



IMO®

**PRODUCT SERVICE MANUAL  
AND  
PARTS LIST  
FOR  
3E SERIES PUMPS  
ROTOR SIZES 143, 143J AND 162**



**WARNING**

*This Special Instruction Manual and General Installation, Operation, Maintenance, and Troubleshooting Manual Three Screw and CIG Pumps (SRM00046) should be read thoroughly prior to pump installation, operation or maintenance.*

**Manual: SRM00018**

**Rev. 04 (20-0051)**

**February 2020**

## READ ENTIRE PAGE BEFORE PROCEEDING

FOR SAFETY OF PERSONNEL AND TO PREVENT DAMAGE TO EQUIPMENT, THE FOLLOWING NOMENCLATURE HAS BEEN USED IN THIS MANUAL:

	<b>DANGER</b>	
Failure to observe precautions noted in this box can result in severe bodily injury or loss of life.		

	<b>WARNING</b>	
Failure to observe precautions noted in this box can cause injury to personnel by accidental contact with equipment or liquids. Protection should be provided by user to prevent accidental contact.		

	<b>CAUTION</b>	<b>ATTENTION</b>
Failure to observe precautions noted in this box can cause damage or failure of equipment.		

Non compliance of safety instructions identified by the following symbol could affect safety for persons:  <div style="text-align: center;"></div>	Safety instructions where electrical safety is involved are identified by:  <div style="text-align: center;"></div>	Safety instructions which shall be considered for reasons of safe operation of the pump and/or protection of the pump itself are marked by the sign:  <div style="text-align: center;"><b>ATTENTION</b></div>
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<b>ATTENTION</b>
<b><i>If operation of this pump is critical to your business, we strongly recommend you keep a spare pump or major repair kit in stock at all times. As a minimum, a minor repair kit (o-rings, gaskets, shaft seal and bearings) should be kept in stock so pump refurbishment after internal inspection can be accomplished.</i></b>

## A. GENERAL INSTRUCTIONS

Instructions found herein cover disassembly, assembly and parts identification of 3E-143, 143J and 162 pumps.

**NOTE:** Individual contracts may have specific provisions that vary from this manual. Should any questions arise which may not be answered by these instructions, refer to **General Installation, Maintenance and Trouble Shooting Manual, SRM00046** provided with your order. For further detailed information and technical assistance please refer to Imo Pump, Technical/Customer Service Department, at (704) 289-6511.

This manual cannot possibly cover every situation connected with the inspection, and maintenance of equipment supplied. Every effort was made to prepare text of manual so that engineering and design data is transformed into most easily understood wording. Imo Pump must assume personnel assigned to operate and maintain supplied equipment and apply this instruction manual have sufficient technical knowledge and are experienced to apply sound safety and operational practices which may not be otherwise covered by this manual.

In applications where equipment furnished by Imo Pump is to become part of processing machinery, these instructions should be thoroughly reviewed to ensure proper fit of said equipment into overall plant operational procedures.



### WARNING

If installation, operation and maintenance instructions are not correctly and strictly followed and observed, injury to personnel or serious damage to pump could result. Imo Pump cannot accept responsibility for unsatisfactory performance or damage resulting from failure to comply with instructions.

## B. INTRODUCTION

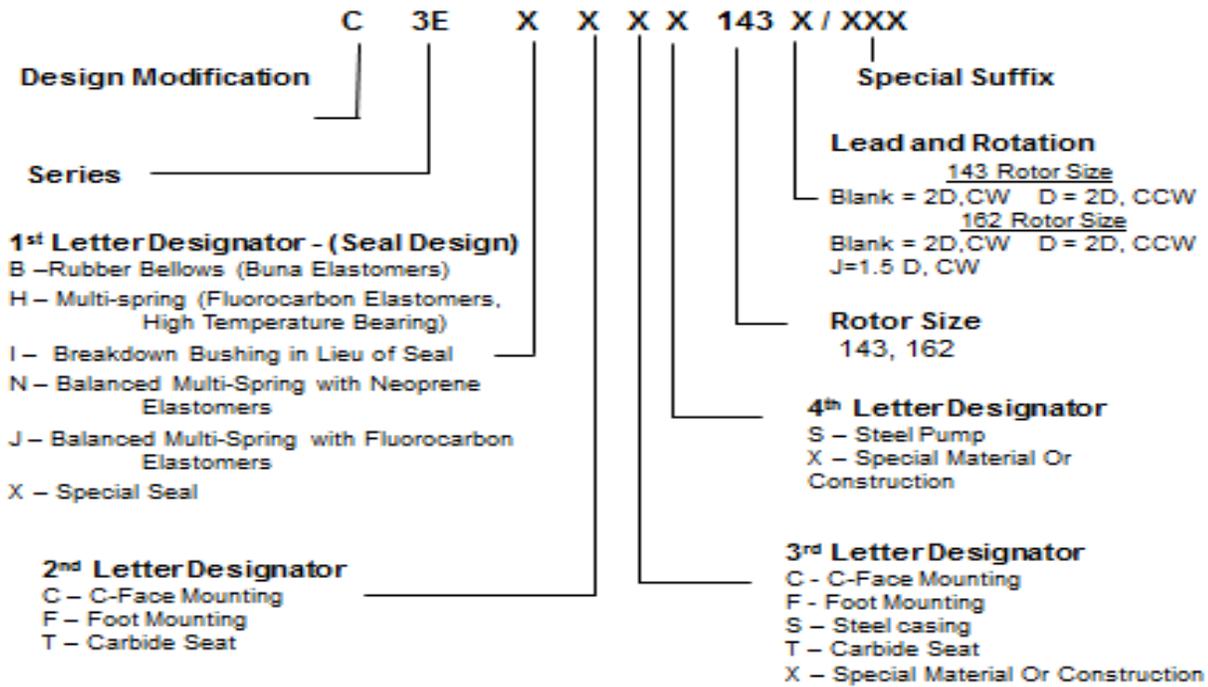
Instruction manual covers 3E-143, 143J and 162 series pumps. Specific models covered by this manual are identified in Table 2. Model of each particular pump is identified on pump end cover. Refer to Figure 1 for definition of model designator. Refer to assembly drawing corresponding to your pump model, Figures 3 through 11 as you use this instruction manual.

## C. DESCRIPTION OF EQUIPMENT

3E-143, 143J and 162 series pumps are positive displacement, rotary screw pumps consisting of precision bored housings which enclose a driven screw (power rotor) and intermeshing following screws (idler rotors). These screws when rotating form a succession of closures or cavities. As they rotate, fluid is moved axially from inlet port to outlet port in a continuous, uniform flow with minimum fluid pulsation and pump noise.

## D. PUMP MODEL IDENTIFICATION

This service manual covers Imo Series 3E-143, 143J and 162 pumps. The model of each pump is identified on pump nameplate. Refer to figure 1 and table 1 for instructional keys when using this manual.



**Figure 1 – Definition of Model Designators of 3E Series Pumps**

## E. ORDERING INSTRUCTIONS

All correspondence pertaining to renewal parts for equipment must refer to instruction manual number and should be addressed to nearest Imo representative. Handling of renewal orders will be greatly facilitated if following directions are carefully observed:

1. Provide number of instruction manual with revision level and date.
2. Provide serial number of pump for which part is desired. This number appears on pump nameplate.
3. Identify kit (Minor or Major) required.

Imo sales and service representatives are listed herein and in General Installation, Maintenance and Trouble Shooting Manual, SRM00046.

## F. OPERATION

### F.1 LIQUID LIMITATIONS

	<b>CAUTION</b>	<b>ATTENTION</b>
Never operate with thin liquids such as solvents or water. Pump is designed for liquids having general characteristics of oil.		

### F.2 OPERATING LIMITS

	<b>CAUTION</b>	<b>ATTENTION</b>
Operating conditions, such as speed, fluid viscosity, temperature inlet pressure, discharge pressure, filtration, duty cycle, drive type, mounting, etc., are interrelated. Due to these variable conditions, specific application limits may be different from operational limitations. Equipment must not be operated without verifying system's operating requirements are within pump's capabilities.		

Under no circumstances are the following operating limits (specified in table 1) to be exceeded without specific approval from Imo Pump.

**Table 1 – Pump Operating and Structural Limits**

Maximum Speed....	4000 RPM for Type B and H seals 3500 Rpm for Type H and J Seal Up to 7000 Rpm for Type I Pumps. Contact factory for exact speeds. 1800 rpm for #6 fuel oil, crude oil and fluids known to contain fine abrasives
Viscosity.....	Type B and I Pumps – 33 to 3000 SSU (2 to 650 Cst) Type H Pumps – 33 TO 25,000 SSU (2 to 5400 Cst) Type N ad J -60 to 5000 SSU (10 to 1100 Cst)
Temperature.....	Type B Mechanical Seal - 0° to 180°F [-17 C to 82.2 C] Type H Mechanical Seal, Integral Mounted Pumps, and Packing Pumps - 0° to 250°F [-17 to 121 C]
Suction Pressure.....	Type 3EB and 3EH, 3EI - 75 PSIG Maximum [1.72 bar Maximum] Type 3EJ and 3EN – 250 psig
Drive .....	Direct Only
Maximum Differential Pressure .....	150 PSIG [10.3 bar]
Filtration.....	Light Fluids – 60 mesh Heavy Fluids – 1/16 to 1/8 inch [1.58 mm to 3.17 mm]

**F.3 Pump Weights:** Foot Mount – 36 LBS [16.4 KG] C-Face = 32 LBS [14.5 KG]

**F.4 Pump Airborne Noise levels are expected to be less than 70 dBA.**

**G. PARTS LIST**

**Table 1 – List of Material**

Item	Qty.	Part Description	Item	Qty	Part Description
1	1	Case/Housing	16(1)	1	Seal
2(2)	1	Outboard End cover	26(1)	1	Inboard Cover O-Ring
3	4	End Cover Hex Bolts	27	4	Inboard Cover Hex Bolts
4	1	Inboard Cover	75(2)	1	Housing***
5(1)	1	Inlet O-Ring*			
6	4	Bearing Cover Hex Bolts	76(2)	1	Housing O-Ring***
7(2)	1	Power Rotor	92	1	Seal Seat Adapter
8(2)	2	Idlers	93(1)	1	Seal Seat Adapter O-Ring
11(1)	1	Ball Bearing	96	1	Pipe Plug
12	1	Bearing Retainer	97	1	Dowel Pin
13	2	Shaft Key			
15	1 or 2**	Bearing Snap Rings			

- \* On 3EJ(N) pumps only
- \*\* Qty 2 on 3EJ(N) pumps only
- \*\*\* Used On Steel Case Pumps Only

**NOTE:** (1) Minor Repair Kit items (iron and steel case pumps, not including 3EIC).  
(2) Major Repair Kit items (steel case pumps only). Items marked (1) also included in Major Repair Kit.

**REPAIR KITS**

Minor Repair Kits are available for pumps equipped with mechanical seal and ball bearing. Major Repair Kits are available for all steel case pumps. Major Repair Kits are not available for iron case pumps because major repairs are not considered economical. If extensive repair is required to an iron case pump, the pump should be discarded and a new pump purchased. Repair parts are available only in kit form.

## H. PUMP MAINTENANCE



### WARNING

Failure to observe precautions while installing, inspecting and maintaining pump can cause injury to personnel from accidental handling of liquids that may harm skin or clothing, or fire hazard risks from flammable liquids, or injury from high pressure fluid jets.



### DANGER

**BEFORE** working on equipment, make sure all power to equipment is disconnected and locked-out.

### H.1 GENERAL COMMENTS

**NOTE:** Part number identifiers contained within parenthesis, such as (3), refer to circled numbers shown on assembly drawings (Figures 3 through 11).



### DANGER

De-energize driver before starting with any maintenance action

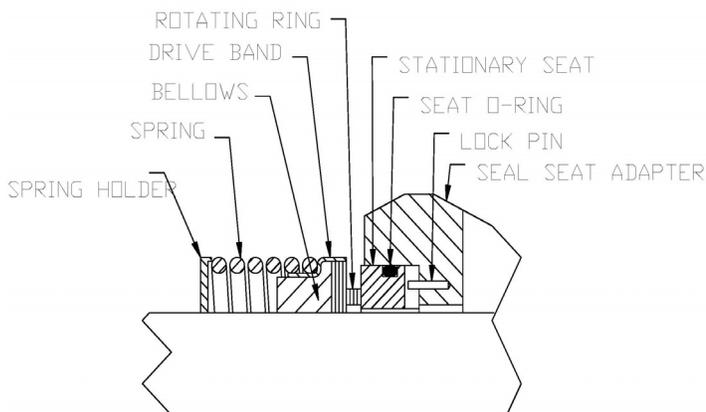
### H.2 TOOLS REQUIRED

Procedures described in this manual require common mechanics hand tools, a torque wrench, dial indicators for alignment and a suitable lifting device such as slings, straps, etc.

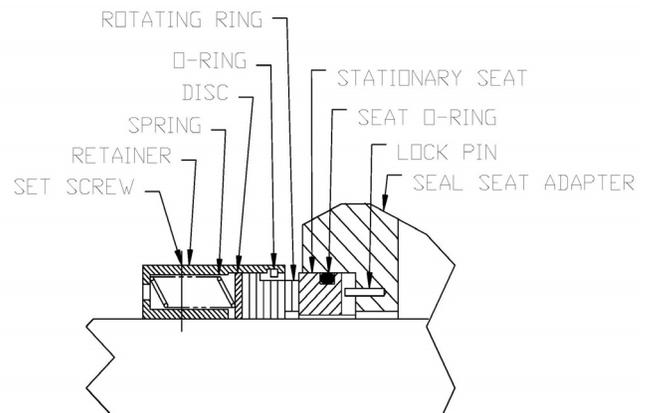
### H.3 Pump Disassembly Procedure

**NOTE:** For disassembly, use mechanical seal drawing (Figure 2) below and appropriate assembly drawing per chart 2 below for particular pump types.

#### SINGLE SPRING, RUBBER BELLOWS MECHANICAL SEAL



#### MULTI-SPRING MECHANICAL SEAL



**Figure 2 - MECHANICAL SEALS**

**Table 2 – 3E-143, 143J and 162 Pump Models Versus Assembly Figure Numbers**

Figure Number	Pump Models
3	C3EIC, C3EICX
4	D3EICS, D3EICSX
5	C3EBC, C3EHC, C3EBTC, C3EHTC, C3EXC, C3EBCX
6	C3EBF, C3EHF, C3EBTF, C3EHTF, C3EXF, C3EXTF
7	D3EBCS, D3EHCS, D3EBTCS, D3EHTCS, D3EXCS, D3EBCSX, D3EBCSTX
8	D3EBFS, D3EHFS, D3EBTFS, D3EHTFS, D3EXFS, D3EHFSX, D3EXTFS
9	D3ENC, D3ENCX, D3EJC, D3EJCX
10	D3ENCX, D3EJCS, D3ENCX, D3EJCSX
11	D3ENFS, D3EJFS, D3ENFSX, D3EJFSX



**CAUTION**

Fluid leakage from disassembly of pump may make floor slippery and cause personal injury

1. If pump is an iron case seal-less version C3EIC (See figure 3), it is not repairable. Contact Imo for a replacement pump. If pump is steel case seal-less version D3EICS (See Figure 4), proceed to step 6 below for disassembly. If pump is any other type, proceed with step 2 below.
2. Remove bearing retainer bolts (6) and bearing retainer (12).
3. Grasp power rotor (7) shaft and pull assembled power rotor (7) from pump. Removal of power rotor will also remove bearing (11), seal (16), seal seat adapter (92) and snap ring(s) (15).
4. Disassemble power rotor as follows:
  - a. Remove drive side bearing retaining ring (15) from groove of power rotor (7). Put power rotor (7) on a press with bottom of seal seat adapter (92) on plate of press. Press power rotor (7) through bearing (11) and seal seat adapter (92). On high inlet pumps, Figure 9, 10 and 11 only, remove inner retaining ring (15) from power rotor (7).

**CAUTION**

**ATTENTION**

Ensure power rotor (7) does not fall to floor when it is pressed off ball bearing (11).

- b. Remove seal seat adapter (92) from shaft (7) and stationary seal seat with O-ring from seal seat adapter (92) and remove O-ring from stationary seal seat. Remove O-ring (93) from groove in OD of seal sleeve adapter.
  - c. Remove rotating assembly of mechanical seal (16) from power rotor (7) sleeve as outlined below:
    - (1) If single spring seal. Slide rotating assembly from power rotor (7).
    - (2) If multi-spring type seal. Loosen setscrews and slide rotating assembly from power rotor (7).
5. If only seal (16) is being replaced, disassembly is complete. Follow steps 5, 7 and 8 of reassembly procedure below to assembly new seal (16) on power rotor (7) and assembly power rotor (7) into pump. If rest of pump is to be disassembled, proceed to step 6 below.
6. Remove hex bolts (27) and cover (4) from case (1). Remove O-ring (26) from either case (1) or cover (4). If pump is D3EICS, figure 4, remove power rotor (7) from housing (1).

7. Remove bolts (3) and cover (2) from case (1). Clean Loctite gasket eliminator from cover (2) and flange of case (1). If pump is high inlet pressure type (3EJ(N), Figures 9 and 10) remove O-ring (5) from cover (2) instead of loctite.
8. Remove idlers (008) from idler bores of housing.
9. If pump is steel case type, see figures 4, 7, 8, 10, 11, Remove housing (75) with O-ring (76) from case (1) by removing plug (96) and pin (97). Remove O-ring (76) from groove of housing (75).

#### H.4 Pump Reassembly:

**NOTE:** Prior to assembly of pump, clean and inspect all parts for nicks and burrs. Replace all worn or damaged parts. Imo Pump recommends replacement of all O-rings, mechanical seal (25) and ball bearing when these parts are disturbed from their previously installed positions. Coat all parts with light lubricating oil to assist in assembly. Inspect power rotor (7) shaft and remove any nicks or burrs which are present. Polish power rotor shaft to remove any rust or oxidants that may be present under shaft sleeve.

1. If pump is steel case seal-less version D3EICS (See Figure 4), proceed to step 2 below otherwise proceed to step 4.
2. Install O-ring (76) in groove of housing (75) and install housing (75) in case (1), ensuring that anti-rotation groove in housing (75) is aligned with anti-rotation boss in case (1). Install pin (97) and plug (96).
3. Install power rotor (7) in housing (75).
4. Install O-ring (26) on rabbit of inboard cover (4) and assemble inboard cover (4) to case (1) with hex bolts (27). Skip to step 9.
5. Assembly Power rotor as follows:
  - a. Coat power rotor (7) seal area with lubricating fluid, and install seal rotating assembly on power rotor (7) as below:
    - (1) If single spring seal, slide rotating assembly on power rotor (7) sleeve until rotating assembly is positioned next to idler stop.
    - (2) If multi spring type seal, slide rotating assembly on power rotor (7) sleeve until rotating assembly is positioned next to idler stop. Tighten seal set screws.
  - b. Assemble seal seat adapter (92) by installing mechanical seal O-ring in groove in stationary seat of mechanical seal and then installing stationary seat in seal seat adapter (93). Be sure that pin in seal seat adapter lines up with slit in back of stationary seat.
  - c. Apply lubricating oil on running faces of mechanical seal and install seal sleeve adapter (92) on power rotor (7) with stationary seal seat contacting installed rotating assembly seal face.
  - d. If pump is high inlet pressure (3EJ(N) type, see figures 9 and 10), install retaining ring (15) into power rotor (7) groove furthest from shaft coupling end.
  - e. Install ball bearing (11) by first supporting thread end of power rotor (7) on press and then pressing ball bearing (11) on power rotor (7) shaft, pressing only on bearing (11) inner race until bearing either contacts sleeve on power rotor (7), or in case of 3EJ(N) pump, contacts inner snap ring (15). Install coupling facing snap ring (15) on shaft (7).

**CAUTION**

**ATTENTION**

Ball Bearing (11) will be damaged if installed by pressing on inner race.

6. Assemble inboard cover (4) to case (1) with hex bolts (27).
7. Install assembled power rotor, centering each part as it enters cover (4). NOTE: Sleeve subassembly (92) drain port is to be aligned with drain port in cover (4).
8. Install retainer (12) on cover (04) using hex bolts (6). Tighten bolts (6) to a torque on assembly drawing.
9. Install idlers (8) in housing (1) being sure that idler (8) ends with taper face thrust plate (2).
10. Wipe all traces of oil from the mating flanges of cover (2) and flanges of case (1). Install loctite gasket eliminator #504 on edges of thrust plate (O-ring (5) will be used instead of gasket eliminator on high inlet 3EJ(N) pumps.) and then install cover (2) on case/housing (1) with hex bolts (3). Torque bolts to value on assembly drawing.
11. Rotate power rotor to ensure freedom of rotation.
12. Install key (13) and coupling hub on power rotor (7). Install pump on driver and check alignment as described in Manual Number SRM 00046 (General Installation, Operation, Maintenance, and Troubleshooting Manual). Prime pump to expel air prior to startup.

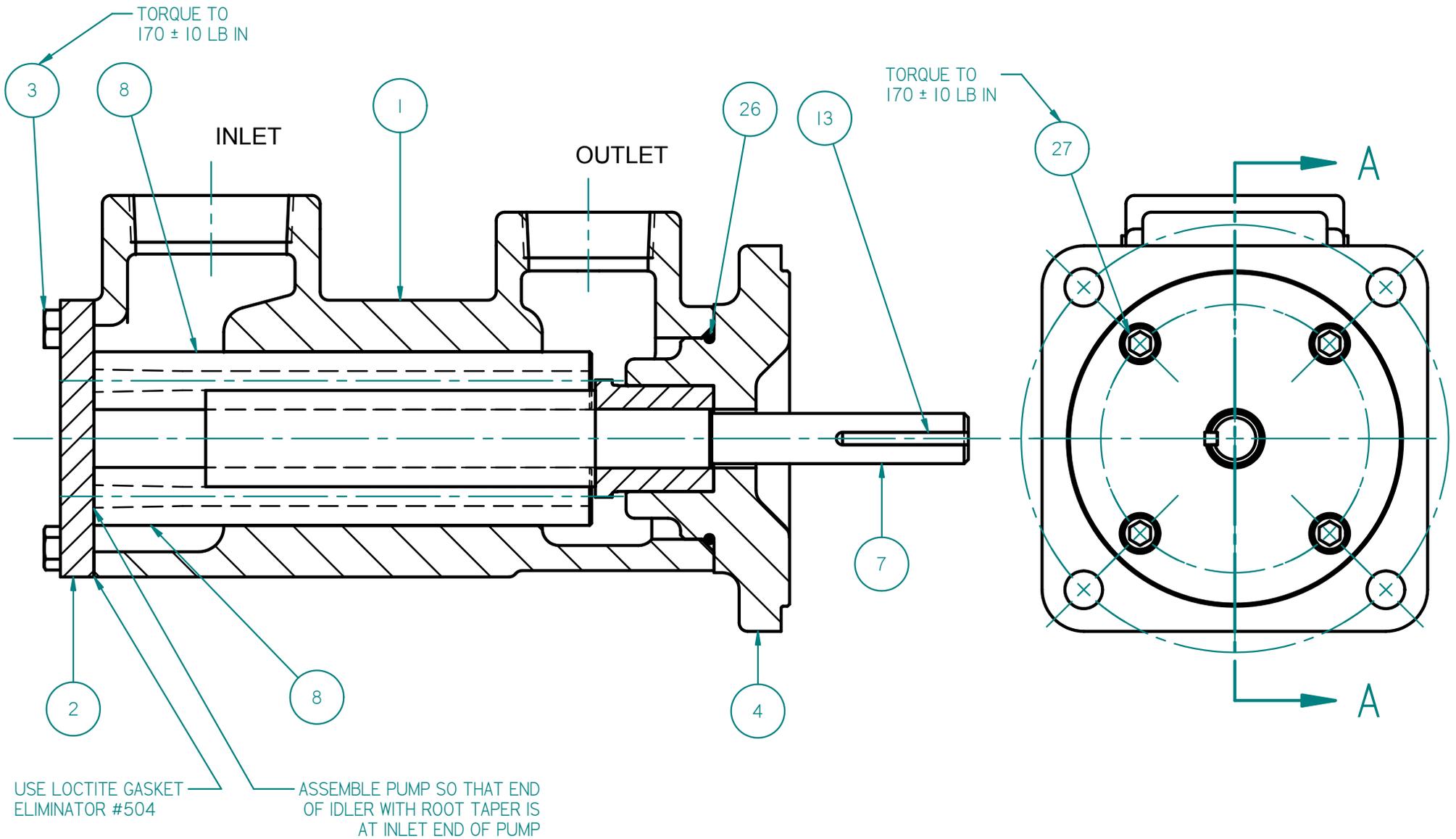
## **I. Troubleshooting**

For assistance with troubleshooting see the General Installation, Maintenance and Trouble Shooting Manual, SRM00046.

## **J. FIELD AND FACTORY SERVICE AND PARTS**

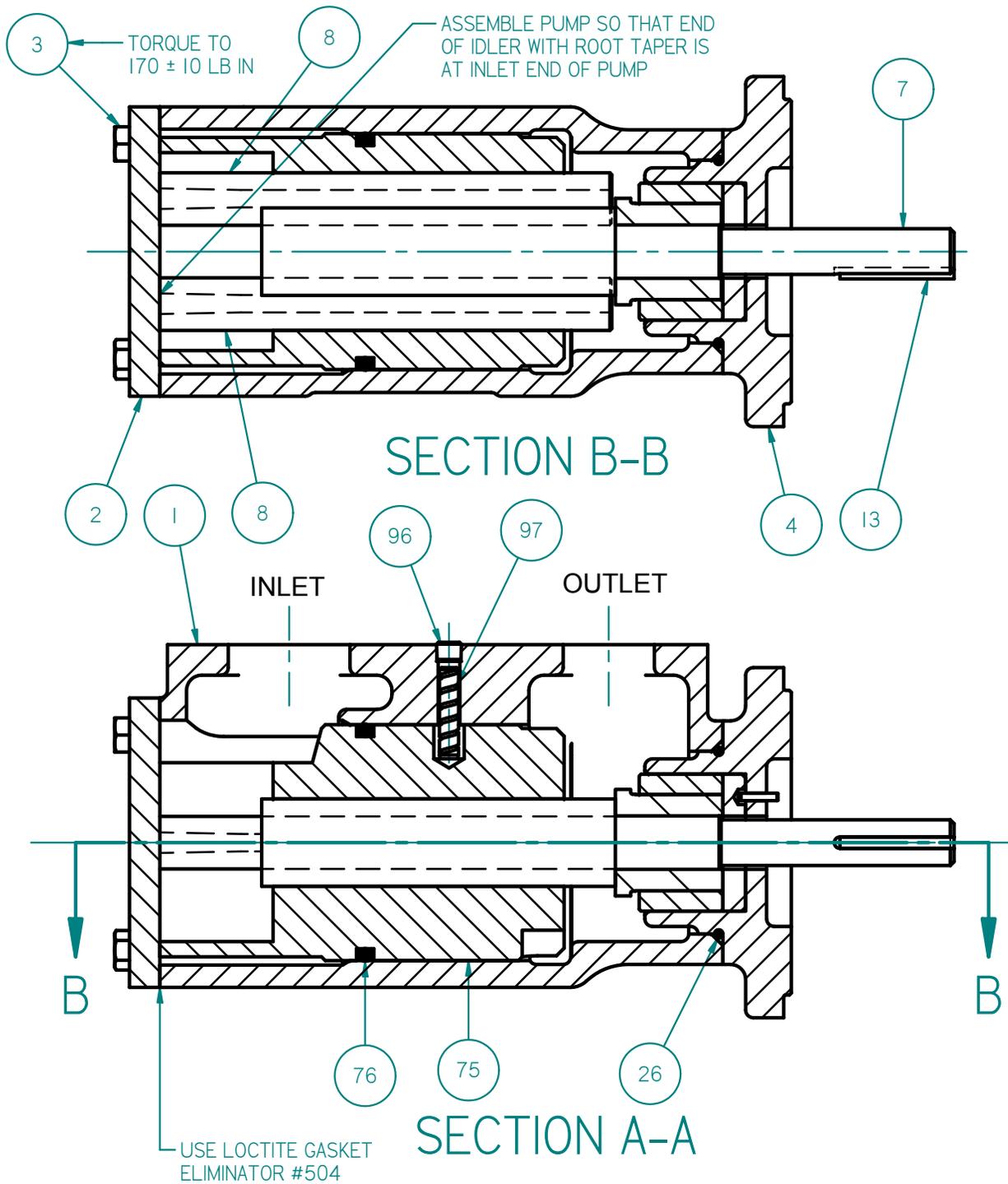
Imo Pump maintains a staff of trained service personnel that can provide pump installation, pump start-up, maintenance/overhaul and troubleshooting supervision as well as installation and maintenance training.

Our factories provide maintenance as well as overhaul and a test facility in event user prefers to return pumps for inspection or overhaul. Factory-overhauled pumps are normally tested and warranted "as-new" for a period of one year from date of shipment. For either field service or factory overhaul assistance, contact your local Imo Sales Office or representative at Technical/ Customer Service Department in Monroe, NC, USA.



## SECTION A-A

# FIGURE 3 - IRON CASED C3EIC PUMP



NOTES:  
 1. DRAIN HOLE IN COVER (#4) TO BE ASSEMBLED IN THE DOWN POSITION.

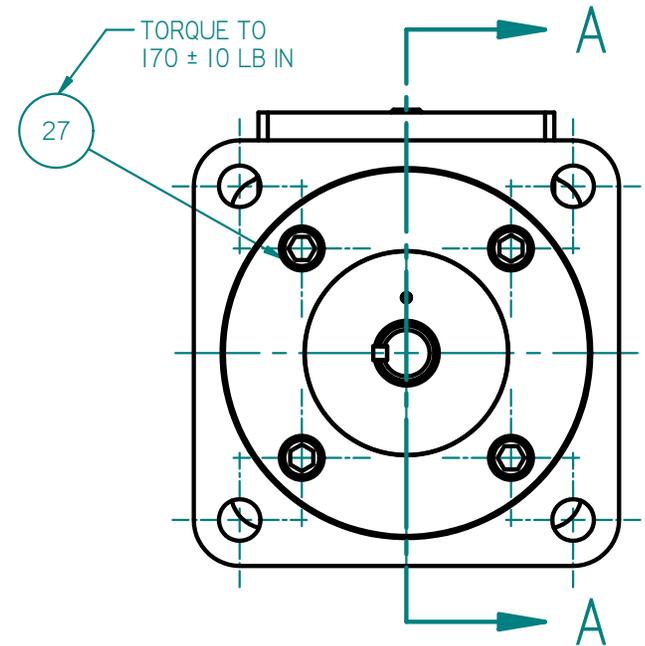
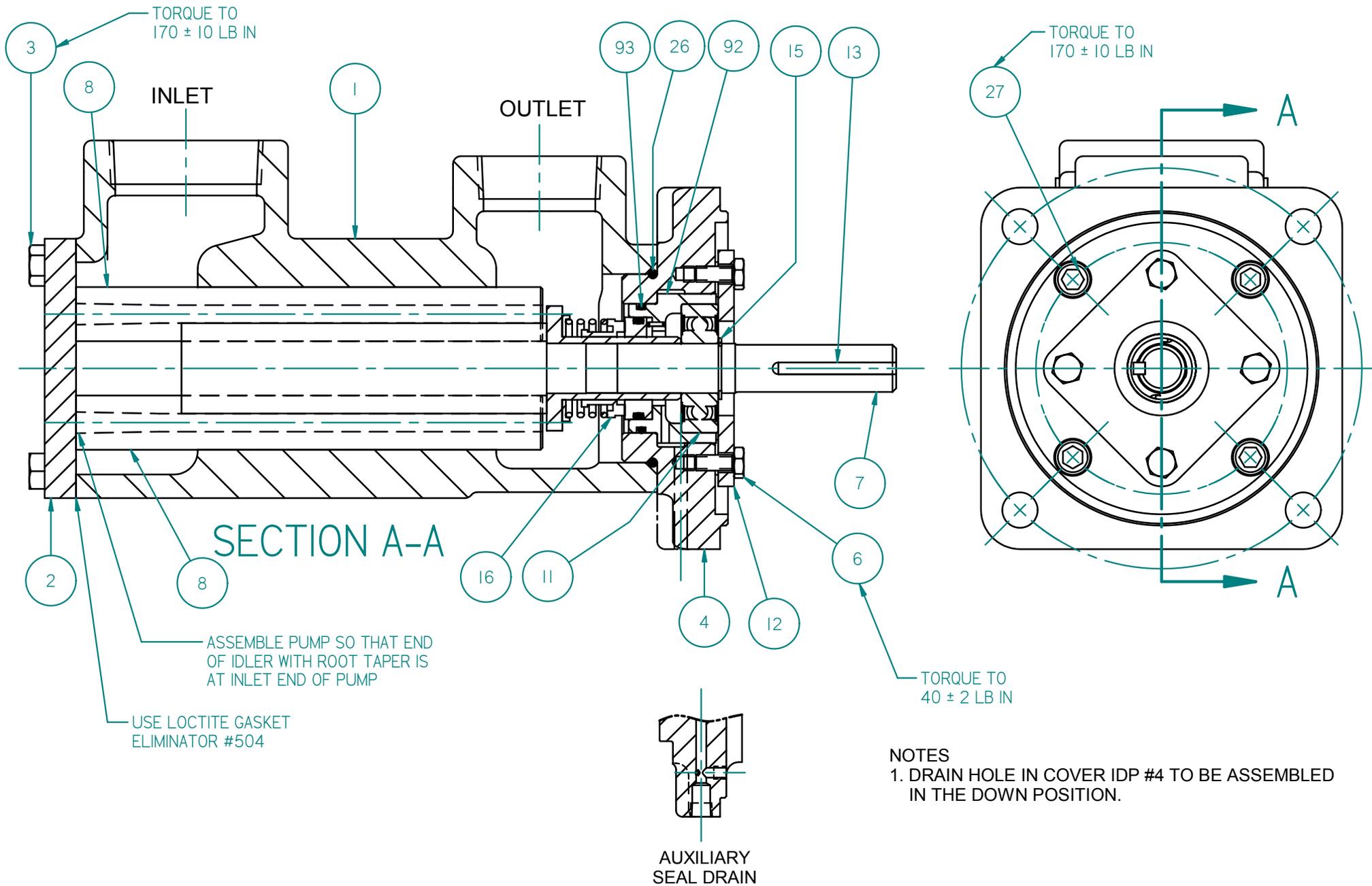
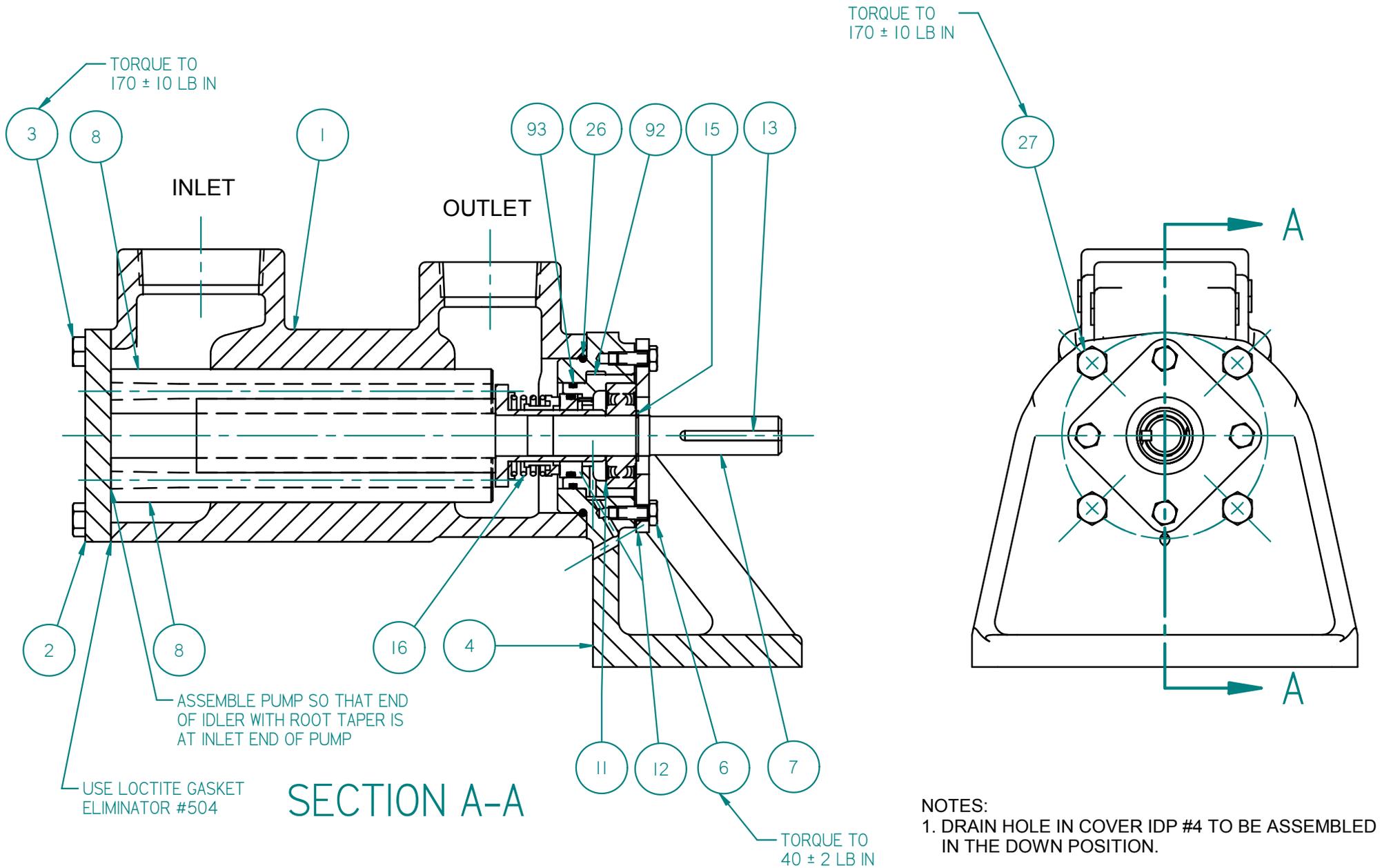


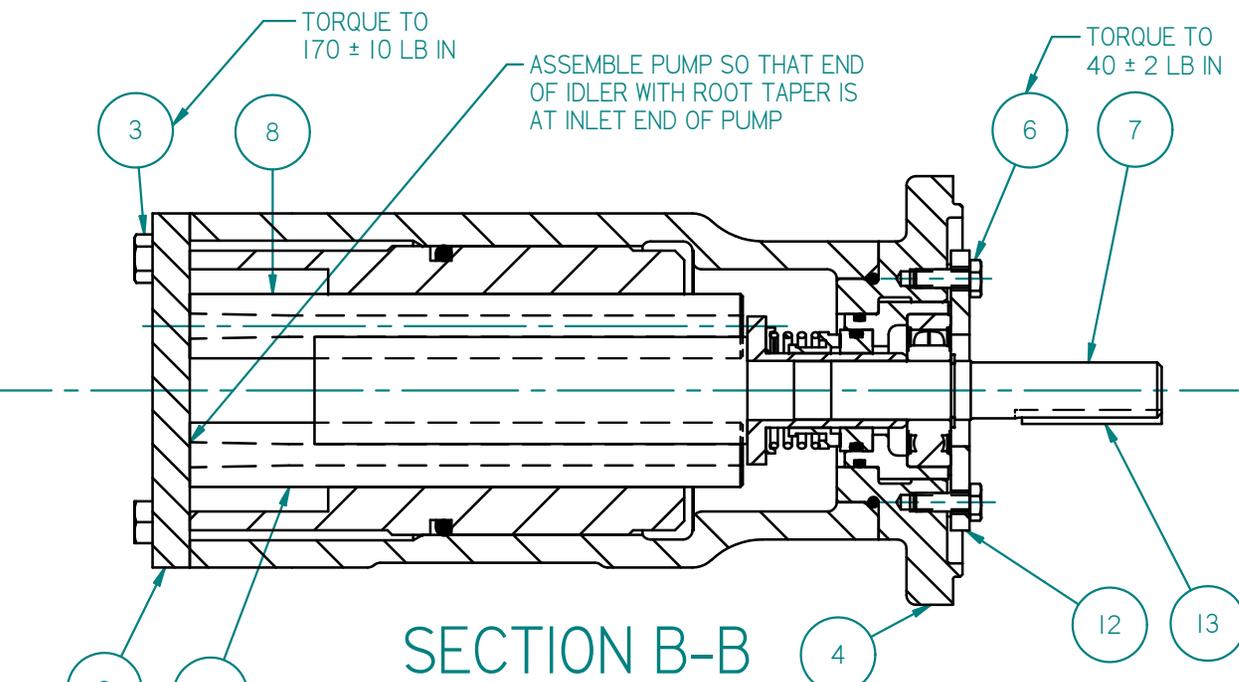
FIGURE 4- STEEL CASED D3EICS PUMP



**FIGURE 5 - IRON CASED C3EB(H)C - C-FACE MOUNTED PUMP**



**FIGURE 6 - IRON CASED C3EB(H)F - FOOT MOUNTED PUMP**



NOTES:  
 1. DRAIN HOLE IN COVER (#4) TO BE ASSEMBLED IN THE DOWN POSITION.

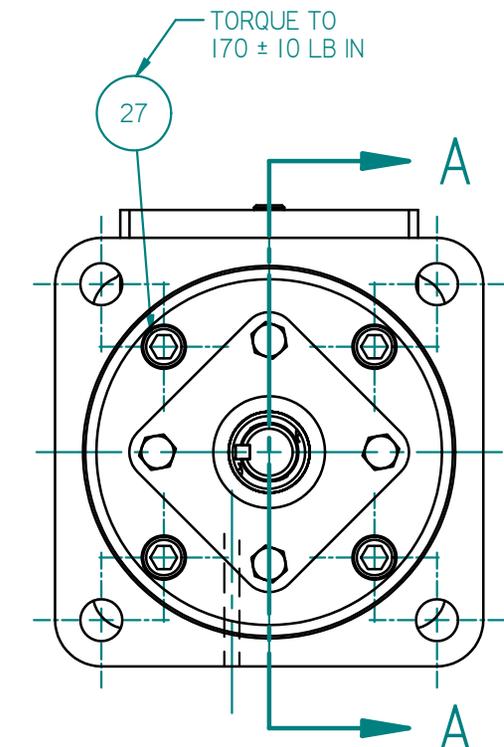
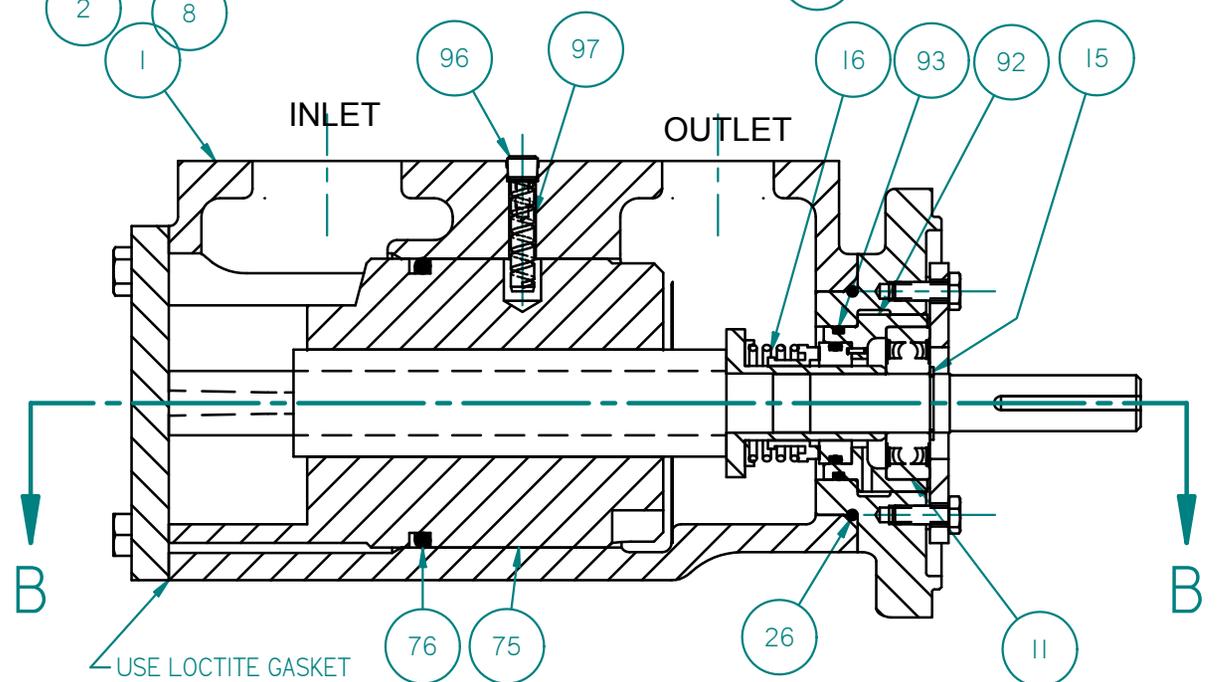
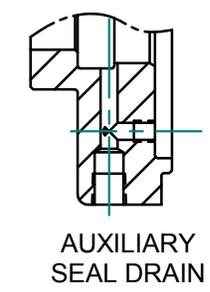
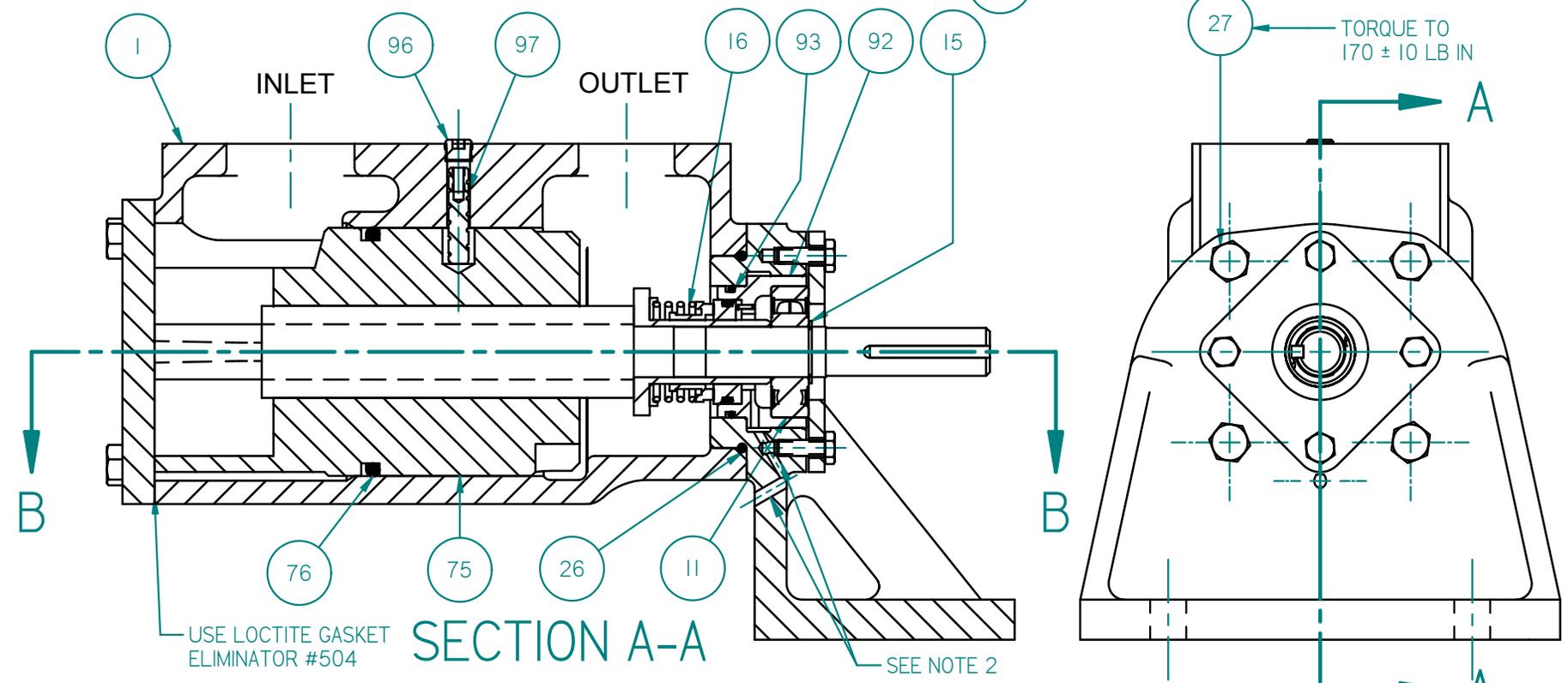
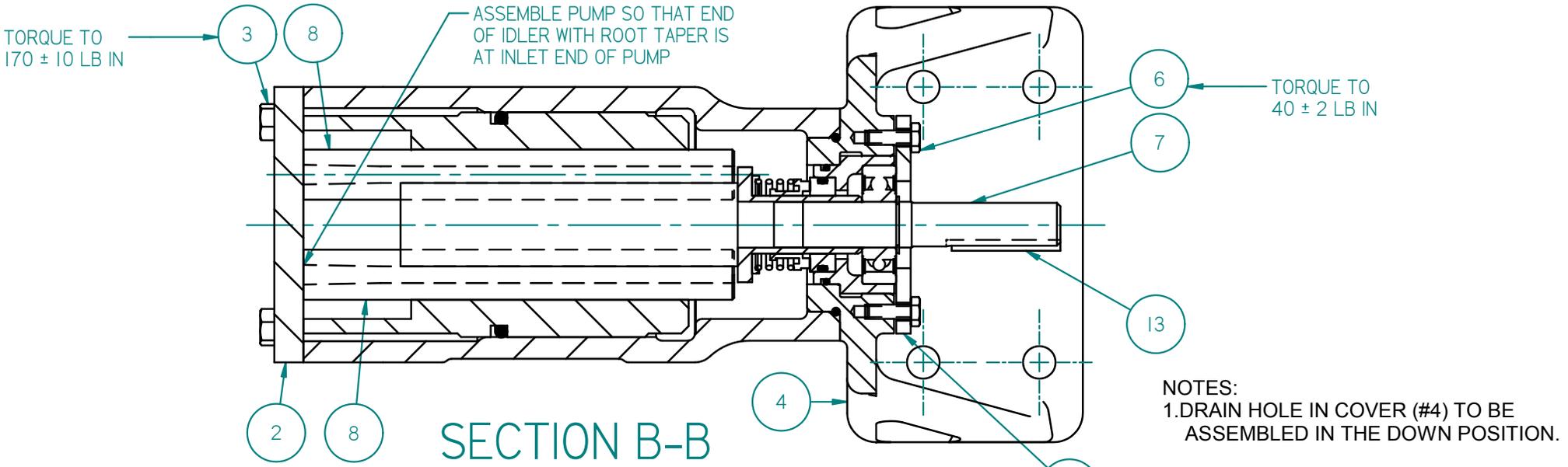
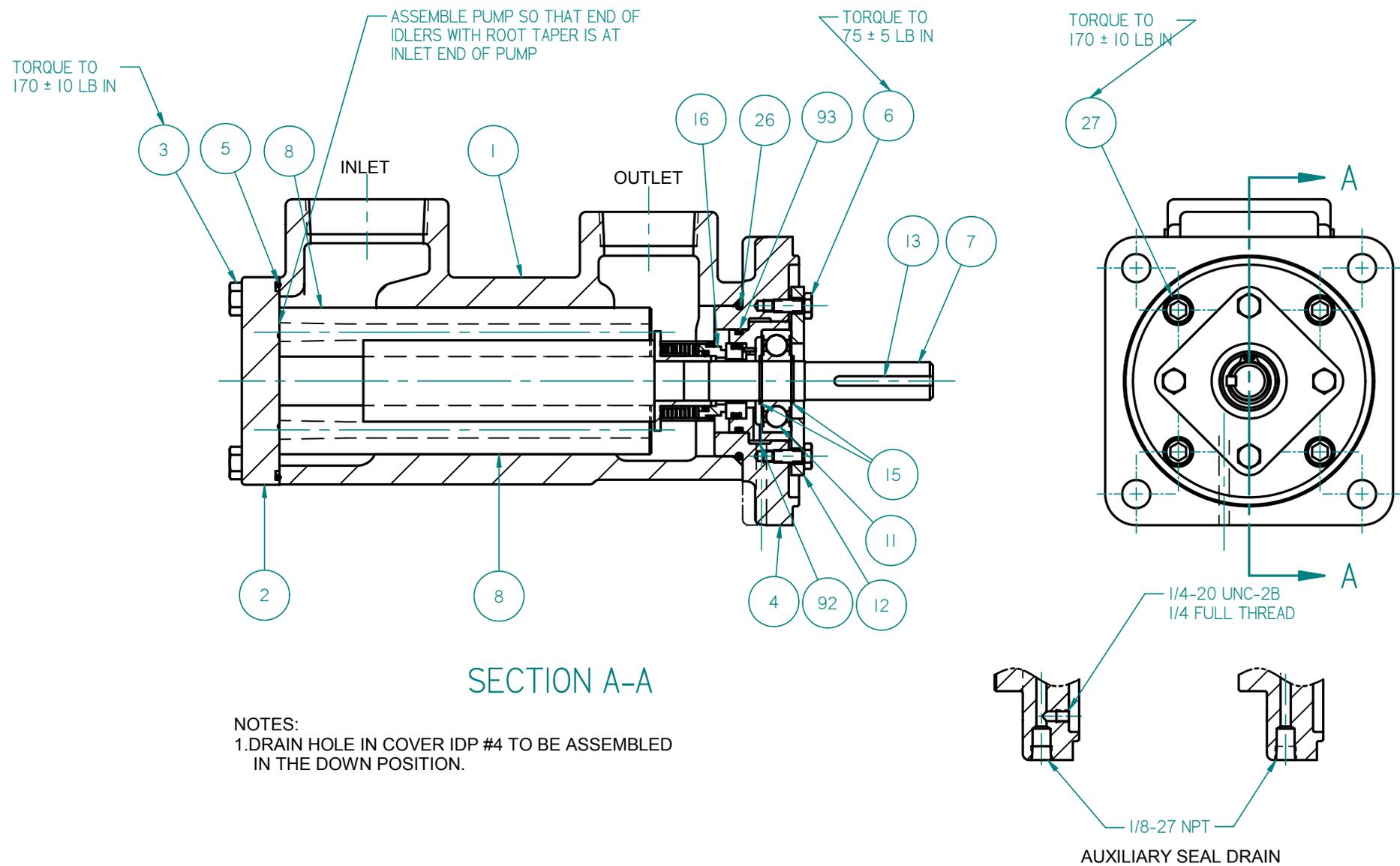


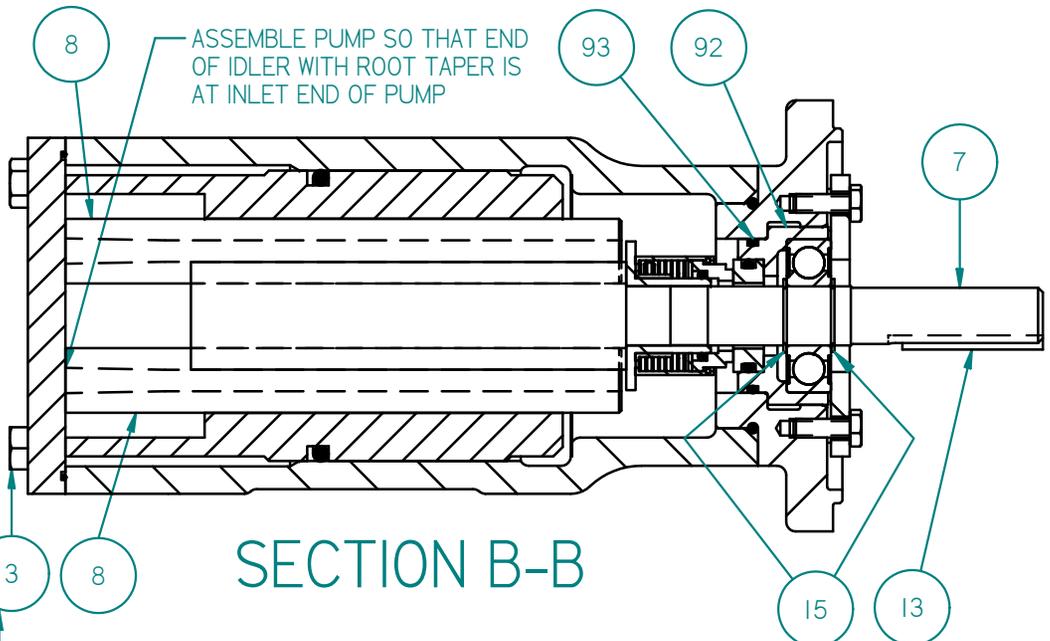
FIGURE 7 - STEEL CASED D3EB(H)CS - C-FACE MOUNTED PUMP



**FIGURE 8 - STEEL CASED D3EB(H)FS - FOOT MOUNTED PUMP**



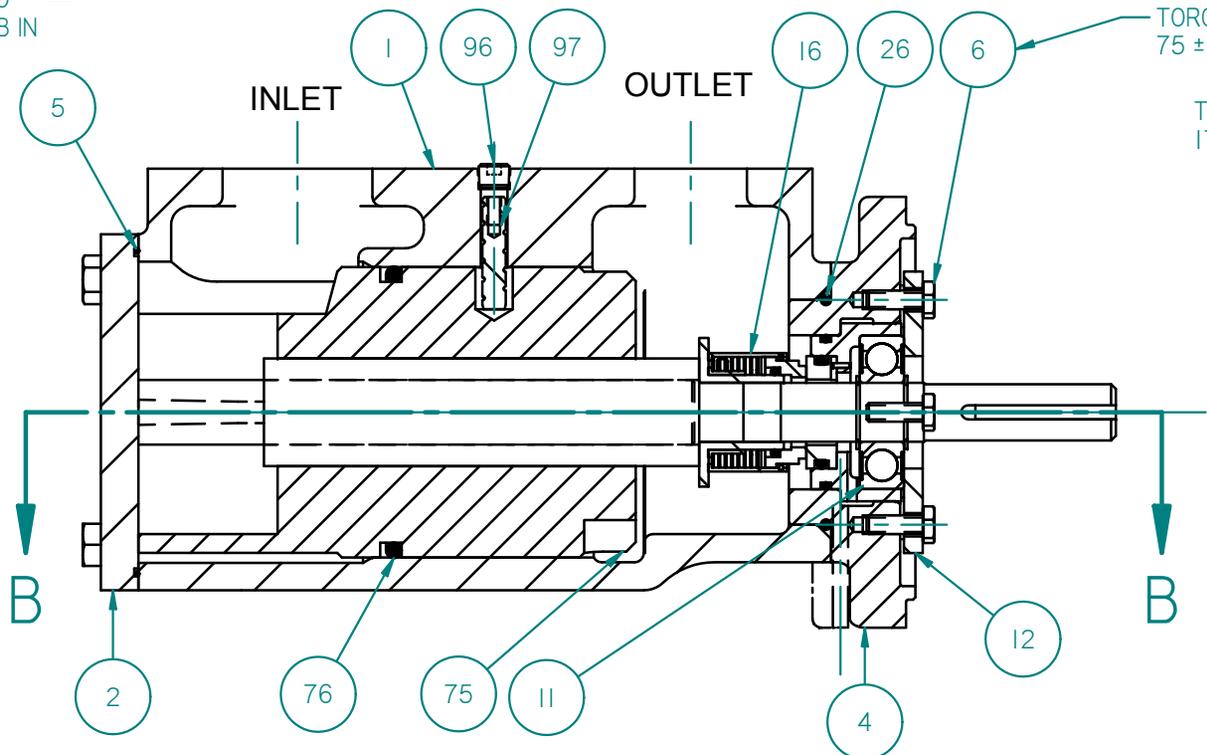
**FIGURE 9 - IRON CASED D3EJ(N)C - C-FACE MOUNTING**



SECTION B-B

NOTES:  
1. DRAIN HOLE IN COVER IDP #4 TO BE ASSEMBLED IN THE DOWN POSITION.

TORQUE TO  
170 ± 10 LB IN



SECTION A-A

TORQUE TO  
75 ± 5 LB IN

TORQUE TO  
170 ± 10 LB IN

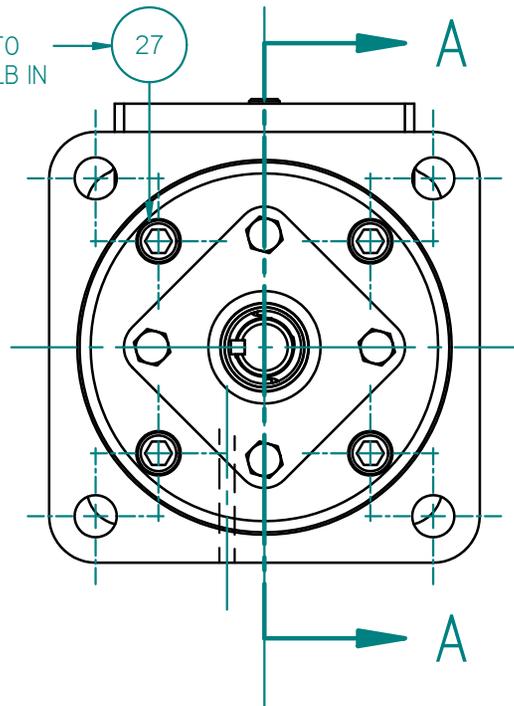


FIGURE 10 - STEEL CASED D3EJ(N)CS - C-FACE MOUNTING

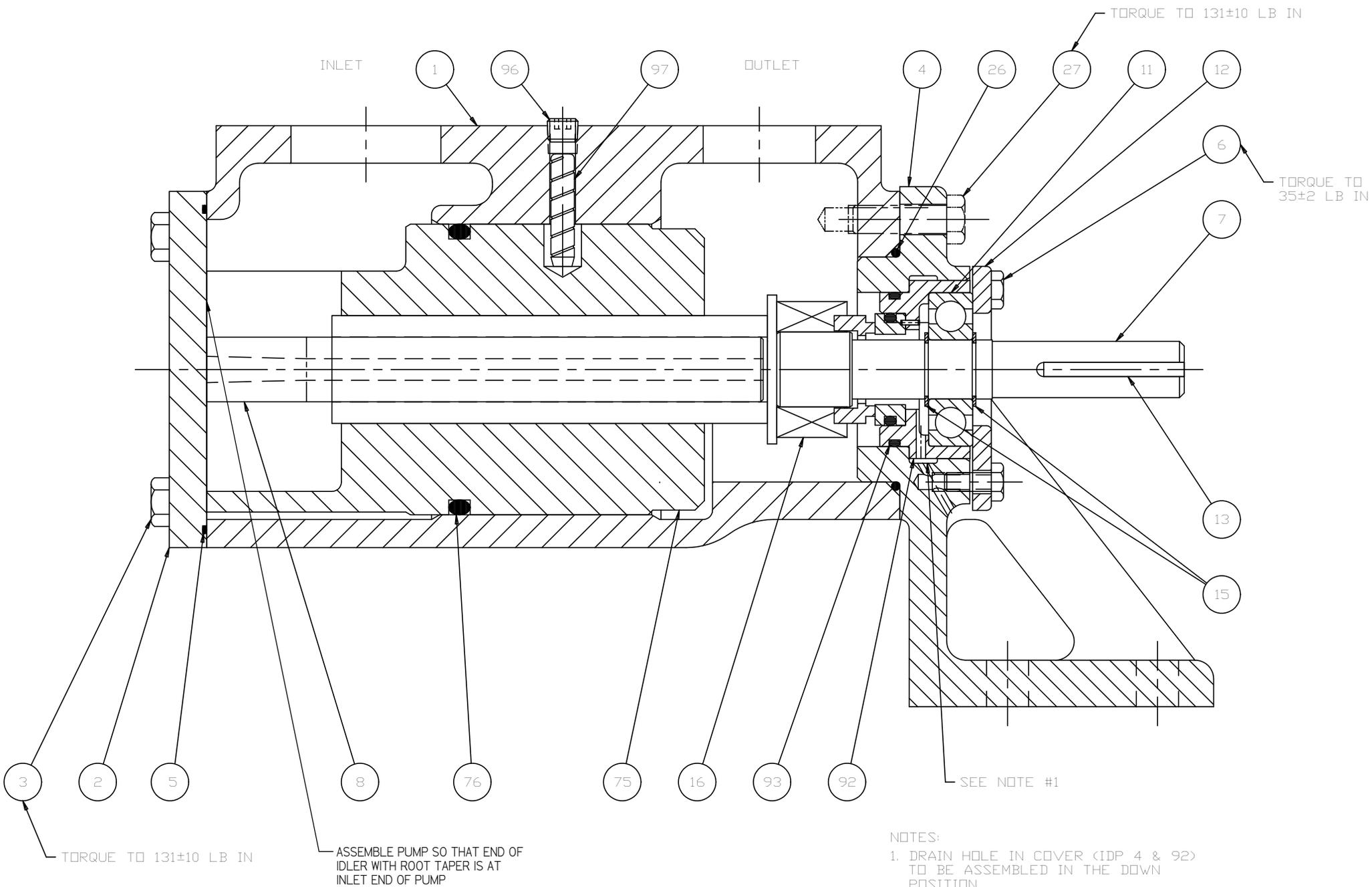


FIGURE II - STEEL CASED D3EJ(N)FS - FOOT MOUNT PUMP



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