

- 9. Corrosion Survey.** Corrosion surveys are performed for the specifications design phase; however, they are not usually required for the feasibility design phase. Corrosion surveys are necessary to determine suitable material requirements and corrosion protection requirements.
- A. In-situ electrical resistivity measurements of geologic materials in the area of construction. Additional measurements should be made in the areas where there is a pronounced change in type of geologic materials, drainage, and/or moisture conditions.
 - B. Performance history of construction materials that have been used in the area.
 - C. List of structures within ¼ mile of the vicinity of the proposed structure and appurtenant features. Determine if buried structures in the vicinity have cathodic protection and, if so, the type and location of the cathodic protection groundbed.
 - D. List location, output, and purpose of the direct-current sources in the earth situated within ¼ mile of the proposed structure and appurtenant features. If the purpose of the direct current is for cathodic protection, describe the structure protected and its location.
 - E. Information as to any unusual chemistry in the area from geologic materials, ground water, or manmade sources shall be gathered. In particular, analyze for pH, chlorides, and sulfates.
 - F. Report alkali conditions in soil and water which might affect the choice of sulfate resisting cement.
 - G. Pipelines: In order to determine corrosion mitigation measures for external surfaces, corrosivity surveys shall be performed on all projects where buried pipe options with ferrous materials are considered. This survey shall include information relating to the native corrosivity of the surroundings and to interfering direct current (DC) and alternating current (AC). The following determinations shall be included:
 - (1) In-situ electrical resistivity measurements in accordance with the 10-percent Soil Resistivity Method (see Technical Memorandum No. MERL-05-19) shall be made. Resistivity data are to be processed through an inversion program such as Resix-Plus (Interpex, Ltd.) or equivalent. The controlling 10-percent soil resistivity shall be determined following computer processing of the data.
 - (2) Road salt use is aggressive and shall be noted.
 - (3) Identify the location of any nearby high-voltage AC (HVAC) transmission lines running parallel or nearly parallel to the pipeline in question. If not

parallel, provide approximate angle of real or projected intersection between the pipeline and such electrical transmission lines. Determine:

- (a) Distance from the pipeline to the nearest tower legs.
 - (b) Horizontal distance between the ground below the nearest load carrying conductors and the nearest pipeline segment(s) roughly paralleling the conductors.
 - (c) Distance of the conductors above ground.
 - (d) Obtain from the power company the geometric mean radius (GMR) of the shield wires and their lineal resistance (e.g., Ohms per kilometer).
 - (e) Obtain from the power company the maximum fault currents anticipated along the run of the pipeline for each circuit.
 - (f) Obtain from the power company the maximum anticipated current loading of each circuit.
 - (g) Obtain from the power company the horizontal and vertical separation distances between each of the phase conductors and shield wires.
 - (h) Obtain from the power company the order in which the phases are arranged on the tower.
 - (i) Measure the longitudinal electric field strength for AC lines using the horizontal wire method and obtain from the power company the percent of line load at the time of the measurement.
 - (j) Determine soil resistivity at pipe depth along the powerline route.
- (4) Identify the location of any high-voltage DC (HVDC) grounding electrode beds within 50 miles of the pipeline.
 - (5) Based on soil resistivity values, Technical Memorandum No. 8140-CC-2004-1, *Corrosion Considerations for Metallic Water Pipe* (posted on the Intranet) presents required external corrosion protection measures for pipelines.

H. **Pipelines.** Determine the corrosivity of fluids carried by the pipeline or in which the pipeline is immersed. Corrosion mitigation measures shall meet or exceed service life requirements. The following determinations shall be included:

- (1) Determine the pH, chloride, and sulfate content of the fluid.

- (2) Determine the corrosion rate of the pipeline in the carried fluid, at temperature, by subjecting the pipe metal in question to standard corrosion tests such as ASTM G4, ASTM G31, ASTM G102, or similar.
 - (3) If the external surfaces of a pipeline are immersed but not buried, then the external corrosion rate of the pipeline in that fluid, at temperature, shall be determined by subjecting the metal in question to standard corrosion tests such as American Society for Testing and Materials (ASTM) G4, ASTM G31, ASTM G102, or similar.
- I. Identify the location of any high voltage DC (HVDC) grounding electrode beds within 50 miles of the pipeline.