

SCOPE

- I ↕ 1.1 This practice covers installation and field testing of electrical distribution systems. The contents of this practice are arranged as follows:

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- 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.
- I ↕ 1.3 The following references are synonymous: BP and IP.

SUMMARY OF ADDITIONAL STANDARDS

- I ↕ 2.1 For installation of above-ground wiring and all conduit wiring, the appropriate sections of **ANSI/NFPA 70, National Electrical Code (NEC)** and other requirements of the authority having jurisdiction shall be followed for plant locations in the U.S.A.
- I ↕ 2.2 For testing, **Table 1** lists the standards which are to be used for the applicable equipment. For general testing methodology and minimum acceptable test values, refer to **NETA**.

TABLE 1

STANDARDS	
ASTM Standard	
D117	Testing Electrical Insulating Oils
NETA - International Electrical Testing Association	
Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems	

- I ↕ 2.3 Applicable standards and testing for equipment used in the USA are given in this practice. For facilities installed in other countries, field tests shall conform to the nationally recognized standards which are required within that country.

IP 16-13-1		Field Installation and Testing of Electrical Equipment	EXXON INTERNATIONAL PRACTICE
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DEFINITIONS

- I ♦ *3.1 **Acceptable and Preferred Practices.** Where this practice lists more than one type of material or method as acceptable, the Contractor shall make the selection based on installed cost. Where one particular type of equipment or method is listed as preferred, it shall be selected, provided it is lower or equivalent in installed cost to other acceptable types or methods. Optimum cost benefits may be achieved by reducing maintenance and operating expense through initial added investment. Economic basis for calculating optimum cost benefits will be included in the general job specification. Owner's Engineer shall approve alternative choices.

CONDUIT SYSTEM INSTALLATION

- S ♦ 4.1 **All underground conduit runs and duct banks** shall be encased in red concrete and shall be as follows:
- Concrete shall be colored red with a permanent coloring additive mixed with the concrete.
 - The minimum thickness of encasement shall be 3 in. (75 mm) on top, and 2 in. (50 mm) on sides and bottom. If conduits rise above ground, the encasement shall extend 6 in. (150 mm) above ground.
 - The top of the concrete encasement shall be at least 18 in. (450 mm) below grade. At road and railroad crossings, the top of the encasement shall be at least 30 in. (750 mm) below the road surface or rail base.

BURIED CABLE INSTALLATION

- C ♦ *5.1 **Cables shall be laid in trenches** in single horizontal tiers, unless a 2-tier design is approved by the Owner's Engineer, as follows:
- Before cables are placed, the trench bottom shall be leveled and backfilled with a layer of sand 4 in. (100 mm) thick.
 - The cables shall be placed on the sand, then be covered with another layer of sand 4 in. (100 mm) deep as measured from the top of the largest cable.
- S ♦ c. A protective covering 2 in. (50 mm) thick of red concrete, shall then be applied, using either precast concrete slabs (preferred) or cast-in-place concrete (alternate). Size of pre-cast concrete slabs shall be at least 10 in. x 12 in. (250 mm x 300 mm). The protective cover shall extend a minimum of 3 in. (75 mm) beyond the outer cables in the trench, but need not be extended under elevated substations.
- The top surface of the largest cable in the trench shall be a minimum of 30 in. (750 mm) below finished grade. This may be reduced to 18 in. (450 mm) for trenches outside process unit limits containing only lighting circuits.
 - Burial depth may be increased where necessary to meet underground conditions, but it is preferred that burial depth does not exceed 48 in. (1.2 m).

MARKING

- M ♦ 5.2 **Underground cables** shall be identified by circuit number stamped on bands attached to each cable as follows:
- *
- Bands shall be corrosion resistant metal, except that plastic bands designed for the purpose, with machine-raised lettering and mechanical (not adhesive) closure, may be approved by the Owner's Engineer.
 - Bands shall be attached to cables at intervals not over 25 ft (7.5 m), at every splice, at entrance and exit of duct banks and at the equipment supplied. Bands on cables originating at elevated substations shall be located visibly between the substation floor and grade.

- S 5.3 **A system of aboveground concrete markers** shall be provided to locate and identify direct buried cables as follows:
- Markers shall be located at every point where the trench changes direction, and at intervals not greater than 50 ft (15 m) within process unit limits and 150 ft (45 m) outside process unit limits.
 - Markers shall be located above every underground splice.
- M 5.4 **For trenches 3 ft (900 mm) or more in width**, markers shall be provided on both edges of the trench; **if less than 3 ft (900 mm) in width**, provide markers at one edge of the trench only.
- M 5.5 **Markers** shall have identification plates of corrosion-resistant metal suitable for marking with a steel die stamp. Plates shall have the following information:
- Direction of cable runs.
 - Location of splices.
 - Location of trench with respect to marker.

GROUNDING CABLE INSTALLATION

- S,R 6.1 **Separate grounding cables when specified shall be installed** as follows:
- In trenches with buried insulated cables, with the same protection as the other cables.
 - In separate trenches with a 3 in. (75 mm) sand bedding all around plus a red concrete cover. The concrete cover shall not be extended under elevated substations, or installed in switch or transformer yards.
 - Alongside a duct bank with a 3 in. (75 mm) sand bedding all around but no concrete cover.
 - Soil free of stones over 1/4 in. (6 mm) may be substituted for sand.

ABOVE-GROUND WIRING SYSTEM INSTALLATION - CABLE TRAYS

- M 7.1 **Each cable shall be identified** as for **Buried Cable Installation** in **Par. 5.2** of this practice, except marker intervals shall be 50 ft. (15 m). Bands shall be attached to cables where cables enter and leave trays or ladders, or enter branch trays or ladders.
- R 7.2 **Plastic and nylon cable straps** shall not be used to tie cables to vertically mounted cable trays.

INSULATED WIRE AND CABLE INSTALLATION

- R 8.1 **Qualification of Contractor's splicing personnel** for both control cables and power cables, shall be approved by Owner's Engineer.
- R 8.2 **Splices and taps.** Wire and cable shall be run in single lengths between terminations, where practical.
- R 8.3 **Wire and cable connections at motors having pigtail leads** shall be made with lug type connectors and corrosion resistant bolts, nuts, washers, and lockwashers. Motors with pigtail leads shall be lugged in the field if not so furnished.
- R 8.4 **All stranded conductors** which connect to terminal strips or boards having screw type terminals shall be connected to the terminal screws with lugs. All wiring shall be terminated with a lug or ferrule applied with a mechanical crimp. CT secondary wiring shall be terminated with ring lugs.

TEST PROCEDURES

- R,C 9.1 **Before the electrical facilities are placed in operation**, the Contractor shall make suitable field tests to establish that all equipment, devices, and wiring have been correctly installed, are in satisfactory working condition, and will operate as intended. Unless otherwise specified, manufacturer's recommendations shall be included. All tests specified in this practice must be performed in the field before energizing. Shop tests shall not be used to satisfy any field test requirement. When pre-fabricated building modules are tested prior to shipping, Contractor shall propose a field test program for Owner's Engineer approval.