

# Supplementary Specification to API Standard 614 for Lubrication and Oil-control Systems and Auxiliaries

**NOTE** This version (S-744J) of the specification document provides the justification statements for each technical requirement, but is otherwise identical in content to S-744.

#### Revision history

VERSION	DATE	PURPOSE
1.0	April 2024	First Edition

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## Acknowledgements

This IOGP Specification was prepared by a Joint Industry Programme 33 Standardization of Equipment Specifications for Procurement organized by IOGP with support by the World Economic Forum (WEF).

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## Foreword

This specification was prepared under Joint Industry Programme 33 (JIP33) "Standardization of Equipment Specifications for Procurement" organized by the International Oil & Gas Producers Association (IOGP) with the support from the World Economic Forum (WEF). Companies from the IOGP membership participated in developing this specification to leverage and improve industry level standardization globally in the oil and gas sector. The work has developed a minimized set of supplementary requirements for procurement, with life cycle cost in mind, resulting in a common and jointly agreed specification, building on recognized industry and international standards.

Recent trends in oil and gas projects have demonstrated substantial budget and schedule overruns. The Oil and Gas Community within the World Economic Forum (WEF) has implemented a Capital Project Complexity (CPC) initiative which seeks to drive a structural reduction in upstream project costs with a focus on industry-wide, non-competitive collaboration and standardization. The CPC vision is to standardize specifications for global procurement for equipment and packages. JIP33 provides the oil and gas sector with the opportunity to move from internally to externally focused standardization initiatives and provide step change benefits in the sector's capital projects performance.

This specification has been developed in consultation with a broad user and supplier base to realize benefits from standardization and achieve significant project and schedule cost reductions.

The JIP33 work groups performed their activities in accordance with IOGP's Competition Law Guidelines (November 2020).

## Table of Contents

Foreword.....	1
Introduction .....	4
1 Scope .....	6
2 Normative References.....	6
3 Terms, Definitions, Acronyms, and Abbreviations .....	7
3.1 Terms and Definitions .....	7
3.2 Acronyms and Abbreviations .....	7
4 System Configuration (How to Use This Standard to Specify an Oil System) .....	8
6 Design .....	8
6.2 System Selection .....	8
6.3 Pressure Design Code .....	12
6.4 Welding .....	12
6.5 Baseplates.....	13
6.6 Oil Reservoirs.....	13
6.7 Pumps and Pump Drivers .....	18
6.8 Lube-oil Heat Exchangers.....	21
6.9 Filters.....	24
6.10 Transfer Valves .....	26
6.11 Accumulators.....	27
6.12 Overhead Tanks.....	29
7 Piping.....	29
7.1 General.....	29
7.2 Lubricating, Control, and Seal-oil Piping.....	35
7.3 Instrument Piping and Tubing .....	35
8 Instrumentation, Control, and Electrical Systems .....	36
8.1 General.....	36
8.2 Alarm, Shutdown, and Control Systems .....	37
8.3 Instrumentation.....	38
8.4 Electrical Systems .....	42
8.5 Control Panels.....	42
8.6 Grounding.....	43
9 Inspection, Testing, and Preparation for Shipment .....	43
9.2 Inspection .....	43
9.3 Testing.....	44
9.5 Package Markings and Shipping Documentation .....	45
10 Vendor's Data .....	46
10.1 General.....	46

10.2 Documentation .....46

10.4 Contract Data .....46

10.5 Nameplates and Tagging .....47

Bibliography .....49

List of Tables

Table 12—Lube-oil Cooler Materials for Salt or Brackish Water Service.....22

Table 3—Minimum Requirements for Piping Materials—Auxiliary Process Fluid.....29

Table 5—Minimum Requirements for Piping Materials—Cooling Water .....30

Table 13—Minimum Piping and Tubing Materials for Lubricating and Control-oil Systems in Offshore and Coastal Locations .....30

## Introduction

The purpose of the IOGP S-744 specification documents is to define a minimum common set of requirements for the procurement of lubrication and oil-control systems and auxiliaries in accordance with API Standard 614, 6<sup>th</sup> Edition, February 2022, Lubrication, Shaft-sealing, and Oil-control Systems and Auxiliaries for application in the petroleum and natural gas industries.

The IOGP S-744 specification documents follow a common structure (as shown below) comprising a specification, also known as a technical requirements specification (TRS), a procurement data sheet (PDS), an information requirements specification (IRS) and a quality requirements specification (QRS). These four specification documents, together with the purchase order, define the overall technical specification for procurement.



### **JIP33 Specification for Procurement Documents Supplementary Technical Requirements Specification (TRS)**

This specification is to be applied in conjunction with the supporting PDS, IRS and QRS as follows.

#### **IOGP S-744: Supplementary Specification to API Standard 614 for Lubrication and Oil-control Systems and Auxiliaries**

This specification defines the technical requirements for the supply of the equipment and is written as an overlay to API 614, following the API 614 clause structure. Clauses from API 614 not amended by this specification apply as written.

Modifications to API 614 defined in this specification are introduced by a description that includes the type of modification (i.e. Add, Replace or Delete) and the position of the modification within the clause.

**NOTE** Lists, notes, tables, figures, equations, examples and warnings are not counted as paragraphs.

### **IOGP S-744D: Procurement Data Sheet for Lubrication and Oil-control Systems and Auxiliaries (API)**

The PDS defines application-specific requirements. The PDS is applied during the procurement cycle only and does not replace the equipment data sheet. The PDS may also include fields for supplier-provided information required as part of the purchaser's technical evaluation. Additional purchaser-supplied documents may also be incorporated or referenced in the PDS to define scope and technical requirements for enquiry and purchase of the equipment.

### **IOGP S-744L: Information Requirements for Lubrication and Oil-control Systems and Auxiliaries (API)**

The IRS defines information requirements for the scope of supply. The IRS includes information content, format, timing and purpose to be provided by the supplier, and may also define specific conditions that invoke the information requirements.

### **IOGP S-744Q: Quality Requirements for Lubrication and Oil-control Systems and Auxiliaries (API)**

The QRS defines quality management system requirements and the proposed extent of purchaser conformity assessment activities for the scope of supply. Purchaser conformity assessment activities are defined through the selection of one of four generic conformity assessment system (CAS) levels on the basis of evaluation of the associated service and supply chain risks. The applicable CAS level is specified by the purchaser in the PDS or in the purchase order.

The specification documents follow the editorial format of API 614 and, where appropriate, the drafting principles and rules of ISO/IEC Directives Part 2.

The PDS and IRS are published as editable documents for the purchaser to specify application specific requirements. The TRS and QRS are fixed documents.

The order of precedence of documents applicable to the supply of the equipment, with the highest authority listed first, shall be as follows:

- a) regulatory requirements;
- b) contract documentation (e.g. purchase order);
- c) purchaser-defined requirements (e.g. PDS, IRS and QRS);
- d) this specification;
- e) API 614.

## 1 Scope

### Add to section

This specification covers the minimum requirements for lubrication systems, oil-control systems and auxiliaries for special-purpose (unsparred equipment in critical service) applications.

Requirements related specifically to oil-film type shaft sealing systems, dry gas seal systems and fuel systems have not been addressed or modified in this specification.

General-purpose lube-oil systems are covered by the system configuration codes in API 614, Table 2 supplemented with the PDS to address API 614 requirements starting with a bullet (●).

### *Justification*

*With rare exceptions, all new centrifugal compressors and expanders are now equipped with dry gas seals. Many old machines are upgraded by converting original wet seals with dry gas seals. Dry gas seals are excluded from API 614 and are now covered by API 692. Sections 6.12.3, 6.13 and 6.14 of this specification are mapped as per API 614 but assigned as no action in the gap analysis. Following completion of the gap analysis and to increase standardization, it was concluded that general-purpose systems would be covered by a PDS-only specification, with an IRS and a QRS.*

## 2 Normative References

### Add to first paragraph

The following documents are referred to in this specification, the PDS (IOGP S-744D) or the IRS (IOGP S-744L) in such a way that some or all of their content constitutes requirements of these specification documents.

### Add to section

API Recommended Practice 582, *Welding Guidelines for the Chemical, Oil, and Gas Industries*

ASTM A312/A312M, *Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes*

ASTM A790/A790M, *Standard Specification for Seamless and Welded Ferritic/Austenitic Stainless Steel Pipe*

ASTM A815/A815M, *Standard Specification for Wrought Ferritic, Ferritic/Austenitic, and Martensitic Stainless Steel Piping Fittings*

EN 13445 (all parts), *Unfired pressure vessels*

IEC 60034-1, *Rotating electrical machines – Part 1: Rating and performance*

IEC 60085, *Electrical insulation – Thermal evaluation and designation*

IOGP S-703, *Supplementary Specification to IEC 60034-1 Low Voltage Three Phase Cage Induction Motors*

IOGP S-705, *Supplementary Specification to API Recommended Practice 582 Welding Guidelines for Welding of Pressure Containing Equipment and Piping*

IOGP S-715, *Supplementary Specification to NORSOK M-501 Coating and Painting for Offshore, Marine Coastal and Subsea Environments*



IOGP S-716:2021, *Specification for Small Bore Tubing and Fittings*

IOGP S-733D, *Procurement Data Sheet for Low Voltage Motors (IEEE Std 841)*

ISO 10474, *Steel and steel products — Inspection documents*

ISO 12944-2, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 2: Classification of environments*

ISO 12944-9, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 9: Protective paint systems and laboratory performance test methods for offshore and related structures*

NEMA 250, *Enclosures for Electrical Equipment (1000 Volts Maximum)*

NFPA 70, *National Electrical Code*

### 3 Terms, Definitions, Acronyms, and Abbreviations

#### 3.1 Terms and Definitions

##### 3.1.30

##### **observed**

Delete term 3.1.30

##### 3.1.56

##### **witnessed**

Replace definition with

Point, in the chain of activities, at which the vendor notifies the purchaser or purchaser's representative before the operation or process.

NOTE The operation or process may proceed without witness if the purchaser does not attend after the agreed notice period.

Add new term 3.1.57

##### 3.1.57

##### **onshore**

Inland installations sited more than 1 km (0,6 miles) from shore.

#### 3.2 Acronyms and Abbreviations

Add to section

CAS conformity assessment system

IRS information requirements specification

PDS procurement data sheet

QRS quality requirements specification

TRS technical requirements specification

## 4 System Configuration (How to Use This Standard to Specify an Oil System)

### 4.8

Replace second sentence with

The lube-oil systems shall conform to the diagrams of typical complete lubrication and control-oil systems provided in Annex H and as listed in Table 2, as a minimum.

#### *Justification*

*These diagrams form a good basis for reviewing the vendor's system P&IDs.*

## 6 Design

### 6.2 System Selection

#### 6.2.8

Replace "the purchaser" with

the vendor having unit responsibility

#### *Justification*

*It is standard industry practice for the vendor having unit responsibility to specify the characteristics of the oil for the common oil system with agreement from all vendors supplying equipment in the equipment train. It should not be the purchaser's responsibility.*

#### 6.2.13

Delete "If specified."

#### *Justification*

*This requirement provides sufficient access for operation and maintenance.*

Add new section

##### 6.2.13.1

Clearance between the outside rim of a valve handwheel or the end of a valve handle and an obstacle located within the field of travel of the handwheel or the handle shall be at least 75 mm (3 in.).

#### *Justification*

*This requirement provides access for operation and maintenance.*

Add new section

##### 6.2.13.2

For valves installed in ambient temperature applications below 0 °C (32 °F), clearance between insulated valves and other piping items shall be at least 50 mm (2 in.).

### **Justification**

*Minimum clearance (i.e. the total gap to be equal to insulation thickness plus 50 mm) provides clearance needed in cold weather climates to allow for insulation.*

#### Add new section

#### **6.2.13.3**

Clearance between the back of the valve handle and insulation on the line shall be at least 75 mm (3 in.).

### **Justification**

*This requirement provides access for operation and maintenance by ensuring that clearance between the pipe insulation and the valve handle is allowed for.*

#### Add new section

#### **6.2.13.4**

Blind flanges heavier than 50 kg (100 lbs) shall be oriented vertically.

### **Justification**

*Heavy vertically oriented blind flanges are easier to handle than horizontally oriented blind flanges.*

#### Add new section

#### **6.2.13.5**

Clearance around automated valve actuators shall be at least 300 mm (12 in.).

### **Justification**

*This requirement provides increased clearance around valve actuators as these items are likely to require more space for maintenance or replacement.*

#### Add new section

#### **6.2.13.6**

Valve handles in the open position and in the closed position shall be between 150 mm (6 in.) and 1980 mm (6 ft 6 in.) from ground or platform level.

### **Justification**

*This requirement provides sufficient access for operation. The reservoir can be raised to meet the low-level requirement of 150 mm (6 in.) for the low-point drain valve handles. A portable step ladder can be used to access high-level valve handles.*

#### Add new section

#### **6.2.13.7**

Junction boxes shall be installed with the horizontal centerline of the box at least 1 m (40 in.) above ground level or above the permanent access platform.

### ***Justification***

*This requirement provides sufficient access for maintenance and cable installation without excessive cable bending.*

### **Add new section**

#### **6.2.13.8**

For equipment that requires removal using mobile hoisting equipment, vertical clearance and access shall be shown on the general arrangement drawing of the lube-oil skid.

### ***Justification***

*This requirement provides the information needed by the plant layout design for safe access for removal of equipment for maintenance.*

### **Add new section**

#### **6.2.13.9**

Clearance around components that require access for maintenance and inspection shall be at least 800 mm (30 in.).

### ***Justification***

*This requirement provides an easy path with a clearance of 800 mm which is considered sufficient for access to components requiring maintenance and inspection.*

### **Add new section**

#### **6.2.13.10**

Equipment shall be accessible from ground level or from a permanent platform.

### ***Justification***

*This requirement provides safe access without a ladder for operation and maintenance.*

### **Add new section**

#### **6.2.13.11**

Permanent access platforms with guardrails shall be supplied complete with the following:

- permanently installed stairs with guardrails; or
- permanently installed ladders with guardrails.

### ***Justification***

*This requirement provides safe access for operation and maintenance.*

Add new section

**6.2.13.12**

The horizontal reach to access components from a platform shall be less than or equal to 510 mm (20 in.).

**Justification**

*A horizontal reach of 510 mm is considered the maximum distance to provide safe access for operation and maintenance as it is less than an average arm length.*

Add new section

**6.2.13.13**

Drain valve connections shall be provided with clearance for rodding out devices.

**Justification**

*This requirement provides easy access for maintenance by allowing for a standard clearance for rodding out devices.*

Add new section

**6.2.13.14**

Clearance between the outside surface of the piping insulation system and adjacent equipment or structural members shall be at least 75 mm (3 in.).

**Justification**

*A clearance of 75 mm between pipework and adjacent equipment or structural members is considered necessary as this is 25 mm more than is required between adjacent pipework and tubing. Equipment and structural members are bulkier than pipework and tubing.*

Add new section

**6.2.13.15 Cleaning and flushing connections**

**6.2.13.15.1**

Cleaning and flushing connections of strainers shall be provided with clearance for rodding out devices and for connections of hoses.

**Justification**

*This requirement facilitates the use of rodding out devices and for connections of hoses for flushing by providing a standard clearance of usually 1 m.*

**6.2.13.15.2**

Cleaning and flushing connections of filters shall be provided with clearance for rodding out devices and for connections of hoses.

**Justification**

*This requirement facilitates the use of rodding out devices and for connections of hoses for flushing by providing a standard clearance of usually 1 m.*

Add new section

**6.2.13.16**

A vertical clearance of at least 150 mm (6 in.) shall be provided between the bottom of the piping flange and the ground level or the top of the floor grating.

**Justification**

*This requirement provides sufficient access for maintenance. The reservoir can be raised to meet the low-level requirement of 150 mm (6 in.) for low-point drain valve flanges.*

Add new section

**6.2.25**

The manual force required to operate valve handles at the MAWP shall not exceed 360 N (80 lbf).

**Justification**

*This requirement allows for safe ergonomic valve operation and is aligned with API 6D:2021, 5.4.2.1.*

**6.3 Pressure Design Code**

**6.3.3**

Add to section

Vessels smaller than the size and pressure required for a code stamp as per ASME BPVC, Section VIII, Division 1 shall be manufactured from piping components.

**Justification**

*Pressure and size are factors in determining the requirement for code stamping.*

**6.4 Welding**

**6.4.1**

Add new section

**6.4.1.1**

Welding of pressure-containing parts for downstream applications shall be in accordance with API 582.

**Justification**

*For downstream applications, typically, API 582 is followed without overlays.*

Add new section

**6.4.1.2**

Welding of pressure-containing parts for offshore applications shall be in accordance with IOGP S-705.

### **Justification**

*IOGP S-705 is the supplementary specification to API 582 for offshore (upstream) applications.*

## **6.5 Baseplates**

### **6.5.4**

Delete "If specified,"

### **Justification**

*This requirement prevents personnel accessing the skid from slipping.*

### **6.5.5**

Delete "If specified,"

### **Justification**

*This requirement prevents the pooling of liquids on the baseplate.*

### **6.5.6**

#### **6.5.6.3**

Replace section with

Permanently attached lifting lugs, pad eyes and trunnions shall pass 100 % radiographic or ultrasonic inspection in accordance with AWS D1.1/D1.1M or an alternative applicable code.

### **Justification**

*Additional inspection is considered necessary for these components for safety assurance and compliance.*

Add to section

Materials in the heat-affected zone that directly attach to lifting lugs, pad eyes and trunnions shall pass 100 % radiographic or ultrasonic inspection in accordance with AWS D1.1/D1.1M or an alternative applicable code.

### **Justification**

*Additional inspection is considered necessary for these components for safety assurance and compliance.*

## **6.6 Oil Reservoirs**

### **6.6.2 Oil Connections and Internal Piping**

#### **6.6.2.10**

Delete "If specified,"

### **Justification**

*This requirement provides robust connections and ease of maintenance.*

### **6.6.3 Manways and Drains**

#### **6.6.3.1**

Delete "If specified,"

##### **Justification**

*This requirement assists with complete drainage.*

#### **6.6.3.3**

Delete "If specified,"

##### **Justification**

*This requirement provides ease of maintenance and robust connections. A blind flange also provides a secure seal to prevent leakage.*

### **6.6.4 Features**

#### **6.6.4.3**

##### **6.6.4.3.1**

Delete "If specified,"

##### **Justification**

*This requirement provides a robust corrosion-resistant level gauge with sufficient span.*

#### **6.6.4.5**

Delete "If specified,"

##### **Justification**

*This requirement prevents the fill connection from being left open and foreign matter from entering the lube-oil system.*

#### **6.6.4.6**

Delete "If specified,"

##### **Justification**

*A blind-flanged vent connection of 50 mm provides a robust connection and ease of maintenance.*

### **6.6.7 Capacity and Configurations**

#### **6.6.7.2**

Delete section 6.6.7.2

##### **Justification**

*Working capacity of 5 minutes is required as per 6.6.7.4.*



### 6.6.7.3

Delete section 6.6.7.3

#### **Justification**

*Retention capacity of 8 minutes is required as per 6.6.7.5.*

### 6.6.7.4

Delete "If specified,"

#### **Justification**

*This requirement provides greater duration between oil top-ups, which is important for unsparred equipment in critical service to prevent plant shutdown.*

### 6.6.7.5

Delete "If specified,"

#### **Justification**

*This requirement provides greater duration between oil top-ups, which is important for unsparred equipment in critical service to prevent plant shutdown.*

### 6.6.7.11

Delete "If specified,"

#### **Justification**

*It is essential for unsparred equipment in critical service to allow for operator intervention and prevent plant shutdown due to the low oil level.*

### 6.6.7.12

Delete "If specified,"

#### **Justification**

*This requirement ensures that the oil reservoir has enough free surface area to allow any entrained air bubbles to disperse prior to the oil being recirculated through the oil system. As such, the free surface requirement is a function of the oil flow of the system.*

## **6.6.8 Heating**

### 6.6.8.5

Delete "If specified,"

#### **Justification**

*This requirement provides the facility for remote lube-oil temperature monitoring and control that assists with preventative maintenance. An integral thermostat does not provide this facility.*

#### 6.6.8.7

Replace first sentence with

Electric immersion heaters shall be installed for online removal for maintenance without interrupting operation of the oil system.

#### **Justification**

*This permits online replacement of the heater which is essential for unsparred equipment in critical service.*

#### 6.6.8.8

Replace section with

The vendor having unit responsibility shall submit a report that validates the heater capacity to satisfy the heat-up timing requirements specified in 6.6.8.2.2.

#### **Justification**

*This provides a documented check that the heat-up time for the lube-oil system is in accordance with API 614.*

### 6.6.10 Plugged Connections

#### 6.6.10.1

Delete "If specified,"

#### **Justification**

*A diameter of 1 in. is required for mechanical strength for purge gas, makeup oil supply or oil conditioner application, or other application. These connections are required to be above the rundown level to prevent oil leakage during the application of the conditioner.*

Add to section

Plugs in reservoir connections shall be made from stainless steel.

#### **Justification**

*This requirement prevents the corrosion of plugs.*

### 6.6.11 Provision for Oil Conditioner

Add new section

#### 6.6.11.4 Permanent or Mobile Oil Conditioner

##### 6.6.11.4.1

If a permanent or mobile oil conditioner is specified, it shall be of filter coalescer or vacuum dehydrator type.

#### **Justification**

*These are proven methods for removal of water in oil.*

#### 6.6.11.4.2

If a permanent or mobile oil conditioner is specified, it shall have a protective device that prevents loss of lube oil via the oil conditioner system.

##### *Justification*

*This requirement prevents loss of lube oil via the oil conditioner system.*

#### 6.6.11.4.3

If a permanent or mobile oil conditioner is specified, its capacity shall be at least 1 % of the normal flow rate through the oil reservoir.

##### *Justification*

*This is standard industry practice for sizing the oil conditioner.*

#### 6.6.11.4.4

If a permanent or mobile oil conditioner is specified, it shall have connections and accessory equipment to take oil from and return oil to the reservoir at equal flow rates in accordance with 6.6.11.1, 6.6.11.2 and 6.6.11.3.

##### *Justification*

*This requirement ensures no loss of oil from the reservoir.*

### 6.6.13 Special Features

#### 6.6.13.1

##### Replace section with

If the top of the oil reservoir contains equipment that requires routine operations or maintenance access and is higher than 2 m (6 ft), an accessible ladder with extended handrails shall be provided.

##### *Justification*

*This provides safe access for maintenance and operation.*

#### 6.6.13.2

##### Replace section with

If the top of the oil reservoir contains equipment that requires routine operations or maintenance access and is higher than 2 m (6 ft), handrails shall be provided around the perimeter of the reservoir top.

##### *Justification*

*This provides safe access for maintenance and operation.*

#### 6.6.13.3

##### Replace section with

If the top of the oil reservoir contains equipment that requires operations or maintenance access, a nonskid surface shall be provided on top of the reservoir.

### **Justification**

*This reduces potential for slipping and therefore provides increased safety. The nonskid surface is typically checker or diamond plate, or hot-dipped galvanized steel grating.*

## **6.7 Pumps and Pump Drivers**

### **6.7.1**

#### Add to section

Pump casings shall be steel or alloy steel, unless they are submerged.

### **Justification**

*Steel is a more suitable material as cast iron casings can fail due to brittle fracture and are not repairable. Submerged pump casings are made of cast iron as these pumps are not exposed to atmospheric conditions but are protected by maintaining the reservoir temperature.*

### **6.7.1.3**

#### Replace section with

One electric motor-driven standby pump designed for continuous operation shall be provided for start-up and main pump failure backup.

### **Justification**

*This provides reliability for start-up conditions and main pump failure backup.*

### **6.7.7**

#### Replace section with

For the main oil pump, the type of pump driver shall be as specified in the pump data sheet.

### **Justification**

*The purchaser needs the option to specify the type of pump driver in the data sheet.*

### **6.7.18**

#### Delete "If specified,"

### **Justification**

*Most machines are vulnerable to reverse rotation and oil needs to be provided if it occurs.*

### **6.7.20**

### **6.7.20.1**

#### Replace section with

Oil pump discharge PLVs shall be installed on vendor-supplied piping.

### **Justification**

*This prevents PLVs mounted directly on the pump casing, which complicates maintenance and could lead to hidden failures of the PLV.*

### **6.7.21**

#### **6.7.21.2**

#### Add to section

Oil pump discharge PLVs shall be routed back to the oil reservoir through sight flow indicators.

### **Justification**

*This requirement provides monitoring of valve leakage.*

### **6.7.22**

#### **6.7.22.4**

#### Delete "If specified,"

### **Justification**

*PLVs are not acceptable for continuous pressure regulation as they tend to leak during this type of service.*

### **6.7.22.7**

#### Delete "If specified,"

### **Justification**

*This requirement permits online maintenance and is also required for start-up.*

#### Add to section

Manual bypass valves shall be of globe type in accordance with Annex C figures.

### **Justification**

*Globe valves provide tight shutoff and are better suited for throttling service compared to gate valves.*

### **6.7.23**

#### **6.7.23.2**

#### Replace section with

Bypass pressure-regulating valves shall be located downstream of oil coolers and upstream of oil filters.

### **Justification**

*This prevents bypassing of coolers in case of leaking bypass valves.*

## 6.7.28

### 6.7.28.5

#### Add to section

The design, location and arrangement of strainers shall permit removal of the internal basket or element without removing the strainer body.

#### **Justification**

*This requirement permits easy maintenance.*

## 6.7.30

#### Delete "If specified,"

#### **Justification**

*This requirement permits monitoring of any blockage in the pump suction line.*

## 6.7.41

#### Delete "If specified,"

#### **Justification**

*This requirement helps ensure that the oil pump coupling operates reliably through the entire operating range, including transients and automatic start-up.*

#### Add to section

Couplings shall have a minimum transient torque service factor for induction motor-driven applications of 400 % of driver torque at 1.0 service factor.

#### **Justification**

*This requirement helps prevent coupling failure when subjected to transient torque from an induction motor.*

## 6.7.45

### 6.7.45.1

#### Add new section

#### 6.7.45.1.7

For offshore and coastal applications, mounting pads for the oil pump and driver shall be of noncorrosive material (i.e. 300 series stainless steel or equivalent).

#### **Justification**

*This requirement prevents corrosion of mounting pads.*

## **6.8 Lube-oil Heat Exchangers**

### **6.8.1 General**

#### **6.8.1.1**

##### Add to section

For onshore applications, water-cooled heat exchangers shall be used.

##### **Justification**

*Water-cooled exchangers provide greater reliability and fresh good quality cooling water is often available in onshore locations.*

#### **6.8.1.2**

##### Delete "If specified,"

##### **Justification**

*The first requirement provides a backup heat exchanger in case of failure of the primary heat exchanger, therefore increasing reliability.*

*The second requirement provides transfer of operation from the main heat exchanger to the backup heat exchanger without shutting down the equipment.*

#### **6.8.1.15**

##### Delete "If specified,"

##### **Justification**

*This requirement regulates the oil-supply temperature.*

#### **6.8.1.15.3**

##### Delete "If specified,"

##### **Justification**

*Flanged valves permit easy changeout. Pneumatic valves are more robust and suitable for operation in hazardous areas. The fail-closed feature allows oil flow through the bypass valve for manual control on failure of air supply.*

#### **6.8.1.15.6**

##### Delete "If specified,"

##### **Justification**

*This requirement permits operation independent of temperature conditions.*

#### **6.8.1.20**

##### Delete "If specified,"

### Justification

*Flanged vent and drain nozzles are more robust than screwed connections, increasing the operating time of the heat exchanger before repair is necessary. They are also less susceptible to damage from inadvertent knocks.*

#### 6.8.1.22

Delete "If specified,"

### Justification

*This requirement provides monitoring of leakage from vents on the oil side.*

## 6.8.2 Shell-and-tube Heat Exchangers

#### 6.8.2.4

Delete "If specified,"

### Justification

*This requirement assists with tube cleaning and prevents possible blockages. 18 BWG is a standard thickness used in the industry for heat exchanger tubing for oil systems.*

#### 6.8.2.6

Add new section

#### 6.8.2.6.3

Materials of construction for salt or brackish water cooling service shall be in accordance with Table 12.

### Justification

*This requirement specifies the correct materials for salt or brackish water service to prevent corrosion.*

Add new Table 12

**Table 12—Lube-oil Cooler Materials for Salt or Brackish Water Service**

Water Cooled Shell and Tube Heat Exchanger Components	Material <sup>a</sup>	Coating <sup>b</sup>
Shell (cooling media on tube side)	Carbon steel	Yes
Channels and covers	Super duplex or 90-10 Cu-Ni or 70-30 Cu-Ni	No
Tubesheets	Super duplex or 90-10 Cu-Ni or 70-30 Cu-Ni	No
Tubes	Super duplex or 90-10 Cu-Ni or 70-30 Cu-Ni or titanium	No
<sup>a</sup> Refer to 6.8.2.6.3.1 to 6.8.2.6.3.6. <sup>b</sup> Refer to IOGP S-715.		



### **Justification**

*This table specifies the materials for salt or brackish water service within the limitations stated in the sections referred to in footnote a.*

#### **6.8.2.6.3.1**

For filtered seawater, 90-10 Cu-Ni shall have a fluid velocity less than or equal to 2.5 m/s (8.3 ft/s).

### **Justification**

*This requirement prevents premature corrosion within the limitations stated resulting in increased heat exchanger life.*

#### **6.8.2.6.3.2**

For filtered seawater, 70-30 Cu-Ni shall have a fluid velocity less than or equal to 3.0 m/s (9.8 ft/s).

### **Justification**

*This requirement prevents premature corrosion within the limitations stated resulting in increased heat exchanger life.*

#### **6.8.2.6.3.3**

Super duplex stainless steel and CuNi parts shall not be mixed.

### **Justification**

*This requirement prevents galvanic corrosion.*

#### **6.8.2.6.3.4**

Super duplex stainless steel shall not be used in non-de-aerated seawater at temperatures above 30 °C (86 °F).

### **Justification**

*This requirement prevents premature corrosion within the limitations stated resulting in increased heat exchanger life.*

NOTE With crevices and depending on chlorination, this limit can be reduced.

### **Justification**

*This requirement prevents premature corrosion within the limitations stated resulting in increased heat exchanger life.*

#### **6.8.2.6.3.5**

Titanium tubes shall be used in non-de-aerated seawater above 30 °C (86 °F) without a velocity limitation.

### **Justification**

*This requirement prevents premature corrosion resulting in increased heat exchanger life.*

#### 6.8.2.6.3.6

Super duplex stainless steel used for filtered chlorinated seawater shall conform to IOGP S-716:2021, Table 2.

#### *Justification*

*This requirement prevents premature corrosion within the limitations stated resulting in increased heat exchanger life.*

### 6.8.4 Air-cooled Heat Exchangers

#### 6.8.4.4

##### 6.8.4.4.1

Delete "If specified,"

#### *Justification*

*This requirement provides greater reliability.*

##### 6.8.4.4.5

Delete "If specified,"

#### *Justification*

*This requirement allows condition monitoring of fans and prevents the need for personnel access associated with the manual collection of data if no transducer is installed.*

Add new section

##### 6.8.4.4.11

U-bends shall not be permitted in air-cooled heat exchangers.

#### *Justification*

*U-bends are difficult to clean.*

### 6.9 Filters

#### 6.9.1

##### 6.9.1.8

Delete "If specified,"

#### *Justification*

*Flanged connections are more robust than screwed connections and less prone to leakage.*

##### 6.9.1.10

Delete "If specified,"

### **Justification**

*This requirement assists with maintenance and operation by removing air pockets from the filter housing. It also assists with maintenance and operation by preventing cross-contamination during draining of filters for maintenance. Valved vents provide easier operation and maintenance than plugged vents.*

#### **6.9.1.12**

Delete "If specified,"

### **Justification**

*This requirement mitigates static electricity build-up.*

Add new section

#### **6.9.1.13**

If specified, filter drain connections shall be piped to a convenient location at the skid edge.

### **Justification**

*This requirement allows easy access for draining operations.*

#### **6.9.6**

Delete "If specified,"

### **Justification**

*Several operators require filter vents to be routed to reservoir via sight glass for special-purpose systems to monitor leakage.*

#### **6.9.7**

Replace list section e) with

- e) The number of filter cartridges in a stack shall be one (i.e. no multi-layer stacking allowed).

### **Justification**

*This reduces bypass of oil around the filter due to misalignment of filter elements.*

Delete list section f)

### **Justification**

*Stacked cartridges allowed by API are no longer allowed by this specification because of the replacement of 6.9.7, list section e).*

Add new list section h)

- h) The filter cartridge shall be retained by an internal hold-down mechanism, other than the filter housing cover, with stops.

### **Justification**

*This requirement provides secure retention of the filter cartridge and prevents over-tightening of the filter housing cover.*

#### Add new list section i)

- i) Inlets to filter housings and the fill/equalization line or orifice shall prevent direct impingement of oil jet onto the filter element.

### **Justification**

*This requirement prevents damage to the filter elements.*

#### Add new list section j)

- j) Seals or resilient seats for filter elements shall be part of the filter element (i.e. not be on the filter housing or head).

### **Justification**

*This requirement permits easy replacement when seats become worn.*

## **6.10 Transfer Valves**

### **6.10.2**

#### Delete first sentence

### **Justification**

*Two three-way valves joined with a single operating lever permit easier operation than multiple two-way transfer valves.*

#### Replace second sentence with

Transfer valves shall be two three-way ball valves permanently aligned and joined with a single operating lever.

### **Justification**

*Ball valves provide tighter shutoff than plug valves to prevent possible leakage. Two three-way valves joined with a single operating lever permit easier operation than multiple two-way transfer valves, with a smaller number of activities.*

### **6.10.6**

#### Delete "If specified,"

### **Justification**

*Spectacle blinds are required for maintenance isolation.*

#### Add new section

### **6.10.7**

The transfer valve shall include a permanently affixed indication of the equipment in service.

### ***Justification***

*This requirement makes it clear to operators and other personnel which item is in service.*

## **6.11 Accumulators**

### **6.11.1**

#### Add to section

Lube-oil and control-oil systems shall be provided with an accumulator.

### ***Justification***

*This requirement maintains the turbine control-oil pressure during servo control transients or maintains the lube-oil pressure while the standby pump accelerates from an idle condition to operating speed.*

### **6.11.2**

#### Replace section with

If the required accumulator capacity is less than 150 l (40 gal), a bladder-type accumulator shall be provided (see Figure C.18).

### ***Justification***

*This is the standard size for a bladder-type accumulator.*

### **6.11.2**

#### Add to section

If the required accumulator capacity exceeds 150 l (40 gal), a direct-contacting-type (i.e. bladderless-type) accumulator shall be provided (see Figure C.19).

### ***Justification***

*It is difficult to obtain bladder-type accumulators for volumes larger than 150 l (40 gal).*

### **6.11.3**

#### Replace section with

Direct-contact-type accumulators shall have a manual pre-charge valve, a check valve and a 100 mesh stainless steel element Y strainer.

### ***Justification***

*Pre-charge and check valves assist with charging the accumulator. The strainer prevents contamination of the oil system.*

### **6.11.9**

#### Delete "If specified,"

### **Justification**

*This requirement prevents internal corrosion and ensures cleanliness.*

#### **6.11.20**

Add new section

##### **6.11.20.1**

For systems with motor-driven standby oil pumps, the accumulator shall provide constant lubrication and control-oil pressure for at least 5 seconds.

### **Justification**

*This requirement maintains lubrication and control-oil pressure during upset conditions.*

Add new section

##### **6.11.20.2**

For systems where the main equipment drivers are auto-start steam turbines with shaft-driven main oil pumps, the accumulator shall provide constant lubrication and control-oil pressure for at least 15 seconds.

### **Justification**

*This requirement maintains lubrication and control-oil pressure during upset conditions.*

Add new section

##### **6.11.20.3**

Direct-contact-type accumulators shall be equipped with flanged opening(s) to permit hand cleaning.

### **Justification**

*This requirement permits hand cleaning of the accumulator.*

Add new section

#### **6.11.21**

A stainless steel nameplate with the following information shall be provided for bladder-type accumulators:

- a) required precharge pressure;
- b) normal operating oil pressure;
- c) MAWP.

### **Justification**

*The nameplate assists with maintenance.*

## 6.12 Overhead Tanks

### 6.12.2 Lube-oil Rundown Tanks

#### 6.12.2.1

Add new section

##### 6.12.2.1.1

The atmospheric tank vent shall have a coarse 1 mm (U.S. Mesh 18) mesh screen.

#### *Justification*

*This requirement prevents ingress of airborne foreign matter and bugs.*

Add new section

##### 6.12.2.1.2

The atmospheric tank vent shall terminate in the downward facing direction.

#### *Justification*

*This requirement prevents ingress of water.*

Add new section

##### 6.12.2.1.3

The allowable working pressure of atmospheric tanks shall be at least 35 kPag (5 psig).

#### *Justification*

*An MAWP has to be specified for additional pressure from oil mist formation.*

#### 6.12.2.6

Delete "If specified,"

#### *Justification*

*A bypass valve facilitates proper venting of the rundown tank.*

## 7 Piping

### 7.1 General

#### 7.1.3

**Table 3—Minimum Requirements for Piping Materials—Auxiliary Process Fluid**

In sixth row "Flange gaskets", replace first and second paragraphs with

All ANSI piping classes shall have spiral wound gaskets.

### Justification

*This is essential in oil service. This requirement provides ease of installation, strong stress compensation, stable and reliable sealing performance, stability and sealability.*

**Table 5—Minimum Requirements for Piping Materials—Cooling Water**

#### Add to first row "Pipe"

For saltwater or brackish cooling water, super duplex stainless steel piping (ASTM A790/A790M UNS S32750 and UNS S32760) shall be used.

### Justification

*This requirement prevents piping corrosion in saltwater or brackish cooling water service.*

#### Add to second row "Pipe fitting"

For saltwater or brackish cooling water, the material for fittings shall be as per ASTM A815/A815M UNS S32750 or UNS S32760 Classes WP-S, WP-W and WP-X.

### Justification

*This requirement prevents piping corrosion in saltwater or brackish cooling water service.*

#### Add to section

Minimum requirements for piping and tubing materials in offshore and coastal locations shall conform to Table 13.

### Justification

*Materials requirements for piping and tubing in offshore and coastal locations are dependent on service temperature. Type 316L stainless steel is only suitable for service temperatures up to 60 °C. 6 Mo grade is only suitable for service temperatures up to 120 °C. Super duplex is required above that temperature.*

#### Add new Table 13

**Table 13—Minimum Piping and Tubing Materials for Lubricating and Control-oil Systems in Offshore and Coastal Locations**

Service	Temperature <sup>a</sup>		Material	Coating <sup>b</sup>
	°C	°F		
Lubricating and control-oil	< 60	< 140	Type 316L stainless steel	Yes
	60 to 120	140 to 248	Type 6 Mo stainless steel	Yes
	> 70	> 158	Super duplex stainless steel (25 % Cr)	Yes (coating under lagging only)
<sup>a</sup> These temperatures represent the maximum oil temperature at the maximum ambient plus temperature increase due to heat gained in oil flowing through equipment bearings and any solar gains. <sup>b</sup> Refer to IOGP S-715.				



### **Justification**

*Material requirements for piping and tubing in offshore and coastal locations are dependent on service temperature. 316L is only suitable for service temperatures up to 60 °C. 6Mo grade is suitable for service temperatures up to 120 °C. Super Duplex is suitable for service temperatures above 70 °C.*

## **7.1.6**

### **7.1.6.1**

#### Add new section

#### **7.1.6.1.1**

Drain lines shall terminate with an isolation valve.

### **Justification**

*This requirement allows the operator to drain oil from equipment for maintenance. Valved drains provide easier maintenance than plugged drains.*

#### Add new section

#### **7.1.6.1.2**

Headers shall terminate with blind flanges.

### **Justification**

*This requirement accommodates flushing and cleaning.*

## **7.1.8**

#### Add new list section j)

j) hoses and bellows shall not be used.

### **Justification**

*This requirement prevents possible leaks in the piping system due to wear and tear from fatigue stress.*

## **7.1.9**

#### Add to section

Blind flanges shall be installed at dead ends of all piping.

### **Justification**

*This requirement accommodates flushing and cleaning.*

### 7.1.13

#### Add new section

#### 7.1.13.1

Threaded connections shall not be used, except for instrument connections downstream of the root valve and for tubing systems.

#### **Justification**

*Flanged connections are more robust. It is less beneficial in terms of cost and availability to obtain flanged connections on small instrument connections and tubing.*

#### Add new section

#### 7.1.13.2

Tubing fittings shall have rolled threads.

#### **Justification**

*This requirement prevents galling in stainless steel joints.*

### 7.1.20

#### Add new section

#### 7.1.20.1

Tubing compression fittings shall be of two-ferrule design.

#### **Justification**

*Two-ferrule tube fittings offer predictable, leak-tight performance up to a rated pressure of AISI Type 316 and 304 stainless steel tubing, thus providing enhanced sealing and vibration fatigue resistance.*

#### Add new section

#### 7.1.20.2

Couplings in tubing systems shall be located at least 1 m (3.28 ft) from high-temperature equipment components such as turbine casings and steam piping.

#### **Justification**

*"High temperature" in this case is defined as the temperature at which there is a risk of ignition of the fluid which could come in contact with the hot surface in case of leakage from the coupling. The heat can cause the coupling to expand and subsequently fail or leak. This requirement prevents ignition by maintaining a safe distance between the couplings and hot surfaces.*

### 7.1.21

#### Replace section with

Tubing size shall not exceed DN 25 (NPS 1).

### **Justification**

*It is more difficult to install larger sizes of tubing to achieve a good seal.*

### **7.1.25**

#### Replace section with

Tapped openings shall be supplied with threaded, non-seal-welded, round-head, solid stainless steel plugs in accordance with ASME B16.11.

### **Justification**

*Stainless steel plugs are more resistant to corrosion. Tapped openings allow for removal of the plug during maintenance.*

### **7.1.27**

#### Add to section

Weld neck raised face flanges shall be provided on oil supply piping downstream of the oil filters.

### **Justification**

*Weld neck flanges provide the greatest factor of safety and fatigue strength, and are suitable for all pressures and temperatures. Raised faces provide high pressure on a small gasket area, increasing containment capability, and can tolerate more misalignment. Weld-neck flanges also prevent accumulation of dirt which could occur in slip-on flanges.*

### **7.1.28**

#### Add new section

#### **7.1.28.1**

Flanges and valve internals in contact with oil shall be stainless steel ASTM A312 Type 304 or 316.

### **Justification**

*This requirement provides corrosion resistance for valves and cleanliness of the oil system resulting in reduced maintenance.*

#### Add new section

#### **7.1.28.2**

For steam turbine applications, valves downstream of oil filters shall be stainless steel ASTM A312 Type 304 or 316.

### **Justification**

*This requirement provides valve corrosion resistance and cleanliness of the oil system. Oil used for steam turbine applications is more likely to contain water contamination, causing corrosion.*

#### 7.1.30

Replace section with

Soft-seated-type and wafer-type check valves shall not be used.

##### **Justification**

*Soft-seated check valves can be damaged by dirt, especially during the flushing process, and consequently are prone to leakage. Wafer-type check valve bolting can expand and cause leakage during a fire.*

#### 7.1.37

Delete "If specified,"

##### **Justification**

*This requirement assists with hook-up and maintenance of the lube-oil system by reducing the number of purchaser's connections.*

Add new section

#### 7.1.42

Vents to safe locations shall not be manifolded.

##### **Justification**

*Different vents might need to go to different areas. An oil mist vent might need to be routed to a different location than a non-hazardous vent. Therefore, a common manifold cannot be used.*

Add new section

#### 7.1.43

Cadmium or zinc plated studs, bolts and nuts shall not be used.

##### **Justification**

*During a fire, zinc burns and the excessive heat generated causes embrittlement of stainless steel which subsequently leads to premature failure and possible feeding of lube oil as fuel to the fire. Cadmium is a known carcinogen so frequent contact with this material is to be prevented.*

Add new section

#### 7.1.44

Valves larger than DN 50 (NPS 2) shall be flanged.

##### **Justification**

*This requirement facilitates removal and ease of maintenance. It also provides more robust connections than threaded connections.*

Add new section

**7.1.45**

Control valves up to DN 25 (NPS 1) in air or inert gas service shall be flanged or threaded.

**Justification**

*Flanged control valve connections are preferred but these could be difficult to obtain at small sizes. Threaded control valve connections may be prompt to leakage, which is a safety hazard for steam, process gas and oil applications, but can be accepted for these non-hazardous applications.*

Add new section

**7.1.46**

Control valves greater than DN 25 (NPS 1) shall be flanged.

**Justification**

*Flanged connections are more robust than threaded connections which can leak when subjected to stress and knocks. Flanged valves are non-standard for sizes 1 in. or below.*

**7.2 Lubricating, Control, and Seal-oil Piping**

**7.2.1**

In list section g), replace “have a minimum size of DN 40 (NPS 1 ½)” with

have lube-oil and control-oil drain lines with a line size of DN 50 (NPS 2) or greater

**Justification**

*This replacement provides better needed drainage by increasing the line size, thereby reducing the resistance to flow, and a larger drain line size is more robust.*

Add new section

**7.2.7**

For steam turbines supplied without turning gears for cooling down, a car-sealed open isolation valve shall be provided in the oil supply header.

**Justification**

*This requirement permits isolation and mechanical work on the driven equipment while oil for cool down is continued to the steam turbine.*

**7.3 Instrument Piping and Tubing**

**7.3.3**

Add to section

Instrument tubing and fittings in coastal and offshore environments shall conform to IOGP S-716:2021, Table 2.

### **Justification**

*Tube failures can be prevented by specifying the material for the environment.*

### **7.3.5**

Replace section with

Heads of oil-actuated control valves shall be vented back to the oil reservoir through restriction orifices.

### **Justification**

*This reduces the pressure of oil entering the oil reservoir to reduce turbulence.*

### **7.3.7**

Replace second sentence with

Instrument valves shall be stainless steel ASTM A312 Type 304 or 316 with stainless steel stems.

### **Justification**

*This requirement prevents corrosion and subsequent contamination of the oil system.*

### **7.3.13**

Delete "If specified,"

### **Justification**

*This requirement assists with maintenance of instrumentation.*

## **8 Instrumentation, Control, and Electrical Systems**

### **8.1 General**

#### **8.1.4**

Replace section with

The instrument and control terminal box material shall be Type 316 stainless steel.

### **Justification**

*This requirement provides the needed corrosion resistance for reduced maintenance.*

Add to section

Instrument and control terminal boxes shall be of bottom entry design.

### **Justification**

*This requirement maintains the ingress protection rating by preventing ingress of moisture that can occur with top entry design.*

Add new section

**8.1.11**

**8.1.11.1**

Pneumatic-control valves shall have a filter.

**Justification**

*This requirement ensures that the air is filtered to the level required by the control valve, preventing possible failure of the valve due to contamination.*

**8.1.11.2**

Pneumatic-control valves shall have a pressure-reducing valve.

**Justification**

*This requirement reduces the instrument air pressure to the level required by the control valve for trouble-free operation.*

**8.1.11.3**

Pneumatic-control valves shall have a pressure gauge.

**Justification**

*This requirement indicates the reduced pressure for the correct function of the pressure-reducing valve.*

**8.1.11.4**

The filter body and regulator valve body (or combined filter-regulator body) shall be of metal construction.

**Justification**

*This requirement specifies a metal valve body because it is a more robust construction than a plastic valve body.*

**8.2 Alarm, Shutdown, and Control Systems**

**8.2.1 General**

**8.2.1.1**

Delete "If specified,"

**Justification**

*This requirement provides greater availability of equipment.*

**8.2.1.3**

Add new section

**8.2.1.3.1**

Shutdown sensing devices shall have isolation valves.

### **Justification**

*Isolation valves permit online maintenance of shutdown sensing devices.*

#### Add new section

##### **8.2.1.3.2**

Isolation valves for shutdown sensing devices shall be car sealed in the fully open position.

### **Justification**

*Provision of car-seal open valves prevents tampering with the device isolation valves, inadvertently causing a machine shutdown.*

##### **8.2.1.4**

#### Replace section with

Hand-off-auto (HOA) starting switches that have a facility to be locked in the "off" position shall be provided for pump motors.

### **Justification**

*This replacement permits separate control of each lube-oil pump motor for operation and maintenance. Locked in the "off" position is required for safety during maintenance.*

## **8.2.2 Alarm, Shutdown, and Trip Systems**

##### **8.2.2.6**

##### **8.2.2.6.8**

#### Delete "If specified,"

### **Justification**

*This requirement allows online testing of the instrument without bypassing or interfering with the protective function(s) of the other instruments in the system.*

## **8.3 Instrumentation**

### **8.3.1 Instrument Installation and Gauge Boards**

##### **8.3.1.7**

#### Add to section

Separate junction boxes shall be provided for the following types of systems:

- a) intrinsically safe analogue and digital;
- b) non-intrinsically safe analogue and digital;
- c) instrument power.



### ***Justification***

*Segregation allows the cable troubleshooting of each type of system, minimizes interference from higher voltage cables and provides a safer environment for working as higher voltages are separated from signal cables.*

#### **8.3.1.11**

##### Add new section

##### **8.3.1.11.1**

Nameplates of instruments and switches shall be fixed on or adjacent to the device.

### ***Justification***

*This requirement provides identification of individual instruments and switches for operation and maintenance.*

##### Add new section

##### **8.3.1.11.2**

Nameplates of instruments and switches shall show the process identification and service.

### ***Justification***

*This requirement provides identification of instruments and switches for operation and maintenance.*

##### Add new section

##### **8.3.1.11.3**

Plugs and sockets used for instrument connections shall be labelled with the corresponding instrument identification.

### ***Justification***

*This requirement provides identification of plugs and sockets for operation and maintenance.*

##### Add new section

##### **8.3.1.16**

Instruments shall be pre-wired and terminated in a local terminal box.

### ***Justification***

*This requirement reduces site installation work.*

##### Add new section

##### **8.3.1.17**

Local display of status and monitoring signals shall be repeated and transferred from the local control panel to the ICSS.

### **Justification**

*It is essential to have local and remote monitoring in the control room for this critical equipment to prevent plant shutdowns.*

## **8.3.7 Level Instruments**

### **8.3.7.1**

Delete "displacers, floats"

### **Justification**

*Displacers and floats are not commonly used by operators.*

Add new section

### **8.3.7.3**

Level gauge glass shall be tempered borosilicate.

### **Justification**

*Tempered borosilicate is resistant to thermal and mechanical shock, which prevents shattering even in the event of physical damage.*

## **8.3.8 Pressure Indicators**

### **8.3.8.2**

Delete "If specified," and "in locations subject to vibration"

### **Justification**

*Liquid-filled gauges are required to dampen vibration.*

## **8.3.9 Oil Sight Flow Indicators**

### **8.3.9.4**

Add new list section g)

g) have positive mechanical flow indication (e.g. paddle wheel, rotating assembly or equivalent designs).

### **Justification**

*This requirement provides a good visual indication of flow.*

## **8.3.10 Solenoid Valves**

### **8.3.10.1**

Add after "class F insulation"

in accordance with IEC 60085

### **Justification**

*This requirement is the relevant normative reference for class F insulation.*

## **8.3.11 Pressure-limiting Valves and Pressure Safety Relief Valves**

### **8.3.11.8**

Delete "If specified,"

### **Justification**

*This requirement provides thermal protection of equipment that can be blocked in by isolation valves.*

Add new section

### **8.3.11.11**

#### **8.3.11.11.1**

PSVs and PLVs shall have isolation valves in the supply and outlet line.

### **Justification**

*This requirement permits safe maintenance.*

#### **8.3.11.11.2**

PSV supply and outlet line isolation valves shall be car sealed in the fully open position.

### **Justification**

*Tampering with the device isolation valves can cause inadvertent shutdown of the machinery train and car-seal open valves prevent this tampering.*

Add new section

#### **8.3.11.12**

PSVs shall be installed in an upright vertical position above the highest oil level in the oil reservoir.

### **Justification**

*Installing the PSV in the correct location and position is necessary for correct valve operation to prevent any debris from accumulating in the valve.*

## **8.3.12 Control Valves and Regulators**

Add new section

### **8.3.12.10**

#### **8.3.12.10.1**

Control valves shall be supplied with isolation, bleed and bypass valves.

### ***Justification***

*When valve replacement becomes necessary, this requirement allows uninterrupted operation of the lube-oil system.*

#### **8.3.12.10.2**

Bypass valves shall be of globe type as per Annex C figures.

### ***Justification***

*Globe valves provide better control than other valve types.*

#### **Add new section**

#### **8.3.12.11**

The control of oil system pressure or level shall be via self-regulating instrumentation.

### ***Justification***

*This requirement provides an independent self-contained control system for greater reliability, which is necessary for equipment in critical service.*

## **8.4 Electrical Systems**

#### **8.4.7**

#### **Add new section**

##### **8.4.7.1**

Terminal strips shall have block identification markers to indicate polarity and ground connections.

### ***Justification***

*This requirement assists with operation and maintenance by identifying polarity and ground connections.*

#### **Add new section**

##### **8.4.7.2**

Wiring at terminal blocks shall be tagged with permanent sleeve-type tags.

### ***Justification***

*This requirement assists with operation and maintenance by identifying wiring at terminal blocks.*

## **8.5 Control Panels**

#### **Add new section**

#### **8.5.29**

Internal control panel wiring shall be run in plastic wire-way or wire ducting.

### **Justification**

*This requirement provides protection for wiring against accidental damage.*

### **Add new section**

## **8.6 Grounding**

### **8.6.1**

Earth bar ends shall have an earthing termination point.

### **Justification**

*Two connections from each earth bar ensure proper earthing to ground even if one connection fails.*

### **8.6.2**

Earth terminals shall be provided with M10 (1/2 in.) brass studs screwed into carbon steel bosses fillet welded to the equipment/structure.

### **Justification**

*Electrical equipment has to be earthed to prevent injury from electrical shocks to personnel.*

### **8.6.3**

Earthing studs shall be supplied with Type 316 stainless steel vibration-resistant washers and nuts.

### **Justification**

*Vibration-resistant washers and nuts are required to secure earthing cables and to prevent them from becoming loose due to vibration from adjacent machinery resulting in loss of earth continuity.*

## **9 Inspection, Testing, and Preparation for Shipment**

### **9.2 Inspection**

#### **9.2.1 General**

##### **9.2.1.3**

Delete "If specified,"

### **Justification**

*This requirement ensures that all leaks are visible during hydro testing and that painting does not cover minor leaks which may occur during the test. It may also prevent damage to painting.*

## 9.3 Testing

### 9.3.2 Hydrostatic Test

#### 9.3.2.2

Replace first sentence with

The assembled and piped oil console or oil console subassemblies, inclusive of instrument tubing and fittings, shall be hydrostatically tested with compatible oil as per 9.3.2.1.

#### **Justification**

*This ensures the pressure integrity of the fabrication, and leak-free pipework and leak-free assembled oil consoles. Oil should be used for hydrostatic testing to prevent contamination with other liquids that would require thorough cleaning and verification of cleanliness prior to the oil console functional test.*

Delete second sentence

#### **Justification**

*The assembled piping system needs to be tested to ensure its integrity.*

#### 9.3.2.6

##### 9.3.2.6.2

Add to section

If leaks or seepage occur, the test shall be repeated with the corrections made to eliminate the observed leaks or seepage.

#### **Justification**

*This requirement ensures the integrity of the fabrication.*

### 9.3.3 Operational Tests

#### 9.3.3.1

Add to section

The operational test procedure shall include a marked-up P&ID that indicates the location of temporary jump overs and of test flow and pressure instruments.

#### **Justification**

*This requirement assists with witnessing the operational test of the lube-oil console.*

#### 9.3.3.4

Delete "If specified," from first sentence

#### **Justification**

*Common industry practice for special purpose equipment to allow the system to reach thermal equilibrium and to further achieve representative results. This test applies to the lube-oil system only.*

#### 9.3.3.10

##### Add to list section b)

PLVs shall be demonstrated to lift with an accumulation that does not exceed 110 % of the system design pressure.

##### **Justification**

*This requirement prevents system overpressure.*

##### Add new list section k)

k) The reservoir shall be drained to the low-level alarm point.

##### **Justification**

*This requirement verifies that the suction head is sufficient for satisfactory lube-oil pump operation (i.e. sufficient NPSHA and prevention of vortices).*

##### Add new list section l)

l) The filter differential pressure shall be measured and recorded at the minimum oil temperature with the normal system flow and pressure.

##### **Justification**

*This requirement ensures that this parameter is measured and recorded under the correct operating conditions necessary for plant operation and maintenance in the field.*

#### 9.3.3.12

##### Delete "If specified,"

##### **Justification**

*This requirement ensures that no dirt is introduced or left behind in the oil system after previous testing. It also ensures that oil system cleanliness is verified prior to shipping, which could be used as a baseline for field cleanliness verification after installation and prior to start-up.*

### 9.5 Package Markings and Shipping Documentation

#### 9.5.8

##### Delete "If specified,"

##### **Justification**

*This requirement ensures timely submission of installation instructions.*

## 10 Vendor's Data

### 10.1 General

#### 10.1.2

Replace section with

Proposals, contract documentation and vendor's data content shall be in accordance with IOGP S-744L.

#### *Justification*

*The documentation requirements are specified in the IRS.*

### 10.2 Documentation

#### 10.2.1

##### 10.2.1.1

Replace section with

The vendor shall complete and forward the supplier's master information schedule to the address noted on the inquiry or order.

#### *Justification*

*The supplier's master information schedule replaces the vendor's drawing and data requirements form in Annex D and includes a list of documentation required in the IRS.*

##### 10.2.1.2

Replace "form" with

master information schedule

#### *Justification*

*The term "form" has been replaced in accordance with the replacement of 10.2.1.1.*

### 10.4 Contract Data

#### 10.4.3 Technical Data

##### 10.4.3.2

Delete "If specified,"

#### *Justification*

*This requirement ensures that the equipment is not delivered to the site until all testing has been completed to the owner's satisfaction.*



#### 10.4.4 Progress Reports

Delete "If specified,"

##### **Justification**

*The submission of progress reports and intervals is covered in the IRS and is required to monitor progress and coordinate inspection activities.*

Delete NOTE

##### **Justification**

*The IRS is the standard used for documentation requirements in this specification.*

#### 10.4.6 Installation, Operation, Maintenance, and Technical Data Manuals

##### 10.4.6.4 Technical Data Manual

##### 10.4.6.4.2

Delete section 10.4.6.4.2

##### **Justification**

*This item is covered by the IRS requirement for the manufacturer's record book with an entry for the delivery date.*

Add new section

#### 10.5 Nameplates and Tagging

##### 10.5.1 Nameplates

##### 10.5.1.1

Nameplates shall be affixed with Type 316 stainless steel rivets or screws.

##### **Justification**

*The material and fixing method are specified for durability as per existing industry best practice.*

##### 10.5.1.2

Nameplates shall be Type 316L stainless steel.

##### **Justification**

*The material is specified for durability as per existing industry best practice.*

##### 10.5.1.3

The nameplate information shall be stamped or engraved.

##### **Justification**

*Experience has demonstrated that illegibility causes problems.*

## **10.5.2 Tag Plates**

### **10.5.2.1**

Tag plates shall be Type 316 stainless steel.

#### ***Justification***

*The material is specified for durability as per existing industry best practice.*

### **10.5.2.2**

Tag plates shall be affixed with Type 316 stainless steel rivets or screws.

#### ***Justification***

*The material and fixing method are specified for durability as per existing industry best practice.*

### **10.5.2.3**

The tag plate information shall be stamped or engraved.

#### ***Justification***

*Experience has demonstrated that illegibility causes problems.*

## Bibliography

### Add to start of Bibliography

The following documents are informatively cited in the text of this specification, API 614, the PDS (IOGP S-744D) or the IRS (IOGP S-744L).

### Add to Bibliography

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\* Cited in IOGP S-744J only.

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