

# **GOULDS PUMPS**

## **Installation, Operation, and Maintenance Instructions**





# FOREWORD

This manual provides instructions for the Installation, Operation, and Maintenance of the Goulds Model NM 3171 Non-Metallic Vertical Process Pump. This manual covers the standard product plus common options that are available. For special options, supplemental instructions are supplied. **This manual must be read and understood before installation and start-up.**

The design, materials, and workmanship incorporated in the construction of Goulds pumps makes them capable of giving long, trouble-free service. The life and satisfactory service of any mechanical unit, however, is enhanced and extended by correct application, proper installation, periodic inspection, condition monitoring, and careful maintenance. This instruction manual was prepared to assist operators in understanding the construction and the correct methods of installing, operating, and maintaining these pumps.

**Goulds shall not be liable for physical injury, damage, or delays caused by a failure to observe the instructions for installation, operation, and maintenance contained in this manual.**

**Warranty is valid only when genuine Goulds parts are used.**

Use of the equipment on a service other than stated in the order will nullify the warranty, unless written approval is obtained in advance from Goulds Pumps.

Supervision by an authorized Goulds' representative is recommended to assure proper installation. Additional manuals can be obtained by contacting your local Goulds representative or by calling 1-800-446-8537.

## THIS MANUAL EXPLAINS

- Proper Installation
- Start-up Procedures
- Operation Procedures
- Routine Maintenance
- Pump Overhaul
- Trouble Shooting
- Ordering Spare or Repair Parts



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## IMPORTANT SAFETY NOTICE

*To: Our Valued Customers*

User safety is a major focus in the design of our products. Following the precautions outlined in this manual will minimize your risk of injury.

ITT Goulds pumps will provide safe, trouble-free service when properly installed, maintained, and operated.

Safe installation, operation, and maintenance of ITT Goulds Pumps equipment are an essential end user responsibility. This *Pump Safety Manual* identifies specific safety risks that must be considered at all times during product life. Understanding and adhering to these safety warnings is mandatory to ensure personnel, property, and/or the environment will not be harmed. Adherence to these warnings alone, however, is not sufficient — it is anticipated that the end user will also comply with industry and corporate safety standards. Identifying and eliminating unsafe installation, operating and maintenance practices is the responsibility of all individuals involved in the installation, operation, and maintenance of industrial equipment.

Please take the time to review and understand the safe installation, operation, and maintenance guidelines outlined in this Pump Safety Manual and the Instruction, Operation, and Maintenance (IOM) manual. Current manuals are available at [www.gouldspumps.com/literature\\_ioms.html](http://www.gouldspumps.com/literature_ioms.html) or by contacting your nearest Goulds Pumps sales representative.

**These manuals must be read and understood before installation and start-up.**

For additional information, contact your nearest Goulds Pumps sales representative or visit our Web site at [www.gouldspumps.com](http://www.gouldspumps.com).

# SAFETY WARNINGS

Specific to pumping equipment, significant risks bear reinforcement above and beyond normal safety precautions.

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 **WARNING**

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A pump is a pressure vessel with rotating parts that can be hazardous. Any pressure vessel can explode, rupture, or discharge its contents if sufficiently over pressurized causing death, personal injury, property damage, and/or damage to the environment. All necessary measures must be taken to ensure over pressurization does not occur.

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 **WARNING**

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Operation of any pumping system with a blocked suction and discharge must be avoided in all cases. Operation, even for a brief period under these conditions, can cause superheating of enclosed pumpage and result in a violent explosion. All necessary measures must be taken by the end user to ensure this condition is avoided.

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 **WARNING**

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The pump may handle hazardous and/or toxic fluids. Care must be taken to identify the contents of the pump and eliminate the possibility of exposure, particularly if hazardous and/or toxic. Potential hazards include, but are not limited to, high temperature, flammable, acidic, caustic, explosive, and other risks.

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 **WARNING**

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Pumping equipment Instruction, Operation, and Maintenance manuals clearly identify accepted methods for disassembling pumping units. These methods must be adhered to. Specifically, applying heat to impellers and/or impeller retaining devices to aid in their removal is strictly forbidden. Trapped liquid can rapidly expand and result in a violent explosion and injury.

ITT Goulds Pumps will not accept responsibility for physical injury, damage, or delays caused by a failure to observe the instructions for installation, operation, and maintenance contained in this Pump Safety Manual or the current IOM available at [www.gouldspumps.com/literature](http://www.gouldspumps.com/literature).

# SAFETY

## DEFINITIONS

Throughout this manual the words **WARNING**, **CAUTION**, **ELECTRICAL**, and **ATEX** are used to indicate where special operator attention is required.

**Observe all Cautions and Warnings highlighted in this Pump Safety Manual and the IOM provided with your equipment.**



### **WARNING**

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

**Example:** Pump shall never be operated without coupling guard installed correctly.

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### **CAUTION**

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

**Example:** Throttling flow from the suction side may cause cavitation and pump damage.

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### **ELECTRICAL HAZARD**


Indicates the possibility of electrical risks if directions are not followed.

**Example:** Lock out driver power to prevent electric shock, accidental start-up, and physical injury.

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When installed in potentially explosive atmospheres, the instructions that follow the Ex symbol must be followed. Personal injury and/or equipment damage may occur if these instructions are not followed. If there is any question regarding these requirements or if the equipment is to be modified, please contact an ITT Goulds Pumps representative before proceeding.







**Example:**  Improper impeller adjustment could cause contact between the rotating and stationary parts, resulting in a spark and heat generation.














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## GENERAL PRECAUTIONS

### WARNING

A pump is a pressure vessel with rotating parts that can be hazardous. Hazardous fluids may be contained by the pump including high temperature, flammable, acidic, caustic, explosive, and other risks. Operators and maintenance personnel must realize this and follow safety measures. Personal injuries will result if procedures outlined in this manual are not followed. ITT Goulds Pumps will not accept responsibility for physical injury, damage or delays caused by a failure to observe the instructions in this manual and the IOM provided with your equipment.

General Precautions		
WARNING		NEVER APPLY HEAT TO REMOVE IMPELLER. It may explode due to trapped liquid.
WARNING		NEVER use heat to disassemble pump due to risk of explosion from tapped liquid.
WARNING		NEVER operate pump without coupling guard correctly installed.
WARNING		NEVER run pump below recommended minimum flow when dry, or without prime.
WARNING		ALWAYS lock out power to the driver before performing pump maintenance.
WARNING		NEVER operate pump without safety devices installed.
WARNING		NEVER operate pump with discharge valve closed.
WARNING		NEVER operate pump with suction valve closed.
WARNING		DO NOT change service application without approval of an authorized ITT Goulds Pumps representative.
WARNING		<p><b>Safety Apparel:</b></p> <ul style="list-style-type: none"> <li>♦ Insulated work gloves when handling hot bearings or using bearing heater</li> <li>♦ Heavy work gloves when handling parts with sharp edges, especially impellers</li> <li>♦ Safety glasses (with side shields) for eye protection</li> <li>♦ Steel-toed shoes for foot protection when handling parts, heavy tools, etc.</li> <li>♦ Other personal protective equipment to protect against hazardous/toxic fluids</li> </ul>
WARNING		<p><b>Receiving:</b></p> <p>Assembled pumping units and their components are heavy. Failure to properly lift and support equipment can result in serious physical injury and/or equipment damage. Lift equipment only at specifically identified lifting points or as instructed in the current IOM. Current manuals are available at <a href="http://www.gouldspumps.com/literature_ioms.html">www.gouldspumps.com/literature_ioms.html</a> or from your local ITT Goulds Pumps sales representative. Note: Lifting devices (eyebolts, slings, spreaders, etc.) must be rated, selected, and used for the entire load being lifted.</p>
WARNING		<p><b>Alignment:</b></p> <p>Shaft alignment procedures must be followed to prevent catastrophic failure of drive components or unintended contact of rotating parts. Follow coupling manufacturer's coupling installation and operation procedures.</p>

<b>General Precautions</b>		
<b>WARNING</b>		Before beginning any alignment procedure, make sure driver power is locked out. Failure to lock out driver power will result in serious physical injury.
<b>CAUTION</b>		<b>Piping:</b> Never draw piping into place by forcing at the flanged connections of the pump. This may impose dangerous strains on the unit and cause misalignment between pump and driver. Pipe strain will adversely effect the operation of the pump resulting in physical injury and damage to the equipment.
<b>WARNING</b>		<b>Flanged Connections:</b> Use only fasteners of the proper size and material.
<b>WARNING</b>		Replace all corroded fasteners.
<b>WARNING</b>		Ensure all fasteners are properly tightened and there are no missing fasteners.
<b>WARNING</b>		<b>Startup and Operation:</b> When installing in a potentially explosive environment, please ensure that the motor is properly certified.
<b>WARNING</b>		Operating pump in reverse rotation may result in contact of metal parts, heat generation, and breach of containment.
<b>WARNING</b>		Lock out driver power to prevent accidental start-up and physical injury.
<b>WARNING</b>		The impeller clearance setting procedure must be followed. Improperly setting the clearance or not following any of the proper procedures can result in sparks, unexpected heat generation and equipment damage.
<b>WARNING</b>		If using a cartridge mechanical seal, the centering clips must be installed and set screws loosened prior to setting impeller clearance. Failure to do so could result in sparks, heat generation, and mechanical seal damage.
<b>WARNING</b>		The coupling used in an ATEX classified environment must be properly certified and must be constructed from a non-sparking material.
<b>WARNING</b>		Never operate a pump without coupling guard properly installed. Personal injury will occur if pump is run without coupling guard.
<b>WARNING</b>		Make sure to properly lubricate the bearings. Failure to do so may result in excess heat generation, sparks, and / or premature failure.
<b>CAUTION</b>		The mechanical seal used in an ATEX classified environment must be properly certified. Prior to start up, ensure all points of potential leakage of process fluid to the work environment are closed.
<b>CAUTION</b>		Never operate the pump without liquid supplied to mechanical seal. Running a mechanical seal dry, even for a few seconds, can cause seal damage and must be avoided. Physical injury can occur if mechanical seal fails.
<b>WARNING</b>		Never attempt to replace packing until the driver is properly locked out and the coupling spacer is removed.
<b>WARNING</b>		Dynamic seals are not allowed in an ATEX classified environment.
<b>WARNING</b>		<b>DO NOT</b> operate pump below minimum rated flows or with suction and/or discharge valve closed. These conditions may create an explosive hazard due to vaporization of pumpage and can quickly lead to pump failure and physical injury.

<b>General Precautions</b>		
<b>WARNING</b>		Ensure pump is isolated from system and pressure is relieved before disassembling pump, removing plugs, opening vent or drain valves, or disconnecting piping.
<b>WARNING</b>		<b>Shutdown, Disassembly, and Reassembly:</b> Pump components can be heavy. Proper methods of lifting must be employed to avoid physical injury and/or equipment damage. Steel toed shoes must be worn at all times.
<b>WARNING</b>		The pump may handle hazardous and/or toxic fluids. Observe proper decontamination procedures. Proper personal protective equipment should be worn. Precautions must be taken to prevent physical injury. Pumpage must be handled and disposed of in conformance with applicable environmental regulations.
<b>WARNING</b>		Operator must be aware of pumpage and safety precautions to prevent physical injury.
<b>WARNING</b>		Lock out driver power to prevent accidental startup and physical injury.
<b>CAUTION</b>		Allow all system and pump components to cool before handling them to prevent physical injury.
<b>CAUTION</b>		If pump is a Model NM3171, NM3196, 3198, 3298, V3298, SP3298, 4150, 4550, or 3107, there may be a risk of static electric discharge from plastic parts that are not properly grounded. If pumped fluid is non-conductive, pump should be drained and flushed with a conductive fluid under conditions that will not allow for a spark to be released to the atmosphere.
<b>WARNING</b>		Never apply heat to remove an impeller. The use of heat may cause an explosion due to trapped fluid, resulting in severe physical injury and property damage.
<b>CAUTION</b>		Wear heavy work gloves when handling impellers as sharp edges may cause physical injury.
<b>CAUTION</b>		Wear insulated gloves when using a bearing heater. Bearings will get hot and can cause physical injury.

## ATEX CONSIDERATIONS and INTENDED USE

Special care must be taken in potentially explosive environments to ensure that the equipment is properly maintained. This includes but is not limited to:

1. Monitoring the pump frame and liquid end temperature.
2. Maintaining proper bearing lubrication.
3. Ensuring that the pump is operated in the intended hydraulic range.

The ATEX conformance is only applicable when the pump unit is operated within its intended use. Operating, installing or maintaining the pump unit in any way that is not covered in the Instruction, Operation, and Maintenance manual (IOM) can cause serious personal injury or damage to the equipment. This includes any modification to the equipment or use of parts not provided by ITT Goulds Pumps. If there is any question regarding the intended use of the equipment, please contact an ITT Goulds representative before proceeding. Current IOMs are available at [www.gouldspumps.com/literature\\_ioms.html](http://www.gouldspumps.com/literature_ioms.html) or from your local ITT Goulds Pumps Sales representative.

All pumping unit (pump, seal, coupling, motor and pump accessories) certified for use in an ATEX classified environment, are identified by an ATEX tag secured to the pump or the baseplate on which it is mounted. A typical tag would look like this:



The CE and the Ex designate the ATEX compliance. The code directly below these symbols reads as follows:

- II = Group 2
- 2 = Category 2
- G/D = Gas and Dust present
- T4 = Temperature class, can be T1 to T6 (see Table 1)

<b>Code</b>	<b>Max permissible surface temperature °F (°C)</b>	<b>Max permissible liquid temperature °F (°C)</b>
T1	842 (450)	700 (372)
T2	572 (300)	530 (277)
T3	392 (200)	350 (177)
T4	275 (135)	235 (113)
T5	212 (100)	Option not available
T6	185 (85)	Option not available

The code classification marked on the equipment must be in accordance with the specified area where the equipment will be installed. If it is not, do not operate the equipment and contact your ITT Goulds Pumps sales representative before proceeding.

## PARTS



The use of genuine Goulds parts will provide the safest and most reliable operation of your pump. ITT Goulds Pumps ISO certification and quality control procedures ensure the parts are manufactured to the highest quality and safety levels.

Please contact your local Goulds representative for details on genuine Goulds parts.

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# GENERAL INFORMATION

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## PUMP DESCRIPTION

Goulds Model NM 3171 is a vertical centrifugal submerged or wet pit type pump intended for installation directly into a sump or vessel vented to atmospheric pressure.

All pump parts in contact with the pumpage are constructed of glass reinforced vinylester or polyester resin, except for the shaft and hardware, which are of an alloy selected for compatibility with the pumpage.

The design of the NM 3171 incorporates one or more non-metallic column (steady) bearings which require a source of clean liquid for cooling and lubrication.

## GENERAL INFORMATION

### IMPORTANCE OF INSTRUCTIONS

This instruction manual is intended to assist those involved with the installation, operation and maintenance of Goulds Model NM 3171 pump. It is recommended that this manual be thoroughly reviewed prior to installing or performing any work on the pump or motor.

Study thoroughly and carefully follow the instructions for installation and operation. Keep this instruction manual available for reference.

Further information may be obtained by contacting the Seneca Falls Operations at Goulds Pumps, Seneca Falls, N.Y. 13148, or your nearest Goulds sales office or representative.

### PRECAUTIONS



#### WARNING

***Personal injuries will result if procedures outlined in this manual are not followed.***

1. Do not over tighten bolts and nuts. Tighten according to Chart C-I (Appendix I)
2. Never rotate pump in the wrong direction. Severe pump damage can be caused by wrong rotation. Proper rotation direction is indicated on the motor support (240).
3. Never force pump parts during disassembly or assembly.
4. Avoid undue impacts or shocks to pump while hanging.

5. Do not put pipe strain or bending moments on discharge pipe and flange (195C). Piping should be independently supported and should line up naturally with the discharge. Use properly restrained expansion joints between pump and piping.
6. Clean liquid must be applied to the column bearings (213) at a rate of 0.25 - 0.50 GPM (0.16 - 0.32 l/s)
7. Never operate pump without coupling guard correctly installed.
8. Never operate pump beyond the rated conditions to which the pump was supplied.
9. Never operate pump without safety devices installed.
10. Lower ends of pumps must be braced in turbulent sumps.
11. Always lock out power to the driver before performing pump maintenance.

## SPECIAL WARNINGS

Goulds Pumps will not be liable for any damages or delay caused by failure to comply with the provisions of this instruction manual.

This pump is not to be operated at speeds, working pressures, discharge pressures or temperatures higher than, or used with liquids other than, that stated in original order acknowledgement without written permission of Goulds Pumps.

## RECEIVING INSPECTION - SHORTAGES

Care should be taken when unloading pumps. If shipment is not delivered in good order and in accordance with the bill of lading, note the damages or shortages on both receipt and freight bill. **Make any claims to the transportation company promptly.**

Instruction sheets on various components, as well as the installation, operation and maintenance instructions for the pump, are included in the shipment.

**Do not discard!**

## PRESERVATION AND STORAGE

Goulds' normal domestic storage preparation is suitable for protecting the pump during shipment in covered trucks. It also provides protection during covered storage at the job site and for a short period before installation and start-up.

Motor manufacturers should be contacted for their recommendations on preservation and protection procedures.

## HANDLING TECHNIQUES



### WARNING

***Pump and components are heavy. Failure to properly lift and support equipment could result in serious physical injury, or damage to pumps. Steel toed shoes must be worn at all times.***

Care should be used in moving pumps. Slings should be put under the mounting plate (189) to properly support the unit.

**The best method of lifting unit is with parallel straps attached to a horizontal bar.**

# INSTALLATION

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## LOCATION OF UNIT

Vertical sump pumps are to be mounted directly in a sump or tank, with proper support under the polyester mounting plate (189). Floor space and head room allotted to the unit must be sufficient for removal from the sump or tank.

## PREPARATION FOR INSTALLATION

Vertical units are shipped completely assembled except for level controls and motors. Make sure all bolts are securely tightened. Use a torque wrench on all non-metallic joints. Bolt and nut torque values should not exceed those shown in Chart C-1 (Appendix I).

Install level controls per the manufacturer's recommendations included with the controls.

## INSTALLATION OF UNIT IN PIT

Installation must be done with care to avoid damage and insure proper operation.

1. Check clearance between the unit and pit. There must be at least 1/2 inch (13 mm) clearance between the sides of the pumping unit and any portion of the pit. There should be 5.50 to 7.50 inches (140 to 190 mm) from the bottom of the pump to the bottom of the pit. Check pump dimension print for the distance pertaining to your pump.
2. Guide the assembled pump carefully into pit so that it does not strike the sides.
3. Once mounting plate (189) is supported on the pit, shim under mounting plate where necessary to level unit. Pump must hang vertically to avoid placing a bending stress on the unit. Bolt mounting plate to the supports on the pit.
4. Check for free turning. If shaft (122) does not turn freely, misadjustment of the discharge pipe collar (242) may be placing a bending moment on the column pipe assembly (192), causing the shaft to bind or rub. If that occurs, follow the steps listed below.
  - a. Loosen set screws (222J). Gently raise or lower discharge pipe assembly (195) while rotating shaft (122) by hand in a clockwise direction until shaft turns freely.
  - b. Tighten set screws (222J).

## ASSEMBLY OF MOTOR TO MOTOR SUPPORT

If motor is shipped from Goulds' factory, both coupling halves will be assembled on shafts in their correct positions. If motor is shipped direct or furnished by customer, the motor half coupling must be fitted on motor shaft.

Place motor on motor support (240) and tighten hex cap screws (370U) snugly.

## ROTATION CHECK

Before coupling is connected, motor should be wired and the direction of rotation checked. A rotation arrow is located on the motor support (240).

Standard rotation for Model NM 3171 is clockwise (CW) as viewed from the driver.



### CAUTION

***Serious damage may result if pump is run in the wrong direction.***

## CONNECTION OF PIPING

Connect discharge piping to discharge pipe flange (195C) above mounting plate (189). This piping should be independently supported, should align naturally with the discharge flange, should be as direct as possible and should have a minimum number of fittings. A gate valve should be used for flow control. There should be no strain on the piping, and a properly restrained expansion joint must be used.



### WARNING

***Never draw piping into place by forcing at the flange connections of the pump. This may impose dangerous strains on the unit and adversely affect the operation of the pump resulting in physical injury and damage to the equipment.***

## ALIGNMENT OF FLEXIBLE COUPLING

Check for coupling alignment by laying a straight edge across both coupling rims at four points 90 degrees apart. When the straight edge rests evenly at all four points, the coupling will be in correct alignment. Tighten hex cap screws (370U).

# OPERATION

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## PREPARATION FOR OPERATION

### MOTOR BEARINGS

Check and follow motor manufacture's lubrication instructions.

### PUMP BEARINGS

The upper (ball) bearing (112) is greased for life. No additional lubrication is necessary.

Optional regreasable ball bearing is available upon request. Grease is applied as standard from Goulds Pumps. The bearing must be regreased periodically through the grease fitting in the bearing housing.

The column bearings (213) are a sleeve type and are made of Rulon, a corrosion resistant non-metallic bearing material. The bearings must be lubricated. If the pumpage is clean and suitable for lubrication, a bypass off the discharge is possible. If not, a connection above the mounting plate (189) will be provided for bearing lubrication. A flow of 15-30 GPH (gallons per hour) (57-115 liters per hour) of clean water is sufficient to lubricate the bearing.

### COUPLING

Assure that the coupling is properly lubricated if required by the coupling manufacturer's instructions.

### CHECK FOR FREE TURNING

Before pump is started, rotate shaft by hand to be sure it is free. If pump cannot be turned by hand, or binding or rubbing is noticed, refer to Installation of Unit in Pit, Step 4 (page 11).

Install coupling guard securely before starting the pump to prevent serious injury.

### PRIMING

The pump must be full of liquid with specified submergence head above centerline of impeller.

# OPERATION



## WARNING

***Check motor rotation before coupling motor to pump. Refer to Rotation Check (page 12) for instructions.***



## CAUTION

***Serious damage may result if pump is run in the wrong rotation.***

## START-UP PROCEDURE

1. Connect coupling, following instructions for the particular make of coupling used. This data is supplied separately, giving complete instructions for connection, lubrication, alignment and maintenance.
2. Check for free turning.
3. Install coupling guard.



## WARNING

***Never operate a pump without coupling guard properly installed. Personal injury will occur if pump is run without coupling guard.***

4. Before pump is started, the flushing flow specified in Precautions, Step 6 (page 10) should be started. Do not run the pump without flush to the column bearings (213). (Internal for clean liquids - external for dirty liquid).
5. Starting: Pump is now ready to start. Start pump with closed or slightly opened discharge valve. Open immediately after starting.

## OPERATIONAL CHECKS

Inspect pump carefully and frequently during the first few hours of operation. Check motor for excessive heating. Check motor for excessive vibration or unusual noise. Do not run pump at greatly reduced flow because all the motor power will go into heating the liquid in the pump and damage may result. If this condition exists over a long period, the temperature of the liquid in the pump may increase until the boiling point is reached. If this occurs, the rotating parts are exposed to vapor with no lubrication, and they may score or even seize to the stationary parts. Continued operation under these conditions may create an explosive hazard due to the confined vapor under high pressure and temperature.

## OPERATING WITH SURGE CONDITIONS IN LINE

If the pump is installed with a quick-acting valve in the discharge line that could close when the pump is running, dangerous pressure surges may be built up that can cause damage to the pump or line. In services of this kind, some cushioning arrangement must be provided to protect the pumping equipment.

## FREEZING CONDITIONS

If exposed to freezing conditions while the pump is standing idle, liquid inside the pump must be drained.

## SHUTDOWN PRACTICE

When a check valve is installed in the discharge, the pump can be shut off without closing any valves. When no check valve is used, the discharge valve must be closed before the pump is stopped to prevent back flow through the pump.



## WARNING

***When handling hazardous and/or toxic fluids, proper personal protective equipment should be worn. If pump is being drained, precautions must be taken to prevent physical injury. Pumpage must be handled and disposed of in conformance with applicable environmental regulation.***

# PREVENTIVE MAINTENANCE

## LUBRICATION

The ball bearing (112) supplied is greased for life. No further lubrication is required. Column bearings (213) must be lubricated by an integral pumpage flush or clean source of external liquid flush. Consult Goulds Pumps for appropriate option. Follow motor and coupling manufacturers lubrication instructions.

## VIBRATION

It is good practice to periodically monitor vibration of the pump. Normally, vibration level will be well below accepted standards. Of equal importance is that the vibration level not increase. If a problem with vibration is encountered, refer to Trouble Shooting (page 20).



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## DISASSEMBLY

1. Lock out power supply to motor.



### WARNING

*Lockout driver power to prevent accidental start up and physical injury.*

2. Shut off valves controlling flow from pump.
3. Disconnect coupling.
4. Disconnect motor and remove from motor support (240).
5. Remove coupling hub.
6. Remove motor support (240) from adapter (106) by removing screws (371 S).
7. Disconnect discharge pipe at the discharge flange (195C).
8. Dismantle flow controls (when furnished).
9. Loosen and remove mounting plate to pump support structure screws or bolts.
10. Disconnect flush lines (190).
11. Lift pump from sump and if possible, disassemble in vertical position. If not, lay horizontally on proper supports.



### WARNING

*Operator must be aware of pump and safety precautions to prevent physical injury.*



### WARNING

*Pump components can be heavy. Proper methods of lifting must be employed to avoid physical injury and/or equipment damage. Steel toed shoes must be worn at all times.*

**SAVE ALL BOLTS, NUTS, SCREWS AND MISCELLANEOUS HARDWARE.**

**THEY ARE OF ALLOY CONSTRUCTION FOR CORROSION RESISTANCE.**

12. Loosen pipe collar set screws (222J).
13. Remove casing/discharge pipe assembly screws (371H).
14. Remove casing/discharge gasket (351A).
15. Remove casing/suction tail pipe assembly screws (372A).
16. Remove suction tail pipe assembly (161) and gasket (36OY).
17. Remove casing stud nuts (425).
18. Remove casing (100). It may be necessary to GENTLY tap or pry casing loose from pump cover (160).
19. Remove pump cover O-ring (4122).
20. Unscrew impeller (101) from shaft (122).

***NOTE: Model NM 3171 impellers are threaded onto the pump shaft and removal can be difficult unless some means is used to hold the shaft from turning.***

21. Remove impeller O-ring (412A).
22. Remove and discard anti-rotation pin (445A).
23. Disconnect any column bearing flush tubing.
24. Unscrew impeller adjustment bolts (370D) and bearing end cover to bearing housing screws (370C).
25. Remove bearing end cover (109) and O-ring (496).

26. Remove bearing locknut (136) and bearing lockwasher (382).
27. Pull ball (thrust) bearing (112) off shaft (122) using suitable bearing puller and pulling on bearing housing (134). DO NOT hammer on pump shaft to remove bearing.
28. Slide pump shaft (122) out of column assembly (192) from impeller end.
29. Unscrew column pipe assembly/pump cover screws (371W).
30. Remove pump cover (180). Be sure shaft column assembly (192) is supported properly.
31. Remove column bearing housing (213).

**Note: Pump may be supplied with intermediate column bearing housing (213), Remove column/column screws (372B), column pipe assemblies (192) and intermediate column bearing housings (213) individually.**

32. Remove column pipe assembly/protector plate screws (371Z).
33. Remove shaft column assembly (192).

**Note: Protector plate (215) should not be removed unless it is to be replaced. To remove protector plate, unscrew protector plate/mounting plate screws (317X). Remove protector plate from mounting plate (189).**

## INSPECTION AND PARTS REPLACEMENT GUIDELINES

**Impeller (101)** - Replace if impeller shows excessive erosion, corrosion, extreme wear or vane breakage. O-ring groove and impeller hub must be in good condition. Check impeller balance if possible.

**Shaft (122)** - Check for runout (.005" MAX) to see that the shaft has not been bent. Shaft surface and threads must be in good condition. Replace if necessary.

**Casing (100)** - Replace if casing shows excessive erosion, corrosion or extreme wear.

**Lip Seals** - upper (332) and lower (333A) - Replace if damaged.

**Vapor Seal (215A)** - Replace if damaged.

**Column Bearing Assembly (213)** - Assure flush passages are clean. Check clearance. Assembly should be replaced if diametral clearance exceeds 0.062" (1.6mm).

**Flush Tubing (190)** - Make sure tubing is clear and clean.

**Ball Bearing (112)** - Renew at each overhaul and when damage is obvious (through vibration, etc.).

**Note: Refer to back cover for information on ordering spare parts.**

# REASSEMBLY

This procedure covers reassembly of pumps after complete disassembly. Make sure all Inspection and Parts Replacements Guidelines above have been followed.

All parts should be clean before assembly. This is especially important for O-ring grooves, threads, lock fits, and gasket surfaces. Any burrs should be removed.

If access permits, it is recommended that the pump be reassembled in vertical position. If necessary to reassemble pump in horizontal position, be sure to properly support shaft (122) and shaft column assembly (192).

**NOTE: Refer to Chart C-1 (Appendix I) for recommended torque values.**

1. Slide mounting plate (189) and adapter (108) assembly on shaft (122) from motor end and past ball (thrust) bearing (112) location.
2. Install vapor seal (215A).
3. Install new lower lip seal (333A) (if required) in bearing housing (134).
4. Slide bearing housing (134) on shaft (122). Be careful not to damage lip seal (333A).
5. Lubricate bearing seat on shaft (122) and slide the ball bearing (112) as far as possible by hand. Place pipe or driving sleeve over shaft against inner race of bearing. Make sure bearing is "square" on shaft. Tap or press evenly until bearing is seated firmly against shaft shoulder. Do not mar the shaft.
6. Place bearing lockwasher (382) on shaft (122).
7. Tighten bearing locknut (136) firmly on shaft (122).
8. Bend "tang" of bearing lockwasher (382) into slot in bearing locknut (136).
9. Pull bearing housing (134) over ball bearing (112) until firmly seated against bearing.
10. Install new upper lip seal (332) (if required) in bearing end cover (109).
11. Install bearing housing O-ring (496) in groove in bearing housing (134).
12. Slide bearing end cover (109) over shaft (122) and seat in bearing housing (134). Be careful not to damage lip seal (332).

13. Install impeller adjustment screws (370D) and bearing end cover screws (370C).
14. Lubricate outside surface of bearing housing (134).
15. Pull mounting plate (169) and adapter (106) assembly over bearing housing (134). If assembly becomes cocked, push apart and realign. It may be necessary to use bearing end cover screw (370C) to seat bearing housing in adapter (106).
16. Slide first column pipe assembly (192) over pump shaft (122) and fasten to protector plate (215) using screws (371Z). Make sure vent hole is toward protector plate.
17. Slide a column bearing assembly (213) against the column pipe assembly (192) flange. Make sure drilled flush opening in column bearing assembly matches location of holes in mounting plate (169).
18. Install additional column pipes (192) and column bearing assemblies (213), if any, using screws (3728).

**NOTE: All column bearings (213), except the last, are to be installed with the bearing retaining lip facing toward the casing (100). The last, and in cases where there is only one bearing assembly, install with bearing retaining lip facing the motor end of the pump.**

19. Place pump cover (180) against last column bearing (213).
20. Fasten pump cover (180) to column assembly (192) using screws (371W).
21. Apply O-ring lube to pump cover O-ring (412Z).
22. Place O-ring in groove of pump cover (180).
23. Apply a small amount of O-ring lube to impeller O-ring (412A).
24. Install O-ring (412A) in impeller (101).
25. Place new anti-rotation pin (445A) in hole in shaft threads.

**NOTE: Make sure shaft threads and impeller insert threads are clear of dirt, grease and oil. Scrube or wipe clean if necessary.**

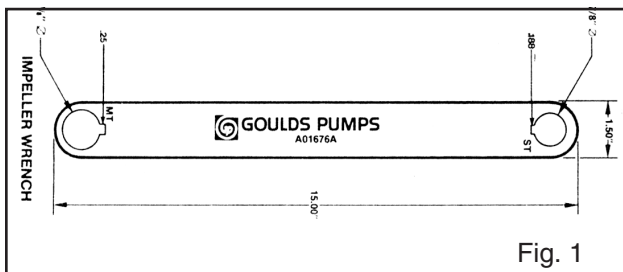
26. Spray shaft (122) threads and impeller (101) threads with Loctite Locquic Primer T or equivalent. Allow 5 minutes for drying.
27. Coat entire threaded area of shaft (122) threads with Loctite 242 or equivalent.
28. Evenly disperse three (3) drops of Loctite 242 or equivalent on impeller (101) threads. Refer to manufacturers literature for set and cure times.
29. Screw impeller (101) on shaft (122) assuring impeller does not touch pump cover (180). If impeller does hit, use adjusting screws (370D and 370C) to correct. Firmly tighten impeller using Shaft Key Wrench.

Model NM 3171 impellers are threaded onto the pump shafts. Removal can be difficult unless some means is used to hold the shaft from turning.

Figure 1 shows a "shaft key wrench" which is an excellent tool for holding the shaft. It provides a positive restraint and does not damage the shaft or coupling hub as a pipe wrench could.

The impeller should be turned clockwise by hand, raising the shaft key wrench off the table or floor. The impeller should then be given a quick turn counter-clockwise causing the wrench to impact the table.

The shaft key wrench has Goulds Part Number A01676, and customers can order through their local Goulds Pumps sales office.



**NOTE: NEVER USE HEAT TO ASSIST IN IMPELLER REMOVAL! The application of heat to the hub or nose area of the impeller will not aid in removal and could cause the hub area to fail.**

30. Align casing studs (356A) with pump cover (180) and fasten with nuts (425). Torque nuts (425) to values shown in table C-I.
31. Check axial travel of the impeller (101) within the casing (100) by using the procedure in Impeller Adjustment (page 20).
32. Replace casing/discharge pipe assembly gasket (351A).

33. Connect discharge pipe assembly (195) to casing using screws (371H).
34. Tighten pipe collar set screws (222J). Make sure no strain has been placed on the pump. Rotate shaft (122) by hand to assure that no bending is present.
35. Replace casing/suction tail pipe assembly gasket (360Y).
36. Align suction tail pipe assembly (161) with casing (100) and fasten using screws (372A).
37. Reconnect flush tubing (190) to bearing housing assembly (213).
38. Install motor support (240) on adapter (106) using screws (371S).
39. Install coupling hub.

Refer to the Installation section for instruction on installation. Particular attention should be directed to instructions concerning alignment and rotation.

## IMPELLER ADJUSTMENT

Model NM 3171 is designed so that the impeller must be adjusted relative to the casing.

This procedure should be followed with pump installed in the vertical position.

1. Disconnect coupling.
2. Loosen bolts (370D) evenly while slowly rotating the shaft (122) clockwise until impeller contacts pump casing (100).
3. Place and zero a dial indicator on top of shaft (122).
4. Tighten evenly and alternately impeller adjustment bolts (370D) until dial indicator reads .015" (.38mm). This adjustment has raised the impeller from contact with the casing (100) .015" (.38mm) which is the normal clearance between these two parts.
5. Tighten bearing end cover/bearing housing screws (370C). Rotate shaft (122) to ensure no binding or rubbing of parts occurs.
6. Install coupling guard.

# TROUBLESHOOTING

## CAUSES AND CORRECTIVE MEASURES . . . . . 21

Problem	Possible Causes & Corrections
No liquid delivered, not enough liquid delivered or not enough pressure	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 15, 16, 17
Pump works a while and then quits	4, 5, 7, 8, 9, 17
Pump takes too much power	6, 10, 11, 12, 13, 14, 18, 19, 20, 22
Pump is noisy or vibrates	4, 12, 13, 14, 21, 22

1. Priming - Liquid level in sump not equal to or greater than minimum submergence.
2. Speed too low - check whether motor wiring is correct and receives full voltage.
3. System discharge head too high - check system head, particularly friction losses.
4. Suction lift too high - check sump level.
5. Impeller or piping obstructed - check for obstructions.
6. Wrong direction of rotation - check rotation.
7. Air pocket in casing increasing - increase level in sump.
8. Float controls operating incorrectly - check operation.
9. Entrained air or gases in liquid - consult factory.
10. Impeller clearance too great - check for proper clearance.
11. Impeller damaged - inspect and replace as required.
12. Rotating parts bind - check internal wearing parts for proper clearances.
13. Shaft bent - straighten or replace as required.
14. Coupling or pump and driver misaligned - check alignment and realign if required.
15. Impeller diameter too small - consult factory for proper impeller diameter.
16. Improper pressure gauge location - check correct position and discharge nozzle or pipe.
17. Pump cover O-ring damaged - check O-ring and replace as required.
18. Speed too high - check motor winding voltage.
19. Head lower than rating; pumps too much liquid -consult factory. Install throttle valve, cut impeller.
20. Liquid heavier than anticipated - check specific gravity and viscosity.
21. Cavitation - Consult factory. Increase NPSH available.
22. Bearings worn out - inspect and replace as required. Assure bearings have proper lubrication.



# PARTS LIST AND MATERIALS OF CONSTRUCTION

Item No.	Qty Per Pump	Part Name	Material
100	1	Casing	GMP-2000
101	1	Impeller with Insert	GMP-2000/Hastelloy C
108	1	Adapter	Cast Iron
109	1	Bearing End Cover	Cast Iron
112	1*	Ball Bearing	Steel
113	1	Grease Relief Fitting (Optional)	Steel
122	1	Shaft	316 SS (Optional - Various Alloys)
134	1	Bearing Housing	Cast Iron
136	1*	Bearing Locknut	Steel
180	1	Pump Cover	Polyester
181	1	Suction Tail Pipe Assembly	Polyester
189	1	Mounting Plate	Polyester
190	A 1-4	Flush Tubing	Polypropylene
192	A 1-4	Column Pipe Assembly	Vinyl Ester
193A	1	Grease Fitting (Optional)	Steel
194	1	Suction Strainer	Valox
195	1	Discharge Pipe Assembly	Vinyl Ester
195C	1	Flange - Discharge Pipe	Vinyl Ester
213	A 1-4 *	Column Bearing Assembly	Polyester / Rulon
215	1	Protector Plate	Polyester
215A	1*	Vapor Seal	Teflon
222J	3	Set Screw - Pipe Collar / Discharge Assembly	304 SS
240	1	Motor Support	Cast Iron
242	1	Pipe Collar	Polyester
332	1*	Lip Seal - Upper	Steel / Buna
333A	1*	Lip Seal - Lower	Steel / Buna
351A	1*	Gasket - Casing / Discharge Pipe Assembly	Non-Asbestos
356A	B 4-16	Stud - Casing / Pump Cover	316 SS (Optional - Various Alloys)
360Y	1*	Gasket - Casing / Tail Pipe Assembly	Non-Asbestos
370C	3	H-Cap Screw-Bearing, End Cover / Bearing Housing	304 SS
370D	3	H-Tap Bolt - Impeller Adjustment	304 SS
370U	C 4-8	H-Cap Screw - Motor / Motor Support	304 SS
371H	B 4-8	H-Cap Screw - Casing / Discharge Pipe Assembly	316 SS
371S	4	H-Cap Screw - Motor Support Adapter	304 SS
371W	4	H-Cap Screw - Column Pipe Assembly / Pump Cover	316 SS
371X	3	H-Cap Screw - Protector Plate / Meeting Plate	304 SS
371Y	4	H-Cap Screw - Adapter / Protector Plate	304 SS
371Z	4	H-Cap Screw - Column Pipe Assembly / Protector Plate	316 SS
372A	B 4-8	H-Cap Screw - Casing / Suction Tailpipe Assembly	316 SS
372B	A 0-12	H-Cap Screw - Column / Column	316 SS
372X	3	H-Cap Screw - Pipe Collar / Meeting Plate	304 SS
382	1*	Bearing Lockwasher	Steel
400	1	Key Coupling	Steel
412A	1*	O-Ring, Impeller	Acid-Resistant Viton
412Z	1*	O-Ring, Pump Cover	Acid-Resistant Viton
415	3	Locknut - Impeller Adjustment	304 SS
425	B 4-16	Hex, Nut - Casing / Pump Cover Stud	316 SS
445A	1*	Pin, Anti-Rotation	Nylon
496A	1*	O-Ring, Bearing Housing	Buna

\* Suggested replacement parts  
A Quantity determined by pump setting  
B Quantity determined by pump size  
C Quantity determined by motor size



# ORDERING SPARE PARTS

## SPARE PARTS

To insure against possible long and costly down time periods, it is advisable to have spare parts on hand.

The recommended spare parts for the NM 3171 are:

1. Impeller (101)
2. Shaft Assembly (122)
3. Ball Bearing (112)
4. Column Bearing Assembly (213)
5. Complete set of O-rings and gaskets

## INSTRUCTIONS FOR ORDERING SPARE PARTS

Repair orders will be handled with a minimum of delay if the following directions are allowed:

1. Give model number, size of pump, and serial number. These can be obtained from the nameplate.
2. Write plainly the names, part numbers and materials of the parts required. The names and numbers should agree with those on the sectional view in Section VIII.
3. Give the number (quantity) of each part required.
4. Give complete shipping instructions.



# APPENDIX I

## CHART C-1, RECOMMENDED TORQUE VALUES . . . . . 27

Chart C-1 Recommended Torque Values (All Values in ft-lb)			
Description	Item Number	Size	Recommended Torque Value
Casing Nuts - 6" ST & All MT	425	5/8 - 11	30
Casing Nuts - 8" ST Only	425	1/2 - 13	40
Nozzle/Connections 1" and 1 1/2" Flanges	371H	1/2	30
Nozzle Connections 2" - 4" Flanges	371H	5/8	40
Column/Pump Cover Screw All	371W	5/8 - 11	25
Protector/Mounting Plate Screw All	371X	1/2 - 13	25
Adapter/Protector Plate Screw All	371Y	1/2 - 13	15
Column/Protector Plate Screw All	371Z	5/8 - 11	25
Column Pipe Joint Screw All	372B	5/8 - 11	25
Pipe Collar/Mounting Plate Screw All	372X	1/2 - 13	25



# APPENDIX II

## SUPPLEMENTAL INSTRUCTIONS FOR NM3171 MAINTENANCE . . . . . 29

### SEALED BEARING DESIGN

This supplement addresses the grease lubricated/sealed bearing design that uses the pumpage to externally cool the bearing cavity. The standard bearing configuration is product lubricated, and is addressed in the IOM. The bearing housing will be provided fully assembled. This will include the bearing housing, bearing, lip seals and snap rings.

**Note: it is important to ensure that all air is out of grease lines and grease lines are charged before pump startup.**

Assembly steps to immediately follow the attachment of the first column pipe assembly to the protector plate. (Page 11 of the NM3171 IOM):

1. Squeeze the top lip seal of the bearing assembly so that it will go over the pump shaft.
2. Slide the bearing assembly onto the shaft and lock it into place on the lock collar of the column shaft.

**Note: Care must be taken to align the cooling connections on the bearing housing with the cooling piping. The same care must be taken to align the grease connection with the grease line. All fittings should line up with the appropriate supply lines as originally installed by the factory.**

3. Repeat steps 1-3 until all column shafts and bearing assemblies are in place.
4. Grease the bearing with NLGI#2 Grade Lithium 12 Hydroxysterate EP Grease or equivalent before assembling grease lines.
5. Assemble all grease lines, fittings and connectors together but do not connect to bearing housing.
6. Charge all grease lines from the grease cup down to the connector of the bearing assembly.
7. Confirm that grease comes out of the male connector of the bearing assembly, and then connect to the bearing assembly.
8. Continue with instructions in IOM at point of placing pump cover against last column bearing.

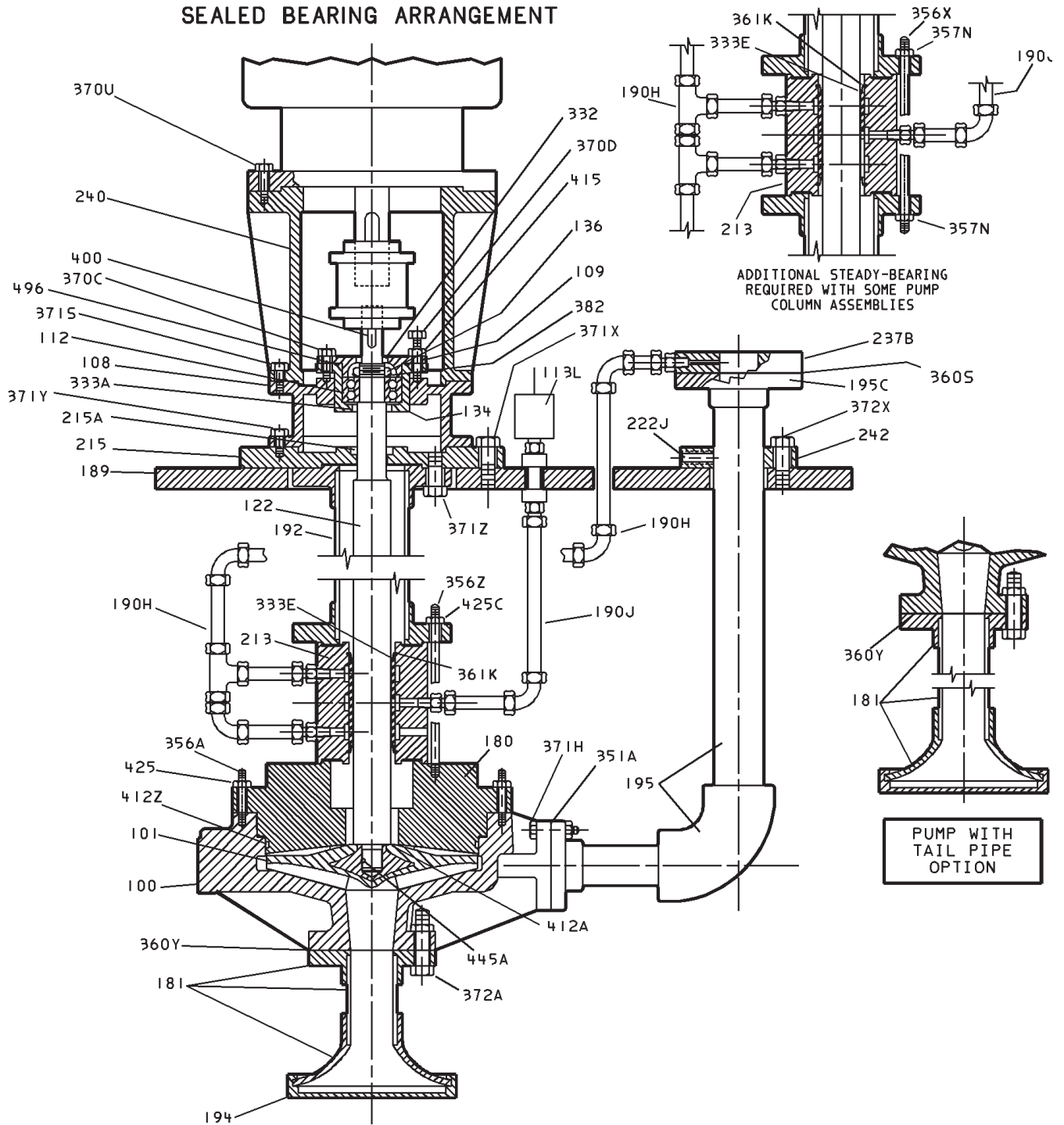
**Note: Keep grease cup reservoir full at all times.**

## PARTS LIST AND MATERIALS OF CONSTRUCTION

ITEM NO.	QTY. REQ'D	PART NAME	MATERIAL
100	1	CASING	GMP-2000
101	1	IMPELLER WITH INSERT	GMP-2000/HASTELLOY C
108	1	ADAPTER	CAST IRON
109	1	BEARING END COVER	CAST IRON
112	1 *	BALL BEARING (GREASED FOR LIFE)	STEEL
113L	1 *	GREASE CUP	STEEL
122	1	SHAFT	316SS
134	1	BEARING HOUSING	CAST IRON
136	1 *	BEARING LOCKNUT	STEEL
180	1	PUMP COVER	POLYESTER
181	1	SUCTION TAIL PIPE ASSEMBLY	POLYESTER
189	1	MOUNTING PLATE	POLYESTER
190H	1 *	TUBE ASSY, INTERNAL ANNULAR FLUSH	POLYPROPYLENE
190J	1 *	TUBE ASSY, GREASE LINE	POLYPROPYLENE
192	4	COLUMN PIPE ASSEMBLY	VINYL ESTER
194	1	SUCTION STRAINER	VALOX
195	1	DISCHARGE PIPE ASSEMBLY	VINYL ESTER
195C	1	FLANGE, DISCHARGE PIPE	VINYL ESTER
213	4 *	COLUMN BEARING ASSEMBLY	POLYESTER/CARBON
215	1	PROTECTOR PLATE	POLYESTER
215A	1 *	VAPOR SEAL	TEFLON
222J	3	SET SCREW, PIPE COLLAR/DISCH ASSY	304 SS
237B	1	FLUSH SPACER	POLYESTER
240	1	MOTOR SUPPORT	CAST IRON
242	1	PIPE COLLAR	POLYESTER
332	1 *	LIP SEAL, UPPER BRG HOUSING	STEEL/BUNA
333A	1 *	LIP SEAL, LOWER BRG HOUSING	STEEL/BUNA
333E	1 *	LIP SEAL, STEADY BRG ASSY	GRAPHITE/TEFLON
351A	1 *	GASKET, CASING/DISCH PIPE ASSY	NON-ASBESTOS
356A	12	STUD, CASING/PUMP COVER	316SS
356X	4 *	STUD, COLUMN/COLUMN	316SS
356Z	4	STUD, COLUMN/PUMP COVER	316SS
357N	8	HEX NUT, COLUMN/COLUMN	316SS
3605	1	GASKET, DISCH PIPE FLG/FLUSH SPCR	NON-ASBESTOS
360Y	1 *	GASKET, CASING/TAIL PIPE ASSY	NON-ASBESTOS
361K	1 *	RETAINING RING, STEADY BRG ASSY	316SS
370C	3	CAP SCR, BRG END COVER/BRG HSG	304 SS
370D	3	TAP BOLT, IMPELLER ADJUSTMENT	304 SS
370U	4	CAP SCR, MOTOR/MOTOR SUPPORT	304 SS
371H	4	CAP SCR, CASING/DISCH PIPE ASSY	316SS
371S	4	CAP SCR, MOTOR SUPPORT/ADAPTER	304 SS
371X	3	CAP SCR, PROTECTOR PLATE/MTG PLATE	304 SS
371Y	4	CAP SCR, ADAPTER/PROTECTOR PLATE	304 SS
371Z	4	CAP SCR, COL PIPE ASSY/PROT PLATE	316SS
372A	4	CAP SCR, CASING/SUCT TAILPIPE ASSY	316SS
372X	3	CAP SCR, PIPE COLLAR/MTG PLATE	304 SS
382	1 *	BEARING LOCKWASHER	STEEL
400	1	KEY, COUPLING	STEEL
412A	1 *	O-RING, IMPELLER	ACID-RESISTANT VITON
412Z	1 *	O-RING, PUMP COVER	ACID-RESISTANT VITON
415	3	LOCKNUT, IMPELLER ADJUSTMENT	304 SS
425	12	HEX NUT, CASING/PUMP COVER STUD	316SS
425C	4	HEX NUT, COLUMN/PUMP COVER STUD	316SS
445A	1 *	PIN, ANTI-ROTATION	NYLON
496	1 *	O-RING, BEARING HOUSING	BUNA

SYMBOL LEGEND	
SYMBOL	MEANING
*	SUGGESTED REPLACEMENT PARTS
#	QTY SPECIFIED PER EACH ADDITIONAL STEADY BRG ASSY

# SEALED BEARING ARRANGEMENT







## HOW TO ORDER

When ordering parts call  
**1-800-446-8537**  
or your local Goulds Representative

## EMERGENCY SERVICE

Emergency parts service is available  
24 hours/day, 365 days/year . . .  
Call 1-800-446-8537

*For more information, call your nearest Goulds sales representative or visit our website at [www.gouldspumps.com](http://www.gouldspumps.com)*

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