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

NIOEC SP

NIOEC SPECIFICATION FOR INSTRUMENT INSTALLATION MATERIAL

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 on going 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) 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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14. APPENDIX I. INSTRUMENT LINE CLASSES

1. SCOPE

This specification defines NIOEC's minimum requirements for the instrument installation material, based on the American National Standard Institute Code for Pressure Piping ASME B31.3 'Process Piping', and [NIOEC-SP-50-04](#).

This specification may be used with other Sections of the ANSI B31 Code, and/or Section I of the ASME Code, after reviewing for compliance with the applicable sections and modifying as necessary.

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

2. REFERENCES

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

API (AMERICAN PETROLEUM INSTITUTE)

API RP 941, 1997.

"Steels for Hydrogen Service at Elevated Temperatures and Pressures in Petroleum Refineries and Petrochemical Plants".

ASME (AMERICAN SOCIETY OF MECHANICAL ENGINEERS)

B 31.3

"Process Piping"

ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIAL)

SECTION I

"Iron and Steel Products"

NIOEC (SPECIFICATIONS)

[NIOEC-SP-00-10](#)

"Specification For Units".

[NIOEC-SP-50-04](#)

"Specification For Piping Material"

[NIOEC-SP-50-09](#)

"Specification For Piping Material Purchase Pipe"

[NIOEC-SP-50-11](#)

"Specification For Piping Material Purchase Fitting"

[NIOEC-SP-50-18](#)

"Specification For Piping Material Purchase Valves"

[NIOEC-SP-80-02](#)

"Specification For Painting"

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, Hydrogen Service shall mean any service with hydrogen partial pressure greater than 5 bar (a).

5. NOTES PERTAINING TO ALL INSTRUMENT LINE CLASSES

5.1 Item Descriptions

5.1.1 The item descriptions shown in the individual classes are abbreviated and shall not be used for purchase. For Purchase Descriptions, reference shall be made to the Master Commodities catalogue.

5.1.2 Full size and reducing size components shall have the same Item Code Number.

5.2 Manufacturer Reference

5.2.1 Items specified or referenced by manufacturer and figure number are not intended to exclude equal items offered by other manufacturers. Products of reputable manufacturers and of comparable type, quality and characteristics shall be submitted for NIOEC's approval. Materials shall be supplied from approved vendor list.

5.3 Design conditions

5.3.1 Unless otherwise noted, all pressure and temperatures referred to are at the design conditions.

5.3.2 Selection of steels exposed to hydrogen service shall be in accordance with API RP 941, 1997 "Steels for Hydrogen Service at Elevated Temperatures and Pressures in Petroleum Refineries and Petrochemical Plants".

Hydrogen Service shall mean any service with hydrogen partial pressure greater than 5 bar (a).

5.4 Material Identification

5.4.1 Valves and Special Items shall be supplied with a metal tag attached, bearing the applicable Item Code Number.

5.4.2 Each individual length of pipe shall be identified in the field with the applicable Item Code Number, as follows:

- a.** The number shall be applied continuously throughout each full length.
- b.** Numbers shall be applied with a Pannier Model TSS Hand Bar and Tube Printer, with E-Z Set Printing Wheel and be changeable dies. The marking ink shall be Pannier 1001 Yellow Industrial Ink.
- c.** Readily identifiable material such as austenitic stainless steel, galvanized, cast iron, copper, or non-metallic will normally be exempt from this requirement.

5.5 Colour Coding

5.5.1 Carbon steel flanges with a special smooth, finish shall be colour coded blue. This does not apply to flanged ends of valves.

5.5.2 Alloy pipe, flanges and fittings that could be mistaken for carbon steel shall be colour coded yellow. Special carbon steel items shall also be colour coded yellow. Each pipe shall have a band of yellow paint approximately 2.5 cm. wide along its full length. Flanges shall be painted all round their periphery and fittings shall have a dot of paint on them. This is a means of alerting Construction that the Material is alloy or otherwise special. Reference should then be made to the manufacturer's markings to determine the exact type of material.

6. NOTES PERTAINING TO SPECIFIC INSTRUMENT LINE CLASSES

The following notes, identified by a number in parentheses, on the reference column of the line sheets, become a part of an individual class wherever the same number in parentheses appears in those classes.

1) Valves

Valves shall conform to the Purchase Specification NIOEC-SP-50-18 applicable.

2) Pipe

Pipe shall conform to Purchase Specification NIOEC-SP-50-9.

3) Fittings

Pipe fittings shall conform to Purchase specification NIOEC-SP-50-11.

4) Seal Welding

a) Screwed pipe joints shall be seal-welded' where called for in individual Line Classes, except normally the following shall not be 'seal-welded':

Tubing Nuts

Union Nuts

Vent connection

Drain Connection

Connection at Instrument Body

b) All thread shall be clean cut to full depth. Joint shall be made up wrench tight without the use of thread compound.

c) Seal welding shall cover the exposed pipe threads at screwed fittings but shall not exceed 10 mm fillet.

d) Where deemed necessary, screwed plug valves may be seal-welded, however care must be exercised to avoid excessive heat, resulting in valve distortion.

e) Gate and globe valves shall be in a lightly closed position while being seal-welded or socket-welded.

5) Tube Bending Requirements

Use Standard radius bends in place of fittings whenever possible.

6) Pipe Bends

a) Bends (seamless pipe only) may be used in place of screwed or socket-weld fittings unless otherwise indicated in the individual class.

b) Bend radius shall be a minimum of 5 times the normal pipe diameter.

7) Thread Compound

a) Thread compound requirements, unless otherwise specified in the individual Line Class, shall conform to the following:

Temperatures up to 232°C: Teflon Tape

Temperatures above 232 °C: Armite LED-PLATE NO. 250 Anti Seize Compound

(Armite: Armite Laboratories)

When thread compound is used, it should be applied to the male thread only.

In hydrogen services, graphite tape shall be used in place of PTFE (Teflon) tape.

b) On joints which must be seal-welded, thread compound shall not be used.

7. INSTRUMENT IMPULSE LINE MATERIAL SPECIFICATION

7.1 Tubing

In general, for services of ANSI flange class 300 and 600, and for the pipe line classes indicated in the following Table 7.1, all instrument impulse lines, downstream of the first process isolating valve shall be ½ inch OD, 316 SS seamless tubing with wall thickness of 0.065 inch minimum, and 316 Stainless Steel, bar stock double-ferrule compression type fittings. Byte type fittings are not permitted.

INSTRUMENT ½ INCH TUBING MATERIAL SPECIFICATION

REV.	*CLASS	*PIPE LINE CLASS	FITTING	* GENERAL MATERIAL	* SERVICE
	ZA	A, AB, C CB	316 Stainless Steel , bar stock double-ferrule compression type	316 Stainless Steel, 0.065 inch wall thickness	Hydrocarbons, Caustic, in Hydrogen (to 5 Bars a)
	ZB	AF,AM F,L,LA LAA,RA,SA CSH,SS,FC	316 Stainless Steel , bar stock double-ferrule compression type	316 Stainless Steel, 0.065 inch wall thickness	Liquid Sulphur Asphalt, Foul Condensate with or without Hydrocarbons, Hydrocarbons, Hydrogen (to 5 Bars-a) Steam, BFW, Condensate, Draft Gauge, Air-Utility, Instrument Water Plant, Cooling, Fire

Table 7.1

7.2 Pipe

For the pipe line classes indicated in the following Table 7.2, for ANSI flange class of above 600# , or cases where the impulse lines are subject to physical expansion, impulse lines shall be ½“ seamless pipes.

For service with pressure of greater than 40 Barg, fully butt-welded construction with heavy wall tubing or line pipe shall be provided.

INSTRUMENT PIPING MATERIAL SPECIFICATION

REV.	*CLASS	*PIPE LINE CLASS	FITTING RATING	* GENERAL MATERIAL	* SERVICE
	ZC	AH,AV,CH, CMH,FCH FDH,FH GCH,GH,HCH HH,JH	6000# SCRD	Steel	Hydrogen (above 5 Bars-a) with or without Hydrocarbons, Chemical Injection
	ZD	AK	6000#	Steel	93-98% Sulphuric Acid
	ZE	JCH,JIH JSH,HSB	6000# SCRD	316/347 Stainless steel	Hydrogen (above 5 Bars-a) with or without Hydrocarbons, Hot H ₂ Rich Reformer Gas.
	ZF	AC,AD,AL AS,CC,CD CL,CS,HL CN,ASS	6000# SCRD	304/316 Stainless steel	Hydrocarbons, Rich Amine, Carbon Dioxide Rich Condensate compressor Lube and Seal Oil
	ZG	LB	Sch 80	PVC	Brine
	ZJ	LD	300# SCRD	Galvanized Steel Brass and Copper	Water-Domestic Air-Instrument, sub-Header, Branch Lines to Filter-Regulator
	ZY		250# SCRD	Brass Copper	Control Instrument Air
	ZZ				Instrument and Tubing Support
	INSTR.				To be used for all Line Classes
	-----	-----	-----	Stainless Steel Tube and Fittings	Steam Tracing

Table 7.2

NOTES:

* For general reference only. Refer to General Notes and Material Classes for specific details. For Piping Material Reference shall be made to NIOEC-SP-50-04.

8. INSTRUMENT AIR SUPPLY PIPING

Field instrument air piping shall be seamless galvanized steel, sealing of ends shall be Teflon compound, and fittings shall be according piping standards.
Valves shall be brass, ball type, size ½ inch for each user.

9. INSTRUMENT AIR TUBING

9.1 Individual instrument air supply and pneumatic field transmission lines to and from instruments shall be PVC coated ¼" copper tubes unless otherwise specified (e.g.) stainless steel for corrosive atmosphere.

9.2 Where necessary for fast action of control valves ½ inch PVC coated copper tube or stainless tube will be used.

9.3 Material of air fittings and end connectors shall be brass in general; vinyl cap shall be supplied for protection fitting and connectors. Stainless-steel fitting shall be supplied for specific critical areas.

10. ANALYSER AND HOOK-UP TUBING

10.1 Analyser tubing shall be stainless steel with considering line pressure and temperature.

10.2 Tube fittings and connectors shall be stainless steel and high pressure with double ferrule.

10.3 Hook-up tubes shall be stainless steel, seamless with minimum 1.7 mm wall thickness for line pressure up to 10 bars.

11. SUPPORTS

Pipe stanchion for instrument shall be 2 inch schedule 80.

Stud bolt/nuts shall be galvanized steel.

Supports shall be painted according painting specification NIOEC-SP-80-2.

Expansion bolts (roll bolts) shall be minimum 12 mm galvanized.

12. INSULATION & SEALING MATERIALS

Sealing material for cable duct bank shall be Bentonite.

Sealing material for air piping shall be Teflon compound.

13. TAG-NO AND NAME PLATE MATERIAL

Name plate of instruments shall be stainless-steel plate.

Tag number and identification band of instrument cables shall be stainless-steel tape.

Wire for fixing tag-number to cables be stainless-steel.

14. APPENDIX I INSTRUMENT LINE CLASSES



SE Q. NO.	R E V	SIZE	ITEM NAME	NOTES	DESCRIPTION	REFERENCE	NOTES	
01				16.57			16.SPRAY SHIELD REQUIRED FOR	
02				50	SPECIAL PROVISIONS		ALL FLANGED JOINTS AND VALVE	
03							BONNETS IN CAUSTIC AND ACID	
04							SERVICES	
05				16	METER VALVES	GENERAL NOTE(1)	57.VELOCITY SHALL BE LIMITED 10	
06							8 FEET PER SECOND	
07					(GENERAL PURPOSE)		58.CONCENTRATION AND TEMPERATURE	
08		1/4 – 1	NEE		NEEDLE VALVE 10000 SCRD STL H/JC 187-1	MARSH 1900FF0	SHALL BE LIMITED TO ZONE A OF	
09					(FOR MONEL TRIM PROCESS LINE VALVE ONLY		THE SHELL CORROSION DATA:	
10		1/4 – 1	NEE-SCR		NEEDLE VA 10000 SCRD STL. MONEL TRIM	MARSH 1900	SURVEY “CAUSTIC SODA SERVICE	
11							CHART”	
12								
13					MANIFOLD VALVES	GENERAL NOTE(1)		
14								
15					(USE AT ORIFICE FLANGE			
16					GENERAL PURPOSE-260 AND LOWER)			
17		1/2 – ½	MAV		MANIFOLD VA 6000” FLG STL 5 VA ASSY	AGCO MMAVC		
18								
19					(USE AT ORIFICE FLANGE-FOR MONEL TRIM			
20					PROCESS LINE VALVE ONLY-260 AND LOWER)			
21		1/2 – ½	MAV-FLG		MANIF VA 6000” FLG STL MONEL TR 3VA ASSY	AGCO MMAVC-50		
22								
23					(USE AT ONIFICE FLANGE-			
24					GENERAL PURPOSE –261 AND HIGHER)			
25		1/2 – ½	MAV-SCR		MANIFOLD VALVE 1500” SCRD STL 5 VA ASSY	AGCO M2HC		
26								
27					(USE AT ORIFICE FLANGE-FOR MONEL TRIM			
28					PROCESS LINE VALVE ONLY-261 AND HIGHER)			
29		1/2 – ½	MAV-SCR		MANIF VA 1500” SCRD STL MONEL TR 3VA ASSY	AGCO M2HC-50		
30								
31					MANIFOLD VALVE ADAPTOR			
32							SERVICE	
33		1/2 – 1/2	ADP		VERTICAL ADAPTOR 1500” SCRD A-G AM25	GREENWOOD	SERVICE –SEE INDEX	
34								
35					PIPE	GENERAL NOTE(2)	THIS SPECIFICATION SHALL BE USED	
36							FOR INSTRUMENT PIPING FOR LINE	
37					PIPE SCH 80 SMLS STL A53-B		CLASSES:	
38		1/4 – 1 1/2	PIP				A, AB, C & CB	
39								
40								
41							MATERIAL –STEEL	
42								
43							TEMPERATURE RANGE:-30 THRU 400	
44							PRESSURE RANGE: PER ANSI B16.5	
45								
46								
47								
48								
49								
50								
CONSTRUCTION						CORROSION ALLOWANCE	CLASS	PAGE
1-1/2 INCHES AND SMALLER SCREWED AND /OR SOCKET WELD						NONE	ZA	1 OF 3

SE Q. NO.	R E V	SIZE	ITEM NAME	NOTES	DESCRIPTION	REFERENCE	NOTES		
01					...PIPE FITTINGS...	GENERAL NOTE(3)			
02					ELL 90 DEG 3000" SW STL A105				
03					TEE 3000" SW STL A105				
04		1/4 - 1/2	ELL		CAP 3000" SCRDL STL A105				
05		1/4 - 1/2	TEE		COUPLING 3000" SW STL A105				
06		1/4 - 1/2	CAP		UNION 3000" SW STL A105				
07		1/4 - 1/2	COU		PLUG ROUND HEAD SCRDL STL A105				
08		1/4 - 1/2	UNI		ADAPTOR PE FPT STL	MILLS L531			
09		1/4 - 1/2	PLG		ADAPTOR MPT FPT STL	MILLS L534			
10		1/4 - 1/2	ADF-PF						
11		1/4 - 1/2	ADP-MF						
12									
13					...PIPE FLANGES, BOLTS AND GASKETS ...				
14					USE LINE CLASS MATERIALS				
15									
16					...PIPE NIPPLES...				
17									
18									
19									
20									
21		1/4 - 1/2	NIP-TBE		NIPPLE XS STL A53-B TBE				
22		1/4 - 1/2	NIP-TBE		NIPPLE XS STL A53-B TBE				
23		1/4 - 1/2	NIP-PBE		NIPPLE SCH 80 STL A53-B PBE				
24		1/2 - 1/2	NIP-TBE		NIPPLE SCH 160 STL A53-B TBE				
25		1/2 - 1/2	NIP-TBE		NIPPLE SCH 160 STL A53-B TBE				
26									
27					USE WITH MANIFOLD VALVE...				
28		1/2 - 1/2	NIP-ECC		NIPPLE-ECCENTRIC. STL TBE AGCO 2-2517C	AGCO 2-2517C			
29									
30					...SWAGE NIPPLE...				
31									
32									
33		1/4 - 1/2	SWA-CTE		SWAGE CONC XS STL A234 GR WPB TBE				
34		1/4 - 1/2	SWA-CTS		SWAGE CONC XS STL A234 GR WPB TSE				
35		1/4 - 1/2	SWA-CTL		SWAGE CONC XS STL A234 GR WPB TLE				
36		1/4 - 1/2	SWA-CBE		SWAGE CONC XS STL A234 GR WPB BBE				
37		1/2 - 1/2	SWA-CTE		SWAGE CONC SCH 160 STL A234 GR WPB TBE				
38		1/2 - 1/2	SWA-CTS		SWAGE CONC SCH 160 STL A234 GR WPB TSE				
39		1/2 - 1/2	SWA-CTL		SWAGE CONC SCH 160 STL A234 GR WPB TLE				
40		1/2 - 1/2	SWA-CBE		SWAGE CONC SCH 160 STL A234 GR WPB BBE				
41									
42					...VENT PLUGS...				
43									
44					(IN SERVICE 250 AND LOWER)				
45		1/4 - 1/2	BLD		PURGE VALVE 4000" SCRDL 316 SS	NUPRO			
46									
47					(IN SERVICE 251 AND HIGHER)				
48					USE PLUGGED METER VALVE				
49									
50									
CONSTRUCTION						CORROSION ALLOWANCE	CLASS	PAGE	
1-1/2 INCHES AND SMALLER SCREWED AND /OR SOCKETWELD						NONE	ZA	2 OF 3	