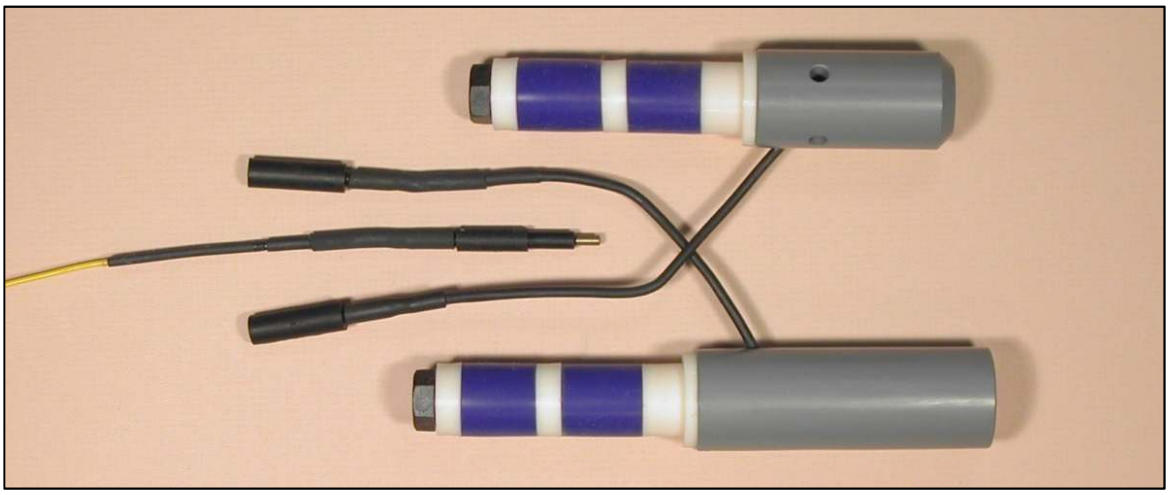
Model TE - Tube Sheet Reference*

Typical Applications:

- Condenser tube sheets

Featuring:

- Ability to place a reference electrode in selected locations on the tube sheet
- In-line underwater connector for easy removal
- CPVC housing rated to 180F (82C)
- All non-metallic double tube plug for attachment



Electrode Housings

Gelled Element - 1 1/16" dia. x 3" long
(2.7 cm dia x 7.5 cm long)
Dry element - 1" dia. x 2" long
(2.6 cm dia x 5 cm long)

Element Types

AGG - Saturated gelled Ag/AgCl
CUG - Saturated gelled $Cu/CuSO_4$
AGD - Dry-type Ag/AgCl
ZIN - 99.99% zinc

Electrode Termination

Female underwater connector on
6 inch (15 cm) (nominal) lead wire

Lead Wires

Male underwater connector attached to #22 AWG Teflon insulated lead wires in the following colors: red, orange, yellow, green, blue, purple, brown, black, white, gray

Model Designation - Electrode

Specify as EDI Model TE-xxx-SW
where xxx = element type

Model Designation – Wire

Specify as EDI Model TW-col-LWnnn
where col = color code and
nnn = wire length in feet: 025 or 050

Cathodic protection applied to a waterbox can cause a non-uniform potential distribution to exist over the face of the tube sheet. A remotely mounted reference electrode cannot detect these potential gradients. Excessively electronegative potentials can result in hydrogen damage on titanium and ferritic stainless steel tubes while excessively electropositive potentials mean inadequate protection of the tube sheet. **Model TE** references are the only means to verify that the actual potential at the tube sheet surface is within the acceptable range.

*** U. S. Patent 4,957,616**

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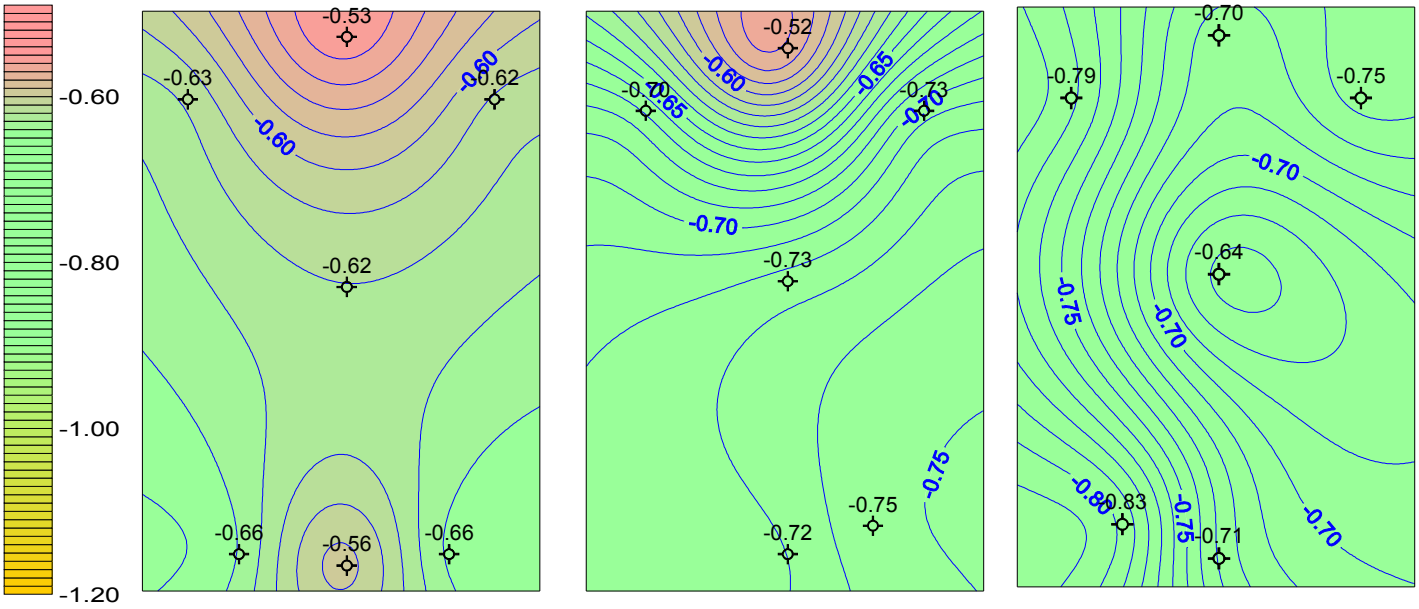
T Series Tube Sheet Mounted References

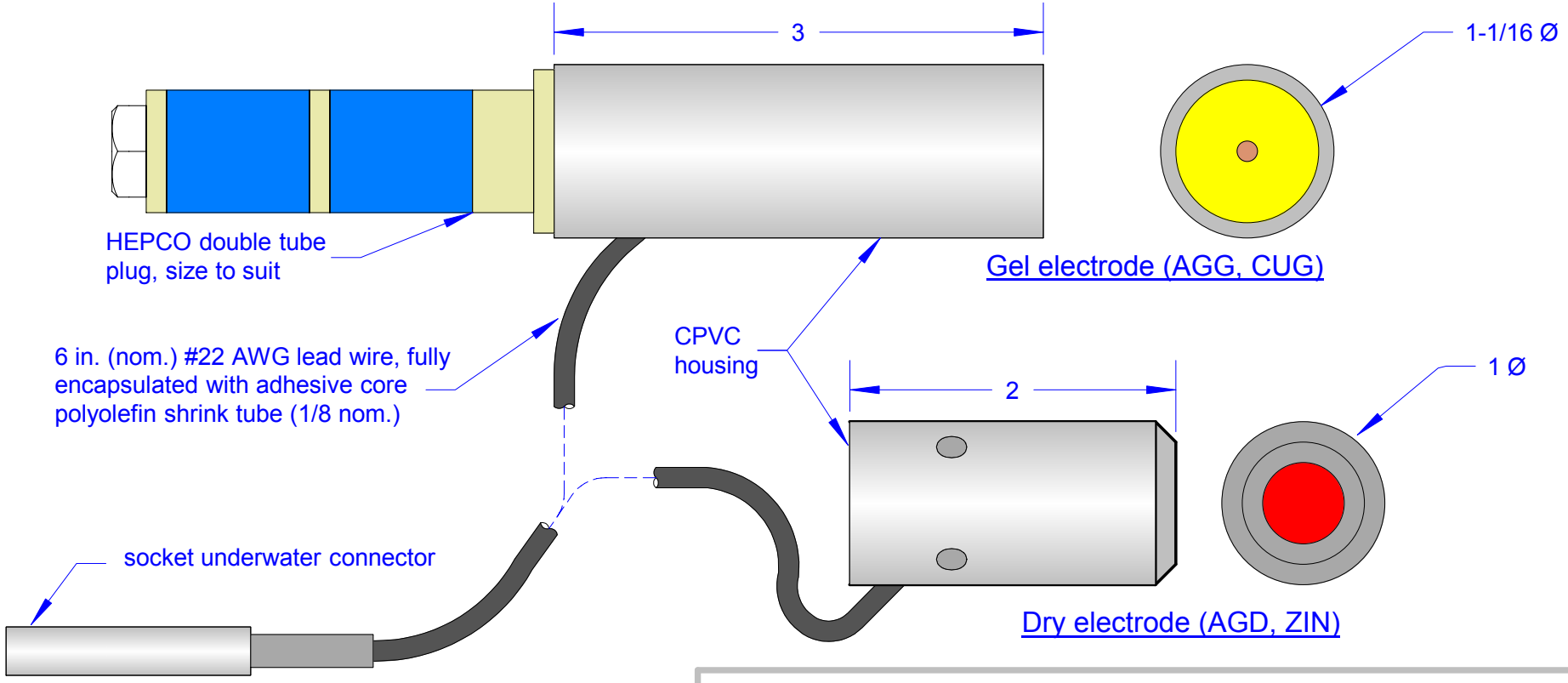
Typical Data

The potential across a tube sheet under cathodic protection can show large variations from one location to another. A smaller variation will also occur with time. Different waterboxes of the same apparent design can produce different potential distributions.

Data from several EDI Model TE reference electrodes spotted at strategic locations on the tube sheet can be used to construct iso-potential diagrams that clearly show the potential distributions. EDI can construct these diagrams from a customer's data. Experience has shown that iso-potential diagrams constructed from 30 day average data correlate very closely with inspection reports listing tubes with hydrogen damage.

The accuracy of these diagrams depends upon the number of reference electrodes used and their distribution. Six to twelve reference electrodes on each tube sheet will provide sufficient data for construction an accurate diagram.



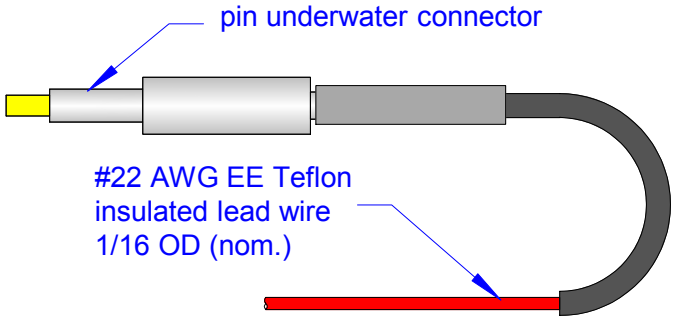


Electrode with 6 inch lead wire and socket underwater connector

Specify as EDI Model TE-xxx-SW where xxx = element type
AGG = gelled silver/silver chloride
CUG = gelled copper/copper sulfate
AGD = dry silver/silver chloride
ZIN = dry 99.99% zinc

Lead wire

Color	Code
Red	RED
Orange	ORN
Yellow	YEL
Green	GRN
Blue	BLU
Purple	PUR
Brown	BRN
Black	BLK
Gray	GRY
White	WHI



Lead wire with pin underwater connector

Specify as EDI Model TW-col-nnn
col = color code; nnn = wire length in feet
wire lengths are in 25 ft. increments.

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Tubesheet Mounted Reference Electrode

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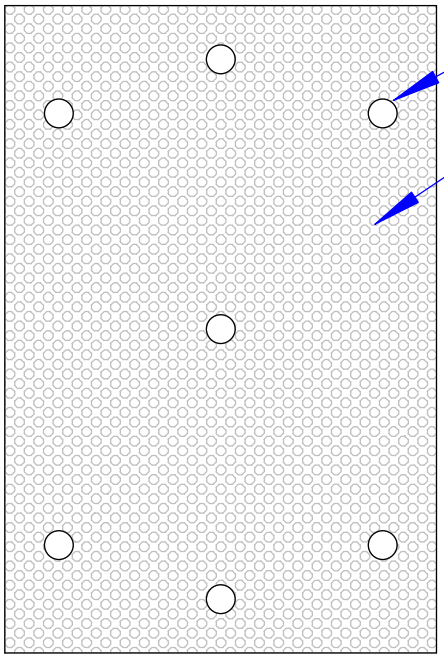
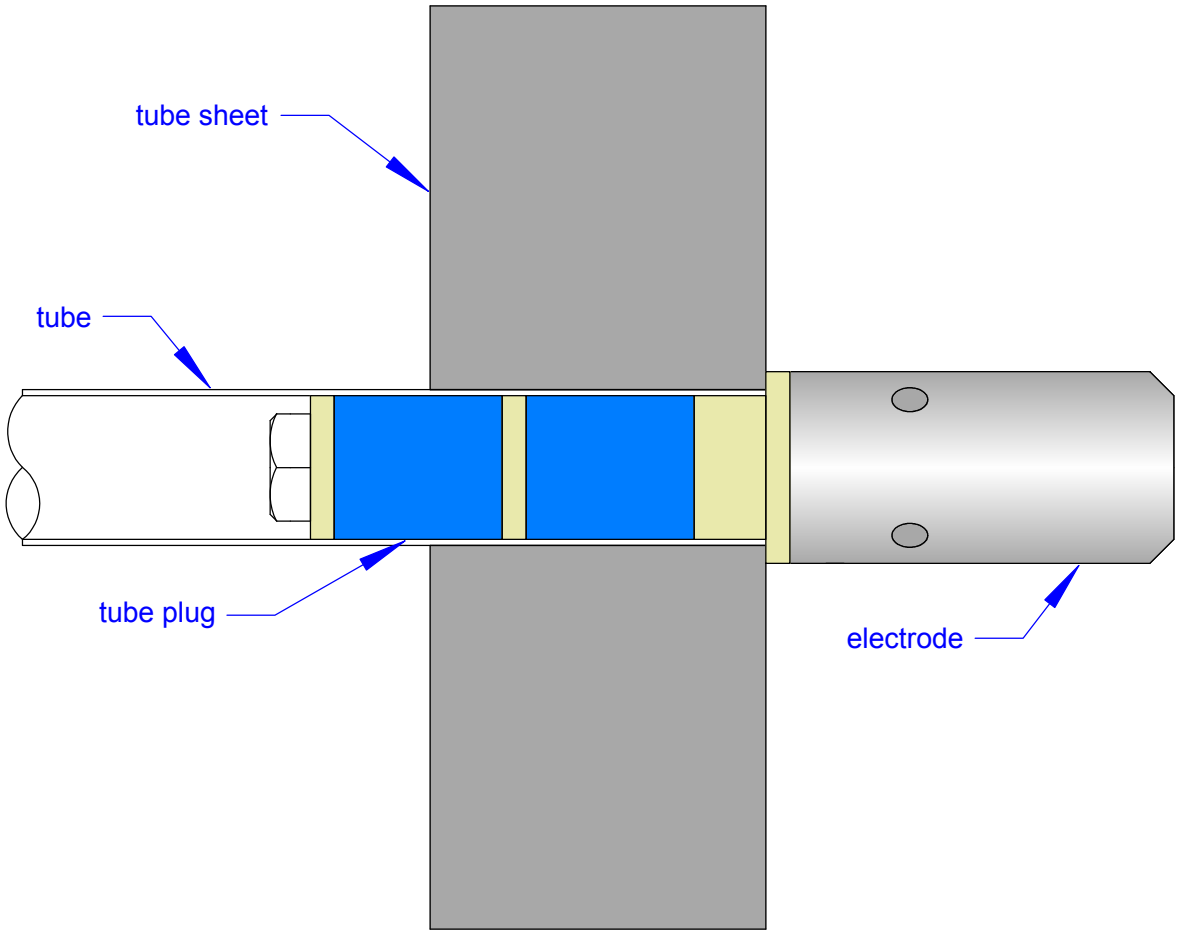
FULL	FJA	16 APR 2015	TEASY-2



Locate electrodes in tubes adjacent to lanes, route lead wires along lanes to waterbox wall. Tubes containing reference electrodes must be plugged at both ends, either with a tube sheet mounted reference electrode or tube plug.

A minimum of two tube sheet mounted reference electrodes should be used: one is located close to the anodes to monitor over-protection; the other is mounted remote from all anodes to monitor under-protection.



Typical Installation on Tube Sheet

SCALE	FULL
DRAWN BY	FJA
DATE	15 APR 2015
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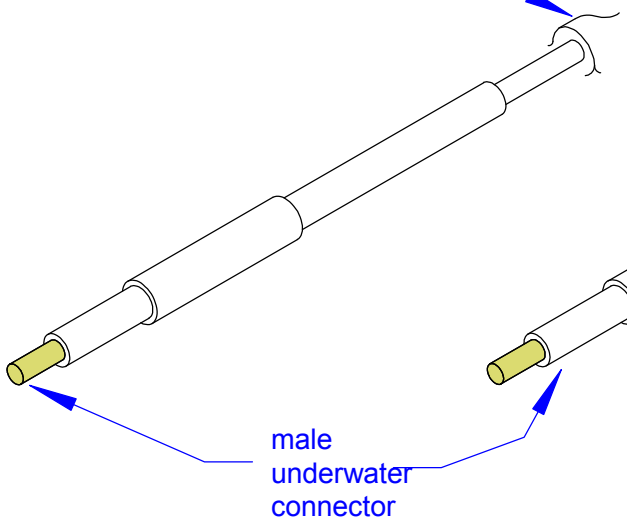
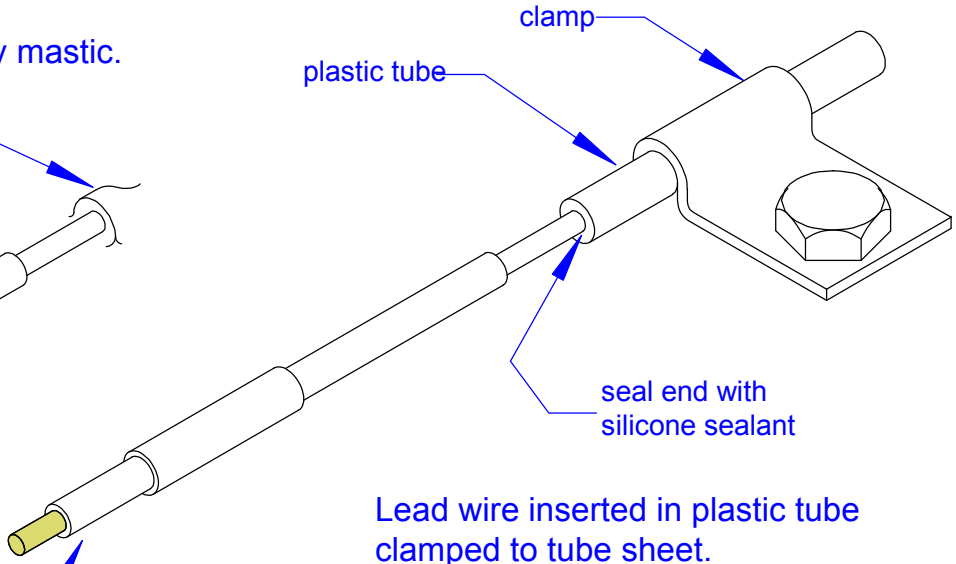
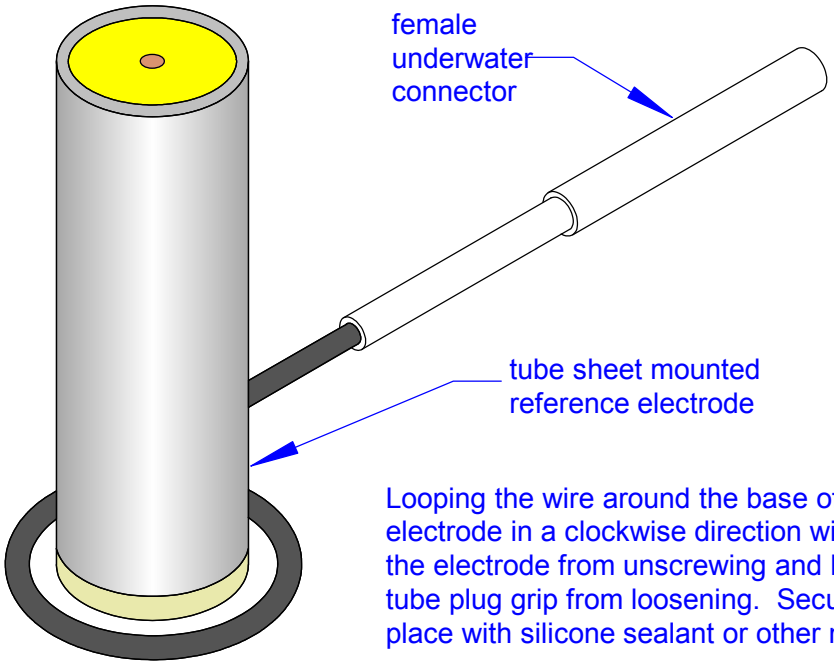
Lead wire embedded in epoxy mastic.





Lead wire inserted in plastic tube clamped to tube sheet.



Looping the wire around the base of the electrode in a clockwise direction will prevent the electrode from unscrewing and keep the tube plug grip from loosening. Secure in place with silicone sealant or other mastic.

Lead wires can be passed through waterbox wall via a Conax MHC-062 or MHM-062 sealing gland or equivilant

Suggested Installation Techniques

SCALE	FULL
DRAWN BY	FJA
DATE	15 APR 2014
DRAWING NUMBER	TEINSTL-2

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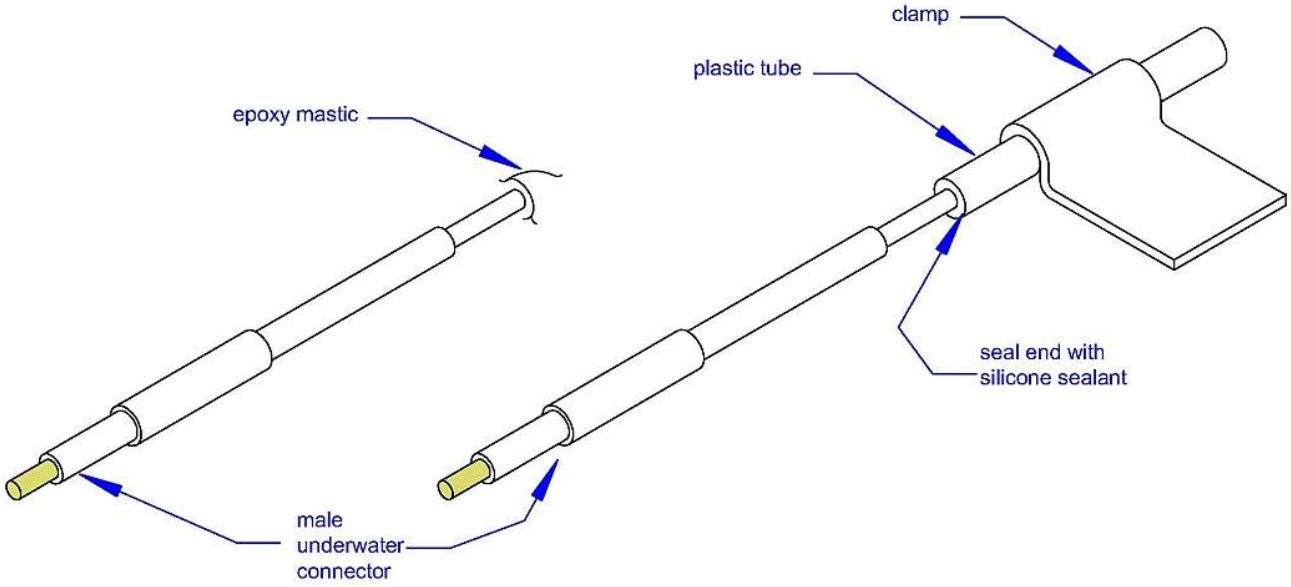
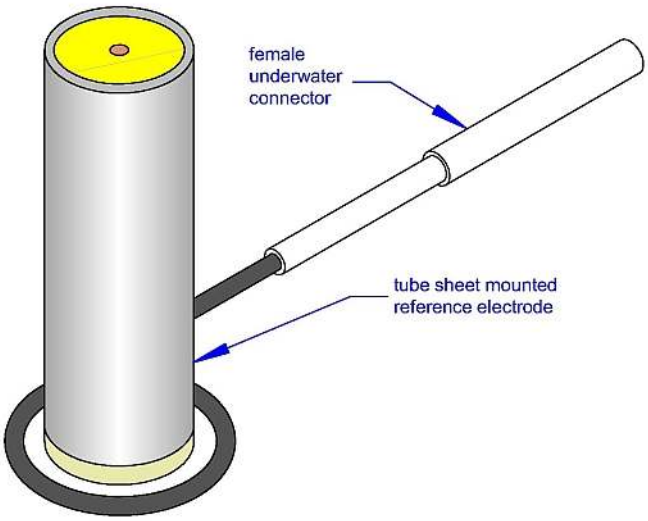
Installation Instructions

Tube Sheet Reference Electrodes

New Installation – These instructions apply to EDI **T Series** tube sheet mounted reference electrodes. Electrodes should be located in a tube adjacent to a lane. Choose a location remote from all anodes to measure underprotection and a location near anodes to measure overprotection. Tubes containing reference electrodes must be plugged at both ends, either with a second electrode or a tube plug. The lead wire is routed along the lane to the side wall where it exits the waterbox through a Conax MHC-062 or MHM-062 sealing gland or equivalent. Wire attachment is by either embedding it in a suitable epoxy mastic or threading the wire through a plastic tube clamped to the tubesheet.





Remove electrode from carton and record the serial number and QC test potential; these are located on the yellow tag attached to the lead wire. Remove the protective vinyl cap covering the membrane on electrodes with AGG or CUG in the model designation. Insert tube plug into the tube and hand tighten securely. Loop extra lead wire around electrode in a clockwise direction and plug the electrode connector into the lead wire connector. Silicone sealant is used to secure the wires and connectors as required.

Electrode Replacement – Remove sealant securing wires and connector. Unplug and remove old electrode and install new one as described above.