

SCOPE

- I 1.1 This practice contains additional requirements for the protection of electrical equipment in contaminated environments. Contaminated environments included are:
- a. Extreme moisture, promoting fungus growth, deterioration of hygroscopic materials, and accelerated corrosion.
 - b. Marine exposure promoting corrosion by salt spray or the presence of chlorides in the air.
 - c. Copper-attacking contaminant leakage, such as ammonia and acetylene, and hydrogen sulfide.
 - d. Solvent and corrosive chemical spillage and spray areas.
 - e. Conducting and corrosive dust fallout areas, as in fertilizer plants.
 - f. Powder and non-conducting material fallout areas, as in poly-propylene and polyethylene plants.
- I 1.2 **An asterisk (*) indicates that additional information is required. If a job is contracted, this additional information is furnished in the Job Specification.**

CONDITIONS AND PROTECTIVE TREATMENTS

PROTECTIVE MEASURES APPROVAL

- C ↗ * 2.1 The contractor shall develop those protective measures most suitable for the plant location. They may involve selection of materials and coatings, localized climate control, and plot layout. Means of protection and details of materials and design shall be approved by the Owner's Engineer.

EXTREME MOISTURE

- O * 2.2 Tropical locations. Exposure to extreme moisture shall be assumed when a plant location is specified to be tropical.
- R,C 2.3 Certain classes of electrical equipment may require special treatment or protection, or both, in order to guard against extreme moisture conditions and fungus growth. The contractor shall determine what equipment requires treatment or protection, or both, and the extent to which treatment or protection is required.

MARINE EXPOSURE

- R * 2.4 Exposed insulators in marine exposure may require protection if sunny days' accumulation of salt spray is followed by fog or drizzle. Protective measures are the same as for conducting and corrosive dusts.

COPPER-ATTACKING FUMES

- R,O 2.5 Acetylene. Protection against acetylide formation is required for all copper, silver, or gold not isolated from atmospheric contact in acetylene manufacturing plants.
- R 2.6 Hydrogen Sulfide - Protection against copper oxidation is required in hydrosulfurization plants and any other hydrogen sulfide producing units. The following protective measures shall be taken:
- a. All underground electrical conduit installation entering a power distribution building shall be sealed. Also, all conduit stub-ups to electrical equipment, such as power transformers, motors, motor controllers, disconnect switches, etc., in the field shall be sealed.
 - b. Exposed copper, such as ground busses, shall be coated.
 - c. Enclosures containing exposed electrical connections shall be sealed or pressurized.
 - d. Exposed electrical connections shall be insulated or coated.
 - e. For substations, control buildings and other enclosures for power, control and instrumentation, the best method for minimizing exposure to ambient air containing H₂S. Method may be use of air conditioning, pressurizing from clean air source, air filtering, etc.

SOLVENTS AND CORROSIVE CHEMICALS

- R 2.7 Protection is required for cable exposed frequently or for prolonged periods to materials which will degrade its insulation. Plasticized and rubber-like insulations may be degraded by acids, aromatics, cycloparaffins, phenol, and other materials with highly solvent properties:
- a. Frequent exposure shall be assumed for aboveground cable within striking or splashing distance of likely point of leakage such as pump glands and valves.

1P 16-1-3		Protection of Electrical Equipment in Contaminated Environments	
Page 2 of 2			
Rev. 0	March 1998		

CONDITIONS AND PROTECTIVE TREATMENTS (Cont)

- b. Prolonged exposure shall be assumed for underground cables in areas where spills and washdowns can occur, unless the entire area involved is concrete paved and drained. Spills or washdowns are assumed to occur around pumps, storage tanks, and loading facilities.
- R 2.8 Cables in aboveground conduits are considered protected. Cables in underground conduits are not considered protected. Cables requiring protection shall be rerouted to avoid exposure insofar as possible. When routing cannot provide protection, cables shall be protected from attack by protective sheaths or jackets. Lead sheaths are suitable for most agents, and nylon jackets for some. Neoprene alone is not an acceptable jacket.

CONDUCTING AND CORROSIVE DUSTS

- I * 2.9 Exposure. Plants in which conductive or corrosive solids are ground, crushed, mixed, dried, bagged, loaded, conveyed, or otherwise handled in a way likely to release dust, shall be considered as exposing the electrical facilities to dust exposure. Other plants may be specified to have dust exposure from neighboring facilities.
- R 2.10 Floor troughs and floor raceways shall not be used for cable ways in dusty locations.
- R 2.11 Cable supports, for other than completely enclosed wiring systems in dusty locations, shall be of a design that allows essentially continuous access along the runs for cleaning.
- a. Cable ladders are acceptable.
- b. Wireways are not acceptable.
- c. Cable trays are acceptable only without covers and with the wide face mounted vertically.
- M,R 2.12 Exposed insulators and bushings, such as in open wire lines and outdoor switchyards, shall be avoided in dusty locations if possible. If exposed insulators or bushings must be used in dusty locations, the following shall govern:
- a. A dust diagram shall be prepared by the contractor showing predicted fallout density pattern.
- b. Plant layout shall be arranged as far as practical to keep the vulnerable equipment in areas of minimum fallout.
- c. Conversion to cable and enclosed equipment shall be used as far as practical, for example, lightning arresters.
- d. Wide skirt fog type insulators shall be used.
- e. Clearances in dually-fed switchyards shall be sufficient to permit safe and convenient cleaning of the insulators and bushings of either feed, with the other in service, by personnel without electrical training.
- f. Overinsulation shall not normally be used, and then only for conditions of light fallout.

POWDERS AND NONCONDUCTING MATERIAL

- R 2.13 Electrical equipment in powder handling plants shall be enclosed in a pressurized, well-filtered enclosure or building. The requirement of **Pars. 2.9 through 2.12** shall apply. Top entry of conduit into enclosures is permitted if the powder is non-corrosive.

Revision Memo

9/68	Original Issue of Basic Practice	6/83	Revision 2
6/72	Revision 1	12/93	Revision 3

3/98

Revision 0 - Original Issue of the International Practice.

Editorial revision to rationalize this practice with the referenced standards and other IPs. Significant changes include: The following paragraphs of **IP 16-1-3** Revision 3 have been deleted: **Pars. 2.4-2.10, 2.12, 2.16, 2.21, and 2.22.** **Par. 2.1** reworded, contractor has main responsibility for protective measures.

Old Par. No.	New Par. No.	Old Par. No.	New Par. No.
2.11	2.4	2.17 - 2.20	2.8 - 2.11
2.13 - 2.15	2.5 - 2.7	2.23, 2.24	2.12, 2.13

© Exxon Research and Engineering Company, 1993, 1998