

THE FOLLOWING PARAGRAPH NUMBERS REFER TO API 682, FIRST EDITION, DECEMBER, 1994
WHICH IS A PART OF THIS PRACTICE

SECTION 1 - GENERAL

- 1.1 SCOPE
- I 1.1.1 a. (Exception) This practice covers **pump mechanical seals and sealing systems** regardless of size, pressure, temperature or fluid of application.
- b. All specifications in this practice are additions to those of **API 682**, unless specifically noted as exceptions. Paragraph numbers in this practice which do not appear in **API 682** are new paragraphs.
- c. **An asterisk (*)** indicates that a decision by the purchaser is required or that **additional information** is furnished by the Purchaser.
- d. The following references are synonymous: BP and IP.
- R ↗ e. **Vendor Qualification.** Seals and sealing systems rated **over 500 psig (34.5 barg)**, sealing liquids **above 500°F (260°C) or below 32°F (0°C)** or with a **balance diameter** equal to or greater than **4 in. (100 mm)** and all dual seals regardless of service shall be supplied by vendors **qualified by experience** to manufacture the units proposed. To qualify, the vendor must have at least **two seals** of comparable tangential speed, pressure, temperature and fluid properties. These seals must have been **in service for at least one year** and be performing satisfactorily.
- * 1.2 ALTERNATIVE DESIGNS
- R a. Where the vendor qualification requirement of **Par. 1.1.1e** prevents the application of the **latest technology**, the vendor shall submit to the purchaser an alternative proposal incorporating such features for review and approval by the Owner's Engineer. The proposal shall specifically **identify the undemonstrated features and state their advantages**.
- 1.5 REFERENCED SPECIFICATIONS
- I a. **Table 1** lists the practices and standard which shall be used with this practice.
- I * b. **Table 2** lists the practices which shall be used with this practice as specified by the purchaser.

TABLE 1

PRACTICES	
IP 3-12-5	Compact and Extended Body Steel Gate and Globe Valves
IP 18-12-1	Positive Material Identification
STANDARD	
API Standard	
682	Shaft Sealing Systems for Centrifugal and Rotary Pumps

TABLE 2

PRACTICES	
IP 3-3-1	Cooling Water Piping for Centrifugal Pumps and Drivers
IP 18-6-1	Impact Requirements for Materials

SECTION 2 - SEAL DESIGN

- 2.1 STANDARD SEAL TYPES AND ARRANGEMENTS
- R ↗ * 2.1.5 (Exception) Balanced outer seals are preferred.
- R ↗ * 2.1.6 a. Pressurized dual seals which cannot be operated at rated barrier pressure with atmospheric pressure in the pump require approval by the Owner's Engineer.
- I b. Pressurized dual seals using a gas or vapor as the barrier fluid are acceptable alternatives to liquid barrier designs and shall also meet the requirements of **Par. 2.1.6a**.

IP 10-1-3		Shaft Sealing Systems for Centrifugal and Rotary Shaft Pumps (This practice is appropriate for attachment to Inquiry or Purchase Document)	EXXON INTERNATIONAL PRACTICE
Page 2 of 9			
Rev. 1	June 1997		

2.3 SEAL CHAMBERS AND GLANDS

- I ♦ 2.3.6 Operation of a pressurized dual seal (Arrangement 3) with rated barrier fluid pressure and ambient pressure in the pump shall be considered when determining stress levels.
- R 2.3.9 a. Mechanical seal **gland plates** shall be furnished with a **connection to permit measurement of seal chamber pressure** during normal operation when a connection is **not provided on the seal chamber directly**. The seal chamber external vent if provided may be used for this purpose.
- * b. When a **pressure measurement port** is provided in the **gland** it shall be directed to **an area of the seal chamber and not the area used for distribution of flush fluid**. When inclusion of this second port restricts the flow area for flush distribution or may otherwise negatively impact seal face cooling/flushing the design shall be submitted to the purchaser for review and approval of the Owner's Engineer.
- O,R ♦ * 2.3.10 (Exception) **Seal chamber conditions** of pressure and temperature shall **meet the seal vendor's requirements** for satisfactory margin to vaporization with a minimum margin of 25 psi (1.72 bar). Where **special provisions must be added** to the pump or seal (such as floating throat bushings, coolers or hydropadded faces) to meet the required conditions the special provisions shall **be submitted** to the purchaser for **review and approval of the Owner's Engineer**.
- R 2.3.11 For **single seals with stationary flexible elements**, the flush inlet **arrangement** shall be designed to **avoid erosion** of the stationary seal elements.
- O,M ♦ 2.3.16 **Gland plates** for Arrangement 1 seals shall be furnished with **flush inlet, quench inlet and drain connections** as a minimum.
- O,R ♦ 2.3.18.1 Unless specified otherwise, for vertical pumps utilizing any flush plan other than 02, 23, 53 or 54, the specified port for the inner seal shall be used to connect a plan 13 flush in addition to the specified flush. The orifice shall be sized to allow free removal of vapor without significantly affecting seal chamber pressure. When the port is used as the barrier/buffet fluid exit of a dual seal, the orifice and valve shall be eliminated.
- I * 2.3.20 a. **Floating bushings** shall be carbon.
- * b. (Exception) **Alternative secondary devices will be specified by the purchaser**.
- c. Contacting (dry running) backup seals and non contacting abeyant backup seals shall not be used for pumping temperatures above 350°F (176°C) unless a Plan 21, 23 or 32 cool flush is used to avoid coking and the need for steam quench.

2.7 WELDING

- S 2.7.5.5 **PWHT** is required for all carbon and ferritic alloy steel pressure-containing components that are welded and/or weld repaired, when the weldment is exposed to a process containing **wet H₂S**. The **PWHT** procedure outlined in the **ASME Code Section VIII, Par. UW40, UW49, UH32, and UCS 56** shall be followed, except that the notes in Tables UHA 32 and UCS 56 to not apply. All welds, regardless of type or size, that are exposed to **wet H₂S** shall be **PWHT** at a minimum temperature of 1150°F (620°C). External attachments or seal welded threaded connections on **P-1** Group 1 and 2 materials do not require **PWHT**.

- I * 2.8 LOW TEMPERATURE
(Exception) **Impact requirements** shall be per **IP 18-6-1** for the specified Critical Exposure Temperature (CET).

SECTION 3 - MATERIALS

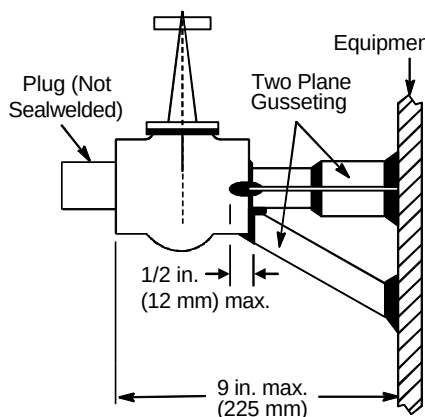
3.2 SEAL FACES

- R * 3.2.3 (Exception) The **mating ring shall be tungsten carbide** when this is the **vendor standard material** (such as for designs utilizing a stationary flexible element and pumps operating above 3600 rpm). Use of a **rotating mating ring made of silicon carbide for pusher seals and all seals operating above 3600 rpm** shall be approved by the Owner's Engineer.
- I ♦ * 3.2.4 (Exception) Alternate face materials will be specified.
- R,M ♦ * 3.5.4 Secondary sealing element selection, e.g., elastomers and gaskets, shall be based on the **maximum** temperature specified.

SECTION 4 - ACCESSORIES

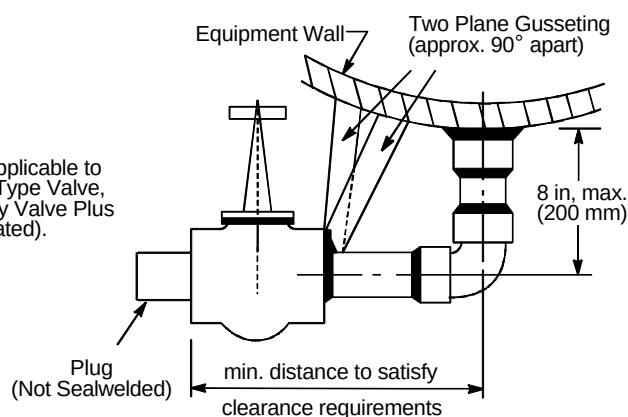
4.1 AUXILIARY PIPING SYSTEMS

- R * 4.1.1 a. **Auxiliary process piping** shall be provided with a minimum **corrosion allowance of 0.050 in. (1.3 mm)** unless otherwise specified.
- I c. (Exception) **Cooling water piping** shall be per **IP 3-3-1**.
- R,M 4.1.5 (Exception) **Seal flush system auxiliary piping over 1 in. NPS** shall be **seamless steel piping per Table 6**. Auxiliary piping for seal flush systems for sizes **1 in. NPS and smaller**, and barrier/buffer fluid piping **shall be as follows**:
- 4.1.5 a. Group I service which **connects directly between the seal gland(s) and any point on the pump casing or pump flanges** shall be **seamless tubing per Table 6**. An example is API flush plan 11.
- b. Group 1 service which **connects directly between the seal gland and any point not on the pump casing or pump flanges** or does not connect to the seal gland at either end shall be **seamless piping per Table 6** with the **exception of barrier and buffer fluid lines per Par. 4.1.5.c**. Examples are API flush plan 21 and 23 arrangements.
- c. Auxiliary piping connecting the **barrier or buffer fluid reservoir to the seal gland(s) or seal chamber connection** shall be a minimum of **3/4 in., 0.065 wall seamless tubing** meeting the material requirements of Table 6.
- I 4.1.7 g. Valved piping vent and drain connections shall be braced and supplied with threaded, non-seal welded round head plugs per **ANSI B 16.11**.
- S h. Bracing design shall be as follows:



100103

General Note:
Bracing Detail Applicable to
Extended Body Type Valve,
or Compact Body Valve Plus
Nipple (as illustrated).



Acceptable Bracing Design for
Equipment Only Where Pipe Bend Necessary.

1. **Gusseting material** for welded gussets shall be of the same nominal chemistry as the connected parts except that carbon steel may be used for gusseting P-1, P-3, P-4, and P-5 materials.
2. **Connections shall be braced in two planes** with gussets having a minimum thickness of 3/16 in. (5 mm), minimum width 3/4 in. (19 mm) as shown above.
- * 3. **Gusset attachment welds to a pressure boundary shall be postweld heat treated (PWHT) whenever:** (1) PWHT is required for all welds, based on service conditions (see 2.7.5.5). (2) PWHT is required in the alloy steel components to which the attachment is to be made, based on **ANSI B31.3 PWHT criteria for butt welds in alloy steel materials** - whether or not butt welds are used in the assembly.
- * 4. **Proposals to use clamped or bolted gusset designs** shall be submitted to purchaser for approval by the Owner's Engineer.
- * 5. **Bracing design for piping connections requiring double block valves** shall be submitted to purchaser for approval by the Owner's Engineer.
6. Nipples used to fabricate connections shall be less than 6 in. (150 mm) long.