



**Resalat Oil Field Development Project
Phase 1 (EPC-EPD)**



Contract
No.

Specification for Asynchronous Electrical Motors

Class

1

5365

Pr. Code
LRSL

Area
000

Disc.
EL

Type
SP

Seq.
614

Rev.
02

Page 1 of 7

Specification for Asynchronous Electrical Motors

					<i>S.S.</i>	<i>A.S.</i>	<i>M.A.</i>	
02	27-Jun-21	Approved for Construction	IOEC	-	S.Saffari	A.Samadi	M.Aghaei	-
01	16-May-20	Issued for Approval	IOEC	-	S.Saffari	A.Samadi	M.Aghaei	-
00	20-Dec-20	Issued for Comment	IOEC	-	A.Samadi	A.Samadi	M.Aghaei	-
REV.	Date	Purpose of Issue	ORIG.	BY	PREP'D	CHECK'D	APP'D	COMPANY APP'D



**Resalat Oil Field Development Project
Phase 1 (EPC-EPD)**



Contract
No.

Specification for Asynchronous Electrical Motors

Class

1

5365

Pr. Code
LRSL

Area
000

Disc.
EL

Type
SP

Seq.
614

Rev.
02

Page 3 of 7

REVISION RECORD SHEET

REV. NO.	PURPOSE	LIST OF UPDATED MODIFIED SECTIONS IF ANY
01	Due to change of purpose of issue	-
02	Modification to remove discrepancies with design criteria	According to highlighted items



**Resalat Oil Field Development Project
Phase 1 (EPC-EPD)**



Contract
No.

Specification for Asynchronous Electrical Motors

Class

1

5365

Pr. Code	Area	Disc.	Type	Seq.	Rev.
LRSL	000	EL	SP	614	02

Page 4 of 7

Table of Contents

1. INTRODUCTION	5
1.1. Development Overview	5
1.2. Purpose of Scope.....	6
1.3. Definitions	6
2. CODES AND STANDARDS.....	6
3. GENERAL STATEMENT.....	6
4. ADDITION/MODIFICATION/DELETION.....	7



**Resalat Oil Field Development Project
Phase 1 (EPC-EPD)**



Contract
No.

Specification for Asynchronous Electrical Motors

Class

1

5365

Pr. Code	Area	Disc.	Type	Seq.	Rev.
L RSL	000	EL	SP	614	02

Page 5 of 7

1. INTRODUCTION

1.1. Development Overview

The Resalat Field previously known as Rakhsh Field, is located in the Persian Gulf, some 80 km to the South of Lavan Island, in water depth of 65-75 meters. The facilities which were originally developed in 1968 have sustained some damage due to the Iran/Iraq war and adverse climate conditions thereafter.

To increase oil production capacity from this field (adding 12,000 stock barrels per day to current production), Iranian Offshore Oil Company (IOOC) has defined new project which includes Engineering, Drilling, Procurement, Construction for following items:

- New satellite Wellhead Platform (WHP1) with totally nine (9) conductor slots.
- Development and renovation of Existing offshore complex consist of new power generation, control system, HVAC, Electrical /control room, electrical panels(LV &MV),process & utility piping, and all necessary activities which shall be done for connection to existing facilities(Tie in requirements)
- Drilling of two new production wells in R1 and three wells in WHP1 platform and Re-entry and work-over of one existing well in R1 platform.
- One 10” productions submarine pipeline from WHP1 to PP and a single submarine cable (power and data) from SP to WHP1
- Inspection, Strengthening, Modification and Repair of existing R1 complex Jackets and topsides and replacement of boatlanding and Barge Bumpers.

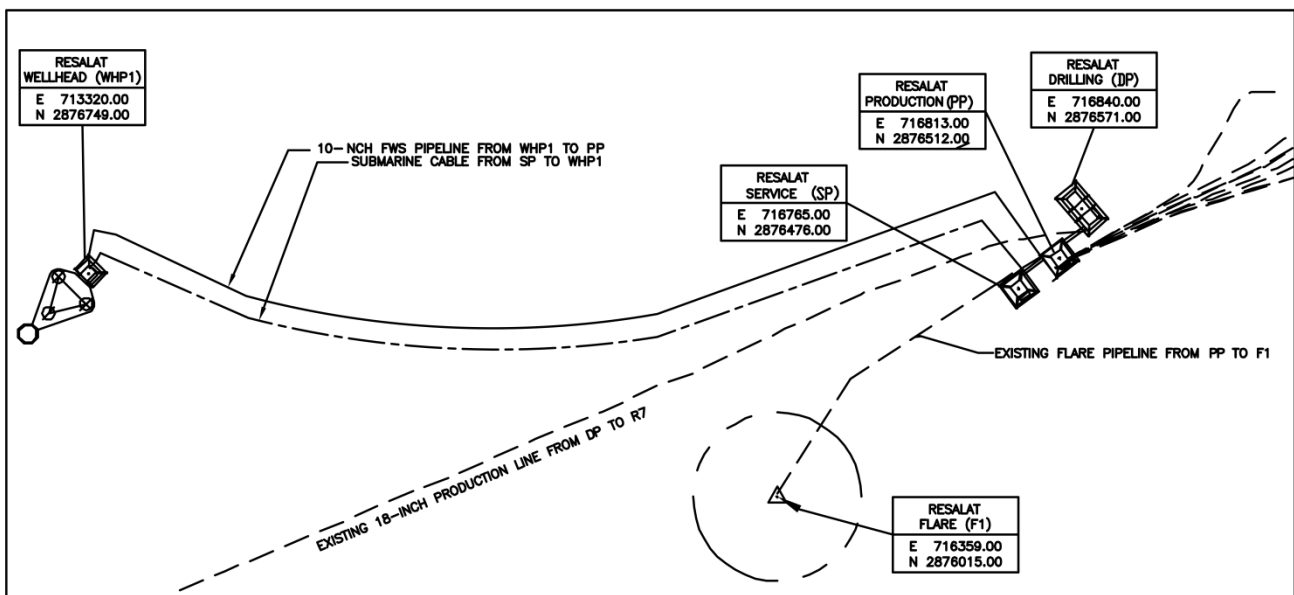


Figure 1: Resalat Development Field Layout (Datum ED 77, Zone 39, Cent. Meridian 51° East)



**Resalat Oil Field Development Project
Phase 1 (EPC-EPD)**



	Contract No.	Specification for Asynchronous Electrical Motors					Class	1
	5365	Pr. Code	Area	Disc.	Type	Seq.	Rev.	Page 6 of 7
	LRS L	000	EL	SP	614	02		

1.2. Purpose of Scope

This specification covers the minimum requirements for design, manufacture, quality control, testing and finishing of MV and LV asynchronous electrical motor.

1.3. Definitions

PROJECT	Resalat Oil Field Development – Phase 1
COMPANY	Iranian Offshore Oil Company (IOOC)
CONTRACTOR	Consortium of Iranian Offshore Engineering and Construction Company (IOEC) and Intelligent Solutions Inc. (ISI)
SUB-CONTRACTOR	Tehran Raymand Consulting Engineers (TRCE)
PURCHASER	Any firm who buy services, material and/or equipment for execution of the project within a dedicated contract.
SUPPLIER	Any vendor, manufacturer who supply any Service, Material or Equipment for the project
SHALL	Refer to a mandatory requirement
SHOULD	Refer to a recommendation
MAY	Refer to one acceptable course of action

2. CODES AND STANDARDS

LRS L-000-PM-LI-743	List of Applicable Codes and Standards
---------------------	--

3. GENERAL STATEMENT

The attached SPECIFICATION FOR INDUCTION MOTORS is confirmed as the Specification for MV & LV Asynchronous Electrical Motor, except as added/modified/deleted herein, and renumbered/reissued as Specification for Asynchronous Electrical Motors (LRS L-000-EL-SP-624) for Resalat Oil Field Development Project, Phase 1.



**Resalat Oil Field Development Project
Phase 1 (EPC-EPD)**



Contract No.

Specification for Asynchronous Electrical Motors

Class

1

5365

Pr. Code
LRSL

Area
000

Disc.
EL

Type
SP

Seq.
614

Rev.
02

Page 7 of 7

4. ADDITION/MODIFICATION/DELETION

The following items refer to the attached SPECIFICATION FOR INDUCTION MOTORS.

The clauses set out below modify or replace the clauses in the original specification as noted.

4.1 Section 9.2. RATING AND PERFORMANCE

Modification		Nameplate (KW)	Voltage	Frequency
	Motors	>160 >150	See note	50 HZ
	Motors	≤160 ≤150	400 V	50HZ

4.2 Section 8.4 Area Classification

Additional	8.4.4 On offshore platforms for equipment selection, all areas except Zones 0 & 1 shall be considered as Zone 2 as minimum for safety concepts and standardization reasons.
------------	---

4.3 Section 9.2.3 Starting, re-starting and re-acceleration

Additional	9.2.3.7 The maximum starting current shall not exceed 7 times of rated current for LV motors. For motors rated above 150 kW, the starting current shall not exceed 6 times the rated current of the motor.
------------	--

4.4 Section: 9.3.2 Enclosure degree of protection

Modification	The minimum enclosure degree of protection according to IEC-60529 shall be: <ul style="list-style-type: none"> - Machine and bearing house : IP-5556 - Terminal boxes : IP-5566 - Auxiliary boxes : IP-6566
--------------	--

4.5 Section: 9.3.7 Anti-condensation heaters (Paragraph 9.3.7.1)

Modification	All HV motors and LV motors shall be provided with heating devices (space heaters) to prevent condensation during periods of idleness. Space heaters for LV motors shall be provided by Seller when the design lifetime under the specified environmental conditions cannot be guaranteed. LV motor designs without space heaters are preferred.
--------------	---



I.O.O.C
Iranian Offshore Oil Co

SPECIFICATION FOR INDUCTION MOTORS

Area	Discipline	Document	Scope/Location	Sequence	Rev


**SPECIFICATION FOR
INDUCTION MOTORS**

01	Nov. 2017	B.B, A.S	M.R.M	
REV	DATE	PREPARED	CHECKED/APPROVED	DESCRIPTION

مدیریت توسعه بازار
تأسیسات دریایی ایران

(Handwritten signature)

خوانده شد و مورد تایید است


 I.O.O.C Iranian Offshore Oil Co						
	SPECIFICATION FOR INDUCTION MOTORS					
	Area	Discipline	Document	Scope/Location	Sequence	Rev

INDEX

<u>SECTION</u>	<u>INDEX</u>	<u>PAGE</u>
1.	INTRODUCTION	3
2.	DEFINITION OF TERMS	3
3.	SCOPE OF THIS DOCUMENT	3
4.	ABBREVIATIONS	4
5.	INTERNATIONAL STANDARDS	4
6.	UNITS OF MEASUREMENTS	6
7.	LANGUAGE	6
8.	SERVICE CONDITIONS	6
	8.1	ENVIRONMENTAL CONDITIONS
	8.2	ELECTRICAL SYSTEM VARIATIONS
	8.3	SYSTEM NEUTRAL EARTHING
	8.4	AREA CLASSIFICATION
9.	DESIGN AND CONSTRUCTION	7
	9.1	GENERAL
	9.2	RATING AND PERFORMANCE
	9.3	DESIGN REQUIREMENTS
	9.4	NOISE LEVEL
	9.5	ADDITIONAL REQUIREMENTS FOR MACHINES IN HAZARDOUS AREAS
10.	INSPECTION AND TESTING	18
11.	CORROSION PROTECTION	19
12.	MARKING	20
13.	SELLER DOCUMENTATION	21



خوانده شد و مورد تایید است

 <p>I.O.O.C Iranian Offshore Oil Co</p>						
	SPECIFICATION FOR INDUCTION MOTORS					
	Area	Discipline	Document	Scope/Location	Sequence	Rev

1. INTRODUCTION

Iranian Offshore Oil Company (IOOC) with over half century of experience has 6 major operational areas in the Persian Gulf. These six areas include KHARG, SIRRI, LAVAN, BAHREGAN, QESHM, KISH and relevant onshore and offshore facilities.

2. DEFINITION OF TERMS

COMPANY Means Iranian Offshore Oil Company (I.O.O.C)

COMPANY DOCUMENTS Means all information, data, documents calculations, notes, data sheets, computer data, specifications, drawings, plans, sketches, procedures, letters, reports and the like to be provided by COPMANY.

CONTRACTOR Refers to the persons, firm or company whose tender has been accepted by the company.

SUB-CONTRACTOR Means the contractor to whom some part of the contract has been awarded to undertake and perform part of work.

EXECUTOR Executor is the party which carries out all or part of construction and/or commissioning for the project.

INSPECTOR The Inspector referred to in this Standard is a person/persons or a body appointed in writing by the company for the inspection of fabrication and installation work.

PROJECT Means the specified job defined for contractor according to scope of work.

TPA Means the project Third Party Authorized Agency/company (or the representative person) which shall be approved by company.

VENDOR Means the manufacturer and/or supplier of a commodity, system or piece of equipment to perform the specified duty.

PURCHASER Means the Company/Contractor as the client of VENDOR for a Job, duty, system or equipment to be purchased.

WORK Means the whole activities to be performed by EPC CONTRACTOR under the CONTRACT to fulfill Scope of Work

YARD Means worksite upon which CONTRACTOR shall perform fabrication, erection, pre-commissioning, and commissioning activities prior to transportation of component to the SITE.

SITE Means the location of installation/construction and operation of the project.

SHALL Is used where a provision is mandatory.

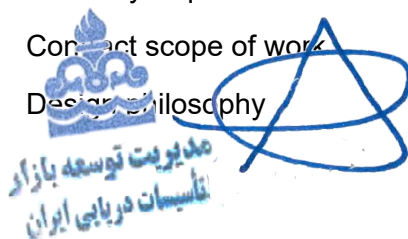
SHOULD Is used where a provision is advisory only.

MAY is used for acceptable alternatives.


3. SCOPE OF THIS DOCUMENT

This specification gives the minimum requirements for design, materials, manufacturing, testing and inspection for the Induction Motors for offshore complexes. Any conflict between requirement of this document, specifications, contract documents, standards and codes of practice shall be referred to the COMPANY for clarification. Where conflict occur, the order of precedence shall be as follows

- Statutory requirements
- Contract scope of work
- Design Philosophy



خواننده شد و مورد تایید است

 I.O.O.C Iranian Offshore Oil Co	SPECIFICATION FOR INDUCTION MOTORS					
	Area	Discipline	Document	Scope/Location	Sequence	Rev

- Specifications
- Applicable codes and standards

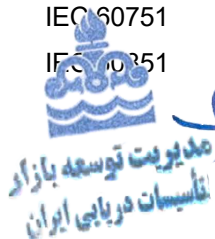
4. ABBREVIATIONS

Standard terms and abbreviations are used in this document. Listed below are the abbreviations that may be used here and in subsequent documents.


MV	Medium Voltage
LV	Low Voltage
ICSS	Integrated Control and Safety System
RMU	Ring Main Unit
UPS	Uninterruptible Power Supply
MCC	Motor Control Centre
LCS	Local Control Station
VDU	Video Display Unit
LNAN	Liquid Natural Air Natural
ACB	Air Circuit Breaker
VCB	Vacuum Circuit Breaker
NER	Neutral Earthing Resistor
SCADA	Supervisory, Control and Data Acquisition
FBA	Factory-built Assemblies
IACS	International Annealed Copper Standard
VT	Voltage Transformer
CT	Current Transformer
LTR	Local Technical Room
MCB	Miniature Circuit Breaker
RCCB	Residual Current Circuit Breaker
MCCB	Molded Case Circuit Breaker COG
COG	Centre of Gravity
SWL	Safe Working Load
PCS	Process Control System

5. INTERNATIONAL STANDARDS

- IEC 60034 Rotating Electrical Machines.
- IEC 60038 IEC Standard Voltages.
- IEC 60044 Instrument Transformers – part 1: Current Transformers.
- IEC 60072 Dimensions and Output Ratings for Rotating Electrical Machines.
- IEC 60079 Electrical Apparatus for Explosive Gas Atmospheres.
- IEC 60085 Thermal Evaluation and Classes of Electrical Insulation.
- IEC 60529 Degree of Protection provided by Enclosures.
- IEC 60584 Thermocouples.
- IEC 60751 Industrial Platinum Resistance Thermometer Sensors.
- IEC 60351 Methods for Tests for Winding Wires.



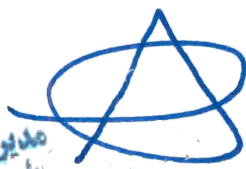
خوانده شد و مورد تایید است

 I.O.O.C <i>Iranian Offshore Oil Co</i>					
	SPECIFICATION FOR INDUCTION MOTORS				
	Area	Discipline	Document	Scope/Location	Sequence


- IEC 60894 Guide for Test Procedures for the Measurement of Loss Tangent on Coils and Bars.
- ISO 281 Rolling Bearings - Dynamic Load Ratings and Rating Life.
- ISO 2954 Mechanical Vibration of Rotating and Reciprocating Machinery – Requirements for instruments for measuring vibration severity.

Note:

Parts of multipart IEC standards issued from 1997 will carry the 60000 series reference, while existing parts and related amendments will continue to carry old references.



خوانده شد و مورد تایید است

 <p>I.O.O.C Iranian Offshore Oil Co</p>						
	SPECIFICATION FOR INDUCTION MOTORS					
	Area	Discipline	Document	Scope/Location	Sequence	Rev

6. UNITS OF MEASUREMENTS

The International System (S.I.) shall be adopted for the project. Exception to metric system shall be for conduit size, which shall be expressed in inches.

7. LANGUAGE

All equipment labelling shall be in English. All documentation, drawings and correspondence shall be in English.

8. SERVICE CONDITIONS

The ratings of the equipment shall take full account of the service conditions specified. All heat sources within the enclosures shall be accounted for. The ratings shall be quoted on basis of the equipment being housed in enclosures under natural ventilation conditions.

Unless otherwise specified in the data sheets and / or other requisitioning documents, low-voltage switchgear shall be suitable for use under the following service conditions:

8.1 Environmental Conditions

Environmental conditions shall be as specified in environmental conditions are accordance to environmental design data of project.

The equipment shall be designed for 45°C ambient temperature and 100% maximum relative humidity. Altitude is less than 1000m above sea level.

8.2 ELECTRICAL SYSTEM VARIATIONS

The static electrical system voltage and frequency will not vary more than:

- Voltage : plus or minus 10 percent.
- Frequency : plus or minus 5 percent.

Voltage depressions to 80 % of the nominal system voltage at equipment during motor starting shall have no detrimental effect on equipment operation. Dynamic voltage overshoots to 115 % of the nominal system voltage at equipment terminals for a duration of maximum 5 seconds shall have no detrimental effect on equipment operation.

8.3 System neutral earthing

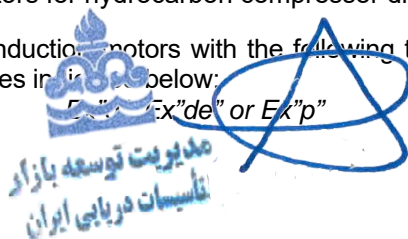
- System earthed through an impedance (or earthing transformer) for HV motors;
- System solidly earthed for all LV motors.

8.4 Area Classification


8.4.1 The applicable hazardous area classification will be indicated on the data sheets. If not specified, the equipment Seller shall contact Buyer to establish the assigned area classification before beginning the design of the equipment.

8.4.2 Motors for use in hazardous areas shall meet the additional requirements as specified in section 5.5. The minimum required explosion protection degree in accordance with the IEC 60079 standards will be indicated on the motor data sheets.
HV motors for hydrocarbon compressor drives shall be Ex'd' or Ex'p' design.

8.4.3 Cage Induction motors with the following types of protection may be permitted to be installed in the zones in the table below:
Zone 1 Ex'd' or Ex'p'



خواننده شد و مورد تایید است

 I.O.O.C Iranian Offshore Oil Co						
	SPECIFICATION FOR INDUCTION MOTORS					
	Area	Discipline	Document	Scope/Location	Sequence	Rev

*Zone 2 Ex"n" or Ex"de" for LV motors & Ex"d" or Ex"p" for HV motors
 For Ex"de" the combination shall be Ex"d" motor with Ex"e" terminal box.*

9. DESIGN AND CONSTRUCTION

9.1 GENERAL

- 9.1.1 All materials and parts included in the construction of the motor or ancillary equipment, shall be new or unused, of current manufacture, of the highest grade, and free from all defects and imperfections likely to affect their performance.
- 9.1.2 The motor shall be the product of a company regularly engaged in the manufacture of motors and shall be of modern design, of proven performance and in regular production at the Seller's place of business.
- 9.1.3 Seller shall only quote motors which have already been successfully type tested in accordance with the relevant IEC standards. Type test reports shall be made available, on Buyer's request, with the bid.
- 9.1.4 The motor shall meet the requirements of this specification in every respect and shall be suitable for continuous operation at full load within the service and environmental conditions under which they will operate.
- 9.1.5 The equipment shall have a design lifetime of at least 25 years.
- 9.1.6 Motors shall be designed for a minimum of 25000 hrs. continuous operation without maintenance.

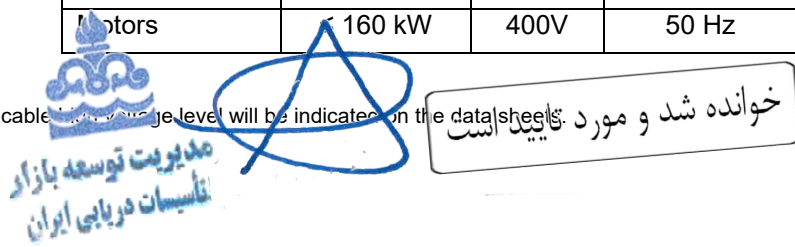
9.2 RATING AND PERFORMANCE

- 9.2.1 Basis for rating and duty
 - 9.2.1.1 Unless otherwise indicated on the data sheets, motors shall be suitable for continuous running duty, type S1 in accordance with IEC 60034-1.
 - 9.2.1.2 Motors shall be fully suitable for starting and driving the equipment as indicated in the data sheet, without any restriction.
 - 9.2.1.3 If motors are destined to drive machines which draw a continuous fluctuating load, the irregularity factor has to be taken into account. The drive system shall have sufficient inertia to limit the variations in motor current to maximum 20 % of rated full load current. Seller shall base his calculations on the tangential effort diagrams prepared by the driven equipment manufacturers.
 - 9.2.1.4 The rated voltage and frequency of the motors shall be as follows:

	Nameplate rating	Voltage	Frequency
Motors	> 160 kW	See note	50 Hz
Motors	≤ 160 kW	400V	50 Hz


Note:

The applicable pollution level will be indicated on the data sheets.



خونده شد و مورد تایید است

مدیریت توسعه بازار
 تأسیسات دریایی ایران

 I.O.O.C Iranian Offshore Oil Co						
	SPECIFICATION FOR INDUCTION MOTORS					
	Area	Discipline	Document	Scope/Location	Sequence	Rev

9.2.1.5 The preferred rated output in kW shall be in accordance with IEC-60072 for motors up to 1000 kW.

9.2.2 Efficiency and power factor

When economically justified, motors with high efficiency and high power factor are preferred.

Machines rated at more than 1 000 kW shall have efficiencies and power factors not less than the following, related to full load operation of the machine:

Efficiency, (%)		Power Factor	
2-pole	4-pole	2-pole	4-pole
96.5	96.6	0.91	0.88

9.2.3 Starting, re-starting and re-acceleration

5.2.3.1 Motors shall be designed for direct-on-line starting or re-acceleration with any voltage between 80% and 100% of the rated voltage applied at the machine terminals, if not indicated otherwise.

5.2.3.2 Unless indicated otherwise on the data sheets, motors shall be suitable for three (3) starts in succession from cold and two (2) starts in succession from hot at 80% of the nominal voltage with the actual external inertia connected and taking the area classification restrictions into consideration.

5.2.3.3 Seller shall indicate on the motor data sheets the normal and maximum allowed running-up time on above mentioned starting conditions based at 80 % and 100 % rated voltage, applied at the motor terminals.

For low voltage motors the initial value of the external (load) inertia used in this calculation may be based on the data given in IEC 60034-12, table III.

For high voltage motors the actual load inertia and driven equipment torque speed characteristics shall be used for the running-up calculations.

5.2.3.4 Torque characteristics shall be such, that motors are able to accelerate (reaccelerate) the load, at any voltage between 80 % and 100 % of the rated voltage and at rated operation conditions applied to the motor terminals


For high voltage machines, started with a korndorffer starting arrangement, other starting requirements will prevail. In these situations the design of the motor together with the korndorffer auto-transformer shall be optimised with respect to the maximum allowable voltage drop at the busbar and the start / re-start performance of the motor.

5.2.3.5 Motors shall be able to re-accelerate under full load conditions following a power interruption not exceeding 0.2 seconds.

5.2.3.6 Starting torque and locked rotor apparent power shall at least be in accordance with IEC 60034-12. The counter torque (at starting) shall not be less than 10% of the full load torque at any point Motor-driven equipment with a torque curve varying as the square of the speed shall, as a minimum, have a starting torque complying with design "N" as per IEC 60034-12.

مدیریت توسعه بازار
 تأسیسات دریایی ایران

خواننده شد و مورد تایید است

 I.O.O.C Iranian Offshore Oil Co						
	SPECIFICATION FOR INDUCTION MOTORS					
	Area	Discipline	Document	Scope/Location	Sequence	Rev

Motor-driven equipment with a constant torque shall, as a minimum, have a starting torque complying with design "H" as per IEC 60034-12.

9.2.4 Rotation

Generally, motors shall be suitable for rotation in both directions. However, when noise limitations require this, a unidirectional fan shall be quoted.

9.2.5 Rotor Shaft Critical Speeds

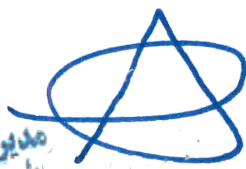
Critical speed of rotors shall not occur between 80 % and 125 % of the rated motor speed. Rigid rotor designs are preferred with the first critical speed over 125 % of the rated speed.

9.2.6 Vibration


5.2.6.1 Motors shall be dynamically balanced. The use of solder or similar deposits is not acceptable. Parent metal removed to achieve dynamic or static balance shall be drilled out in a manner which maintains the structural integrity of the rotor. All motors shall have provisions for future balance adjustments.

5.2.6.2 Test shall be performed with motor running at rated speed and at no load. Vibration level measuring instrument frequency range shall be from 10 - 1000 Hz in accordance with ISO 2954.

5.2.6.3 Vibration severity shall not exceed the values given in table 1 of IEC 60034-14 for grade N (normal) vibration. Balancing and measurement of vibration severity shall be done with a half key fitted in the key way. Rotors and fans shall be individually balanced before the assembly is balanced.



خوانده شد و مورد تایید است

 I.O.O.C Iranian Offshore Oil Co						
	SPECIFICATION FOR INDUCTION MOTORS					
	Area	Discipline	Document	Scope/Location	Sequence	Rev

9.3 DESIGN REQUIREMENTS

9.3.1 Frame

- 5.3.1.1 Motors shall have IEC frame size in accordance with Publication IEC-60072-1 and IEC-60072-2. Proven standard design of Seller is only acceptable after Buyer's approval, however, motors with end-shield bearings and only one shaft end extension (IM V1 and IM B3 types) are preferred.
- 5.3.1.2 All motors shall be designed for bolting to a foundation or sole plate to facilitate removal and replacement of the complete motor.
- 5.3.1.3 The motor data sheet shall indicate the mounting method, i.e. horizontal, vertical, foot or flange, using IEC designations.
- 5.3.1.4 When air filters are mounted on the motors, these must be installed for easy maintenance or replacement while nearby machines are running and without the necessity of taking the machine apart.
- 5.3.1.5 Ferrous materials for construction of motor frames and end shields are preferred. Ferrous materials shall be used for all HV motors.
- 5.3.1.6 Corrosion-resistant bolts shall be used for all applications external to motor enclosure.
- 5.3.1.7 Coating and surface material finish shall be suitable for offshore conditions

9.3.2 Enclosure degree of protection

9.3.2.1 The minimum enclosure degree of protection according to IEC 60529 shall be:

- Machine and bearing house : IP-55
- Terminal boxes : IP-55
- Auxiliary boxes : IP-65

9.3.2.2 Weather-proofing of terminal boxes shall be provided by a neoprene or equivalent material gasket of the retained type. Flameproof type Ex'd' boxes may utilise an approved grease applied to the flange surfaces.


9.3.2.3 Bearing housings, especially for vertical machines with upwards drive-end shaft, (mounting arrangement IM V3 and IM V6 to IEC 60034-7) shall be sealed to prevent water entry to the machine via the shaft. Water and dirt collecting on the upper bearing end-shield shall not reduce performance or lifetime of the machine.

9.3.2.4 Motors shall be provided with drain holes at locations where water may collect in accordance with IEC 60034-5 at the bottom of the motor enclosure. Special attention shall be given to the location of the drain hole for vertical motors. Drain holes shall be in compliance with the explosion protection requirements.

9.3.3 Cooling methods



خوانده شد و مورد تایید است


 I.O.O.C Iranian Offshore Oil Co						
	SPECIFICATION FOR INDUCTION MOTORS					
	Area	Discipline	Document	Scope/Location	Sequence	Rev

- 9.3.3.1 The motor shall be totally enclosed air cooled. The selected cooling method, either IC-4A1A1, IC-5A1A1 or IC-6A1A1 in accordance with IEC 60034-6, will be indicated in the requisitioning documents. Preference shall be given to air-to-air cooling by a shaft driven fan.
- 9.3.3.2 The flow of cooling air shall be such that it is exhausted in the direction of the driving end of the motor.
- 9.3.3.3 Deleted.
- 9.3.4 Windings
- 5.3.4.1 All HV motors shall have their windings star connected. Star connected windings are preferred for all LV motors.
- 5.3.4.2 Insulated neutral end terminations shall not be brought out unless specified otherwise on the Motor Data Sheets.
- 5.3.4.3 Differential protection shall be provided on machines with rated outputs in excess of 3 500 kW. Machines equipped with differential protection shall have the star point connections brought out to a star-point terminal box.
- 5.3.4.4 Stator windings of HV motors shall be pre-formed, resin-varnish-impregnated, pressed, baked and inserted into the stator slots. The completed stator shall then be resin-varnish-impregnated and baked.
- The vacuum/pressure-impregnated method is an acceptable alternative for series-constructed motors.
- For motors for voltages of 6 kV and above, the main insulation material shall be mica. All coils shall have anti-corona protection, achieved using a semi-conducting tape, in the slot part of the coil. Where the rated voltage is in excess of 7 kV, all coils shall, in addition to anti-corona protection, have stress grading.
- 5.3.4.5 All insulation materials shall be class F in accordance with IEC 60034-18. The rating of the motor shall be based on a class B temperature rise of all parts of the motor windings.
- 5.3.4.6 Material for stator slot wedges shall be non-magnetic.
- 9.3.5 Winding temperature protection
- If not stated otherwise in the requisitioning documents, all fixed speed motors in excess of 1000 kW and all variable speed drive (VSD) controlled motors shall be provided with embedded temperature detectors in order to monitor the stator winding temperature. At least six detectors shall be installed in the machine, two for each stator phase. The detectors shall be PT-100 platinum resistance elements in accordance with IEC 60751. The elements shall be wired to a separate terminal box mounted on the machine frame. The terminals and control amplifier shall be suitable for 3-wire or 4-wire systems.

Seller shall confirm whether the insulation system is such that no over-voltage surge arrestors are required for the elements. If this cannot be confirmed by Seller, RTD elements shall be provided with short-circuit type over-voltage surge diverters installed in the auxiliary terminal box.

مدیریت توسعه بازار
تأسیسات دریایی ایران

خواننده شد و مورد تایید است

 <p>I.O.O.C Iranian Offshore Oil Co</p>						
	SPECIFICATION FOR INDUCTION MOTORS					
	Area	Discipline	Document	Scope/Location	Sequence	Rev

9.3.6 Terminal boxes

5.3.6.1 The terminal box shall either be located at the top or at the right hand side of the machine facing the driving end. The terminal box shall be able to rotate 90° and 180°.

5.3.6.2 In view of the maximum acceptable voltage drop, de-rating as result of bunching, ambient temperature and short-circuit rating of the system, the prescribed cable size or the number of cables can be twice that considered normal by Seller. Consequently a larger terminal box than standard may be required.

5.3.6.3 The terminals and the cable gland or pot head shall be sized for the supply cable specified on the motor data sheet. The boxes shall be designed such that small parts cannot pass into the motor frame

5.3.6.4 All glands for use in zone 1 or 2 areas shall be Ex certified type, metric threaded, suitable to accept armoured cables. Not used cable entries shall be closed with plugs, in compliance with the degree of protection specified.

5.3.6.5 The terminals shall be clearly and permanently marked in accordance with Publication IEC 60034-8. Terminals in auxiliary boxes shall be clearly and permanently marked to correspond with the identification of the leads connected to the various motor accessories.

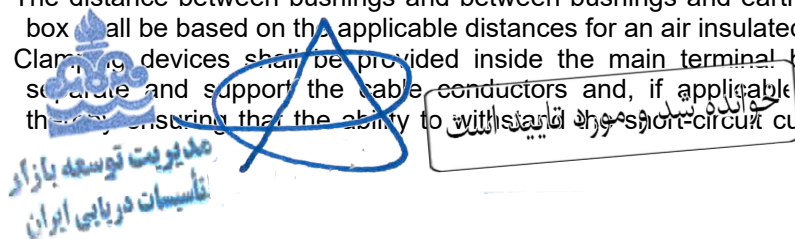
5.3.6.6 The main terminal box for HV motors and, if applicable, the star point box shall be made of steel. Cast iron is not acceptable. The main terminal box shall be of a non-compound filled design.

5.3.6.7 Main terminal boxes shall include the following features:


- a) Where single core supply cables are used, all gland plates and glands shall be of non-magnetic materials.
- b) The lowest part of the terminal box, including cable gland and other miscellaneous parts, shall not be lower than the lowest part of the machine.
- c) If applicable, the starpoint box shall be located at the opposite side of the machine from the main terminal box, and shall be sized to accommodate the current transformers for differential protection.
- d) Bushings and insulators shall be rated for the rated machine voltage and shall be able to withstand the dynamic and thermal effects of a through going short-circuit current for at least 0.2 seconds. The expected short-circuit current shall be based on the maximum supply fault level specified in the requisition.
- e) Cable termination materials, e.g. cable lugs, stress-relieving materials and other terminating components are excluded from the Sellers scope of supply.

5.3.6.8 In addition to above, main terminal boxes for HV motors shall also include the following features:

- a) The products of an electrical breakdown within the terminal box shall be relieved through a pressure relief diaphragm to the outside of the box. (This does not apply to Ex'd' terminations)
- b) Pressure relief shall be arranged and located such that the potential for injury to personnel is minimized.
- c) The distance between bushings and between bushings and earthed parts of the terminal box shall be based on the applicable distances for an air insulated installation.
- d) Clamping devices shall be provided inside the main terminal box of HV machines to separate and support the cable conductors and, if applicable, the winding end-tails, thereby ensuring that the ability to withstand short-circuit current will be maintained



 وزارت انرژی جمهوری اسلامی ایران

 I.O.O.C Iranian Offshore Oil Co						
	SPECIFICATION FOR INDUCTION MOTORS					
	Area	Discipline	Document	Scope/Location	Sequence	Rev

after completion of the non-compound filled type of termination. Materials used for clamping devices shall be non-hygroscopic.

9.3.7 Anti-condensation heaters

5.3.7.1 All HV motors shall be provided with heating devices to prevent condensation during periods of idleness. Space heaters for LV motors shall be provided by Seller when the design lifetime under the specified environmental conditions can not be guaranteed. LV motor designs without space heaters are preferred.

5.3.7.2 Heaters shall be of a fully insulated design.

5.3.7.3 Heaters shall be arranged to provide uniform heating of the stator and, if applicable, rotor windings and shall maintain the temperature of the machine windings at approximately 5 °C above ambient temperature.

5.3.7.4 The surface temperature of the heater element or the machine enclosure shall not exceed the limiting temperature specified.

5.3.7.5 The connecting leads of the heater elements shall be brought out to terminals in a separate heater terminal box mounted on the machine frame. Alternatively, the space heater auxiliary terminals may be completely segregated from the motor main terminals, in a separate compartment. A prominent warning label shall be provided to indicate that the circuit may be live when the motor is stationary.

5.3.7.6 The supply voltage and frequency shall be as stated on the data sheets.

9.3.8 Bearings and lubrication

5.3.8.1 Motors shall be equipped with ball and/or roller bearings. When stated on the data sheet or when confirming with Seller's standards, sleeve bearings may be offered.

5.3.8.2 Vertical motors shall have thrust bearings, with adequate thrust capacity to handle up and down thrust imposed by the driven equipment.

5.3.8.3 The responsibility of providing the correct bearings to suit the motor type and application shall rest with the motor Seller.

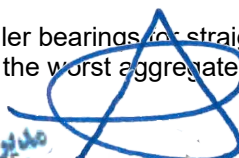
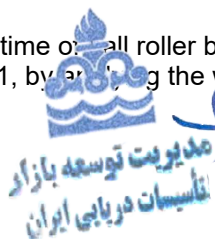
5.3.8.4 Within the application limits, all motors shall preferably be equipped with two pre packed and sealed grease lubricated ball bearings.

5.3.8.5 Lubricating grease shall be lithium based.


5.3.8.6 Ball bearings shall have C3 internal radial clearance. Roller bearings may have a normal or C3 internal radial clearance.

5.3.8.7 Ball and roller bearings shall have a rated L10 life time for at least 40,000 hours and construction of the bearing housings shall be such that re-lubrication, if required, can be carried out without stopping the motor.

The lifetime of all roller bearings for straight coupled motors shall be calculated in accordance with ISO 281, by applying the worst aggregate of manufacture dimensional tolerances.



خوانده شد و مورد تایید است

 I.O.O.C Iranian Offshore Oil Co						
	SPECIFICATION FOR INDUCTION MOTORS					
	Area	Discipline	Document	Scope/Location	Sequence	Rev

5.3.8.8 The minimum lubrication intervals shall be 4,000 hours for horizontal motors and 2,000 hours for vertical motors. The re-greasing interval calculations shall be based on an ambient temperature of 40°C whereby the actual bearing temperature at rated load should be considered.

5.3.8.9 Grease lubricated motors with re-lubrication facilities shall have a grease relief device to the outside of the motor.

5.3.8.10 Suitable seals shall be provided to prevent the ingress of foreign matter into the bearings and, to prevent the loss of lubricant from the bearings.

5.3.8.11 Where sleeve bearings are fitted, it is preferred that they are executed with thrust or location bearings. When this design cannot be met the Seller shall state on the data sheets the maximum permitted end float and shall provide durable markings on the motor shaft to indicate the maximum float limits and the correct running position.

5.3.8.12 Sleeve bearings shall preferably be provided with oil-ring lubrication. For larger motors force-feed oil lubrication shall be considered. When bearings need forced cooling this system shall, if possible, be combined with the driven equipment lubrication system.
If a combined lubrication system is not possible, the motor manufacturer shall supply the lubrication unit required.

5.3.8.13 To prevent damage to bearings by shaft circulating currents the non-drive end bearing shall be electrically insulated from the motor frame, or base plate, if the induced voltage measured between shaft ends, when the machine is running idle at rated voltage and speed, exceeds the following values:

- 250 mV rms, ball and roller bearings
- 400 mV rms, sleeve bearings

The bearing insulation resistance shall not be less than 1 megohm when measured with a 500 V megger. Provisions shall be made to permit regular measurements of the bearing insulation resistance without disassembling the motor or removing it from its base.

Insulated bearings will be provided only with HV motors.

A warning nameplate shall be fitted near the insulated bearing to read:

“BEARING MUST BE KEPT INSULATED”

5.3.8.14 Bearing temperature detectors shall be provided for large motors when indicated on the motor data sheets. The detectors shall be platinum resistance thermometer elements (PT 100)

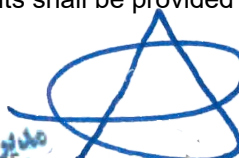
9.3.9 Lifting facilities

Each motor weighing in excess of 25 kg shall be provided with lifting eye bolts or lugs to enable the secure and stable uplift of the motor unit. Blind tapped holes are not acceptable.


9.3.10 Jacking bolts

Vertical lift jacking bolts shall be provided in the base of all foot mounted motors weighing 500 kg or more.

9.3.11 Air inlet screens



خوانده شد و مورد تایید است

 I.O.O.C Iranian Offshore Oil Co						
	SPECIFICATION FOR INDUCTION MOTORS					
	Area	Discipline	Document	Scope/Location	Sequence	Rev

Air inlet screens shall be made of corrosion resistant materials. Mesh wire of galvanised steel is not acceptable.

9.3.12 Earthing

Motors shall have an external earthing connection with a corrosion resistant stud or tapped pad on its frame at the same side as the main cable connection box. Inside the terminal box an earthing clamp or bolt of adequate dimensions shall be provided for connection of the cable earthing. The earthing facility shall be clearly marked with the appropriate symbol.

Bolted earth connections shall be made with corrosion-proof materials with spring washers and/or locknuts.

9.4 Noise level

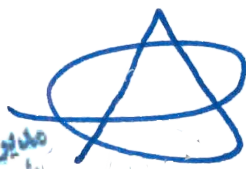
5.4.1 The sound pressure level of loaded low voltage motors shall not exceed 77 dB(A) in the work area. The sound pressure level of loaded high voltage motors shall not exceed 82 dB(A) in the work area) (Reference $2 \times 10^{-5} \text{ N/m}^2$ at 1 metre distance). More stringent requirements may be indicated in the requisitioning documents. The measuring method shall be in accordance with ISO 1680-2.

However, if the machine produces noise with tonal components, the maximum sound pressure levels shall be 5 dB(A) less as specified in the data sheet.


Note:

A tonal component is considered to exist if the level of any octave band exceeds the level of the adjacent bands by 5 dB with the sound meter set to linear response.

5.4.2 Motors shall meet the maximum allowable noise limits by design and not by corrective measures. However, if this is not possible, Seller shall quote a noise limiting cover/enclosure as an option for his standard noise limiting fan.



خوانده شد و مورد تایید است

 I.O.O.C Iranian Offshore Oil Co						
	SPECIFICATION FOR INDUCTION MOTORS					
	Area	Discipline	Document	Scope/Location	Sequence	Rev

9.5 Additional requirements for machines in hazardous areas

9.5.1 Certificates

It is the Seller's responsibility to ensure that all electrical equipment, materials and associated wiring within their supply conform to the requirements for the specified area in which the equipment is to operate. The Seller shall provide certificates from a recognised testing authority for all equipment specified for operation in a zone 1 and zone 2 hazardous areas.

For Type 'n' machines a Certificate of Conformity shall be supplied, except that, subject to the prior approval of Buyer, a Declaration of Compliance may be issued by the Seller.

9.5.2 Bonding straps

Machines shall be fitted with bonding straps across joints within or between the main enclosure, the bed plate and the heat exchanger. Bonding across the main frame and terminal box is necessary unless the Seller can demonstrate the absence of circulating current effects. Internal steelwork, e.g. air guides, shall be such that no sparking can occur across joints.

9.5.3 Requirements for machines of Type of Protection 'e'

The machine shall comply with IEC 60079-7. Listed below are the options to be selected where IEC 60079-7 gives alternatives:

- wire insulation used for machine windings shall comply with IEC 317 and be tested in accordance with IEC 60851;
- winding and rotor temperatures shall under no operating condition exceed the limiting temperature determined by the temperature group applicable - usually T3
- winding temperatures shall not exceed the maximum temperatures specified for Class B insulation materials as specified in table 5 of IEC 60079-7;
- the t_g time shall be at least 5 seconds;
- testing of all thermal characteristics of the motor shall be carried out in accordance with Appendix B of IEC 60079-7.

For machines equipped with noise reduction measures, the certification procedure shall take this into account.

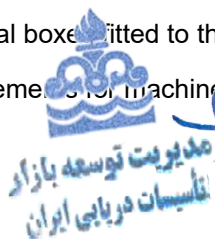
9.5.4 Requirements for machines of Type of Protection 'd'

5.5.4.1 The machine shall comply with IEC 60079-1. Listed below are the options to be selected where IEC 60079-1 gives alternatives:


- A flameproof gland shall be provided wherever a shaft passes through the wall of a flameproof enclosure.
- The length of flame path in a flameproof shaft entry associated with a sleeve bearing shall not be less than the diameter of the shaft or 25 mm, whichever is lower.
- For shafts fitted with ball or roller bearings, the radial clearance in the flameproof shaft entry shall not exceed the maximum diametrical clearance allowed for shaft entries used with sleeve bearings.

5.5.4.2 Terminal boxes fitted to the motor shall have type of protection 'e'.

9.5.5 Requirements for machines of Type of Protection 'p'




خواننده شد و مورد تایید است

 I.O.O.C Iranian Offshore Oil Co						
	SPECIFICATION FOR INDUCTION MOTORS					
	Area	Discipline	Document	Scope/Location	Sequence	Rev

- 5.5.5.1 The machine shall comply with IEC 60079-2.
- 5.5.5.2 For machines with type of protection 'p' the temperature limitations specified in clause 7.10 of IEC 60034-1 shall apply. However, the temperature of any surface to which the potentially explosive atmosphere has access under normal operating conditions shall not exceed the limiting temperature of temperature group T3.
- 5.5.5.3 Terminal boxes fitted to the machine shall be of type of protection 'e' or 'p'
- 5.5.5.4 A minimum over-pressure of 0.05 kPa shall be maintained relative to the external atmospheric pressure at every point within the enclosure.
- 9.5.6 Requirements for machines of Type of Protection 'n'
- 5.5.6.1 The machine shall comply with IEC 60079-15.
- 5.5.6.2 For machines used in Zone 2 areas the same temperature limitations apply as for machines in non-hazardous areas.
- 5.5.6.3 In addition, to prevent thermal ignition, the temperature of any external or internal surface to which the potentially explosive atmosphere has access shall not exceed the limiting temperature of Class T3 temperature group under normal operating conditions.
- 5.5.6.4 Auxiliary devices mounted on the machine for protective, alarm or other purposes shall comply with the appropriate standard for the type of protection of electrical equipment used in hazardous areas.
- 5.5.6.5 The equipment shall be suitable for an area characterized by class T3 temperature group and class IIA gas group, unless otherwise specified.

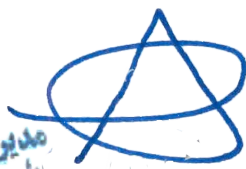


خوانده شد و مورد تایید است


 I.O.O.C <i>Iranian Offshore Oil Co</i>					
	SPECIFICATION FOR INDUCTION MOTORS				
	Area	Discipline	Document	Scope/Location	Sequence

10. INSPECTION AND TESTING

- 6.1 In general, all motors shall be routine tested in accordance with the applicable IEC standards.
- 6.2 If not otherwise stated in the requisition, the IEC 60034-1 schedule of tolerances will be applied on performance characteristics.
- 6.3 The intention of witnessing the tests and eventual supplementary inspection items will be specified in the requisition.

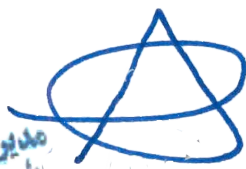


خوانده شد و مورد تایید است


 I.O.O.C <i>Iranian Offshore Oil Co</i>					
	SPECIFICATION FOR INDUCTION MOTORS				
	Area	Discipline	Document	Scope/Location	Sequence

11. CORROSION PROTECTION

- 7.1 All motor parts shall be adequately protected against corrosion, based upon the environmental conditions specified in section 4.
- 7.2 Surface preparation and painting shall be seller's standard for the applicable environmental conditions. Seller shall submit in his quotation his standard surface preparation and painting system for Buyer's review.
- 7.3 Colour of top coat shall be seller's standard unless a specific colour is specified on the motor data sheet.



خوانده شد و مورد تایید است


 I.O.O.C Iranian Offshore Oil Co					
	SPECIFICATION FOR INDUCTION MOTORS				
	Area	Discipline	Document	Scope/Location	Sequence

12. MARKING

- 8.1 Marking shall be on stainless-steel rating plates securely fastened to a non-removable part of the frame on a well-visible and accessible place.
- 8.2 The rating plate shall show at least the appropriate information as required as per IEC 60034-1.
- 8.3 Motors suitable for use in hazardous areas shall bear the marking as required per IEC 60079-0.
- 8.4 For motors to be used in hazardous areas the following additional information shall be provided:
- a) type of protection of the following components to IEC 60079:
 - machine;
 - terminal box;
 - auxiliary devices
 - b) Temperature class and gasgroup
 - c) Testing authority name and certificate no.
 - d) For motors with 'e' type protection the te time
 - e) For motors with 'd' type protection any information essential to ensuring the flameproof integrity of the enclosure
 - f) For motors with 'p' type protection, the minimum and maximum pressure during operation, or the minimum flow rate of protective gas, the internal free volume, and the minimum volume of protective gas necessary for purging the enclosure.

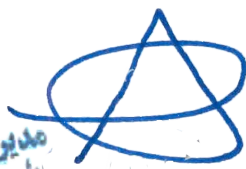


خوانده شد و مورد تایید است

 I.O.O.C <i>Iranian Offshore Oil Co</i>					
	SPECIFICATION FOR INDUCTION MOTORS				
	Area	Discipline	Document	Scope/Location	Sequence

13. SELLER DOCUMENTATION

9.1 Seller shall, as a minimum, provide all information as stated on the "Requirements for Document" form, which is an integral part of the requisition.



خوانده شد و مورد تایید است