SIMFLO®

PERFORMANCE BEYOND THE PUMP®

SUBMERSIBLE PUMP

INSTALLATION, OPERATION & MAINTENANCE

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SIMFLO, LLC. Terms and Conditions

SIMFLO, LLC. is herein referred to as the "**Seller**" and the customer purchasing goods ("**Goods**") from the Seller is referred to as the "**Buyer**." The Terms and Conditions as set forth herein, and the Seller's quotation, estimate or bid to Buyer, shall collectively and exclusively govern all of the rights, duties and obligations of Seller and Buyer related to Buyer's purchase order for the Goods Seller is agreeing to sell to Buyer. Any terms and conditions set forth in Buyer's purchase order which are different or inconsistent with Seller's Terms and Conditions and/or Seller's quotation, estimate or bid, shall be null and void. Buyer's receipt of the Goods, and/or payment, or partial payment, to Seller for the Goods being sold to Buyer, shall evidence Buyer's acceptance of the terms and conditions of the sale as set forth herein. Seller reserves the right, in its sole discretion, to refuse any purchase order.

1. PRICES: Prices for Goods shall apply to the specific quantities stated in Seller's quotation, estimate or bid. Prices shall include standard packing according to Seller's specification for packing and delivery. All costs and taxes for special packing requests by Buyer, including packing for exports, shall be paid by Buyer as an additional charge. Prices for Goods are subject to change without notice based on any subsequent changes in the cost to Seller for sub-supplier materials, supplies or other related increases, and the adjusted price will be based on the cost to Seller in effect at the time of the requested shipment date, and each shipment will be invoiced at such increased price. All prices for Goods are exclusive of, and do not include, any applicable sales, use, excise, GST, VAT or similar taxes, duties or levies, or transportation or insurance costs, and all such costs are the sole responsibility of, and shall be paid by, Buyer.

2. TAXES: Any current or future tax or government charge, or increase in same, affecting Seller's costs of production, sales, delivery or shipment, or which Seller is otherwise required to pay or collect in connection with the sale, purchase, delivery, storage, processing, use of consumption of Goods, shall be paid by Buyer and shall either be added to the purchase price of the Goods or billed to Buyer separately, at Seller's election.

3. ARBITRATION: Seller and Buyer agree that any controversy or claim, excluding collections and past due accounts, arising out of or relating to the agreed terms as provided herein to sell Goods, or the breach thereof, shall be submitted to mandatory arbitration in accordance with the Texas Arbitration Act, and the arbitration award or dispositive order, shall be final and binding and may be entered in any court of competent jurisdiction in the State of Texas. The exclusive place of arbitration shall be within Lubbock County, Texas, and the parties hereby submit to such jurisdiction and venue. Collections and past due accounts may be filed in the appropriate court located in Lubbock County, Texas, and Buyer hereby submits to the exclusive jurisdiction and venue in Lubbock County, Texas.

4. TERMS OF PAYMENT: Seller reserves the right to require payment in advance or C.O.D., and otherwise modify credit terms should Buyer's credit standing not meet Seller's credit requirements. Unless otherwise specified in writing by Seller, the terms of payment are net thirty (30) days from the date of Seller's invoice to be paid in U.S. currency. All credit sales are subject to prior approval by Seller. Seller may, at its option, require copies of pertinent contracts, financial statements and other documents relative to any given sale of Goods in order to evaluate and determine, in its sole discretion, Buyer's credit status or the credit status of any third party with whom Buyer has a contractual relationship concerning the Goods to be furnished to Buyer. Failure or delay in delivery of this information will postpone production and delivery of Goods, and may result in a price increase. In the event payment is not made when due, Buyer agrees to pay Seller a service or finance charge of the lessor of: (i) one and one-half percent (1.5%) per month (18% per annum); or (ii) the highest rate permitted by applicable law, on the unpaid balance of the invoice from and after the invoice due date. Buyer shall be responsible for all costs and expenses associated with any checks returned due to insufficient funds. If, during the performance hereunder with Buyer, the financial responsibility or condition of Buyer is such that Seller in good faith deems itself insecure, or if Buyer becomes insolvent, or if a material change in the ownership of Buyer occurs, or if Buyer fails to make any payments in accordance with the terms as provided herein, then, in any such event, Seller is not obligated to continue performance under the agreed terms as provided herein, and may stop Goods in transit and defer or decline to make delivery of Goods, except upon receipt of satisfactory security or cash payments in advance, or Seller may terminate Buyer's purchase order upon written notice to Buyer without further obligation to Buyer whatsoever. Payment by Buyer to Seller shall not be conditioned upon Buyer receiving payment from any third party.

5. Quotation, (Estimate or Bid), Withdrawal, Expiration. Quotations, estimates or bids are valid for thirty (30) calendar days from the date of issuance, unless otherwise provided therein. Seller reserves the right to cancel or withdraw any quotation, estimate or bid at any time, with or without notice or cause, prior to acceptance by Buyer. There is no agreement if any conditions specified within the quotation, estimate or bid are not completed by Buyer to Seller's satisfaction within thirty (30) calendar days of Seller's written acknowledgement of a purchase order by Buyer. Seller, nevertheless, reserves its right to accept any contractual documents received from Buyer after this 30-day period.

6. SELLER'S RIGHTS IN DEFAULT: In the event Buyer fails to make any payment when due, Seller shall have the right, among other remedies, either to terminate its agreement with Buyer, or suspend further performances under the agreed terms as provided herein and/or any other agreements with Buyer. Buyer shall be liable for all expenses, including attorneys' fees, relating to the collection of past due amounts. Additionally, upon any payment default by Buyer, Buyer shall immediately pay to Seller the entire unpaid amounts for any and all shipments made to Buyer irrespective of the terms of said shipment and whether said shipments are made pursuant to the agreed terms as provided herein, or any other agreement between Seller and Buyer, and Seller may also withhold all subsequent shipments until the full amount due is paid by Buyer. Acceptance by Seller of less than full payment shall not be a waiver of any of its rights hereunder. Buyer shall not assign or transfer its rights, duties or obligations, or any interest in it, or monies payable under it, without the written consent of Seller, and any assignment made without such written consent shall be null and void.

7. SHIPMENT AND DELIVERY: While Seller will use all responsible commercial efforts to maintain the delivery date(s) acknowledged or quoted by Seller, all shipping dates are proximate and not guaranteed. Shipment dates are best, estimates only at the time of the proposal, and are subject to change based on manufacturing load and sub-supplier schedules at Seller's date of order and/or full release to manufacture. Seller reserves the right to make partial shipments. Seller, at its option, shall not be bound to tender delivery of any Goods postponed or delayed by Buyer for any reason. Buyer agrees to reimburse Seller for any and all storage costs and other additional expenses resulting therefrom. Risk of loss and legal title to the Goods shall transfer to Buyer for sales in which the end destination of the Goods is outside the United States immediately after the Goods have passed beyond the territorial limits of the United States. For all other shipments, risk of loss for damage and responsibility shall pass from Seller to Buyer upon delivery to and receipt by a carrier at Seller's shipping point. All shipments are F.O.B. Seller's shipping point. Any claims for shortages or damages suffered in transit are the responsibility of the Buyer and shall be submitted by Buyer directly to the carrier. Shortages or damages must be identified and signed for at the time of delivery. Seller is not responsible for any such shortages or loss. Seller shall not be responsible to Buyer for any loss, whether direct, indirect, incidental or consequential in nature, including without limitation loss of profits or liquidated damages, arising out of or relating to any failure of the Goods to be delivered by the specified delivery date. In the absence of specific instructions, Seller will select the carrier. Buyer shall reimburse Seller for the additional cost of its performance resulting from inaccurate or lack of delivery instructions, or by any act or omission on Buyer's part. Any such additional cost may include, but is not limited to, storage, insurance, protection, re-inspection and delivery expenses. Buyer further agrees that any payment due on delivery shall also be made if the Goods are delivered into storage as though the Goods had been delivered in accordance with the purchase order. Buyer grants to Seller a continuing security interest in and a lien upon the Goods and the proceeds thereof (including insurance proceeds), as security for the payment of all such amounts and the performance by Buyer of all of its obligations to Seller pursuant to this the agreed terms as provided herein and all such other sales, and Buyer shall have no right to sell, encumber or dispose of the Goods. Buyer shall execute any and all financing statements and other documents and instruments and do and perform any and all other acts and things which Seller may consider necessary, desirable or appropriate to establish, perfect or protect Seller's title, security interest and lien. In addition, Buyer authorizes Seller and its agents and employees to execute any and all such documents and instruments, and do and perform any and all such acts and things, at Buyer's expense, in Buyer's name and on its behalf related to its security interest in the Goods. Such documents and instruments may also be filed without the signature of Buyer to the extent permitted by law.

8. LIMITED WARRANTY: Subject to the limitations of Section 9, below, Seller warrants that the Goods manufactured by Seller will be free from defects in material and workmanship at the time of shipment under normal use and regular service and maintenance, for a period of eighteen (18) months from the date of shipment of the Goods by Seller, or one year from start-up, whichever occurs first, unless otherwise specified by Seller in writing. Products and Special Coating Applications purchased by the Seller from a third party for resale to Buyer ("**Resale Products**") shall carry only the warranty extended by the original manufacturer or supplier. ANY ITEM OF THE PRODUCT(S) WHICH IS NOT MANUFACTURED OR APPLIED BY SELLER IS NOT WARRANTED BY SELLER and shall be covered only by the express warranty, if any, of the manufacturer or applicator thereof. **THE WARRRANTY SET FORTH IN THIS SECTION 8 AND THE WARRANTY SET FORTH IN SECTION 9, BELOW, ARE THE SOLE AND EXCLUSIVE WARRANTIES GIVEN BY SELLER WITH RESPECT TO THE GOODS, AND ARE IN LIEU OF AND EXCLUDE ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, ARISING BY OPERATION OF LAW OR OTHERWISE, INCLUDING WITHOUT LIMITATION, MERCHANTABLITY AND FITNESS FOR A PARTICULAR PURPOSE, WHETHER OR NOT THE PURPOSE OR USE HAD BEEN DISCLOSED TO SELLER IN SPECIFICATIONS, DRAWINGS OR OTHERWISE, AND WHETHER OR NOT SELLER'S GOODS ARE SPECIFICALLY DESIGNED AND/OR MANUFACTURED BY SELLER FOR BUYER'S USE OR PURPOSE.** This warranty does not extend to any losses or damages due to misuse, accident, abuse, neglect, normal wear and tear, negligence (other than Seller's), unauthorized modification or alteration, use beyond rated capacity, unsuitable power sources or environmental conditions, improper installation, repair, handling, maintenance or application or any other cause not the fault of the Seller. To the extent that Buyer, or its agents, has supplied specifications, information, representation of operating conditions or other conditions or other data to Seller in the selection or design of the Goods and the preparation of Seller's quotation, estimate or bid, or in the event that actual operating conditions or other conditions differ from those represented by Buyer, any warranties or other provisions contained herein which are affected by such conditions shall be null and void. Equipment performance is not warranted unless separately agreed to in writing by the Seller. Seller manufactures engineered-to-order Goods based on the design point specified by the Buyer. Warranty on performance results will be based on laboratory tests performed at Sellers location. Due to the inaccuracies of field testing, if there are any conflicts between the results of field testing conducted and laboratory testing conducted, the laboratory tests results will control. Seller will not provide or furnish any equipment for field testing. (See Section 16) If within thirty (30) days after Buyer's discovery of any claimed warranty defects within the warranty period, and Buyer notifies Seller thereof in writing; Seller shall, at its option and as Buyer's exclusive remedy, repair, correct, replace or refund the purchase price for that portion of the Goods found by Seller to be defective. Failure by Buyer to give such written notice within the applicable time period shall be deemed absolute and unconditional waiver of Buyer's claims for such defects. Seller shall have the right to require the Buyer to deliver the Goods to Seller's designated repair center or manufacturing facility. All responsibility and expenses associated with removal, dismantling, reinstallation and transportation to and from Seller's designated repair center or manufacturing facility, and the time and expense of Seller's personnel and representatives for site travel and diagnosis under this warranty, shall be paid by Buyer. Goods repaired or replaced during the warranty period shall be covered by the foregoing warranty for the remainder of the original warranty period, or ninety (90) days from the shipment date that the Goods are returned to Buyer, whichever is longer. Buyer assumes all other responsibility for any loss, damage, or injury to persons or property arising out of, connected with, or resulting from the use of the Goods, whether alone or in combination with other products/components.

Buyer agrees to provide any subsequent transferee of the Goods conspicuous, written notice of Section 8 and 9 herein. Sections 8 and 9 shall apply to any entity or person who may buy, acquire or use the Goods, including any entity or person who obtains Goods from Buyer, and such entity or person shall be bound by the limitations as provided herein.

9. LIMITATION OF REMEDY AND LIABLITY: BUYER'S SOLE AND EXCLUSIVE REMEDY FOR BREACH OF ANY WARRANTY HEREUNDER SHALL BE LIMITED TO REPAIR, CORRECTION, REPLACEMENT OR REFUND OF THE PURCHASE PRICE UNDER SECTION 8. SELLER SHALL NOT BE LIABLE FOR DAMAGES CAUSED BY DELAY IN PERFORMANCE, AND THE REMEDIES OF BUYER UNDER THE AGREED TERMS AS PROVIDED HEREIN ARE EXCLUSIVE. IN NO EVENT, REGARDLESS OF THE FORM OF THE CLAIM OR CAUSE OF ACTION (WHETHER BASED IN CONTRACT, INFRINGEMENT, NEGLIGENCE, STRICT LIABLITY, ANY OTHER TORT OR OTHERWISE), SHALL SELLER'S LIABLITY TO BUYER AND/OR ITS CUSTOMERS EXCEED THE PRICE PAID BY BUYER FOR THE SPECIFIC GOODS PROVIDED BY SELLER GIVING RISE TO THE CLAIM OR CAUSE OF ACTION. BUYER AGREES THAT IN NO EVENT SHALL SELLER'S LIABILTY TO BUYER AND/OR ITS CUSTOMERS EXTEND TO INCLUDE LIQUIDATED, INCIDENTAL, CONSEQUENTIAL, PUNITIVE, EXEMPLARY OR SPECIAL DAMAGES, INCLUDING BUT NOT LIMITED TO, LOSS OF PROFITS OR ANTICIPATED PROFITS, LOSS OF ANTICIPATED SAVINGS OR REVENUE, LOSS OF INCOME, LOSS OF BUSINESS AND BUSINESS INTERUPTION, LOSS OF USE, LOSS OF PRODUCTION, LOSS OF OPPORTUNITY, LOSS OF REPUTATION, AND/OR LOSS OR DAMAGE TO PROPERTY OR EQUIPMENT. THE FOREGOING LIMITATIONS OF LIABILITY SHALL BE EFFECTIVE WITHOUT REGARD TO SELLER'S ACTS OR OMISSIONS OR NEGLIGENCE OR STRICT LIABILITY IN THE PERFORMANCE OR NON-PERFORMANCE HEREUNDER. It is expressly understood that any technical advice furnished by Seller with respect to the use of the Goods is given without charge, and Seller assumes no obligation or liability for the advice given, or result obtained, and all such advice being given is accepted at Buyer's risk.

10. Buyer Warranty: Buyer warrants the accuracy of any and all information relating to the details of its operating conditions, including temperatures, pressures, and where applicable, the nature of all hazardous materials. Seller can justifiably rely upon the accuracy of Buyer's information in its performance. Should Buyer's information prove inaccurate, Buyer agrees to reimburse Seller for any losses, liabilities, damages and expenses that Seller may have incurred as a result of any inaccurate information provided by Buyer to Seller.

11. EXCUSE OF PERFORMANCE/FORCE MAJEURE: Seller shall not be liable for delays in performance or for non-performance due to acts of God; acts of Buyer; war; fire; flood; weather; natural disasters; terrorism; sabotage; strikes; labor disputes; civil disturbances or riots; currency restrictions; pandemics; disease; governmental requests, restrictions, allocations, laws, regulations, orders or actions; unavailability of or delays in transportation or in obtaining materials, fuel, power and energy; default of suppliers; or unforeseen circumstances or any events or causes beyond Seller's reasonable control. Deliveries or other performances may be suspended for an appropriate period of time or canceled by Seller upon notice to Buyer in the event of any occurrence of the foregoing, but the balance of the agreement shall otherwise remain unaffected as a result of the foregoing. If Seller determines that its ability to supply the total demand for the Goods, or to obtain material used directly or indirectly in the manufacture of the Goods, is hindered, limited or made impracticable due to causes set forth hereinabove, Seller may allocate its available supply of the Goods or such material (without obligation to acquire other supplies of any such Goods or material) among itself and its buyers on such a basis as Seller determines to be equitable, in its sole discretion, without liability for any failure of performance which may result therefrom.

12. CANCELLATION:. Except as otherwise provided herein, no order may be cancelled on special or made-to-order Goods unless requested in writing by either party and accepted in writing by the other party. In the event of a cancellation by Buyer, Buyer shall, within thirty (30) days of such cancellation, pay Seller a cancellation fee, which shall include all costs and expenses incurred by Seller prior to the receipt of the request for cancellation, including but not limited to, all commitments to its suppliers, subcontractors and others, all fully burdened labor and overhead expended by Seller, plus a reasonable profit charge. Return of Goods shall be in accordance with Seller's most current return policy and subject to a minimum thirty percent (30%) restocking fee, unless otherwise agreed to by the parties in writing. Notwithstanding anything to the contrary herein, in the event that: (i) there is a commencement by or against Buyer of any voluntary or involuntary proceedings in bankruptcy or insolvency; (ii) it is determined Buyer is insolvent; (iii) Buyer makes a general assignment for the benefit of its creditors; (iv) a receiver is appointed on account of Buyer's insolvency; (v) Buyer fails to make payment when due under the agreed terms as provided herein; or (vi) Buyer does not correct or, if immediate correction is not possible, commence and diligently continue action to correct any default of Buyer to comply with any of the provisions or requirements of the agreed terms as provided herein within ten (10) calendar

days after being notified in writing of such default by Seller, Seller may, by written notice to Buyer, without prejudice to any other rights or remedies which Seller may have, terminate its further performance hereunder. In the event of such termination, Seller shall be entitled to receive payment as if Buyer has cancelled its purchase order pursuant to this paragraph. Seller may nevertheless elect to complete its performance of under the agreed terms provided herein by any means it chooses. Buyer agrees to be responsible for any additional costs incurred by Seller in so doing. Upon termination of the agreed terms as provided herein, the rights, obligations and liabilities of the parties, which shall have arisen or been incurred hereunder prior to its termination, shall survive such termination.

13. CHANGES: Buyer may request changes or additions to the Goods consistent with the Seller's specifications and criteria. In the event Seller accepts such changes or additions, Seller may revise the price and dates of delivery. Seller reserves the right to change the design and specifications for the Goods without prior notice to the Buyer, except with respect to Goods being made-to-order for Buyer. Seller shall have no obligation to install or make such change in any Goods manufactured prior to the date of notification of such change.

14. NUCLEAR/FIRE/MEDICAL: GOODS SOLD HEREUNDER ARE NOT FOR USE IN CONNECTION WITH ANY NUCLEAR, FIRE SYSTEMS, MEDICAL, LIFE-SUPPORT AND RELATED APPLICATIONS. Buyer accepts Goods with the foregoing understanding, and agrees to communicate same in writing to any subsequent purchasers or users, and to defend, indemnify and hold harmless Seller for any claims, losses, suits, judgments and damages, including incidental and consequential damages, arising from such use, whether the cause be based in tort, contract or otherwise, including allegations that the Seller's liability is based on negligence or strict liability.

15. ASSIGNMENT: Buyer shall not assign its rights or delegate its duties hereunder, or any interest herein, without the prior written consent of Seller, and any such assignment, without such consent, shall be null and void.

16. INSPECTION/TESTING: Buyer shall have the right to inspect the Goods upon their receipt. When delivery is to Buyer's site or to a project site ("**Site**"), Buyer shall notify Seller in writing of any nonconformity of the Goods with the quotation, estimate or bid, or the agreed terms as provided herein, within three (3) days from receipt of the Goods by Buyer, unless a shorter period is required in Seller's quotation, estimate or bid. For all other deliveries, Buyer shall notify Seller in writing of any nonconformity of the Goods with the quotation, estimate or bid, or the agreed terms as provided herein, within fourteen (14) days from receipt of the Goods by Buyer. Failure to give such applicable notice shall constitute a waiver of Buyer's right to inspect and/or reject the Goods for nonconformity, and shall be equivalent to an irrevocable acceptance of the Goods by Buyer. Claims for loss of or damage to Goods in transit must be made to the carrier, and not to Seller. Buyer, at its option and sole expense, may inspect and observe the testing by Seller of the Goods for compliance with Seller's standard test procedures prior to shipment, which inspection and testing shall be conducted at Seller's plant at such reasonable time as is determined by Seller. Any rejection of the Goods must be made promptly by Buyer before shipment. Tests shall be deemed to be satisfactorily completed, and the test fully met, when the Goods meet Seller's criteria for such procedures. Acceptance by Buyer, or Buyer's representative, of any witnessed testing or coatings will preclude any future rejection.

17. STANDARD, TOLERANCE: Except for made-to-order Goods specified by the Buyer in writing and expressly agreed to in writing by Seller, all Goods furnished hereunder are produced in accordance with the standard manufacturing practices in the country of origin of the Goods. All materials incorporated into the Goods are subject to mill tolerances and variations consistent with normal manufacturing practices for dimension, weight, straightness, section, composition and mechanical properties, normal surface and internal conditions, and deviations in quality resulting from practical testing. Seller is not responsible for any deterioration in quality as a result of the foregoing tolerances and variations.

18. DRAWINGS: Seller's prints and drawings (including without limitation, the underlying technology) furnished by Seller to Buyer in connection with Seller's quotation, estimate or bid are the property of Seller, and Seller retains all rights, including without limitation, exclusive rights of use and license. Buyer shall return all copies (in whatever medium) of such prints or drawings to Seller immediately upon request by Seller. Seller does not supply detailed or shop working drawings of the Goods; however, Seller will supply necessary installation drawings. The drawings and bulletin illustrations submitted with Seller's quotation, estimate or bid, show general type, arrangement and approximate dimensions of the Goods to be furnished for Buyer's information only, and Seller makes no representation or warranty regarding their accuracy. Unless expressly stated to the contrary within the quotation, estimate or bid, all drawings, illustrations, specifications or diagrams form no part of the agreed terms as provided herein. Seller reserves the right to alter such details in design or arrangement of its Goods which, in its sole discretion, constitute an improvement in construction, application or operation of the Goods. All engineering information necessary for installation of the Goods shall be forwarded by Seller to Buyer at the time the Goods are shipped. After Buyer's acceptance of Seller's quotation, estimate or bid, any changes requested by Buyer in the type of Goods, the arrangement of the Goods, or the application of the Goods will be made at Buyer's expense. Instructions necessary for installation, operating and maintenance will be supplied when the Goods are shipped.

19. EXPORT/IMPORT: Buyer agrees that all applicable import and export control laws, regulations, orders and requirements, including without limitation those of the United States and the European Union, and the jurisdictions in which the Seller and Buyer are established, or from which the Goods may be supplied, will apply to the Goods receipt and use. In no event shall Buyer use, transfer, release, import or export any Goods in violation of such applicable laws, regulations, orders or requirements. The Buyer shall not, and shall not permit any third parties to, directly or indirectly, export, re-export or release any Goods to any jurisdiction or country to which, or any party to whom, the export, re-export or release of any Goods is prohibited by applicable law, regulation or rule. The Buyer shall be solely responsible for any breach of this Section 19.

20. Proprietary Information, Injunction: Seller's designs, illustrations, drawings, specifications, technical data, catalogues, "know-how", economic or other business or manufacturing information (collectively "**Proprietary Information**") disclosed to Buyer shall be deemed proprietary and confidential to Seller. Buyer agrees not to disclose, use or reproduce any Proprietary Information without first having obtained Seller's express written consent. Buyer's agreement to refrain from disclosing, using or reproducing Proprietary Information shall survive completion of the work and delivery of the Goods under the agreed terms as provided herein. Buyer acknowledges that its improper disclosure of Proprietary Information to any third party will result in Seller's suffering irreparable harm. Seller may seek injunctive or equitable relief to prevent Buyer's unauthorized disclosure of Proprietary Information.

21. Installation and Start-up: Unless otherwise agreed to in writing by Seller, installation of the Goods shall be the sole responsibility of Buyer. In the event Buyer has engaged Seller to provide an engineer for start-up supervision, such engineer will function in a supervisory capacity only, and Seller shall have no responsibility for the quality of workmanship of the installation. Buyer understands and agrees that it shall furnish, at Buyer's sole expense, all necessary foundations, supplies, labor and facilities that might be required to install and operate the Goods.

22. INSURANCE: Buyer agrees to do all acts necessary to protect Seller's interest by adequately insuring the Goods against loss or damage from any external cause, with Seller named as insured, additional insured or co-insured. Seller and Buyer agree to maintain liability insurance in commercially reasonable amounts covering claims of any kind or nature for damage to property or personal injury, including death, made by anyone that may arise from activities performed or facilitated related to the Goods, whether these activities are performed by that company, its employees, agents, or anyone directly engaged or employed by that party or its agents.

23. GENERAL PROVISIONS: These terms and conditions herein supersede all other communications, negotiations, and prior oral or written statements regarding the subject matter of the agreed terms as provided herein. No change, modification, rescission, discharge, abandonment, or waiver of these terms and conditions shall be binding upon the Seller, unless made in writing and signed on its behalf by a duly authorized officer of Seller. No conditions, usage of trade, course of dealing or performance, understanding or agreement purporting to modify, vary, explain, or supplement these terms and conditions shall be binding unless hereafter made in writing and signed by the party to be bound, and no modification or additional terms shall be applicable to the agreed terms as provided herein by Seller's receipt, acknowledgement, or acceptance of purchase orders, shipping instruction forms, or other documentation containing terms at variance with or in addition to those set forth herein. Any such modifications or additional terms are specifically rejected and deemed a material alteration hereof. If this document shall be deemed an acceptance of a prior offer by Buyer, such acceptance is expressly conditional upon Buyer's assent to any additional or different term set forth herein. There is no waiver by either party with respect to any other breach or default of any other right or remedy, unless such waiver be expressed in writing and signed by the party to be bound. All typographical or clerical errors made by Seller in any quotation, estimate or bid, acknowledgement or publication are subject to correction. No action, regardless of form, arising out of transactions relating to this contract, may be brought by either party more than two years after the cause of action has accrued.

24. GOVERNING LAW: THE AGREED TERMS AS PROVIDED HEREIN, AND THE VALIDITY, PERFORMANCE, AND ALL OTHER MATTERS RELATING TO THE INTERPRETATION AND EFFECT OF AND ALL RIGHTS AND OBLIGATIONS HEREUNDER, SHALL BE GOVERNED BY THE LAWS OF THE STATE OF TEXAS, WITHOUT REFERENCE TO PRINCIPLES OF CONFLICTS OF LAW. SUBJECT TO THE ARBITRATION PROVISION AS PROVIDED HEREINABOVE, THE JURISDICTION OF ANY PROCEEDING RELATED TO THE GOODS SHALL BE IN THE STATE OF TEXAS AND VENUE SHALL BE LUBBOCK COUNTY, TEXAS. THE RIGHTS AND OBLIGATIONS OF THE PARTIES HEREUNDER SHALL NOT BE GOVERNED BY THE 1980 U.N. CONVENTION ON CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS.

25. Titles: The section titles herein are for reference only, and shall not limit or restrict the interpretation or construction of this Agreement.

26. Waiver: Seller's failure to insist, in any one or more instances, upon Buyer's performance of this Agreement, or to exercise any rights conferred, shall not constitute a waiver or relinquishment of any such right or right to insist upon Buyer's performance in any other regard.

27. Severability: The partial or complete invalidity of any one or more provisions of this Agreement shall not affect the validity or continuing force and effect of any other provision

SIMFLO®
WE SEE WATER DIFFERENTLY®

SIMQUAL®
CERTIFIED

SEVEN MORE WAYS WE DELIVER
PERFORMANCE BEYOND THE PUMP.®

Our SIMQUAL quality control program codifies our decades-long dedication to ensuring every SIMFLO product meets specifications and surpasses performance expectations – fostering trust, confidence, brand reputation as an industry leader and exceptional customer loyalty. SIMQUAL is comprised of a meticulous seven-stage process. Each stage scrutinizes key project aspects. From raw materials to final assembly and shipping, SIMFLO leaves no detail unchecked.

1. PROJECT APPLICATION REVIEW
2. ENGINEERING & TECHNICAL (E&T) AUDIT
3. MANUFACTURING REVIEW & VERIFICATION (MR&R)
4. PERFORMANCE TESTING
5. ASSEMBLY TESTING
6. FINAL COATING PROCESS (FCP)
7. TRANSPORTATION PREPARATION

ONCE ALL SEVEN STEPS ARE VERIFIED, A FINAL SIMQUAL STICKER IS ATTACHED TO THE PUMP (SYSTEM) AND SIGNED, CERTIFIED, DATED AND SENT ON ITS WAY!

SIMFLO®
WE SEE WATER DIFFERENTLY®

SIMQUAL® CERTIFIED

7-STEP SIMQUAL® PROCESS EXPLAINED

1. **Project Application Review:**
   Starting with a detailed review to confirm all requests align with project scope is critical. Our sales and engineering team work to carefully develop accurate quotes you can rely on for budgeting and approval.

2. **Engineering and Technical (E&T) Audit:**
   Approved project application requests are given a pre-production audit to ensure that all products being developed meet the final submitted parameters before beginning production including MTRs verifications. SIMFLO designs customized pumps and specs for final system components. MTRs verification to meet project requirements.

3. **Manufacturing Review and Verification (MR&V)**
   All designed and produced base piping and components are inspected for correct sizing, tolerances, or defects. Parts are then moved into final machining and finishing processes. Then each part is inspected a second time before moving on to testing.

4. **Performance Testing:**
   All parts, both custom designed and manufactured, as well as sourced system parts are performance tested to ensure they meet E&T audit and approved project scope.

5. **Assembly Testing:**
   Approved parts are combined for system assembly and are put through a series of physical and computer testing to match exact output and pressure specifications.

6. **Final Coating Process (FCP):**
   Specific coatings to meet technical requirements like ASME are applied. Formulated coatings also provide added performance and longevity to the pumps through abatement of various environmental conditions.

7. **Transportation Preparation:**
   Completed, tested and approved products/systems are weighed and properly fitted into appropriate custom-built packaging to ensure the final product is shipped safely, securely and ready for installation.

ONCE ALL SEVEN STEPS ARE VERIFIED, A FINAL SIMQUAL STICKER IS ATTACHED TO THE PUMP (SYSTEM) AND SIGNED, CERTIFIED, DATED AND SENT ON ITS WAY!

1.0 SAFETY CONSIDERATIONS

1.1 SAFETY INSTRUCTIONS

There is a multitude of potential dangers when installing, operating and/or maintaining pumping equipment (rotating assemblies, high pressure, high heat, high voltage, chemicals, lifting and handling hazard) just to mention a few. Paying attention to safety is important. Follow OSHA guidance for safety awareness and compliance as well as the safety instructions outlined in this manual. Failure to follow the instructions can cause serious personal injury, death, or property damage.

Information in these user instructions is believed to be reliable. Despite all the efforts to provide correct and necessary information, the content of this manual may appear insufficient and is not guaranteed as to its completeness or accuracy.

Safety Apparel is encouraged, some examples are as follows:

- Insulated Work Gloves
- Heavy Work Gloves
- Safety Glasses
- Steel Toe Boots
- Hard Hats
- Ear Plugs/Covers
- Other Personal Protective Equipment – as may be required to protect against other hazardous conditions, such as electrical shock, toxic fumes and/or fluids.

All personnel involved in the operation, installation, inspection, and maintenance of the unit must be qualified to carry out the work involved. If the personnel in question do not already possess the necessary knowledge and skill, appropriate training and instruction must be provided.

If needed, the operator may commission the manufacturer/representative to provide applicable training.

Always coordinate repair activity with operations and health and safety personnel and follow all plant safety requirements and applicable safety and health laws and regulations.

Additionally, there can be situations that require special attention. These situations are highlighted throughout this manual by the following symbols.

SAFETY ALERT SYMBOL – *When you see this symbol on the pump or in the manual, look for one of the following signal words and be alert to the potential for personal injury or property damage,*

DANGER

Immediate hazards which WILL result in severe personal injury or death if procedures in this manual are not followed.

WARNING

Hazards or unsafe practices which COULD result in severe personal injury or death if procedures in this manual are not followed.

CAUTION

Hazards or unsafe practices which COULD result in minor personal injury or product or property damage if procedures in this manual are not followed.

NOTICE: INDICATES SPECIAL INSTRUCTIONS WHICH ARE VERY IMPORTANT AND MUST BE FOLLOWED.

(NOTE: Notes points of instruction which require specific considerations.)

1.2 SAFETY ACTIONS

WIRE SIZING - Install, ground and wire according to local and national electrical code requirements.

DISCONNECT SWITCH - Install a disconnect switch near the pump.

POWER LOCKOUT - Disconnect and lockout electrical power before installing or servicing the pump.

ELCTRICAL SUPPLY - Electrical supply must match motor's nameplate specifications. Incorrect voltage can cause fire, motor damage and void warranty.

THERMAL CIRCUITS - Single phase pump motors are equipped with an automatic thermal protector, which opens the motor's electrical circuit when an overload condition occurs. This can cause the pump to start unexpectedly when the circuit cools and closes allowing voltage to the motor circuit.

⚠ PUMP ISOLATION - Ensure pump is isolated from the system and the pressure is relieved before disassembling the pump, removing plugs, or disconnecting the piping.

⚠ LIFTING AND HANDLING - Use proper lifting and supporting equipment to prevent serious injury. Do not work under a heavy suspended object unless there is positive support and safeguards, which will protect personnel, should a hoist or sling fail.

⚠ DECONTAMINATION - Observe all decontamination procedures.

⚠ THERMAL SHOCK - Rapid changes in the temperature of the liquid within the pump can cause thermal shock that can result in damage or breakage of components and should be avoided.

⚠ APPLYING HEAT – Great care shall be taken if heat is used to disassemble a pump. Some parts may have been shrunk to fit on the pump shaft and may require heat for removal. Special care should be taken to ensure that all gas toxins and or flammables are not present which could cause a fire and/or explosion.

⚠ HOT/COLD PARTS – If hot or freezing part and/or components can present a hazard to operators and/or persons entering the immediate area, then actions must be taken to avoid accidental contact. If complete protection is not possible, then access must be limited to maintenance personnel only, with clear visual warnings and indicators to those entering the immediate area.

⚠ HAZARDOUS LIQUIDS – if a pump is handling hazardous liquids, care must be taken to avoid exposure to the liquid by appropriate setting of the pump, limiting personnel access, and by operator training. If the liquid is flammable and/or explosive, strict safety procedures must be applied.

⚠ EXPLOSIVE ATMOSPHERES - Prior to installing any equipment, determine the hazardous area classification and any other requirements applicable to the specific location and confirm all equipment has the required certifications.

⚠ EXTERNAL PIPE LOAD - Do not use pump as a support for piping. Do not mount expansion joints, unless allowed by the pump manufacturer in writing, so that their force, due to internal pressure, acts on the pump flange.

⚠ PUMP STARTUP – (Unless otherwise stated at a specific point in the user instructions), Pumps may be started with the valve further open only on installations where a partly opened valve cannot occur. The pump outlet valve may need to be adjusted to comply with the duty following the run-up process*. (See Section 5, Pump Startup, Operation and Shutdown.)*

⚠ NEVER RUN THE PUMP DRY

⚠ DO NOT RUN THE PUMP CONTINUOUSLY OUTSIDE THE ALLOWABLE OPERATING RANGE – Operating at a flow rate outside the pumps design parameters with no back pressure on the pump may overload the motor and cause cavitation/vibration. Running the pump at a flow rate below the pumps design parameters can cause damage due to reduction in pump bearing life, inter-bowl recirculation of fluids, overheating of pump, instability, and cavitation/vibration.

⚠ EXCESSIVE PUMP NOISE OR VIBRATION – may indicate a dangerous operating condition. The pump(s) must be shut down immediately.

⚠ ALL EQUIPMENT USED FOR LIFTING MUST BE MAINTAINED AND INSPECTED TO BE IN GOOD CONDITION AND APPROPRIATE FOR THE WEIGHT.

1.3 EMERGENCY PROCEDURES

Several possible emissions or leakage of hazardous substances may be possible depending on the product being pumped. Ensure you are familiar with site and local procedures and requirements.

2.0 GENERAL INSTRUCTIONS

2.1 RECEIVING THE PUMP

When receiving the shipment, extreme care must be taken while unloading not to drop or damage the pump or packaging. Handle all components carefully. Inspect the shipping crate for transit damage prior to unpacking the pump. After unpacking, visually inspect the pump and check the following:

- Contents of the pump assembly against the packing list.
- All components against damage.
- All shafting for damage, should the crate be broken or show careless handling.

Any shortages or damages should be immediately called to the attention of the freight carrier or agent by which the shipment arrived, and proper notation made on the bill. This will prevent any controversy when claim is made and facilitate prompt and satisfactory adjustment. Pictures are always an advantageous form of added documentation for any signs of damage prior to and/or promptly after removal from the freight carrier. Pictures of any damaged components/parts after opening a damaged package is also highly suggested.

NOTICE: Damaged pumps, components and/or parts are the responsibility of the freight carrier and not the shipper (manufacturer). Any claims for shortages and/or damages must be filed by the receiver with the freight carrier. Prompt notification and filing is highly suggested to facilitate a prompt and satisfactory adjustment.

2.2 HANDLING & TRANSPORTATION

⚠ WARNING

ALL LIFTING AND RIGGING must be performed by qualified and experienced personnel who are familiar with safe lifting practices and requirements. A lifting plan should be established and followed to ensure safe lifting of all equipment.

The pump and additional equipment have been prepared for shipment at the factory in such a way to minimize potential damage from handling and transport. It is important to exercise extreme care in handling all parts. Certain items are precision machined for proper alignment and, if dropped, banged, sprung, or mistreated in any way, misalignment and malfunction will result.

The pump must be transported in the horizontal position. If the bowl assembly is strapped to an I-beam for support, do not remove the bowl assembly from the I-beam support until the bowl assembly is in the vertical position. If this is not possible, the longer units must be supported at more than one place to avoid putting undue strain on the unit when raising to the vertical position. Components should be unsecured and removed from shipping containers only when necessary for installation.

All components must be handled and transported securely by using suitable slings and tie-down devices. Handling must be carried out by specialized personnel to avoid damage to the pump and persons. The lifting rings attached to various components should be used exclusively to lift the components for which they have been supplied.

Parts which are too heavy to be manually lifted from the transporting vehicle and appropriate lifting equipment is not available, should be skidded slowly and carefully to the ground to prevent damage. Never unload by dropping parts directly from the carrier to the ground and never use shipping crates for skids. Best practice for safe loading and unloading of all equipment is to make sure the proper personnel and equipment are available.

Other components, such as the electrical cable, may be vulnerable to gouging or scuffing. Special care and protection should be given to ensure the jacket and insulation on the power cable and motor leads are not damaged in any way.

⚠ WARNING

DAMAGED POWER CABLES MAY CAUSE EQUIPMENT FAILURE AND PERSONAL INJURY OR DEATH.

2.3 SHORT-TERM STORAGE

SIMFLO defines short-term storage as three months or less. The storage time is considered to start from the time the pump is delivered and awaiting installation.

This section is intended to be of general assistance to users of SIMFLO submersible pumps. It shall not modify, amend and/or otherwise alter the scope of SIMFLO submersible pumps warranty responsibilities to the purchaser in any way whatsoever. Specific procedures for storing motors should be obtained from the equipment manufacturer.

SIMFLO uses approved protective preservatives with an effective life of 3-18 months or less depending on the storage environment.

Normal packaging is designed to protect the pump during shipment and for dry, indoor storage for up to three months or less. The pump shall be considered in storage when it has been delivered to the job site and waiting to be installed. Steps should be taken to protect the pump against moisture, dirt, and foreign particulate intrusion.

Indoor storage is preferred. If indoor storage is not available, then it is preferred that the storage area is paved, well drained and free from flooding. Pumps and/or component parts shall be sorted to permit ready access for inspection and/or maintenance without excessive handling.

Minimum requirements for short-term storage is as follows:

- Loose unmounted items. This packaging will provide protection for up to twelve months without damage to mechanical seals, bearings, lip seals, etc. due to humidity, salt laden air, dust, etc.
- After unpacking, protection will be the responsibility of the user. Addition of oil to the bearing housing will remove the inhibitor. If units are to be idle for extended periods after the addition of lubricants, inhibitor oils and greases should be used.
- Re-greaseable bearings are packed with grease.
- All uncoated surfaces require rust preventative monthly.
- Exposed threads are taped with polywrap.
- Flange faces are protected with covers.
- All assemblies are attached to a wood skid which confines the assembly within the perimeter of the skid, at least 6" above grade.
- Added protection is provided to assemblies with special paint.
- All assemblies are packaged and braced to withstand normal handling during shipment. The pump must be stored in a covered, dry location.
- Enclose the unit with black polyethylene with a minimum thickness of 0.15mm and seal it with tape.
- Rotating assembly should not be left in one position for more than one month at minimum without rotating the pump shafting counterclockwise. Shaft should rotate freely.

2.4 LONG-TERM STORAGE

SIMFLO defines long-term storage as more than three months. The storage time is considered to start from the original time the pump is delivered and awaiting installation.

In addition to the short-term storage procedures above, the recommended procedures for long-term storage of pumps are as follows:

- Place 5 pounds of vapor phase inhibitor crystals or 10 pounds of moisture absorbing desiccant near the center of the pump. If the pump is assembled, place an additional one pound in the discharge opening securely fastened to the discharge elbow.
- Install a moisture indicator near the perimeter of the pump. Provide a small ventilation hole approximately ½ inch diameter.
- Provide a roof or warehouse shelter to protect from direct exposure to the elements.

2.5 MATERIALS & EQUIPMENT REQUIRED

The materials and equipment required for the installation of the pump will vary depending on the type and size of the pump, and the type of installation. The following list of supplies and tools is provided only as a guide.

Hand Tools

- Pipe wrenches
- Mechanics tools
- Clean rags
- Feeler gauges
- Dial indicator to assist with equipment alignment
- Machinist level
- Taperlock driver

Rigging Equipment

- Mobile power hoist, traveling crane or derrick.
- Drag line and blocks.
- Lifting bell for threaded column.
- Lifting slings, cables, and chains (properly sized and inspected for good condition).
- Elevator clamps if unit is unassembled.
- Clevises for use with eyebolts.
- Timbers: size, length, and quantity to support long pump parts on the floor.
- I-Beams to support pump over installation.

2.6 GENERAL DESCRIPTION

PUMP NAME PLATE IDENTIFICATION

All pumps are identified by serial number, model number and size. This information is stamped on a stainless-steel identification plate which is permanently attached to the Discharge Head and Bowl Assembly. The pumps serial number is critical information regarding spare parts and duplicates when contacting factory.

COMPONENT DESCRIPTIONS

Submersible motors are considered a solid-shaft driver and are connected directly to the bottom of the pump by a splined and/or keyed coupling.

The discharge head supports the driver and bowl assembly. It is used as a discharge connections. Ports are provided for connecting gauges and allowing electrical connections through,

Column pipe connects the bowl assembly to the discharge head.

The bowl assembly main components:
BOWLSHAFT – connects the impellers to submersible motor.
IMPELLERS – pressure generating hydraulic components.
IMPELLER ATTACHMENTS

- Taperlocks are used to fasten the Impellers to the bowl shaft in fluid temperatures up to 180°F Max. and shaft sizes up to 2.19".
- Keyed Impellers are used for fluid temperatures over 180°F and bowl sizes over 16".

BOWLS – reorient flow produced via impellers and contain pressure. They generally have flanged connections.
DISCHARGE ADAPTER –used to adapt bowls to a flange or threaded column.
BEARINGS –placed in the suction and in each bowl.
SUCTION –bolts directly to motor
MOTOR COUPLING – keyed or splined connection to the motor shaft
STRAINER – to strain large foreign objects from entering the eye of the impeller.

3.0 INSTALLATION & ALIGNMENT

⚠ WARNING
WARNING – PERSONAL INJURY
The pump must be installed, operated, and maintained only by personnel who are trained and have sufficient knowledge about the hazards that may occur during such work.

3.1 PREPARATION

Review Safety Procedures and look for any safety hazards that require attention prior to beginning installation. Make sure the work area is clean and clear of any debris or objects which are not needed as a part of each progressive step of installation.

Proper installation is necessary to obtain maximum service life from the pump.

All machined mating surfaces must be clean and free of burrs and nicks. These surfaces must be cleaned thoroughly with scraper, wire brush and cloth if necessary, and any nicks or burrs must be removed with a fine file.

All threads must be checked for damage and repaired if necessary. If filing is required, remove the part from the pump if possible, or arrange a rag to catch all the filings so that they do not fall into other parts of the pump. Clean all threads with wire brush and cleaning solvent. Lubricate all screwed connections with a thread lubricant suitable for steel. Use an anti-galling compound on stainless and Monel mating threads.

3.2 WELL OR SUMP CONDITIONS

WELL CONDITIONS

Make sure that the well complies with applicable local codes. Ensure the casing I.D. is large enough to accommodate the motor flow sleeve, power cable and cable guard without scrapping or damaging the cable during installation and operation.
Ensure the pumps inlet of the suction is located below the water according to manufacturer's minimum submergence, while complying with ANSI/HI 9.8 for distance to the bottom of sump.

The pump unit must be operated in a straight well. Installing a pump unit in a crooked well may bind and distort the pump column causing premature failure. When the straightness of the well is not known, the well should be gauged prior to installation by lowering a dummy assembly, slightly longer and larger diameter than the bowl assembly to ensure the pump unit can be set at the proper depth to meet the service condition requirements.

Some benefits for wells developed with a test pump prior to installation. Test pumps remove excess sand, and can help determine capacity and draw down.

SUMP CONDITIONS

The sump you provide can influence both the mechanical and hydraulic performance of your pump. The intake configuration should be designed to deliver an evenly distributed flow of water to the pump suction as uneven flow patterns can create surface and sub-surface vortices. Vortexing can introduce air into the pump, can increase power consumption, can influence submergence requirements, and can produce objectionable noise and vibration.

For these reasons, we recommend you put your sump design questions in the hands of an experienced sump design engineer who can match intake configuration with pump requirements in the plant design phase and make it possible for you to realize optimum performance from each.

3.3 FOUNDATION PLATE

The foundation must be located to allow adequate space for operation, maintenance, and inspection. The foundation must be able to absorb any vibration and form a permanent, rigid support for the pumping unit. Additionally, the foundation must be strong enough to support the total weight of the pump and the liquid passing through it.

CONCRETE FOUNDATION

Though foundations can be formed of steel structures, they are typically formed of concrete that is poured on a solid footing. The recommended mass of a concrete foundation is three times that of the pump, motor, and base. A typical installation will have bolts with a pipe sleeve 2 to 2-1/2 times the bolt diameter embedded in the concrete. Bolts should be sized and located according to the dimensions on the certified pump outline drawing and/or the foundation plate to be used. The pipe sleeve allows movement for the final positioning of the foundation bolts to align with the holes in the plate.

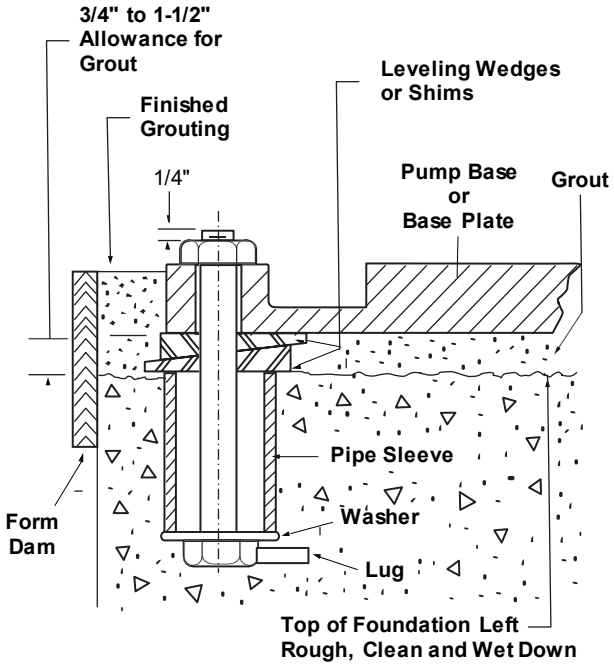

Figure 1

FOUNDATION PLATE

Foundation plate is a term used to describe a solid steel plate mounted in grout or bolted to steel structures at the interface of the pump discharge head to the foundation, completing the load path into the foundation. These plates help provide a uniform distribution of the pumps total weight load to the foundation, and therefore conform to the shape of the foundation, typically a square or a rectangle.

CAUTION

Once the foundation plate is grouted, the plate cannot be adjusted so it is extremely important that all alignment procedures be completed prior to grouting.

NEW FOUNDATION PLATE

If the pump is equipped with a foundation plate, it should be installed separately.

Make sure that the pump will pass through the opening in the plate. If the pump does not pass through the plate, it will complicate service and maintenance operations.

Thoroughly clean both sides of the plate with an appropriate solution. It is sometimes necessary to coat the underside of the plate with an epoxy primer.

Leveling the plate may be done by several methods.

- Leveling Wedges and Shims.
- Leveling Nuts on the anchor bolts.

- Jack Screws mounted through the plate.

Shims and metal wedges are not recommended for leveling because they are difficult to remove before or after grouting. On large units, small leveling screws (jack screws) made of cap screws and nuts under the sole plate may be used. If used, the leveling screw threads should be covered with a nonbinding material, such as grease, putty, or tape, before grouting, to facilitate their removal. A gap of about ¾" to 1-½" inches should be allowed between the plate and the foundation for grouting.

Regardless of the method, a machinist level should be used for leveling. To ensure an accurate reading the surface should be free of all contaminants, such as dust. Level the plate in two directions at 90 degrees on the machined surface. The levelness tolerance is 0.005 inches per foot for commercial, and 0.001 inches per foot for API, regardless of machined face or not.

If the plate has machine planed mounting surfaces, these machined surfaces are to be referenced when leveling the plate. If the plate is without machine planed mounting surfaces, the pump and motor are to be left on the plate. The proper surfaces to reference when leveling the plate assembly are the pump suction and discharge flanges. Do not stress the plate, and do not bolt the discharge flanges of the pump to the piping until the plate foundation is completely installed. Use leveling jackscrews to level the plate. Check for levelness both inline direction with the discharge and 90° direction to the discharge. Do not rely on the bottom of the plate to be flat. Standard plate bottoms are not machined, and it is not likely that the field mounting surface is flat.

After leveling the plate, tighten the anchor bolts. If shims were used, make sure that the plate was shimmed near each anchor bolt before tightening. Failure to do this may result in a twist of the plate, which could make it impossible to obtain final alignment. Check the level of the plate to make sure that tightening the anchor bolts did not disturb the level of the plate. If the anchor bolts did change the level, adjust the jackscrews or shims as needed to level the plate. Continue adjusting the jackscrews or shims and tightening the anchor bolts until the plate is level.

Grouting the plate. Provisions to properly fill and vent the plate grout must be made prior to installation. Inspect foundation for dust, dirt, oil, chips, water, etc. and remove any contaminants. Do not use oil-based cleaners as grout will not bond to it. Refer to grout manufacturer's instructions.

Form a dam around foundation. Thoroughly wet foundation. If the elevation of the plate is critical, this should be considered prior to and during leveling. Pour grout between plate and concrete foundation, up to level of formed dam. A gap of about 1 to 2 inches should be allowed between the plate and the foundation for grouting. Remove air bubbles from grout as it is poured by puddling, using vibrator, or pumping the grout into place. Non- shrink grout is recommended.

Allow grout to set for 48 to 72 hours before tightening the foundation bolts.

EXISTING GROUTED FOUNDATION PLATES

Installation will vary when installing a pump on an existing grouted plate. Mount the pump on the existing plate. Level the pump by putting a level on the discharge flange. If not level, the plate will have to be removed and then realigned and re-grouted or add or delete shims between the pump discharge head and the plate.

3.4 PIPING

Refer to Hydraulic Institute Standards guidelines for piping and must be reviewed prior to pump installation.

⚠ WARNING

Never draw piping into place by forcing the flange connections of the pump. Pipe strain will adversely affect the operation of the pump resulting in damage to the equipment and possible physical injury.

Exterior strain must not be transmitted to the pump. The most common cause of trouble is forcing the discharge piping to mate with the pump. It is recommended that flexible connectors are installed in the piping adjacent to the pump, when possible. All piping must be independently supported and accurately aligned so that undue pipe strain is not imposed on the pump. It should be possible to install suction and discharge bolts through mating flanges without pulling or prying on either of the flanges.

Carefully clean all pipe parts, valves and fittings, and pump branches prior to assembly.

Exercise special care when handling parts which have special coatings. If the coating is damaged (nicks, scrapes, wrench marks, etc.), the damaged spots should be repaired before the installation is completed

All piping must be tight. Pumps may vapor- lock if air is allowed to leak into the piping.

With pump setting less than 400 ft, check valves should be installed 20 ft above the bowl assembly, and at the top of the well with a third check valve installed halfway between the two.

For pump settings greater than 400 ft, check valves should be installed 20 ft above the bowl assembly, and at the top of the well intermediate check valves should be placed such that spans never exceed 200 ft.

3.5 BOWL ASSEMBLY INSTALLATION

Use a protective covering over open well, sump, column and or discharge piping when appropriate to decrease the chances for foreign material or objects to enter. Should a foreign object enter any openings, they must be removed before proceeding.

⚠ WARNING

Do not work under a heavy suspended object unless there is positive support and safe guards, which will protect personnel, should a hoist or sling fail.

1. Inspect as follows:
   - Make sure all bolting is tight.
   - Turn the pump shaft by hand and make sure it turns freely.
   - Make sure no rags, wood or other foreign material are in the nozzles
   - Meg the motor to ensure proper splicing
2. Place two I-beam supports across the foundation plate opening, strong enough to safely support the weight of the entire pump assembly. Use protective plywood between the beams and the plate to prevent plate surface damage. These I-beams should be connected by threaded rods and nuts to firmly clamp them together around the portion to be supported.
3. Place a properly sized hoist or derrick over the foundation plate opening with the hook hanging in the center.
4. Lift motor vertically and lower it into the well. Place elevator clamps around the motor being sure to not nick the motor cables.
5. At this time if the motor requires lubrication of any sort, do so in accordance with motors IOM.
6. Place the elevator clamps just below the discharge bowl and utilize a lifting bail sized to handle the weight of the bowl assembly and suction apparatus. For flanged column install two threaded eyebolts through the discharge bowl bolt holes 180° apart.
7. Attach a sling to the elevator clamps, eyebolts, or lifting bail.
8. Hoist the bowl assembly to a vertical position being careful not to damage the pump suction. Use a rope to tail in the bowl assembly preventing it from swinging.
9. Lower bowl assembly over the motor and carefully align the motor coupling with the motor shaft.
10. Once aligned with the bolt the suction to the motor.
11. Re-install the coupling guard over the motor leads. Do not overtighten the guard fasteners.
12. Place a cover over the discharge bowl opening to prevent entrance of foreign matter until ready for installation of the column assembly.

⚠ CAUTION

Do not drop any foreign object into the bowl assembly. Any foreign object dropped into the bowl assembly must be retrieved prior to continuing.

3.6 COLUMN INSTALLATION

⚠ CAUTION

If at any point the pump is observed to bind or will not rotate freely on the hook swivel, then either there is an obstruction in the well or the well is crooked. Either way, the well is not acceptable for a proper pump installation and continuing with the installation will void the warranty.

COLUMN INSTALLATION

1. Determine the correct sequence of installation of the column sections and organize them accordingly.
2. Secure a friction clamp or elevator clamp immediately beneath the column coupling on the first section of column to be installed. If column is flanged, secure the clamp about 6" below the bottom of the flange.

⚠ WARNING

Slip Plates should be manufactured and maintained to tight tolerances to ensure a safe fit for each column and flange size.

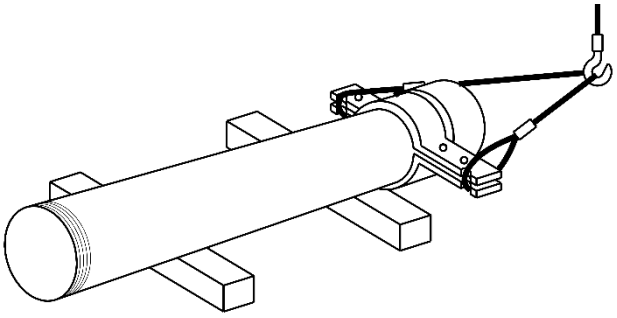

Figure 2

3. Hoist the column assembly to the vertical position taking care not to strain or damage the pipe threads.
4. Before centering the column pipe over the bowl assembly, hit the sides of the column pipe with a hammer to ensure that any loose debris is cleared from within the column pipe.
5. For threaded column connections, apply thread compound to the discharge threads and to the column pipe threads. Lower the column ensuring the shaft feeds smoothly through the bearing in the spider until the column engages the bowl adapter. Using chain tongs, tighten the pipe into the bowl while slowly lowering the derrick hoist. Tighten the pipe into the bowl so that it seats securely against the mating shoulder in the bowl.
6. For flanged column connections, spread a thin even film of thread compound on the bowl discharge flange. Lower the pipe, align the studs in the bowl with the holes in flanges, seat the column flange against the bowl flange and then install and tighten the hex nuts evenly.
7. Hoist the unit slightly, remove the bowl clamp and slide the setting beams out enough to allow passage of the unit.
8. If the bowl and column are coated with any special application, any required touch up work should be done before lowering the unit.
9. Lower the unit, slide the setting beams in close to the column and continue lowering the unit until the clamp ears rest on the setting beams. Remove the sling. If an airline is being installed, be careful not to crush it during install.
10. Steel bands should be placed at intervals of 10-12 ft, taking care to not pinch the submersible cables.
11. Once spliced motor leads hit the water, it is necessary to meg the leads to ensure proper resistance.
12. Ensure check valves are installed per Section 3.4

CAUTION

Do not drop any foreign object into the column assembly. Any foreign object dropped into the column must be retrieved prior to continuing.

3.7 DISCHARGE INSTALLATION

The bottom of the discharge head will either be a threaded or flanged column mounting configuration. Install the discharge head as follows:

1. If a steel foundation plate is provided for use under the discharge head and this plate is not already attached to the head, attached the plate as described below.
   - Clean the mating surfaces of the head and the plate.
   - Place the head on the foundation plate. Orient the head so that the holes in the head, line up with the holes in the plate.
   - Bolt the head to the plate by installing two bolts in diagonally opposite holes in the base of the head.
   - Install studs in the threaded holes near the large hole in the plate. Tighten the studs into the plate as deep as the threads will allow. Also assure that the stud protrudes from the same side of the lifting plate as the female register.
   - Clean the mating surfaces of the head and the lifting plate and install the O-ring and/or gasket if required.
   - Place the discharge head on the lifting plate. Orient the head to the desired position, making sure that the auxiliary holes in the head, lines up with the auxiliary holes in the plate.
   - Install the cap screws provided to secure the plate to the head.
2. Attach slings to the head using lifting devices, and if not present, use the window opening.
3. Lift the head, remove the hex nuts from the studs and clean the mating surfaces on the bottom of the head and on the column pipe. Apply a thin coat of thread compound to all the head-to-column mating surfaces.
4. If the head-to-column pipe connection is flanged, align the head with flange holes, lower the head until it is seated squarely on the flange, and then install and tighten the fasteners.
5. If the head-to-column pipe connection is threaded, lower the head until it contacts the pipe, apply a set of chain tongs to the pipe and turn the head until the pipe seats. To tighten the head further, place a long pipe through the head windows or into the discharge being careful not to damage the motor leads.
6. If the head-to-column pipe connection is flanged to thread, check to be sure that the threaded column flange adapter is securely attached to the bottom of the discharge head. Check and

tighten the cap screws gradually in diametrically opposite pairs. lower the head until it contacts the pipe, apply a set of chain tongs to the pipe and turn the head until the pipe seats. To tighten the head further, place a long pipe through the head windows or into the discharge being careful not to damage the motor leads.

DANGER

Sling should be rated to handle more than the total pump weight.

7. Hoist the discharge head by lifting lugs and remove the elevator clamp attached to column.
8. Remove the support timbers or I-beams and clean the top of the foundation plate. Orient the discharge head in the required position.
9. Lower bowl, column, and head assembly until discharge head mounting flange engages the foundation plate. Secure discharge head to the foundation plate. Check the levelness of the discharge head in all directions, utilizing a machinist level across the driver's mounting surface of the discharge head.

4.0 MISCELLANEOUS EQUIPMENT

4.1 AIR RELEASE VALVES

The air release valve prevents a large volume of air from being compressed and then setting up a severe shock wave when suddenly released, with potential for serious equipment damage. The air release valve also prevents air from entering a pressurized system.

The air release valve also relieves the vacuum that might otherwise be generated in the discharge during shutdown when the liquid recedes in the column pipe to the sump or well standing level. Vacuum release valves may be critically important to prevent equipment damage on restarting flow into an evacuated column.

For medium and large-size vertical wet-pit pumps discharging into a pressurized system, an automatic air and vacuum release valve is recommended. The valve should be located on the pump discharge nozzle or between the pump discharge nozzle and the discharge valve or check valve, whichever is closest.

Install the air release valve to the pump head or just beyond the head flange on the discharge piping. It is recommended that a throttling device be used on the discharge side of the air release valve to restrict the discharge of air ensuring that a cushion of air is available in the discharge head during start up.

Open the air release system isolation valve. Adjusting the air release system throttling device so that is partially open, it should not be closed or fully open.

Not exhausting the air or releasing it too fast can damage the pump.

4.2 MISCELLANEOUS ACCESSORIES

PRESSURE GAUGES

Connect the pressure gauge, and/or gauge cock, if furnished to the tapped hole at the top of the discharge flange on the head. Position the dial face to facilitate reading.

DISCHARGE VALVES

A check valve and an isolation valve should be installed in the discharge line. The check valve serves to protect the pump from reverse flow and excessive backpressure. The isolation valve is used in priming, starting, and when shutting down the pump. Operating pumps of specific speed over 100 (5000) at shutoff may cause a dangerous increase in pressure or power.

CAUTION

Start the pump with the Isolation Valve partly opened.

CAUTION

Do not run the pump continuously outside the allowable operating region.

PIPE REDUCERS / INCREASERS

If increasers are used on the discharge side of the pump to increase the size of piping, they should be placed between the check valve and the pump.

EXPANSION JOINTS

If expansion joints are used, they should be placed between the pipe anchor and the check valve.

4.3 ELECTRICAL CONNECTIONS

All connections to the motor such as main leads, space heater leads, thermocouple leads, etc. should be made in accordance with motor manufacturer's recommendations and local codes.

All control, monitoring, and alarm equipment should be installed in accordance with the installation instruction provided by the manufacturer of that equipment.

Ensure that all control equipment is supplied with the proper voltage and that they are functioning normally prior to running the pump the first time.

Electrical boxes and conduit should be installed in accordance with industry standards, local ordinances, and in unison with specific factory recommendations for a certain pump (if any).

⚠ DANGER
WIRE SIZING - Install, ground and wire according to local and national electrical code requirements.

⚠ DANGER
DISCONNECT SWITCH - Install an all leg disconnect switch near the pump.

⚠ DANGER
POWER LOCKOUT - Disconnect and lockout electrical power before installing or servicing the pump.

⚠ DANGER
ELCTRICAL SUPPLY - Electrical supply must match motor's nameplate specifications. Incorrect voltage can cause fire, damage motor and void warranty.

⚠ DANGER
NEVER DO MAINTENANCE WORK WHEN THE UNIT IS CONNECTED TO POWER.

4.4 AIR LINE

When required, the water level in the well can be determined by installing an open-ended airline from just above the pump, up along the column pipe to the surface and through the inspection port of the discharge head. At the surface, attach an air valve (snifter valve) and a pressure gauge to the air line. Attach a bicycle tire pump or other source of compressed air to the air valve and force air into the air line until the pressure gauge reading is constant. This pressure reading is then converted to feet of water (1 PSI = 2.31 Ft.) indicates the number of feet of submergence of the end of the air line. The water level in the well is determined by subtracting the amount of submergence from the known length of the air line and the known length of the pump.

4.5 CONNECTING THE PIPING

Whatever your system is, all piping must be independently supported. It must not be allowed to impose stresses on the discharge head due to weight, thermal expansion, misalignment, or any other condition.

When bolting the system flange to the pump discharge head flange, determine that the flanges fit face to face and hole to hole before inserting bolts. Do not draw the flanges together with the flange bolts.

Above the floor piping should be installed in such a manner as to eliminate the possibility of the discharge head being placed in a strain or being thrown out of alignment.

If a flexible joint such as a dresser coupling is to be used, sufficiently strong tie bolts and lugs should be used to span the flexible joint capable of resisting the force created by the discharge pressure at the pump head. None of this force should be imposed on the head. Tension should be taken carefully on these tie bolts so that any amount of forward movement induced to the head will be counteracted during operation so that alignment is maintained during operation.

Flange faces should be thoroughly clean and free of all nicks or burs and should be in perfect alignment before tightening bolts.

5.0 STARTING THE PUMP

5.1 INITIAL PUMP STARTUP

PRE-START CHECK LIST

Before starting the pump, the following checks should be made to ensure that all pump installations as described in preceding sections of this manual are complete and correct.
Has the driver been properly lubricated in accordance with the instructions furnished with the driver?

Check the connections to the driver and control equipment.

Has the driver been checked for proper rotation? The driver must rotate counter-clockwise.

A pump is designed to run at specific head and flow conditions. Operating at conditions other than design can damage the pump.

If the motor has not been tested for rotation, perform the following: Open valve 45 degrees. Turn on starter. Start opening the valve, if the pump is spinning clockwise, you will never reach design head and amperage reading will be low. Turn off the starter, open the panel and interchange any two leads.

Check all automatic control systems.

⚠ CAUTION

Automatic controls that do not function properly can cause severe damage to the pump.

Check that all auxiliary equipment has been installed, serviced, and is ready for operation.

Check that all piping connections are secure.
Check that the anchor bolts are properly torqued.

PRE-START OPERATING NOTES

Special consideration must be given to the following conditions:

A time delay relay must be installed when any type of automatic system is used to prevent starting of the motor while it is spinning backwards due to column drain- back through the pump. A three-minute time delay relay is normally adequate. This provides safety measures in the event of failure in the automatic control system creates a rapid recycle series. It also provides a period for the rotating element of pump and motor to stop, after reverse rotation due to vertical discharge column drain-back.

Water hammer can be caused by starting high pressure pumps in a shallow setting, leading to damage. Special consideration must be given to the rate of releasing the air from these pumps and to the operation of the discharge valve.

STARTING THE PUMP

Ensure that the system to which the pump is connected is ready to receive flow from the pump.

Partially open the flow isolation valve in the discharge line.

Partially open the Air Release Isolation Valve. It should not be closed or fully open. Not exhausting the air or exhausting it too quickly can damage the pump.

Energize the pump. If any abnormal noises, jerking, or vibration is noted, stop the pump immediately, determine the cause of the abnormalities and correct them.

After the pump is operating at full speed, slowly open discharge valve. If driver overheats or there is excessive vibration, stop the pump, determine the causes, and correct them.

If the air release valve is manually operated, close it.

5.2 NORMAL OPERATION & SHUTDOWN

Subsequent normal start-ups are the inverse of initial start-up described above, consisting of:

- Checking that the driver, the auxiliary equipment, and the system into which the pump is discharging are ready for operation.
- Energizing the pump.
- Managing air-release.
- Checking or adjusting system for desired flow.

On any system, automatic or manual, the maximum number of starts on a motor should be controlled to (6) per hour.

Units should not be run at shutoff as the energy created by the pump dissipates into heat, creating overheating problems for the pump and motor.

6.0 PREVENTATIVE MAINTENANCE

Systematic inspection of the pump and its components shall be made at regular intervals.

Consult the applicable manufacturer's instructions for detailed information on maintenance for the prime mover, submersible motors.

Any deviation in performance or operations from what is expected can be traced to some specific cause. Variances from initial performance will

indicate changing system conditions, wear, or impending breakdown of the unit.

DANGER

Before initiating maintenance procedures, disconnect all power sources to the equipment and accessories completely. Discharge all parts and accessories which retain electric charge. Failure to comply may result in severe personnel injury or death.

6.1 MAINTENANCE SCHEDULE

TABLE 1

PROCEDURE	TIME INTERVAL (Operating Hours)
Clean dirt, oil and grease from discharge head.	As required
Tighten all loose bolts, and check for excessive vibration.	As required or annually.
Megging	Annually

7.0 DISASSEMBLY & REASSEMBLY

7.1 DISASSEMBLY

DANGER

POWER LOCKOUT - Disconnect and lockout electrical power before installing or servicing the pump.

1. After following Power Lockout procedures, remove the electrical connections at the conduit box and tag the electrical leads.
2. Follow instructions outlined in Section 3.5-3.7

NOTE: If more than minor repairs are anticipated it is recommended that the unit be taken to a shop or other clear area with a smooth floor and overhead lifting equipment.

BOWL DISASSEMBLY

The Bowl Assembly is constructed using a Suction Motor Adapter, Intermediate Bowl(s), Top Discharge Bowl, Impellers and Securing Hardware, Bearings, and Pump Shaft.

Turbine bowl impellers are secured to the shaft by either a taperlock or a key and split ring. Follow appropriate procedures that apply to the construction supplied.

It is helpful to match mark bowls and impellers in sequence of disassembly to aid in re-assembly.

TAPERLOCK CONSTRUCTION

1. Remove cap screws from the intermediate bowls
2. Slide discharge and top bowl off the bowlshaft.
3. Pull shaft out as far as possible and strike Impeller hub by sliding driver along the bowlshaft to unseat the taperlock.

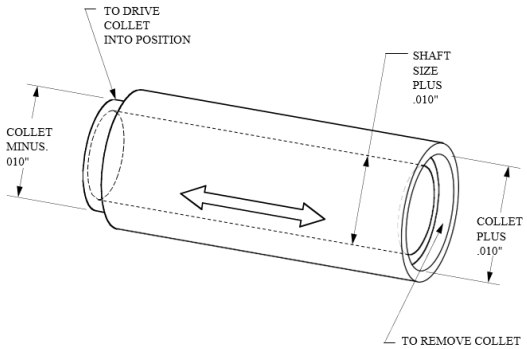

Figure 3

4. After the impeller is freed, insert a screwdriver into the taperlock slot and pull it off the shaft.
5. Repeat the above procedures until the bowl assembly is completely disassembled.

BOWL WEAR RING REMOVAL

1. Remove the set screws or grind off tack weld, when rings are furnished with those locking methods.
2. Using a diamond point chisel, cut two “V” shaped grooves on the bowl wear ring approximately 180 degrees apart. Be careful not to damage the wear ring seat.
3. With a chisel or drift, knock the end of one half of the ring in, and pry the ring out.
4. On special materials such as chrome steel, set the bowl up in a lathe and machine the wear ring off using extreme care not to machine or damage the ring seat.

BOWL AND BEARING REMOVAL/INSTALL

Use an arbor press and a piece of pipe or sleeve with outside diameter slightly smaller than the outside diameter of the bearing to press the bearing out.

When pressing, ensure the bearing is pressed flush by using an oversized shaft to ensure bearing is not kinked. Pressing inside a bowl with the flange downward, until bearing if flush with the hub.

WARNING

NOTE: Bowl bearings are press fit. Do not remove unless replacement is necessary.

7.2 INSPECTION AND REASSEMBLY

When disassembled, inspect all components for wear, damage, or other deformities. All pump components that are worn or damaged components should be replaced with new parts.

⚠ CAUTION

When repairing a pump that has been in service for several years, the physical condition or strength of all parts such as cap screws, bowls, threads, etc., must be carefully checked or replaced to avoid failure.

1. Clean all parts thoroughly with a suitable cleaner.
2. Anytime the pump is disassembled caution should be taken to make sure the protruding shaft is supported to maintain straightness throughout the shaft. If a shaft becomes bent or deformed outside of the acceptable limit it requires straightening or replacement. Shaft straightness shall be within 0.0005-inch total indicated runout (TIR) per foot of shaft length.
3. Visually check impellers and bowls for cracks and pitting
4. Check all bowl bearings for total clearance over the shaft diameter. Replace all bearings indicating wear. The maximum allowable diametrical clearance over existing shaft diameter:
   1.00" thru 1.69" shaft - .016" clearance
   1.94" thru 3.69" shaft - .018" clearance
5. Replace all worn or damaged parts with new parts.

REASSEMBLY OF THE BOWL UNIT

NOTE: The shaft, taperlock and impeller must be clean and dry upon assembly. Check shaft for straightness

⚠ WARNING

Wear protective gloves and use appropriate eye protection to prevent injury when handling hot parts.

1. If the sand collar is not assembled to the shaft, install the sand collar. The larger diameter of the counterbore of the sand collar goes toward the suction bell bearing. Measurements should be taken to ensure proper shaft stick-down. Slide the plain end of the pump shaft into the suction motor adapter.
2. Hold the shaft in this position by inserting a long cap screw with an assembly jig into the bottom end of the suction hub and secure tight into the threaded hole at the end of the shaft.
3. Slide the first impeller over the shaft until it seats on the suction.
4. Insert a screwdriver into the taperlock slot, slide the taperlock over the bowlshaft and into the impeller hub.
5. Hold impeller firmly against the suction and drive the taperlock into place with the driver. After the impeller is secured in position, the top end of the taperlock should be flush with the impeller hub.
6. Slide intermediate bowl onto shaft and secure with the cap screws provided.
7. Repeat previous procedure for remaining number of stages.
8. Remove long cap screw and the assembly jig at the end of suction hub and check that the shaft rotates freely without dragging or binding. Also check for adequate lateral.

8.0 SPARE PARTS

8.1 RECOMMENDED SPARE PARTS

The decision on what spare parts to stock varies greatly depending on many factors such as the criticality of the application, the time required to buy and receive new spares, the erosive/corrosive nature of the application, and the cost of the spare part. Please contact your factory representative for more information.

Spare parts can be ordered from the local SIMFLO sales engineer, or from the distributor or representative. The pump size and type can be found on the pump name plate on the discharge head and suction. Please provide the item description, and alloy for the part(s) to be ordered.

TROUBLESHOOTING

PROBLEM		PROBABLE CAUSE		RECOMMENDED REMEDY
1.0	Pump not reaching design flow rate.	1.1	Insufficient NPSHA. (Noise may not be present)	Recalculate NPSH available. It must be greater than the NPSH required by pump at desired flow. If not, redesign suction piping, holding number of elbows and number of planes to a minimum to avoid adverse flow rotation as it approaches the impeller.
		1.2	System head greater than anticipated.	Reduce system head by increasing pipe size and/ than or reducing number of fittings. Increase impeller diameter. NOTE: Increasing impeller diameter may require use of a larger motor.
		1.3	Entrained air.	Air leak from atmosphere on suction side.
				1. Check suction line gaskets and threads for tightness.
				2. If vortex formation is observed in suction tank, install vortex breaker.
				3. Check for minimum submergence.
		1.4	Entrained gas from process.	Process generated gases may require larger pumps.
		1.5	Speed too low.	Check motor speed against design speed.
		1.6	Direction of rotation wrong.	After confirming wrong rotation, re-verse any two of three leads on a three-phase motor. Restart pump and check Flow/TDH.
		1.7	Impeller too small.	Replace with proper diameter impeller. NOTE: Increasing impeller diameter may require use of a larger motor.
		1.8	Impeller clearance too large.	Replace impeller and/or bowl wear rings.
		1.9	Plugged impeller, suction line or casing which may be due to large solids.	1. Reduce length of suction when possible.
				2. Reduce solids in the process fluid when possible.
				3. Consider larger pump.
		1.10	Wet end parts (bowl, impeller) worn, corroded, or missing.	Replace part or parts.
2.0	Pump not reaching design head (TDH).	2.1	Refer to possible causes under Problem #1.0	Refer to remedies listed under Problem #1.0 and #3.0.
3.0	No discharge or flow.	3.1	Not properly primed.	Repeat priming operation, recheck instructions. If pump has run dry, contact factory (or dealer) for further instructions.
		3.2	Direction of rotation wrong.	See #1.6 above.
3.0	No discharge or flow. (Cont'd)	3.3	Entrained air.	Air leak from atmosphere on suction side. Refer to recommended remedy under Problem #1.0, Item #1.3.
		3.4	Plugged impeller, suction line or casing which may be due to a fibrous product or large solids.	Refer to recommended remedy under Problem #1.0, Item #1.9.
		3.5	Damaged pump shaft, impeller.	Replace damaged parts.
4.0	Pump operates for short period, then loses prime.	4.1	Insufficient NPSHA.	Refer to recommended remedy under Problem #1.0, Item #1.1.
		4.2	Entrained air.	Air leak from atmosphere on suction side. Refer to recommended remedy under Problem #1.0, Item #1.1.
5.0	Excessive noise from wet end.	5.1	Cavitation - insufficient NPSH available.	Refer to recommended remedy under Problem #1.0, Item #1.1.
		5.2	Abnormal fluid rotation due to complex suction piping.	Redesign suction piping, reducing number of elbows and number of planes to a minimum to avoid adverse fluid rotation as it approaches the impeller.
		5.3	Bent shaft.	Straighten as required. Average total runout should be less than 0.0005" TIR per foot.
		5.4	Impeller rubbing.	1. Replace impeller and/or case wear rings.
				2. Check outboard bearing assembly for axial end play.
		5.5	Resonance	Check piping strain, consult factory.

PROBLEM		PROBABLE CAUSE		RECOMMENDED REMEDY
6.0	Pump does not start.	7.1	Electrical circuit open or not completed	Check circuit and correct.
		7.2	Improper lateral adjustment. Impeller on bottom.	Reset impeller adjustment.
		7.3	Low voltage supplied to electric driver.	Check whether driver wiring is correct and receives full voltage.
		7.4	Defective motor.	Meg motor
7.0	Pump works for a while and quits.	8.1	Excessive horsepower required.	Use larger driver. Consult factory.
		8.2	Pumping higher viscosity or specific gravity liquid than pump is designed for.	Test liquid for viscosity and specific gravity.
		8.3	Mechanical failure of critical parts	Check bearings and impellers for damage. Any irregularities in these parts will cause a drag on the shaft.
		8.4	Suction strainer clogged.	Pull pump and clean the strainer.
		8.5	Misalignment.	Realign pump and driver.
		8.6	Breaking suction.	Check dynamic water level in the well. Lower bowl assembly by adding column.
8.0	Pump takes too much power.	9.1	Damaged impeller.	Inspect, replace if damaged.
		9.2	Foreign object lodged between impeller and bowl.	Remove object as required.
		9.3	Specific gravity higher than pump designed for.	Test liquid for viscosity and specific gravity.
		9.4	Viscosity too high, partial freezing of pumpage.	Check for both viscosity and specific gravity. They can cause drag on impeller.
		9.5	Defective bearing,	Replace bearing, check shaft or shaft sleeve for scoring.
9.0	Excessive vibrations.	10.1	A. Coupling misalignment, bent impeller unbalance, worn bearings, cavitation, piping strain and/or resonance.	1. Determine cause utilizing shaft vibration frequency analyzer and/or pump disassemble.
				2. Complex problem may require factory service assistance.
		10.2	Motor or gear driveshaft end play mis adjustment.	See Installation of Hollow Shaft Driver (VHS).
		10.3	Bent shaft.	Straighten as required. Average total runout should be less than 0.0005" TIR per foot.
		10.4	Crooked well.	Survey the well and consult factory.