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NATIONAL IRANIAN OIL REFINING & DISTRIBUTION COMPANY
NATIONAL IRANIAN OIL ENGINEERING
& CONSTRUCTION COMPANY

NIOEC SP

NIOEC SPECIFICATION
FOR
INSTRUMENTATION & CONTROL SYSTEM
CALIBRATION, INSPECTION AND TESTS

SECOND EDITION

DECEMBER 2009

THIS SPECIFICATION IS THE PROPERTY OF NATIONAL IRANIAN OIL ENGINEERING & CONSTRUCTION COMPANY. IT IS CONFIDENTIAL AND ALL RIGHTS RESERVED TO THE OWNER. NEITHER WHOLE NOR ANY PART OF THIS DOCUMENT MAY BE DISCLOSED TO ANY THIRD PARTY, REPRODUCED, STORED IN ANY RETRIEVAL SYSTEM OR TRANSMITTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN CONSENT OF THE NATIONAL IRANIAN OIL ENGINEERING & CONSTRUCTION COMPANY.

IN THE NAME OF GOD**FOREWORD**

By their very nature, technical Specifications are continuously subject to modifications and revisions. To strengthen their merit and usefulness, continuous improvements, addendum, deletion of disparate information and consequently provision of updated revisions are to be made in order to ascertain that such Specifications meet the current requirements, inclusive of Iranian Petroleum Standards (IPS) and the recognized and acceptable national and international Standards, as well as the optimal codes and practices based on the accumulated in-house know-how and plant knowledge and experiences.

However, in reality, due to several reasons, not to mention the complexity of the matter, the ultimate goal of continuous direct embedment of the required changes on the relevant Specifications may be far reaching. Therefore, in the interim periods between the officially issued revisions, the required changes will appear in other documents related to the engineering and design work of the ongoing projects.

In response to the initiative of the Design and Engineering Directorate, and considering that the task of the execution of several important and mega projects for the realization of the new oil refineries, pipelines and oil terminals as well as improvements of the existing facilities, has been assigned to NIOEC, it was decided to update the NIOEC Specifications and to issue new official revisions.

The Design and Engineering Directorate was itself entrusted to carry out this important task, and as such by forming several special technical committees, working in close co-operation and cohesion and sharing their expertise and knowledge, the updated and revised NIOEC Specifications were successfully prepared and complied.

These Specifications are intended to be used for Oil Refineries, Distribution Depots, Oil Terminals, Pipelines and Pump Stations within NIOEC's projects, and have been proven to be of high value for such purposes. It must however be appreciated that these Specifications represent the minimum requirements and should in no way be interpreted as a restriction on the use of better procedures, engineering and design practices or materials.

We encourage and highly appreciate the users and other clear sighted and experts to send their comments on the Specifications to the Design and Engineering Director of NIOEC for evaluation and approval.

REVISION INDEX

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NOTES:

- 1) THIS SHEET IS A RECORD OF ALL REVISIONS TO THIS SPECIFICATION.
- 2) WHEN APPROVED EACH REVISION SHALL BE CONSIDERED AS A PART OF THE ORIGINAL DOCUMENT.
- 3) NUMBER OF PAGES EXCLUDES THIS SHEET AND THE COVER SHEET.

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1. SCOPE

- 1.1. This specification defines NIOEC's minimum requirements for the calibration, testing, inspection of field instruments, control systems, control room equipment and loop checks. Included are the visual check procedures of instrument installation, the pressure testing of instrument pneumatic signal lines, and instrument piping systems lead lines from the process line block valve to the instrument to assure mechanical strength and tightness.
- 1.2. This specification will provide guidance for field inspection, calibration and testing of instruments and control systems prior and during to plant commissioning.
- 1.3. Instrument piping includes:
 - 1.3.1. All piping and piping components used to connect instruments to other piping or equipment, except the first block valve.
 - 1.3.2. All instrument air lines, except the main instrument air header, and its valved connections.
- 1.4. Instrument piping excludes:
 - 1.4.1. The piping for-those instruments which are an integral part of a piping system or an integral part of the equipment. Reference shall be made to NIOEC-SP-50-05.
 - 1.4.2. The instruments and/or the permanently sealed fluid filled tubing systems furnished with the instruments.
- 1.5. Unless the commodity handled constitutes a hazard, systems are not pressure tested when the design pressure is
 - 1.5.1. At or above 0 bar (g) but less than 0.34 bar (g) regardless of the temperature.
 - 1.5.2. At or above 0.34 bar (g) but less than 1.0 bar (g) if the design temperature is below 340°C.
- 1.6. Nonmetallic systems are excluded from this specification and shall be tested in accordance with their manufacturer's recommendations.
- 1.7. For any test, NIOEC Field Inspection and Test Plan (FIP) shall be considered.

Deviations from this specification will only be permitted on obtaining written approval from NIOEC.

Resolution on cases not explicitly stipulated in this Specification, or on cases where conflicts may arise among the requirements of the referenced IPS and the international standards, shall be made through written consent and approval of NIOEC.

2. REFERENCES

The following standards, codes, and specifications, to the extent specified hereinafter, shall constitute a part of this NIOEC Specification. Latest edition of the undated referenced documents and the cited edition of the dated references shall apply. The applicability of changes made to the dated references, after the cited date shall be mutually agreed upon between NIOEC and the Vendor/ Contractor.

ANSI	(AMERICAN NATIONAL STANDARD INSTITUTE) ANSI/FCI 70-2 “Control Valve Seat Leakage”
ASME	(AMERICAN SOCIETY OF MECHANICAL ENGINEERS) ASME B31.3 “Process Piping”
NIOEC-FIP	(NIOEC FIELD INSPECTION AND TEST PLAN) NIOEC-FIP-2000 “Work Preparation and Routine Checks” NIOEC-FIP-2100 “Calibration and Prefabrication” NIOEC-FIP-2200 “Construction Installation Inspection” NIOEC-FIP-2300 “Instrument Precommissioning Inspection” NIOEC-FIP-2400 “Instrument commissioning Inspection”
NIOEC-SP	(NIOEC SPECIFICATIONS) NIOEC-SP-00-10 “Specification For Units” NIOEC-SP-50-05 “Specification for Field Pressure Testing” NIOEC-SP-00-75 “Specification for Pressure and Vacuum Relief Devices”

3. UNITS

International System of Units (SI) shall be used in accordance with NIOEC-SP-00-10, unless otherwise specified.

4. DEFINITIONS

Throughout this specification, the following definitions shall apply:

ESD: Emergency Shutdown System.

F&G: Fire and Gas System

PCS: Process Control System.

SGS: Safeguarding System.

5. GENERAL

- 5.1. Prior to initial operation, all installed instrument process and utility lead lines shall be pressure tested to a specified pressure as listed on the Instrument List/Index. Pressure testing medium shall be Nitrogen or other available inert gas. All connections, joints, fittings, etc. shall be checked for leakage with appropriate leak detector solution such as Snoop, Leak-Tec (or equal).
- 5.2. Instrument air supply lines and subheader lines shall be tested, using dry and clean air.
- 5.3. Transmitted and control signal lines shall be leak tested prior to the final instrument inspection and loop check.

6. RECORDS

- 6.1. NIOEC Instrument Supervisor will maintain a record of all tests on the related NIOEC FIP forms (reference NIOEC-FIP-2000, NIOEC-FIP-2100, NIOEC-FIP-2200, NIOEC-FIP-2300, NIOEC-FIP-2400). The completed record will be furnished to the NIOEC Quality Control Superintendent or its representative.

7. TESTING OF THE PROCESS AND UTILITY LEAD LINES

7.1. Testing Pressure

- 7.1.1. Instrument process or utility lead lines shall be tested at 150 percent of the specified process line Max operating pressure. If the instrument process or utility lines contain a pressure reducing regulator, the test pressure down-stream of the regulator shall be 150 percent of the reduced operating pressure. The specified line design pressure is listed in the Instrument List/Index. The reduced operating pressure is listed on the Instrument Specification Sheet of the pressure regulator. The process or utility line design pressure is listed in the Project Pipe Line List. Instrument process leads normally operate at ambient temperature. If a line operates at a temperature above 340 °C for more than ten (10) hours each time and totally more than 100 times per year, refer to test pressure calculation section of the Field Pressure Testing Specification NIOEC-SP-50-05 to calculate the minimum test pressure.

7.2. Test Preparation

- 7.2.1. To avoid damage to instruments during the pressure testing, the following guideline should be observed:
- a) Before testing leads to the flow, differential pressure or level instruments, close block valves at process line and open bypass at d/p cell. This enables a test on both legs at the same time and prevents a high differential pressure on the instrument. Line mounted flow transmitters with manifold valves are not tested.
 - b) Before testing leads to pressure instruments, close block valve at process line and at instrument.
 - c) Before testing leads to level instruments (differential type without bypass valve), close block valves at the vessel and add a temporary bypass line between the high pressure and low pressure sides to prevent high differential pressure on the instrument.
 - d) All connections, including welds, shall be left uninsulated and exposed for examination during test.
 - e) Components installed in the process leads should be reviewed for maximum pressure rating. If the rating is less than the test pressure, remove the component and install a temporary jumper line.
 - f) Lines in vacuum service shall be tested at minimum pressure of 1.0 bar (g) unless limited to lower pressure by line design pressure.
 - g) Analyzer sample lines shall be pressure tested up to the meter valve at the analyzer. Disconnect or vent line at the analyzer before testing. Any pressure reducing regulator and/or sample vaporizers should be removed and a jump line installed during test.