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

NIOEC SP

NIOEC SPECIFICATION FOR AIR COOLED HEAT EXCHANGERS

FIRST EDITION

JUNE, 2015

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	JUNE, 2015	M.MIR AHADI	G.ANVARY	M.R.FARZAM	A.ARMAN MOGHADAM
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1. SCOPE

This NIOEC Specification is intended to cover the minimum requirements for design, fabrication, inspection and supply of air cooled exchangers consisting of coolers and condensers operating under pressure or vacuum.

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 international standards, shall be made through written consent and approval of NIOEC.

- 1.1. Specific performance and design requirements shall be indicated by the Purchaser on Process Data Sheet.
- 1.2. The design, fabrication, test and inspection of air cooled heat exchangers shall conform to API Standard 661 "Air Cooled Heat Exchangers for General Refinery Services" and ASME Code Sect. VIII, Div. I "rules for construction of pressure vessels".
- 1.3. If conflict is discovered between the items listed, it shall be the responsibility of the Vendor to call attention to the conflict.

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.

ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS)

ASME Code Sect. II

ASME Code Sect. V

ASME Code Sect. IX

ASME Code Sect. VIII

B1.1	"Unified screw thread"
B1.20.1	"Pipe thread"
B16.5	"Steel pipe flanges and flanged fittings"
B16.20	"Metallic gasket for pipe flanges"
B18.2.1	"Square and Hex Bolts and screw"
B18.2.2	"Square and Hex Nut"
B31.3	"Petroleum process piping"
B36.10	"Welded and seamless wrought steel pipe"
B16.47	"Large diameter steel flanges"

API (AMERICAN PETROLEUM INSTITUTE)

API 661	"Air Cooled Heat Exchangers for General Refinery Services"
API 640	"Tube dimensions for heat exchangers"

TEMA (TUBULAR EXCHANGER MANUFACTURERS ASSOCIATION)**AISC (AMERICAN INSTITUTE OF STEEL CONSTRUCTION)**

S 310, S 326

AGMA (AMERICAN GEAR MANUFACTURERS ASSOCIATION)

422.03

“Standard practice for Helical, herringbone speed reducers”

NACE (NATIONAL ASSOCIATION OF CORROSION ENGINEERING)

MR-0175

“Sulfide Stress Cracking Resistance Metallic Material for Oil Field Equipment”

MR-0103

NIOEC SP (NIOEC SPECIFICATIONS)

NIOEC-SP-60-02 “NIOEC Specification for Low Voltage Induction Motors”

NIOEC-SP-60-06 “NIOEC Specification for Electrical System Installation”

NIOEC-SP-47-10 “NIOEC Specification for Noise Control and Vibration”

NIOEC-SP-00-50 “NIOEC Specification for Design Criteria for Process and Mechanic”

NIOEC-SP-00-01 “NIOEC Specification for Civil Design Criteria”

NIOEC-SP-80-02 “NIOEC Specification for Painting”

NIOEC-SP-00-10 “NIOEC Specification for Units”

NIOEC-SP-00-11 “NIOEC Specification for Site Conditions”

NIOEC SIP (NIOEC SHOP INSPECTION PROCEDURE)

NIOEC-SIP-60-00 “Shop Inspection Procedure for Electrical Equipment”

NIOEC-SIP-44-02 “Shop Inspection Procedure for Air Cooled Heat Exchangers”

The official code symbol stamp per the applicable code will not be required, unless otherwise specified.

3. UNITS

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

4. DEFINITION & THERMINOLOGY

4.1. This section contains definitions for the terms as they are used in this document.

Employer: National Iranian Oil Engineering & Construction Company. (NIOEC)

Purchaser: National Iranian Oil Engineering & Construction Company. When quoted in this Specification as per of a direct Purchaser order by NIOEC and “Contractor” where this Specification is part of contract documents.

Vendor: The manufacturer from which the equipment is to be purchased.

4.2. Terminology used in the Specification is defined as follows:

Tube Bundle: Assembly of headers tubes and frames.

Section: Assembly of two headers, finned tubes and side channels.

Unit: The air-cooled heat exchange equipment covered by one equipment number, comprising one or more sections, the bundles to perform one specific duty.

Bank: One or more sections including one or more units arranged in a continuous structure.

Forced Draft Type: Designed with tube bundles located on the discharge side of the fan.

Induced Draft Type: Designed with tube bundles located on the suction side of the fan.

Bare Tube Surface: Outside surface of prime tubes based on length measured between outside face of header tube sheets in square meters.

Finned Tube Surface: Total outside surface (exposed to air) based on length of tubes measured between outside face of header tube sheets in square meters.

Hydrogen Service: When partial pressure of hydrogen is 5 bar (74.p.s.i.a.), and greater.

5. PROCESS REQUIREMENTS

Process requirements for each exchanger will be given in a Process Data Sheet for Air Cooled Heat Exchangers; Vendor shall complete all Data Sheet similar to that shown in Appendices.

6. AIR COOLER RATING

- 6.1.** Air Coolers shall be designed for summer and winter conditions. The summer and winter design air temperatures shall be specified in the job Specifications and shall generally be equal to the summer maximum and winter minimum recorded dry bulb temperatures.
- 6.2.** For winter design conditions the minimum tube wall temperature shall be at least 8°C higher than pour point temperature for both normal and minimum design throughput.
- 6.3.** Fouling resistance shown on the process Data Sheet shall be applied to the inside surface of the tube. The tube side fouling factor is net value and must be adjusted by proper outside to inside surface ratio.
- 6.4.** All heat transfer surfaces and coefficients shall be based on total effective outside tube and fin surface.
- 6.5.** When calculating heat transfer coefficients, the inside fouling and inside fluid film resistance shall be multiplied by the ratio of the total effective outside surface to the total effective inside surface.
- 6.6.** The effective tube wall and fin metal resistance shall be included in calculating heat transfer coefficients.
- 6.7.** Pressure drops shall not exceed the maximum allowed values specified. These indicate the total pressure drops across nozzles, headers and tubes.
- 6.8.** Fouling factor in air side of exchangers shall be 0.0004 sq.m.-hr-°C/Kcal (0.00035 sq.m.K/W).
- 6.9.** Combination of items over same fans should receive prior NIOEC approval.
- 6.10.** An over design factor to be considered for the Air coolers as per NIOEC-SP-00-50.