PART I - GENERAL

[NOTE TO AE: Provide project specific content]

PART 2 - PRODUCTS

2.1 Close Coupled In-Line Pumps (≤ 2 HP)
   A. Component seal, rotary design
      1. Carbon / ceramic seal faces
      2. Cup-mounted seals
      3. 316 SS, Hastelloy seat springs

2.2 Vertical Split Coupled In-Line Pumps (≥ 3 HP)
   A. ≤ 10 HP: Component seal, rotary design
      1. Carbon / ceramic seal faces
      2. Unspecified O-Ring material
      3. 316 SS, Hastelloy seat springs
      4. Recirculation / clean water flush lines not required for standard applications
   B. > 15 HP: Balanced cartridge seal, stationary design
      1. Carbon / silicon carbide seal faces
      2. Viton O-Rings
      3. 316 SS, Hastelloy seat springs
      4. Suction recirculation flush lines required

2.3 Close Coupled Base Mounted Pumps (Not allowed by UIUC)

2.4 End Suction Pumps (≤ 4” suction connection size, larger sizes allowed for high-head, low flow applications)
   A. ≤ 10 HP: Component seal, rotary design
      1. Cup-mounted seals
      2. 316 SS, Hastelloy seat springs
      3. Recirculation / clean water flush lines not required for standard applications
   B. > 15 HP: Balanced cartridge seal, stationary design
      1. Viton cup-mounted seals
      2. 316 SS, Hastelloy seat springs
      3. Clean water systems (e.g. chilled water)
         a. Recirculation lines (connection to top of volute not allowed)
            1) Rotameter
            2) Flush water throttling device
               (a) Adjust to 5-10 GPH each
4. Dirty water systems (e.g. cooling tower water)
   a. Clean water flush lines
      1) Rotameter
      2) Flush water throttling device
         (a) Adjust to 5-10 GPH each
      3) Close-tolerance throat bushing
         (a) Provide when limitation of flow system is required
         (b) Adjust to 15 FPS velocity through annular space

2.5 Double Suction Pumps ($\geq 6''$ suction connection size)
A. Balanced split seal, stationary design
   1. Carbon / silicon carbide seal faces
   2. Viton O-Rings
   3. 316 SS, Hastelloy seat springs
   4. Clean water systems (e.g. chilled water)
      a. Recirculation lines (connection to top of volute not allowed)
         1) Rotameter
         2) Flush water throttling device
         (a) Adjust to 5-10 GPH each
   5. Dirty water systems (e.g. cooling tower water)
      a. Clean water flush lines
         1) Rotameter
         2) Flush water throttling device
         (a) Adjust to 5-10 GPH each
         3) Close-tolerance throat bushing
         (a) Provide when limitation of flow system is required
         (b) Adjust to 15 FPS velocity through annular space

2.6 Steam Condensate Pumps
A. Component seal, rotary design
   1. Carbon / silicon carbide seal faces
   2. Aflas O-Rings
   3. Discharge flush line

B. PART 3 - EXECUTION

NOTE TO AE: Following is basic information to facilitate pump seal selection

A. Single vs. Double Seals:
   1. Single seals are standard/preferred for most applications. Double seals are used to positively contain system fluids.

B. Component vs. Cartridge Seals:
   1. Component seals are standard and least expensive.
   2. Component seals are multi-piece requiring assembly as they are installed.
3. Cartridge seals are preassembled and are installed as a single unit.

C. Face material:
1. Specify both face materials but allow manufacturer to determine which is rotating and which is stationary.
2. Carbon/ceramic is standard, carbon / silicon carbide is superior for most applications including split seals.
3. Tungsten carbine is less brittle, good for face-to-face impact due to movement, also good for sticky fluid (not applicable for HVAC).
4. Cannot use for split seals because it won’t “snap”.
5. Other materials available as “problem solvers”.

D. Rotary vs. Stationary Design:
1. Rotary design is industry standard for small pumps (end suction pumps).
2. Rotary design has a spring-loaded rotating face.
3. Stationary design has a spring-loaded stationary face. Unaffected by “parallelness”. of connection between seal and pump gland. Stationary seals only correct once.
4. Rotary seals are constantly flexing, exercising springs.

E. Seal elastomer materials:
1. No industry standard.
2. Buna is undesirable.
3. EPDM is an upgrade for higher temp.
4. Viton is an upgrade for higher temp and chemical resistance.
5. Viton is especially good for acidic fluid, EPDM good for caustic fluid.
6. AFLAS is a newer O-ring material, it is becoming standard on industrial applications. Good for high temp and chemical resistance, both acidic and caustic (and several other applications).

F. Seal elastomer design, O-ring vs. Cup-mounted:
1. Both are adequate for new seals.
2. Cup-mounted seals are better when seat becomes pitted.

G. Flush lines:
1. Recirculation or clean water flush lines should always be used on larger pumps. They are less important on smaller pumps.
2. Serves purpose of air venting, cooling and preventing build-up of particulate.
3. Recirculation lines for clean fluid (e.g. chilled water).
4. Piped from suction side of end suction pumps, cleaner source, additional cleaning due to counter flow, centrifugal action within seal.
5. Piped from discharge side of double suction pumps, no choice due to relative pressures. Avoid connection to top of volute, dirty water due to centrifugal action.
6. Clean water flush required for dirty fluid (e.g. cooling tower water).
7. When limitation of flow into system is required, close-tolerance throat bushing required, adjust flow to achieve 15 FPS across annual space.
8. Recirculation lines are required for all steam condensate pumps, primarily for cooling. Must be piped from discharge side to prevent cavitation due to low pressure at suction side.
9. Throttling device and rotameter recommended in each line on larger pumps, for standard application, adjust flow to 5-10 GPH.
10. When close tolerance throat bushing is used, throttling device should always be used, adjust flow to 15 FPS through annular space.

END OF SECTION 23 21 23

This section of the U of I Facilities Standards establishes minimum requirements only. It should not be used as a complete specification.