





- 2.9.3.3. Voltage unbalance must not exceed 1% as defined per NEMA MG-1 12.45.
- 2.9.3.4. Current unbalance must not exceed 5%.
- 2.9.4. The horsepower of the motor shall be adequately designed to be non-overloading across the entire pump performance curve, to include pump shut-off and pump run-out.
- 2.10. The submersible motor and pump must be designed, constructed and assembled by the same manufacturer.

### **3.0 SUBMERSIBLE MOTOR CORD ENTRY CONSTRUCTION**

- 3.1. The cord entry housing shall be ASTM<sup>®</sup> A48 Gray Cast Iron Class 35.
- 3.2. Power and control cables shall be secured and sealed to the submersible motor. Construction shall be of a method to provide anti-wicking barriers to the submersible motor.
  - 3.2.1. The outer jacket of the power and control cables shall be sealed with an agency-approved, watertight strain relief cord grip fitted with a nitrile compression grommet or rubber compression grommet.
  - 3.2.2. The connections between the power cable and the stator leads and control cable and the internal motor control leads shall be potted and encapsulated in a two-part epoxy in the cord entry system.
- 3.3. All bolted connections in the cord entry construction shall be:
  - 3.3.1. Secured with 304 stainless steel fasteners.
  - 3.3.2. Secured joints in the construction shall be compression fitted with nitrile o-rings.
- 3.4. The power and control cables shall be recognized by Underwriters Laboratory<sup>®</sup> (UL) & Canadian Standard Association<sup>®</sup> (CSA) and will be delivered in a standard length of 40 foot.
- 3.5. The cord entry housing shall be fitted with a stainless steel lifting bale sized and of adequate design to securely lift the complete construction of the submersible grinder pump.
- 3.6. The power and control cables shall be jacketed in a material suitable for submersion, oil resistant, and be flexible for portable installation.
- 3.7. Cable sizing shall be in accordance to NEC<sup>®</sup> specifications.

### **4.0 MECHANICAL SEALS**

- 4.1. Each pump shall be constructed with a tandem mechanical shaft seal system incorporating two independent shaft seal assemblies.
- 4.2. Seals shall operate in a lubricant reservoir that hydro-dynamically lubricates the seal faces at a constant rate.
- 4.3. Inboard and outboard seal construction shall be of the following material:
  - 4.3.1. Primary stationary ring shall be constructed of silicon carbide face material.
  - 4.3.2. Primary rotating ring shall be constructed of silicon carbide face material.
  - 4.3.3. Elastomers shall be constructed of Viton<sup>®</sup> materials.
  - 4.3.4. Metal components shall be constructed of stainless steel for corrosion resistance.
- 4.4. The inboard shall be hydro-dynamically lubricated and operated in a sealed oil reservoir.
- 4.5. The inboard seal chamber seal shall be designed and constructed to prevent lubricant over-filling and provide adequate lubricant expansion to avoid over-pressuring of the seal.
- 4.6. The pump shall be capable of operating in the clockwise or counter clockwise direction without damaging the seal faces.
- 4.7. The pump shall be capable of operating in a dry environment without damage to the seal faces.
- 4.8. Class 1, Division 1, explosion-proof models shall contain an additional line bearing seal constructed of bronze, CDA836 material, and is mounted in the lower seal housing.



- 4.9. The line bearing seal will minimize shaft deflection and serve as the flame path for the motor assembly.

## **5.0 PUMP BEARINGS**

- 5.1. Bearings shall be designed to an ABEC® System 1 or better.
- 5.2. Each pump shall be constructed with a two-bearing system design.
  - 5.2.1. The upper bearing shall be a Conrad type, single row, deep groove ball bearing designed to adequately handle the required radial loads.
  - 5.2.2. The lower bearing shall be a Conrad type, single row, deep groove ball bearing designed to adequately handle the required radial loads.
- 5.3. The bearings shall be designed to deliver a minimum L-10 bearing life of 100,000 hours when operation is within the limitations of the manufacturer's performance curve.
- 5.4. The bearings shall be lubricated in oil and will not require maintenance as described in ANSI/HI 1.4-2010 A.6.

## **6.0 PUMP SHAFT**

- 6.1. The pump shaft shall be an extension of the motor shaft. Any other construction that would include coupling of two shafts is not acceptable.
- 6.2. The pump shaft shall be a Ferritic grade AISI® Type 400 series stainless steel.
  - 6.2.1. Pump shaft material crystal structure shall be body centered cubic (bcc).
  - 6.2.2. Pump shaft shall be of a ferromagnetic material.

## **7.0 IMPELLER**

- 7.1. Material shall be ASTM® A536 ductile cast iron. ASTM® A48 grey cast iron shall be unacceptable.
- 7.2. The design shall be one-piece, 10-vane, vortex flow and dynamically balanced to ISO 1940 G6.3.
- 7.3. The impeller shall be designed with pump out vanes on the back shroud of the pump impeller to prevent the pump media from entering the outboard seal cavity.
- 7.4. The impeller shall be threaded to the pump shaft.
  - 7.4.1. All wetted fasteners shall be of a corrosion resistant stainless steel material.
- 7.5. The mass moment of inertia calculations shall be provided by the pump manufacturer upon request.

## **8.0 GRINDING MECHANISM**

- 8.1. The grinder assembly shall consist of a single rotating grinding cutter and stationary grinding ring secured to the inlet of the volute case.
  - 8.1.1. The rotating grinding cutter shall be threaded onto the pump shaft and secured with a washer and bolt.
  - 8.1.2. The stationary grinding ring shall be secured in place with a metal clamping ring.
- 8.2. Both the stationary and rotating grinding mechanisms shall be removable without disassembling the pump.
- 8.3. No adjustment or shimming grinder assembly shall be necessary.
- 8.4. The grinder components shall be constructed of a martensitic AISI 440C stainless steel hardened to 56-60C Rockwell.
- 8.5. The grinder mechanism shall be capable of producing 12,400 cuts/second.

## **9.0 VOLUTE CASE**

- 9.1. Material shall be ASTM® A48 class 35 gray cast iron.
- 9.2. Design shall be a single piece and a modified constant velocity.
- 9.3. Constructed of smooth passage ways large enough that any macerated solid can enter the impeller.
- 9.4. The discharge is to be of a horizontal centerline configuration.
- 9.5. The discharge is to be 2-1/2" or 3" ANSI® standard Class 125, 4-bolt configuration.