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

NIOEC SP

NIOEC SPECIFICATION

FOR

SAFETY AND FIREFIGHTING EQUIPMENT

FIRST EDITION

DECEMBER, 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.

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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. General

1.1.1. This Specification provides the minimum requirements for safety and firefighting equipment and their datasheet, which are going to be used in *refineries, pumping stations and tank farms*. It covers the technical requirements of design, installation, material, fabrication, accessories, painting; inspection and testing of the following equipment.

- Fire hydrant.
- Fire monitor.
- Outdoor hose box.
- Indoor hose reel.
- Hose and coupling.
- Safety shower and eye/face wash.
- Self-contained breathing apparatus.
- Deluge skid.
- Mobile foam unit.

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

1.1.3. Resolution on cases not explicitly stipulated in this Specification, or on cases where conflicts may arise among the requirements of the referenced/relevant 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.

AWWA (AMERICAN WATER WORKS ASSOCIATION)

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|-----------|----------------------------|
| AWWA C502 | “Dry-Barrel Fire Hydrants” |
| AWWA C503 | “Wet-Barrel Fire Hydrants” |

ASME (AMERICAN SOCIETY OF MECHANICAL ENGINEERS)

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| ASME B1.20.1 | “Pipe Threads, General Purpose (Inch)” |
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BSI (BRITISH STANDARD INSTITUTE)

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| BS-336 | “Specification for Fire Hose Couplings and Ancillary Equipment” |
| BS 5306-1 | “Code of Practice for Fire Extinguishing Installations and Equipment on Premises - Part 1: Hose Reels and Foam Inlets” |
| BS EN 694 | “Fire-fighting hoses Semi-rigid hoses for fixed systems” |
| BS EN 671-1 | “Fixed Firefighting Systems- Hose Systems Part 1: Hose reels with semi-rigid hose” |
| BS EN 671-3 | “Fixed Firefighting Systems - Hose Systems Part 3: Maintenance of hose reels with semi-rigid hose and hose systems with lay-flat hose installations” |
| BS EN 15889 | “Fire-fighting hoses - Test methods” |

IPS (IRANIAN PETROLEUM STANDARD)

IPS-E-SF-300	"Engineering Standard for Application of Breathing Apparatus in Safety and Fire Fighting"
IPS-E-SF-340	"Engineering Standard for Fire Fighting Hose Box and/or Shelter "
IPS-G-SF-340	"General Standard for Ancillary and Miscellaneous Safety and Fire Equipment"
IPS-G-SF-460	"General Standard for First Aids & Sanitation"
IPS-M-SF-105	"Material and Equipment Standard for Valves, Reels, Hoses, Nozzles and Monitors for Fire Fighting"

ISEA (INDUSTRIAL SAFETY EQUIPMENT ASSOCIATION)

ANSI/ISEA Z358.1	"American National Standard for Emergency Eyewash and Shower Equipment"
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NFPA (NATIONAL FIRE PROTECTION ASSOCIATION)

NFPA 1981	"Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services"
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NIOEC-SP (NIOEC SPECIFICATIONS)

NIOEC-SP-47-27	"NIOEC Specification for Active Fire Protection Design Criteria"
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3. UNITS

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

4. FIRE HYDRANT AND MONITOR**4.1. Fire hydrant specification**

4.1.1. Hydrants shall be dry barrel type unless the minimum temperature of the site never falls below 0°C. Under such circumstances wet barrel hydrant shall be used.

4.1.2. Hydrant body shall be two components and made from gray cast iron.

4.1.3. Each permanent hydrant shall have the following characteristics:

- No. of barrel components: two, equipped with break flange.
- Body: 6 inch dry barrel type, with 5 inch main valve, standard trim, compression type.
- Material: Carbon steel.
- Inlet flange: 6 inch 150 lb RF on the side flanged base (as per hydrants to be suitable for 14 barg working pressure).
- Hose outlets: two 2½" connections 180 degree apart, 8NPT-MALE thread or flanged for landing valve connection.
- Pumper connection: one 5" pumper connection. Pumper connection to be female round thread, in accordance with British Standard BS-336. The pumper connection shall face the roadway wherever installed and will be at right angles to the hose nozzle connection. Pumper connection shall be equipped with chain and cap. Cap shall be made of gunmetal and chain shall be galvanized carbon steel.
- Operating stem nut: Operating stem nut to be pentagon, 1½" point to flat with suitable wrench. Operating stem nut to open counter clockwise.

- Each fire hydrant and hydrant shall be equipped with 1" drain pipe (self-draining) to sewer line or other (as per Standard drawing No. NIOEC-SD-5013-1/1)

4.1.4. Wet barrel hydrants shall be equipped with a 6" suitable butterfly valve as the main valve.

4.1.5. Fire hydrants shall have two 2½" connections for landing valve used for hose connection, and one 5" connection for pumper connection. The 2½" and 5" connections shall be located so that the distances between the bottom of the connection caps and finished grade are a minimum of 0.5 m and 0.25 m respectively. The 5" pumper connection shall face the roadway wherever installed and shall be at right angles to the hose nozzle connection.

4.1.6. Unless otherwise specified in the project, fire hydrants shall be designed for minimum 14 barg and tested at 150% of design pressure.

4.1.7. All requirements of dry and wet hydrants other than those sited above shall be as per AWWA C502 and C503 respectively.

4.2. Fire hydrant installation

4.2.1. Location layout of fire hydrants shall in accordance with NIOEC-SP-47-27.

4.2.2. Fire hydrants shall be installed in pits as per Standard drawing NIOEC-SD-5013-1/1 and pits shall be filled with removable, suitable insulating material to protect the hydrant and pipe from frost. Fire hydrants shall have base shoe to facilitate installation.

4.2.3. Hydrants shall be located on the road side of all pipe lines or drainage ditches. The length of the 5" suction hose required between the hydrants and fire truck shall not exceed 4.5 m where large pipe bends or drainage ditches may hinder access from hydrants to process areas or tank farms. Hydrants shall be located near access ways or walkways across such obstructions. Where located on roadsides simple vertical crash posts shall be erected between road and hydrant.

4.2.4. In tankage areas where fixed air foam laterals are installed, hydrants shall be located in relation to terminus of air foam laterals so that the total length of hose from hydrant to fire truck and from fire truck to foam lateral does not exceed 38m.

4.3. Valves for Fire Hydrants

4.3.1. Landing valves for 2½" outlet fire hydrants shall be of gunmetal, single outlet, suitable for above ground installation, globe valve, bib nose type complete with cap and chain. Inlet shall be 2½" threaded 8NPT female as per ASME B1.20.1 or flanged type (flanged type is preferred unless approved by the Client) and outlet shall be 2½", single lug instantaneous pressure release female coupling as per BS-336. Cap shall be made of gunmetal and chain shall be galvanized carbon steel.

4.3.2. All hydrants shall have main valve. In dry barrel hydrants, main valve shall be an integral part of the hydrant and in wet type, a butterfly valve shall be used as main valve.

4.3.3. Dry barrel main valve shall be compression type, made of gray cast iron. Stem rod couplings, lock rings, stop pins, coupler pins and spring pins shall be made of stainless steel and nozzles, valve seat ring, drain ring shall be made of bronze.

4.3.4. Wet barrel main valve shall be a butterfly valves, 6" class 150, body ASTM A105 or A216 WCB, centered in body disc made of ASTM B148 C95500, renewable seat made of EPDM and stem made of 316L, wafer type made as per API 609.

4.3.5. If fire water is corrosive (such as sea water), valve material used as hydrant main valve shall be suitable for such condition.

4.4. Fixed water monitors

4.4.1. Monitors body and nozzle shall be gun metal and be rated for 14 barg design pressure and tested at 150% of design pressure.

4.4.2. Monitors shall have 4" flanged inlet connection as per ASME B16.24 class 150 F.F and 2½" threaded outlet connection for nozzle connection.

4.4.3. Fixed type monitors shall be equipped with fog and jet nozzle assemblies of the lever type. Water/foam nozzle shall be made of gun metal and rated for 120 m³/h capacity at 7 bar g supply pressure and not less than 50 m straight jet throw at 30 degrees elevation and no wind conditions.

4.4.4. Monitors will be provided with a manual operated 4" inlet isolation butterfly valve. Body of this valve shall be made of ASTM A105 or A216 WCB, centered in body disc made of ASTM B148 C95500, renewable seat made of EPDM and stem made of 316L, wafer type made as per API 609. If fire water is corrosive (such as sea water), valve material shall be suitable for such condition

4.4.5. Monitors shall be able to rotate 360 degree horizontally and from -20 to +70 degree vertically. Movement material shall be made of gunmetal and be equipped with ball or roller bearing.

4.4.6. Monitors shall be controlled manually by means of handle or hand-wheel. Handle controlled types shall have lever screw locking device suitable for unattended operation of monitor. In certain condition where manual control of monitors is not possible, such as elevated monitors in jetties, joystick shall be used. Also where manual control of monitor is difficult and dangerous, it may be equipped with water powered self-oscillating system. Handle or hand-wheel shall be made of stainless steel.

5. HOSE AND HOSE BOX

5.1. Hoses and Couplings

5.1.1. Hose coupling shall be standardized as follows:

- All outlet coupling shall be female and inlet coupling male, both conforming to BS-336.
- Pressure connections for collapsible hose shall be 65 mm (2½") conforming to BS-336 British Instantaneous Coupling.
- Hose coupling shall be of gunmetal alloy construction.

5.1.2. Lay-flat fire hose

Fire hoses shall be synthetic collapsible woven textile with PVC or PU coating and internal rubber lining, have 65mm diameter and 30 m lengths, with precompiled instantaneous male and female 65mm BS-336 couplings fastened by stainless steel wire. Design pressure of hoses shall be 14 barg and shall be tested in 22.barg proof pressure and shall have 43 barg burst pressure. Hoses shall have resistance to wear, heat, oil, acid and weather.

5.2. Hose Reel

5.2.1. Fire hose reel for indoor.

5.2.1.1. Hose reels shall be designed as per BS EN 671-1 and their maintenance shall be done as per BS EN 671-3. Hoses shall be designed as per BS EN 694 and tested as per BS EN 15889.

5.2.1.2. Hose for buildings hose reel, shall be rayon braid neoprene, with maximum working pressure of 12 barg, proof pressure of 24 bar and burst pressure of 42 bar. Hose shall be connected directly to fire water supply in the buildings. Their size shall be 1" and 30 m length.

5.2.1.3. Hose shall be equipped with lever ball valve jet and spray nozzle with 31 lpm flow rate at 2 barg. Jet and spray horizontal range of nozzle shall not be less than 10 m and 6 m at 2 barg. Nozzle body material shall be made of gunmetal.

5.2.1.4. Stop valve shall be globe angle type, made of gunmetal. Inlet connection of this valve shall be threaded as per ASME B1.20.1.

5.2.1.5. Each indoor hose reel shall consist of a cabinet, recess mounted for the administration and surface mounted for other buildings. Plate thickness of reel and cabinet shall be at least 1.5 mm. Cabinets shall have door lock with key.

5.2.1.6. If fire water network working pressure is more than 4 barg, building hose reel shall be provided with a suitable self-acting pressure regulator to maintain the hose reel pressure between 4 and 2.5 barg.

5.2.2. Fire Hose Reels for Outdoor.

5.2.2.1. Hose reels shall be floor mounted, and metal cover shall be 1.5 mm steel, painted red complete with 1½", male pipe thread connections equipped with crank re-winder.

5.2.2.2. Inlet connection to hose reel shall be 2" female threaded as per ASME B1.20.1.

5.2.2.3. Hose shall be semi rigid type, as per BS EN 694 and tested as per BS EN 15889. Hose outlet connection shall be 1½" tail female instantaneous as per BS-336 and connection material shall be gunmetal.

5.2.2.4. Hose shall be 25 meters of 1½", rayon braid neoprene tube and cover, 15. barg maximum working pressure, 24 barg proof pressure and 42 bar burst pressure. It also shall be equipped with adjustable jet/spray nozzle and isolating valve.

5.2.2.5. Hose reel shall be equipped with adjustable discharge pattern nozzle (branch pipe) with flow rate of not less than 380 lit/min at 4.5 barg inlet pressure and spray pattern. Throw range shall be about 17 m in jet pattern and 10 m in spray pattern. The nozzle shall be made of gunmetal and equipped with stop device.

5.3. Foam/water branch pipe

5.3.1. Water branch pipe shall have adjustable straight jet/spray nozzle type and made of gunmetal, with 2½ inch inlet male coupling in accordance with British Standard BS-336 and rated for 60 m³/hr capacity at 7 barg inlet pressure.

Water branch pipe shall have 35 m stream horizontal range at straight jet condition at 7 bar g inlet pressure. Water branch pipe do not require screen protection and shall be designed for 10 barg inlet pressure.

5.3.2. Foam branch pipe shall be made of aluminum alloy with 2½ inch inlet male coupling in accordance with BS-336 suitable for low expansion foam. It shall be rated for 30 m³/hr capacity at 7 barg inlet pressure with stream nozzle range about 25m.

Foam branch pipe shall be equipped with pick up tube and shall be suitable AFFF, FP, FFFP and alcohol resistance foam. It shall be designed for 10 barg inlet pressure.

5.4. Outdoor Hose Box

5.4.1. Outdoor hose box will be located in plant process areas, utility areas and offsite areas so that at least one unit shall be available for every two or three hydrants based on situation.

5.4.2. Outdoor hose box shall have locking mechanism, to be locked by key.

5.4.3. Outdoor hose boxes will be self-supporting type for outdoor installation and each shall contain the following:

- Four lay-flat fire hoses as per 5.1.2.
- Two water branch pipes as per 5.3.1.
- Two foam branch pipes as per 5.3.2 to be used with mobile foam unit.
- Two hose spanner wrenches for 5 inch couplings.
- Four 2½" John Morris gaskets for BS-336 coupling.

6. SAFETY SHOWER AND EYE/FACE WASH

6.1. General

6.1.1. Safety Showers and Eye Wash Facilities shall be provided where eyes and body of personnel may be exposed to injurious by dangerous materials (Acids, caustics or other chemicals).

6.1.2. Local and remote audible sound or blinking light to indicate that the unit is in operation shall be considered.

6.1.3. Combination unit (safety shower and eye/face wash) shall be in accessible locations that are within a walking distance no greater than 30.5 meters from hazard. Each unit location shall be identified with sign. The area around combination unit shall be lighted and visible.

6.1.4. Interconnection piping shall be galvanized steel sch 40 and fittings shall be forged fitting. All valve material shall be stainless steel or bronze.

6.1.5. Other requirements of safety shower and eye/face wash not stated below shall be as per ANSI/ISEA Z358.1.

6.2. Eye/Face Wash

6.2.1. Eye/Face wash shall be plumbed type and supplied with potable water.

6.2.2. A means shall be provided to ensure that a controlled flow of flushing fluid is provided to both eyes simultaneously at a velocity low enough not to be injurious to the user. There shall be no sharp projections anywhere in the operating area of the unit.

6.2.3. Nozzles shall be protected from airborne contaminants. Whatever means is used to afford such protection, its removal shall not require a separate motion by the operator when activating the Unit.

6.2.4. Eye/face washes shall be designed, manufactured and installed in such a manner that, once activated, they can be used without requiring manual intervention. It shall be remained activated until intentionally shut off.

6.2.5. Eyewashes shall be capable of delivering flushing fluid to the eyes and face not less than 11.4 liters per minute (3 gpm) for 15 minutes at 2.1 barg operating pressure. If shut off valves are installed in the supply line for maintenance purposes, provisions shall be made to prevent unauthorized shut off.

6.2.6. Outlet liquid temperature shall be between 16 and 38 °C. If it is required suitable heater or cooler shall be considered.

6.3. Combination Unit (Safety Shower & Eye/Face Wash)

6.3.1. Combination Units shall be designed so that all components can be operated individually.

6.3.2. Emergency shower's head shall be designed and located so that a water column is provided not less than 208.3 cm (82 inches) nor more than 1243.8 cm (96 inches) in height from the surface