PROCESS INDUSTRY PRACTICES

COMPLETE REVISION
November 2017

Electrical

PIP ELTFT01
Electrical Equipment and Systems
Field Inspection, Testing, and Commissioning

PURPOSE AND USE OF PROCESS INDUSTRY PRACTICES

In an effort to minimize the cost of process industry facilities, this Practice has been prepared from the technical requirements in the existing standards of major industrial users, contractors, or standards organizations. By harmonizing these technical requirements into a single set of Practices, administrative, application, and engineering costs to both the purchaser and the manufacturer should be reduced. While this Practice is expected to incorporate the majority of requirements of most users, individual applications may involve requirements that will be appended to and take precedence over this Practice. Determinations concerning fitness for purpose and particular matters or application of the Practice to particular project or engineering situations should not be made solely on information contained in these materials. The use of trade names from time to time should not be viewed as an expression of preference but rather recognized as normal usage in the trade. Other brands having the same specifications are equally correct and may be substituted for those named. All Practices or guidelines are intended to be consistent with applicable laws and regulations including OSHA requirements. To the extent these Practices or guidelines should conflict with OSHA or other applicable laws or regulations, such laws or regulations must be followed. Consult an appropriate professional before applying or acting on any material contained in or suggested by the Practice.

This Practice is subject to revision at any time.

PUBLISHING HISTORY

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1. Scope

This Practice describes the minimum requirements for inspection, testing, and commissioning procedures for electrical equipment and systems after installation. This Practice provides minimum acceptable values for the testing results and forms for recording inspection and test values.

Certain specialty equipment and packaged equipment are application specific and the testing of such equipment is not covered by this Practice.

Some inspections, tests, and commissioning may require an independent testing organization or an equipment manufacturer's representative. This Practice does not specify which activities require a third party or designate responsibility for obtaining and coordinating these third parties. These activities, if required, shall be defined in the project scope.

This Practice does not cover full compliance inspections required by various codes and regulations but does provide assurance of equipment integrity and compliance with project-specific documents.

2. References

Applicable parts of the following industry codes and standards shall be considered an integral part of this Practice. The edition in effect on the date of contract award shall be used, except as otherwise noted. Short titles are used herein where appropriate.

Industry Codes and Standards

- International Electrical Testing Association (NETA)
  - ANSI/NETA ATS - *Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (NETA ATS)*
  - ANSI/NETA ECS - *Standard for Electrical Commissioning Specifications for Electrical Power Equipment and Systems*
  - ANSI/NETA ETT - *Standard for Certification of Electrical Testing Personnel*

3. Definitions

commissioner: The party responsible for placing into service newly installed or retrofitted electrical equipment and electrical facilities as defined in the project scope

owner: The party who owns the facility where the inspections, testing, and commissioning services will be performed

Owner's authorized representative: An owner's appointed engineer, inspector, electrical supervisor, electrical designer, or other knowledgeable electrical person authorized to make certain decisions or witness and sign test sheets, or other designated tasks

purchaser: The party who awards the contract to the supplier. The purchaser may be the owner or the owner's authorized agent.

test: Application of external power source or test equipment to prove the integrity of the unit or system; may require witnessing by owner's authorized representative as indicated on the Inspection, Testing, and Commissioning Plan *PIP ELTFT01-R.*

tester: The party responsible for performing the check items, inspection items, testing requirements, and function test items as covered herein for the installed electrical equipment and electrical facilities as defined in the project scope

4. Requirements

4.1 General

4.1.1 Testing and inspection shall comply with the provisions of this Practice, *ANSI/NETA ATS*, and the equipment manufacturer's instructions. Tests that are necessary to retain the manufacturer's warranty will be conducted in accordance with instructions from the manufacturer. Conflicts between these documents shall be submitted in writing to the Owner's authorized representative for resolution.

4.1.2 Testing and inspection shall comply with the provisions of this Practice, *ANSI/NETA ECS*, and the equipment manufacturer's instructions.

4.1.3 Inspection, Testing, and Commissioning Plan *PIP ELTFT01-R* is provided to develop an inspection, testing, and commissioning plan for electrical equipment and facilities. The plan provides a means to define a scope of work for inspection, testing, and commissioning as well as define witness requirements. Check boxes are provided to select inspection, test, commissioning, and witness for a particular inspection, test, and/or commissioning activities. Check box definitions are as follows:

a. An 'STD' box is a PIP recognized standard inspection and/or test.

b. An 'OPT' box is a PIP recognized optional inspection and/or test.

c. A 'WITNESS' box is to be selected if purchaser wants to witness a test.

d. A 'COMM' box is to be selected if the owner requires the equipment to be part of a commissioning plan.

4.1.4 Tester shall perform all inspections, measurements, and tests as indicated on purchaser's Inspection and Testing Plan *PIP ELTFT01-R* and in accordance with the Inspection and Testing Forms, *PIP ELTFT01-T* series. Where *PIP ELTFT01-T* series Inspection and Testing Forms are not available, alternate test forms as described in Section 4.6.1 may be used when approved by the Owner.

4.1.5 Tester shall comply with all federal, state, and local regulations and codes as well as with site-specific safety procedures and requirements.

4.1.6 Before starting any inspection and testing, the Owner's authorized representative and the Tester must agree on the electrical inspection and testing procedures.

4.1.7 Tester shall confirm that all check items, inspection items, and testing are performed. All test forms shall be signed by Tester and Owner's authorized representative before notifying the owner that the equipment is ready for operation.

4.1.8 Tester shall be responsible for arranging and conducting the testing in accordance with the approved project schedule.

4.1.9 Inspection, testing, and function test items shall be witnessed by an Owner's authorized representative unless specifically waived in writing. Tester shall give sufficient notice before any witnessed test.

4.1.10 Before inspection, testing, or commissioning takes begins, a coordination meeting shall take place during which a plan shall be formulated to outline a specific execution that defines various group responsibilities, timing, and documentation requirements for the complete inspection, testing, and commissioning of the electrical systems and components.

4.2 Specialty Testing

4.2.1 With approval from the owner's authorized representative, specialty testing such as Power Factor testing, relay calibration, etc., should be carried out by an independent testing organization.

4.2.2 Test forms for specialty tests are not provided by this Practice. Independent testing organization test forms can be used if approved by the Owner's authorized representative.

4.2.3 *PIP ELFTF01-R*, Inspection, Testing, and Commissioning Plan, does allow for the selection independent testing organization test forms.

4.3 Test Equipment

4.3.1 Test equipment shall be suitable for the tests that will be performed in accordance with *ANSI/NETA ATS 2017* Section 5.2.

4.3.2 Tester shall have a calibration program that assures all test equipment performs within rated accuracy. The program shall include traceability to the National Institute of Standards and Technology (NIST), calibration frequency, date calibration labels, and calibration instructions and procedures in accordance with the requirements of *ANSI/NETA ATS 2017* Section 5.3.

4.4 Commissioning

4.4.1 The commissioning process, when required on the Inspection, Testing, and Commissioning Plan *PIP ELTFT01-R*, is in place to accomplish two items:

a. The assurance that electrical equipment and systems have been installed such that the design bases of the project has been met, the equipment has been tested at the factory and in the field, verified to ensure proper component interconnections, and is functional.

b. The result of the commissioning process forms a base line for maintenance of the electrical system going forward.

4.4.2 The commissioning process should follow the *ANSI/NETA ECS* standard.

4.5 Qualifications of Personnel

4.5.1 Personnel conducting the electrical tests, inspections, and commissioning shall be qualified for the work by virtue of training and experience.

4.5.2 Testing personnel shall be completely familiar with the manufacturer's instructions on the proper operation and application of the test equipment being utilized.

4.5.3 Where indicated on the Inspection, Testing, and Commissioning Plan *PIP ELTFT01-R*, the test personnel shall be certified in accordance with

ANSI/NETA ETT. Where this certification is required, each on-site crew leader shall hold a current certification, Level III or higher, in electrical testing.

4.5.4 Where indicated on the Inspection, Testing, and Commissioning Plan *PIP ELTFT01-R*, the test personnel shall be certified in accordance with *ANSI/NETA ECS*.

4.6 Documentation and Reports

4.6.1 Unless otherwise indicated on the Inspection, Testing, and Commissioning Plan *PIP ELTFT01-R*, the Tester shall document test results on PIP Inspection and Testing forms provided by the Owner. Where alternate forms are provided, these forms shall contain all of the visual and mechanical inspection items and tests included in the *PIP ELTFT01-T* Inspection and Testing Forms series or as required by ANSI/NETA ATS where *PIPELTFT01-T* forms are not available.

4.6.2 The Tester and Commissioner shall be responsible for maintaining the individual test and commissioning sheets as defined in the project scope.

a. Test and commissioning sheets shall be maintained in an up-to-date condition and are subject to review at any time.

b. Copies of individual, completed test and commissioning forms shall be submitted to the Owner's authorized representative within five (5) working days after each test or before the tested equipment is put into service.

c. A complete set of test and commissioning forms in electronic or hard copy format as indicated on the Inspection, Testing, and Commissioning Plan *PIP ELTFT01-R* shall be submitted to the Owner's authorized representative at the completion of the test work. Where alternate forms are used, the use of hard-copy or electronic forms shall be agreed between the Purchaser and the testing contractor.

d. Within 20 days at completion of the job, the Tester and Commissioner shall complete and review all forms and submit them to the Owner's authorized representative for approval (IFA). The IFA package shall contain an Executive Summary stating the scope of work undertaken, scope completed, items repaired in the field, items left to be repaired, overall equipment summary / analysis (i.e., recommended replacements, etc.). Within 10 days after approval by the Owner's authorized representative, the Tester shall issue the final package that will include: Executive Summary, pdf copy of all test and commissioning forms, electronic copy of all test and commissioning forms in their native format (i.e., Excel, Word, etc.), and native files generated by the testing devices.

4.6.3 Each field installed device shall have a "sticker" attached to it identifying it has been checked out in accordance with this practice. The "sticker" shall be marked with the equipment tag number, date inspected, and inspector's initials.

5. Acceptable Measurements

All test values shall fall within the guidelines of *ANSI/NETA ATS*. All components with test results that fall outside the acceptable range and individual measurements that fall outside the average of like measurements stated in *ANSI/NETA ATS* shall be immediately brought to the attention of the Owner's authorized representative.

	ASSOC. PIP: ELTFT01	INSPECTION, TESTING, & COMMISSIONING PLAN	ELTFT01-R
	ELECTRICAL EQUIPMENT & SYSTEMS INSPECTION, TESTING, & COMMISSIONING		PAGE 1 OF 22 NOVEMBER 2017

ISSUED FOR: ☐ PROPOSAL ☐ AWARD ☐ AS BUILT

FACILITY NAME/LOCATION: _____

PURCHASER/LOCATION: _____

CONTRACT NO.: _____

INSPECT/TEST/COMMISSION CONTRACTOR: _____

JOB NO.: _____

TESTER CERTIFICATION: ☐ NETA ETT ☐ NOT REQUIRED

COMMISSIONER CERTIFICATION: ☐ NETA ECS ☐ NOT REQUIRED

TEST FORMS: ☐ PIP FORMS ☐ INDEPENDENT TESTING ORGANIZATION TEST FORMS

WITNESS TESTING: ☐ REQ'D FOR ALL INSPECTIONS AND TESTING

☐ REQ'D FOR SELECTED ITEMS INDICATED BELOW

☐ NOT REQUIRED

REFER TO PIP ELTFT01 FOR GENERAL REQUIREMENTS.

FOR ALL NETA SECTION REFERENCES, REFER TO NETA ATS-2017

APPLICABLE STATE AND LOCAL CODES: _____

NOTES: "STD" – PIP RECOGNIZED STANDARD TEST

"OPT' – PIP RECOGNIZED OPTIONAL TEST

"WIT" – OWNER'S AUTHORIZED REPRESENTATIVE WITNESSED TEST

"COM" – COMMISSIONING REQUIRED

OTHER:

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NO.	DATE	REVISION DESCRIPTION	BY	APPROVED