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

NIOEC SP

NIOEC SPECIFICATION FOR GENERAL DESIGN PHILOSOPHY FOR ELECTRICAL SYSTEM

FIRST EDITION

JULY, 2005

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 NATIONAL IRANIAN OIL ENGINEERING & CONSTRUCTION COMPANY.

IN THE NAME OF GOD**FOREWORD**

By their very nature, technical standard 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 standard 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 standard 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 on going projects.

In response to the initiative of the Design Division of the Engineering and Construction 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 Division of the Engineering and Construction 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 Deputy of the Engineering and Construction Director of NIOEC for evaluation and consideration.

S. R. KASAEIZADEH



EXECUTIVE DIRECTOR

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NOTES:

- 1) THIS SHEET IS A RECORD OF ALL REVISIONS TO THIS SPECIFICATION.
- 2) REMARKS RELATED TO EACH REVISION SHOW A BRIEF DESCRIPTION. THESE REMARKS SHALL BE INTERPRETED IN CONJUNCTION WITH THE REVISED TEXT MARKED BY REVISION NUMBERS.
- 3) WHEN APPROVED, EACH REVISION SHALL BE CONSIDERED AS A PART OF THE ORIGINAL DOCUMENT.
- 4) NUMBER OF PAGES EXCLUDES THIS SHEET AND THE COVER SHEET.

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1.0 SCOPE

- 1.1 The scope of this Specification is to summarize the main requirements and the general criteria to be used for the design of the electrical system.
- 1.2 This Specification shall be read in conjunction with the equipment and system specifications as mentioned in paragraph 5.0 and the requirements of specific codes, recommendations and standards refer to in these Specifications.
- 1.3 Amendment and/or modifications to the said Specifications are applicable only after NIOEC approval.
- 1.4 Other Specifications shall be prepared, if required.

2.0 REFERENCES

Throughout this Specification the following dated or undated standards/codes are referred to. These referenced standards shall, to the extent specified herein, form a part of this Specification. For undated reference, the latest edition of referenced document (including any supplement or amendments) applies. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date, shall mutually be agreed upon by NIOEC and Vendor/Contractor.

API (AMERICAN PETROLEUM INSTITUTE)

API RP505	Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities
API RP540	Electrical Installation in Petroleum Processing Plants
API 610	Centrifugal Pumps for General Refinery Service
API 617	Axial and Centrifugal Compressors and Expander-Compressors for Petroleum, Chemical and Gas Industry Services
API 661	Air-Cooled Heat Exchangers for General Refinery Services

ANSI (AMERICAN NATIONAL STANDARDS)

ANSI C 37.2	Electrical Power System Device Function Numbers
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IEC (INTERNATIONAL ELECTROTECHNICAL COMMISSION)

IEC 60076	Power Transformers
IEC 60079	Electrical Apparatus for Explosive Gas Atmospheres
IEC 60529	Degree of Protection Provided by Enclosures (IP Code)
IEC 60617	Graphical Symbols for Diagrams

IEC 60947 Low-voltage switchgear and controlgear

BS (BRITISH STANDARD)

BS 7430 Code of Practice for Earthing

NIOEC-SP (NIOEC SPECIFICATIONS)

[NIOEC-SP-00-10](#) NIOEC Specification for units

[NIOEC-SP-30-04](#) NIOEC Specification for Work to Be Done and Materials to BE Used IN Masonry Buildings

[NIOEC-SP-60-02](#) NIOEC Specification for Low Voltage Induction Motors

[NIOEC-SP-60-07](#) NIOEC Specification for Aircraft Warning Lights

[NIOEC-SP-60-20](#) NIOEC Specification for Medium and High Voltage Induction Motors

[NIOEC-SP-60-36](#) NIOEC Specification for Electrical Components of Packaged Units

3.0 UNITS

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

4.0 STANDARDS AND CODES

4.1 All materials, equipment and installations shall be in accordance with applicable portions of the latest edition of the following standards and codes:

- 1) The International Electrotechnical Commission (IEC)
- 2) The American Petroleum Institute (API)
- 3) The European Committee for Electrotechnical Standardization (CENELEC)
- 4) The National Electrical Manufacturer's Association (NEMA)
- 5) The American National Electrical Code (NEC)
- 6) The International Civil Aviation Organization (ICAO)
- 7) Iranian Petroleum Standard (IPS)

4.2 Where reference is made to any other standard and code, it is understood that the equivalent IEC standard will also be acceptable.

4.3 In case of conflicts, interferences or discrepancies between items of this document and listed standards and codes NIOEC will decide on the procedures to correct the condition. Should there be any point not clearly specified in this document and/or Specifications the clarification and/or the final decision will be made by NIOEC.

4.4 Documents, drawings, data, etc. shall be in English, and in Metric units.

4.5 The drafting symbols shall be according to latest edition of IEC 60617 except protective relay numbers which shall be according to ANSI C 37.2.

5.0 LIST OF SPECIFICATIONS

1	NIOEC-SP-60-00	GENERAL DESIGN PHILOSOPHY FOR ELECTRICAL SYSTEM DESIGN
2	NIOEC-SP-60-01	SEALED TYPE POWER TRANSFORMERS
3	NIOEC-SP-60-02	LOW VOLTAGE INDUCTION MOTORS
4	NIOEC-SP-60-03	DRY TYPE POWER TRANSFORMERS BELOW 500kVA
5	NIOEC-SP-60-04	LOW VOLTAGE SWITCHGEAR AND CONTROLGEAR
6	NIOEC-SP-60-05	MEDIUM AND HIGH VOLTAGE POWER CABLES
7	NIOEC-SP-60-06	ELECTRICAL SYSTEM INSTALLATION
8	NIOEC-SP-60-07	AIR CRAFT WARNING LIGHTS
9	NIOEC-SP-60-08	CURRENT LIMITTING REACTORS
10	NIOEC-SP-60-09	MEDIUM AND HIGH VOLTAGE SWITCHGEAR AND CONTROLGEAR
11	NIOEC-SP-60-10	CONSERVATOR TYPE TRANSFORMERS
12	NIOEC-SP-60-11	NEUTRAL EARTHING RESISTORS
13	NIOEC-SP-60-12	POWER MANAGEMENT SYSTEM
14	NIOEC-SP-60-13	STANDBY BATTERY AND BATTERY CHARGER
15	NIOEC-SP-60-14	VARIABLE SPEED DRIVES (VSD)
16	NIOEC-SP-60-15	UNINTERRUPTIBLE POWER SUPPLY (UPS)
17	NIOEC-SP-60-16	LOW VOLTAGE CABLES AND WIRES
18	NIOEC-SP-60-17	6kV CAPACITOR BANKS
19	NIOEC-SP-60-18	LOW VOLTAGE CAPACITOR BANKS
20	NIOEC-SP-60-19	ELECTRICAL HEAT TRACING
21	NIOEC-SP-60-20	MEDIUM AND HIGH VOLTAGE INDUCTION MOTORS
22	NIOEC-SP-60-23	TURBINE DRIVEN SYNCHRONOUS GENERATORS

23	NIOEC-SP-60-24	CATHODIC PROTECTION SYSTEM
24	NIOEC-SP-60-25	ELECTRICAL ALARM PANEL
25	NIOEC-SP-60-26	ELECTRICAL REQUIREMENTS FOR BUILDINGS
26	NIOEC-SP-60-27	LOW VOLTAGE BUS DUCTS
27	NIOEC-SP-60-28	SUBMARINE CABLES
28	NIOEC-SP-60-31	ELECTRICAL BULK MATERIAL
29	NIOEC-SP-60-32	FIRE ALARM SYSTEM
30	NIOEC-SP-60-34	INDUSTRIAL LIGHTING
31	NIOEC-SP-60-35	LIGHTING EQUIPMENT
32	NIOEC-SP-60-36	ELECTRICAL COMPONENTS OF PACKAGE UNITS
34	NIOEC-SP-60-37	LIGHTING/SMALL POWER PANELS

6.0 HAZARDOUS AREA CONSIDERATIONS

6.1 Area Classification

- 6.1.1** Classification of hazardous areas shall be in accordance with the latest edition of API RP505.
- 6.1.2** All the locations in which flammable gases and volatile flammable liquids are processed, stored, loaded, unloaded or handled shall be classified and documented.
- 6.1.3** All equipment which is considered a source of hazardous gas or vapor, shall be shown on the drawings. Each source shall be identified by equipment numbers, flammable material (s) handled and atmospheric group.
- 6.1.4** The classification and extent of each area shall be shown on drawings with major structures and equipment indicated.
- 6.1.5** For mixtures of gases of different groups the following shall apply:
- a) In mixtures of group C and group D gases the group C gases shall be disregarded if they constitute less than 40% by volume of the mixture.
 - b) In areas which are adequately ventilated lighter than air vapors in a gas mixture shall be disregarded if they constitute less than 40% by volume of the mixture. The area classification shall be made on the basis of heavier than air vapors.

6.2 Selection of Equipment Enclosures