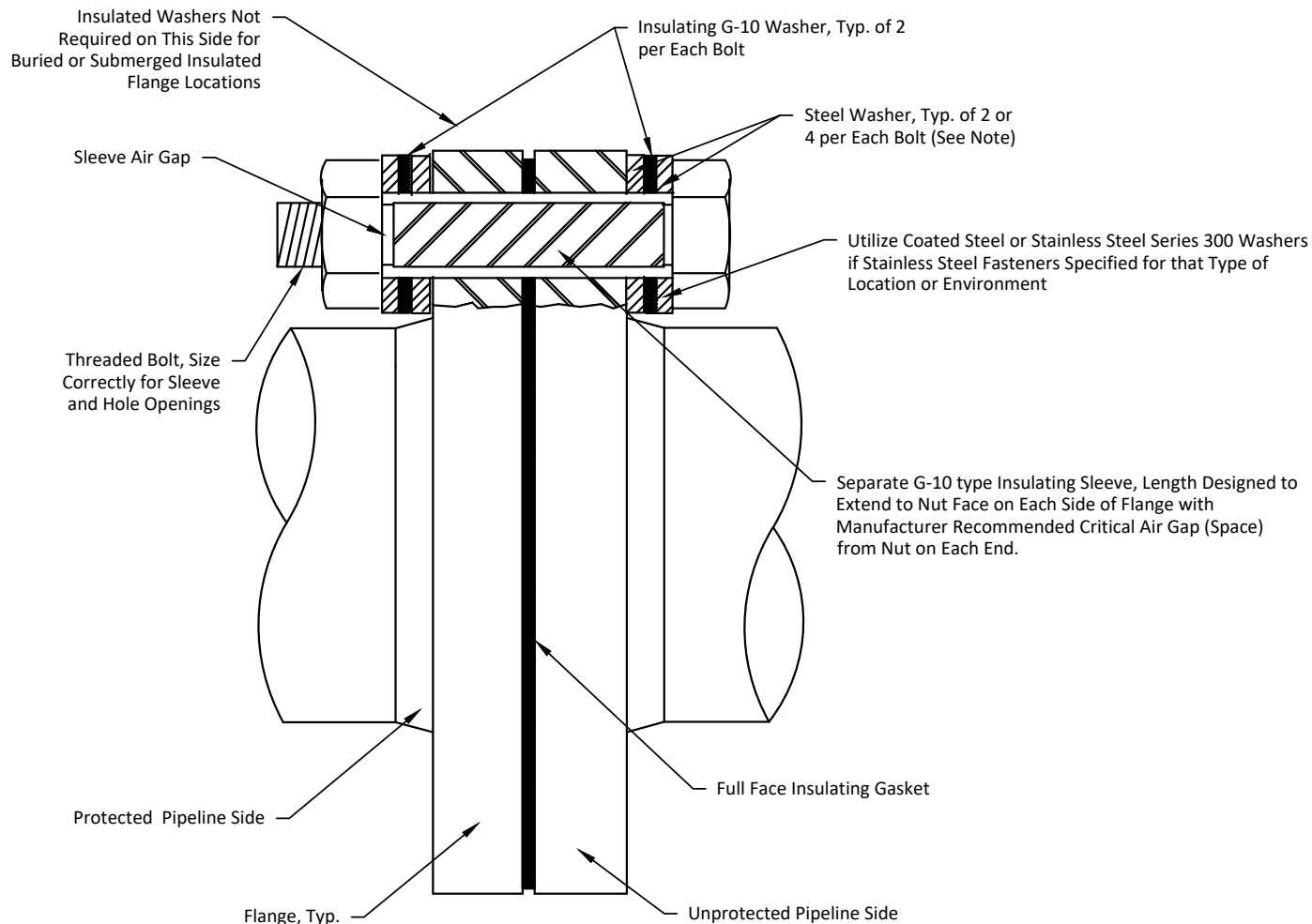


Step 6

Clean and coat connection and exposed structure surface with coating materials, see note below. Apply in accordance with coating manufacturer's recommendations.

- 6-a. Utilize 100-percent moisture tolerant epoxy repair coating for wire connections and for spot external coating repairs;
- 6-b. Utilize exothermic weld protector pad(s) to cover weld area and exposed wire at weld; or
- 6-c. Repair fitting or structure coating damage with specified and approved coating repair materials for original coating type.

N.T.S.



**Notes:**

1. Above grade insulated flange installation shown. For buried or submerged insulating flange installations, do not install insulating washer on protected side of insulating flange.
2. Coat buried or submerged flange after assembly per specifications.
3. Insulated flanges in buried applications allowed only for pipe up to 36" diameter.
4. Test insulated flanges for electrical isolation. Test buried insulators both prior to and after burial.

N.T.S.

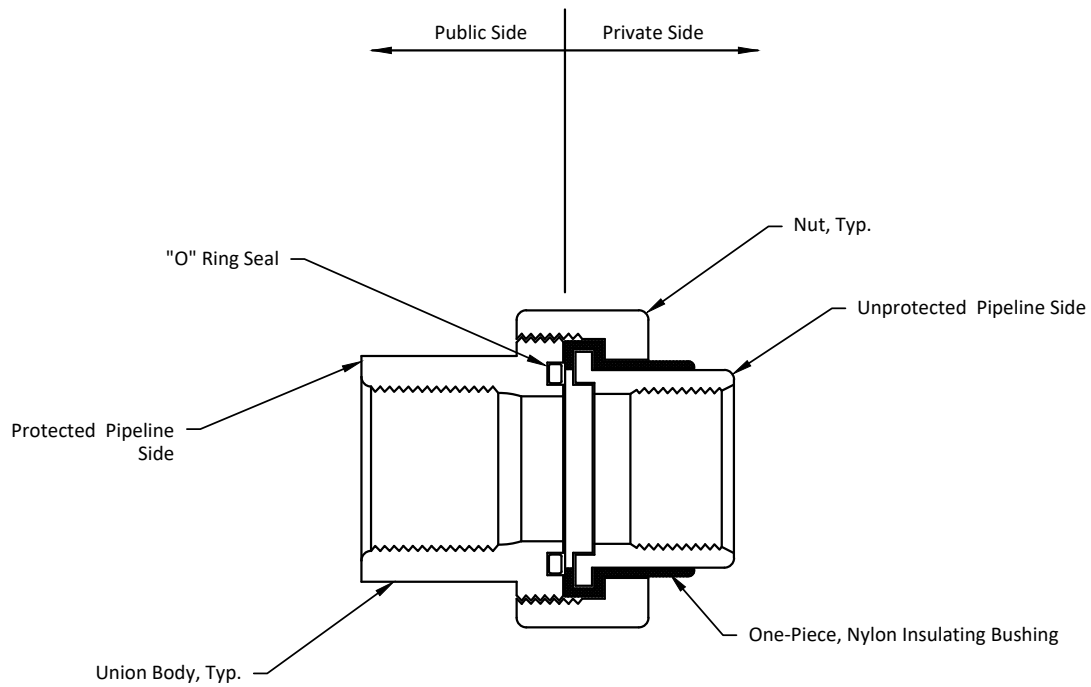
CITY OF RAPID CITY

PUBLIC WORKS DEPARTMENT

# INSULATING FLANGE

DATE: 8-19-22

Sec. - Sht.  
8B-911



**Notes:**

1. "O" ring type insulating union shown. Other types (brass insulated curb ball valves, straight couplings, corporation ball valves, meter couplings, etc.) similar.
2. Insulating O-ring and nylon insulator bushing shall be molded and bonded to the union body by manufacturer.
3. Abovegrade iron pipe shall have galvanized or coated steel bodies. Unions in buried or corrosive areas shall be coated.
4. Copper service line insulators shall have brass union body with insulators formed and molded into brass body, Mueller or approved equal.
5. Stainless steel line insulators shall have stainless steel body with insulators formed and molded into stainless steel fitting body.

N.T.S.

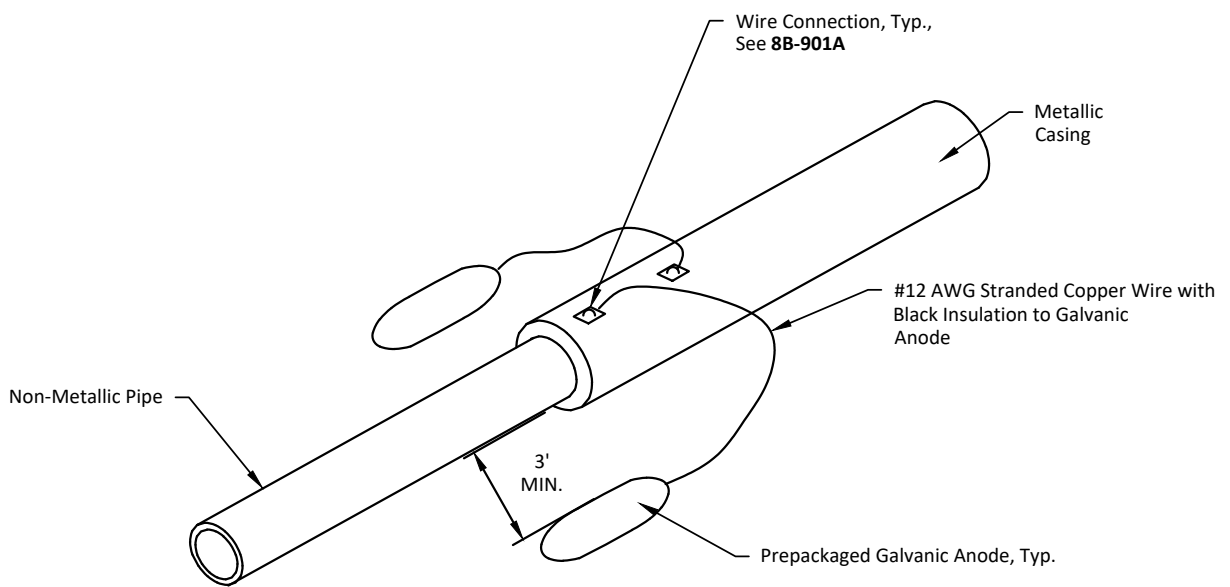
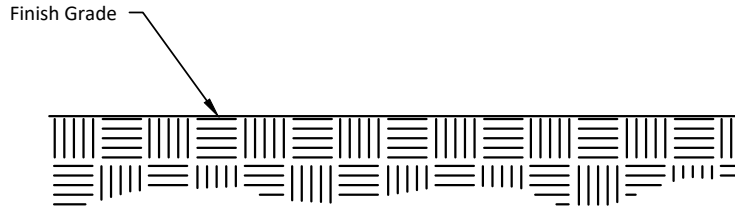
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PUBLIC WORKS DEPARTMENT

**INSULATING UNIONS AND/OR  
COPPER SERVICE INSULATORS**

DATE: 8-19-22

Sec. - Sht.  
8B-913



**Notes:**

1. Install number and size of prepackaged galvanic anodes specified directly to each end of metallic casing.
2. Install galvanic anode in native soil, a minimum of 1-foot below and 3-foot from end of metallic casing end.
3. Install cathodic protection test station per detail **8B-937**, if called out within the project plans.

N.T.S.

CITY OF RAPID CITY

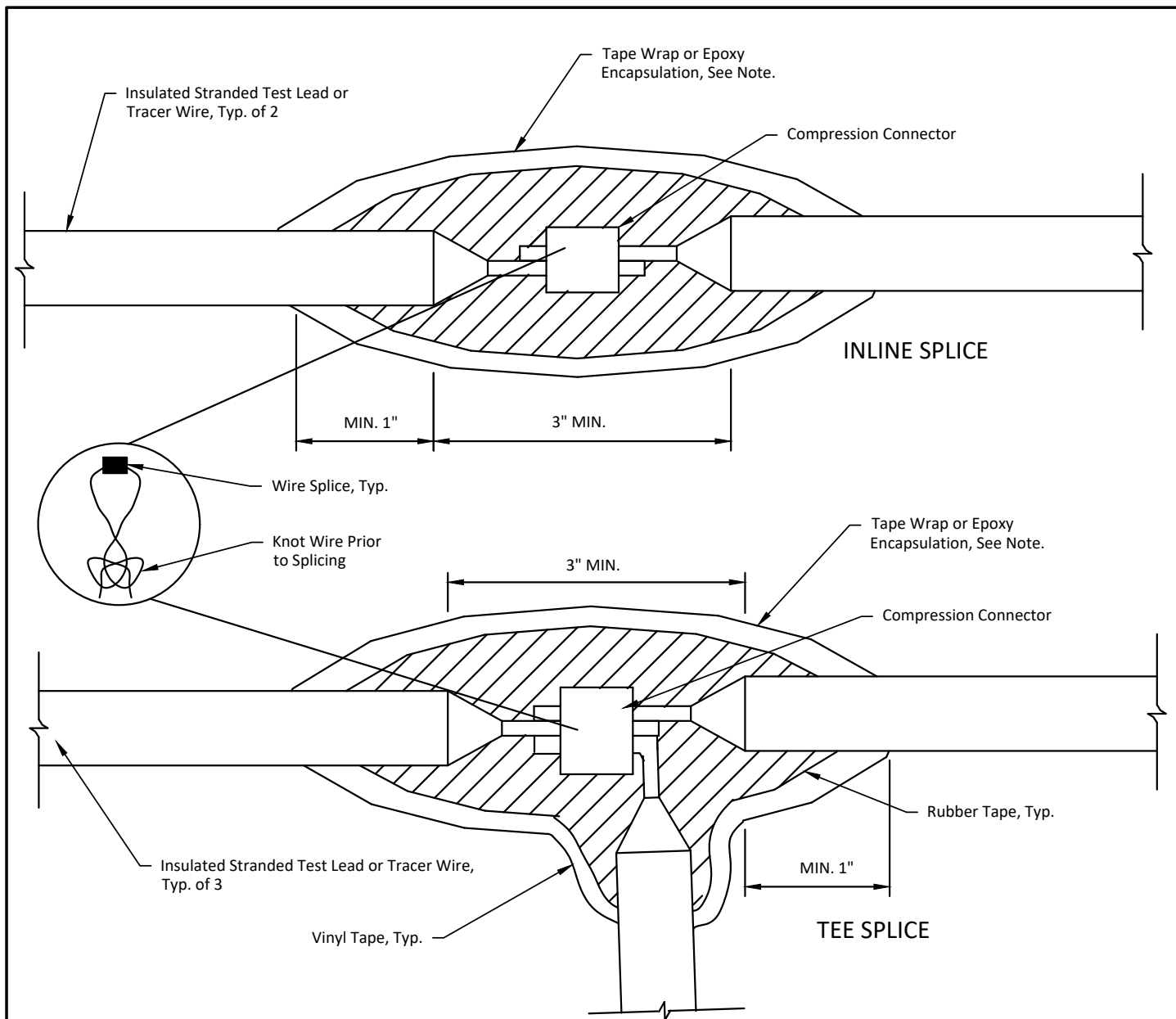
PUBLIC WORKS DEPARTMENT

**GALVANIC ANODES AT CASINGS**

DATE: 8-19-22

Sec. - Sht.  
8B-916A





**Notes:**

1. Knot wires prior to making splice to minimize stress on splice.
2. Make wire splice connection with compression type connector in accordance with compression connector manufacturer recommendations or secure with split bolt and silver solder for test wires. Do not use butt splices or wire nuts. Complete all splices only in the presence of the engineer.
3. Wrap entire connection with two (2) layers of high voltage rubber tape and then wrap with two (2) layers of vinyl electrical tape and coat with sealer or encapsulate in epoxy splice kit. Extend a minimum of 1-inch onto intact wire insulation.
4. Test leads shall be completed per detail.
5. Test lead splice locations shall be documented by the contractor in the red-line, as-constructed plans by station/offset or survey coordinates consistent with project horizontal datum. Location provided shall be within 0.5 feet of true location.

N.T.S.

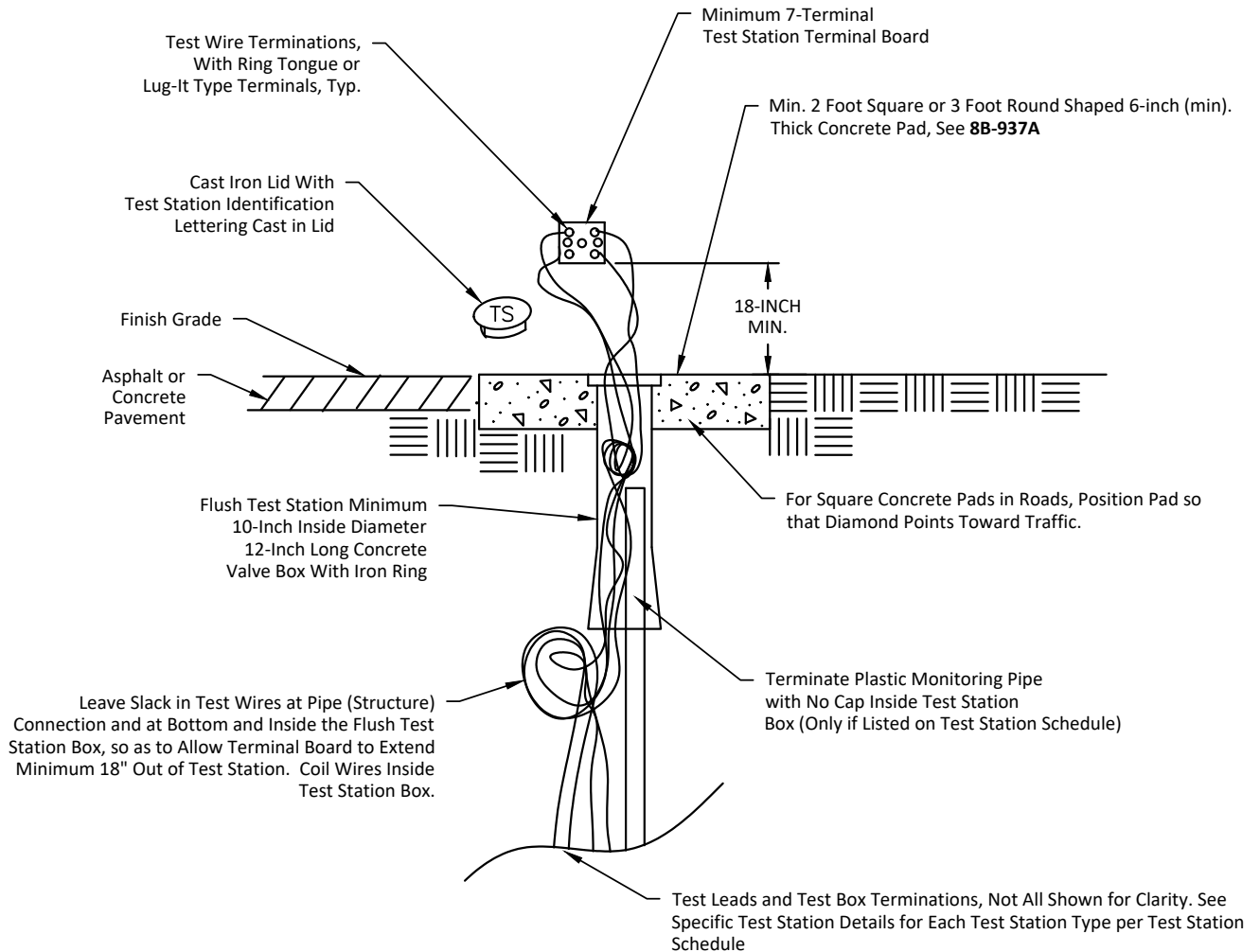
CITY OF RAPID CITY

PUBLIC WORKS DEPARTMENT

**TEST LEAD SPLICES**

DATE: 8-19-22

Sec. - Sht.  
8B-929S



**Notes:**

1. Install plastic monitoring pipe or reference electrode only at test station locations indicated on test station location schedule or drawings. Install pipe marking signs next to test stations, if specified.
2. Utilize insulated stranded copper wire only, size as specified. Color code wires according to wire color code. See **8B-902PRC**.
3. Locate test station in protected location directly over pipe unless offset required by specs or field conditions (in road, field, etc.). Offset to appurtenances, R.O.W., fence line or edge of roadway, if no protected location available over pipeline. Coordinate locations with engineer.
4. If test station and tracer wire access boxes at same location, see inset on **8B-942FH**.
5. Test station locations shall be documented by the contractor in the red-line, as-constructed plans by station/offset or survey coordinates consistent with project horizontal datum. Location provided shall be within 0.5 feet of true location.

N.T.S.

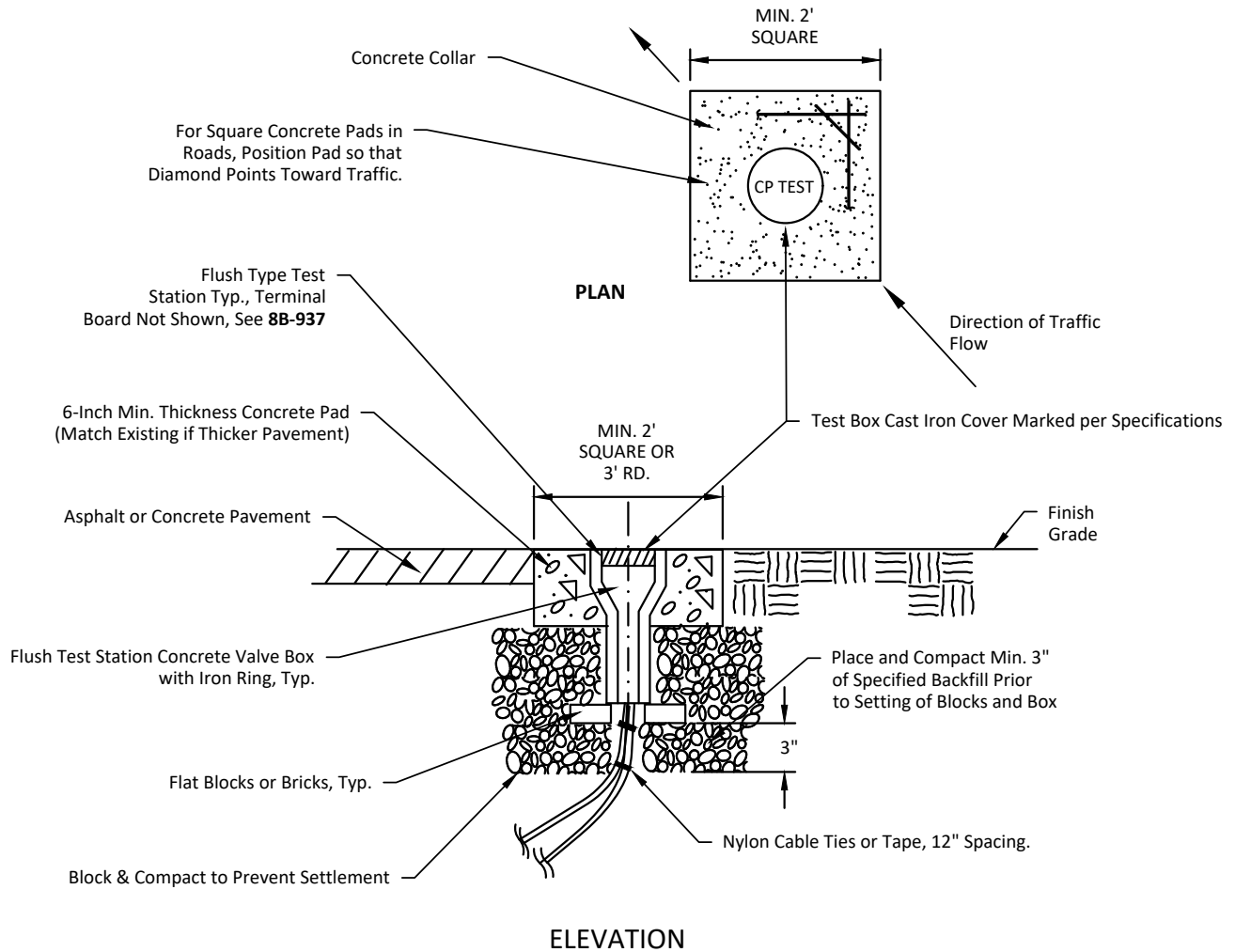
CITY OF RAPID CITY

PUBLIC WORKS DEPARTMENT

**FLUSH-MOUNTED TEST STATION  
STANDARD FLUSH TYPES**

DATE: 8-19-22

Sec. - Sht.  
8B-937



**Notes:**

1. Test station type and number of test leads shall be as indicated on test station schedule or drawings. Utilize insulated stranded copper wire only, size as specified. Color code wires according to wire color code specified, See **8B-902PRC**.
2. All wires shall be run without splices from the connection to the test station box. Terminate with ring tongue or lug-it type terminals and bundle wires together at 12-inch intervals with electrical tape or nylon cable ties.
3. Provide all wires with sufficient slack so that the terminal board may be extended a minimum of 18-inches above the top of the test box. Coil wires in test station. Loop wires both at bottom of test station and at pipe or structure to minimize damage during backfilling and/or future settlement.

N.T.S.

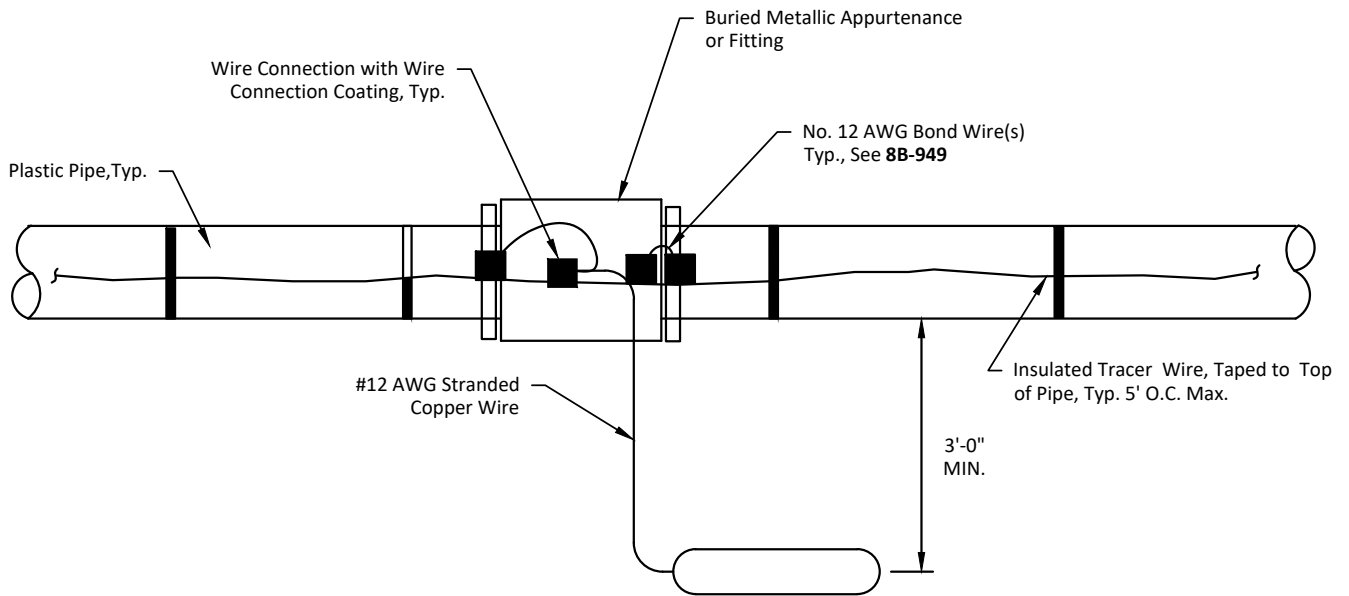
CITY OF RAPID CITY

PUBLIC WORKS DEPARTMENT

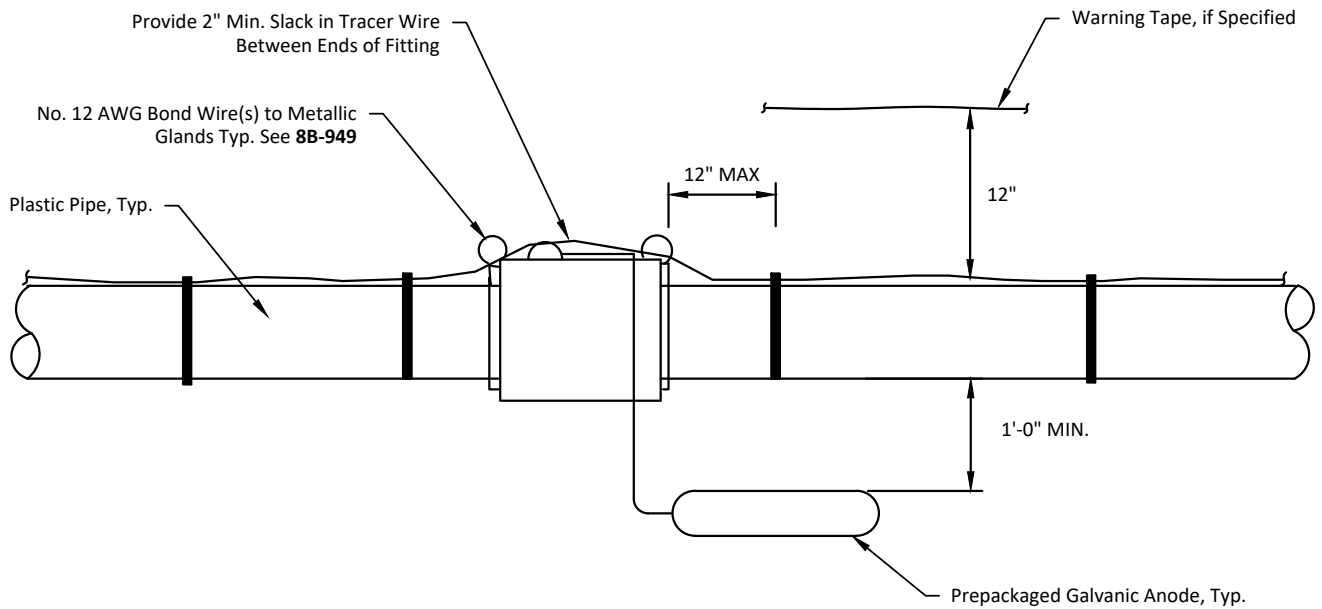
**TYPICAL FLUSH-MOUNTED  
TEST STATION BOX SUPPORT**

DATE: 8-19-22

Sec. - Sht.  
8B-937A



PLAN



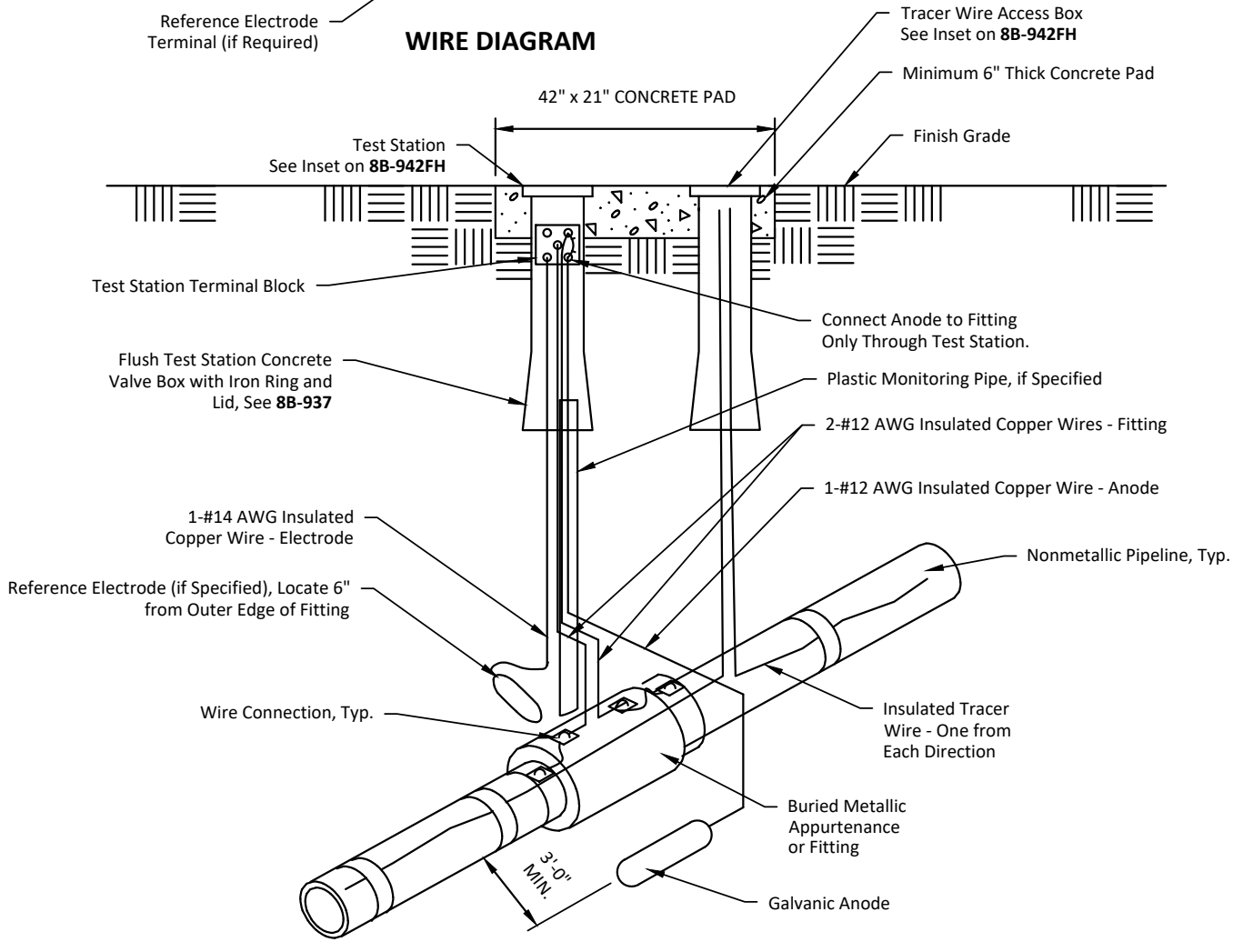
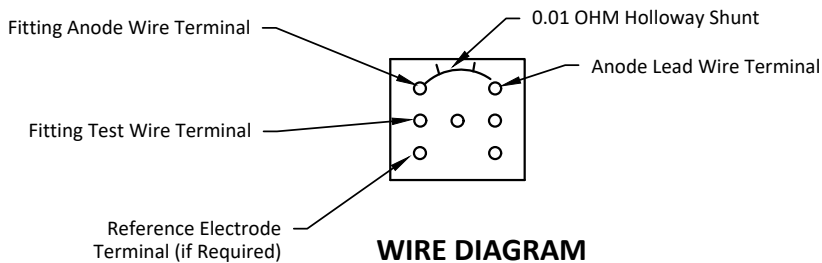
ELEVATION

**Notes:**

1. Minimum of two No. 12 AWG bond wires each for 12" and larger pipe. One bond wire for smaller pipe.
2. Provide type, number and size of anodes as specified. Minimum shall be one anode per fitting.

N.T.S.

**GALVANIC ANODE INSTALLATION  
AT BURIED METALLIC FITTINGS**

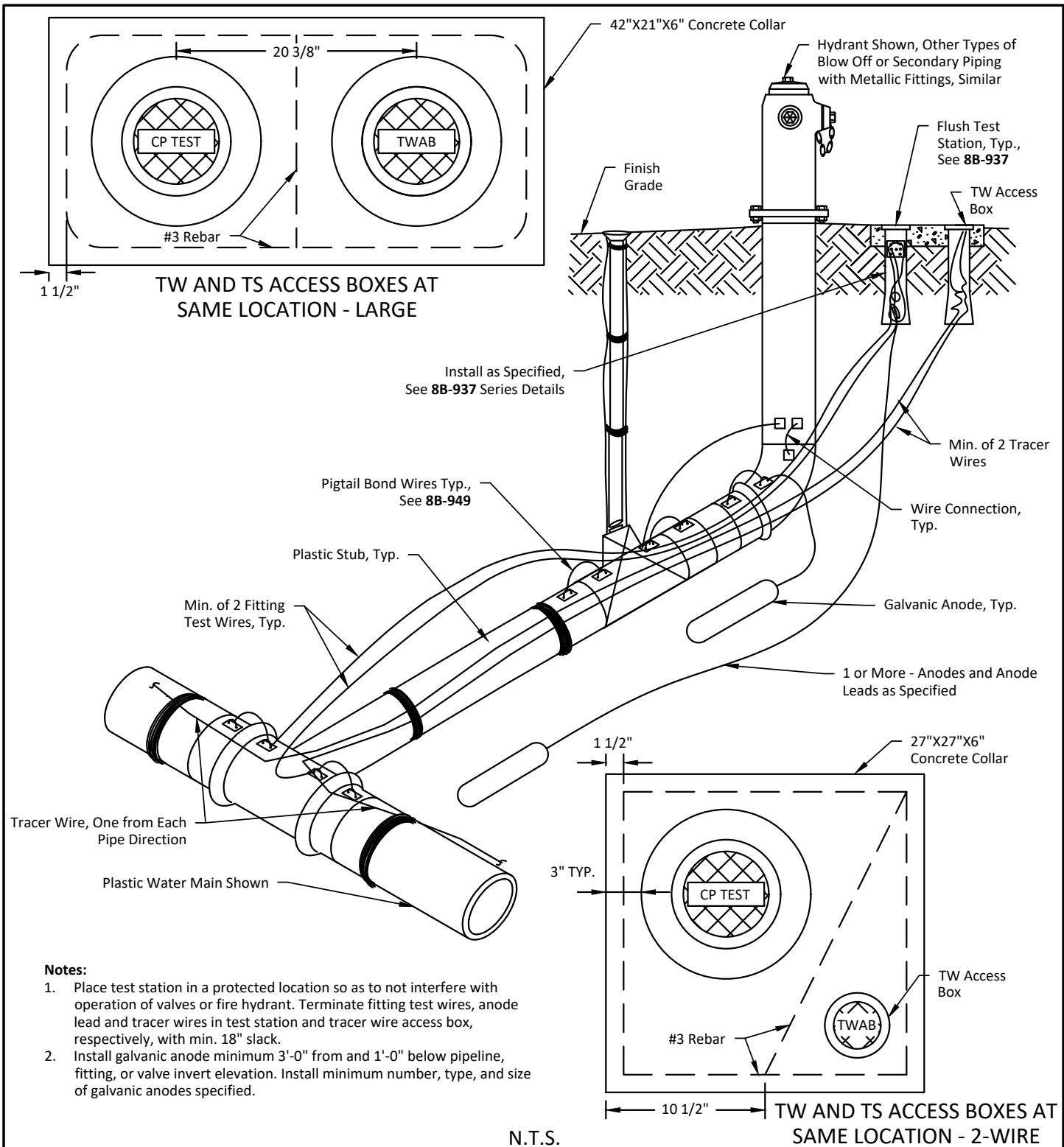


- Notes:**
1. Provide sufficient slack in test wires to allow terminal block to extend 18" out of test station. Coil wires in test station.
  2. Install galvanic anode minimum 1'-0" below pipe invert elevation.
  3. Install reference electrode or plastic monitoring pipe only at test stations indicated on test station location schedule.
  4. Color code wires according to wire color code, see **8B-902PRC**.
  5. If test station and tracer wire access boxes at same location, see inset on **8B-942FH**.

N.T.S.

**FLUSH-MOUNTED TEST STATION WITH GALVANIC ANODE  
(GALVANIC ANODE TO FITTING)**

DATE: 8-19-22  
Sec. - Sht.  
8B-942



- Notes:**
1. Place test station in a protected location so as to not interfere with operation of valves or fire hydrant. Terminate fitting test wires, anode lead and tracer wires in test station and tracer wire access box, respectively, with min. 18" slack.
  2. Install galvanic anode minimum 3'-0" from and 1'-0" below pipeline, fitting, or valve invert elevation. Install minimum number, type, and size of galvanic anodes specified.

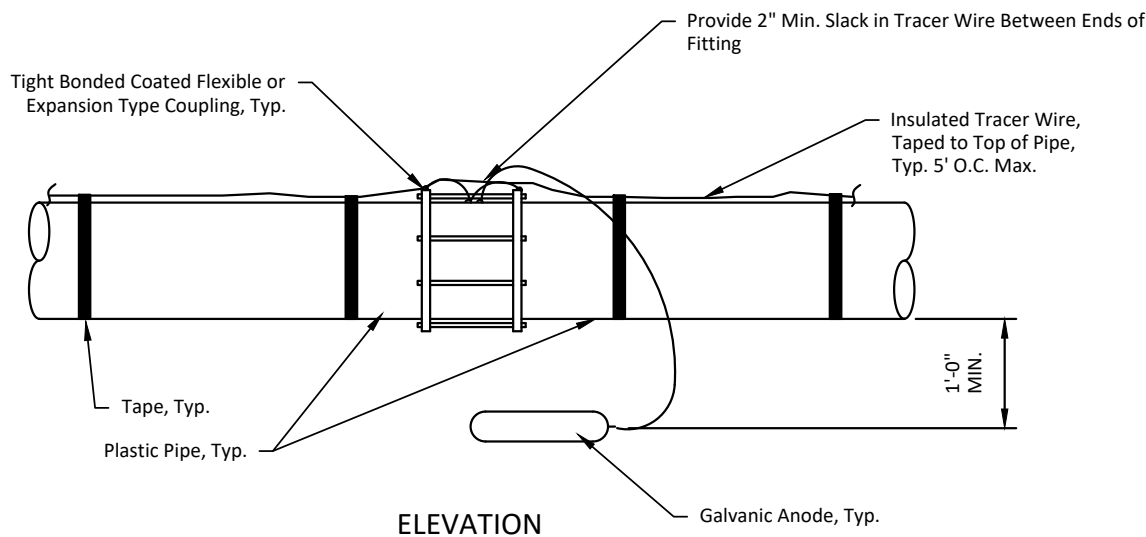
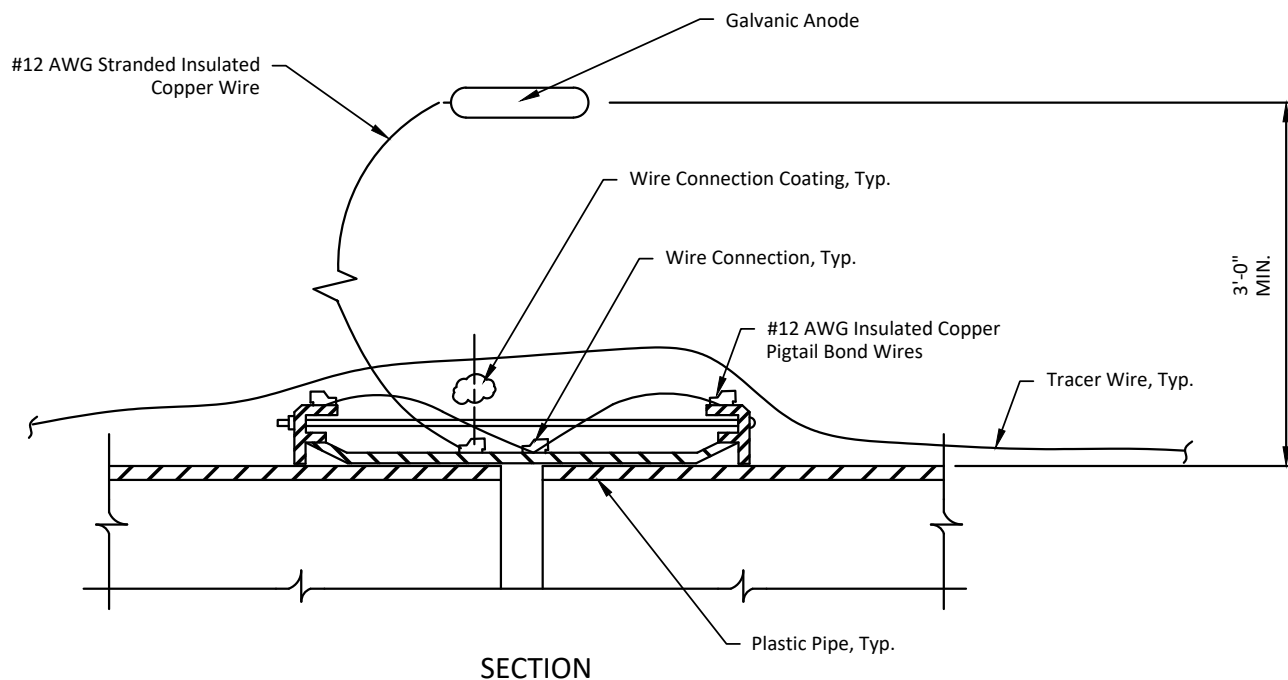
CITY OF RAPID CITY

PUBLIC WORKS DEPARTMENT

# FLUSH-TYPE TEST STATIONS AT HYDRANT ASSEMBLIES W/ PLASTIC STUB

DATE: 8-19-22

Sec. - Sht.  
8B-942FH



**Notes:**

1. Minimum two each No. 12 AWG bonds each for 12" and larger pipe, one bond allowed for smaller pipe.
2. Provide type, number and size of anodes as specified. Minimum shall be one anode per fitting.

N.T.S.

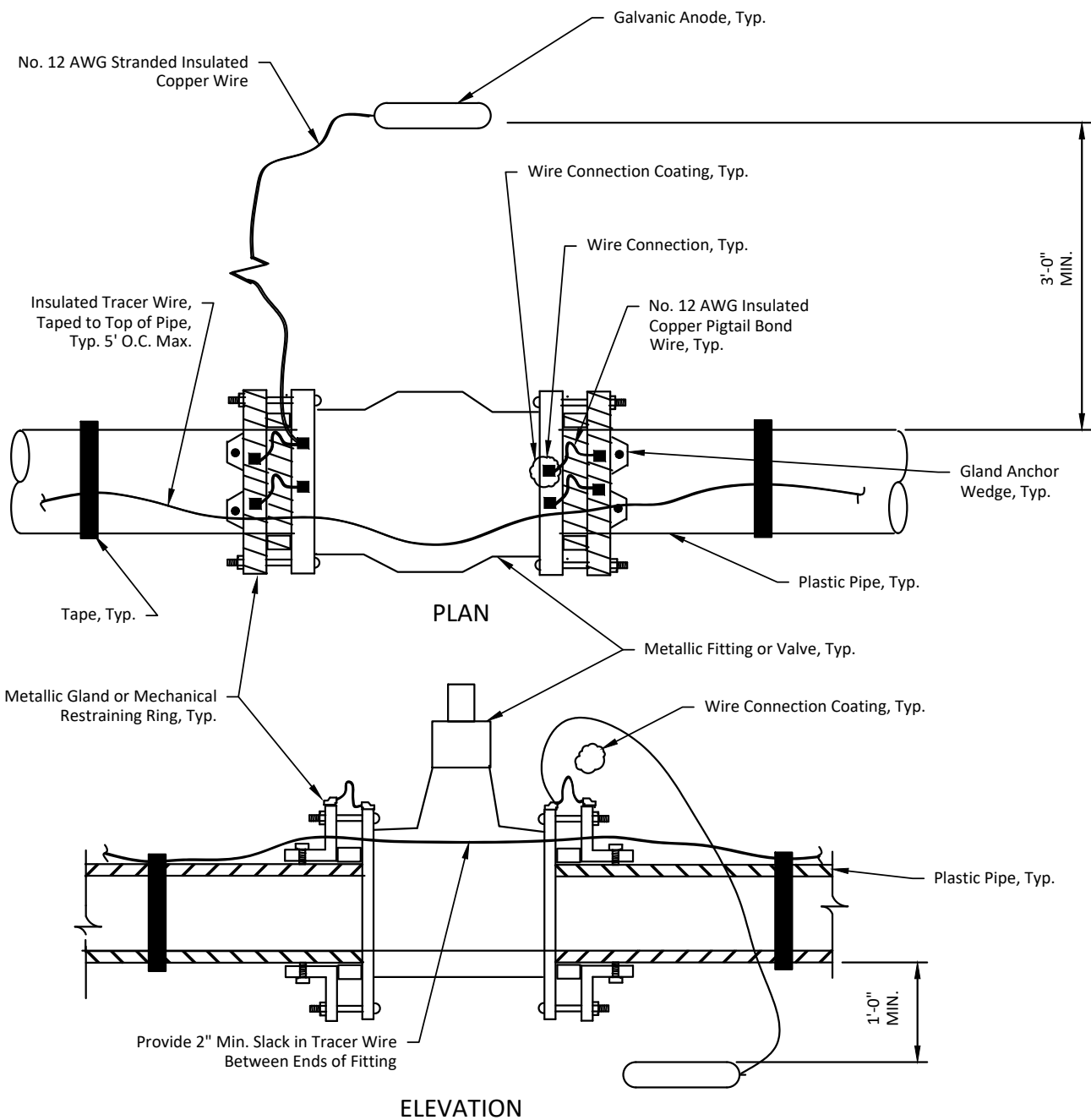
CITY OF RAPID CITY

PUBLIC WORKS DEPARTMENT

**CORROSION PROTECTION FOR FLEXIBLE METALLIC COUPLINGS ON PLASTIC PIPE**

DATE: 8-19-22

Sec. - Sht.  
8B-943



**Notes:**

1. Bond plastic pipe metallic glands or mechanical restraining rings to metallic valve or fitting body, see **8B-940** and **8B-949**.
2. Provide type, number & size of anodes as specified. Minimum shall be one anode per fitting.

N.T.S.

CITY OF RAPID CITY

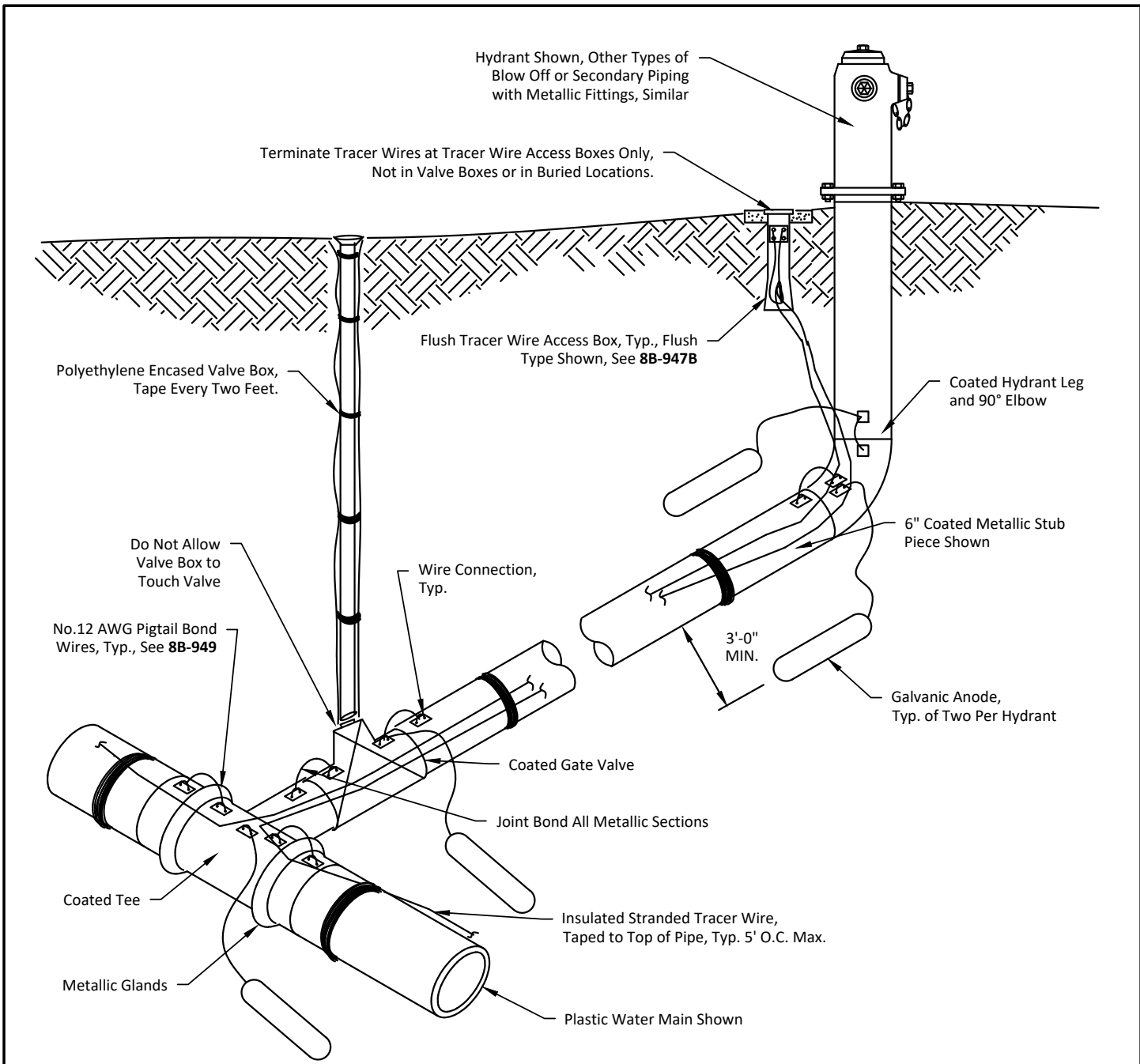
PUBLIC WORKS DEPARTMENT

**CORROSION PROTECTION FOR METALLIC  
VALVES OR FITTINGS ON PLASTIC PIPE**

DATE: 8-19-22

Sec. - Sht.  
8B-943DIP





**Notes:**

1. Install galvanic anode minimum 3'-0" from and 1'-0" below pipeline, fitting, or valve invert elevation.
2. Install minimum number, type, and size of galvanic anodes specified, minimum of two anodes to fire hydrant and one or more anode(s) per each metallic fitting. Number and size of anodes on mainline metallic tee will depend on mainline diameter.

N.T.S.

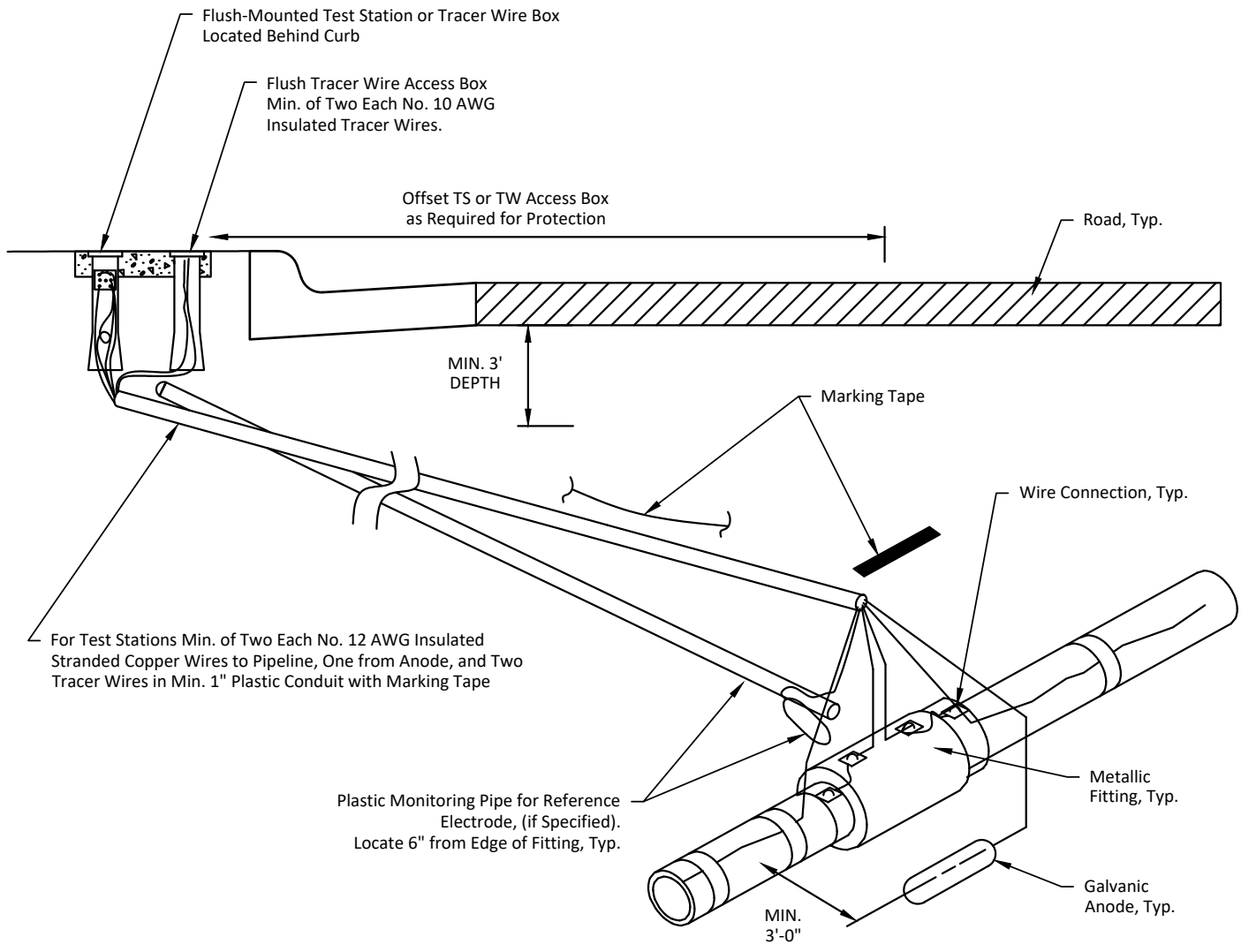
CITY OF RAPID CITY

PUBLIC WORKS DEPARTMENT

**GALVANIC ANODE INSTALLATION AT  
HYDRANT ASSEMBLIES W/ DUCTILE STUB**

DATE: 8-19-22

Sec. - Sht.  
8B-944D



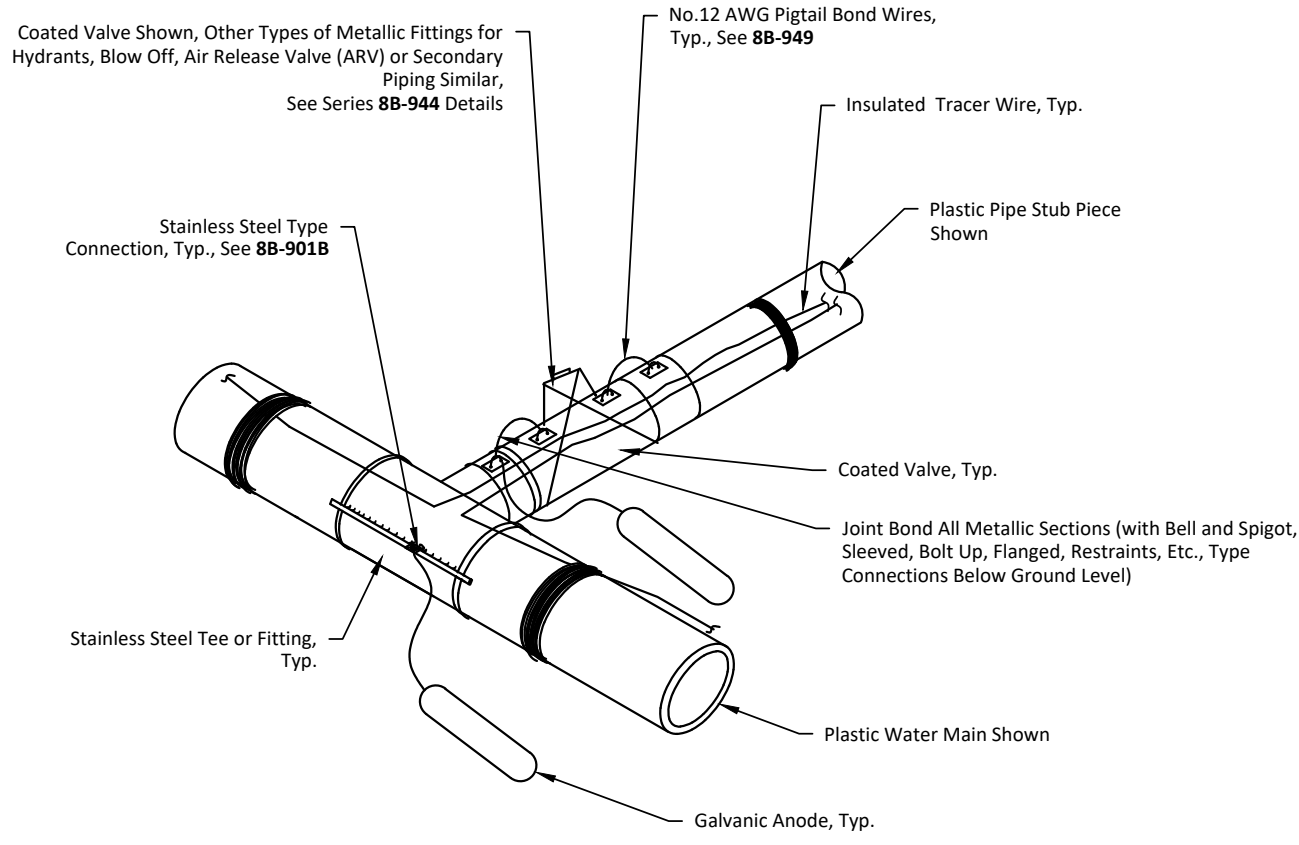
For Test Stations Min. of Two Each No. 12 AWG Insulated Stranded Copper Wires to Pipeline, One from Anode, and Two Tracer Wires in Min. 1" Plastic Conduit with Marking Tape

Plastic Monitoring Pipe for Reference Electrode, (if Specified). Locate 6" from Edge of Fitting, Typ.

- Notes:**
1. Offset behind curb and gutter for test station or tracer wire access box offset locations indicated on test station schedule or plan drawings. Install 1-inch conduit with test and tracer wires to offset test station and/or tracer access box locations as shown.
  2. Color code wires according to wire color code, see **8B-902PRC**.
  3. Utilize insulated stranded copper wire only, size as specified.
  4. If test station and tracer wire access box are called out at same location, refer to inset on **8B-942FH**.

N.T.S.

CITY OF RAPID CITY	PUBLIC WORKS DEPARTMENT
<b>FLUSH TEST STATION OR TRACER WIRE ACCESS BOX OFFSET LOCATIONS</b>	
DATE: 8-19-22	
Sec. - Sht. 8B-944FO	

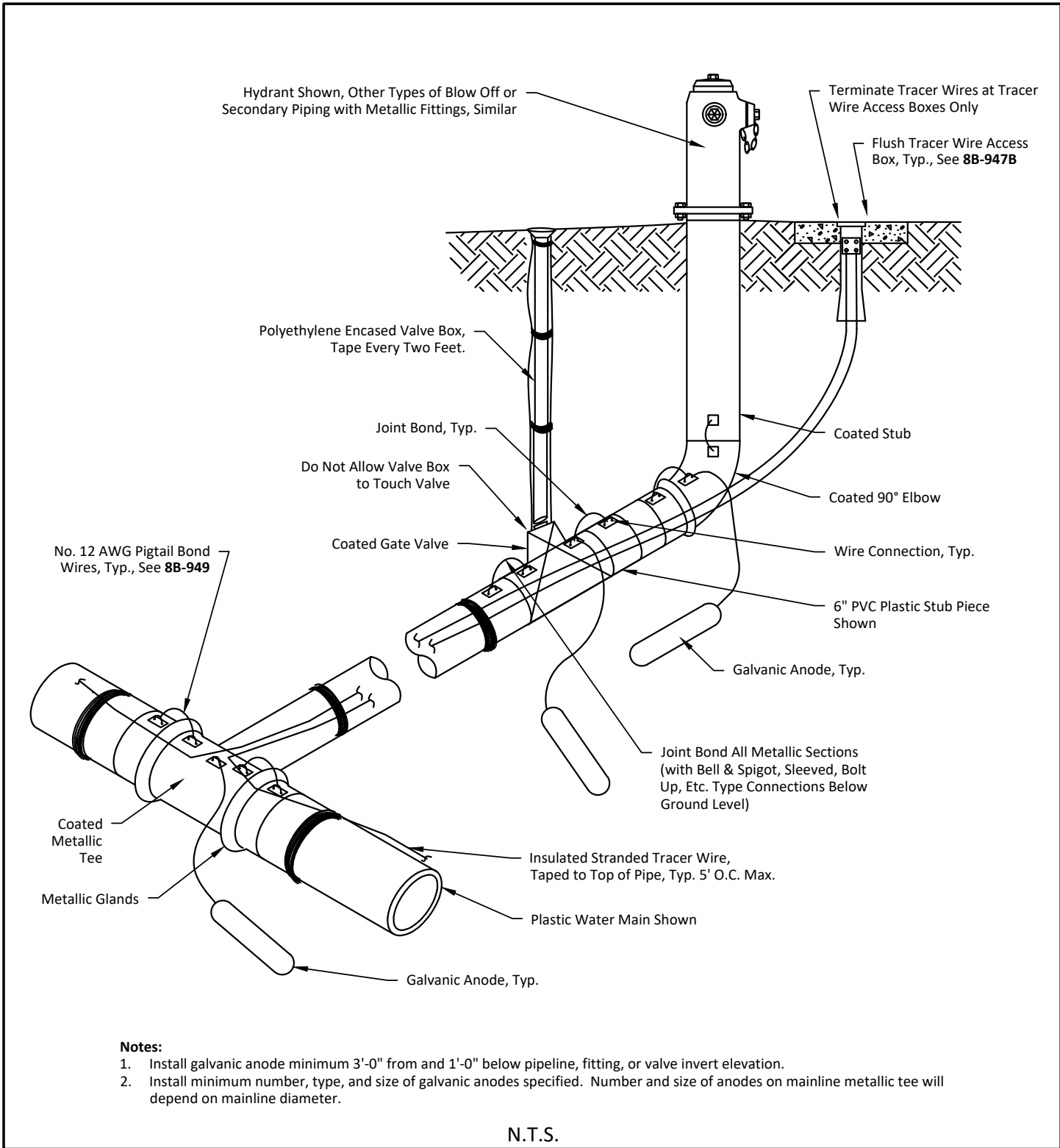


**Notes:**

1. Connect to stainless steel fittings with mechanical type connection or brazed silver solder type connection only. Locate so as to not damage rubber lining or gasket.
2. Install galvanic anode minimum 3'-0" from and 1'-0" below pipeline, fitting, or valve invert elevation. Install minimum number, type, and size of galvanic anodes specified. Minimum of one or more anode per metallic fitting. Number and size of anodes on metallic tee will depend on mainline diameter.

N.T.S.

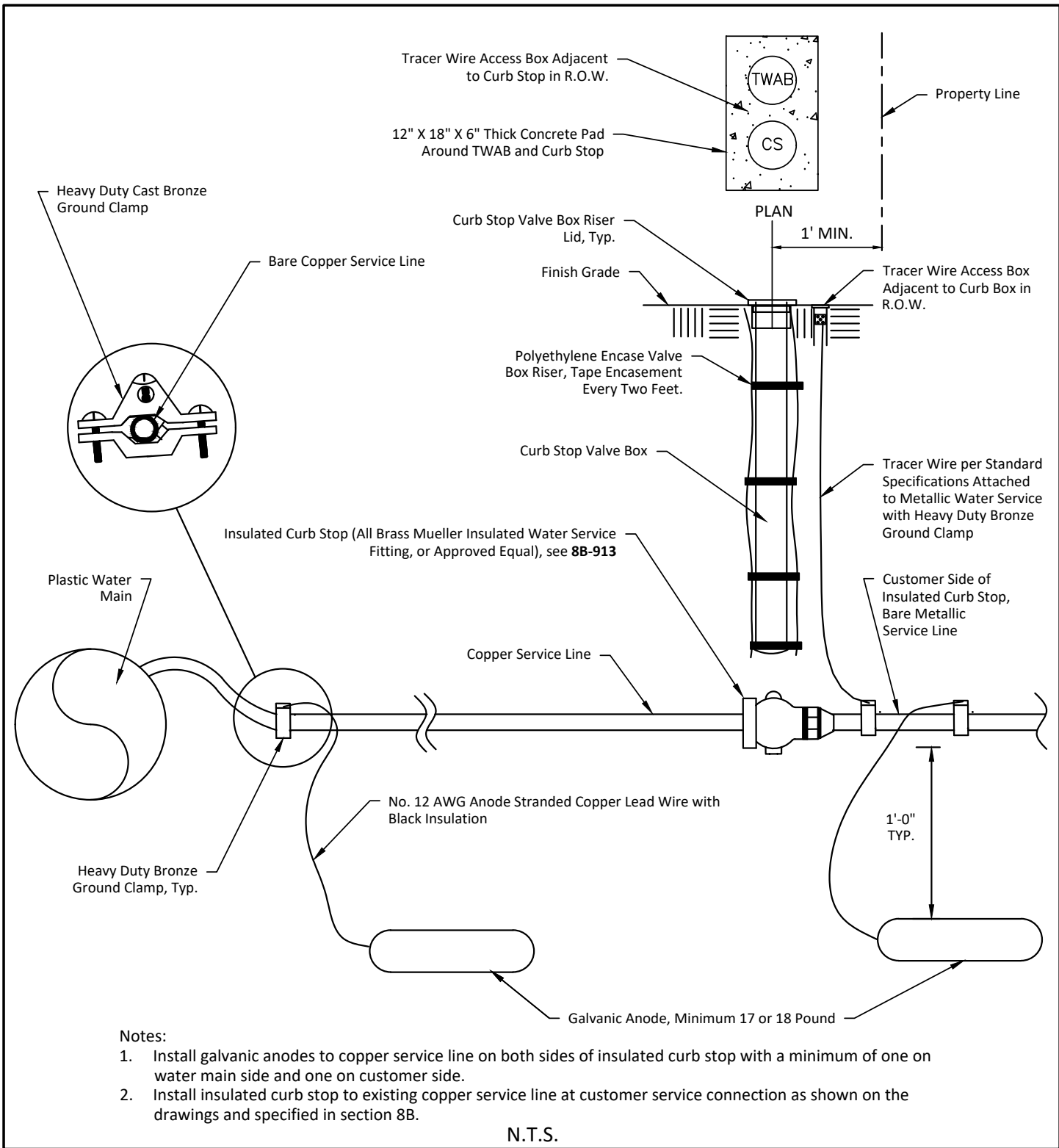
CITY OF RAPID CITY	PUBLIC WORKS DEPARTMENT	DATE: 8-19-22
<b>STAINLESS STEEL TEE FOR PLASTIC PIPE STUB TO FIRE HYDRANT, VALVES, BLOW OFF, ARV FITTINGS OR SECONDARY PLASTIC PIPING</b>		Sec. - Sht. 8B-944SS



- Notes:**
1. Install galvanic anode minimum 3'-0" from and 1'-0" below pipeline, fitting, or valve invert elevation.
  2. Install minimum number, type, and size of galvanic anodes specified. Number and size of anodes on mainline metallic tee will depend on mainline diameter.

N.T.S.

CITY OF RAPID CITY	PUBLIC WORKS DEPARTMENT
<b>GALVANIC ANODE INSTALLATION AT HYDRANT ASSEMBLIES W/ PLASTIC STUB</b>	
DATE: 8-19-22	
Sec. - Sht. 8B-944T	

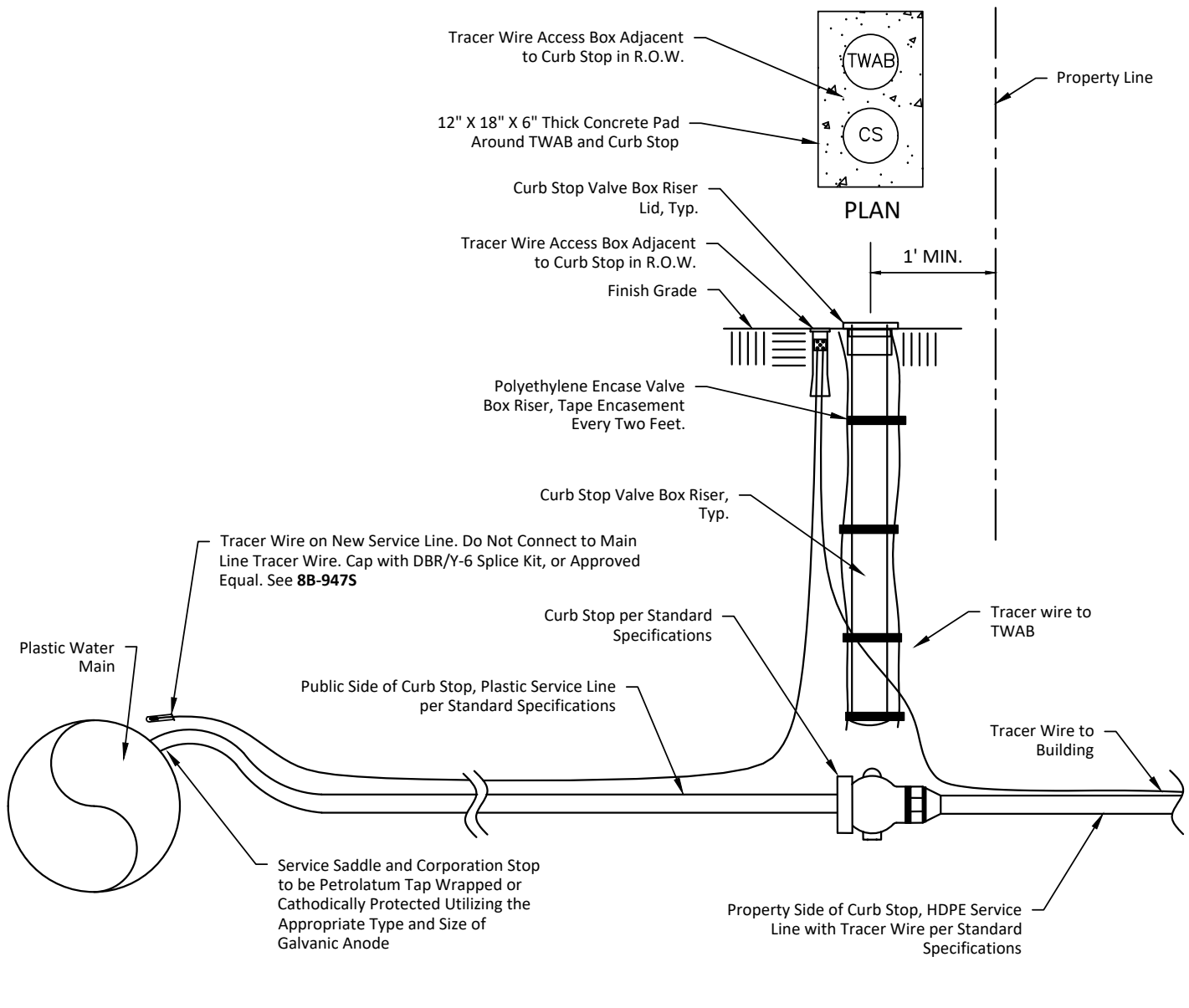


Notes:

1. Install galvanic anodes to copper service line on both sides of insulated curb stop with a minimum of one on water main side and one on customer side.
2. Install insulated curb stop to existing copper service line at customer service connection as shown on the drawings and specified in section 8B.

N.T.S.

**INSULATOR AND WIRE CONNECTIONS  
TO CUSTOMER METALLIC SERVICE LINES**

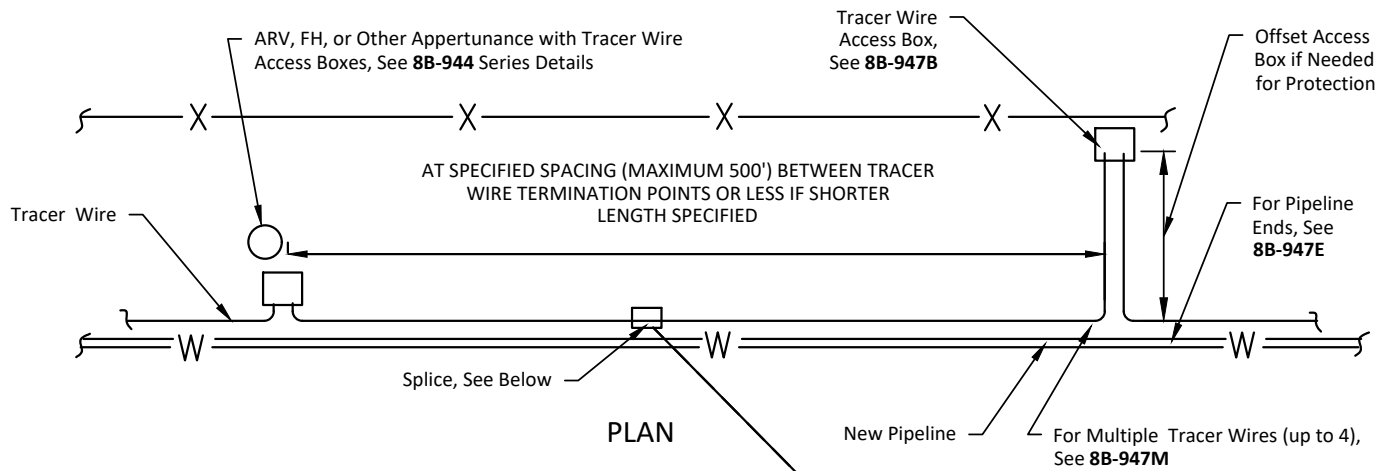


ELEVATION

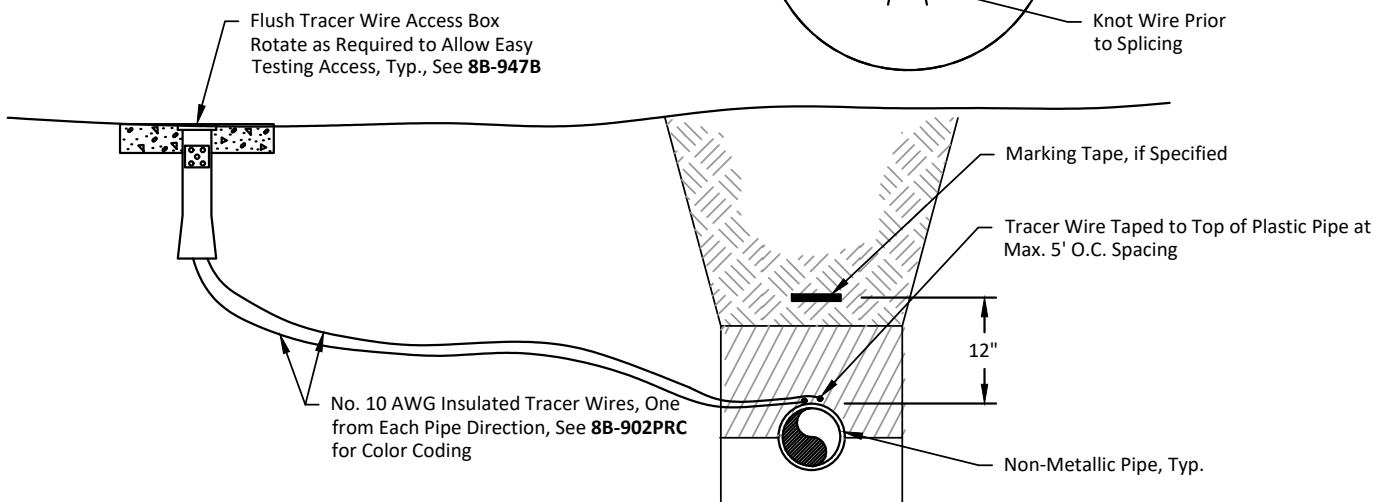
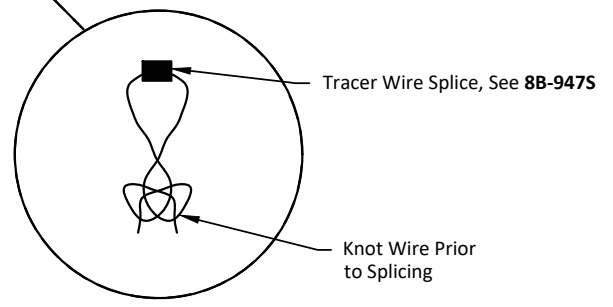
- Notes:**
1. Install tracer wire access box in a protected location at row line adjacent to curb stop box so as to not interfere with operation of curb stop. Terminate tracer wire in access box with min. 18" slack.
  2. Terminate tracer wire with an insulated splice kit and securely fastened to the plastic service line with tape as near as possible to the building foundation.
  3. This tracer wire installation detail shall be used on plastic service lines for residential or commercial services.

N.T.S.

CITY OF RAPID CITY		PUBLIC WORKS DEPARTMENT	
<h1>TRACER WIRE FOR CUSTOMER PLASTIC SERVICE LINE</h1>			DATE: 8-19-22
			Sec. - Sht. 8B-945PS



PLAN



ELEVATION

**Notes:**

1. Terminate tracer wire at tracer wire access boxes only located at specified distances, structures and end of each pipe run. Test tracer wire electrical continuity as specified prior to placement of curb and gutter or paving. Do not connect tracer wire directly to existing or new metallic pipe or fitting.
2. Locate tracer wire access boxes in protected locations directly over pipe unless offset required by plans or field conditions (in road, field, etc.). Offset to back of curb and gutter or hydrant if no protected location available over pipeline. Coordinate locations with engineer.
3. Tracer wire access box locations shall be documented by the contractor in the red-line, as-constructed plans by station/offset or survey coordinates consistent with project horizontal datum. Location provided shall be within 0.5 feet of true location.

N.T.S.

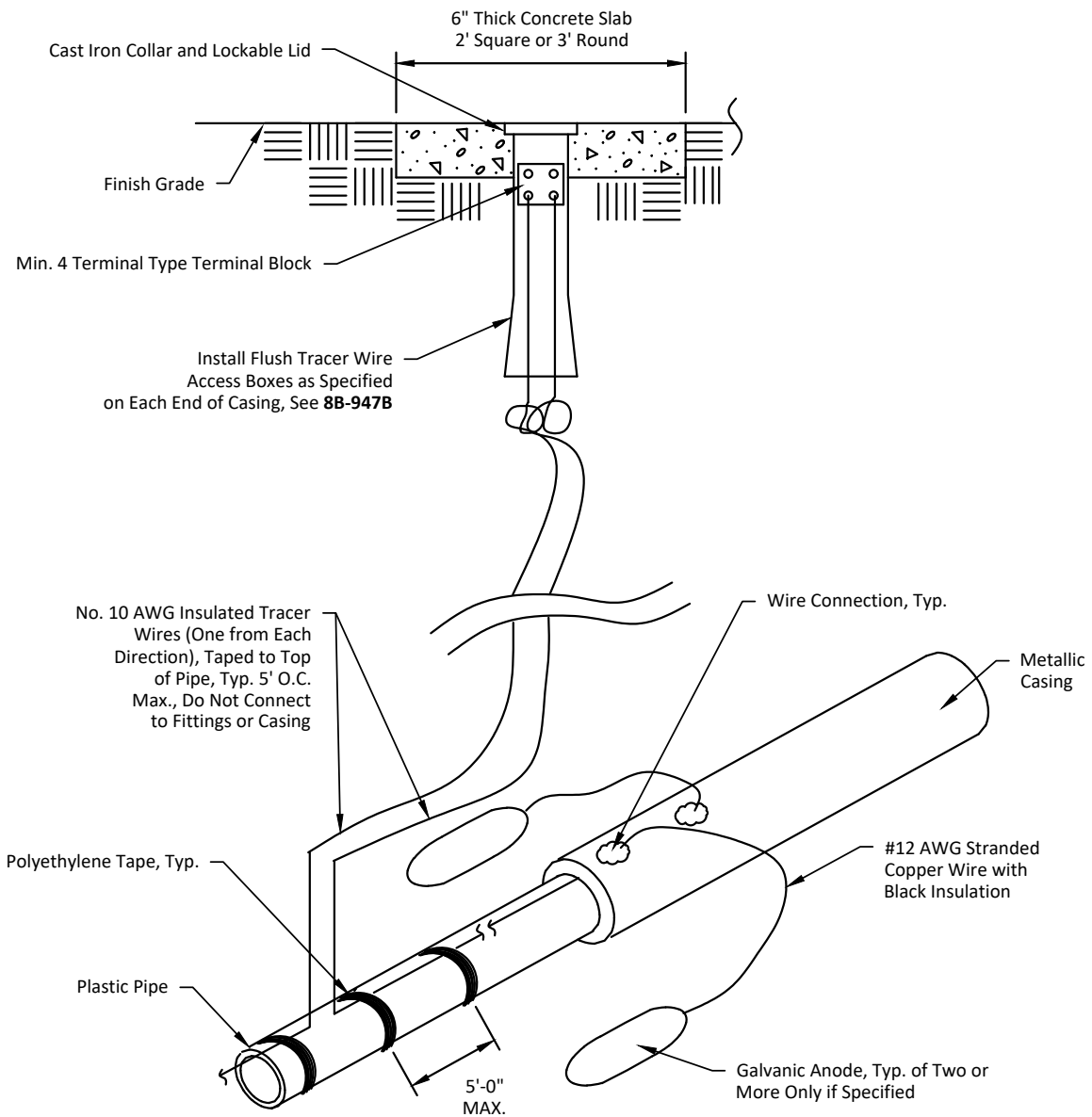
CITY OF RAPID CITY

PUBLIC WORKS DEPARTMENT

TRACER WIRE DETAIL

DATE: 8-19-22

Sec. - Sht.  
8B-947



**Notes:**

1. Install tracer wire access box at each end of casing. For flush boxes provide sufficient slack in wires to allow terminal block to extend min. 18" out of box. Coil wires in flush type access box.
2. Install type, number and size of prepackaged galvanic anodes to metallic casings, if indicated on test station/tracer wire access box location schedule or drawings.
3. Tracer wire access box locations shall be documented by the contractor in the red-line, as-constructed plans by station/offset or survey coordinates consistent with project horizontal datum. Location provided shall be within 0.5 feet of true location.

N.T.S.

CITY OF RAPID CITY

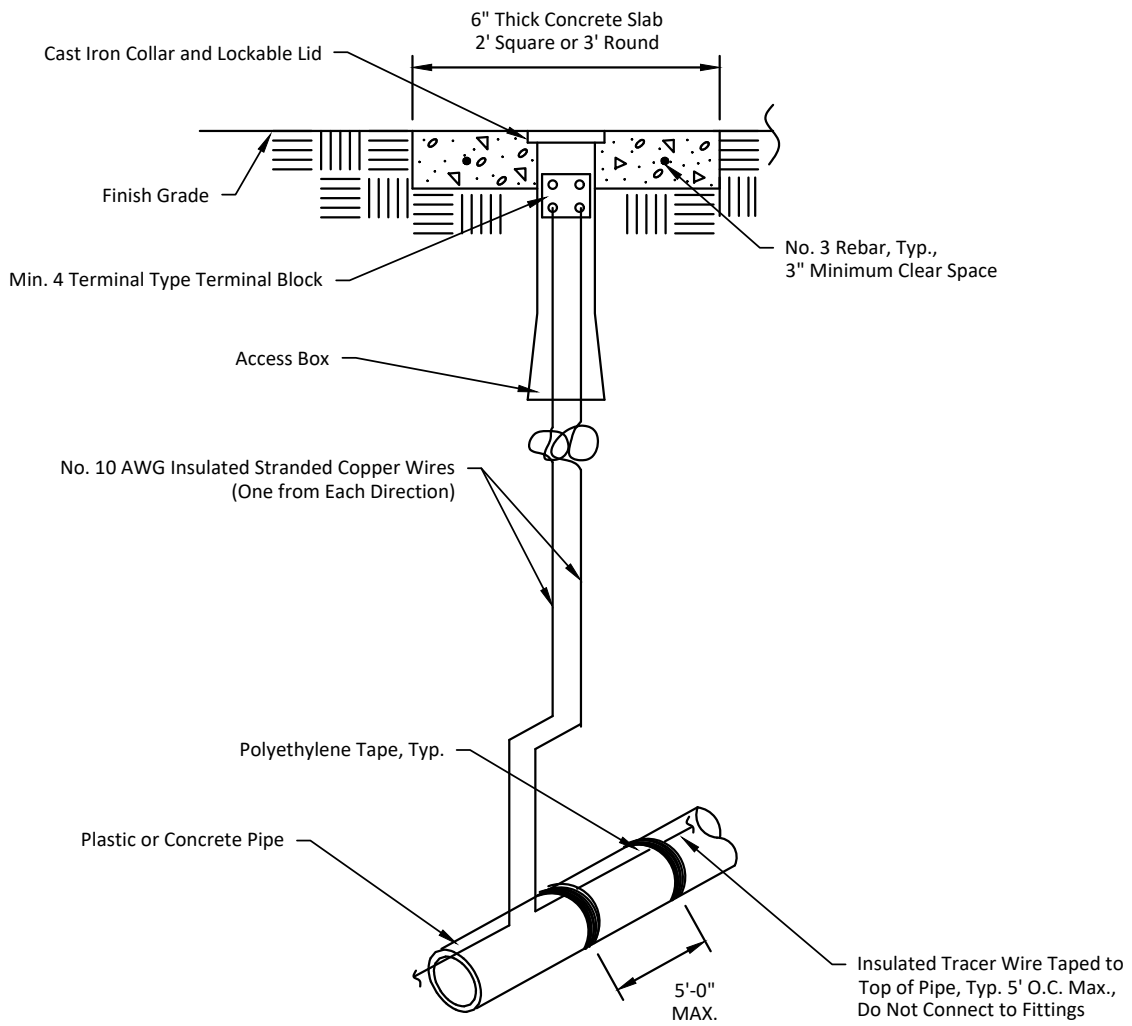
PUBLIC WORKS DEPARTMENT

**TRACER WIRE ACCESS BOXES AT CASING  
WITH ANODES**

DATE: 8-19-22

Sec. - Sht.  
8B-947A





**Notes:**

1. Provide sufficient slack in tracer wires to allow terminal block to extend min. 18" out of box. Coil wires in access box.
2. Install 4 terminal (min.) terminal block tracer wire access box. Install pipe marking signs next to boxes as specified.

N.T.S.

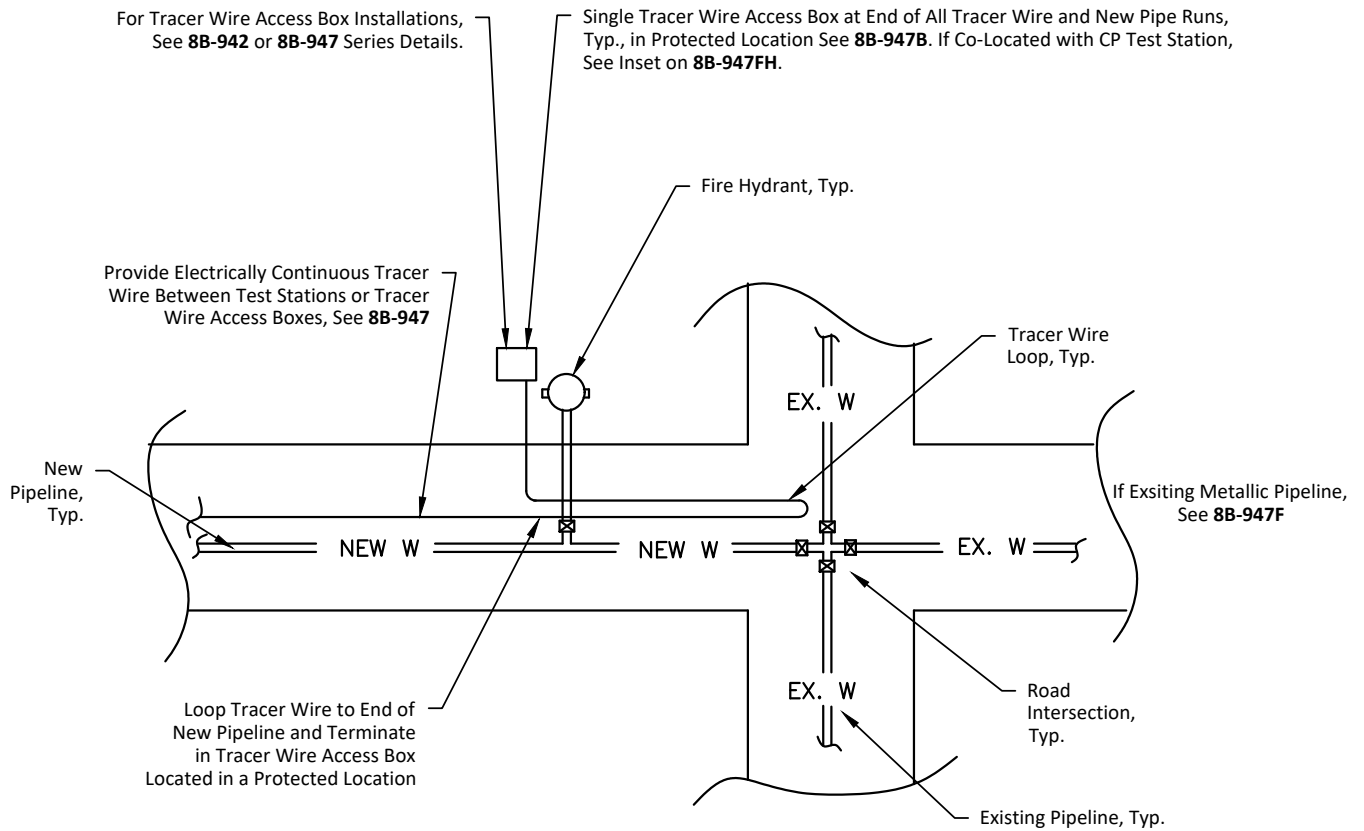
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**TRACER WIRE ACCESS BOXES  
IN UNPROTECTED LOCATION**

DATE: 8-19-22

Sec. - Sht.  
8B-947B



**TRACER WIRE LOOP AT END OF NEW PIPELINE  
CONNECTION IN INTERSECTION OR UNPROTECTED LOCATION**

**Notes:**

1. Terminate tracer wires abovegrade in a flush tracer wire access box located in a protected location at abovegrade structures to side of road. Coordinate location and type with engineer.
2. Loop tracer wire past access box to end of new pipeline run, double back to access box and terminate in box.
3. Single pipe shown, similar for multiple new pipelines.
4. Do not terminate tracer wire ends below grade or in valve boxes.
5. Test tracer wire electrical continuity prior to placement of curb and gutter paving.
6. Tracer wire access box locations shall be documented by the contractor in the red-line, as-constructed plans by station/offset or survey coordinates consistent with project horizontal datum. Location provided shall be within 0.5 feet of true location.

N.T.S.

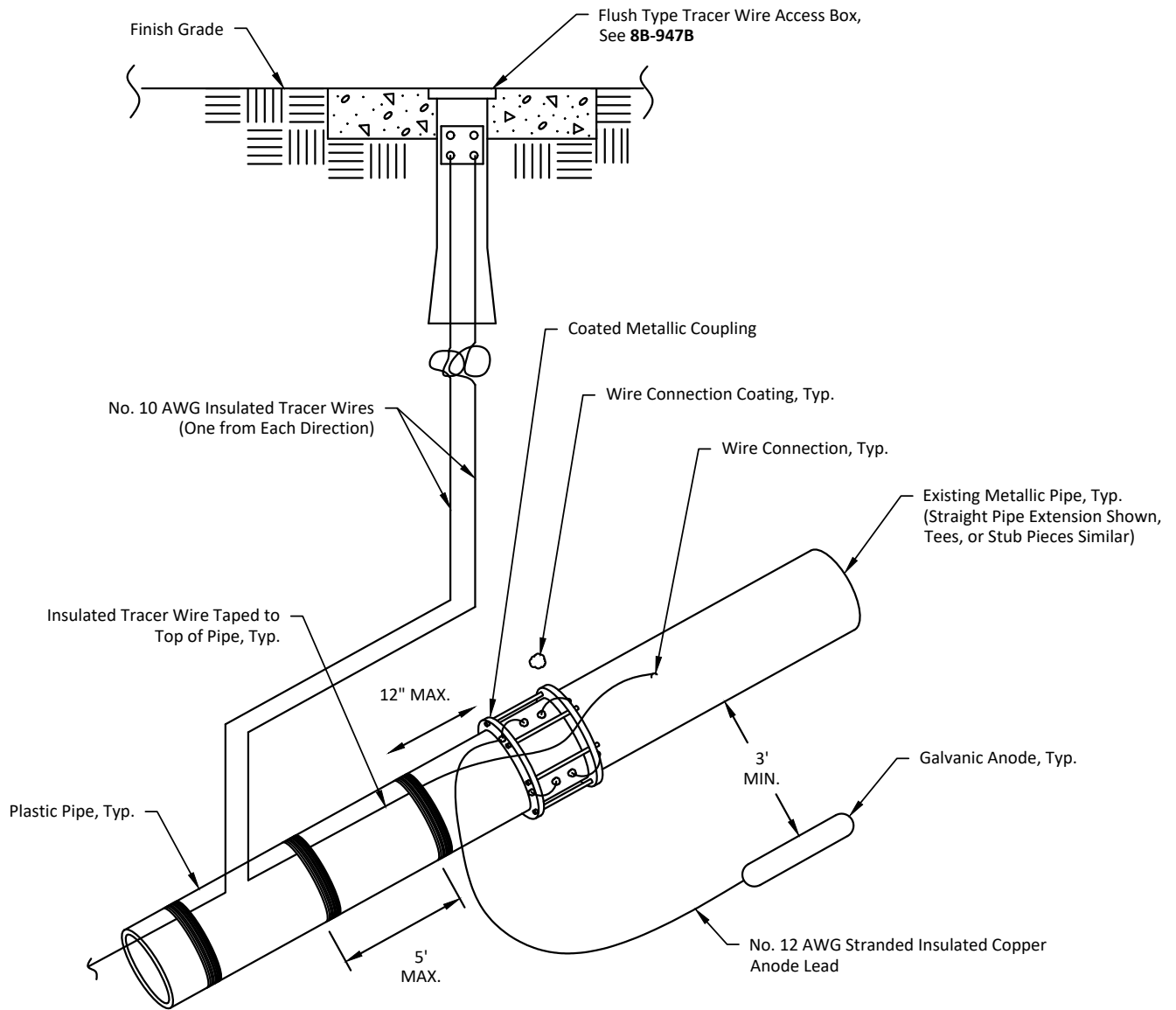
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**TRACER WIRE AT NEW PIPELINE ENDS**

DATE: 8-19-22

Sec. - Sht.  
8B-947E



**Notes:**

1. Install galvanic anode to metallic fitting at connection to existing metallic pipeline (if metallic pipe not already cathodically protected with an impressed current cathodic protection system).
2. If tracer wire connected to existing metallic pipeline, loop tracer wires abovegrade and terminate in tracer wire access box. See 8B-947 series details.
3. Tracer wire access box locations shall be documented by the contractor in the red-line, as-constructed plans by station/offset or survey coordinates consistent with project horizontal datum. Location provided shall be within 0.5 feet of true location.

N.T.S.

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# TRACER WIRE ACCESS BOXES AT CONNECTION TO EXISTING

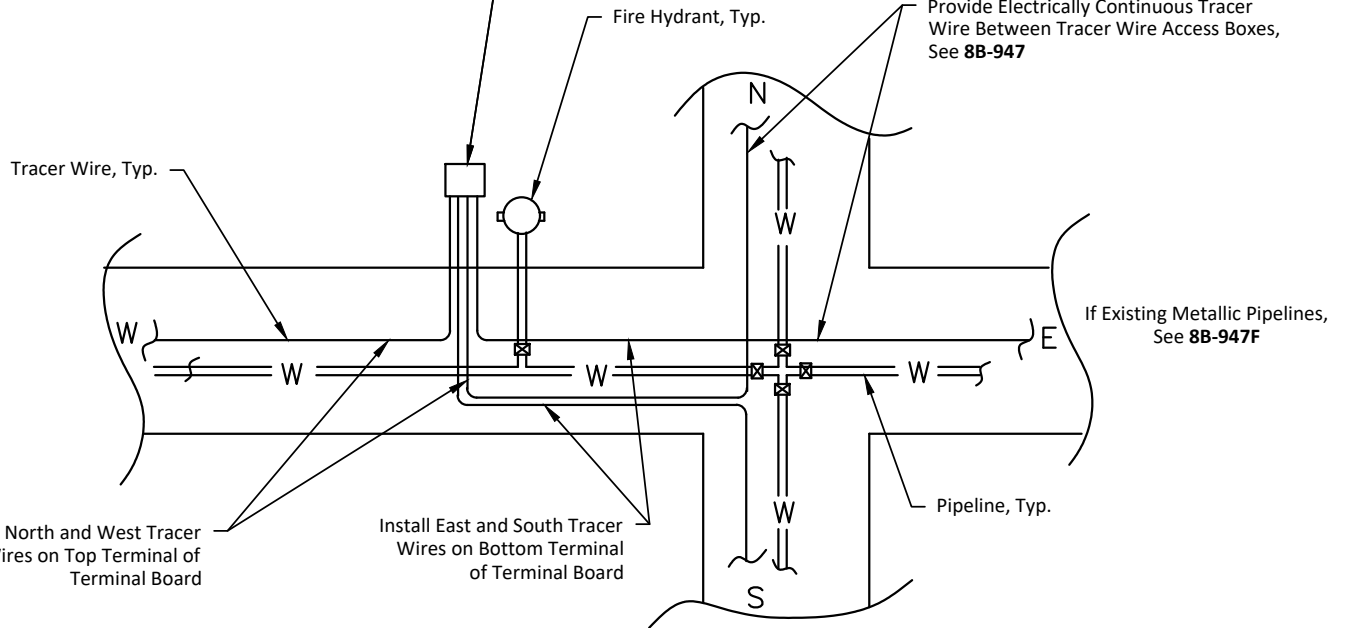
DATE: 8-19-22

Sec. - Sht.  
8B-947F



Two Test Station or Tracer Wire Access Boxes Located Side-by-Side, if Required. Located at End of All Tracer Wire and New Pipe Runs, Typ., in Protected Location, See 8B-947B

For Tracer Wire Access Box Installations, See 8B-942 and 8B-947 Series Details



**TRACER WIRE DIRECTION COLOR CODE:**

- NORTH WIRE - 1 STRIP OF PURPLE TAPE
- SOUTH WIRE - 1 STRIP OF GRAY TAPE
- WEST WIRE - 2 STRIPS OF PURPLE TAPE
- EAST WIRE - 2 STRIPS OF GRAY TAPE

**TRACER WIRE AT THREE OR FOUR-WAY INTERSECTION**

**Notes:**

1. Terminate tracer wires abovegrade in tracer wire access boxes located at abovegrade structures with tracer wire from each pipe direction (up to 4 tracer wires possible). Do not terminate wire ends below grade or in valve boxes.
2. If 3 or 4 tracer wires, terminate tracer wires in one tracer wire access box. Terminate north and west tracer wires on top terminals and east and south tracer wires on bottom terminals of tracer wire terminal board.
3. If two tracer wire access boxes are used in lieu of one (only with engineer approval), terminate the north and south tracer wires in one access box and the east and west tracer wires in the other access box.
4. Use this detail for parallel water mains at intersecting streets. The detail above is mirrored to other side of street. Wiring is exactly the same with the exception of tracer wire direction identification tape.
5. Test tracer wire electrical continuity prior to placement of curb and gutter and before paving.
6. Tracer wire access box locations shall be documented by the contractor in the red-line, as-constructed plans by station/offset or survey coordinates consistent with project horizontal datum. Location provided shall be within 0.5 feet of true location.

N.T.S.

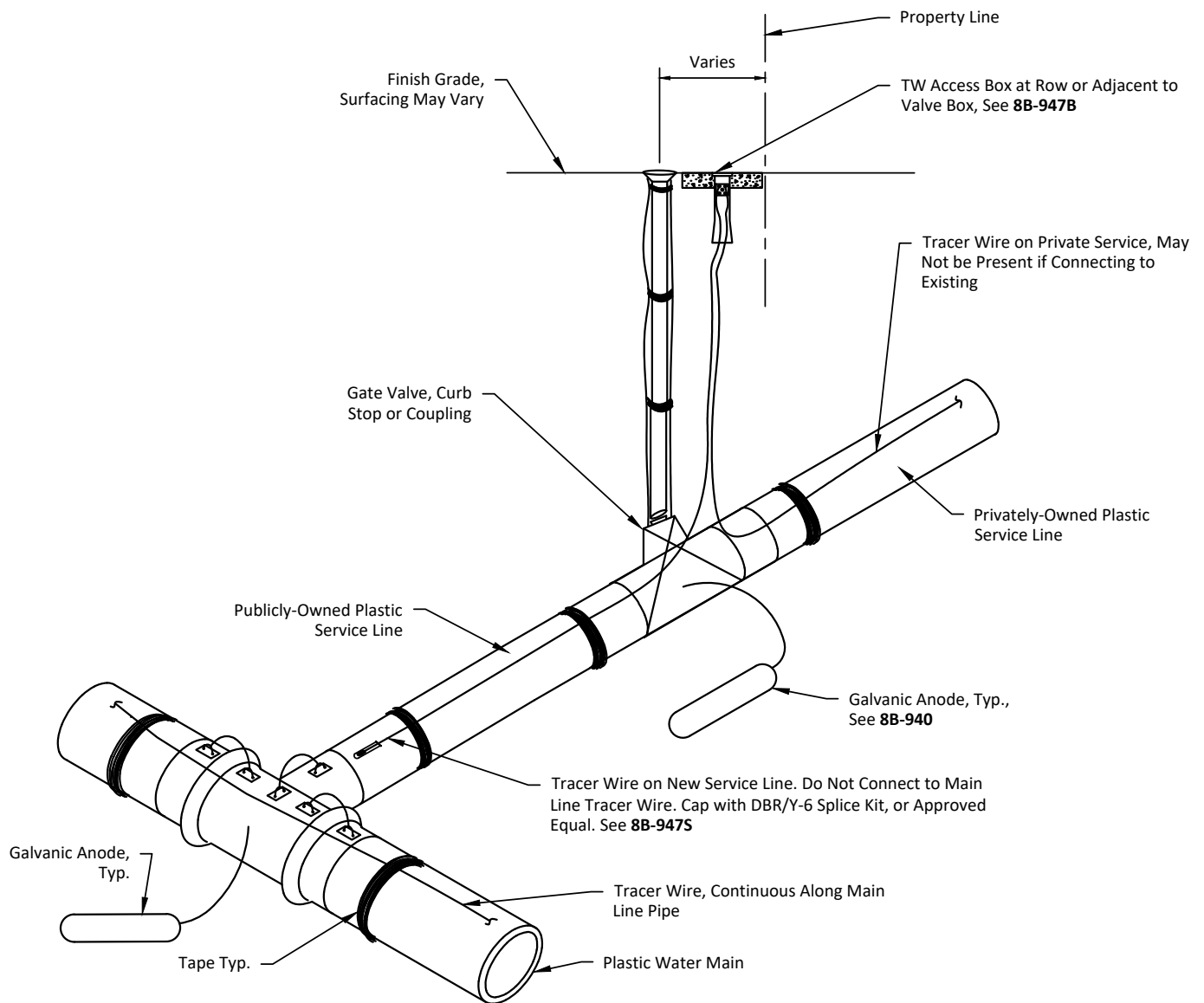
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**MULTIPLE TRACER WIRES**

DATE: 8-19-22

Sec. - Sht.  
8B-947M



**Notes:**

1. Place tracer wire access box in a protected location at row line or adjacent to valve box so as to not interfere with operation of valve. Terminate tracer wires in access box with min. 18" slack.
2. Tracer wire for service line shall not be connected to the main line tracer wire. Terminate tracer wire with an insulated splice kit and securely fastened to the plastic service line with tape as near as possible to the main line fitting.
3. This tracer wire installation detail shall be used on plastic service lines, i.e. Fire lines, residential or commercial plastic water service, etc.
4. Tracer wire on private service may not be present. If tracer wire is present, bring to surface in tracer wire access box. If no private tracer wire exists, extend new tracer wire from tracer wire access box to end of excavation and terminate with DBR/Y-6 splice kit, or approved equal.
5. Tracer wire access box locations shall be documented by the contractor in the red-line, as-constructed plans by station/offset or survey coordinates consistent with project horizontal datum. Location provided shall be within 0.5 feet of true location.

N.T.S.

CITY OF RAPID CITY

PUBLIC WORKS DEPARTMENT

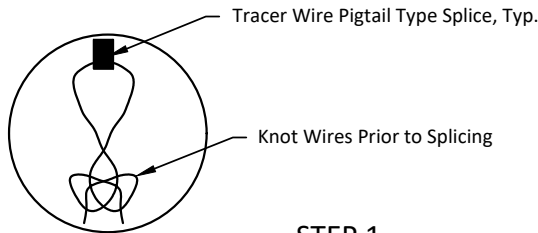
**TRACER WIRE AT PLASTIC SERVICE LINE**

DATE: 8-19-22

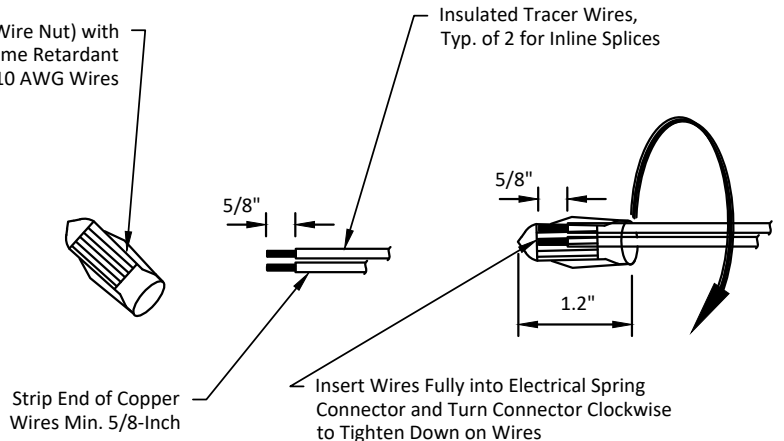
Sec. - Sht.  
8B-947PS

Utilize Only 600-Volt Rated Electrical Spring Connector (Wire Nut) with Internal Expandable Steel Spring, Steel Metal Shell, and Flame Retardant PVC Insulator Sized to Fit Three No. 10 AWG Wires

Insulated Tracer Wires, Typ. of 2 for In-line Splices

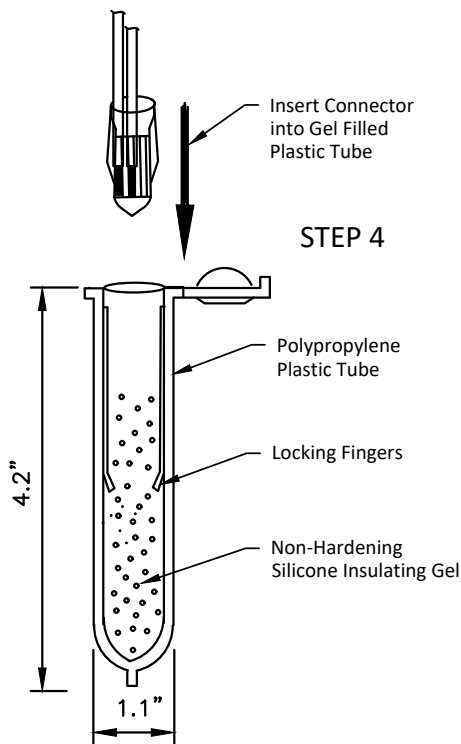


STEP 1

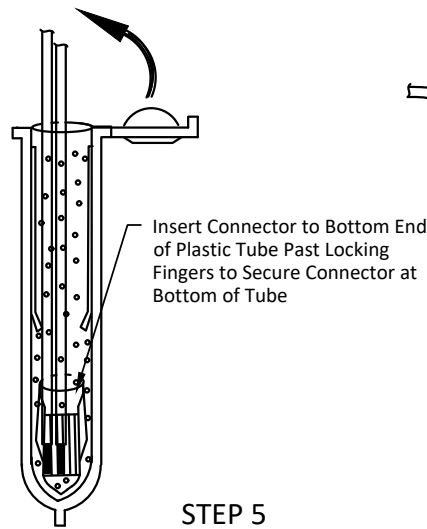


STEP 2

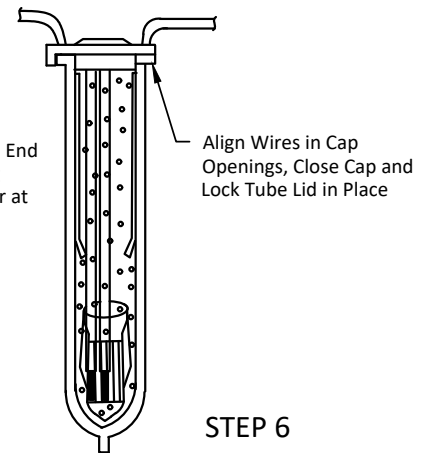
STEP 3



STEP 4



STEP 5



STEP 6

### IN-LINE SPLICES

**Notes:**

1. Allowed for tracer wire type splices only. Tracer wire only required for non-metallic pipe type installations. Knot wires prior to making splice to minimize stress on splice.
2. For copper wire splices only. Strip wires and make wire splice connection with electrical spring (wire nut) type connectors. Insert the connector into the gel filled tube to the end past the locking fingers to hold the connector securely in place, align wires and then shut and lock the insulator tube top lid cover into place. Complete splices and insulate in accordance with connector manufacturer's recommendations.
3. Complete all splices only in the presence of the engineer.
4. In-line splice locations shall be documented by the contractor in the red-line, as-constructed plans by station/offset or survey coordinates consistent with project horizontal datum. Location provided shall be within 0.5 feet of true location.

N.T.S.

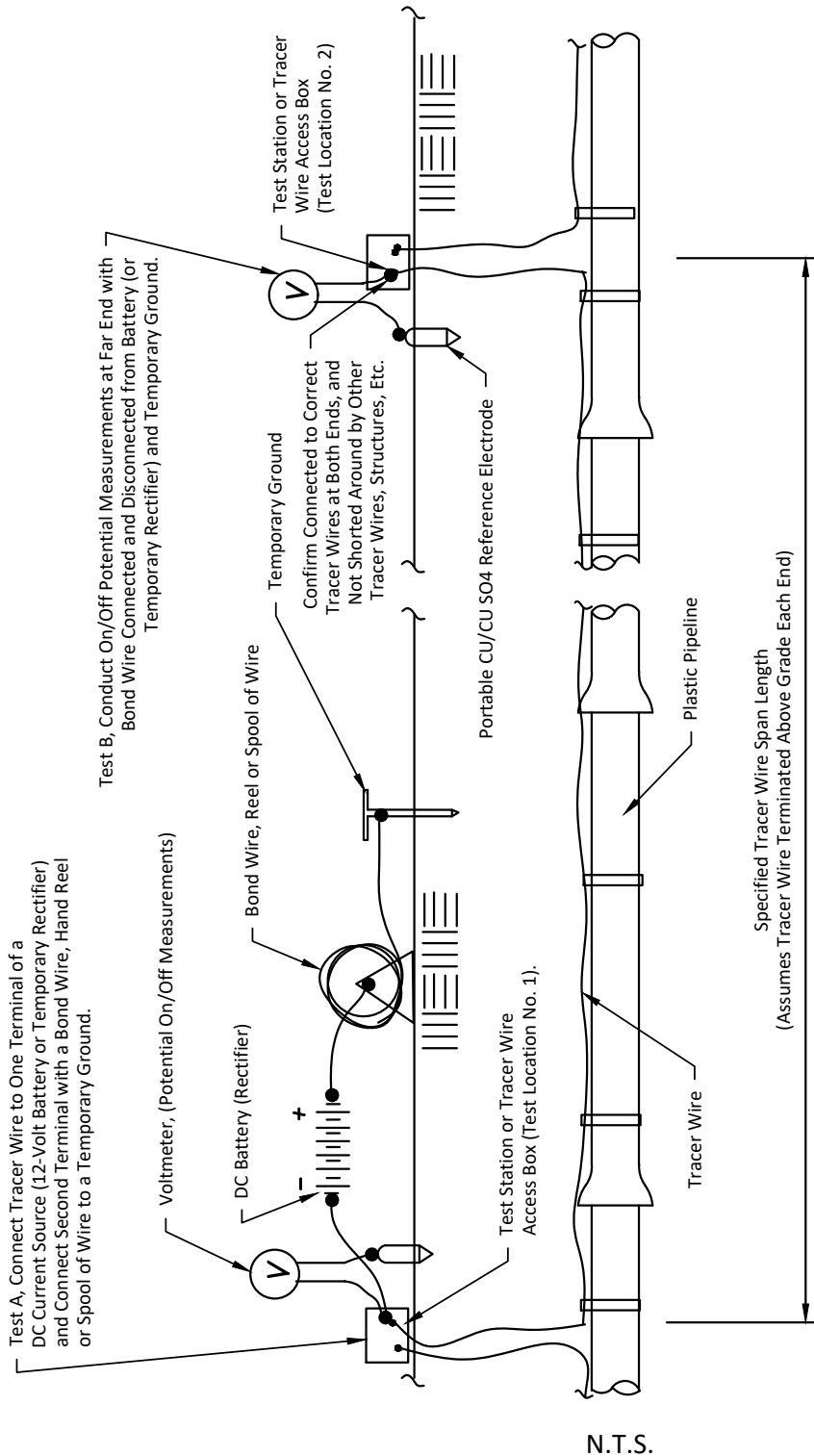
CITY OF RAPID CITY

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## TRACER WIRE SPLICES

DATE: 8-19-22

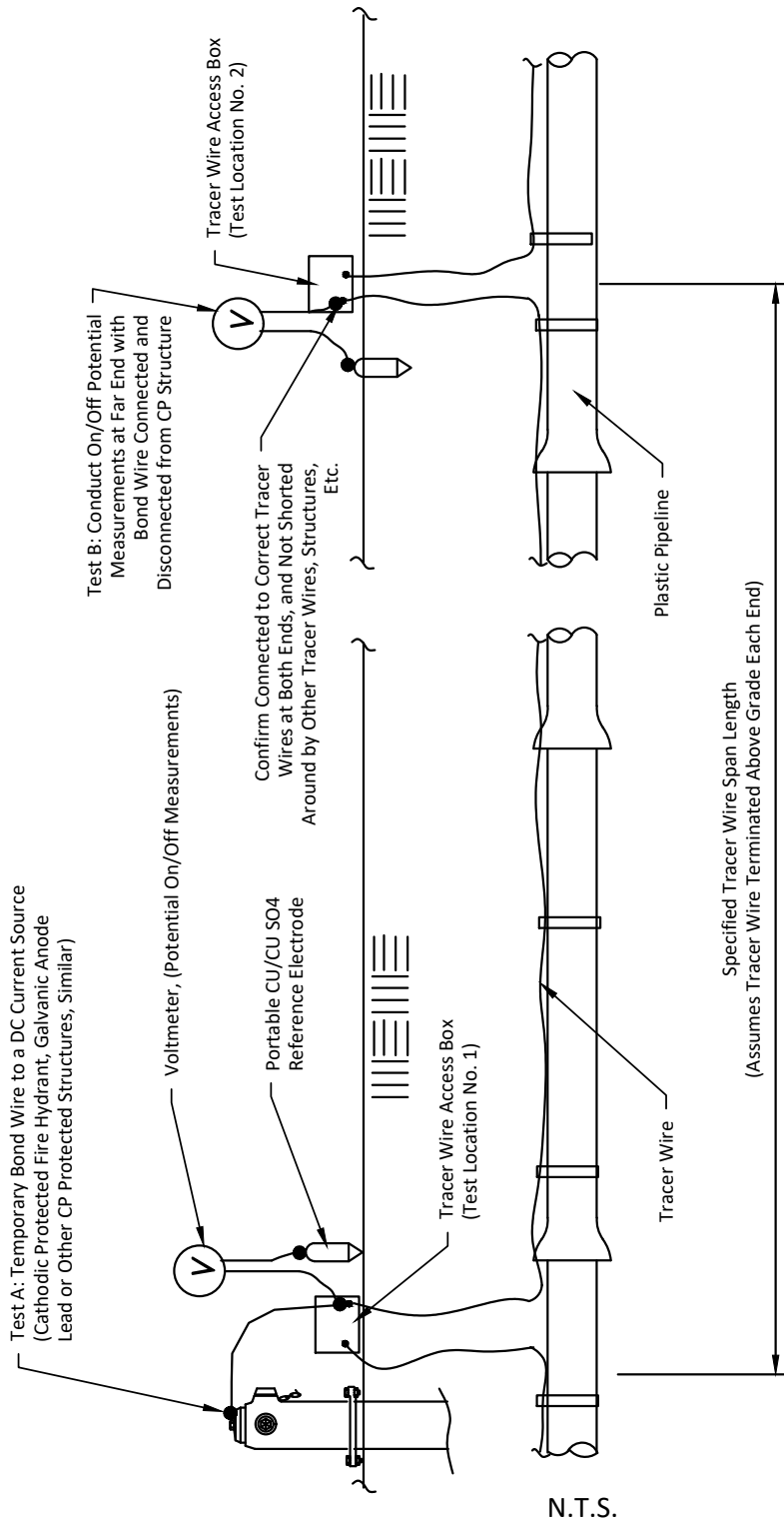
Sec. - Sht.  
8B-947S



**TRACER WIRE CONTINUITY VERIFICATION WITH POTENTIAL SHIFT TEST PROCEDURE:**

1. Conduct on and off potential measurements at Test Location No. 1 with temporary ground and connection to a battery or temporary rectifier at same end. Then conduct an on and off potential test measurement at far end (Test Box Location No. 2). Test is similar to testing with galvanic anode but provides a larger voltage difference.
2. The measured potentials should change near to the same as the voltage of the battery (approximately 12 to 13 volts) or temporary rectifier DC voltage output at both Test Locations 1 and 2.
3. If both test point measured voltages are the same, this indicates the tracer wire for the span tested is continuous.
4. If there is no potential change (off to on) at the test end (Location No. 2, Test B), but there is at the temporary ground end (Test Location No. 1, Test A), this indicates that the tracer wire may either not be electrically continuous with one or more breaks or electrically-short-circuited to another structure.
5. If no potential change, verify by testing from opposite direction. Utilize other test methods to confirm.
6. If a fully-charged 12-volt battery is the source and measured potentials are less than 10 volts at either end of the test, the tracer wire is shorting to a fitting or other metallic structure. Refer to specifications for information regarding locating areas of wire insulation damage or wire breaks.

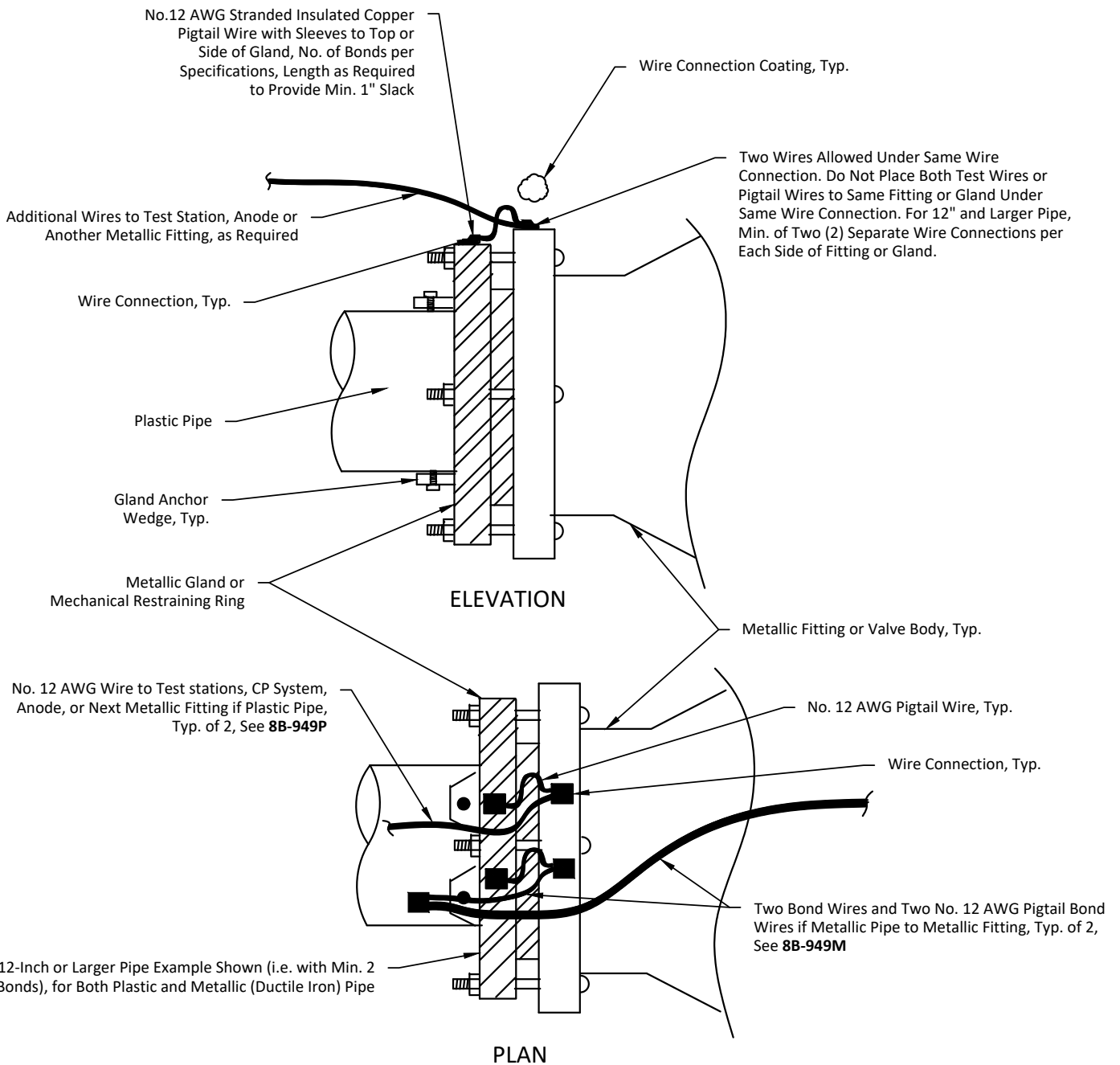
**TRACER WIRE CONTINUITY TEST PROCEDURES  
BATTERY OR RECTIFIER POTENTIAL SHIFT METHOD**



**TRACER WIRE CONTINUITY VERIFICATION WITH GALVANIC ANODE POTENTIAL SHIFT TEST PROCEDURE:**

1. Conduct on and off potential measurements at Tracer Wire Access Box No. 1 with bond wire to cathodic protection source at same end. Then conduct on and off potential tests at far end (Tracer Box Location No. 2). Potential should shift the same amount at far end (Location No. 2), when temporarily connected and disconnected from cathodic protection source at Tracer Wire Box Location No. 1, if tracer wire is continuous and not shorted to other structures.
2. For example: if the off potential of the tracer wire is -0.24 volts and the anode or cathodically protected fire hydrant potential is -1.1 volt, then when the tracer wire is temporarily connected to the cathodically protected structure, the tracer wire potential changes to -1.0 volts at Tracer Wire Access Box Location No. 1 and -0.95 at Tracer Wire Access Box Location No. 2. That indicates that the tracer wire between Locations No. 1 and No. 2 is continuous. If the on potential at Test Location No. 2 does not change it indicates the tracer wire may not be electrically continuous with one or more breaks. If there is only a slight change, say from -0.200 to -0.233 volts, that indicates that either the tracer wire may be broke or electrically shorted to another structure. If insignificant potential change, verify by testing from opposite direction. Utilize other test methods to confirm.





**Notes:**

1. Bond metallic or plastic pipe metallic glands to metallic fitting body. Complete pigtail wire connections to glands before assembly.
2. Bond metallic mechanical restraint rings to metallic fitting body
3. Minimum of two (2) bonds each for 12" and larger pipe. One (1) bond for pipe smaller than 12".

N.T.S.

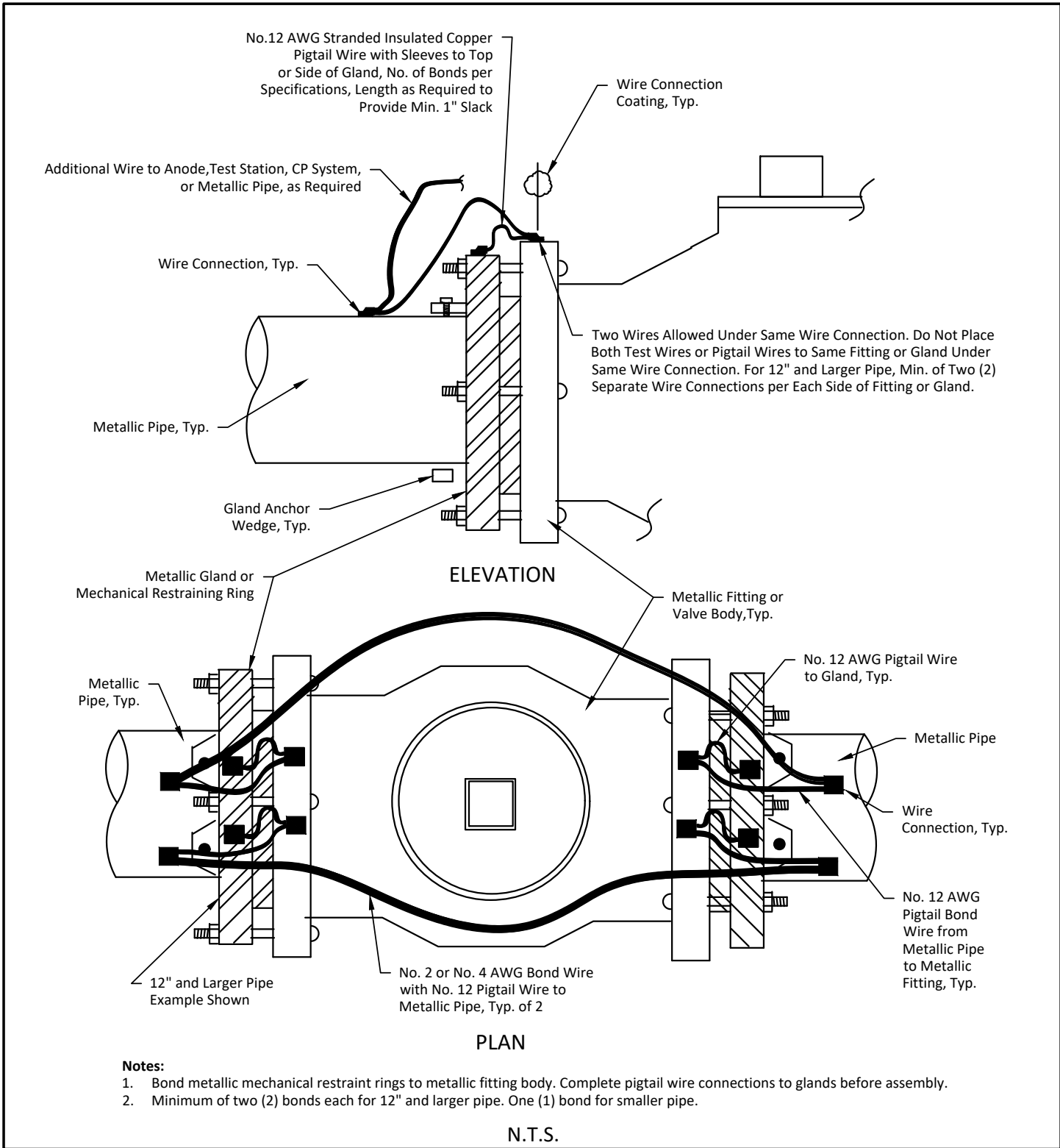
CITY OF RAPID CITY

PUBLIC WORKS DEPARTMENT

# METALLIC FITTING GLANDS AND MECHANICAL RESTRAINT RINGS BONDING

DATE: 8-19-22

Sec. - Sht.  
8B-949

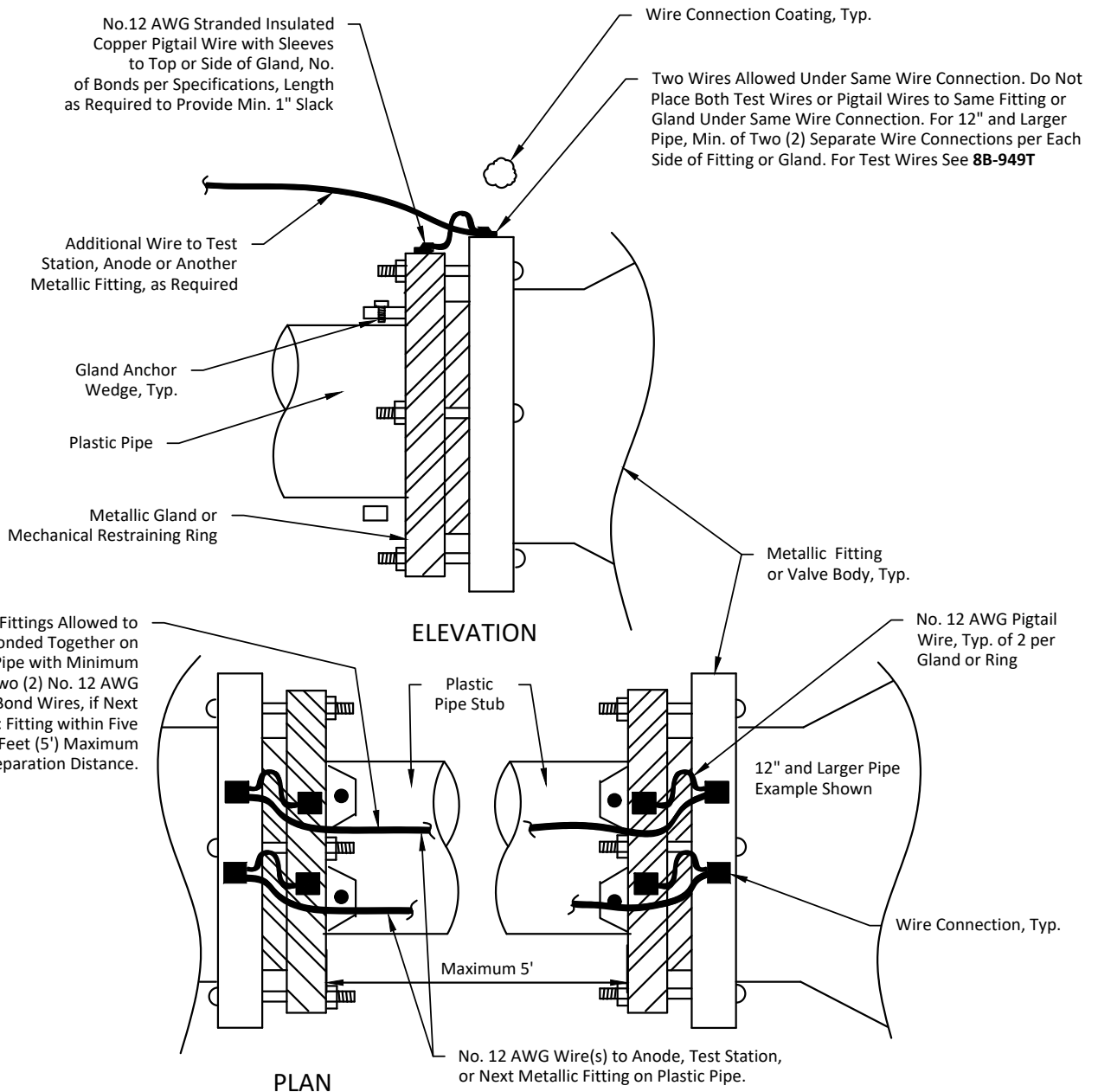


CITY OF RAPID CITY PUBLIC WORKS DEPARTMENT

METALLIC PIPE METALLIC FITTING GLANDS AND MECHANICAL RESTRAINT RINGS BONDING

DATE: 8-19-22

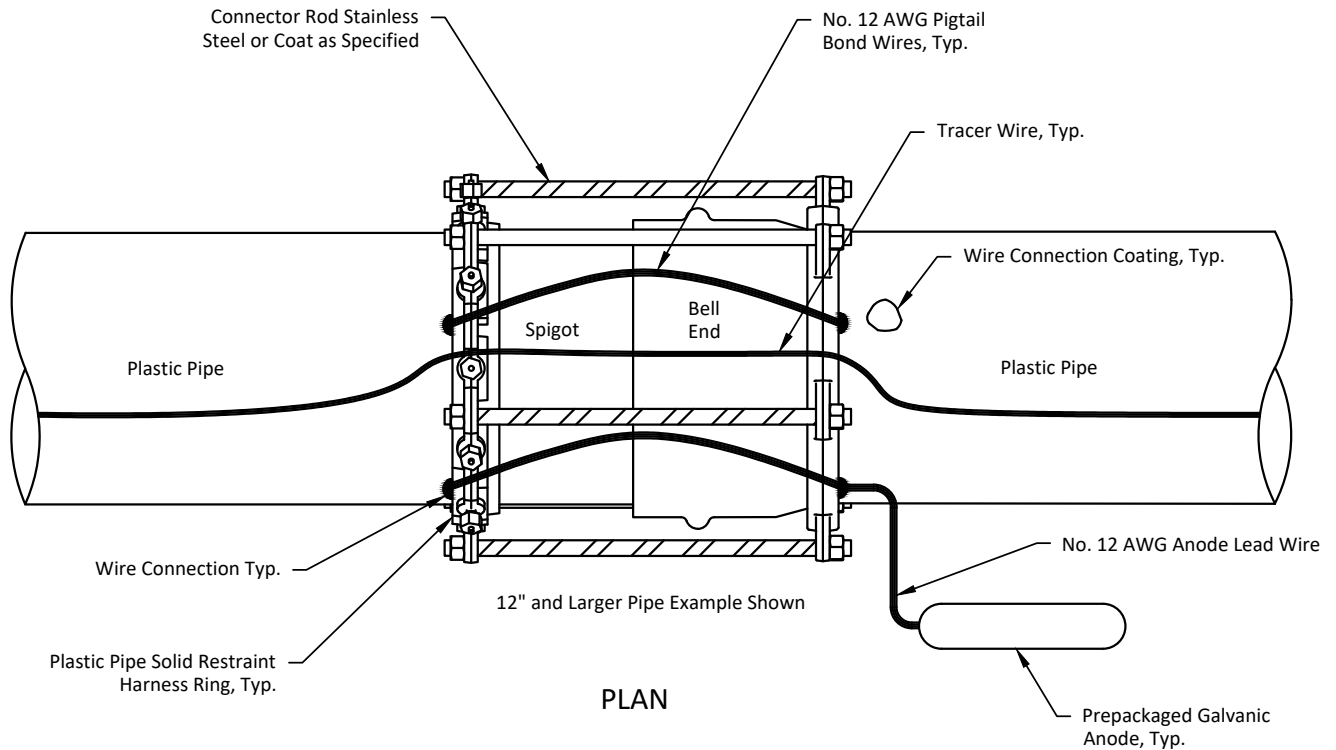
Sec. - Sht. 8B-949M



**Notes:**

1. Bond plastic pipe metallic glands to metallic fitting body. Complete pigtail wire connections to glands before assembly.
2. Minimum of two No. 12 AWG pigtail bonds each for 12" and larger pipe. Minimum of one bond for pipe smaller than 12".
3. Number, size and type of galvanic anodes required per specifications.

N.T.S.



**Notes:**

1. Solid ring type restraints shown with minimum of two pigtail bond wires for 12-inch and larger pipe. Single pigtail bond wire allowed for pipe 10-inch and smaller. Split ring restraints may only be used if approved by engineer and will require additional pigtail bond wires, See **8B-949S**.
2. Number, size and type of galvanic anodes required for single fitting per specifications.
3. Prior to assembly, locate wire connection for No. 12 AWG bond wires to flat area on side of coupling bolt pattern restraint harness ring.
4. Maximum of two wires under any one connection location per specifications.

N.T.S.

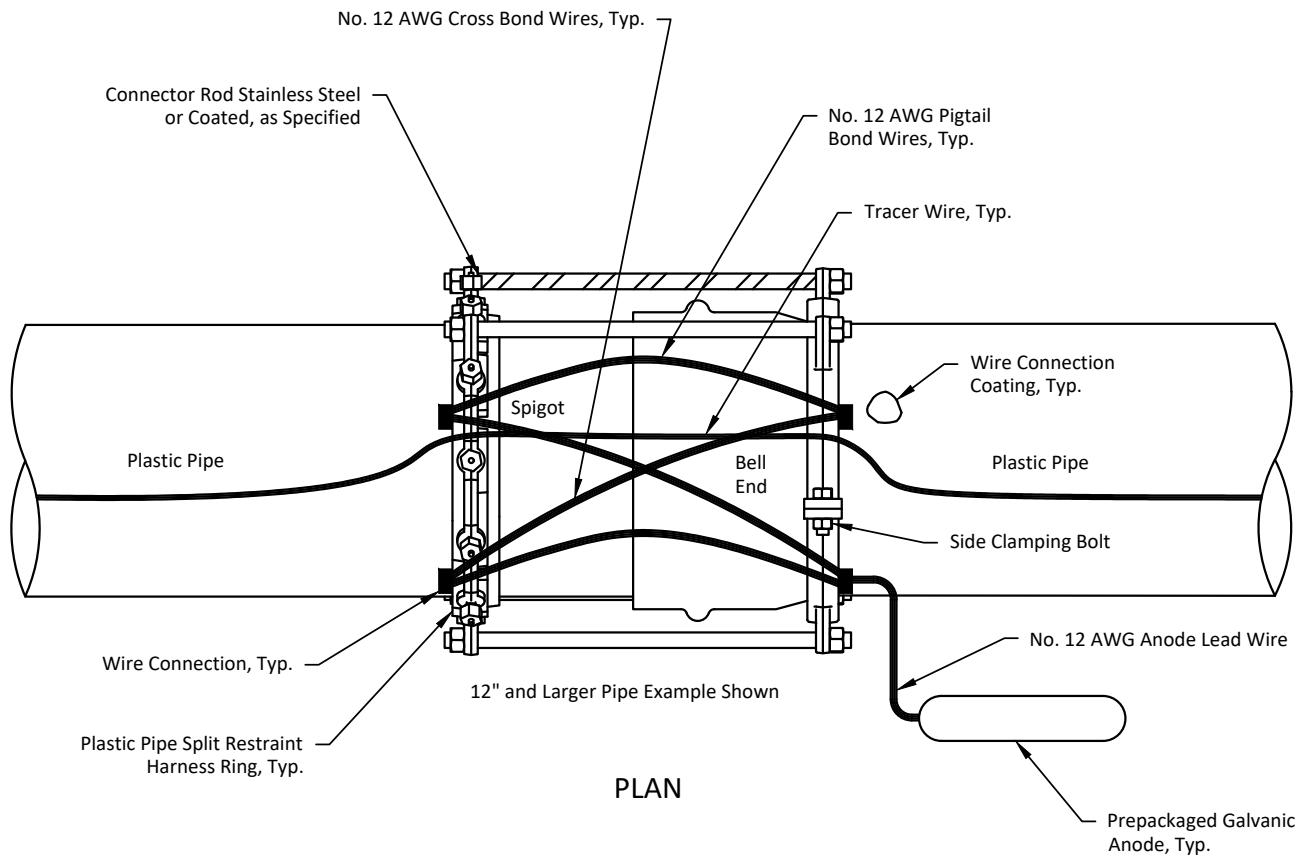
CITY OF RAPID CITY

PUBLIC WORKS DEPARTMENT

**PLASTIC PIPE BELL SOLID RING  
RESTRAINT HARNESS JOINT BONDING**

DATE: 8-19-22

Sec. - Sht.  
8B-949R



PLAN

**Notes:**

1. Split ring type restraints shown with minimum of four (two pigtail and two cross bond wires for 12-inch and larger pipe. Two pigtail cross bond pigtail wires allowed for 10-inch and smaller pipe). Split ring restraints may only be used if approved by engineer. For solid ring pigtail bond wires, see **8B-949R**.
2. Number, size and type of galvanic anodes required for single fitting per specifications.
3. Prior to assembly, locate thermite weld or pin brazed type wire connection for No. 12 AWG bond wires to flat area on side of coupling bolt pattern restraint harness ring.
4. Maximum of two wires under any one connection location per specifications.

N.T.S.

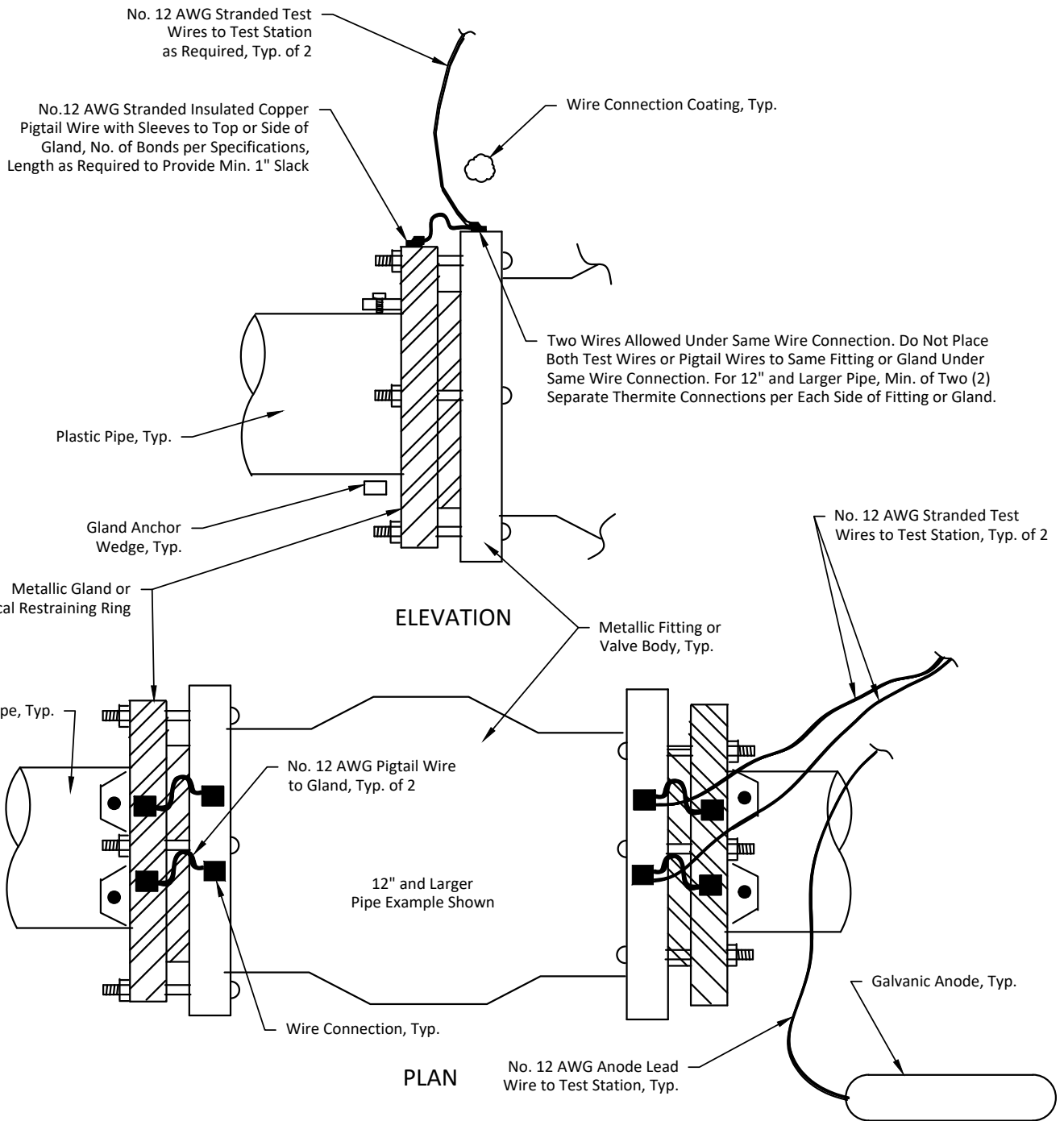
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**PLASTIC PIPE BELL SPLIT RING  
RESTRAINT HARNESS JOINT BONDING**

DATE: 8-19-22

Sec. - Sht.  
8B-949S



**Notes:**

1. Bond metallic mechanical restraint rings to metallic fitting body. Complete pigtail wire connections to glands before assembly.
2. Minimum two No. 12 AWG pigtail bond wires each side of fitting for 12" and larger fitting. One bond wire each side for pipe smaller than 12" diameter.

N.T.S.

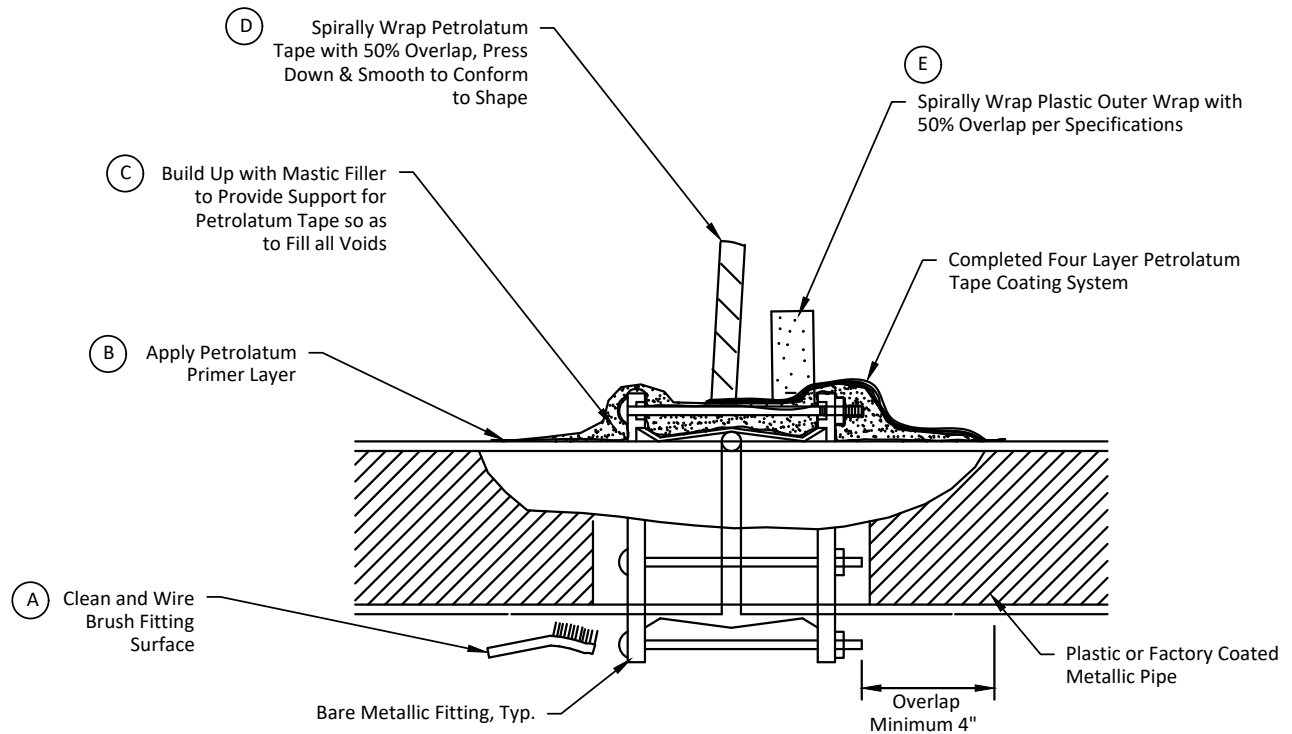
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**PLASTIC PIPE METALLIC GLANDS/RESTRAINT RINGS BONDING, ANODE AND TEST LEADS**

DATE: 8-19-22

Sec. - Sht.  
8B-949T



**Notes:**

1. Provide and install primer, mastic filler, tape, and outer wrap as recommended by tape manufacturer for each fitting type and environment.
2. Clean and roughen fitting surface with wire brush and apply petrolatum primer layer, mastic filler, petrolatum tape, and plastic outer wrap per petrolatum tape manufacturer's directions.
3. Joint bond wires, anode & test leads (not shown) shall be coated with epoxy repair coating and then encased under petrolatum tape coating.
4. Primer and mastic filler shall provide smooth transition at all edges and step-downs and fill all voids.
5. Petrolatum tape coating shall completely encase bare metallic fitting & extend a minimum 4" onto coated metallic or plastic pipe surfaces.
6. Four layer system with protective wrap for buried conditions and three layer system for abovegrade applications.
7. Corrosion protection is shown for flexible coupling joint type. Protection of other bare metallic fitting types similar.

N.T.S.

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**PETROLATUM TAPE COATING FOR BARE METALLIC COUPLINGS AND FITTINGS**

DATE: 8-19-22

Sec. - Sht.  
8B-967