Generic Specification

Subject: ***Generic Specification for the Stelth® Stationary Reference Electrode***

Buried Service *- Stationary reference electrodes shall be used to monitor and audit the level of cathodic protection being achieved by the complete corrosion control system.*

1. *The stationary reference electrode used shall be designed for direct burial service and will not use or require any backfill of any kind and will maintain its stability in desert dry soils as well as soils with a high moisture content. Freezing will have no effect on the reference electrodes performance.*

2 *The reference electrode must operate in a temperature range of –10 to +185° Fahrenheit (-18 to +85° Celsius) and maintain a stability of 5 millivolts with a 3.0 microamp load.*

3. *The reference electrode shall utilize an aluminum oxide ceramic sensor with a minimum surface area of 33 in^2 (213Cm^2) and have a minimum design life of thirty five (35) years.*

4. *To protect the environment from the reference electrode leaching its chemistry into the environment, the reference electrode must use a **"Moisture Retention Membrane"**, that is capable of **"Ion Defusing"** and is integral to and penetrates the entire thickness of the ceramic sensing material.*

5. *The active and passive chemical components comprising the electrolyte of the reference electrode must be in a **"Solid Chemical State Form"** and must be stabilized so as not to lose their potency while in a non-use or dormant state over the life expectancy of the reference electrode.*

6. *The reference electrode must have an **"Indefinite Shelf-Life"**, no exceptions, and must be able to be placed in service, extracted from this service and then reused in any time sequence over the warranty period of the reference electrode.*

7. *The reference electrode must utilize a **"Dual Ion Trapping Method"**. This will on the first level incorporate the trapping material (molecular sponge) in the moisture retention membrane and on the second level it will be integral to the electrolyte. This dual method will trap both chloride and hydrogen sulfide ions in the Cu-$CuSO_4$ (copper-copper sulfate) and Zn-$ZnSO_4$ (zinc-zinc sulfate) reference electrodes and hydrogen sulfide ions in the Ag-AgCl (silver-silver chloride) reference electrodes. The ion trapping material used must be acquired from recognized compounders of this technology - not homemade compounds which do not produce repeatable results.*

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8. *All reference electrodes will have an **"Integral Hydrogen Sulfide Detector"** that will provide a permanent record if the reference electrode was exposed to hydrogen sulfide (H_2S) without having to, in any way, autopsy or physically damage the reference electrode.*

9. *The following industry standard color coding will be used as follows for all reference cell lead wires: **Yellow** for Copper-Copper Sulfate, **Red** for Zinc-Zinc Sulfate, **Blue** for Silver-Silver Chloride. All lead wires will bear the name of the manufacturer of the reference electrode, for quick above ground identification and be #14 RHH-RHW or better*

10. *To minimize the cost of transportation the weight of the reference electrode, exclusive of the lead wire, cannot exceed three (3) pounds.*

11. *All reference electrodes will be individually tested, serial numbers applied and test certificates submitted for the following:*

    a. *Potential as measured against a Calomel reference at 25° C (77° F).*

        1. ***Copper-Copper Sulfate** must be +0.0600 Volts, (+0.007, -0.000 Volts).*

        2. ***Zinc-Zinc Sulfate** must be -1.0295 Volts, (+0.007, -0.000 Volts).*

        3. ***Silver-Silver Chloride** must be -0.0429 Volts, (+0.007, -0.000 Volts).*

    b. *Internal resistance of reference electrode.*

    c. *Microamp output of the reference cell must be a minimum of 3 microamps.*

    d. *Continuity of lead wire.*

    e. *Integrity of lead wire insulation.*

12. *Certification certificates must accompany reference electrodes that certify that the metal element is 99.99% pure (laboratory grade) and has a surface area of a minimum of 18 in^2, that the electrolyte chemistry is 100.00% pure (laboratory grade) and that the lead wire is copper with insulation that is a cross-linked polymer and meets the **National Electrical Code** for wet and direct burial service.*

Technical Bulletin

Subject: ***Generic Specification for the Stelth® Stationary Reference Electrode***

Water Service *- Stationary reference electrodes shall used to monitor and audit the level of cathodic protection being achieved by the complete corrosion control system.*

1. *The stationary reference electrode used shall be designed for water (fluid) and flood zone service and will maintain its stability in these applications. Freezing will no effect on the reference electrodes performance.*

2. *The reference electrode must operate in a temperature range of –10 to +185° Fahrenheit (-18 to +85° Celsius) and maintain a stability of 5 millivolts with a 3.0 microamp load.*

3. *The reference electrode shall utilize an aluminum oxide ceramic sensor with a minimum surface area of 1 in^2 (25 mm^2) and have a minimum design life of thirty five (35) years.*

4. *To protect the environment from the reference electrode leaching its chemistry into the environment, the reference electrode must use a* ***"Moisture Retention Membrane"****, that is capable of* ***"Ion Defusing"*** *and is integral to and penetrates the entire thickness of the ceramic sensing material.*

5. *The active and passive chemical components comprising the electrolyte of the reference electrode must be in a* ***"Solid Chemical State Form"*** *and must be stabilized so as not to lose their potency while in a non-use or dormant state over the life expectancy of the reference electrode.*

6. *The reference electrode must have an* ***"Indefinite Shelf-Life"****, no exceptions, and must be able to be placed in service, extracted from this service and then reused in any time sequence over the warranty period of the reference electrode.*

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