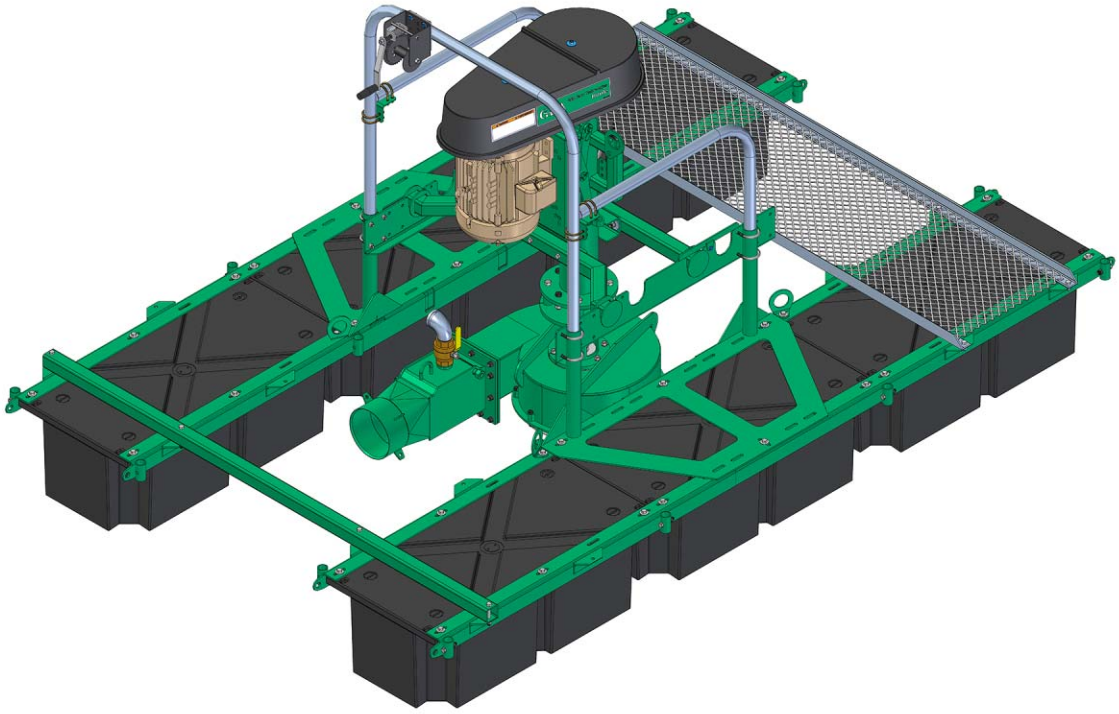


8” Flush Pump on Pontoon

Electric Pump

Operation Manual / Installation Instructions / Parts List
(Original instructions)

2019-9015-009
01-2017

engineering for
a better world

gea.com

Contents

1 Preface

This is a GEA product. GEA is the manufacturer of the Houle product line. This product was formerly known under HOULE trademark.

1.1 About this manual

The manufacturer reserves the right to make changes due to technical developments in the data and illustrations in this manual.

Reproductions, translations and copies of any kind, including extracts, require written authorization from the manufacturer.

This manual is supplied with the product.

- They should be kept close at hand and remain with the equipment even if the equipment is sold.
- This manual is not subject to an amendment service. The most recent version at any time can be obtained through the technical dealer or directly from the manufacturer.

Pictograms used


This pictogram indicates information that will help towards better understanding of a procedure or operation.


This pictogram indicates a special tool required for installation.


A correction bar in the margin indicates changes to the previous edition. The character string ”!!” in the search field of the PDF document locates the correction bar.


This pictogram indicates another document or section to refer to.

All manuals have a part number. The 4 middle digits specify the language of the instruction manual:

	Language		**Language**		**Language**
-9000-	German	-9013-	Dutch	-9032-	Serbian
-9001-	English (United Kingdom)	-9015-	English (North American)	-9034-	Slovak
-9002-	French (France)	-9016-	Polish	-9035-	Chinese
-9003-	Italian	-9018-	Japanese	-9036-	Lithuanian
-9004-	Romanian	-9021-	Danish	-9038-	Portuguese (Brazil)
-9005-	Spanish (Spain)	-9022-	Hungarian	-9039-	French (Canada)
-9007-	Swedish	-9023-	Czech	-9040-	Latvian
-9008-	Norwegian	-9024-	Finnish	-9041-	Estonian
-9009-	Russian	-9025-	Croatian	-9043-	Spanish (Central America)
-9010-	Greek	-9027-	Bulgarian		
-9012-	Turkish	-9029-	Slovene		
The instruction manuals may not be available in all the listed languages.					

1.2 Manufacturer's address

GEA Farm Technologies Canada Inc. / Division GEA Houle
4591 boul. St-Joseph
Drummondville, Qc, J2A 0C6

☎ +1 819 477 - 7444
🖷 +1 819 477 - 5565
✉ geahoule@gea.com
@ www.gea.com

1.3 Customer service

Authorized Technical Dealer

If necessary, please contact your nearest dealer.

There is a comprehensive dealer Internet search function on our website at the following address:

www.gea.com

European Contact Information:

GEA Farm Technologies GmbH
Siemensstraße 25-27
D-59199 Bönen

☎ +49 (0) 2383 / 93-70
🖷 +49 (0) 2383 / 93-80
✉ contact@gea.com
@ www.gea.com

US Contact Information:

GEA Farm Technologies, Inc.
1880 Country Farm Dr.
Naperville, IL 60563

☎ +1 630 369 - 8100
🖷 +1 630 369 - 9875
✉ contact_us@gea.com
@ www.gea.com

1.4 EC - Declaration of conformity for machines in accordance with EC Machinery Directive 2006/42 /EC, Annex II 1. A

Manufacturer: **GEA Farm Technologies Canada Inc. / Division GEA Houle**
4591 boul. St-Joseph
Drummondville, Qc, J2A 0C6

We, as manufacturer, declare in sole responsibility that the machinery

Name:	Electric pump
Model:	8” Flush Pump on Pontoon
Type:	
Serial number:	CAJ2-xxxxxxx

complies to all relevant provisions of this and the following directives:

Relevant EC Regulations:	2006/42/EC	EC Machinery Directive
Applied harmonized standards, in particular:	NF EN 349+A1:2008-08	Safety of machinery - Minimum gaps to avoid crushing of parts of the human body
	NF EN 809+A1:2009-12	Pumps and pump units for liquids - Common safety requirements
	NF EN 894-1-2-3+A1:2008-11	Safety of machinery - Ergonomics requirements for the design of displays and control actuators
	NF EN 953+A1:2009-05	Safety of machinery - Guards - General requirements for the design and construction of fixed and movable guards
	NF EN ISO 12100-1/A1	Safety of machinery - Basic concepts, general principles for design
	NF EN ISO 12100-2/A1	Safety of machinery - Basic concepts, general principles for design
	NF EN ISO 13857:2008-06	Safety of machinery - Safety distances to prevent danger zones being reached upper and lower limbs
	NF EN ISO 14121-1:2007-11	Safety of machinery - Risk assessment
	NF EN 60204-1:2006-09	Safety of machinery - Electrical equipment of machines
Other applied standards and technical specifications:		

Remarks:	We also declare that the special technical documentation for this machine has been created in accordance with Annex VII, Part A and we obligate to provide these upon reasoned request from the individual national authorities by data transfer.

Authorized person for compiling and handing over technical documentation:	Josef Schröer GEA Farm Technologies GmbH Siemensstraße 25-27 D-59199 Bönen ☏ +49 (0) 2383 / 93-70

Drummondville, 1 August 2011

Yann Desrochers
(Head of Research and Development)

1.5 GEA Farm Technologies Canada Inc. / Division GEA Houle - General equipment warranty

☞ **Important notice!**
THIS GENERAL WARRANTY APPLIES TO ALL EQUIPMENT SOLD UNDER THE HOULE TRADEMARK.

1.5.1 Limited warranty

GEA Farm Technologies Canada Inc. / Division GEA Houle (hereinafter referred to as ”the Company”) warrants to the original buyer and end user (hereinafter referred to as the ”Purchaser”) that the parts of all equipment sold under the Company trademark are free from defects in material or workmanship for a period of twelve (12) months from the date of delivery of the equipment to the Purchaser. This written warranty takes precedence over any other written warranty included in previous versions of the Company's manuals. Any equipment used for commercial usage, commercial lease on one or more farms is warranted for a reduced period of thirty (30) days only.

Components from third-party manufacturers that are not built by the Company, and which are accessory to the equipment sold under the Company trademark (including, without limitation, the motors and tires), are subject to such third-party manufacturers' specific warranty coverage.

THIS WARRANTY EXTENDS ONLY TO THE PURCHASER AND DOES NOT APPLY IN THE EVENT THAT THE EQUIPMENT IS SOLD OR OTHERWISE TRANSFERRED.

1.5.2 Condition of the limited warranty

The Company, through its GEA authorized dealers only (hereinafter referred to as ”Dealer”, reserves the right to either repair or replace all parts deemed defective under the following conditions:

1. That the equipment is installed, operated and maintained in accordance with the Company directives;
2. That the Purchaser uses the equipment in accordance with specific instructions, under normal conditions, for the sole purpose for which the equipment was designed;
3. That the Purchaser notifies in writing his Authorized Dealer or the Company (whichever the case may be) of any defect of the equipment. In either case the notification must be made within the twelve (12) months following the date of the delivery to the Purchaser;
4. The Purchaser or the Authorized Dealer must keep the defective parts or equipment for inspection by the Company and return such defective parts or equipment prepaid to the Company, if requested;
5. That the Purchaser does not modify the equipment, nor attempts to repair any equipment or parts without proper authorization from the Company;
6. Depending on the nature of the equipment involved and whether it is fixed or transportable, the Company will repair or replace the defective parts of the equipment free of charge where installed, or at the business place of the Authorized Dealer or the Company, at its sole discretion.

1.5.3 Extent of limited warranty

This limited warranty DOES NOT cover:

- Defects caused by negligence of the Purchaser in the maintenance of the equipment, improper use resulting from failure to adhere strictly to the Company's manuals or non-compliance with prescribed maintenance instructions provided by the Company (including, without limitation, lack of lubrication of the equipment), as well as damages arising from non-conforming installation of the equipment, or ambient temperature or conditions of storage of the equipment that do not comply with the Company's recommendations (including, without limitation, any damages resulting from storage or operation of the equipment at a temperature equal or below (5°C/41°F));
- Damages to equipment due to normal wear and tear or to external causes, including issues of power or inadequate electrical conditions (including, without limitation, inadequate tension (neutral/ground), abnormal mechanical or environmental conditions (including, without limitation, damages caused by fire, lightning, flood or other natural disaster), damages caused by the use of sand litter or other abrasive or inadequate material (including, without limitation, damages caused by solids in the manure, such as stone, wood, iron, concrete, and strings), as well as damages caused by ice or frozen manure blocking the evacuation line of the equipment or the introduction of such solids in the equipment;
- Freight and shipping associated with repair or replacement of equipment under this limited warranty, as well as all costs relating to removal or replacement of any equipment that is welded or affixed permanently to the ground or a building (including, without limitation, labor costs, and costs related to concrete or excavation);
- Claims arising from repairs or replacements made by the Purchaser without the prior written consent of the Company. The Purchaser shall not remove or alter any safety device, guard, or warning sign.

If the Purchaser fails to comply with any of its obligations referred to in this paragraph, the Purchaser agrees to save the Company and the Authorized Dealer harmless in respect of any liability or obligation incurred by the Company or the Authorized Dealer resulting from such failure of the Purchaser.

1.5.4 Warranty limitations and exclusion

NO WARRANTY, ORAL OR WRITTEN, EXPRESS OR IMPLIED, OTHER THAN THE ABOVE WARRANTY IS PROVIDED IN RESPECT OF THE EQUIPMENT SOLD.

Some states (or jurisdictions) do not allow the exclusion of implied warranties so it is possible that this limitation may not apply.

THE COMPANY DISCLAIMS ALL IMPLIED WARRANTIES, INCLUDING THE WARRANTIES OF MERCHANTABILITY, ADAPTABILITY OR OF PERFORMANCE, PROVIDED THAT SUCH EXCLUSION OF LIABILITY COMPLIES WITH THE LAWS HAVING APPLICABLE REGULATORY JURISDICTION.

THE LIABILITY OF THE COMPANY AND ITS AUTHORIZED DEALERS UNDER THIS WARRANTY IS LIMITED TO REPAIR OR REPLACEMENT OF DEFECTIVE PARTS UP TO THE CONTRACT VALUE FOR THE PURCHASED EQUIPMENT. IN NO EVENT SHALL THE COMPANY BE LIABLE FOR ANY SPECIAL, INDIRECT, CONSEQUENTIAL, INCIDENTAL, PUNITIVE OR EXEMPLARY DAMAGES IN ANY KIND OR CHARACTER, INCLUDING INDIRECT COSTS, LOSS OF PRODUCTION, LOSS OF REVENUES OR PROFITS, AND OTHER DISBURSEMENTS WHICH MAY OCCUR.

Some states (or jurisdictions) do not allow the exclusion or limitation of incidental or consequential damages and so it is possible that these limitations or exclusions may not apply.

1.5.5 General statements

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS THAT VARY BY JURISDICTION.

THE DEALER IS NOT AUTHORIZED TO MAKE ANY ADDITIONAL REPRESENTATIONS OR PROMISES THAT DIFFER IN ANY WAY FROM THE TERM OF THIS LIMITED WARRANTY, OR MODIFY THE PROVISIONS, DURATION AND CONDITIONS OF THIS LIMITED WARRANTY. NO WAIVER OR MODIFICATION OF THIS LIMITED WARRANTY IS VALID UNLESS AGREED TO IN WRITING AND SIGNED BY THE AUTHORIZED REPRESENTATIVES OF THE COMPANY.

IN THE EVENT OF ANY CONFLICT BETWEEN THE ENGLISH LANGUAGE VERSION AND ANY OTHER TRANSLATED VERSION OF THIS LIMITED WARRANTY (WITH THE EXCEPTION OF THE FRENCH LANGUAGE VERSION) THE ENGLISH VERSION SHALL PREVAIL.

2 Safety

2.1 Owner's obligation of care

This product is designed for agricultural purposes only. Make sure to follow the local rules and regulations in relation with the use of this product.

This product is designed and constructed while taking into account a risk assessment, a selection of harmonized standards and other technical specifications to be complied with in order to guarantee a maximum level of safety.

If component(s)/equipment not manufactured by GEA is/are added to this GEA product, consider that new risk(s) may arise from this addition. Make sure the equipment and the environment surrounding the equipment remain safe.

Since agitated manure produces heavy toxic gases, make sure to follow the safety procedures for confined spaces before operating or servicing this equipment in such environment. Look at the corresponding Web site below to make sure the local safety procedures for confined spaces are followed.

Location	Administrated by	Web site
Canada	Canadian Centre for Occupational Health and Safety	www.ccohs.ca
USA	Occupational Safety and Health Administration	www.osha.gov
European Union	European Agency for Safety and Health at Work	www.osha.europa.eu

Safety is achieved when the safety instructions are followed. It is part of the owner's obligation of care to implement these safety measures and make sure they are carried out at all times.

The owner must ensure a safe environment by providing:

- this instruction manual with this product. Everyone performing activities in connection with this product must read this instruction manual and follow those instructions;
- all required personal safety gear such as hearing, eye, feet protection, etc;
- adequate training for employee(s) working or performing activities in connection with this product;
- the tools listed in this manual to perform activities in connection with this product;
- locally purchased components and/or products that comply with the technical requirements mentioned in section Technical data, if applicable;
- new parts to replace any defective, worn or damaged parts on this product;
- adequate lighting in all areas where activities in connection with this product are performed.

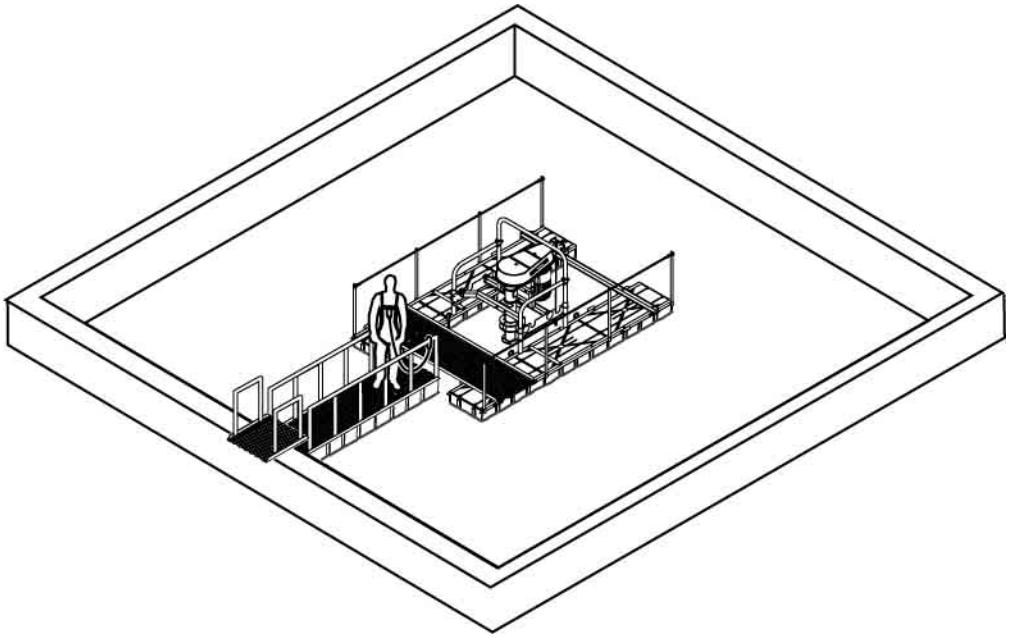
- the installation is equipped with a floating walkway or a winch cable mechanism providing safe access to the equipment.

  When using a floating walkway, wearing a safety harness with a life cord attached to the walkway ramp is Mandatory for all trained personnel to access the pontoon.

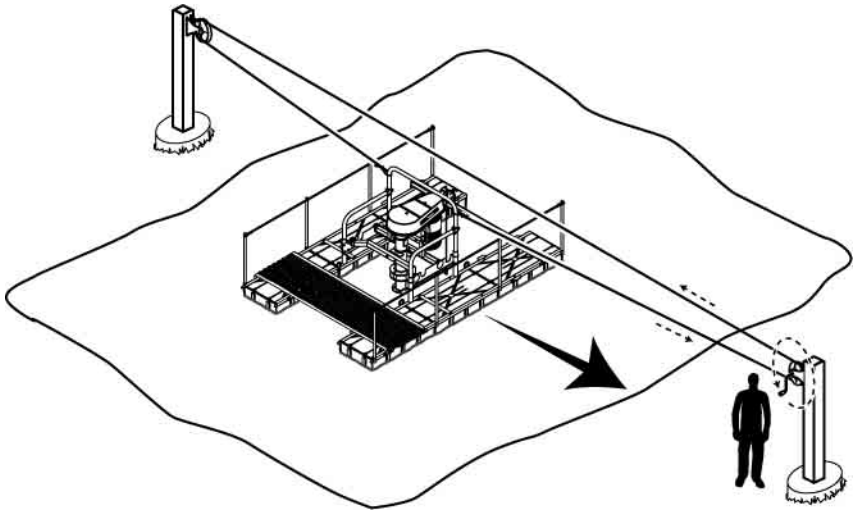
  When using a winch cable mechanism, the pontoon must be on shore before the trained personnel can access.

  Refer to the examples below and to your local requirements concerning safety.

Example of a Floating Walkway



Example of a Winch Cable Mechanism



- safety fences are installed around the reservoir and/or equipment to protect people and livestock against hazardous fall. Refer to your local rules and regulations on safety requirements.

2.2 Explanation of safety symbols

The safety symbols draw attention to the importance of the adjacent text.

The design of the notifications is based on ISO 3864-2 and ANSI535.6.

Safety symbols and key words

Danger!
The signal word ”Danger” indicates an immediate threat to the lives or health of personnel.
Death or serious injury may result if the danger is not avoided.

Warning!
The indication ”Warning” signals danger to life or health of personnel.
Death or serious injury may result if the danger is not avoided.

Caution!
The indication ”Caution” signals a hazardous situation.
Minor or moderate injury may result if the danger is not avoided.

Attention!
The word ”Attention” indicates important information on risks for the product or the environment.

2.3 Basic safety instructions

- Only trained personnel can operate this product to ensure safe operating methods. Make sure the personnel performing activities in connection with this product have the skills when special qualifications are required. Read the section Safety - Personnel qualifications.
- Wear appropriate personal safety gear such as hearing, eye, feet protection, etc. when performing activities in connection with this product. Inspect the personal gear and replace if worn and/or defective.
- Familiarize yourself with the environment surrounding the working area. Locate the elements that can be dangerous in order to avoid them.
- No one stands near this product unless they are performing instructions included in this manual. When near this product, keep body parts such as hands, feet, hair as well as clothing away from dangerous parts such as rotating parts, articulated parts, sharp edges, etc.
- Use this product only when in perfect working condition. Do not use damaged, worn or defective parts on this product, replace immediately to avoid serious damages and injuries.
- The use of any tool or lubricant is subject to certain risks. Follow the manufacturer's recommendations and wear appropriate personal safety gear.
- Never remove the safety devices such as guards, covers, chains, labels, etc. from this product to ensure safety unless otherwise indicated in this instruction manual. Refer to section Safety - Protective devices. Read and follow the instructions of the safety labels affixed on this product and make sure the safety labels are legible at all times.

2.4 Personnel qualifications

The manufacturer intends to determine the difference between trained personnel and qualified personnel.

Trained personnel

The operator was trained by the manufacturer or its legal representative to follow all safety rules, cleaning method, general maintenance as well as the operating methods.

It is the operator's responsibility to inform the farm workers of those rules, maintenance and methods.

Qualified personnel

Qualified personnel refers to those having obtained the academic knowledge of a specific field of work.

This personnel has followed a training and subsequently obtained a certification, diploma or any other official document provided by a recognized academic facility in the country of study.

An equivalence may be required when operating in other countries.

The special qualifications required will be specified in each section.

Everyone who performs work or activities in connection with the product must carefully read and understand the manual and then act accordingly.

2.5 Protective devices

This product is equipped with safety parts protecting the user against dangerous elements.

Those parts must be in perfect working condition and remain in place at all times.

Replace if damaged, worn and/or defective. Refer to the part number.

Safety guard for drive belt
(part no. 2008-7727-440)

Protective lower guard for drive belt
(part no. 2008-1407-730)

Inner guard for drive belt
(part no. 2008-1401-030)

2.6 Safety labels

The labels affixed on this product inform the user of the potential dangers, the prohibited manoeuvres, the proper procedures and applications when performing activities in connection with this product.

The labels must remain in place and legible at all times.

Replace when damaged. Refer to the part number for the appropriate label.

Danger! - Toxic gases (American model)
Manure produces toxic gases that can cause loss of consciousness, asphyxia or death in a few seconds.
Part no 2099-4720-010

Danger! - Toxic gases (European model)
Manure produces toxic gases that can cause loss of consciousness, asphyxia or death in a few seconds.
Part no 2099-4725-210

Danger! - High voltage. (American model)
Always turn off main power before service and maintenance.
Read the operator's manual for safety information and for operating, servicing and maintenance instructions.
Part no 2099-4721-000

Danger! - High voltage. (European model)
Part no 2099-4725-240

Danger! - Finger entanglement hazard.
Part no 2099-4725-110

Read the operator's manual for safety information. (European model)
Part no 2099-4725-100

	Read the operator's manual for safety information before service and maintenance. (European model) Part no 2099-4725-130
	Always turn off and lock main power before service and maintenance. (European model) Part no 2099-4725-150
	Refer to section 11.1 - Appendix - Label position.

3 Description

3.1 Intended Use

This product is exclusively designed to:

- Transfer flush liquid or water having a maximum consistency of 1/8” (3mm). Refer to section 11.3 - Appendix - Consistency test.
- Transfer liquid to flush valves or to a flush flume system.
- Operate in a well-ventilated environment free of explosive gases.
- Operate in a frost free environment.

☞ **Note!**
This product and its equipment are designed for agricultural purposes only. Any applications not listed above are considered as improper use.

Please note that the following is prohibited:

- processing others substances than manure and water into the pump.
- installing an electrical motor on the equipment which does not match the motor technical specifications provided in this manual. The equipment is not designed to use any other type of motor than those listed. Improper motor performance may result in damage to the equipment and/or motor.

The manufacturer/supplier is not liable for any resulting damage. The user alone bears the risk.

Correct use also includes reading the instructions and observing the inspection and maintenance conditions.

- The manufacturer expressly points out that only original parts, original accessories and original chemical substances have been adapted, tested and authorized for use with the product.
- The installation or use of products from other manufacturers may affect the specified properties of the original parts and lead to injury to people and animals.
- The manufacturer does not accept any liability for injury to people or animals, or damage to the product, caused by the use of products from other manufacturers.

3.2 Product Changes

Unauthorized product modifications can have a negative impact on the safety, service life and functionality of the product.

Any modifications not described in the product documentation are deemed to be prohibited.

For safety reasons, do not carry out any unauthorized changes!

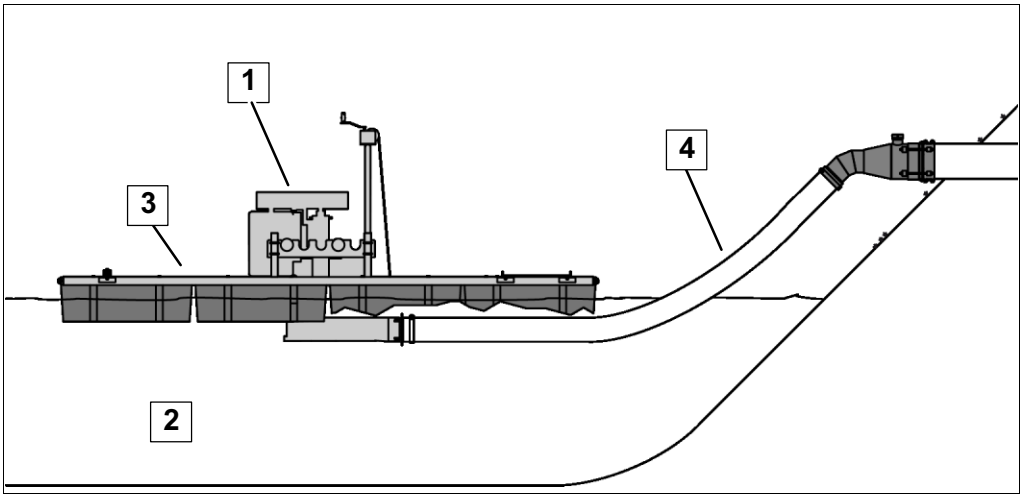
Planned changes must be approved by the manufacturer in writing.

Any unauthorized modifications to the product will invalidate the warranty and may invalidate the manufacturer's declaration or installation declaration provided.

3.3 Functional Description

The 8” flush pump on pontoon feeds either a main line fo a power flume, or feeds valves to flush alleys or flushes a holding area.

The pump either starts automatically or manually via a control panel.



Legend:			
1	Pump	3	Pontoon
2	Lagoon	4	Evacuation line

4 Technical data

4.1 Pump geometric data

length	12' [3.66m]	16' [4.88m]
Width	8' [2.44m]	
Height	62” [157cm]	
Maximum total weight	1340 lb [608kg]	1473 lb [668kg]

4.2 Performance data (S.A.E.)

Maximum manure consistency	1/8”
Maximum pressure	40 psi
Operating temperature	5°C [41°F]

Note!
It is important to consider the manure consistency, the type of bedding and the quantity of bedding contained in the manure because these elements affect the performance of the pump.

8” Flush pump used for maximum flow rate																
Motor size	**50 HP**		**40 HP**		**30 HP**		**25 HP**		**20 HP**		**15 HP**		**10 HP**		**7.5 HP**	
Motor RPM	1760 RPM (60Hz)															
Pump RPM	892		821		709		665		620		553		486		419	
Belts	(4x)5VX730		(4x)BX73		(4x)BX70		(4x)BX70		(3x)BX67		(3x)BX66		(3x)BX65		(3x)BX64	
Motor pulley*	4-5V7.10		4B7.0		4B6.0		4B56		3B52		3B46		3B40		3B34	
Pump pulley*	4-5V14.00		4B15.4		4B15.4		4B15.4		3B154		3B154		3B154		3B154	
Pumping head (feet)	**US GPM**	**HP**	**US GPM**	**HP**	**US GPM**	**HP**	**US GPM**	**HP**	**US GPM**	**HP**	**US GPM**	**HP**	**US GPM**	**HP**	**US GPM**	**HP**
50'	1830	32.1														
45'	2057	35.2														
40'	2276	38.3	1812	27.6												
35'	2486	41.4	2040	30.5												
30'	2690	44.4	2259	33.2	1571	20.3										
25'	2887	47.4	2470	36	1811	22.8	1542	18.4								
20'	3080	50.3	2674	38.7	2039	25.2	1784	20.7	1527	16.6						
17'			2794	40.3	2172	26.7	1923	22.1	1674	18	1297	12.5				
15'			2873	41.4	2258	27.6	2014	23	1770	18.8	1402	13.3	1027	8.8		
13'					2344	28.6	2103	23.9	1863	19.6	1504	14.1	1142	9.6		
11'					2428	29.5	2191	24.8	1955	20.5	1603	14.9	1252	10.3	895	6.5
10'											1652	15.3	1305	10.6	956	6.8
9'															1015	7.2
8'															1073	7.5

* The pulley ratio and pump performances indicated in the following tables are standard combinations. To optimize the pump performance, the pulley ratio will be adapted to the evacuation line configuration when required.

8” Flush pump used for maximum pumping head												
Motor size	**50 HP**		**40 HP**		**30 HP**		**25 HP**		**20 HP**		**15 HP**	
Motor RPM	1760 RPM (60Hz)											
Pump RPM	1168		1053		902		821		709		597	
Belts	(4x)5VX690		(4x)BX73		(4x)BX68		(4x)BX71		(3x)BX68		(3x)BX67	
Motor pulley*	4-5V7.50		4B8.0		4B6.8		4B7.0		3B6.0		3B5.0	
Pump pulley*	4-5V11.3		4B13.6		4B13.6		4B15.4		3B154		3B154	
Pumping head (feet)	**US GPM**	**HP**	**US GPM**	**HP**	**US GPM**	**HP**	**US GPM**	**HP**	**US GPM**	**HP**	**US GPM**	**HP**
102	1527	40.7										
99	1675	43.2										
96	1807	45.7										
93	1955	48.1										
90	2090	50.5										
87			1264	30.5								
84			1422	32.8								
81			1573	35								
78			1719	37.2								
75			1860	39.4								
72			1997	41.6								
69					909	20.2						
66					1086	22.2						
63					1252	24.2						
60					1411	26.1						
57					1562	28						
54					1708	30	1097	19.5				
51							1263	21.3				
48							1420	23				
45							1572	24.8				
42									919	14.1		
39									1096	15.7		
36									1262	17.3		
33									1419	18.8		
30									1571	20.3		
27											1013	11.7
24											1184	13
21											1345	14.3
18											1499	15.6

***** The pulley ratio and pump performances indicated in the following tables are standard combinations. To optimize the pump performance, the pulley ratio will be adapted to the evacuation line configuration when required.

4.3 Performance data (Metric)

Maximum manure consistency	3mm
Maximum pressure	2.76 bar
Operating temperature	5°C [41°F]

Note!
It is important to consider the manure consistency, the type of bedding and the quantity of bedding contained in the manure because these elements affect the performance of the pump.

8" Flush pump used for maximum flow rate																
Motor size	**37 kW**		**30kW**		**22kW**		**18.5kW**		**15kW**		**11kW**		**7.5kW**		**5.5kW**	
Motor RPM	1465 RPM (50Hz)															
Pump RPM	879		784		701		659		617		537		476		430	
Belts	(4x) 5Vx730		(3x) 5vx730		(3x) 5vx710		(3x) 5vx710		(2x) 5vx680		(2x) 2x5vx690		(2x) 5vx690		(2x) 5vx670	
Motor pulley*	4-5v7.50		3-5v7.50		3-5v6.70		3-5v6.30		2-5v5.90		2-5v5.50		2-5v5.20		2-5v4.40	
Pump pulley*	4-5v12.5		3-5v14.00		3-5v14.00		3-5v14.00		2-5v14.00		2-5v15.0		2-5v16.00		2-5v15.00	
Pumping head (feet)	**LPM**	**kW**	**LPM**	**kW**	**LPM**	**kW**	**LPM**	**kW**	**LPM**	**kW**	**LPM**	**kW**	**LPM**	**kW**	**LPM**	**kW**
13.5	7567	25														
12	8389	27.2														
10.5	9180	29.4														
9	9946	31.6	7792	22.2	5834	15.2										
8	10444	33	8337	23.5	6441	16.5	5472	13.4								
7	10932	34.4	8869	24.8	7026	17.7	6093	14.6	5146	11.8						
6	11413	35.9	9389	26.1	7592	18.9	6690	15.7	5781	12.9	3995	8.1				
5.5	11650	36.6	9645	26.8	7870	19.5	6981	16.3	6088	13.4	4348	8.7				
5	11885	37.3	9898	27.4	8143	20.1	7267	16.9	6389	14	4689	9.1	3354	6.1		
4.5			10148	28	8413	20.7	7549	17.4	6685	14.5	5021	9.6	3729	6.6		
4			10396	28.7	8680	21.3	7827	18	6936	15	5345	10.1	4090	7.1	3112	5.1
3.5			10642	29.4	8943	21.9	8101	18.6	7262	15.6	5662	10.6	4440	7.5	3498	5.5
3											5971	11.1	4779	7.9	3868	6

* The pulley ratio and pump performances indicated in the following tables are standard combinations. To optimize the pump performance, the pulley ratio will be adapted to the evacuation line configuration when required.

8” Flush pump used for maximum pumping head												
Motor size	**37 kW**		**30 kW**		**22 kW**		**18.5 kW**		**15 kW**		**11 kW**	
Motor RPM	1465 RPM (50Hz)											
Pump RPM	1155		1037		900		816		701		576	
Belts	(4x)5Vx670		(3x)5vx710		(3x)5vx650		(3x)5vx650		(2x)5vx690		(2x)5vx710	
Motor pulley*	4-5V7.1		3-5v8.0		3-5v6.70		3-5v6.30		2-5v6.7		2-5v5.90	
Pump pulley*	4-5V9.0		3-5v11.3		3-5v10.9		3-5v11.3		2-5v14.0		2-5v15.0	
Pumping head (feet)	**LPM**	**kW**	**LPM**	**kW**	**LPM**	**kW**	**LPM**	**kW**	**LPM**	**kW**	**LPM**	**kW**
33												
32												
31	5413	28.5										
30	6036	30.5										
29	6635	32.5										
28	7214	34.5										
27	7775	36.4										
26			4577	22.1								
25			5239	23.9								
24			5870	25.8								
23			6475	27.5								
22			7059	29.3								
21					3414	15.4						
20					4147	17.1						
19					4832	18.7						
18					5481	20.3						
17					6101	22	3622	13.8				
16							4340	15.3				
15							5014	16.8				
14							5655	18.3				
13									3076	10.1		
12									3834	11.4		
11									4538	12.7		
10									5202	14		
9									5834	15.2		
8											3463	8.2
7											4192	9.2
6											4874	10.3
5											5522	11.4

***** The pulley ratio and pump performances indicated in the following tables are standard combinations. To optimize the pump performance, the pulley ratio will be adapted to the evacuation line configuration when required.

4.4 Motor specifications

GEA provides specifications and wiring diagrams related to Baldor motor(s). For any other motor brand, contact the manufacturer.

Motor type	Farm duty motor	
Standard specifications	NEMA	IEC
Frame sizes required**	213T, 215T, 254T, 256T, 284T, 286T, 324T, 326T	132, 160, 180, 200, 225S
Type of construction	B3	
Weight	No special requirements	
Frame material	No special requirements	
Degree of protection	IP 55	
Method of cooling	TEFC, IC 411 (Totally Enclosed, Fan Cooled)	
Vibration class	No special requirements	
Insulation	155(F) to 130(B)	
Duty type	S1(continuous operation)	
Direction or rotation	Bi-directional	
Rated motor voltage	As per local requirements	
Frequency	50Hz or 60Hz as per local requirements	
Rated motor power	7.5 HP to 50 HP [5.5 KW to 37 KW]	
Rated motor speed	50Hz@1450rpm 60Hz@1760rpm	
Rated motor torque	No special requirements	
Rated motor current		
Power factor		
Efficiency	min. 80%	

** Motor frame sizes that can be fit on the motor support.

4.5 Control panel specifications

The control panel must:

- comply with the following requirements:
  2006/95/CE directives (Electrical equipment designed for use within certain voltage limits)
  92/31/CEE directives (Electromagnetic compatibility)
- comply with the following harmonized standards:
  EN 60204-1 (Safety of machinery - Electrical equipment of machines);
  EN 61082-1 (Documents used in electrotechnology);
  EN 60617 (Graphical symbols).
- be equipped with an emergency stop.
- be protected by a lockable disconnect switch (cut-off switch).
- meet all motor specifications provided in this manual.
- meet local electrical requirements.

Special specifications:

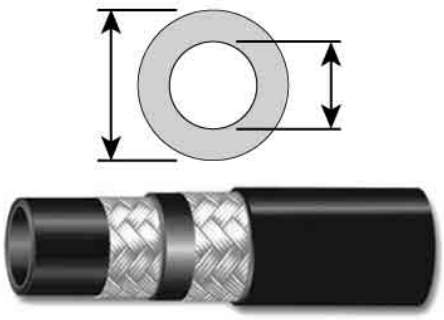
- The control panel protection devices must be designed to avoid any unexpected start.

4.6 Acoustic emission

Noise level	85 dBA

4.7 Hydraulic hoses

Outside diameter (A)	0.56 [14.22mm]
Inside diameter (B)	¼" [6.35mm]
Maximum working pressure	6000 psi [414 bar]
Minimum burst pressure	24 000 psi [1655 bar]
Feature	High pressure
Construction	Nitrile - Type C
Number of braids	2 braids high-tensile steel wire



4.8 Bolt torque chart

Bolt	Mat.	Bolt diameter									
		1/4”	5/16”	3/8”	7/16”	1/2”	9/16”	5/8”	3/4”	7/8”	1”
SAE 2 	LCS	8Nm (6ft-lb)	16Nm (12ft-lb)	27Nm (20ft-lb)	44Nm (32ft-lb)	64Nm (47ft-lb)	94Nm (69ft-lb)	130Nm (96ft-lb)	210Nm (155ft-lb)	279Nm (206ft-lb)	420Nm (310ft-lb)
SAE 5 	MCS HT	14Nm (10ft-lb)	26Nm (19ft-lb)	45Nm (33ft-lb)	73Nm (54ft-lb)	106Nm (78ft-lb)	155Nm (114ft-lb)	209Nm (154ft-lb)	349Nm (257ft-lb)	518Nm (382ft-lb)	796Nm (587ft-lb)
SAE 8 	MCAS	19Nm (14ft-lb)	39Nm (29ft-lb)	64Nm (47ft-lb)	106Nm (78ft-lb)	161Nm (119ft-lb)	229Nm (169ft-lb)	312Nm (230ft-lb)	515Nm (380ft-lb)	814Nm (600ft-lb)	949Nm (700ft-lb)
Socket Head Cap Screw	AS HT	22Nm (16ft-lb)	45Nm (33ft-lb)	73Nm (54ft-lb)	114Nm (84ft-lb)	170Nm (125ft-lb)	244Nm (180ft-lb)	339Nm (250ft-lb)	542Nm (400ft-lb)	868Nm (640ft-lb)	1315Nm (970ft-lb)

4.9 Lubricant specifications

Lubricant type	Product name	Grade	Purpose
Grease	PRECISION™ GENERAL PURPOSE EP2	NLGI 2 NLGI 3	• To lubricate the equipment. • To grease the bearing housing chambers • Grease the sealed bearing
Gearbox oil	TRAXON™	80W-90	• To fill the bearing housing.

5 Handling and assembly

5.1 Special personnel qualification required for handling

Handling must be performed by a qualified forklift operator and/or qualified overhead crane or hoist operator.

Installation work must be performed by trained personnel in accordance with the safety instructions.

Electric work and electric maintenance must be performed by a certified electrician.

Read the section Safety - Personnel qualifications.

5.2 Safety instructions for handling and assembly

Warning!
Do not stand under or near a lifted load, a falling load can cause death!

Read the section Safety.

5.3 Preparation

5.3.1 Visual inspection

Note!
Inspect all equipment and component. Do not install if damaged.

5.3.2 Special tools

Attention!
To lift the equipment, use a lifting device with a minimum capacity of: 5000 lbs (2250 kg).

	Description	Purpose
	Boom Truck	To lift the flush pump on pontoon.
	Lifting Beam	To lift the flush pump on pontoon.
	Forklift truck	To lift the equipment
	Lifting chains	To lift the equipment
	Chain hoist	To lift the equipment

5.3.3 Installation tools

	Description	Purpose
	Hammer drill	To make holes in the concrete floor
	Concrete drill bit	To make holes in the concrete floor
	Hammer	To insert anchor bolts
	Wrench set	To tighten bolts and anchor bolts
	Ratchet tool set	To tighten bolts and anchor bolts
	Allen wrenches Pulleys installation	To tighten set screws on pulleys
	Torque wrench	To tighten bolts and anchor bolts at the specified torque

5.3.4 Items provided by the owner:

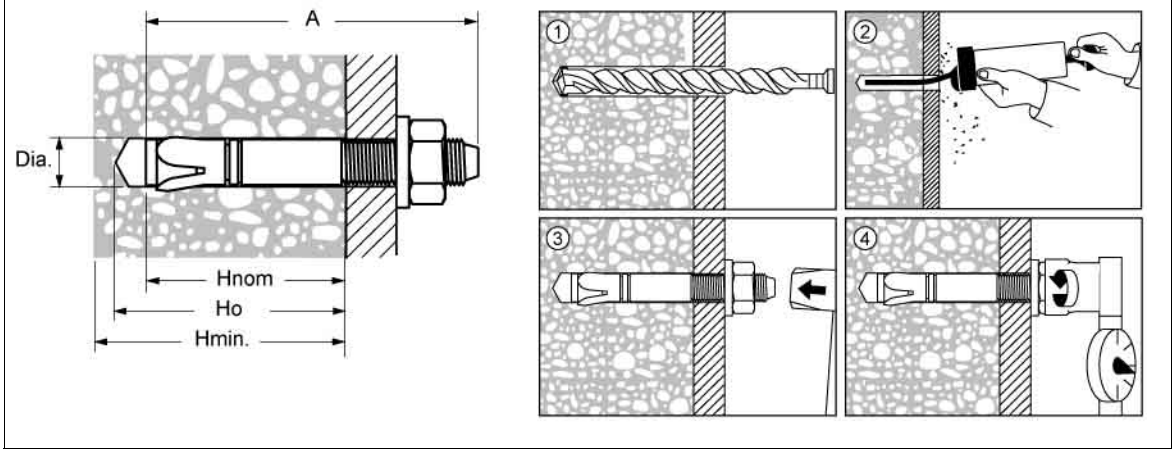
- Safety fences installed around the equipment/reservoir to prevent fall.
- An electric motor meeting the technical specifications provided in this manual. Refer to section 4.4 - Technical Data - Motor specifications.
- A GEA control panel. section 4.5 - Technical Data - Control panel specifications.

5.4 Packing material disposal

Handle the packing material properly and dispose according to your local rules and regulations on waste disposal. Please contact to your local resources for any questions. Recycle if possible.

5.5 Anchor bolt installation procedure

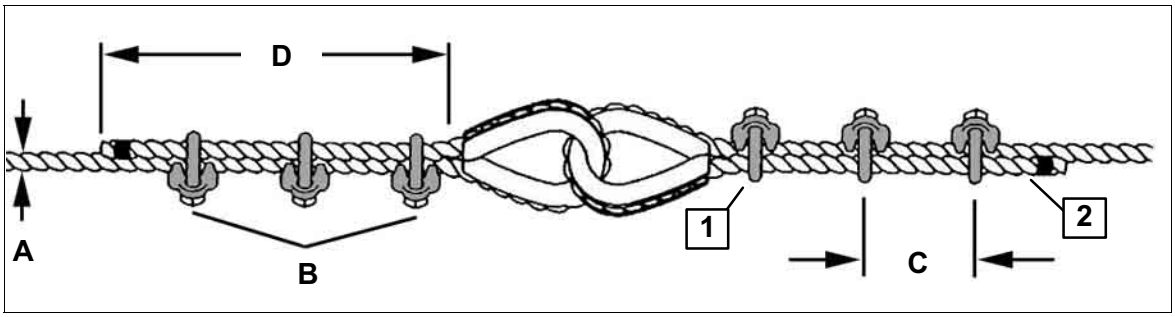
Attention!
Wait at least 7 days before drilling into concrete so that the slab has harden sufficiently.



Bolt diameter	3/8” [10mm]	1/2” [13mm]			3/4” [19mm]
Bolt length **(A)**	3” [76mm]	2 3/4” [70mm]	3 3/4” [95mm]	3 3/4” [95mm]	5 1/2” [140mm]
Material	Steel	Steel	Steel	SS 304	Steel
Minimum hole depth **(Ho)**	2 5/8” [67mm]	2” [51mm]	2 5/8” [67mm]	2 1/2” [63.5mm]	4 1/2” [114mm]
Hnom	2 3/8” [60mm]	1 3/4” [45mm]	2 1/4” [57mm]	2 1/4” [57mm]	4 1/4” [108mm]
Hmin	4” [101mm]	4” [101mm]	4” [101mm]	4” [101mm]	6” [152mm]
Concrete drill bit diameter **(Dia.)**	3/8” [10mm]	1/2” [13mm]	1/2” [13mm]	1/2” [13mm]	3/4” [19mm]
Torque	20ft-lb (25Nm)	40ft-lb (54Nm)	40ft-lb (54Nm)	40ft-lb (54Nm)	110ft-lb (150Nm)

- Position the component on the concrete surface.
- Drill through the holes of the component to 3 ¾” depth (1).
- Remove the particles inside the holes (2).
- Insert the anchor bolts. Keep 1 ½” of length exceeding from the concrete surface.
- Tap the anchor bolt using a hammer until it firmly secures the component.
- Tighten the assembly to appropriate torque. Refer to the table.
- Cut the exceeding threads of the bolts when indicated.

5.6 Cable clamp assembly



Cable Diameter (A)	Clamp size	Quantity of clamp required (B)	Spacing Between Clamps (C)	Dead End Length (D)	Torque
3/16”	3/16”	2	1.125” [29mm]	3.75” [95mm]	7.5 ft-lb [10Nm]
1/4”	1/4”	2	1.5” [38mm]	4.75” [121mm]	15 ft-lb [20.3Nm]
3/8”	3/8”	2	2.25” [57mm]	6.5” [165mm]	45 ft-lb [61Nm]
1/2”	1/2”	3	3” [76mm]	11.5” [292mm]	65 ft-lb [88Nm]

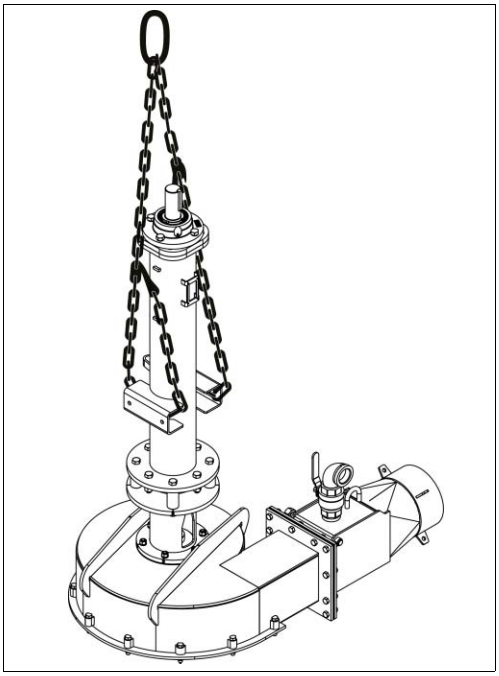
☞ **Note!**
U-bolt (1) of clamps must always be positioned over the dead end segment (2).

5.7 Step 1: Unloading the pump

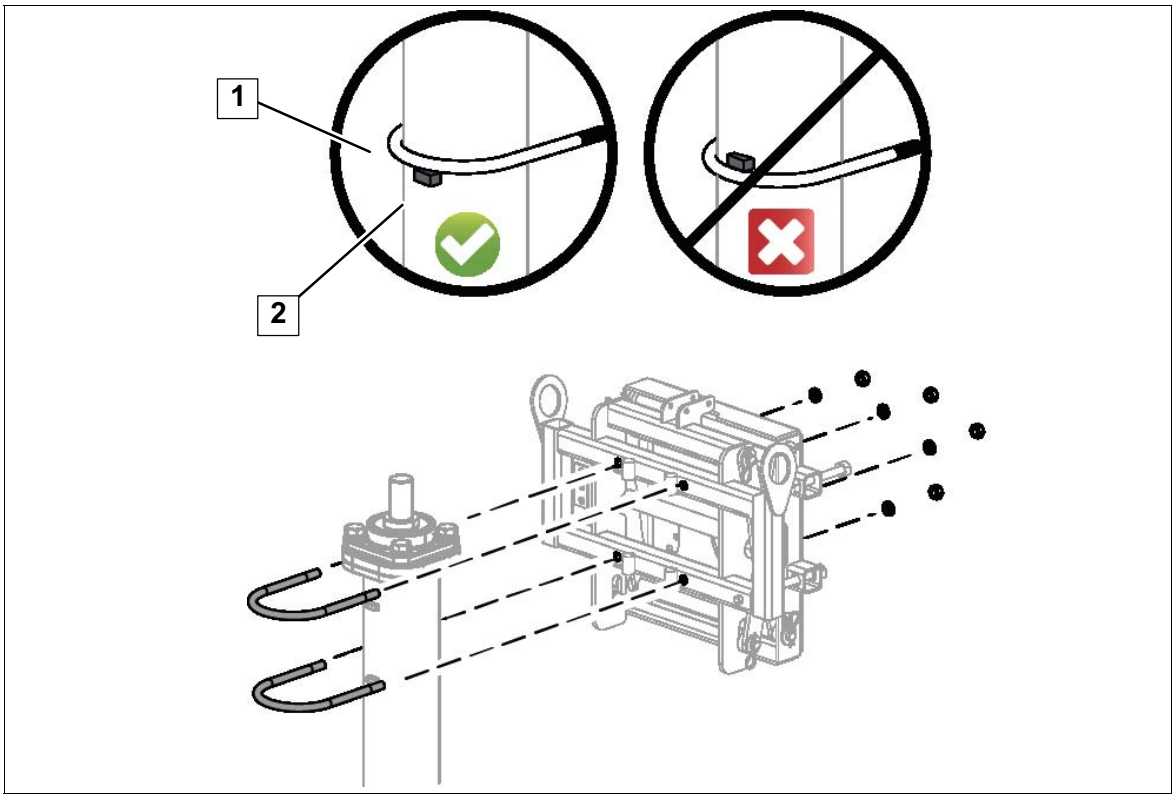
Warning!
Do not stand under or near a lifted load, a falling load can cause death!

Attention!
To lift this product use a lifting device with a minimum lifting capacity of 5000 lbs [2500 kg].

- To unload the pump from the shipping, attach chains to the pump frame, as illustrated;
- Place the pump on its housing over a flat and level surface;
- Secure the pump to prevent it from tipping over.

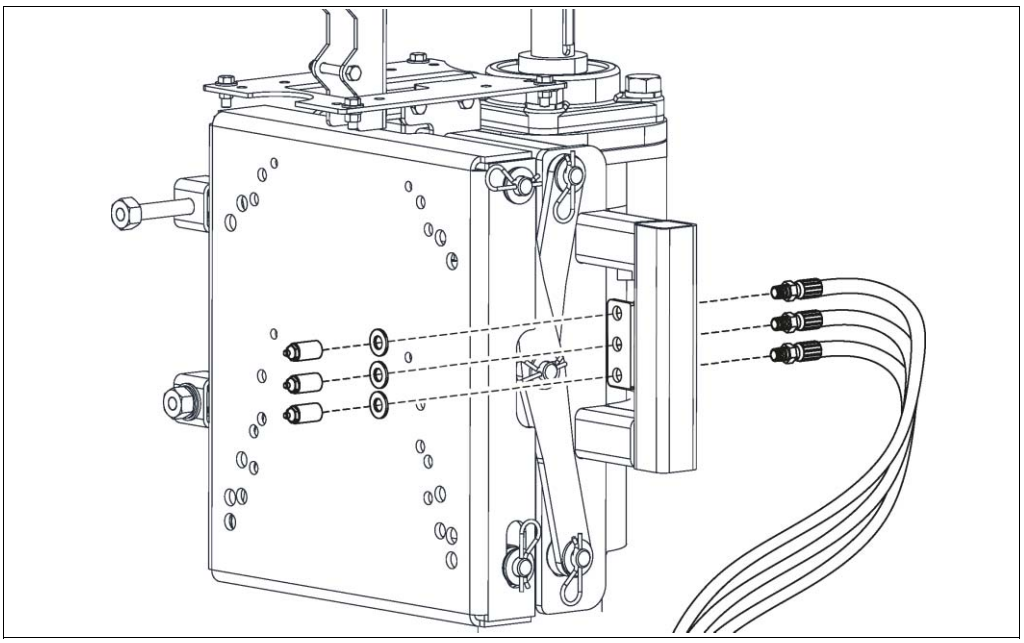


5.8 Step 2: Motor support assembly



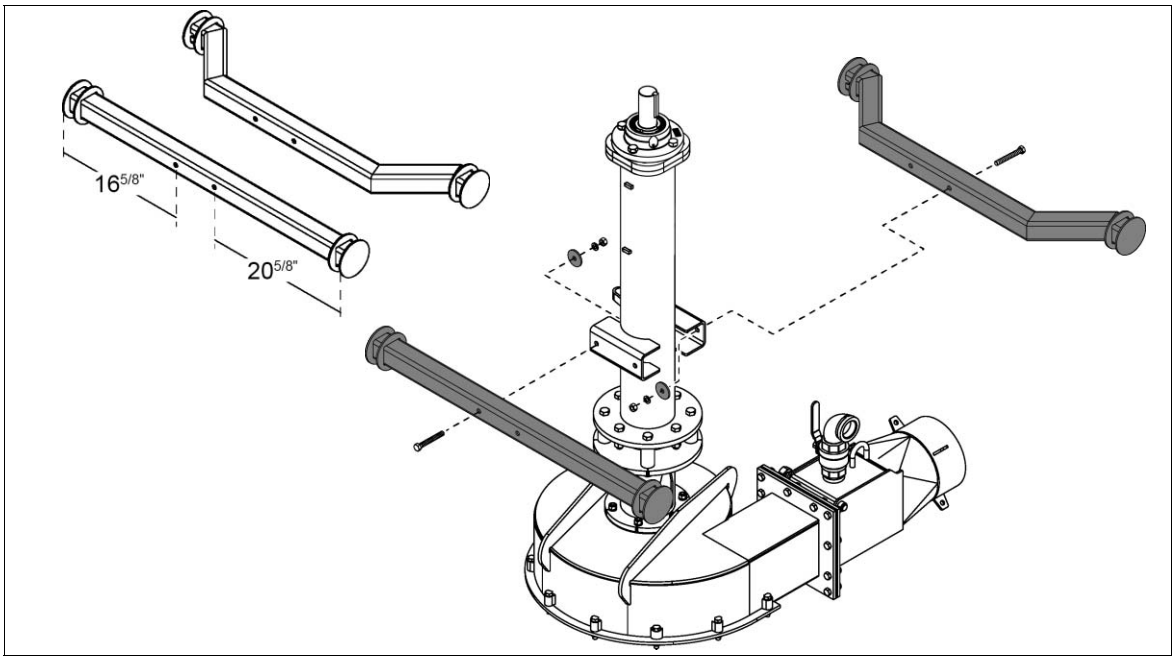
- Assemble the motor support on the pump;
- Make sure the U-bolts (1) are placed over the stop bars (2);
- Torque to 90 ft-lb [130Nm].

5.9 Step 3: Remote grease line assembly



- Assemble the remote grease lines, as illustrated;
- Snug fit, do not torque.

5.10 Step 4: Pump pivots assembly



- Install the pump pivots using washers, lock washers and the nuts provided while making sure the longest portion of the pivots are placed toward the pump discharge;
- Tighten all bolts using a torque wrench.

 Refer to section 4.8 - Technical Data - Bolt Torque Chart.

5.11 Step 5: Control panel installation

Warning!
Risk of electric shock!
Connect the control panel and all conductive equipments to an equipotential bond.

This symbol indicates that the terminal must be connected to earth ground.

Refer to the manufacturer's installation pre-requisites.

Step 1: Check the control panel electric components

- Before performing any electric connection, tighten the screws of all the electric components inside the control panel.
- Make sure all wires are properly connected and secured.

Step 2: Locate the control panel

- On a solid wall, at a convenient height, sheltered from solar rays and weather conditions;
- In a convenient area for the operator;
- Near the pump;
- Near the external cut-off switch;
- In an area having free space around the control panel for aeration purposes.

Step 3: Wall mount the control panel

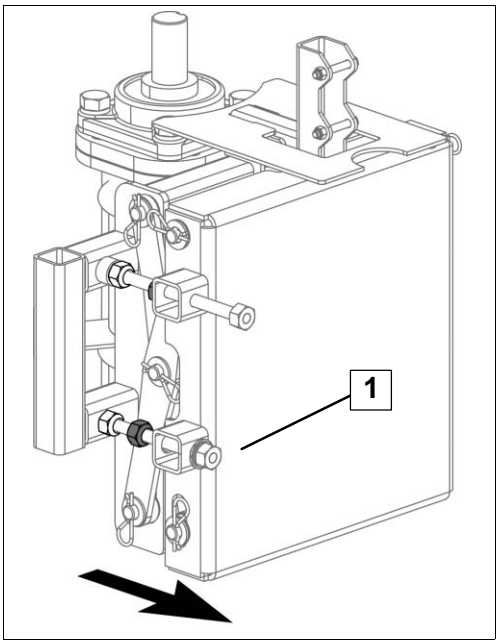
- Place the control panel on the wall and use the holes to sketch the drill pattern;
- Drill through the bolt pattern;
- Secure the control panel in place. DO NOT OVERTIGHTEN.

5.12 Step 6: Electric motor installation

Attention!
GEA provides specifications and wiring diagrams related to Baldor motor(s). For any other motor brand, contact the manufacturer.

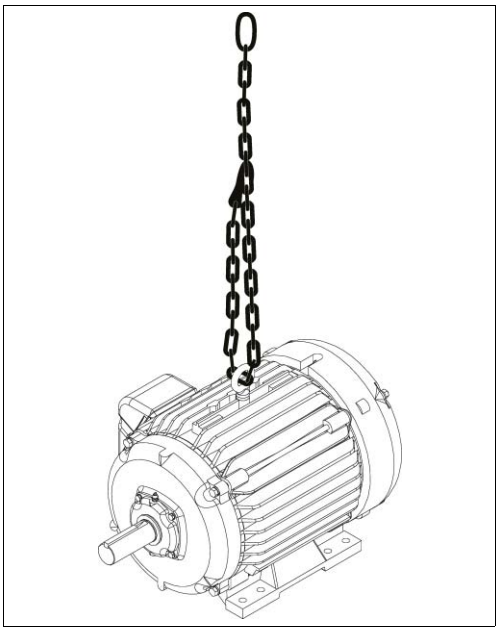
5.12.1 Motor installation

- Loosen bolt (1);
- Pull the support;

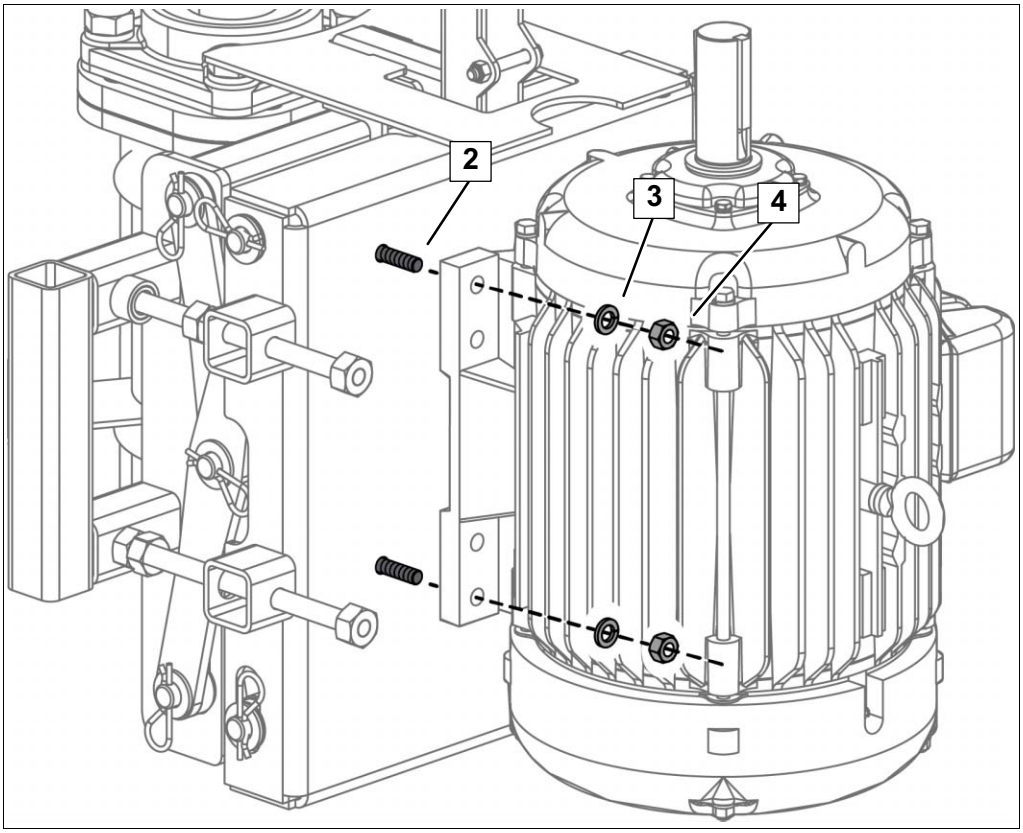


Attention!
To lift this product use a lifting device with a minimum lifting capacity of 1000 lbs [450 kg].

- Lift the motor, as illustrated;
- Place the motor in the proper bolt pattern over the motor support. Refer to the following illustration.



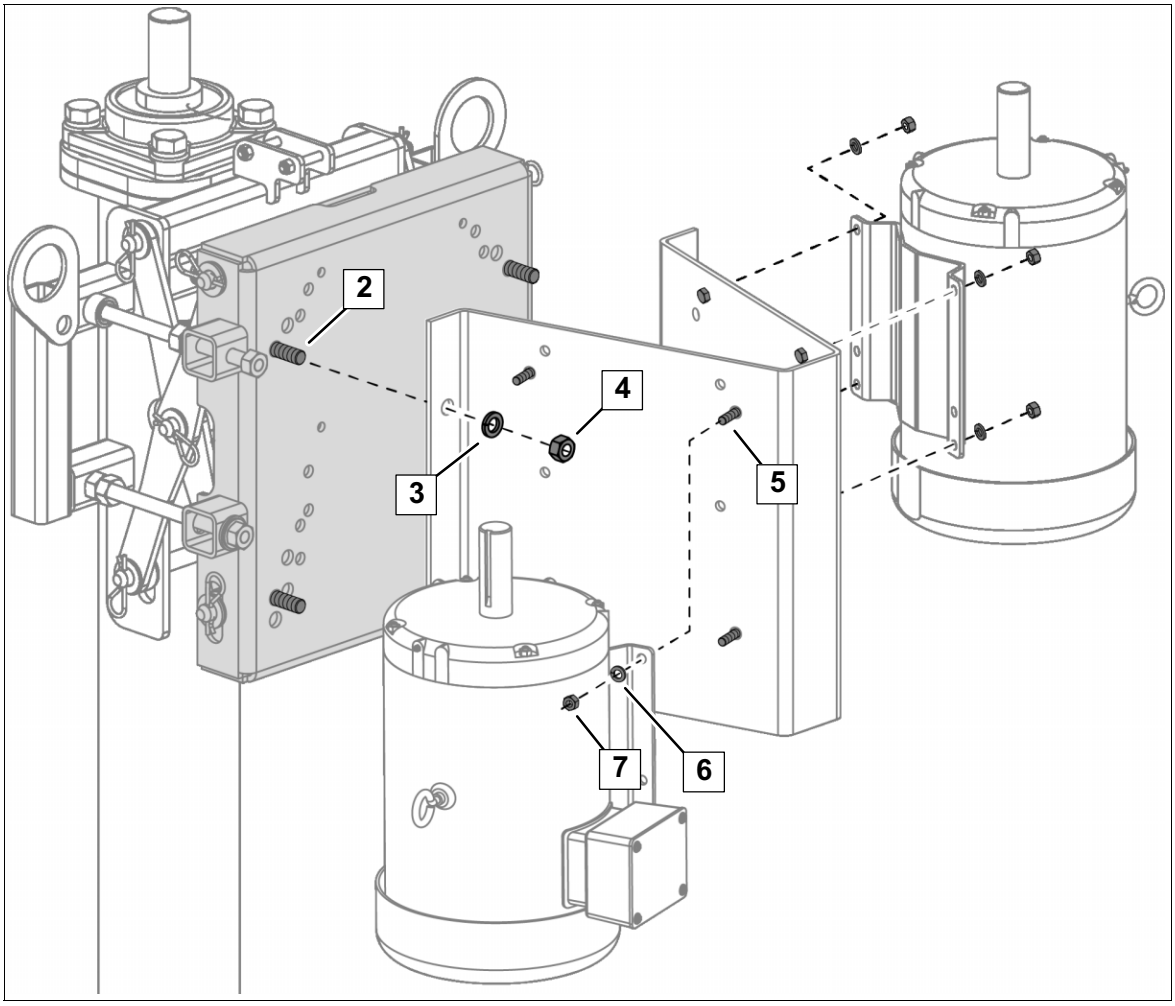
Single motor



- Insert the bolts (2) behind the motor support;
- Secure the motor in place using lock washers (3) and nuts (4);
- Tighten.

Refer to section 4.8 - Technical data - Bolt torque chart.

Double motor



- Insert the bolts (2) behind the motor support;
- Place the adaptor over the motor support;
- Secure using lock washers (3) and nuts (4);
- Tighten;
- Insert the bolts (5) behind the adaptor;
- Place the motors in the proper bolt pattern;
- Secure the motors using lock washers (6) and nuts (7).
- Tighten.

Refer to section 4.8 - Technical data - Bolt torque chart.

5.12.2 Motor direction of rotation

Warning!
Risk of electric shock!
Electric wiring and connection must be performed by an electrician.

Caution!
Risk of electric shock!
To avoid incidental electric cable break, keep additional cable length between the control panel and the pontoon to ensure that the pontoon can move freely in the lagoon or pit.

Attention!
Make sure the motor rotates in the direction indicated on the label apposed on the pump shaft. Inverted rotation can unscrew the impeller and cause a major breakdown.

Attention!
Improper wiring of the motor can cause motor failure.

- Have an electrician connect the electric motor to the control panel. Refer to the wiring diagram supplied in the starter panel control box;

Warning!
Inadvertent start causing injuries!
Never connect an external cut-off switch directly to the motor(s). The external cut-off switch must be connected to the control panel to shutdown or energize the entire cleaning system through the control panel only.

- Engage the motor to check if it rotates in the same direction as the label apposed on the pump shaft;

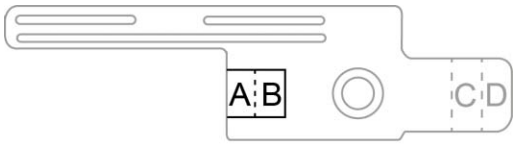
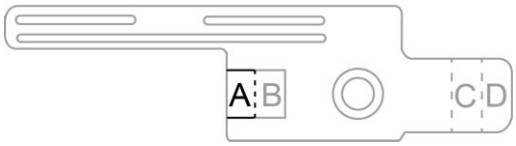
Warning!
Shutdown is required! shut the main power supply and lock with a locking device. Post a sign on the panel stating: ”Do not turn on, maintenance work in progress” in order to prevent an inadvertent energizing of the main electric supply.

- Shut down and lock the main power supply until all steps in this section are completed.

5.12.3 Lower guard assembly

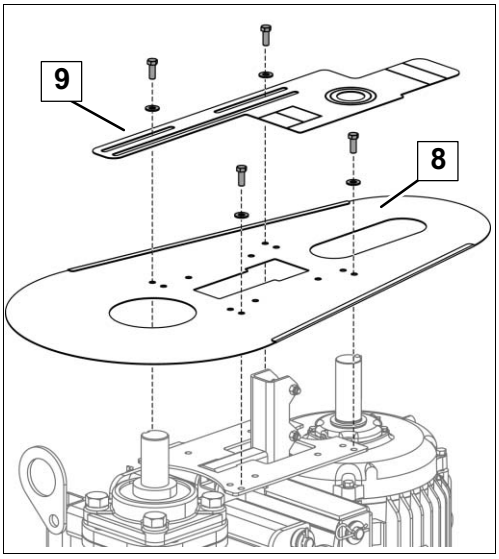
Caution!
Risk of injuries!
Always install the sliding plate over the lower guard to restrain access to the pulleys.

- Remove the segments of the sliding plate according to the HP of the motor. Refer to the following table.

Motor (HP)	Segments to be removed
7½ - 10	
15 - 20	
25 - 30	

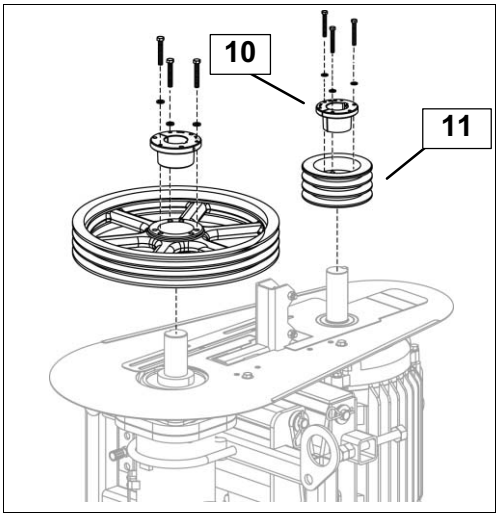
Note!
For segments C and D, remove only the segments exceeding the lower guard.

- Install the lower guard (8) and the sliding plate (9) using 4 bolts and washers;
- Tighten.



5.12.4 Pulleys assembly

- Make sure the external cut-off switch is shut down and locked;
- Assemble the keys, hubs (10) and pulleys (11) on the shafts. Dry mount assembly, never use lubricants or antiseize compounds on the hub and hub mounting area;
- Torque the caps screws of the hubs. Refer to the Instructions supplied in the hub box.
- Secure the hub on each shaft using a set screw. Refer to the following table.



Attention!
Tighten the screws evenly and progressively. Never allow the pulley to be drawn in contact with the flange of the hub.

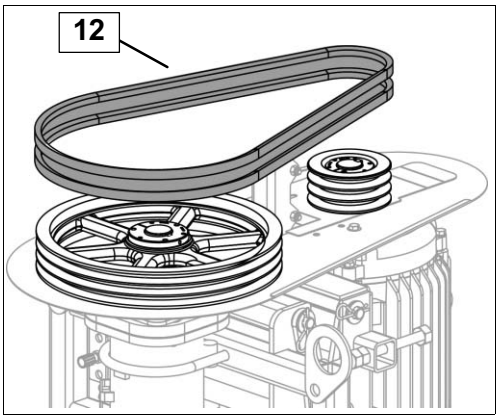
Attention!
The following table contains torque requirements specified by the manufacturer. The information may not reflect the current torque requirements. Refer to manufacturer for more information.

Hub set screw torque	
Set screw size	**Torque (Lbf-inches) [Nm]**
#10 - 24	32 [3.62]
¼" - 20	60 [6.8]
5/16 - 18	110 [12.4]
⅜ - 16	200 [22.6]
½ - 13	400 [45.2]
⅝ - 11	860 [97.2]

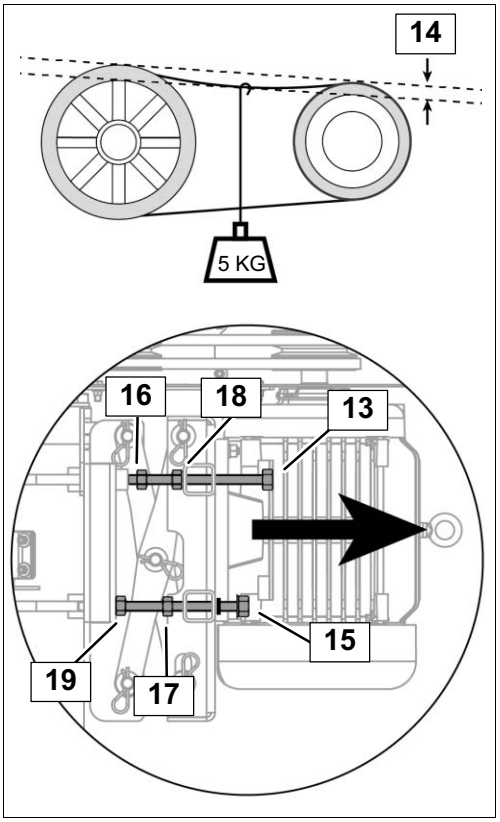
5.12.5 Motor belt installation

Caution!
Pinch point hazard!
Wear protective gloves when handling the belts and pulleys.

- Install the belt (12);
- Pull the motor support to hold the belt on the pulleys.

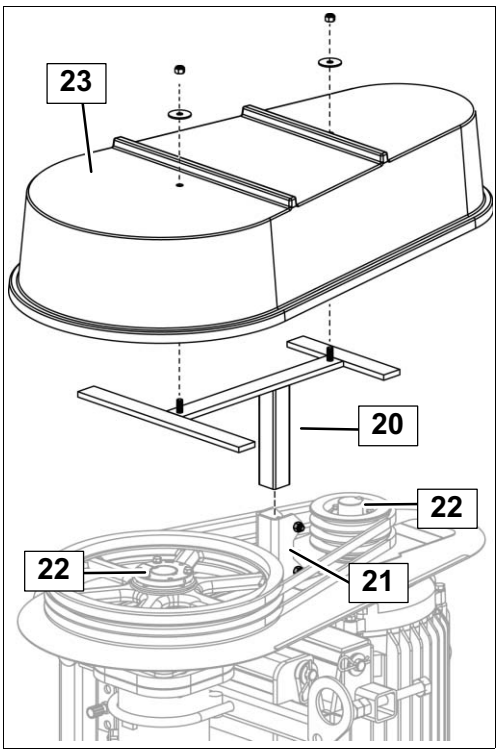


- Apply tension to the belt by tightening the top bolt (13) on the motor support;
- Check tension by applying 12lbs [5kg] of pressure midway (14) between the pulleys. With the pressure applied, the belt must roughly deflect 1/2” (13mm);
- When the deflection is obtained, place a straight edge on top of the pulleys. All pulleys must be parallel and aligned. To adjust the alignment, tighten the bottom bolt (15) on the motor support;
- Secure the position by placing the nuts (16,17) against the welded nuts (18,19).

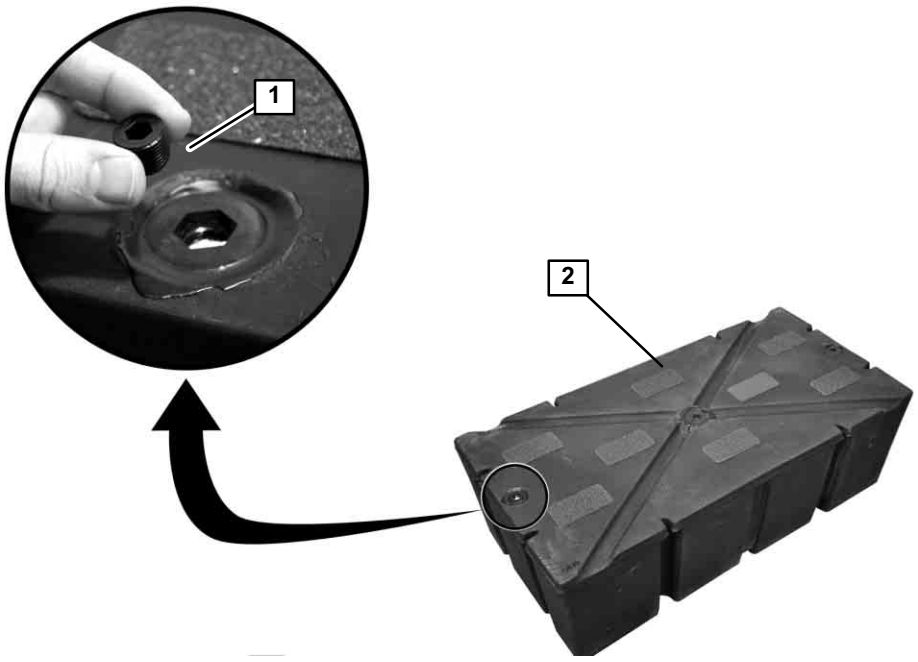


5.12.6 Protective guard installation

- Insert the guard support (20) into the post (21). Make sure the support does not contact the hubs (22);
- Place the upper guard (23) over the support and secure with washers and nuts.



5.13 Step 6: Float preparation



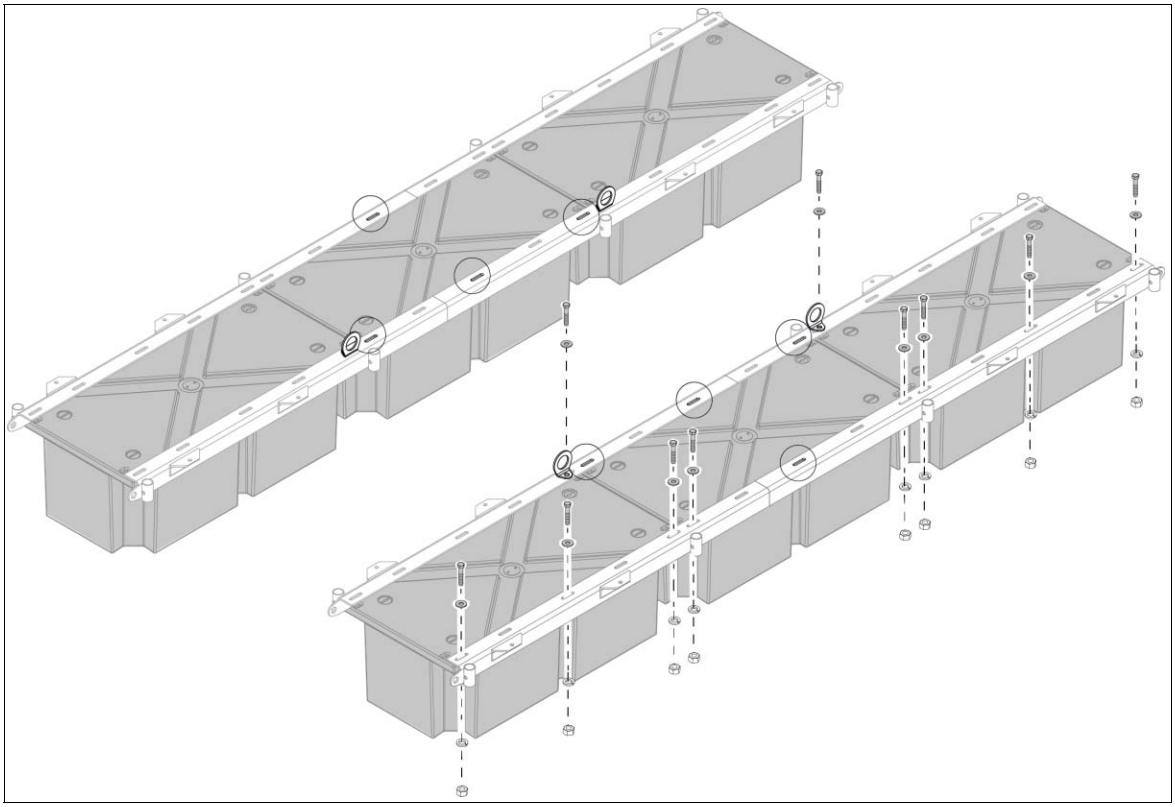
- Install a float cap (1) on each float (2);
- Tighten using an Allen Key.

5.14 Step 7: Pontoon assembly

5.14.1 12ft Pontoon

> **Note!**
> Do not tighten the bolts/U-bolts until the pontoon assembly is completed or unless otherwise instructed.

Step A: Floats and steel angles assembly

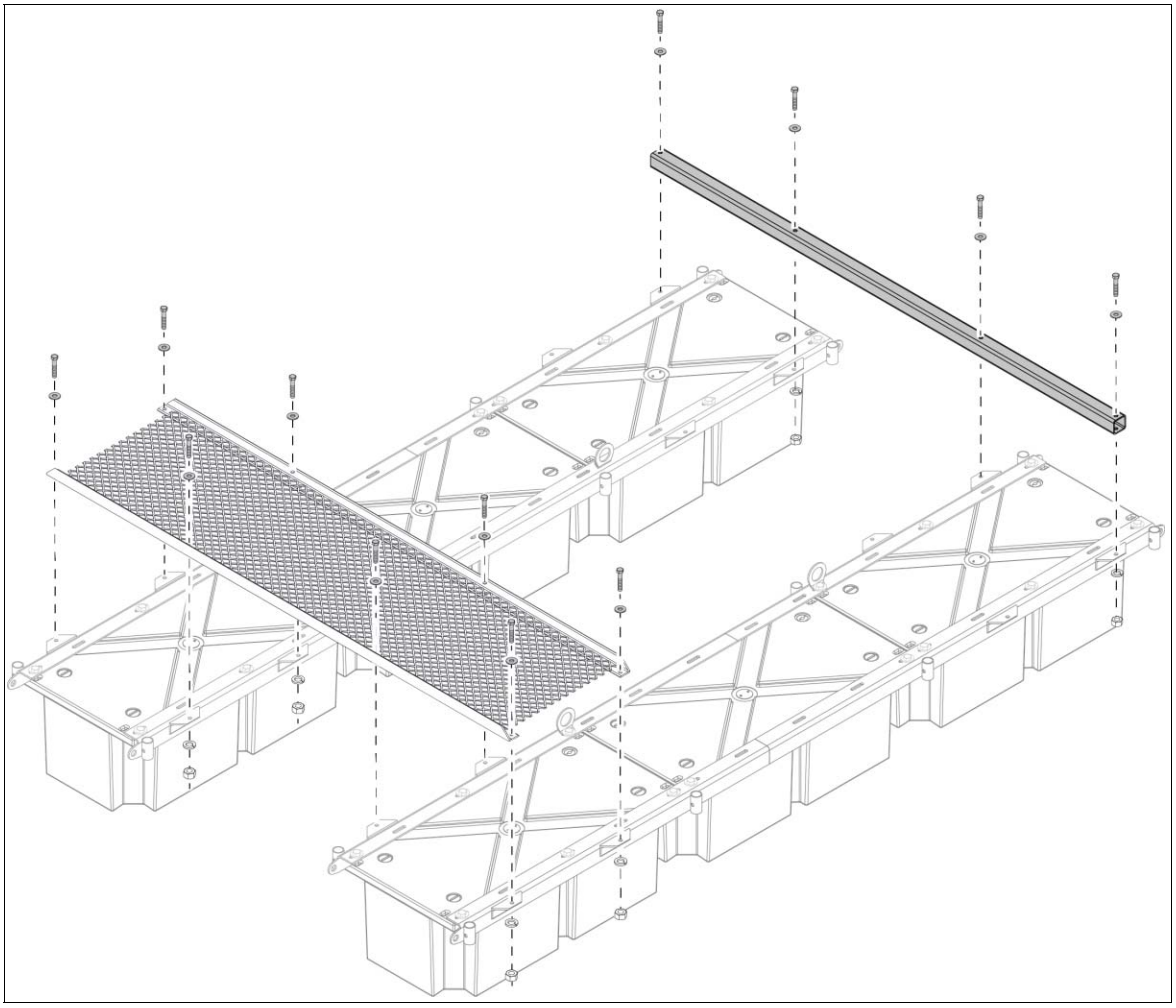


> **Note!**
> Assemble the pontoon on a flat and level surface.

> **Note!**
> Place the anti-slip surface upward.

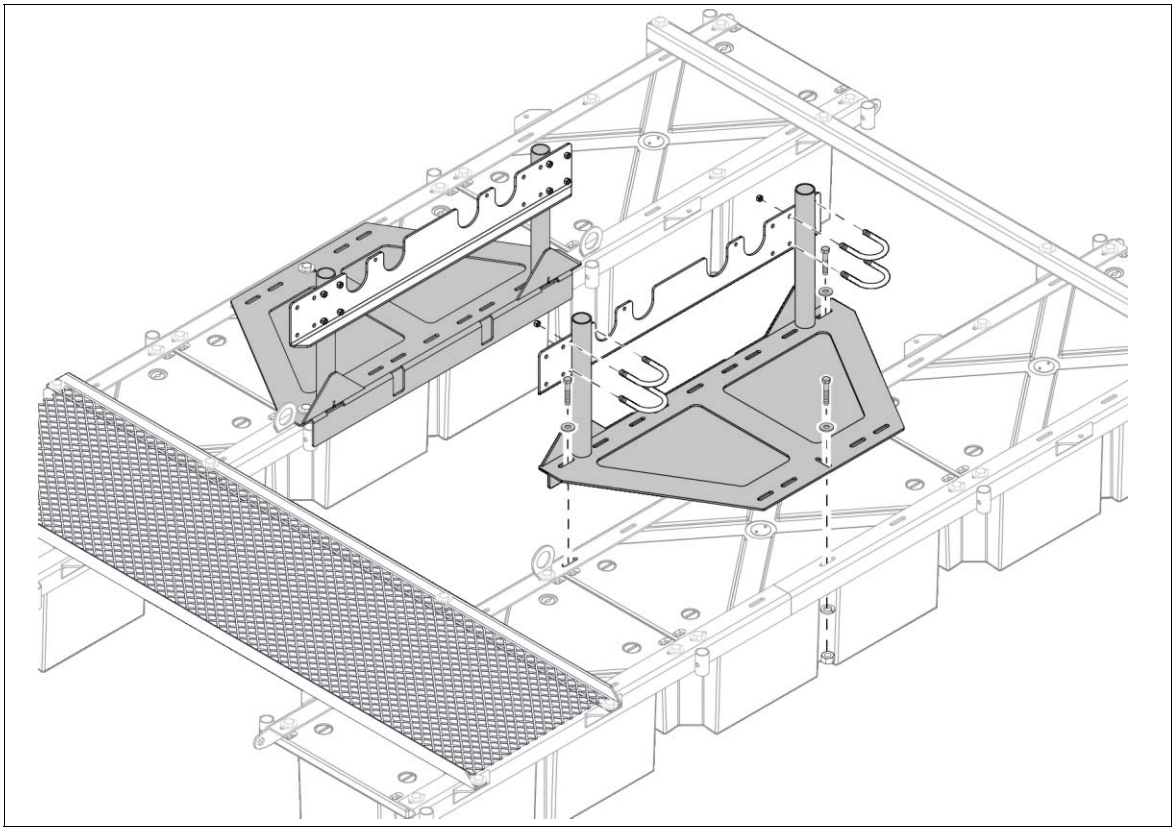
- Align 2 rows of three floats;
- Install 4 steel angle frames over the floats;
- Place the lifting rings, as illustrated;
- Secure the assembly using 28 [½" - 13NC - 3"] bolts, washers, lock washers and nuts, DO NOT TIGHTEN;
- Keep the encircled areas free, as illustrated.

Step B: Cross member and platform assembly



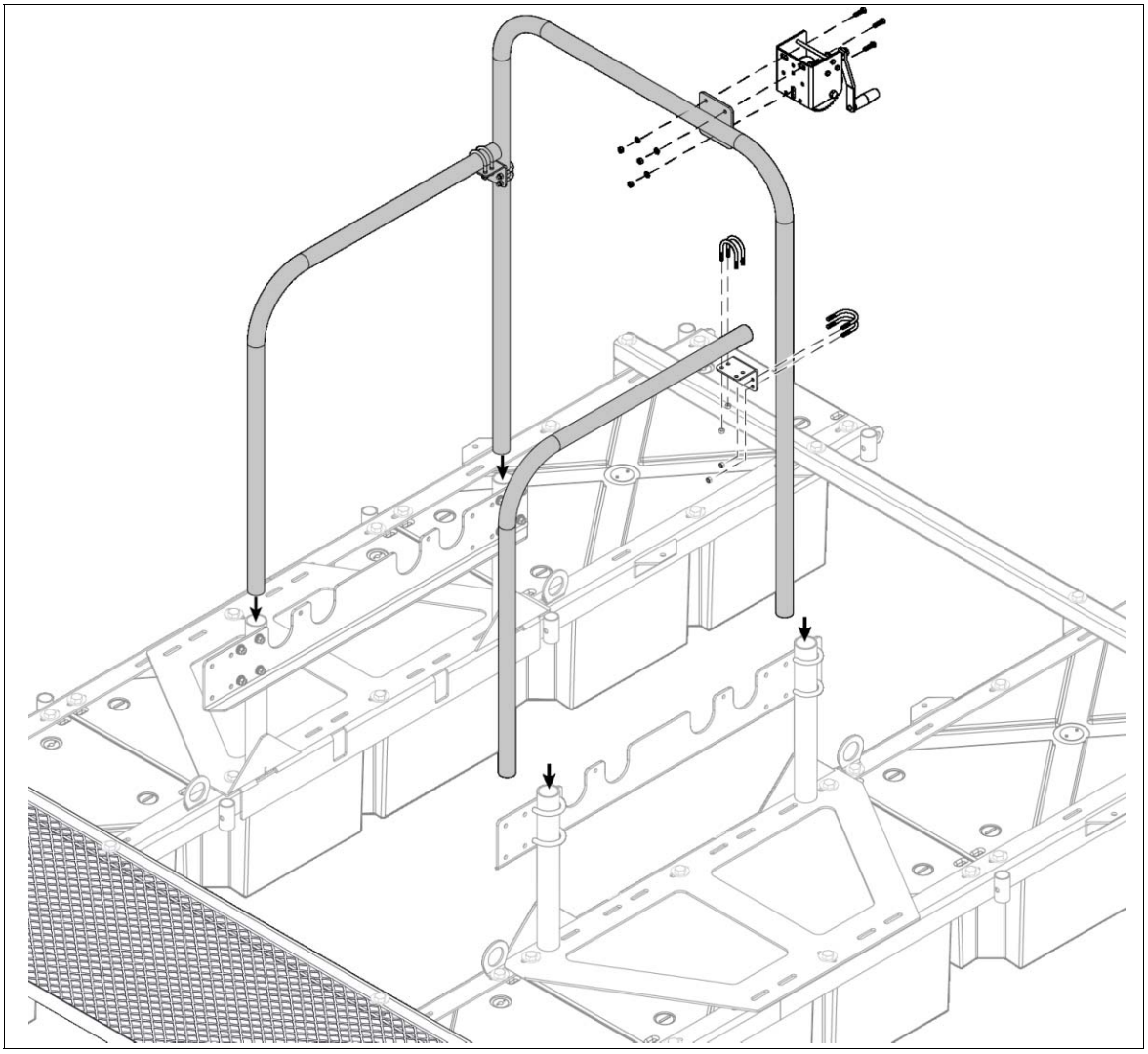
- Install a cross member using 4 [½" - 13NC - 3¾"] bolts, washers, lock washers and nuts, DO NOT TIGHTEN;
- Place the platform over the assembly;
- Secure the platform using 8 [½" - 13NC - 3¾"] bolts, washers, lock washers and nuts, DO NOT TIGHTEN.

Step C: Supports assembly



- Place a pontoon support over each float assembly;
- Secure using 8 [½” - 13NC - 3”] bolts, washers, lock washers and nuts, DO NOT TIGHTEN;
- Assemble the pump supports on the support tubes using 3¼” U-bolts and lock nuts, DO NOT TIGHTEN;

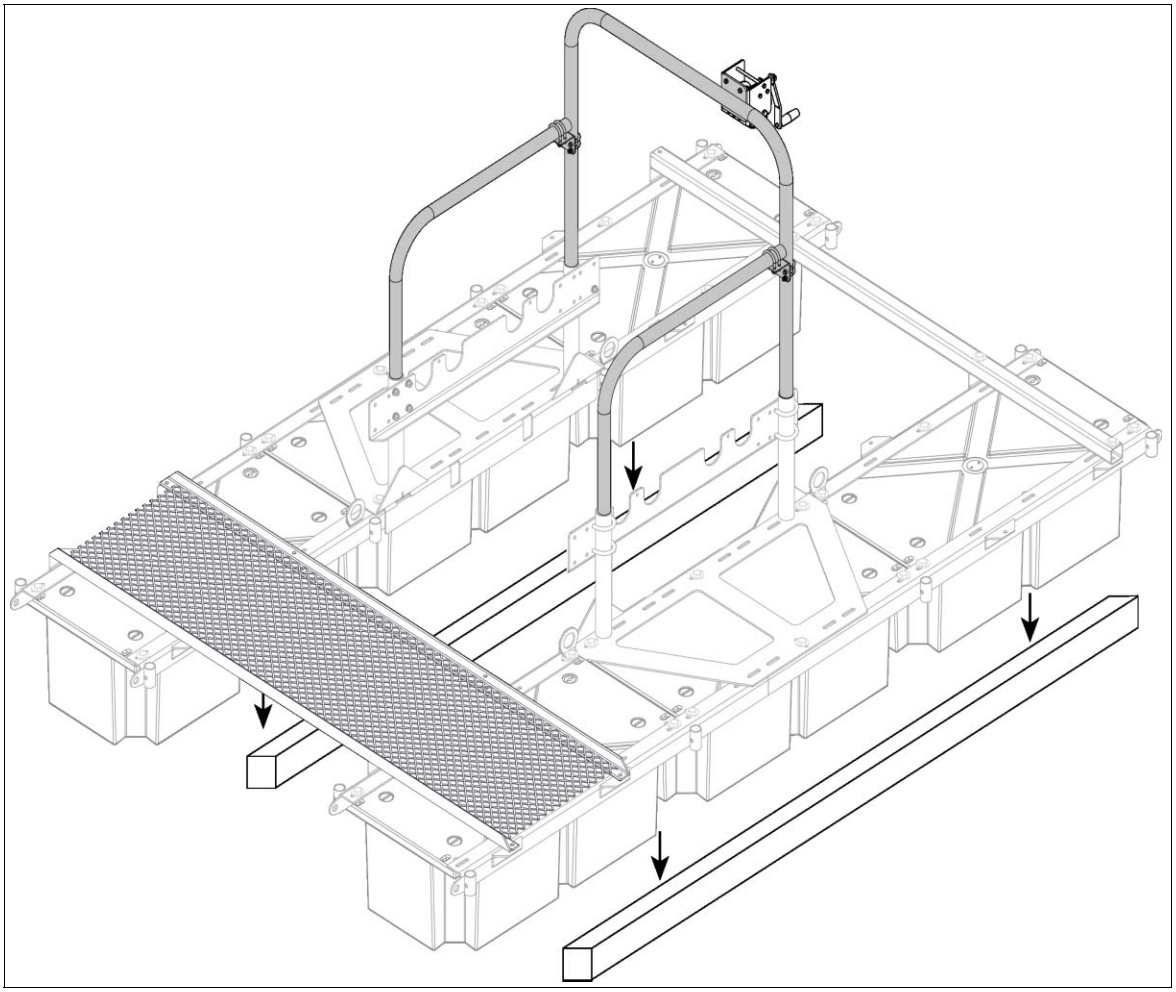
Step D: Handrail pipes and winch assembly



- Insert the handrail pipes into the sleeves of the tube supports;
- Install the winch on the winch support using 3 [3/8" - 16NC - 1¼"] bolts, lock washers and nuts, tighten;
- Fasten the handrail pipes together using 2 corner brackets, 8 [3¾"] U-bolts and nylon lock nuts;
- TIGHTEN ALL bolts/U-bolts of the pontoon to proper torque.

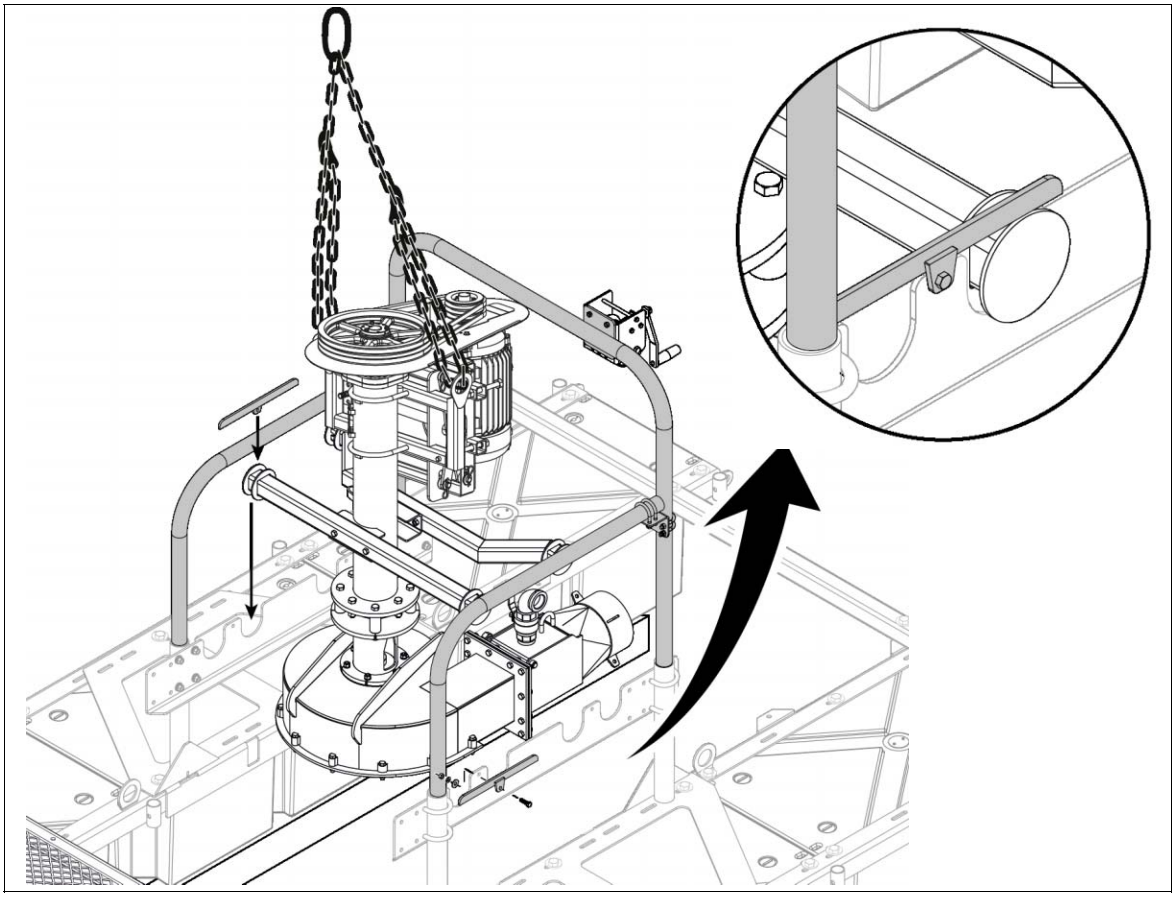
Refer to section 4.8 - Technical data - Bolt torque chart.

Step E: Pontoon shimming



- Using a proper lifting device, carefully lift the pontoon by its lifting rings;
- Place some 6” x 6” [154mmx154mm] beams under each float to shim the pontoon. Make sure the pontoon is stable.

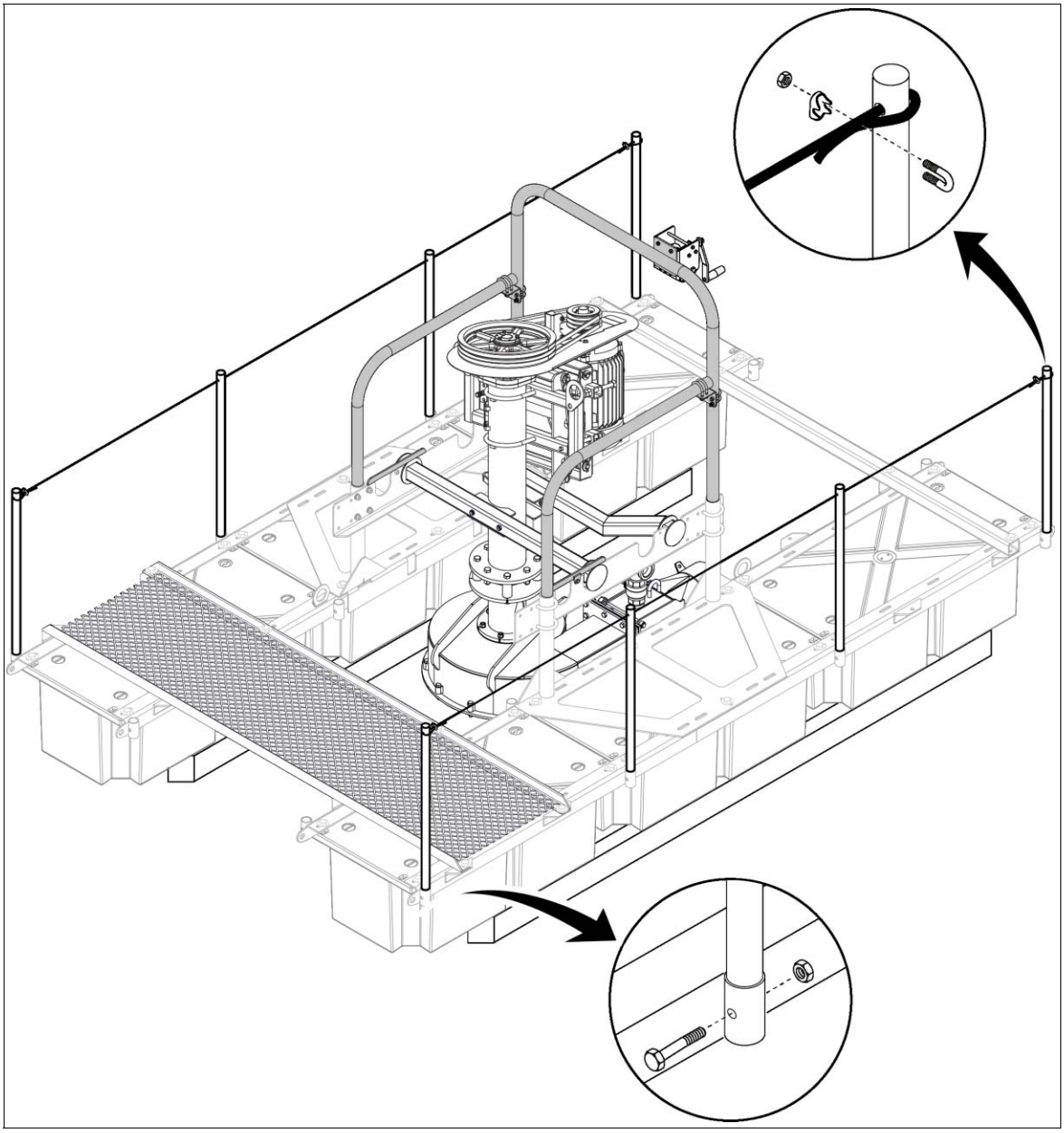
Step F: Motor installation



Attention!
To lift this product use a lifting device with a minimum lifting capacity of 5000 lbs [2500 kg]. The lifting capacity only includes the weight of the product.

- Remove the upper guard from the pump motor;
- Loosen the nylon lock nuts from the U-bolts on the pump supports;
- Lift the pump with a proper lifting device attached to the lifting rings of the motor support;
- Place the pump over the handrail pipes;
- Slowly lower the pump until the housing lays on the ground in between the float assemblies. If required, lower the pump supports from the support tubes for the housing to contact the ground properly;
- Safely hold the pump in position;
- Place the pump supports so that the pump pivots are well seated in the notches of the pump supports;
- Secure the position by tightening the U-bolts and nylon lock nuts;
- Place 2 locking plates, 2 [3/8” - 16NC - 1¼”] bolts, washers, lock washers and nuts over the pump supports, as illustrated in the closeup.
- Tighten.

Step G: Handrails and cable installation

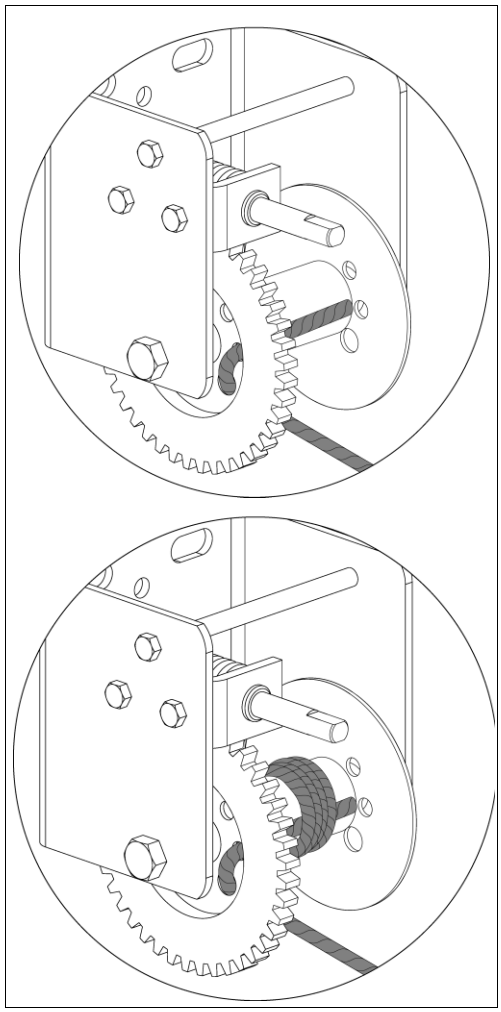


- Insert a post inside each angle frame sleeve;
- Secure using 8 [½” -13NC - 2½”] bolts and nylon lock nuts, as illustrated. Tighten;
- Insert the steel cable through each post located on the same side;
- Keep about 6” [152mm] of cable to tie the end with a cable clamp and nuts, as illustrated in the closeup;
- Tighten. Make sure the cable clamps are secured;
- On the other end of the cable, cut the cable while keeping an extra length to tie the end with a clamp and nut;
- Repeat steps to the opposite posts.

Step H: Winch cable installation

☞ **Note!**
To prevent seizing of metal parts, apply a significant coat of grease when specified.

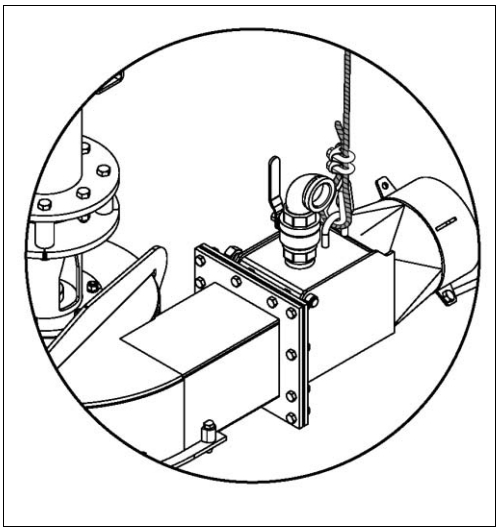
- Install the winch handle;
- Through the inside of the reel, run the cable in the ½" [12.7mm] hole;
- Then, insert the cable inside the reel through the 5/16" [7.95mm] hole;
- Place the cable along the center of the reel;
- Wind 4 turns over the cable to hold in place;
- Apply PRECISION™ general purpose EP2 grease to all mobile and pivoting parts of the winch.



Step I: Pump hoistline installation

☞ **Note!**
To prevent seizing of metal parts, apply a significant coat of grease when specified.

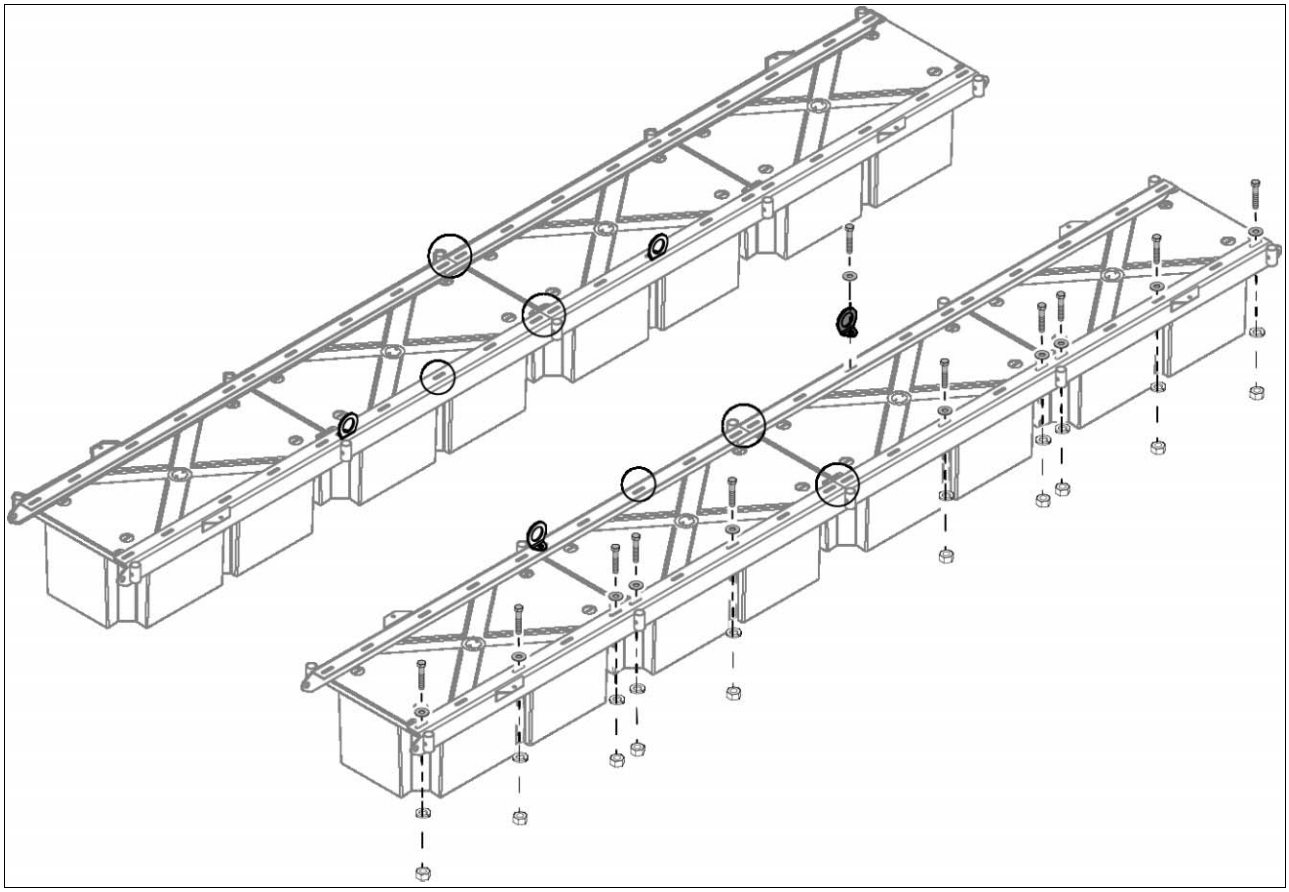
- Insert a cable protector through the ring located next to the pump ball valve;
- Run the cable over the protector and inside the ring;
- Install 2 cable clamps with nuts to fasten the cable;
- Wind the cable until the pump discharge starts to raise.
- Apply PRECISION™ general purpose EP2 grease to the clamps and nuts and to the handle nuts of the ball valve.



5.14.2 16ft Pontoon

> ☞ **Note!**
> Do not tighten the bolts/U-bolts until the pontoon assembly is completed or unless otherwise instructed.

Step A: Floats and steel angles assembly



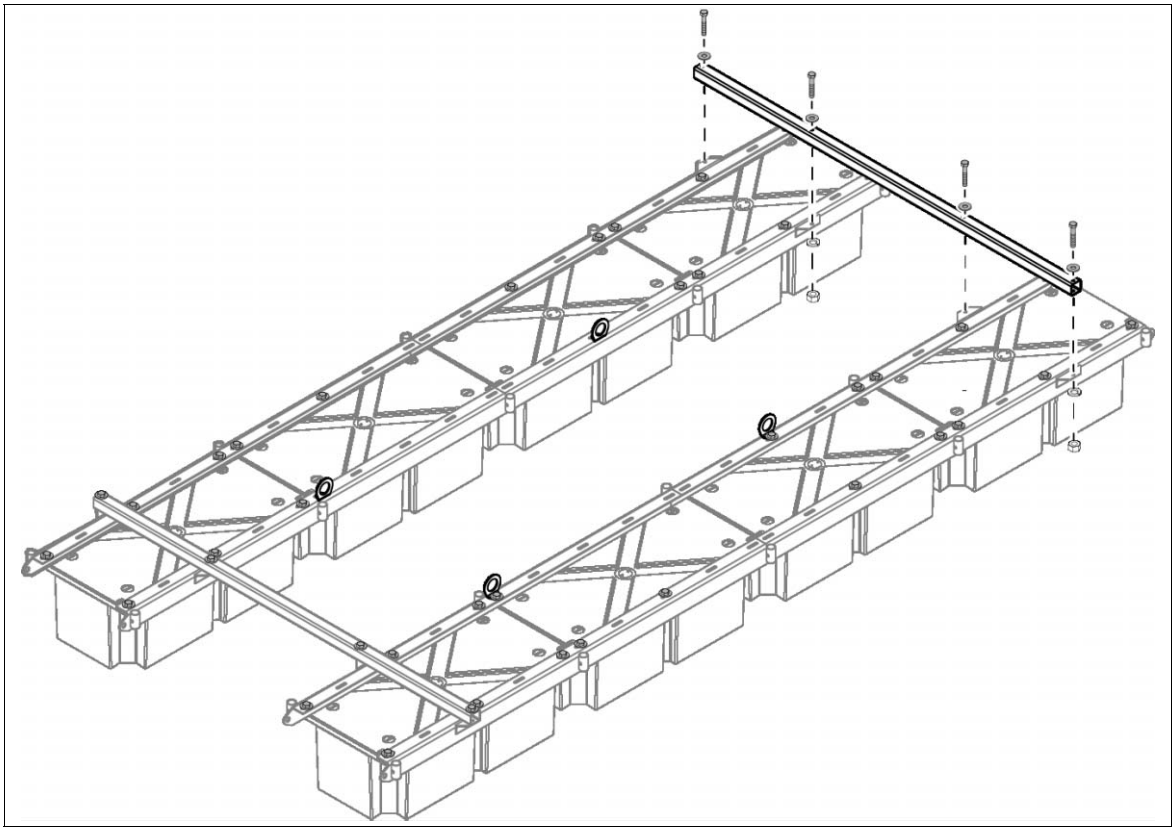
> ☞ **Note!**
> Assemble the pontoon on a flat and level surface.

> ☞ **Note!**
> Place the anti-slip surface upward.

> ☞ **Note!**
> Do not tighten the bolts/U-bolts until the pontoon assembly is completed.

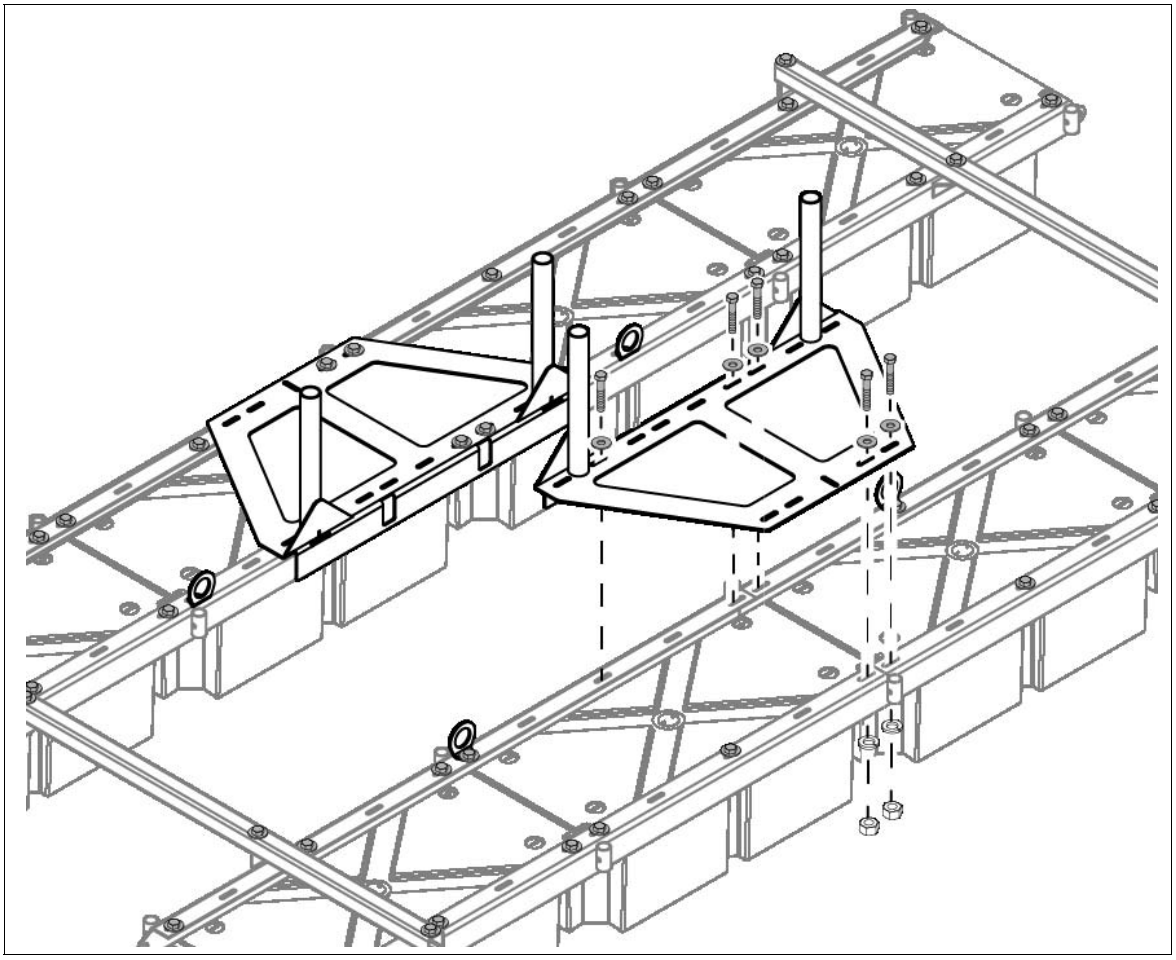
- Align 2 rows of four floats;
- Install 4 steel angle frames over the floats;
- Place the lifting rings, as illustrated;
- Secure the assembly using 38 [½” - 13NC - 3”] bolts, washers, lock washers and nuts, DO NOT TIGHTEN YET;
- Keep the encircled areas free, as illustrated.

Step B: Cross member assembly



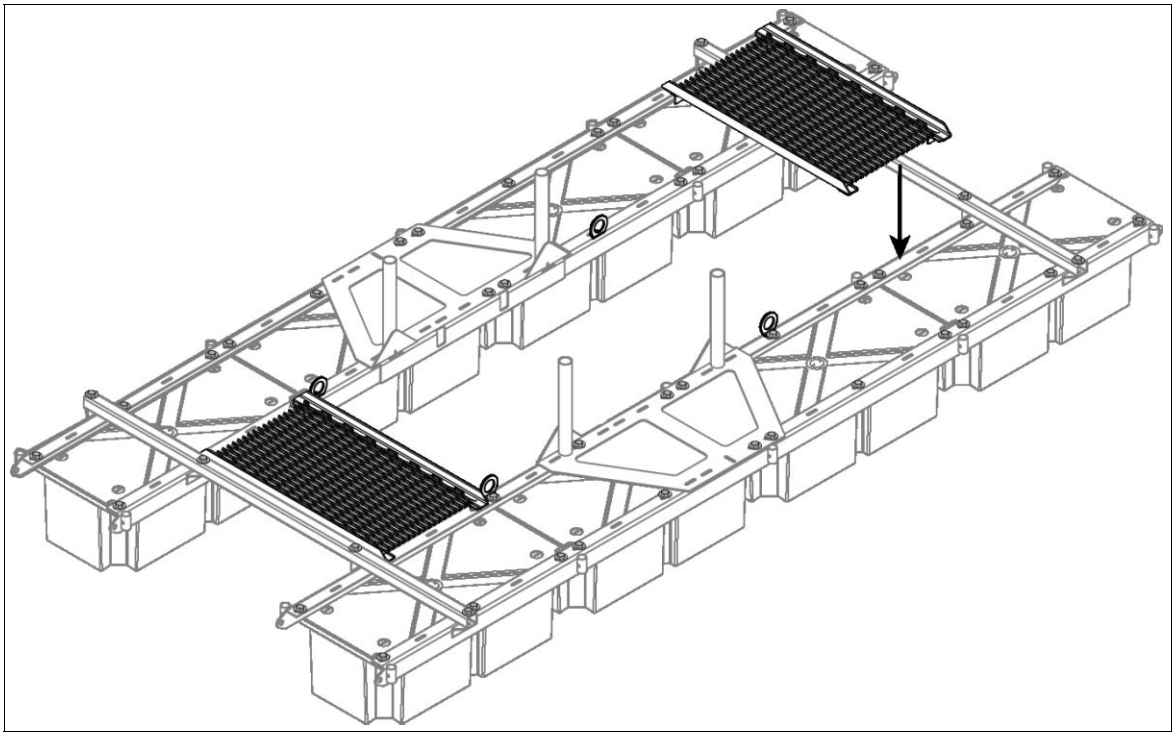
- Install 2 cross members using 8 [½" - 13NC - 3¾"] bolts, washers, lock washers and nuts, DO NOT TIGHTEN YET;

Step C: Pontoon supports assembly



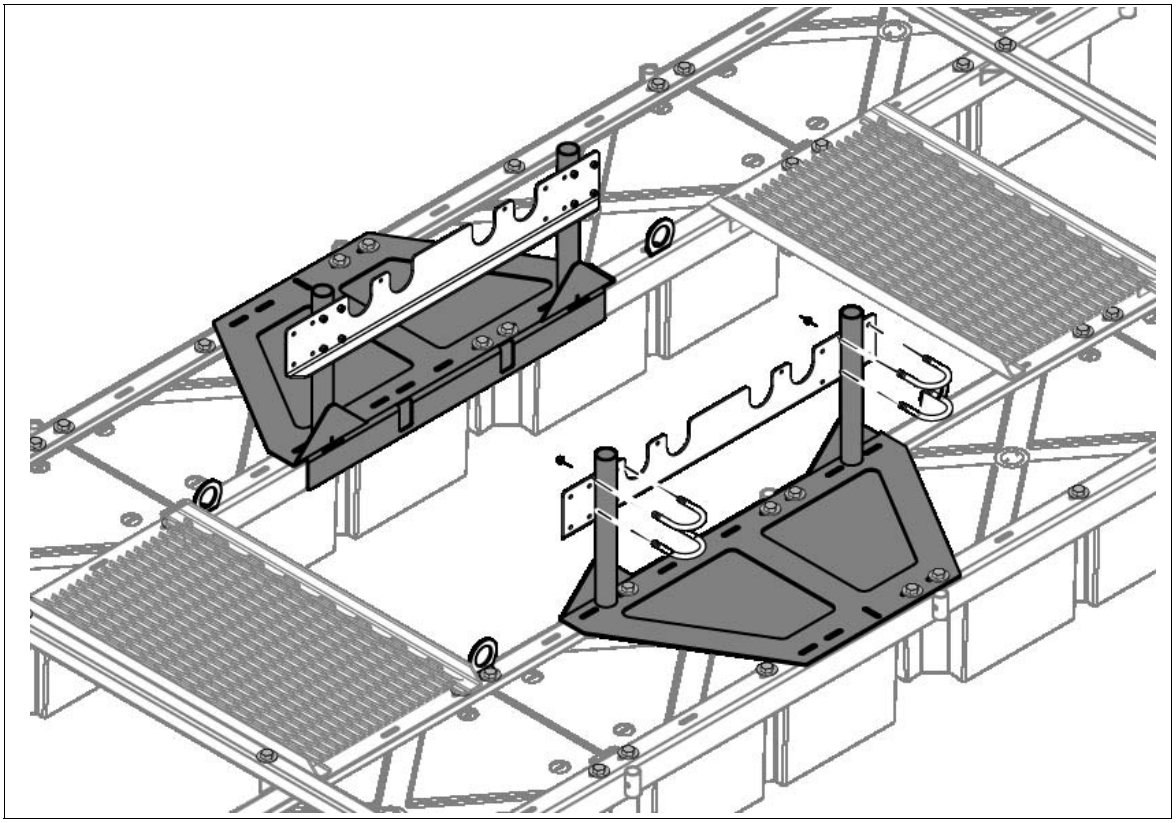
- Place a pontoon support over each float assembly;
- Secure using 10 [½” - 13NC - 3”] bolts, washers, lock washers and nuts, DO NOT TIGHTEN YET;

Step D: Platforms assembly



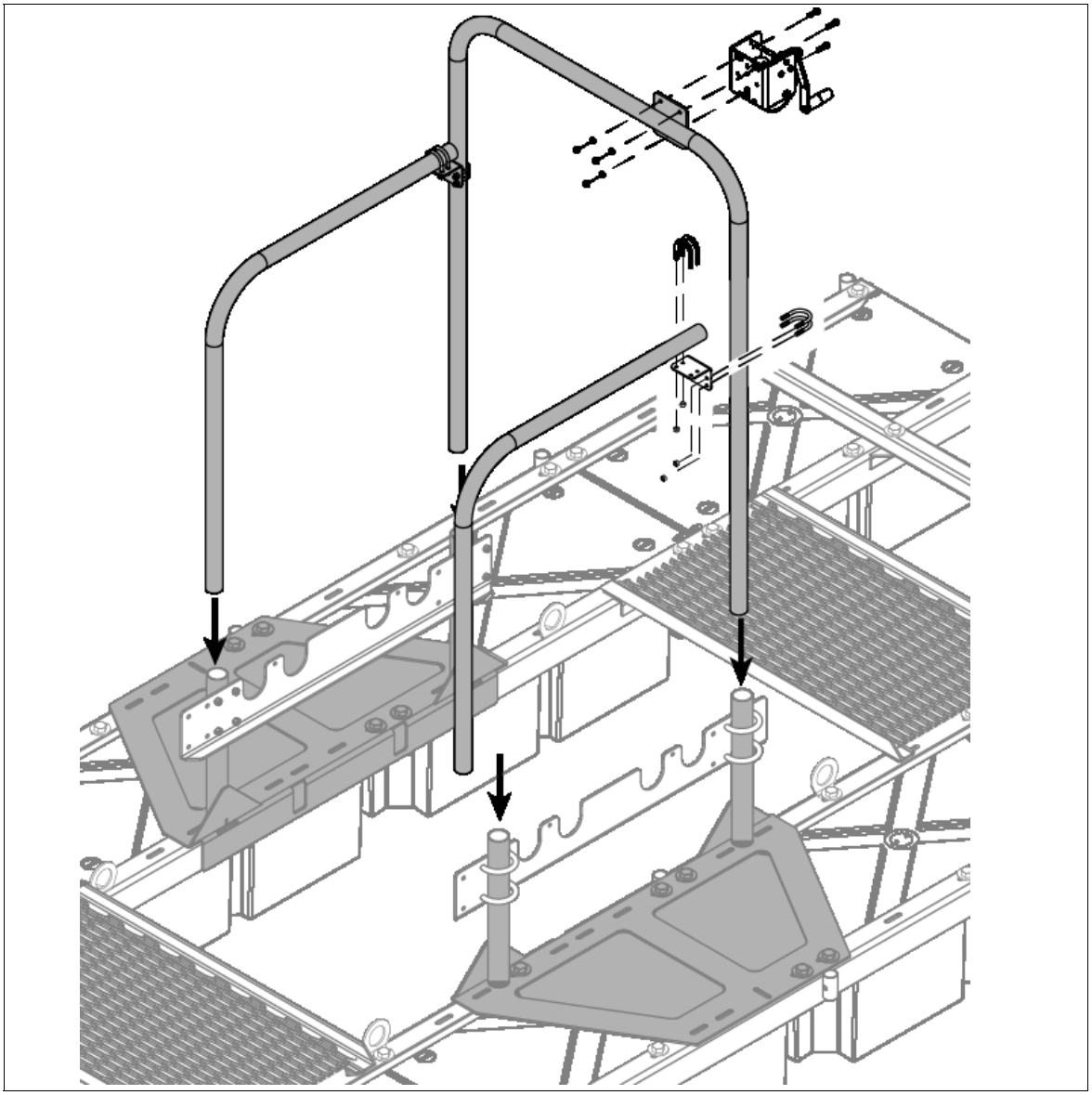
- Place the platforms over the steel angles while making sure they clear the lifitng rings.

Step E: Pump support assembly



- Assemble the pump supports on the support tubes using 3¼” U-bolts and lock nuts, DO NOT TIGHTEN YET;

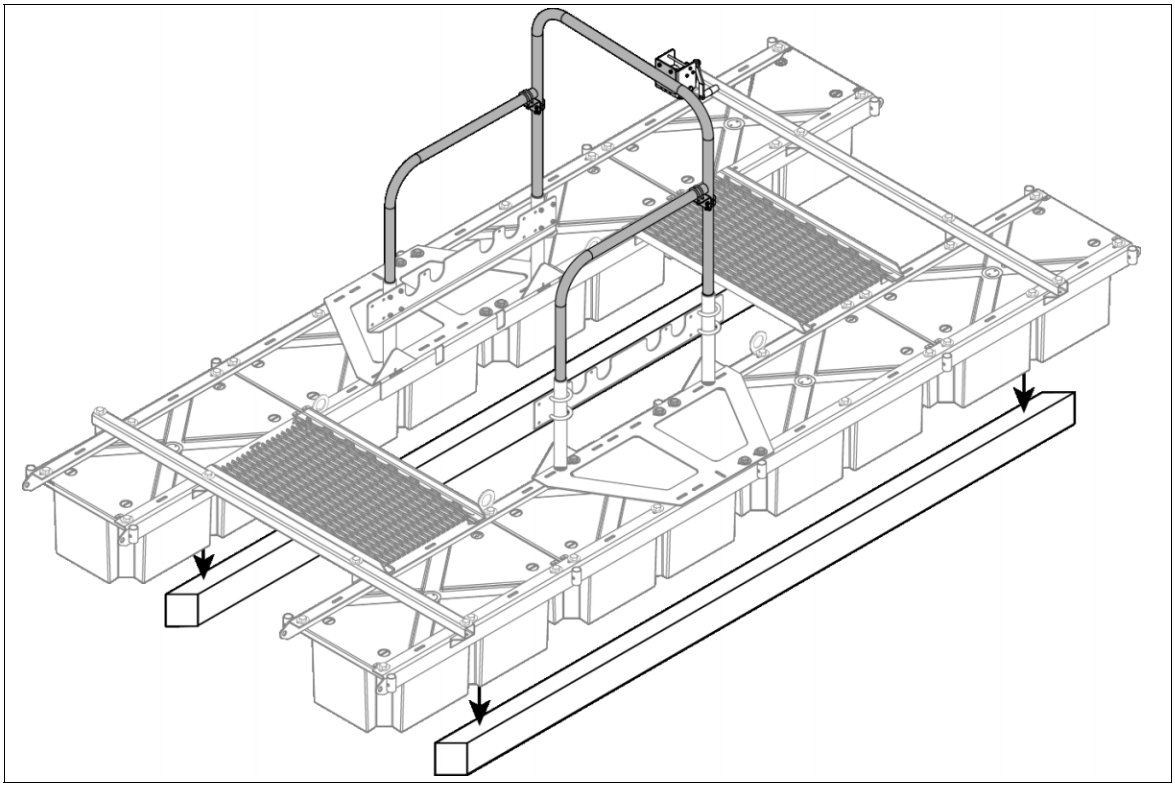
Step F: Handrail pipes and winch assembly



- Insert the handrail pipes into the sleeves of the support tubes;
- Install the winch on the winch support using 3 [3/8” - 16NC - 1¼”] bolts, lock washers and nuts, tighten;
- Fasten the handrail pipes together using 2 corner brackets, 8 [3¾”] U-bolts and nylon lock nuts;
- TIGHTEN ALL bolts/U-bolts of the pontoon to proper torque.

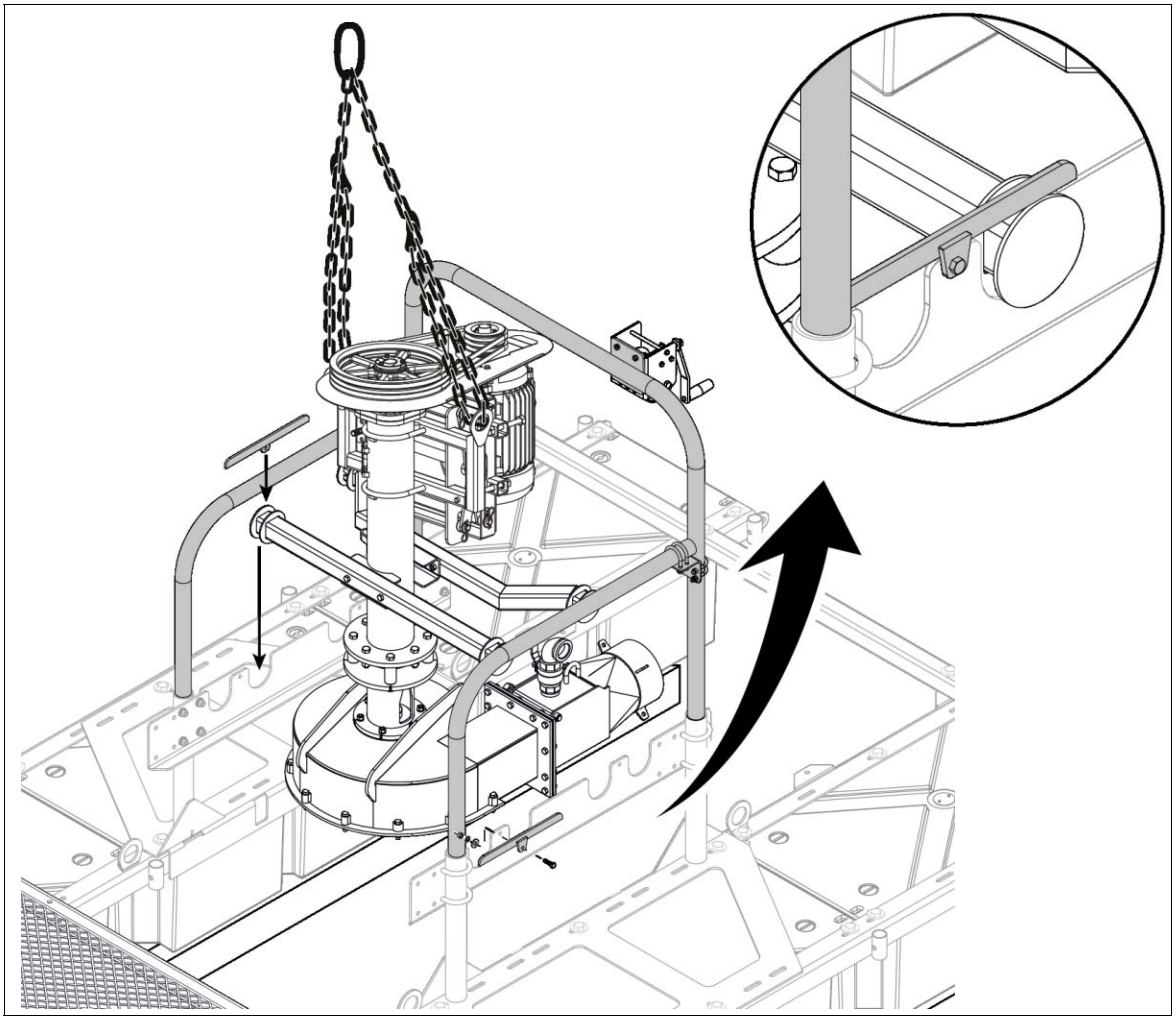
Refer to section 4.8 - Technical data - Bolt torque chart.

Step G: Pontoon shimming



- Using a proper lifting device, carefully lift the pontoon by the lifting rings;
- Place some 6” x 6” [154mmx154mm] beams under each float to shim to pontoon. Make sure the pontoon is stable.

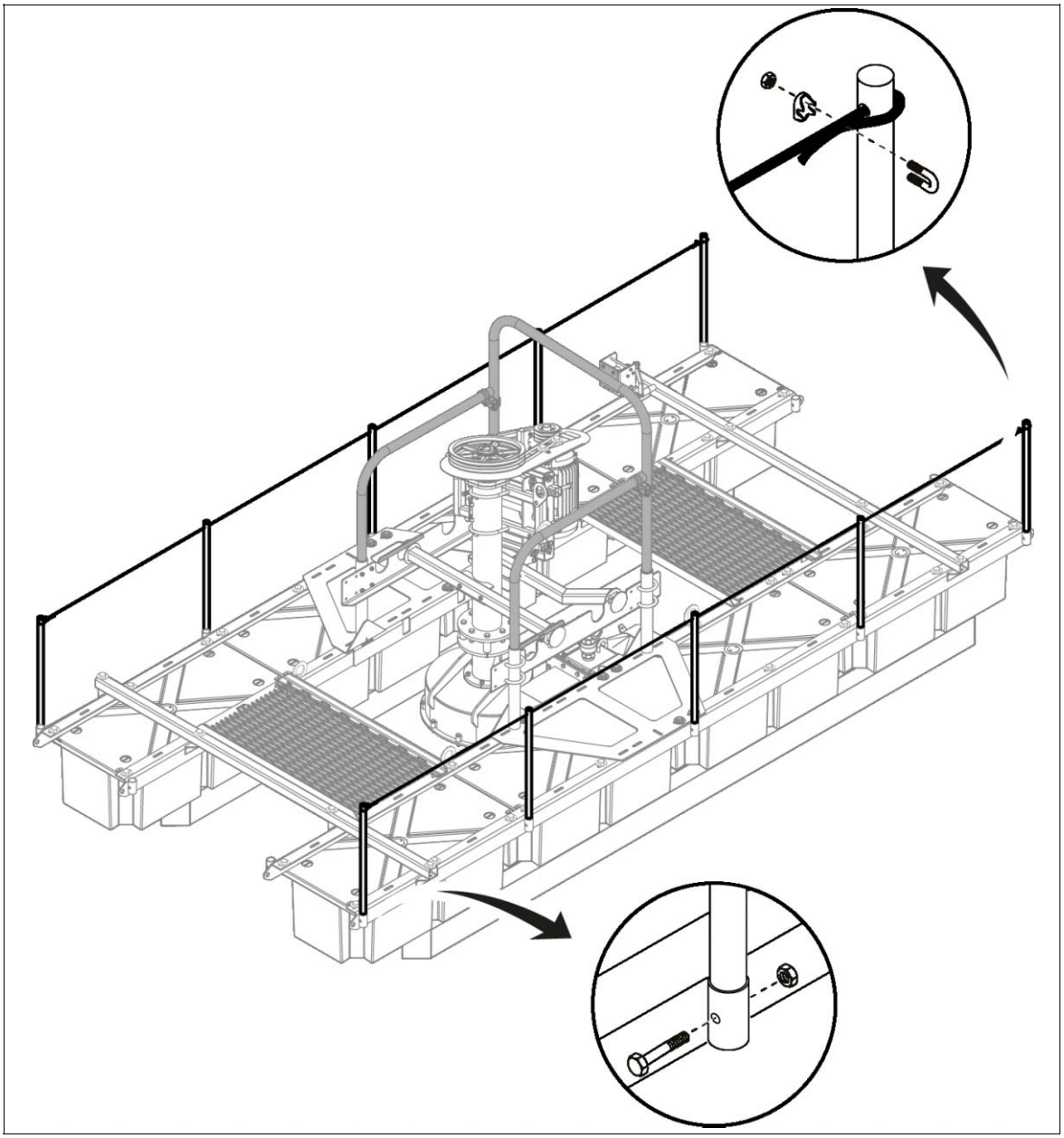
Step H: Motor installation



Attention!
To lift this product use a lifting device with a minimum lifting capacity of 5000 lbs [2250 kg]. The lifting capacity only includes the weight of the product.

- Remove the motor upper guard;
- Attach the lifting device to the motor lifting rings;
- Lift the motor over the pump supports;
- Slowly lower the motor until the housing lays on the ground;
- Hold the position;
- Raise or lower the pump supports so that the pump pivots are well seated in the notches;
- Secure the pump supports by tightening the U-bolts and nylon lock nuts;
- Place 2 locking plates, 2 [3/8” - 16NC - 1¼”] bolts, washers, lock washers and nuts over the pump supports, as illustrated in the closeup. Tighten;

Step I: Handrails and cable installation



- Insert a post inside each angle frame sleeve;
- Secure using 10 [½” -13NC - 2½”] bolts and nylon lock nuts, as illustrated. Tighten;
- Insert the steel cable through each post located on the same side;

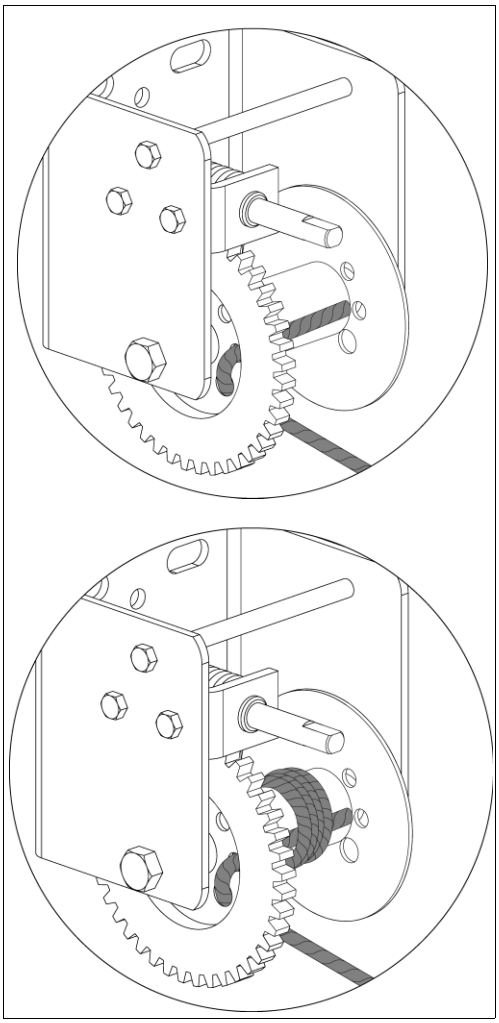
Refer to section 5.6 - Cable clamp assembly.

- Keep about 6” [152mm] of cable to tie the end with a cable clamp and nut, as illustrated in the closeup;
- On the other end of the cable, cut the cable while keeping an extra length to tie the end with a clamp and nut;
- Repeat steps to to the opposite posts.

5.15 Step 8: Winch cable installation

Note!
To prevent seizing of metal parts, apply a significant coat of grease when specified.

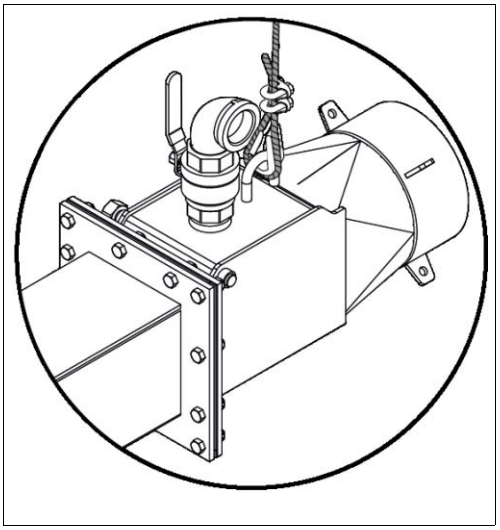
- Install the winch handle;
- Through the inside of the reel, run the cable in the ½" [12.7mm] hole;
- Then, insert the cable inside the reel through the 5/16" [7.95mm] hole;
- Place the cable along the center of the reel;
- Wind 4 turns over the cable to hold in place;
- Apply PRECISION™ general purpose EP2 grease to all mobile and pivoting parts of the winch.



Refer to section 5.6 - Cable clamp assembly

☞ **Note!**
To prevent seizing of metal parts, apply a significant coat of grease when specified.

- Place a cable thimble inside the hoisting ring located next to the ball valve;
- Run the cable around the thimble and inside the hoisting ring;
- Install 2 cable clamps with nuts to fasten the cable;
- Wind the cable until the pump discharge starts to raise;
- Apply PRECISION™ general purpose EP2 grease to the clamps and nuts and to the handle nuts of the ball valve.



5.16 Step 9: Motor safety chain assembly

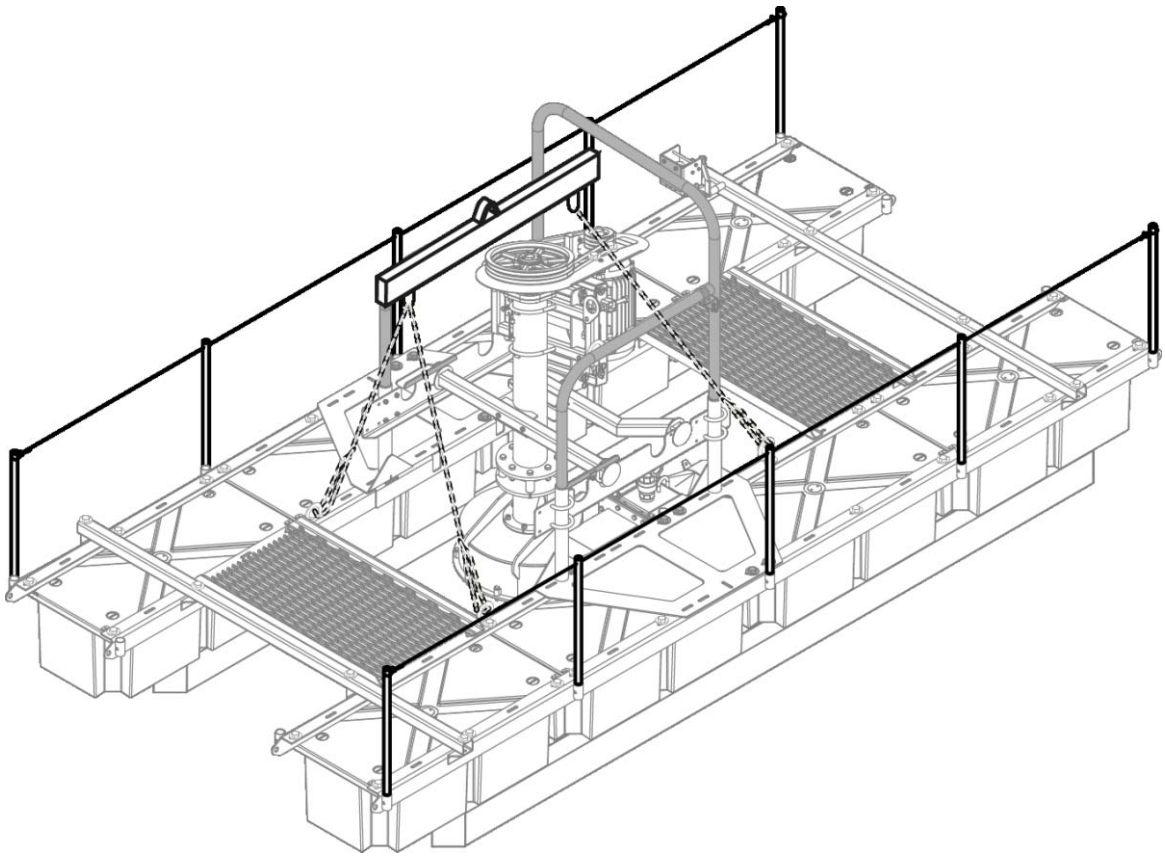
- Insert the chain in the housing of the winch;
- Use a chain link to secure the chain end to one chain ring;
- Insert the other end of the chain through the motor lifting ring;
- Use a chain link to fasten. Before fastening, apply PRECISION™ general purpose EP2 grease to the chain link.

5.17 Step 10: Pontoon installation in a pit or a lagoon

Warning!
Shutdown is required! shut the main power supply and lock with a locking device. Post a sign on the panel stating: ”Do not turn on, maintenance work in progress” in order to prevent an inadvertent energizing of the main electric supply.

Warning!
Do not stand under or near a lifted load, a falling load can cause death!

ATTENTION!
To lift this product, use a lifting device with a minimum lifting capacity of 5000 lb [2250 kg].



NOTE!
Fasten a nylon cable to the pontoon cable attachments to maintain balance when moving the pontoon toward the lagoon or pit. This cable can subsequently be used to link the pontoon to the shore.

- Install the lifting device to the pontoon lifting rings. Make sure the chains do not contact the assembly;
- Lift the pontoon while ensuring load balance;
- Position the pontoon into the pit or lagoon;
- Link the pontoon to the shore using a nylon cable.

5.18 Step 11: Evacuation line connection

Caution!
Risk of fatal injuries!
Only trained personnel is allowed to access the pontoon.

Caution!
Risk of injuries!
Allow only one person at a time on the pontoon.
The pontoon is designed to support additional weight equivalent to one person. Exceeding the weight capacity will reduce flotation which can result in potential injuries.

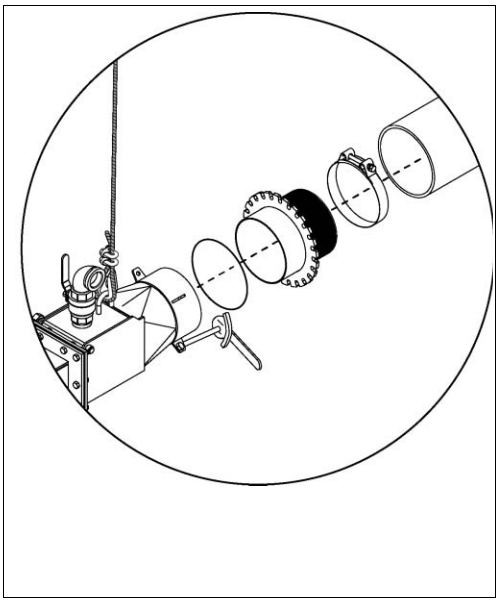
Caution!
Risk of fall!
Always wear a safety harness secured to the handrail of the pontoon.

Caution!
Risk of fall!
Always walk on the anti-slip surface.

Attention!
To avoid incidental disconnection of the evacuation line, keep additional hose length for the pontoon to move freely in the lagoon or pit.

- Before accessing the pontoon, make sure to have in hand:
  - The motor upper guard and hardware;
  - The evacuation line (O-ring, straight adapter, collar and the flexible hose);
  - Tools for assembly.
- Before accessing the pontoon, make sure to be wearing:
  - A safety harness;
  - A safety line;
  - Personal safety equipment required for accessing confined spaces, if applicable.

- Wind the hoistline using the winch until the pump discharge is out of the manure and safely accessible;
- Assemble the evacuation line [straight adapter, collar and the flexible hose], as illustrated;
- Place the O-ring over the pump discharge and connect the evacuation line to the pump discharge using the locking handles. Make sure the O-ring is well seated;
- Close the ball valve located on the housing of the pump;
- Lower the pump discharge into the liquid.



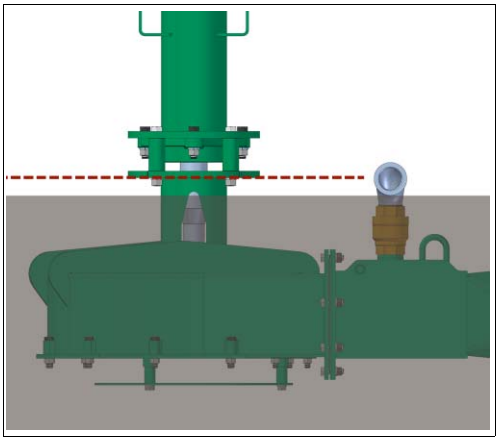
5.19 Step 12: Height adjustment of the pump

Caution!
Risk of injuries!
Make sure the cut-off switch is shut down and locked before accessing the pontoon. The pontoon is unstable when the pump operates.

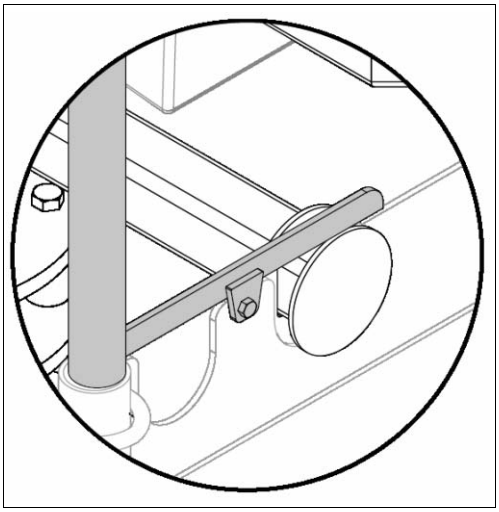
Attention!
Never allow the manure to flow over the dotted line, as illustrated. If manure flows over the dotted line, a potential bearing contamination can occur which can result in bearing failure.

Attention!
If the manure level has reached the bearing, wipe clean the bearing and regrease immediately. Refer to section - Maintenance - Grease the bottom bearing.

- The pump must be submerged in the manure, as illustrated;

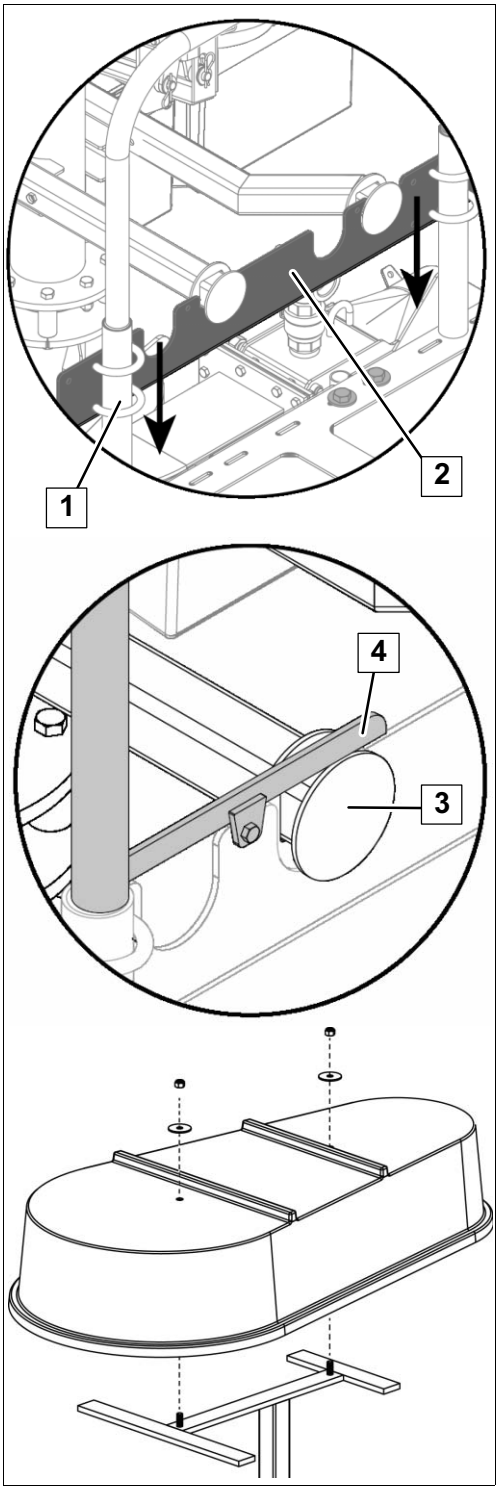


- To adjust the depth of the pump, maintain the pump position using a lifting device attached to the lifting rings of the motor;
- Remove the 2 locking plates holding the pump pivots.



Attention!
If the pump is submerged too deep, remove the pontoon from the pit or lagoon to proceed with the heigth adjustment of the pump. Before removing the pontoon, estimate how high the pump should be raised.

- With the pump well supported, estimate how much the pump should be lowered in order to be at properly submerged;
- Use that measure to mark the support tubes (1) in order to place the pump supports (2) at proper height;
- Loosen the nylon lock nuts of the U-bolts from the pump support (2);
- Using a fiber hammer, tap on top of the pump support (2) to align the support on the marking. Start on one side of the pump than on the other;
- When the supports are in proper position, tighten the nylon lock nuts;
- Slowly lower the pump until the pump pivots (3) are well seated in the notches of the supports;
- Check the manure level. Readjust the pump height if required;
- Secure the pump by fastening 2 locking plates (4) over the pump supports;
- Install the motor upper guard using the hardware provided.



6 Starting for the first time

6.1 Special personnel qualification required for initial commissioning

Initial commissioning must be performed by trained personnel in accordance with the safety instructions.

Read the section Safety - Personnel qualifications.

6.2 Safety instructions for initial commissioning

Warning!
Do not operate this product until the initial commissioning checklist is completed.

Caution!
Risk of injuries!
Do not access the pontoon. The pontoon is unstable when the pump operates.

Attention!
Do not operate the pump when the impeller is out of the liquid manure.

6.3 Initial commissioning checklist

This checklist must be completed by the dealer and the customer. The initial commissioning steps intend to test the product to validate its functionality. Therefore, the dealer and the customer must operate the product to make sure the product is assembled and/or installed according to the manufacturer's instructions.

General	DONE	N/A
The owner received the instruction manual from the dealer and commits to read it.		
The owner is instructed by the dealer on how to operate and maintain the product.		
The safety labels are installed.		
The lubrication points are lubricated.		
All bolts are torqued.		
All connections are secured.		
A visual inspection is performed to ensure there are no leaks, signs of distortion or defective parts.		
The equipment/component provided by the owner comply with the specifications contained in section Technical data.		
Proper segments are removed from the pulley inner guard.		
The motor belts tension is adjusted.		
Each pulley bushing capscrews are torqued.		
Each pulley hubs are secured with a set screw.		
The motor safety guard is installed and bolted.		
Both motor pulleys are aligned and parallel.		
The pump rotates in the proper direction.		
The pump is properly submerged in manure as specified in the installation steps.		
All float caps are installed.		
The handrail cables are installed and fasten.		
The pump ball valve is closed.		
The control panel is connected to an external cut-off switch.		
The pump can be shut down only through the control panel cut-off switch.		

Note!
The dealer and the owner must fill the warranty registration form when the checklist is completed.

Dealer's signature: _____

Owner's signature: _____

Date: _____

6.4 Checks after initial commissioning

The owner must make sure that:

- there are no damaged, worn, defective parts or signs of distortion;
- the safety devices such as guards, covers, chains, etc. are in perfect working condition and remain in place to ensure safety;
- the lubricants such as grease, oil, etc. are at an appropriate level;
- there are no leaks;
- all bolts are tight. Refer to section 4.8 - Technical data - Bolt torque chart;
- the product works perfectly;

6.5 Handing over to the owner

Hand over warranty registration form

The warranty registration form must be completed and signed by the customer and the dealer. The warranty registration form must be returned to GEA Farm Technologies Canada Inc. / Division GEA Houle to validate the warranty.

Declaration of conformity and CE mark
(only necessary for European Union member states)

A declaration of conformity must be produced and a CE mark applied if an entire operational installation is assembled from individual components.

If several directives apply to the complete system, the CE mark indicates that the requirements of all relevant directives have been met.

The technical center/specialist dealer performing the installation work must:

- perform the installation work in accordance with the installation and safety information given in the relevant operating and installation manuals;
- complete the hand-over report and have it signed;
- produce the declaration of conformity for the total installation being handed over;
- Apply the CE mark so that it is clearly visible on the installation.

7 Operation

7.1 Special personnel qualification required for operation

Operation must be performed by qualified personnel in accordance with the safety instructions.


Read the section Safety - Personnel qualifications.

7.2 Safety instructions for operation


Read the section Safety.

7.3 Operating the product

7.3.1 Pump in transfer mode


Caution!
Risk of injuries!
Always shut down and lock the cut-off switch before accessing the pontoon. The pontoon is unstable when the pump operates.


Attention!
Do not operate the pump when the impeller is out of the liquid manure.


ATTENTION!
Open all the gate valves of the evacuation line before operating.

- Start the pump.
- Turn off the pump.

7.3.2 Control Panel


Refer to the instruction manual provided with the start panel for more information.

8 Operating faults

8.1 Special personnel qualification required for troubleshooting

Troubleshooting must be performed by trained personnel in accordance with the safety instructions.

Read the section Safety - Personnel qualifications.

8.2 Safety instructions for troubleshooting

Warning!
Shutdown is required! shut the main power supply and lock with a locking device. Post a sign on the panel stating: ”Do not turn on, maintenance work in progress” in order to prevent an inadvertent energizing of the main electric supply.

Caution!
Risk of injuries!
Do not access the pontoon. The pontoon is unstable when the pump operates. Shut down and lock the cut-off switch before accessing the pontoon.

Attention!
Do not operate the pump when the impeller is out of the liquid manure.

Read the section Safety.

8.3 Troubleshooting possible faults

Troubleshooting may only be performed by specially qualified personnel in accordance with the safety instructions.

Symptom	Possible cause	Solution
Pump does not operate.	The control panel emergency stop switch is activated.	Check the control panel emergency stop switch and reactivate.
	Power supply is disconnected.	Have a certified electrician check the wiring of the motor and control panel.

Symptom	Possible cause	Solution
Motor runs without pumping.	Drive system is disadjusted.	Check belt integrity.
		Check belt tension. Adjust, if required. Refer to section 5.12.5 - Handling and assembly - Motor belt installation.
		Check pulleys assembly. Refer to 5.12.4 - Handling and assembly - Pulleys assembly.
	Obstruction in the impeller .	Contact your dealer.
Pump is working without reaching performance.	Electrical motor incorrectly wired.	Check motor rotation. Make sure it runs counterclockwise as indicated on the label located on top of the pump frame. Refer to section 11.1 - Appendix - Label position. If required, have an electrician rewire the motor.
	Wrong manure consistency.	Perform a consistency test. Refer to section 11.3 - Appendix - Consistency test. Add water and agitate until proper consistency is reached. The maximum manure consistency is 1/8” [3mm].
	Wrong configuration (elevation, evacuation line).	Contact your dealer.
	The impeller intake is obstructed.	Contact your dealer.
	The drive system is not adjusted.	Check belt tension. Adjust, if required. Refer to section 5.12.5 - Handling and assembly - Motor belt installation.

Symptom	Possible cause	Solution
Pump performance decreases.	Wrong manure consistency.	Perform a consistency test. Refer to section 11.3 - Appendix - Consistency test. The maximum manure consistency is 1/8” [3mm].. Add water and agitate until proper consistency is reached.
	Impeller damaged or worn.	Contact your dealer.
Vibration in the driveline.	Pump bearing worn.	Contact your dealer.
	Impeller deformed.	

9 Maintenance

9.1 Special personnel qualification required for maintenance work

Maintenance work must be performed by trained personnel in accordance with the safety instructions.

Read the section Safety - Personnel qualifications.

9.2 Safety instructions for maintenance

Warning!
Shutdown is required! shut the main power supply and lock with a locking device. Post a sign on the panel stating: ”Do not turn on, maintenance work in progress” in order to prevent an inadvertent energizing of the main electric supply.

Caution!
Before performing any repair, any part change, always remove the pontoon from the lagoon or pit. Only preventive maintenance can be performed on the pontoon while in the lagoon or pit.

Caution!
Risk of injuries!
Allow only one person at a time on the pontoon.
The pontoon is designed to support additional weight equivalent to one person. Exceeding the weight capacity will reduce flotation which can result in potential injuries.

Caution!
Risk of fall!
Always wear a safety harness secured to the handrail of the pontoon.

Caution!
Risk of fall!
Always walk on the anti-slip surface.

Read the section Safety.

9.3 Scheduled maintenance responsibilities

Note!
When operating this GEA Houle product using other manufacturer's components and/or products such as a PTO, a tractor, a motor, a pump, etc., ALWAYS perform maintenance of the component and/or product as recommended by its manufacturer.

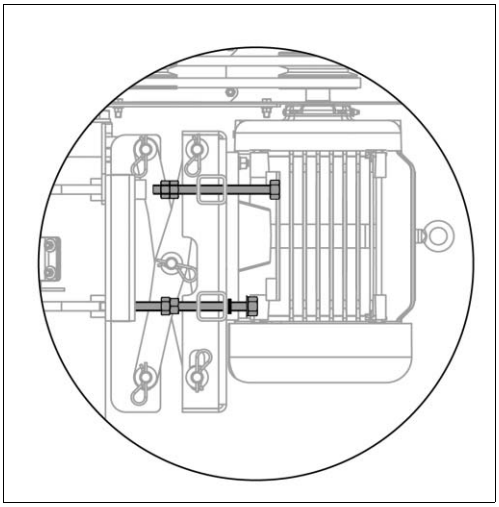
8” flush pump on pontoon							
Task	**When required**	**Every 24 hours of use**	**After the first 50 hours of use**	**Every 100 of use or once a week, which ever comes first**	**After the first 1000 hours of use**	**Every 4000 hours of use**	**Every 6 years**
Maintenance to be performed by trained personnel							
Motor support threaded bolts lubrication	X						
Winch lubrication	X						
Ball valve lubrication	X						
Check the bolts torque			X				
Check the motor belt tension			X				
Visual inspection			X	X			
Upper bearing lubrication				X			
Lower bearing lubrication				X			
Maintenance to be performed by a dealer							
Impeller and housing inspection						i	
Hydraulic hoses change							X
Motor belt change							X

i	If this product operates in an environment where abrasive material such as sand is present, perform this maintenance task twice as often. For example, if maintenance is scheduled at 1000 hours, perform maintenance every 500 hours.

9.4 Motor support threaded bolts lubrication

Note!
To prevent seizing of metal parts, apply a significant coat of grease when performing the following maintenance.

- Apply PRECISION™ general purpose EP2 grease on each threaded rod of the motor support.



9.5 Winch lubrication

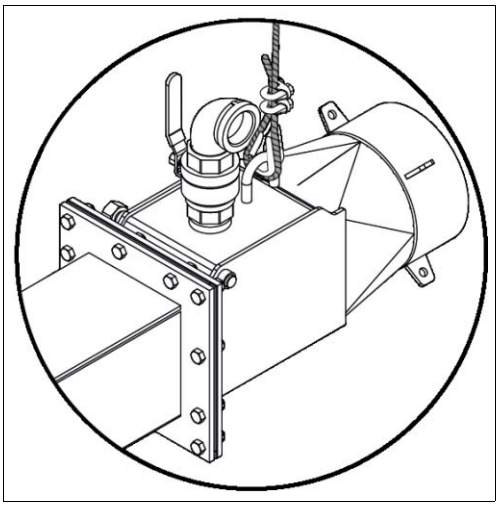
Note!
To prevent seizing of metal parts, apply a significant coat of grease when performing the following maintenance.

- Apply PRECISION™ general purpose EP2 grease on the cable and all mobile parts of the winch.

9.6 Ball valve lubrication

Note!
To prevent seizing of metal parts, apply a significant coat of grease when performing the following maintenance.

- Apply PRECISION™ general purpose EP2 grease over the handle nuts.



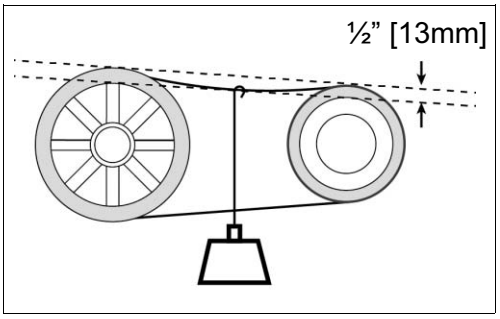
9.7 Check bolts torque

- Check the tightness of all bolts and anchor bolts;
- Retighten to proper torque, if required.

Refer to section 4.8 - Technical data - Bolt torque chart.

9.8 Check the motor belt tension

- Make sure the belts deflect roughly 1/2” (13mm) when applying 12 lbs (5kg) of pressure midway between the pulleys;
- To adjust the belts tension. Refer to section 5.12.5 - Handling and assembly - Motor belt installation.



9.9 Visual inspection

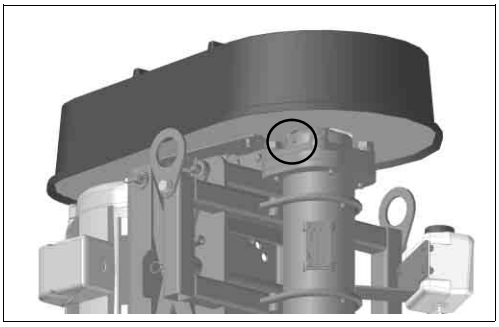
- Monitor closely the product to find any signs of leaks, distortion, wear, damages, vibrations, unusual noise, etc. To repair or change defective part, contact your dealer.

9.10 Upper bearing lubrication

Attention!
Slowly lubricate this bearing to avoid applying significant pressure on the seals. Applying too much pressure will damage the seals inside the bearing.

Note!
Avoid splashing water over the bearing unit! If water contacts the bearing unit, wipe clean the bearing and grease immediately to prevent premature wear.

- Wipe clean the grease fitting;
- Slowly add 10 grams of EP2 general purpose grease while the bearing runs, if possible. Grease must contain mineral oil and lithium thickener having a NLGI rating of 2 or 3 (without MOLY) .

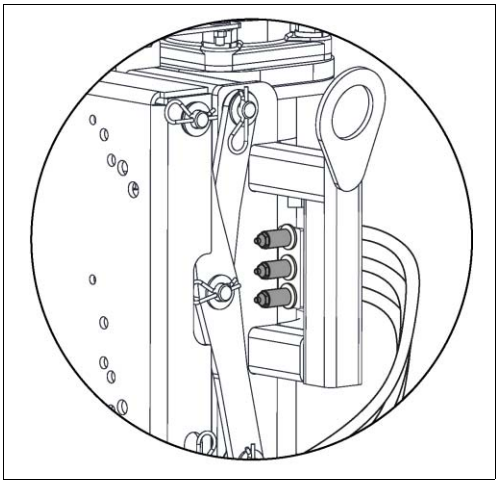


9.11 Lower bearing lubrication

Attention!
Slowly lubricate this bearing to avoid applying significant pressure on the seals. Applying too much pressure will damage the seals inside the bearing.

Note!
Avoid splashing water over the bearing unit! If water contacts the bearing unit, wipe clean the bearing and grease immediately to prevent premature wear.

- Wipe clean the grease fitting of the remote grease lines;
- Slowly add 10 grams of EP2 general purpose grease while the bearing runs, if possible. Grease must contain mineral oil and lithium thickener having a NLGI rating of 2 or 3 (without MOLY).



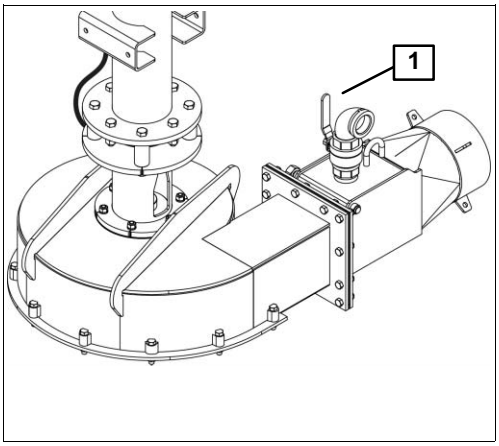
9.12 Disconnecting the evacuation line from the pump

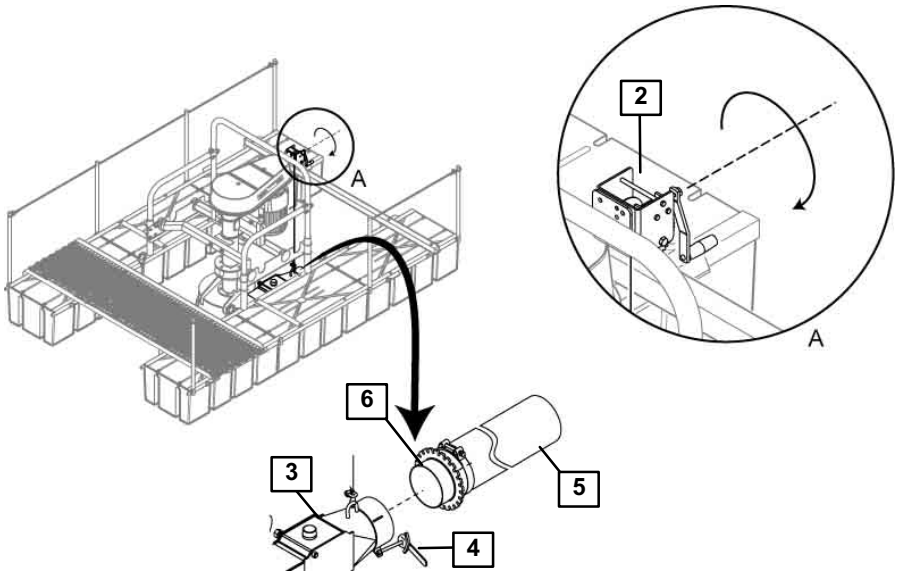
Warning!
Shutdown is required! shut the main power supply and lock with a locking device. Post a sign on the panel stating: ”Do not turn on, maintenance work in progress” in order to prevent an inadvertent energizing of the main electric supply.

Caution!
Risk of injuries!
Always shut down and lock the cut-off switch before accessing the pontoon. The pontoon is unstable when the pump operates.

CAUTION!
Always wear a safety harness secured to the handrail and walk on the anti-slip surface to access to the pontoon. Be careful, the top of the float can be very slippery.

- Bring the pontoon to shore;
- Open the ball valve (1) and drain the evacuation line into the pit or lagoon. When the line is completely drained, close the ball valve.
- Using the winch (2), raise the pump discharge (3) pipe out of the liquid.
- Using the locking handles (4), unlock the adaptor (5) to remove the evacuation line (6) from the pump discharge.





10 Decommissioning

10.1 Special personnel qualification required for decommissioning

Decommissioning may only be performed by specially qualified personnel in accordance with the safety instructions.

Read the section Safety - Personnel qualifications.

10.2 Safety instructions for decommissioning

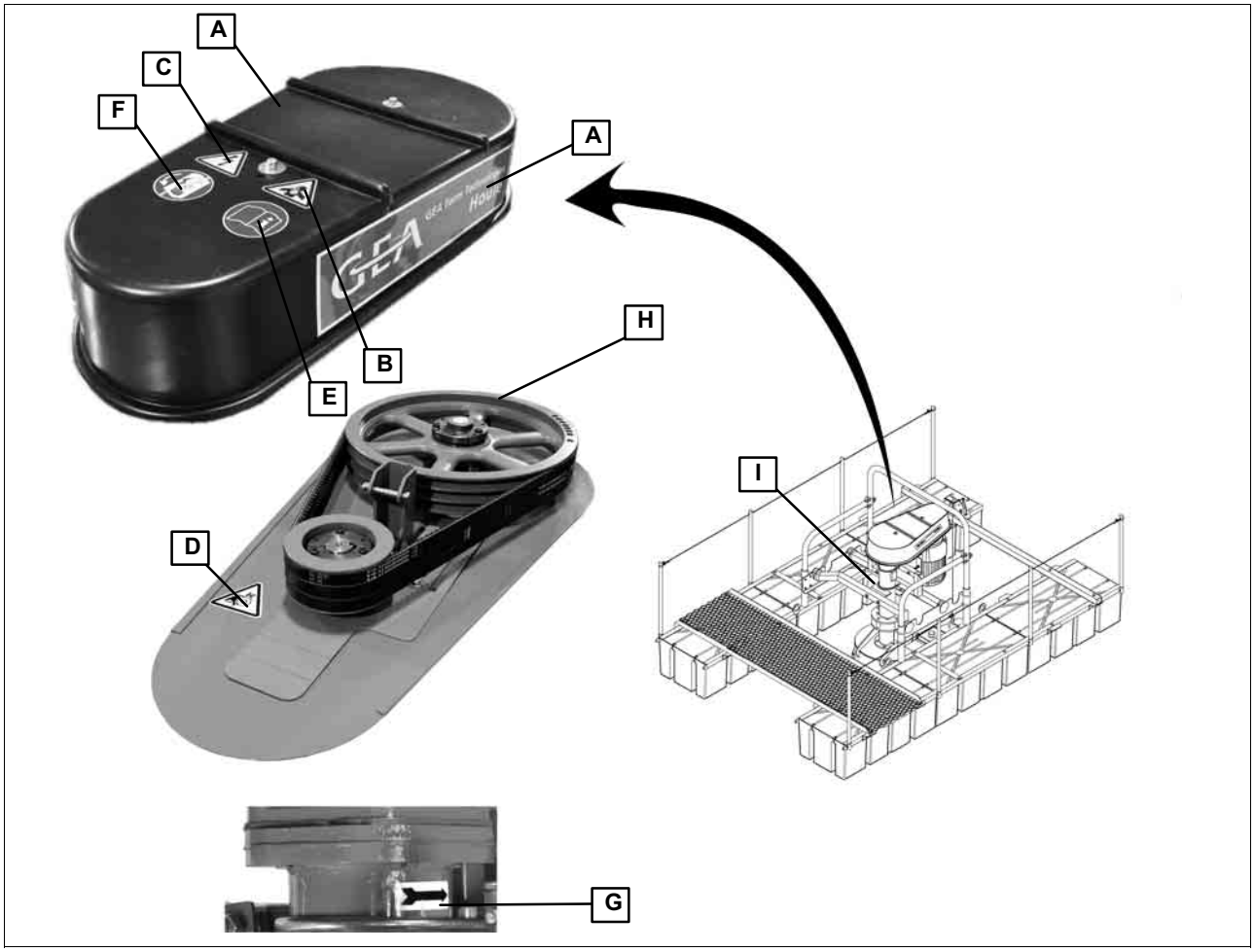
Read the section Safety.

10.3 Final decommissioning/disposal

After final decommissioning, handle all components properly and dispose of them in accordance with your valid local rules and regulations on waste disposal. Recycle if possible.

11 Appendix

11.1 Label position



A	US + EU GEA Farm Technologies Houle 2010-4700-400	**B**	US 2099-4720-010 EU 2099-4725-210	**C**	US 2099-4721-000 EU 2099-4725-240
D	US + EU 2099-4725-110	**E**	EU 2099-4725-100	**F**	EU 2099-4725-150
G	US + EU 2099-4700-390	**H**	US + EU 2099-4725-010	**I**	US + EU 2099-4701-240

US = American label / EU = European label

11.2 Pumping Head Calculation

Note!
Read the following information before calculating and filling the Pumping Head Formula.

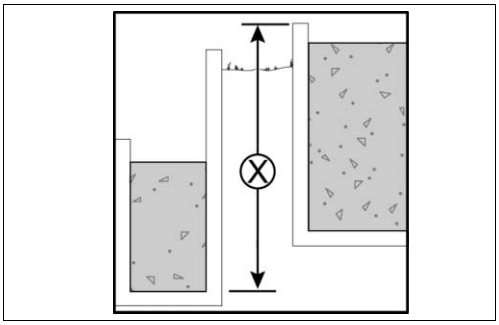
11.2.1 Transfer rate

- In SAE, the transfer rate is expressed in US GPM.
- In metric, the transfer rate is expressed in Liters per minute.

11.2.2 Elevation (X)

The elevation is the height difference between the reception pit bottom and the top of the storage pit.

- In SAE, it is expressed in feet.
- In metric, it is expressed in meters.



11.2.3 Manure consistency

The manure consistency is the viscosity of a well-agitated slurry. A test must be performed to determine the consistency of the manure.

Refer to section 11.3 - Appendix - Consistency test.

11.2.4 Friction coefficient

The friction coefficient is the force engaged between two objects. In this case, the friction occurs between the piping and the manure.

The friction coefficient changes according to the type of pipe/hose (PVC/FLEXIBLE/STEEL) and its diameter as well as the intended flow rate and the manure consistency.

11.2.5 Pipe length equivalence for elbows, adaptors and valves

To complete the total friction loss calculation, each elbow, adapter and valve must be converted into it's equivalent linear dimension of line and added to the length of line.

Components	Pipe Diameter													
	S.A.E.							METRIC						
	3”	4”	6”	8”	10”	12”	15”	75mm	100mm	150mm	200mm	250mm	300mm	350mm
45° PVC elbow	9 '	12 '	18 '	24 '	30 '	36 '	45 '	3 m	3,5 m	5,5 m	7,5 m	9 m	11 m	14 m
90° PVC elbow	9 '	32 '	48 '	64 '				7,5 m	10 m	14,5 m	19,5 m			
45° Houle * steel elbow		8 '	12 '	16 '		24 '			2,5 m	3,5 m	5 m		7,5 m	
90° Houle * steel elbow*		22 '	32 '	42 '		48 '			7 m	10 m	13 m		14,5 m	
”Y” Houle * steel						48 '							14,5 m	
Houle valve	8 '		15 '	20 '				2,5 m		4,5 m	6 m			
Flush tank adaptor *						48 '							14,5 m	
PVC adaptor 12¾” to 15”						45 '								
PVC adaptor 304,8 mm to 381 mm													14 m	

* For 12” [300 mm] GEA Houle steel components, use the Friction Loss Coefficient for PVC pipes.

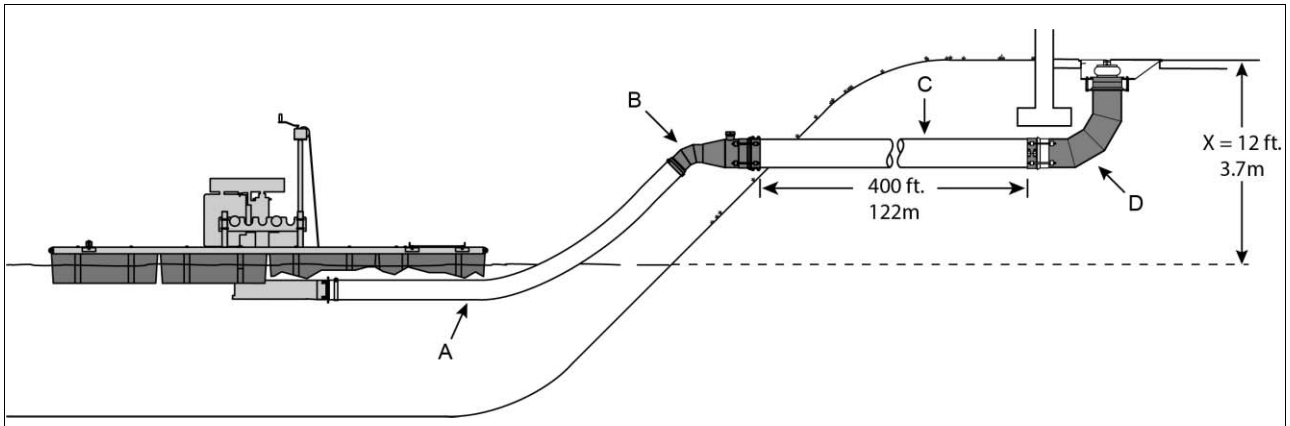
11.2.6 Friction Loss Coefficient of PVC Piping

Diametre	US Gallons per minute	Litres per minute	Liquid and manure consistency				
			Water	1/8" (3mm)	1/4" (6mm)	1/2" (12mm)	3/4" (18mm)
3" (75mm)	150	570	0.0526	0.0599	0.0710	0.1041	0.1519
	210	800	0.0980	0.1117	0.1323	0.1940	0.2832
	270	1020	0.1560	0.1778	0.2106	0.3088	0.4508
	330	1250	0.2261	0.2577	0.3052	0.4477	0.6534
4" (100mm)	200	760	0.0220	0.0251	0.0297	0.0436	0.0636
	280	1060	0.0410	0.0468	0.0554	0.0813	0.1186
	360	1360	0.0653	0.0745	0.0882	0.1294	0.1888
	440	1670	0.0947	0.1080	0.1278	0.1875	0.2737
	520	1970	0.1290	0.1470	0.1741	0.2554	0.3728
6" (150mm)	400	1510	0.0110	0.0125	0.0148	0.0218	0.0318
	500	1890	0.0166	0.0189	0.0224	0.0329	0.0480
	600	2280	0.0233	0.0265	0.0314	0.0461	0.0673
	700	2650	0.0310	0.0353	0.0418	0.0613	0.0895
8" (200mm)	500	1890	0.0041	0.0047	0.0055	0.0081	0.0118
	700	2650	0.0076	0.0087	0.0103	0.0151	0.0220
	900	3410	0.0121	0.0138	0.0164	0.0240	0.0350
	1100	4160	0.0176	0.0200	0.0237	0.0348	0.0508
10" (250mm)	800	3030	0.0033	0.0037	0.0044	0.0065	0.0095
	1100	4160	0.0059	0.0068	0.0080	0.0117	0.0171
	1400	5300	0.0093	0.0105	0.0125	0.0183	0.0267
	1700	6440	0.0133	0.0151	0.0179	0.0262	0.0383
12" (300mm)	1200	4540	0.0029	0.0033	0.0039	0.0057	0.0083
	1600	6060	0.0049	0.0056	0.0066	0.0096	0.0141
	2000	7570	0.0074	0.0084	0.0099	0.0146	0.0213
	2400	9480	0.0103	0.0118	0.0139	0.0204	0.0298
	2800	10600	0.0137	0.0156	0.0185	0.0272	0.0396
15" (350mm)	1500	5680	0.0015	0.0017	0.0020	0.0029	0.0042
	2000	7570	0.0025	0.0028	0.0033	0.0049	0.0072
	2500	9460	0.0037	0.0043	0.0051	0.0074	0.0108
	3000	11360	0.0053	0.0060	0.0071	0.0104	0.0152

11.2.7 Friction Loss Coefficient for Flexible Hoses and Steel Piping

Diametre	US Gallons per minute	Litres per minute	Liquid and manure consistency				
			Water	1/8" (3mm)	1/4" (6mm)	1/2" (12mm)	3/4" (18mm)
3" (75mm)	150	570	0.0682	0.0777	0.0920	0.1350	0.1970
	210	800	0.1271	0.1448	0.1715	0.2516	0.3672
	270	1020	0.2023	0.2306	0.2730	0.4005	0.5845
	330	1250	0.2932	0.3342	0.3958	0.5805	0.8473
4" (100mm)	200	760	0.0286	0.0326	0.0386	0.0565	0.0825
	280	1060	0.0532	0.0607	0.0718	0.1054	0.1538
	360	1360	0.0847	0.0966	0.1144	0.1677	0.2448
	440	1670	0.1228	0.1400	0.1658	0.2431	0.3549
	520	1970	0.1673	0.1907	0.2258	0.3312	0.4834
6" (150mm)	400	1510	0.0143	0.0163	0.0193	0.0282	0.0412
	500	1890	0.0215	0.0246	0.0291	0.0427	0.0623
	600	2280	0.0302	0.0344	0.0408	0.0598	0.0873
	700	2650	0.0402	0.0458	0.0542	0.0795	0.1161
	800	3030	0.0514	0.0586	0.0694	0.1018	0.1486
	900	3410	0.0639	0.0729	0.0863	0.1266	0.1848
	1000	3790	0.0777	0.0886	0.1049	0.1538	0.2245
	1100	4160	0.0927	0.1056	0.1251	0.1835	0.2678
8" (200mm)	600	2280	0.0074	0.0085	0.0100	0.0147	0.0215
	800	3030	0.0126	0.0144	0.0171	0.0250	0.0365
	1000	3790	0.0191	0.0218	0.0258	0.0378	0.0552
	1200	4540	0.0268	0.0305	0.0361	0.0530	0.0774
	1400	5300	0.0356	0.0406	0.0481	0.0705	0.1029
	1600	6060	0.0456	0.0520	0.0616	0.0903	0.1318
	1800	6810	0.0567	0.0646	0.0765	0.1123	0.1638
	2000	7570	0.0689	0.0785	0.0930	0.1364	0.1991
	2200	8330	0.0822	0.0937	0.1109	0.1627	0.2375
	2400	9480	0.0965	0.1100	0.1303	0.1911	0.2790
	2600	9840	0.1119	0.1276	0.1511	0.2216	0.3235
	2800	10600	0.1284	0.1464	0.1733	0.2542	0.3710
	3000	11360	0.1459	0.1663	0.1969	0.2888	0.4215

11.2.8 Pumping Head Formula

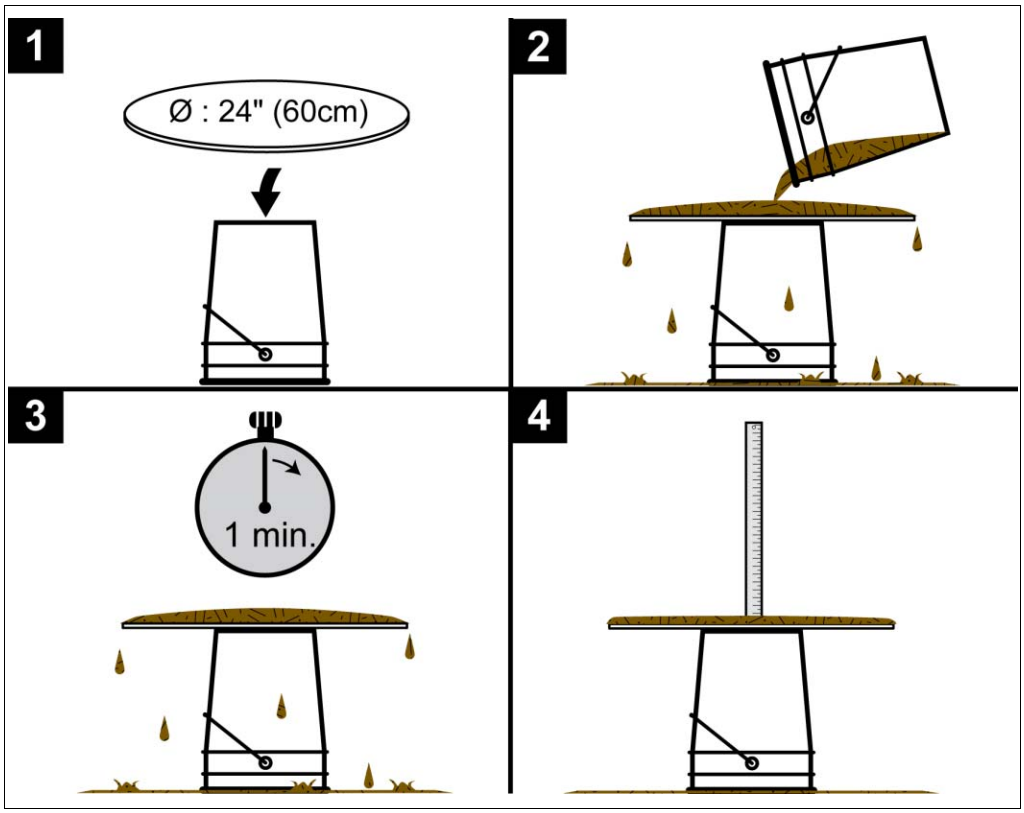


INFORMATION						FORMULA				
	1 Intended transfer rate	**2** Type of piping and material	**3** Evacuation line diameter	**4** Manure consistency		**5** Linear equivalence or pipe/hose length		**6** Friction lost coefficient		**TOTAL**
A	1200 USGPM [4550 lpm]	Hose	8” [205mm]	⅛” [3mm]		50' [15.24m]	x	0.0305	=	1.525' [0.47m]
B	1200 USGPM [4550 lpm]	45º steel elbow	8” [205mm]			16' [4.8m]	x	0.0305	=	0.488' [0.148m]
C	1200 USGPM [4550 lpm]	PVC	12” [300mm]			400' [121.9m]	x	0.0033	=	1.32' [0.40m]
D	1200 USGPM [4550 lpm]	Steel elbow	12” [300mm]			48' [14.63m]	x	0.0033	=	0.158' [0.048m]
								SUM of each total	=	3.49' [1.06m]
								ELEVATION (X)	+	12' [3.7m]
								TOTAL PUMPING HEAD of the transfer line	=	**15.50' [4.72m]**

1. Determine the intended transfer rate;
2. Specify the type of piping and material (elbow, valve, pipe, hose - PVC, steel, flexible);
3. Specify the diameter of each pipe, hose, elbow and valve;
4. Enter the manure consistency after performing a consistency test;
5. Enter the linear equivalence of each elbow and valve (refer to table 11.2.5 - Pipe length equivalence for elbows, adaptors and valves) and enter the length of each pipe and hose;
6. Find the friction lost coefficient for each component (refer to the previous tables 11.2.6 - 11.2.7).

11.3 Consistency test

GEA Houle determined the following method to verify if the viscosity of the liquid manure is suitable for this product.



1. Set a pail on a level surface and install a 24” [60cm] round plate at the center of the pail.
2. Fill a second pail with homogenized liquid manure and slowly pour it in the center of the plate until it overflows all around the plate. Remain close to the plate when pouring the liquid manure.
3. Wait one minute.
4. Measure the thickness of the liquid manure at the center of the plate to determine the consistency.

11.4 Abbreviations

Terms	Explanation	Terms	Explanation
@	at	Ø	diameter
EC	European Community	CW	clockwise
CCW	counterclockwise	fax	facsimile
I.D.	inside diameter	Inc.	Incorporated
NC	national coarse	O.D.	outside diameter
PTO	power take off	PVC	polyvinyl chloride
QC	Quebec	SAE	Society of Automotive Engineers
USA	United States of America	WWW	World Wide Web

Units	Explanation	Units	Explanation
A	ampere	kg	kilogram
AC	alternative current	kPa	kilopascal
cm	centimeter	kW	kilowatt
°	degree	km/h	kilometres per hour
°C	degree Celsius	lpm	liter per minute
°F	degree Fahrenheit	lb	pound
DC	direct current	m	meter
ft	foot	min	minute
ft-lb	foot-pound	mph	miles per hour
gal	gallon	mm	millimeter
gpm	gallons per minute	NM	newton meter
HP	horsepower	psi	pounds per square inch
hr	hour	RPM	revolutions per minute
Hz	hertz	s	second
in.	inch	v	volt

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