

GP 16-13-01	Field Installation and Testing of Electrical Equipment	April 2005
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Field Installation and Testing of Electrical Equipment

GP 16-13-01

Scope

- 1) [I] This Global Practice (GP) covers installation and field testing of electrical distribution systems.
 - 2) [I] An asterisk (*) indicates that additional information is required. If a job is contracted, this additional information shall be furnished in the Job Specification.
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1. Required References

This Section lists Practices and Standards that are generically referenced and assumed to be a part of this document. Unless otherwise specified herein, use the latest edition.

- 1) [I] Applicable standards and testing for equipment used in the U.S. are given in this GP. For facilities installed in other countries, field tests shall conform to the nationally recognized standards required for that country.
- 2) [I] For testing, the following Standards shall be used for the applicable equipment. For general testing methodology and minimum acceptable test values, refer to NETA ATS.

1.1. Global Practices–ExxonMobil Engineering Practices

GP 15-10-01	Instrument Transmission Systems
GP 15-11-01	Instrument Control Panels
GP 16-03-01	Wiring Methods and Material Selection

1.2. API–American Petroleum Institute

API STD 541	Form-Wound Squirrel Cage Induction Motors - 250 Horsepower and Larger
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1.3. ASTM–American Society for Testing and Materials

ASTM D 117	Standard Guide for Sampling, Test Methods, Specifications, and Guide for Electrical Insulating Oils of Petroleum Origin
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1.4. IEEE–Institute of Electrical and Electronic Engineers

IEEE 43	Recommended Practice for Testing Insulation Resistance of Rotating Machinery (ANSI/IEEE)
IEEE 81	Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
IEEE 95	Recommended Practice for Insulation Testing of AC Electric Machinery (2300 V and Above) with High Direct Voltage
IEEE 115	Guide: Test Procedures for Synchronous Machines Part I - Acceptance and Performance Testing Part II - Test Procedures and Parameter Determination for Dynamic Analysis
IEEE 400	Guide for Field Testing and Evaluation of the Insulation of Shielded Power Cable Systems



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IEEE 450	Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications
IEEE 1106	Recommended Practice for Installation, Maintenance, Testing, and Replacement of Vented Nickel-Cadmium Batteries for Stationary Applications
IEEE 1187	Recommended Practice for Installation Design and Installation of Valve-Regulated Lead-Acid Storage Batteries for Stationary Applications
IEEE C37.122.1	Guide for Gas-Insulated Substations
IEEE C57.104	Guide for the Interpretation of Gases Generated in Oil-Immersed Transformers

1.5. NEMA—National Electric Manufacturer's Association

NEMA AB 4	Guidelines for Inspection and Preventive Maintenance of Molded Case Circuit Breakers Used in Commercial and Industrial Applications
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1.6. NETA—International Electrical Testing Association

NETA ATS (NETA ACCEPTANCE)	Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems
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1.7. Other Publications

ExxonMobil Manual TMEE-064	Electrical Equipment Acceptance and Maintenance Manual
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2. Additional Requirements

[I] For installation of aboveground wiring and all conduit wiring, the appropriate Sections of NFPA 70, National Electrical Code, and other requirements of the authority having jurisdiction shall be followed for plant locations in the U.S.

2.1. NFPA—National Fire Protection Association

NFPA 70	National Electrical Code
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3. Definitions

Term	[I] Description
Acceptable and Preferred Practices	* Where this GP lists more than one type of material or method as acceptable, 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. Reducing maintenance and operating expense through initial added investment may optimize cost benefits. Economic basis for calculating optimum cost benefits shall be included in the general job specification. The Owner's Engineer shall approve alternative choices.

4. Conduit System Installation

Conduit installation shall meet the requirements of [GP 16-03-01](#) Section 5 and Section 7 as applicable. All explosion proof fittings (cable glands) shall be certified in accordance with the equipment to which they are connected.

5. Buried Cable Installation

* [C] Cables shall be laid in trenches in single horizontal tiers, unless the Owner's Engineer approves a two-tier design. Direct burial installations shall meet the requirements of [GP 16-03-01](#) Section 6.

5.1. Marking

- 1) [M] Underground cables shall be identified by circuit number stamped on bands, attached to each cable as follows:
 - a) * 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.
 - b) 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.
- 2) [S] A system of aboveground concrete markers shall be provided to locate and identify direct buried cables as follows:
 - a) 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.
 - b) Markers shall be located above every underground splice.

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- 3) [M] 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, markers shall be provided at one edge of the trench only.
- 4) [M] Markers shall have identification plates of corrosion-resistant metal suitable for marking with a steel die stamp. Plates shall have the following information:
 - a) Direction of cable runs
 - b) Location of splices
 - c) Location of trench with respect to marker

6. Grounding Cable Installation

* [S], [R] Separate grounding cables, when specified, shall be installed as follows:

- 1) In trenches with buried insulated cables, with the same protection as the other cables.
- 2) In separate trenches with 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.
- 3) Alongside a duct bank with a 3-in. (75-mm) sand bedding all around, but no concrete cover.
- 4) Soil, free of stones over $\frac{1}{4}$ in. (6 mm), may be substituted for sand.

7. Aboveground Wiring System Installation—Cable Trays

- 1) [M] Each cable shall be identified per Section 5.1, Item (1) of this GP, except that 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.
- 2) [R] Plastic and nylon cable straps shall not be used to tie cables to vertically mounted cable trays.

8. Insulated Wire and Cable Installation

- 1) * [R] Owner's Engineer shall approve the qualification of Contractor splicing personnel for both control cables and power cables.
- 2) [R] Regarding splices and taps, wire and cable shall be run in single lengths between terminations, where practical.
- 3) [R] Wire and cable connections at motors having pigtail leads shall be made with lug type connectors and corrosion resistant bolts, nuts, washers, and lock washers. Motors with pigtail leads shall be lugged in the field if not so furnished.
- 4) [R] All stranded conductors connecting 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.

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