Cable Cross Gutter Scraper

Cross Gutter Scraper

Instruction Manual / Installation Instructions
(Original instructions)

2005-9015-003
06-2014

engineering for a better world

GEA Farm Technologies

Contents

1 Preface

1.1 Information on the instructions

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

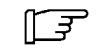
Reproductions, translations and copies of any kind, even of extracts, require written authorization from the manufacturer.

Abbreviations, units, specialist terms, special names or terminology are explained in detail in section: Appendix.

This manual is supplied with the product.

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

Pictograms used



This pictogram indicates information that will be helpful toward a better understanding of the working processes.

This symbol indicates another document or section to refer to.

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

	Language		**Language**		**Language**
-9000-	German	-9013-	Dutch	-9032-	Serbian
-9001-	English (Great Britain)	-9015-	English (America)	-9034-	Slovak
-9002-	French (France)	-9016-	Polish	-9035-	Chinese
-9003-	Italian	-9018-	Japanese	-9038-	Portuguese (Brazil)
-9004-	Romanian	-9021-	Danish	-9036-	Lithuanian
-9005-	Spanish	-9022-	Hungarian	-9039-	French (Canada)
-9007-	Swedish	-9023-	Czech	-9040-	Latvian
-9008-	Norwegian	-9024-	Finnish	-9041-	Estonian
-9009-	Russian	-9025-	Croatian	-9043-	Spanish (North 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

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4591 boul. St-Joseph
Drummondville, Qc, J2A 0C6

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

1.3 Customer service

Authorized technical dealer

If necessary, please contact your nearest authorized technical dealer.

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

www.gea-farmtechnologies.com

European contact information:

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

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@ www.gea-farmtechnologies.com

1.4 Declaration of conformity

Manufacturer:	**GEA Farm Technologies Canada Inc. / Division GEA Houle** **4591 boul. St-Joseph** **Drummondville, Qc, J2A 0C6**
Product description:	**Cross gutter cleaner**
Type of product:	**Cross gutter cleaner with cable**

The named product is in conformity with the requirements of the following European directives:

2006/42/EC Machinery Directive

Conformity with the requirements of these directives is testified by complete adherence to the following standards:

- Harmonized European standards

EN 953 (2009-07)	Safety of machinery Separating safety devices
EN 12100-1 (2009-10)	Machine safety, basic terms, general design guidelines. Part 1: Basic terminology, methods
EN 12100-2 (2009-10)	Machine safety, basic terms, general design guidelines. Part 2: Technical guidelines and specifications
EN ISO 13857 (2008-06)	Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs
EN ISO 14121-1 (2007-12)	Safety of machinery - Risk assessment - Part 1: Principles
EN ISO 14121-2 (2008-02)	Safety of machinery - Risk assessment - Part 2: Practical guidance and examples of methods
EN 60204-1 (2007-06)	Electrical equipment of machines
NF X 08-003-1 (2006-07)	Graphic and pictographic symbols - colors and safety signs

Person responsible for compiling the relevant technical documents:

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Drummondville, 09 June.2014

Yann Desrochers
(Head of Research and Development)

The undersigned is acting by virtue of power of attorney from the management of:
GEA Farm Technologies Canada Inc. / Division GEA Houle, 4591 boul. St-Joseph, Drummondville, Qc, J2A 0C6

This declaration certifies compliance with the guidelines indicated, but does not establish any guarantee in the sense of paragraphs 443, 444 of the BGB.
This declaration of conformity becomes invalid if design changes are made which affect the technical data given in the instructions and the correct use of the product, thereby significantly altering the machine!

1.5 GEA Farm Technologies Canada Inc. / Division GEA Houle - General Equipment Warranty

☞ **Important notice!**
THIS GENERAL WARANTY APPLIES TO ALL EQUIPMENT SOLD UNDER THE GEA 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, labour 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.

1.6 Specific Limited Warranty for Cable Cross Gutter Scraper

This specific limited warranty extends to the Purchaser of all free stall cleaners with cable (individually, the ”Cleaner System”) sold by the Company. All conditions stated in this specific limited warranty are in addition to the General Equipment Warranty that applies to all equipment sold by the Company (see Section 1.5 above).

1.6.1 Extent of Specific Limited Warranty

This specific limited warranty DOES NOT cover:

- Cable wear and tear and cable breaking that may arise after the installation. Warranty on cable is limited to manufacturing defects detectable at the time of installation;
- Wear and tear of wheels;
- Wear and tear of scrapers and all their components.

2 Safety

2.1 Owner's obligation of care

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

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.

In particular, the owner must ensure that:

- everyone working with or performing activities in connection with this product, including himself, read the instructions contained in this instruction manual and follow those instructions;
- everyone is regularly instructed on relevant matters.

The owner must ensure a safe environment by providing:

- this instruction manual with this product;
- adequate lighting in all areas where activities in connection with this product are performed. A minimum of 200 lux is required to ensure visibility of the equipment, the controls and the safety labels;
- all required personal safety gear such as hearing, eye, feet protection, etc. in all areas where activities in connection with this product are performed;
- supervision for inexperienced personnel working or performing activities in connection with this product;
- the tools listed in this manual to perform activities in connection with this product;
- an adequate installation of the product in order to use it only for the sole purpose for which it was designed;
- new parts to replace any defective, worn or damaged parts on this product;
- appropriate devices such as motor, engine, hydraulic unit, etc. to safely operate this product. To meet the technical requirements, refer to section: Description - Technical data;
- a product meeting the local rules and regulations.

2.2 Explanation of the safety symbols

Safety symbols draw attention to the importance of the adjacent text.

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

Safety symbols and key words

Danger!
The indication ”Danger” signals immediate danger to life or health of personnel.
Death or serious injury will 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 indication ”Attention” signals important information on risks for the product or the environment.

2.3 Basic safety instructions

2.3.1 Safety instructions

- Read and follow the instructions of this instruction manual before performing activities in connection with this product. Keep the instruction manual with this product allowing anyone to refer to it at any time.
- 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.
- Always wear 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.
- Make sure the environment is safe through all steps listed in this manual. Always be familiar with the environment surrounding the working area. Locate the elements that can be dangerous in order to avoid them. Beware of leaks and spills such as grease, oil, water, etc. which can make a surface slippery causing injuries.
- 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 and for the sole purpose for which it was designed. Do not use damaged, worn or defective parts on this product, replace immediately to avoid serious damages and injuries.
- Use only the tools listed in this manual to perform activities in connection with this product in order to avoid injuries.
- Do not stand underneath suspended loads when handling this product or parts: there is a potential risks of fall, damage and/or loss of stability. Handling can only be performed by a qualified forklift operator.
- 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 - Safety devices. Read and follow the instructions of the safety labels set on this product and make sure the safety labels are legible.
- The devices supplied by the owner to operate this product such as a motor, an engine, a hydraulic unit, etc. must meet the technical requirements indicated in section: Description - Technical data.

2.4 Personnel qualification

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 in the following activities will be specified in each section when applicable:

- Handling and installation
- Starting for the first time
- Operating
- Operating Faults
- Maintenance
- Decommissioning

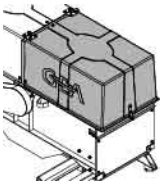
2.5 Safety devices

2.5.1 Protective safety parts

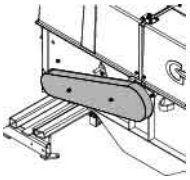
This product is equipped with safety parts protecting the user against dangerous elements.

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

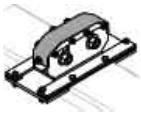
Replace if damaged, worn and/or defective. Refer to the part number.



Drive unit protective hood
SW300 (part no.2005-7600-380)
SW450 (part no.2005-7600-390)
SW650 (part no.2005-7600-390)



Chain #40 guard
SW300 (part no.2005-7700-260 and 2005-7700-270)
SW450 (part no.2005-7700-260 and 2005-7700-270)
SW650 (part no.2005-7700-550 and 2005-770-560)



Safety guard for scraper cable tensioner
(part no. 2005-2005-170)

Misrolled cable arm for drive unit
(part no.2005-7700-280)
(part no.2005-7700-140)
(part no.2005-7700-530)

Misrolled cable safety switch for drive unit
(part no.2005-2900-090)

Stroke limit switch for drive unit
(part no.2005-2900-090)

2.5.2 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.

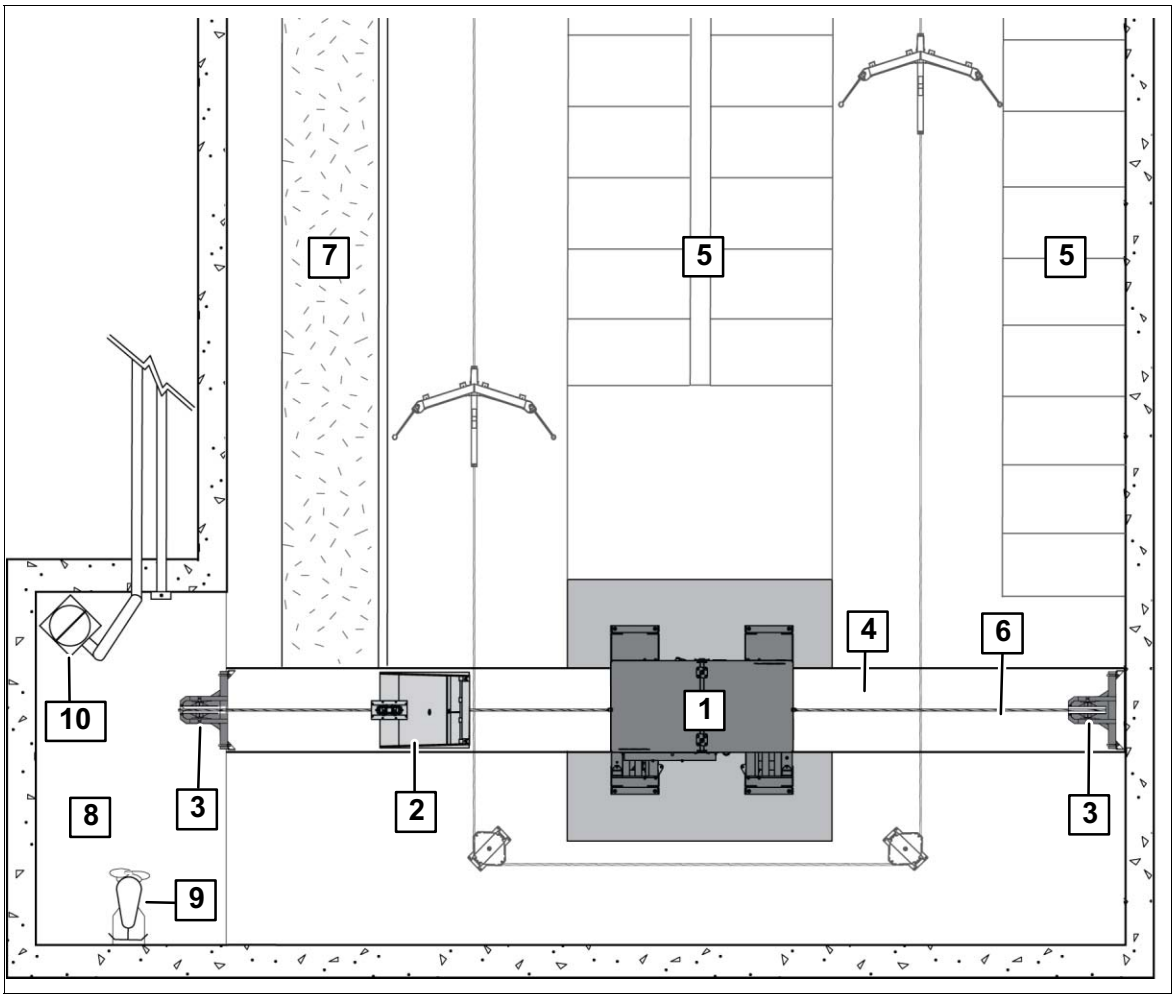
Replace when damaged. Refer to the part number for the appropriate label.

Refer to section: Appendix

3 Description (overview)

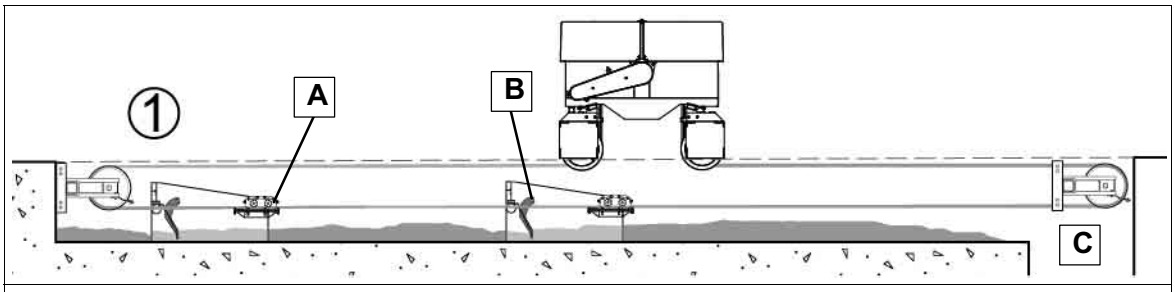
3.1 Product applications

The cable cross gutter system consists of a drive unit, gutter wheels, at least one scraper and a cable. The system is designed to pull a scraper inside a cross gutter in order to direct the manure in a reception pit or any other means of storage. The drive unit is equipped with one or two electric motors and speed reducers depending on the cleaning requirements.

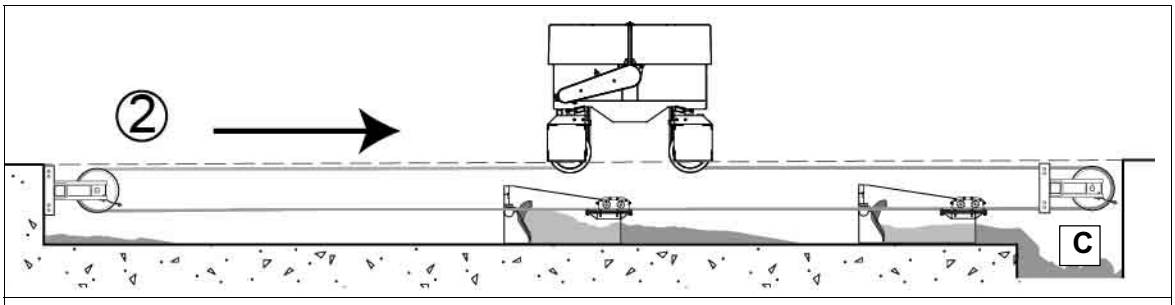


Legend:			
1	Drive unit on stands	6	Cable (nylon or steel)
2	Cross gutter scraper	7	Feeding alley
3	Gutter wheels	8	Reception pit
4	Cross gutter	9	Agitator
5	Stalls	10	Pump

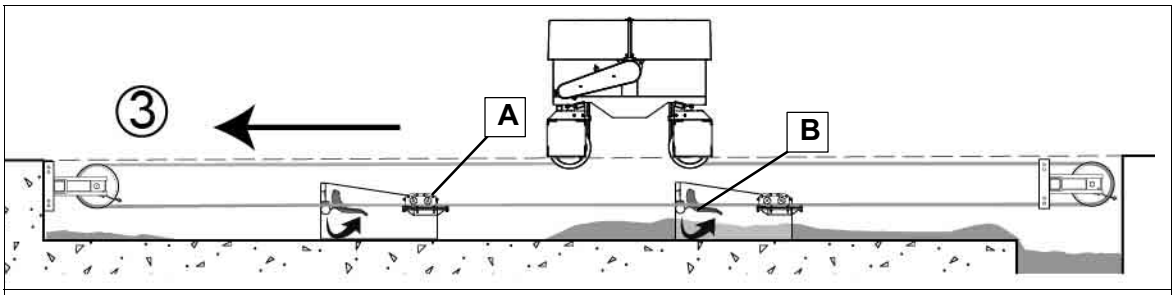
Functional description



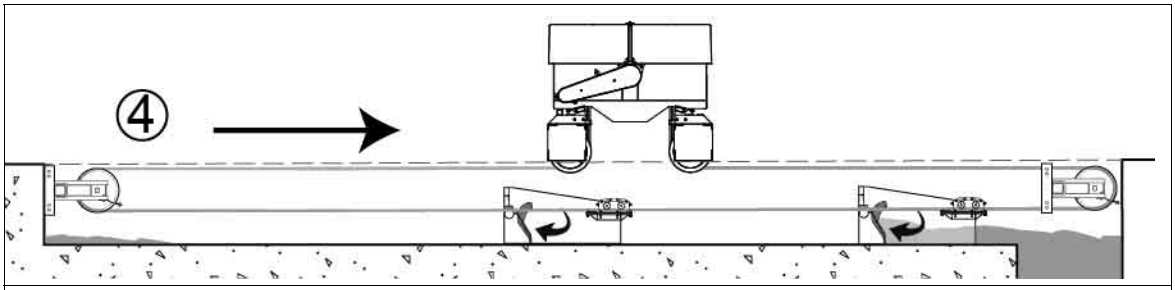
At start-up, the drive unit winds the cable on the drum. The tensioners (A) slide forward allowing the flappers (B) to close by gravity. As a result, the scrapers can push the manure toward the reception pit (C).



On every cleaning stroke, manure piles up in front of each scraper. Only the last scraper is able to forward the manure inside the reception pit (C), therefore the number of stroke is determined by the number of scrapers.



When the scraper(s) return in park position, the tensioners (A) slide backward. As a result, the flappers (B) open allowing the scrapers to backup without carrying manure.



On the final cleaning stroke, the remaining pile of manure is pushed in the reception pit by the last scraper.

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

The manufacturer is not liable for any resulting damages due to improper use of this product. The user carries the risk. Proper use also includes reading and following the instructions of this instruction manual.

- Original GEA Houle parts and accessories are specially designed for GEA Houle products and equipment.
- The manufacturer expressly points out that only original parts and original accessories supplied by GEA Houle are adapted, tested and authorized to be used with this product or equipment. Do not use other supplier's parts or equipment with GEA Houle product unless otherwise approved in writing by GEA Houle.
- The manufacturer does not accept any liability toward injured people or animals or damaged products and equipment caused by the use of other manufacturers products.

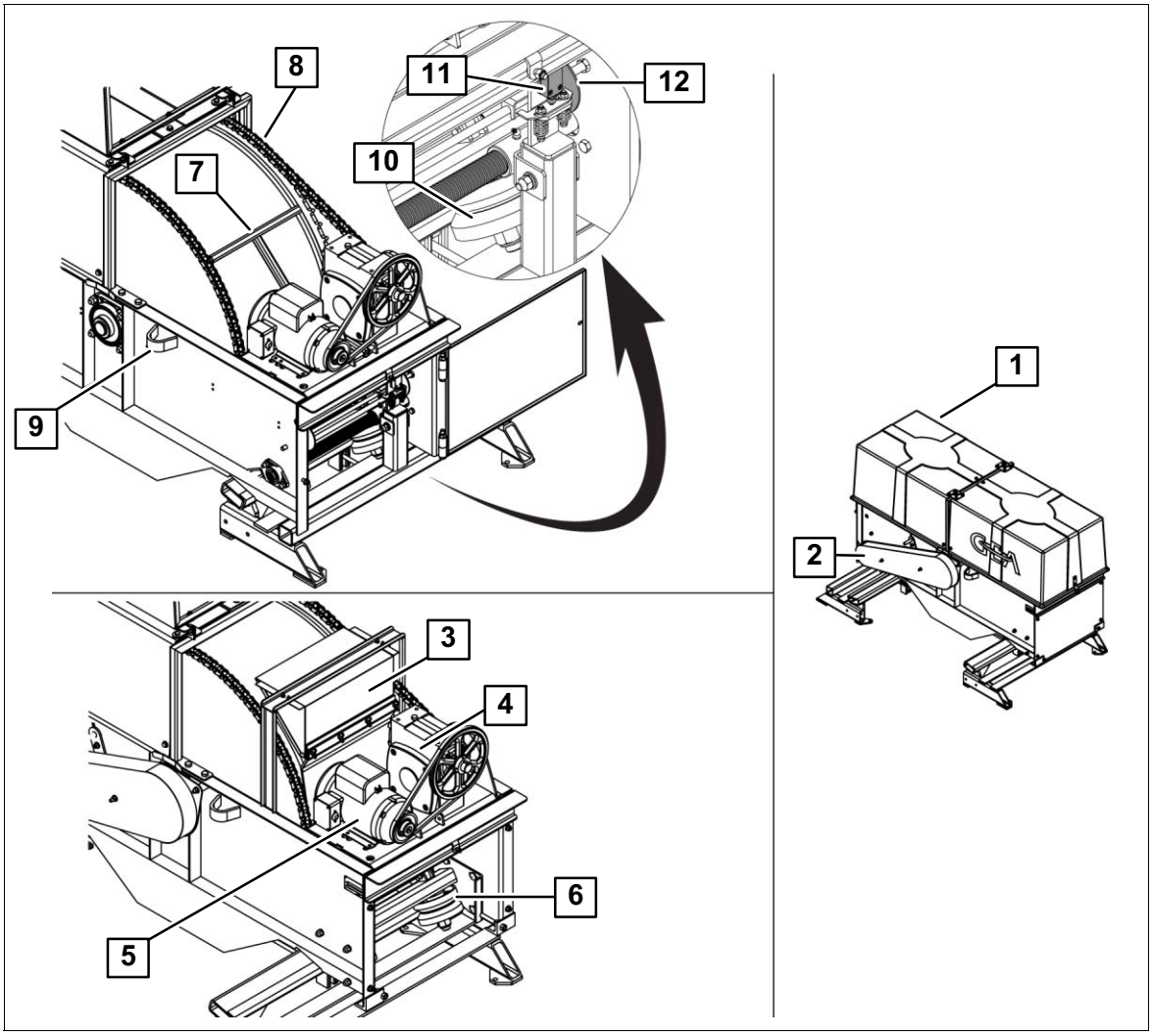
3.2 Modification made to this product

For safety reasons, do not carry out any unauthorized modification to this product!

Any modification must be approved by the manufacturer in writing prior to the change otherwise the warranty will be voided.

4 Main view

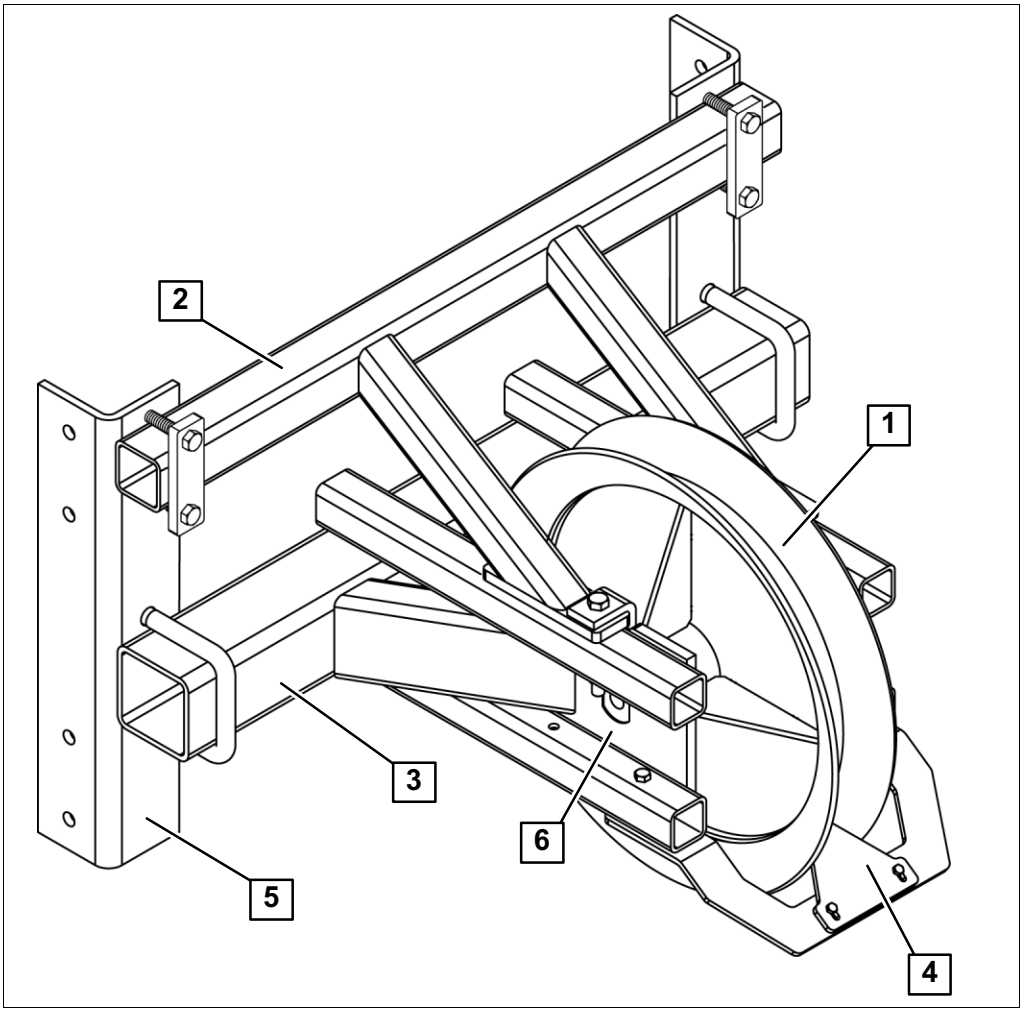
4.1 Drive unit



Legend:			
1	Protective hood	7	Misrolled cable detection arm
2	#40 chain guard	8	#80 chain
3	Cable lubricator (drive mount)	9	Lifting ring
4	Speed reducer	10	Threaded rod
5	Electric motor	11	Stroke limit switch
6	Steel roller	12	End of stroke washer

☞ **Note!**
The cable lubricators are strongly recommended for the cable free stall cleaner installed in an arid climate area. A cable requires lubrication specially when exposed to wind, heat, etc.

4.2 Gutter Wheel

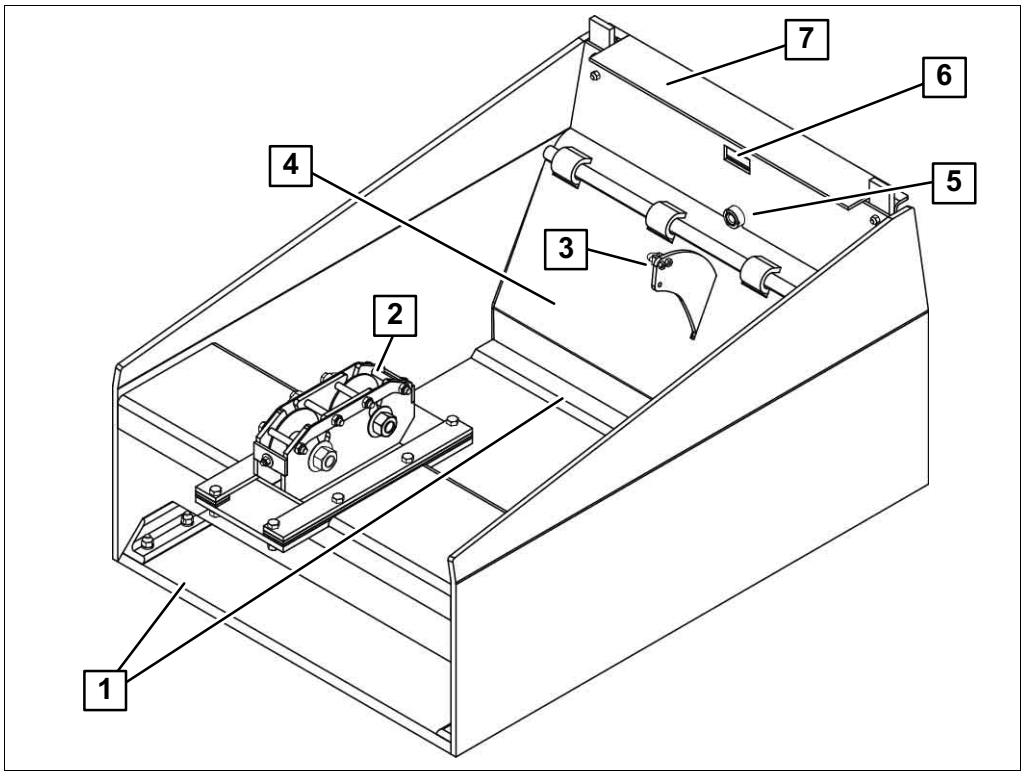


Legend:			
1	16” [406mm] Wheel	4	Wheel cleaner
*2	Strengthening support	5	Anchoring angle
3	Wheel support	6	Grease fitting

* The strengthening support is required only when using a drive unit on stands (1 wheel). The support must be installed to the gutter wheel located under the drive unit.

4.3 Cross gutter scraper

The cable cross gutter scraper is adapted for a cross gutter having 36” [914 mm] of width.

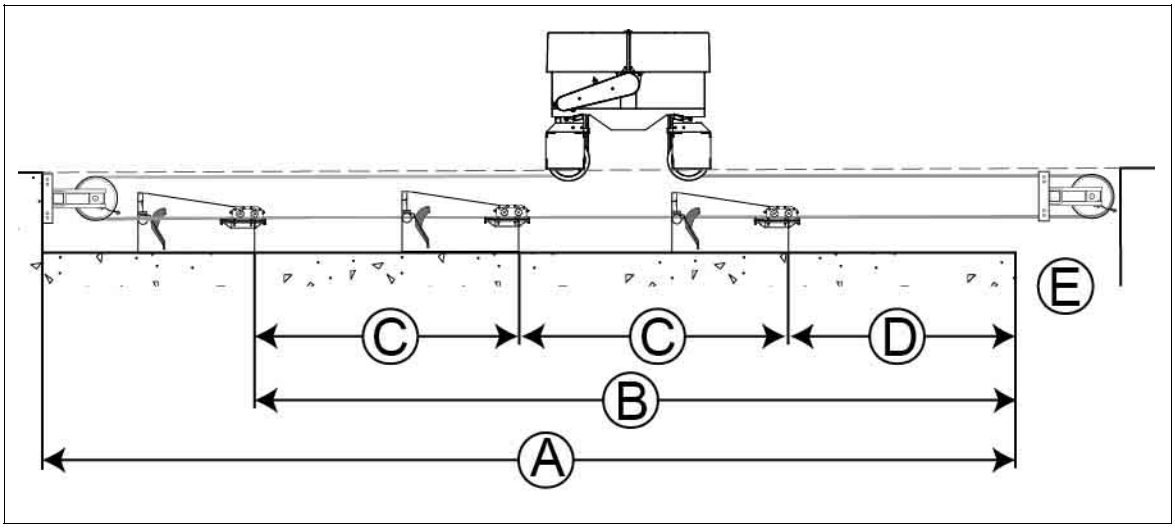


Legend:			
1	Replaceable wear plate	5	Cable guide bushing
2	Sliding tensioner	6	Opening for flapper wire
3	Flapper arm	7	Replaceable protective flat bar
4	Flapper		

5 Free stall cleaner designing guide

5.1 Technical terms and definitions

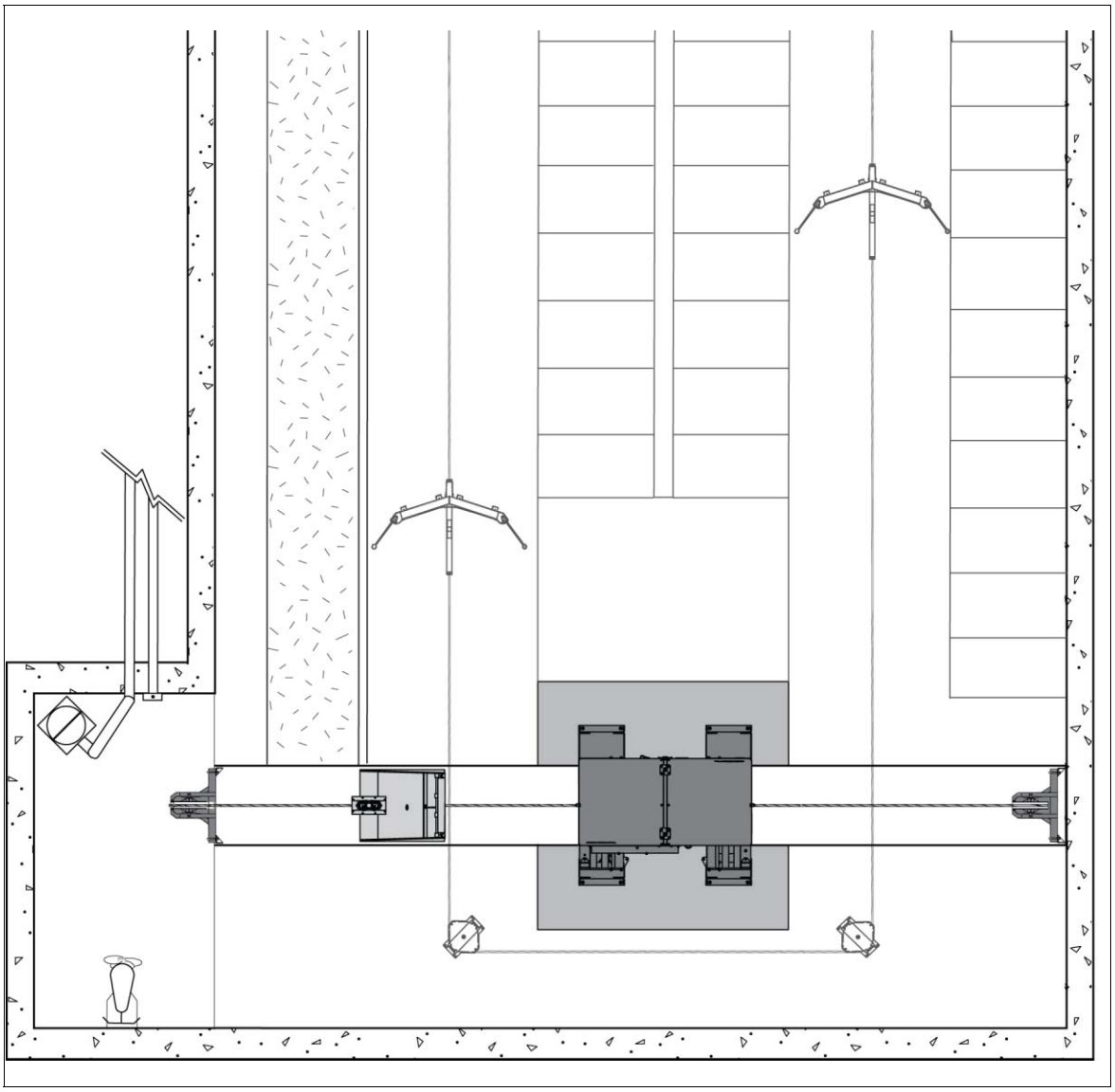
Cross gutter length (A)	Length of the gutter from one end to the other.
Cleaning zone (B)	The area cleaned by the scrapers.
Scraper spacing (C)	The scraper spacing is the distance required between each scraper.
Stroke length (D)	Distance travelled by each scraper when performing a stroke.
Drop point (E)	Site located at the end of the gutter where the manure is stocked.
Single stroke scraper configuration	Only 1 scraper cleans the entire gutter.
Shuttle stroke scrapers configuration	Several scrapers are attached together; one scraper behind the other. The first scraper carries the manure up to the end of its stroke. On the next stroke, the second scraper scoops up the manure to the end of its stroke. And so on, the manure shifts from one scraper to the other until it reaches the drop point.



5.2 Sketching the barn

Locate:

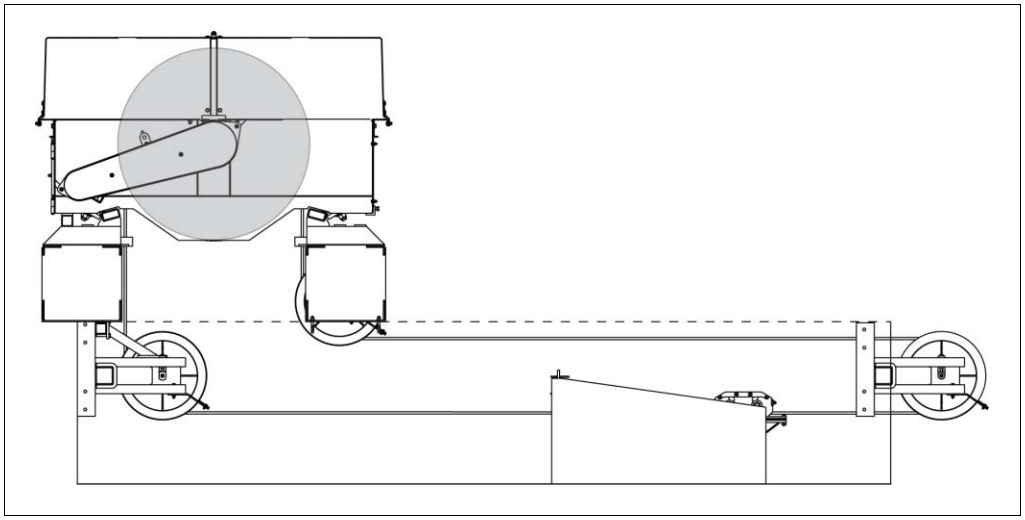
- the stalls,
- the gutter(s),
- the gutter drop point position.
- the feeding alleys,
- the alley(s),
- the drive unit.



5.3 Choosing the drive unit configuration

- Choose among the 3 following drive unit configurations.
- Make sure the space requirements are followed.

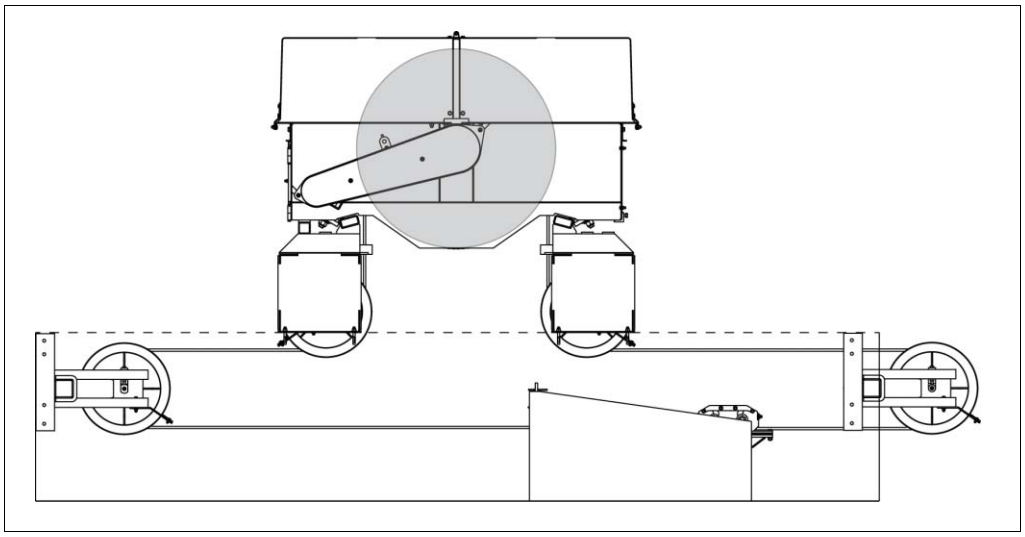
5.3.1 Drive unit on stands (1 wheel)



Features

- The drive unit on stands equipped with a single wheel can only be installed at one of the cross gutter ends over a gutter wheel.
- The drive unit must be placed over the gutter wheel to vertically align the cable to the drum of the drive unit.
- The gutter wheel under the drive unit requires a strengthening support.
- No recess required.
- One wheel is bolted under the drive unit stand to vertically align the cable to the drum.

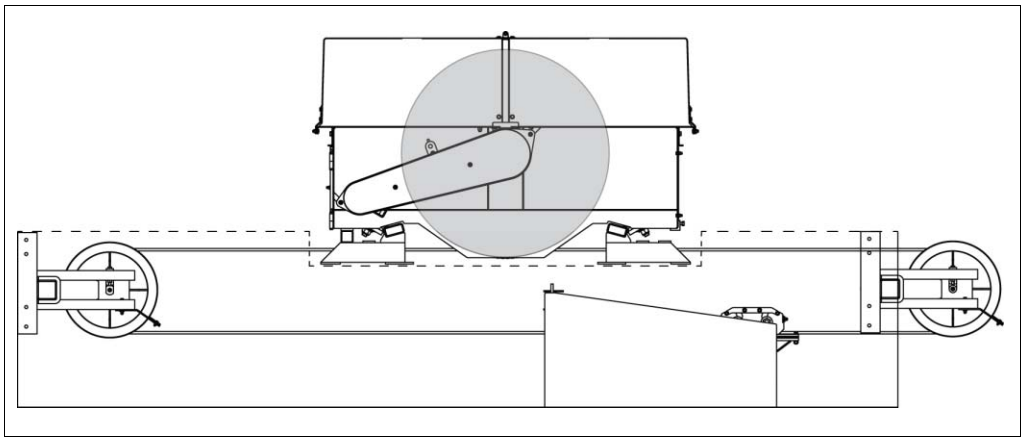
5.3.2 Drive unit on stands (2 wheels)



Features

- The drive unit on stands equipped with 2 wheels can be installed anywhere between the cross gutter wheels. It must be placed 30” [874 mm] away from the gutter wheels for clearance purposes.
- Two wheels are bolted under the drive unit stands to vertically align the cable to the drum.
- No recess required.

5.3.3 Drive unit in a recess

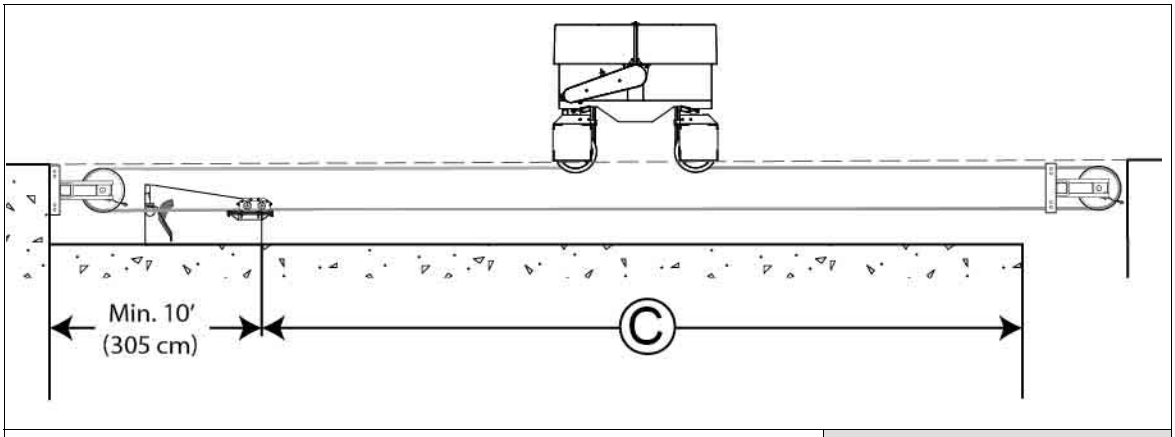


Features

- This drive unit is installed in a recess and can be placed anywhere between the cross gutter wheels. (minimum 30” [874 mm] away from any wheel).
- The recess lowers the drive unit which horizontally aligns the cable on the drive unit drum.

5.4 Estimating the number of scraper

- Determine the number of scraper required to clean the gutter. Refer to the following table.



Cross gutter length (C) 10' or more		Number of scraper
Min. length	**Max. length**	
-	120' [37 m]	1
120' [37 m]	224' [68 m]	2
224' [68 m]	330' [101 m]	3
330' [101 m]	430' [131 m]	4
430' [131 m]	540' [165 m]	5

5.5 Selecting the cable

- Choose the cable that best suits the barn configuration.

Galvanized ½”	Stainless ½”	Nylon rope 7/16”
• Economical. • Designed for long gutter.	• Better corrosion resistant. • Designed for long gutter.	• Flexible and lightweight. • Easy to handle. • Designed for gutter having less than 300' [91 m] in length. • Long life span. • Requires more monitoring during the first 6 months of operation.

5.6 Choosing the electric motor(s)

To choose the electric motor required to operate the cable cross gutter scraper, refer to the following table. Consider the number of scraper and the number of cows in the barn.

SAE				
Model	**Motor size**	**Max. scraper**	**Max. cows**	**Speed**
SW300	1 Hp	2	450	6.5 Ft/min
	1.5 Hp	2	650	9.5 Ft/min
SW300-HD (double motor and reducer)	1 Hp	5	850	12.75 Ft/min
	1.5Hp	5	1250	19.25 Ft/min

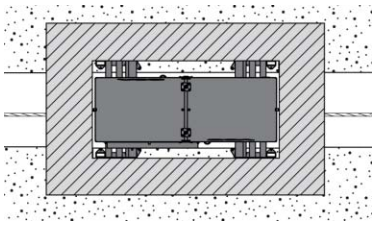
Metric				
Model	**Motor size**	**Max. scraper**	**Max. cows**	**Speed**
SW300	0.75 kW	2	450	2.15 m/min
	1.1 kW	2	650	2.84 m/min
SW300-HD (double motor and reducer)	0.75 kW	5	850	3.69 m/min
	1.1 kW	5	1250	6.14 m/min

The specifications in these charts are based on a 36” [91 cm] wide gutter having a maximum length of 540' [165 m]. The maximum stroke length is 120' [37 m].

5.7 Performing concrete work

5.7.1 Drive unit spacing

Warning!
For safety purposes, keep a clearance zone around the drive unit. Refer to section: Technical data - Drive unit geometric data. If the barn does not allow observing this requirement, the owner must restrain access to the drive unit by means of safety fences.

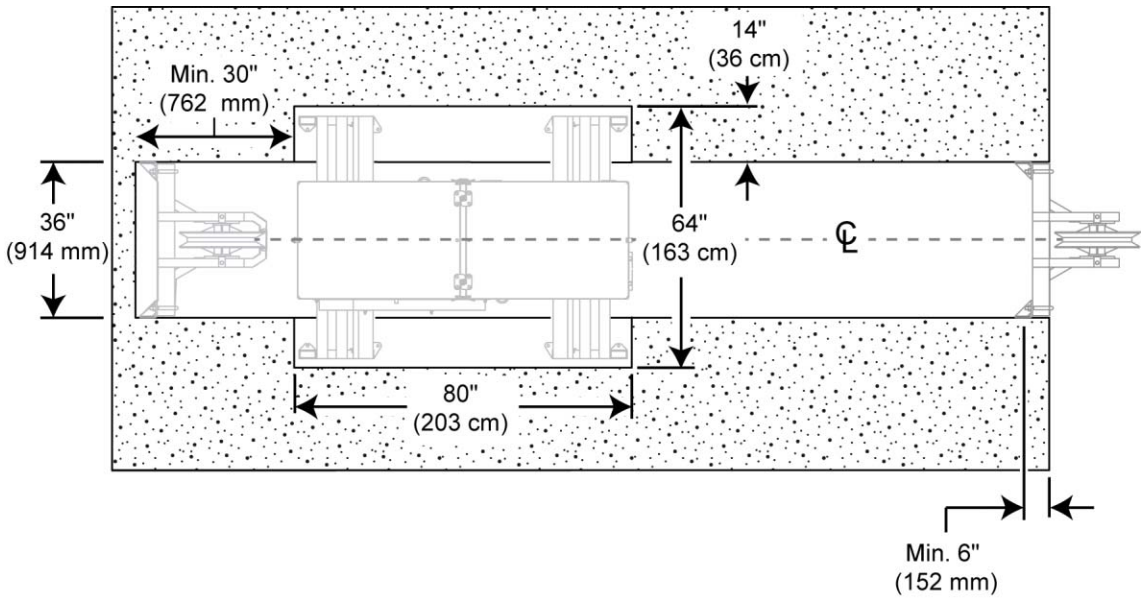


Attention!
Make sure all concrete work is levelled.

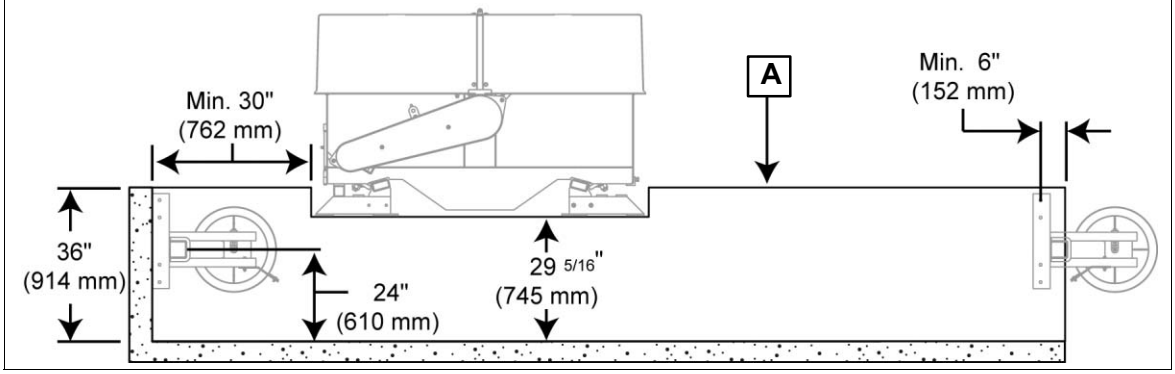
Attention!
The gutter length must not exceed 540' [165 m].

5.7.2 Drive unit in a recess

Top view



Side view

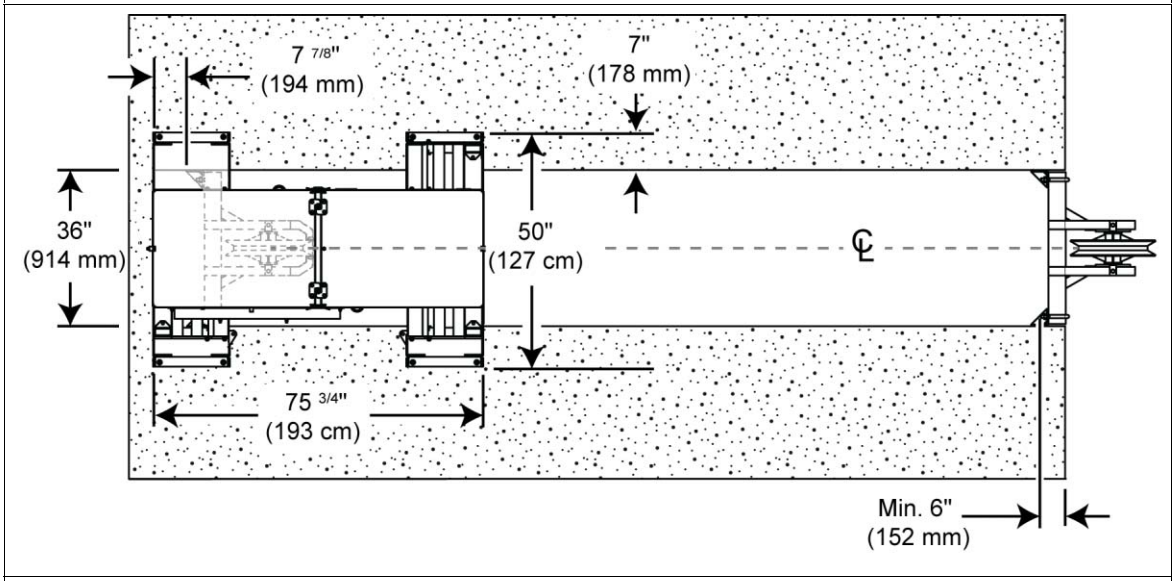


Note!
The floor level (A) represents the bottom of manure alleys level, where the free stall cleaners operate.

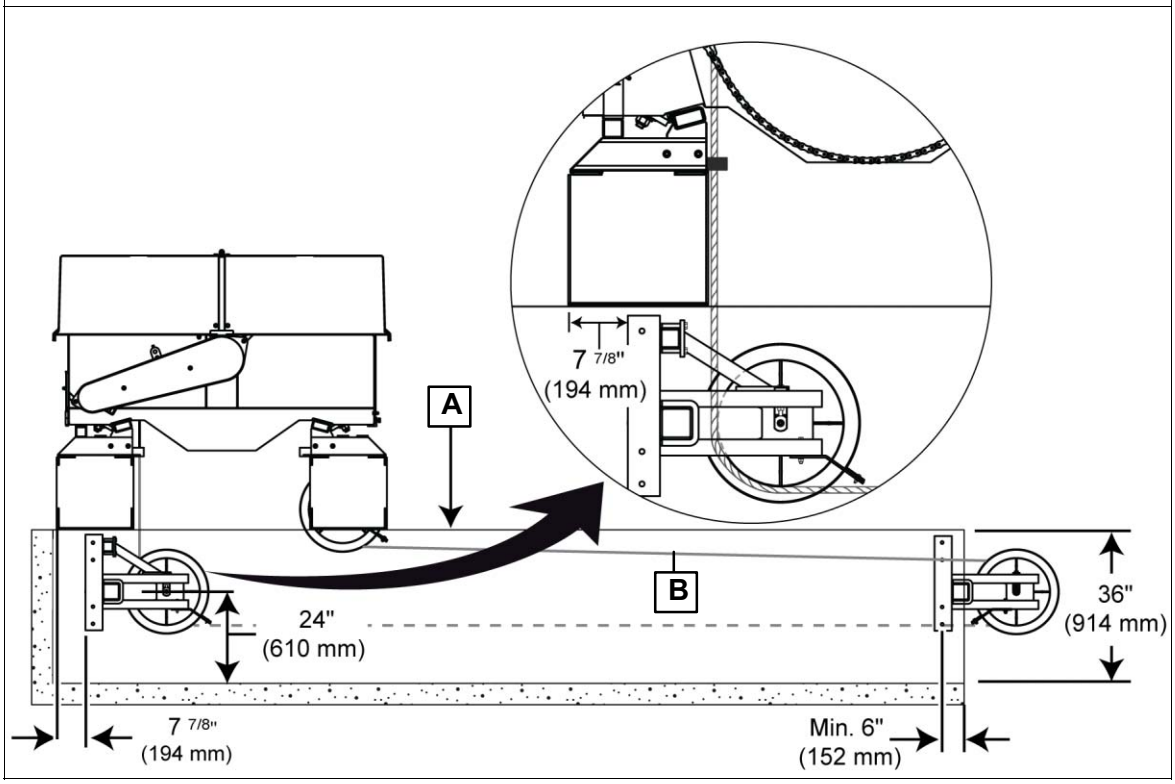
- A minimum concrete thickness of 6” [152 mm] is required for proper anchoring of the gutter wheels and the drive unit.

5.7.3 Drive unit on stands (1 wheel)

Top view



Side view

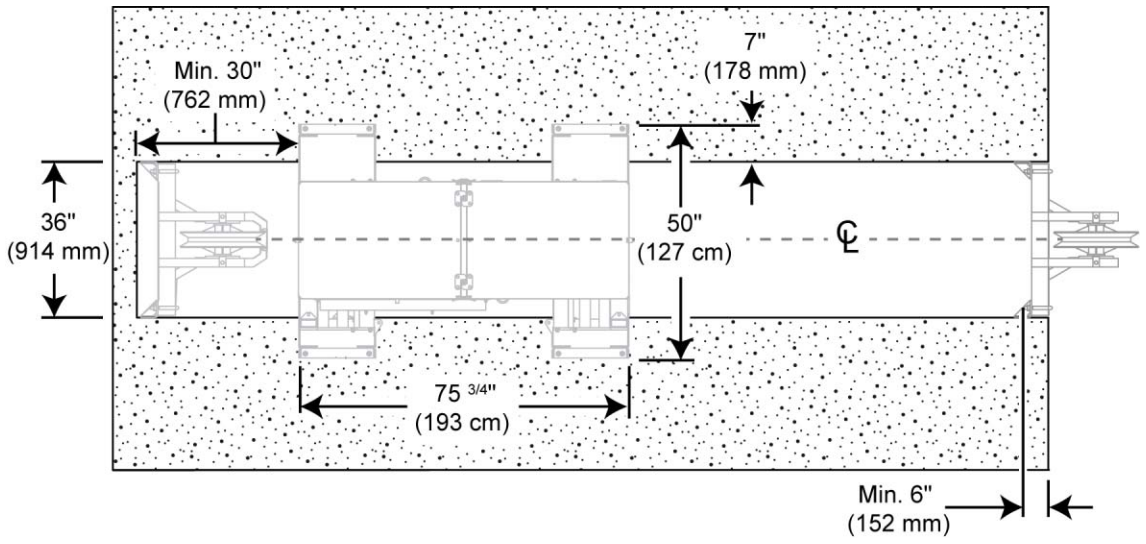


Note!
The floor level (A) represents the bottom of manure alleys level, where the free stall cleaners operate. Make sure the cable (B) does not rise above the manure alley level and come in contact with objects

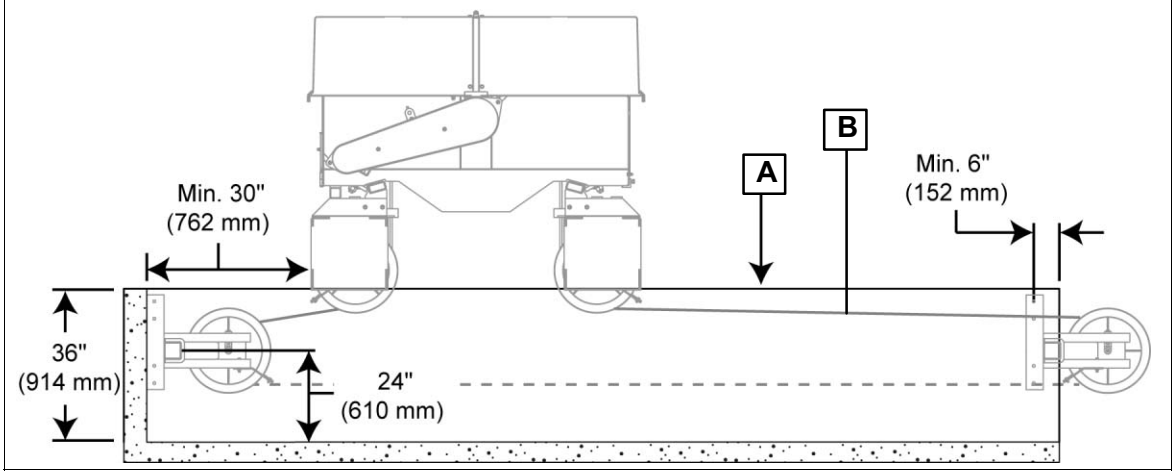
A minimum concrete thickness of 6” [152 mm] is required for proper anchoring of the gutter wheels and the drive unit.

5.7.4 Drive unit on stands (2 wheels)

Top view



Side view



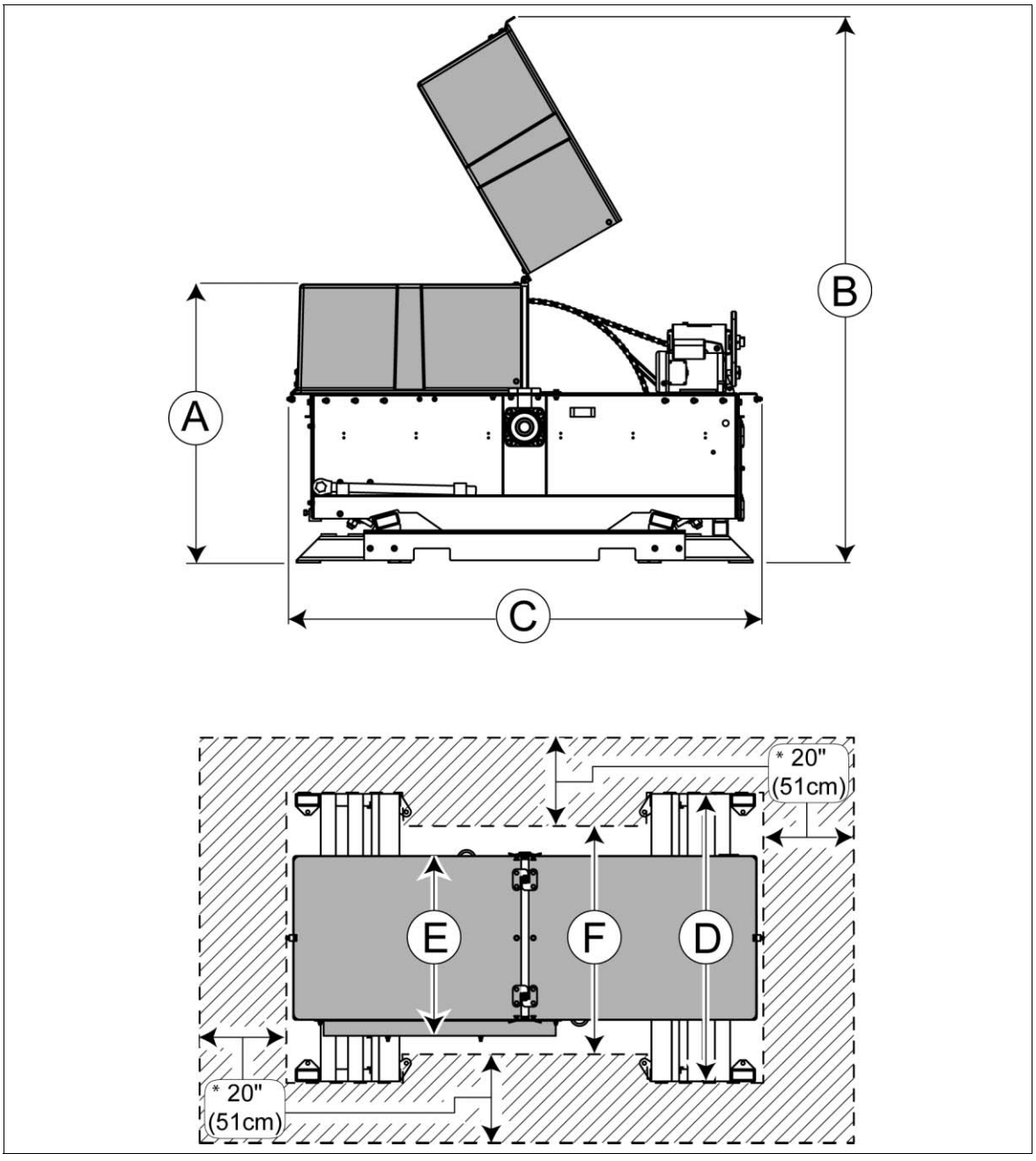
Note!
The floor level (A) represents the bottom of manure alleys level, where the free stall cleaners operate. Make sure the cable (B) does not rise above the manure alley level and come in contact with objects

A minimum concrete thickness of 6” [152 mm] is required for proper anchoring of the gutter wheels and the drive unit.

6 Technical data

6.1 Drive unit geometric data

6.1.1 Drive unit in a recess



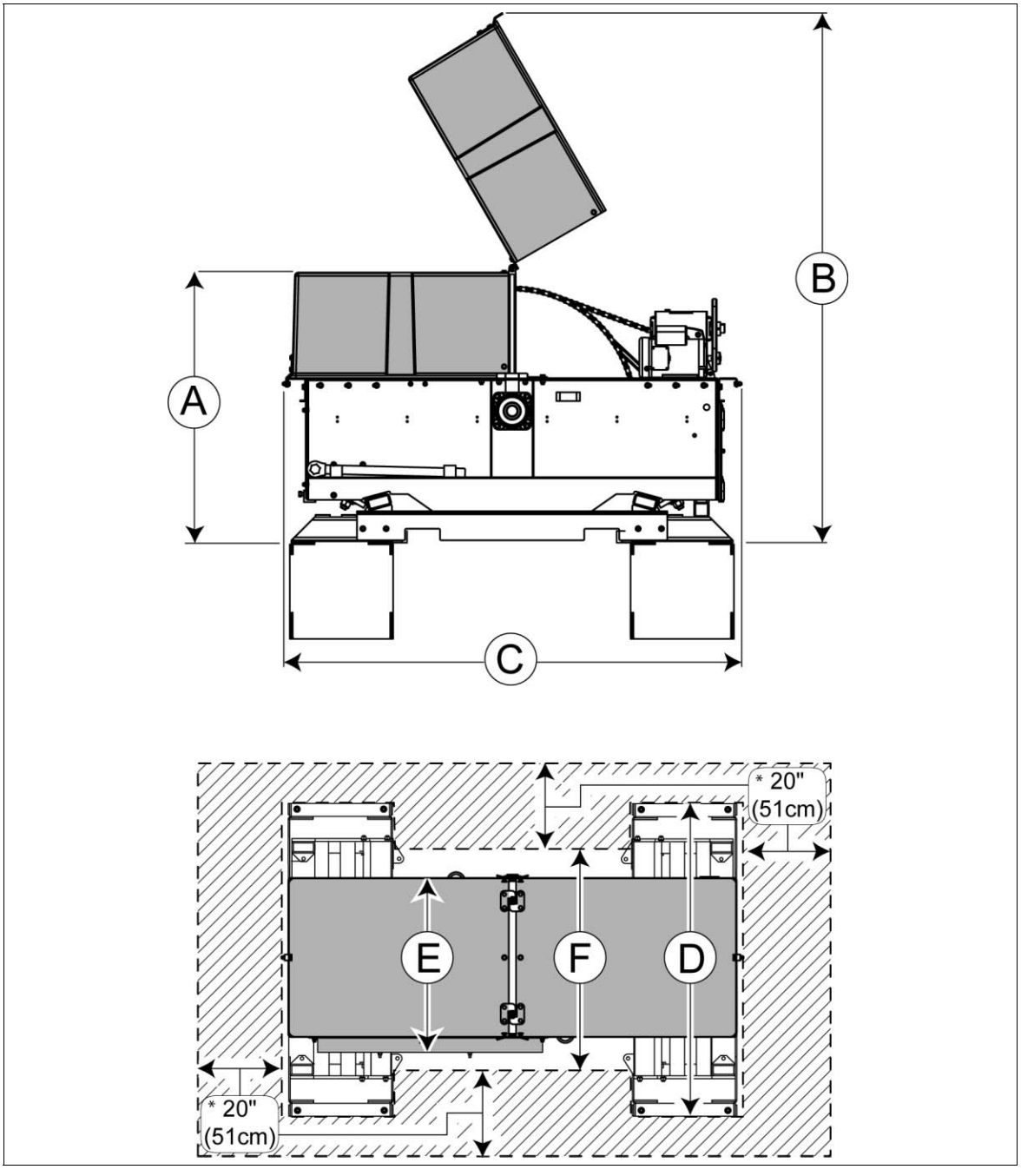
***** Safety standards require having a 20” [51 cm] clearance zone around the drive unit for safety purposes. The clearance zone must take into consideration the drive unit displacement (F). If the clearance zone cannot be respected, safety fences must be installed around the drive unit.

Model	Weight	Drum		Height		Length	Width		
							Base	Unit	Disp. (max)
		Dia.	Width	A	B	C	D	E	F (1)
SWR300	1545 lb [700 kg]	38 ¾” [99cm]	18” [46 cm]	46 ½” [118cm]	90” [229cm]	80” [203cm]	56” [142cm]	30 ⅞” [78cm]	37 ⅛” [94cm]
SWR300-HD	1765 lb [800 kg]								

1. Maximum drive unit displacement.
   The maximum displacement is reached when the drive unit uses its max. stroke. When the drive unit uses less than its max. stroke, the displacement is reduced. The SW300 series used with cross gutter cleaner(s) is limited to a maximum stroke of 120' [36.5 m]
   Use the following formula to evaluate the real displacement in order to define the 20” [51 cm] clearance zone.

Formula (SAE units)			
Model	Formula		Real displacement (in)
SWR300 SWR300-HD	Gutter scraper stroke (ft) X 6.31 ÷ 120 + 30.875”	=	

6.1.2 Drive unit on stands (1 wheel / 2 wheels)



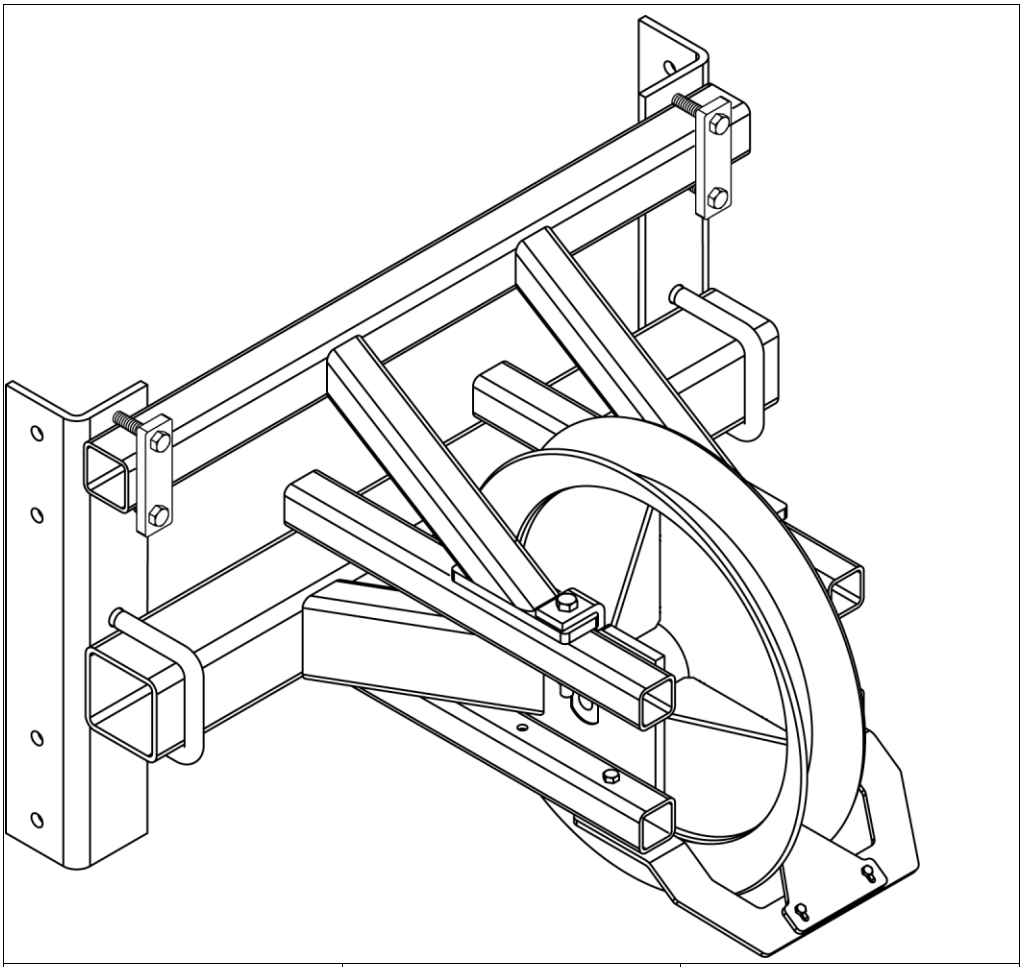
* Safety standards require having a 20” [51 cm] clearance zone around the drive unit for safety purposes. The clearance zone must take into consideration the drive unit displacement (F). If the clearance zone cannot be respected, safety fences must be installed around the drive unit.

Model	Weight	Drum		Height		Length	Width		
							Base	Unit	Disp. (max)
		Dia.	Width	A	B	C	D	E	F (1)
SWS300	1780 lb [810 kg]	38 ¾" [99cm]	18" [46 cm]	63 ¼" [160cm]	106 ¾" [271cm]	80" [203cm]	50" [127cm]	30 ⅞" [78cm]	37 ⅛" [94cm]
SWS300-HD	2005 lb [910 kg]								

1 Maximum drive unit displacement.
The maximum displacement is reached when the drive unit uses its max. stroke. When the drive unit uses less than its max. stroke, the displacement is reduced. The SW300 series used with cross gutter cleaner(s) is limited to a maximum stroke of 120' [36.5 m]
Use the following formula to evaluate the real displacement in order to define the 20" [51 cm] clearance zone.

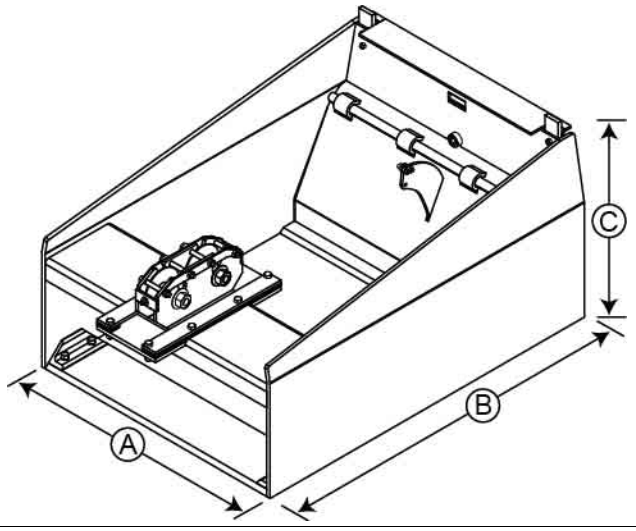
Formula (SAE units)			
Model	Formula		Real displacement (in)
SWS300 SWS300-HD	Gutter scraper stroke (ft) X 6.31 ÷ 120 + 30.875"	=	

6.2 Gutter wheel geometric data



Diameter	Width of support	Weight
15 ½” [39.4 cm]	36” [914 mm]	130 lb [59 kg]

6.3 Scraper geometric data



A	34 ½" [876 mm]
B	47 ½" [1207 mm]
C	23 3/16" [589 mm]
Weight	469 lb [212.7 kg]

6.4 Control panel requirements

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.

6.5 Electrical motor specifications

The motor used to operate the system must comply with the specifications indicated in the following table. For further information, contact your dealer.

Standard specifications	NEMA	IEC
Frame sizes required**	56H, 143T, 145T	90
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	
Isulation	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	1 HP and 1.5 HP [0.75 KW and 1.1 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 can be fitted on the motor support.

6.6 Acoustic emission

Noise level	Less than 65 dBA

6.7 Operating temperature

Operating temperature	Over 5°C [41°F]

6.8 Bolt torque chart

Note!
Refer to the bolt torque chart below unless otherwise specified in this manual.

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	6 ft-lb 8Nm	12ft-lb 16Nm	20ft-lb 27Nm	32ft-lb 44Nm	47ft-lb 64Nm	69ft-lb 94Nm	96ft-lb 130Nm	155ft-lb 210Nm	206ft-lb 279Nm	310ft-lb 420Nm
SAE 5 	MCS HT	10ft-lb 14Nm	19ft-lb 26Nm	33ft-lb 45Nm	54ft-lb 73Nm	78ft-lb 106Nm	114ft-lb 155Nm	154ft-lb 209Nm	257ft-lb 349Nm	382ft-lb 518Nm	587ft-lb 796Nm
SAE 8 	MCAS	14ft-lb 19Nm	29ft-lb 39Nm	47ft-lb 64Nm	78ft-lb 106Nm	119ft-lb 161Nm	169ft-lb 229Nm	230ft-lb 312Nm	380ft-lb 515Nm	600ft-lb 814Nm	700ft-lb 949Nm
Socket head cap screw	AS HT	16ft-lb 22Nm	33ft-lb 45Nm	54ft-lb 73Nm	84ft-lb 114Nm	125ft-lb 170Nm	180ft-lb 244Nm	250ft-lb 339Nm	400ft-lb 542Nm	640ft-lb 868Nm	970ft-lb 1315Nm

6.9 Lubricant specifications

Lubricant Type	Grades / Specifications	Purpose
All-purpose grease	Use this grade (or equivalent): ● EP2 mineral grease	● General lubrication of the equipment.
Synthetic oil	Use this brand (or equivalent): ● Petro Canada Ultima G220 ● Exxon SHC 629	● To fill the speed reducer.
High performance chain lubricant	Use this brand (or equivalent): ● Chaingang	● To lubricate the chain #40 and #80.
Biodegradable oil	Use this brand (or equivalent): ● PPG Chemil Chemlube Agri-eco 1000	● Lubricate the steel cable.

7 Handling and installation

7.1 Special qualifications required for handling and installation

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.

Welding work must be performed by a qualified welder.

Refer to section: Safety - Personnel qualifications.

7.2 Safety instructions for handling and installation

Warning!
Do not stand under suspended loads. Falling loads can cause fatal injuries!

Warning!
Close and lock the safety guards on the equipment after completing the steps included in this section.

Caution!
Wear protective boots, eye gear and gloves for all steps included in this section.

Caution!
No one stands near this product unless they are performing instructions included in this section.

Read the section: Safety.

7.3 Environmental prerequisite

- This product must be installed in a frost-free environment.
- The concrete of each alley and each cross gutter must be levelled, free from imperfections such as holes, cracks, bumps, etc.

7.4 Preparations

Attention!
Use only the tools listed in this instruction manual to handle these products.

7.4.1 Necessary documents

- Barn layout
- Electric wiring diagram

7.4.2 Handling tools

	Description	Purpose
	Fork lift truck	To lift accessories, drive unit, scraper, etc.
	Chain	To lift accessories.
	Overhead hoist or crane	To lift the drive unit.
	Chain hoist with safety chains	To lift the scraper.

7.4.3 Installation tools

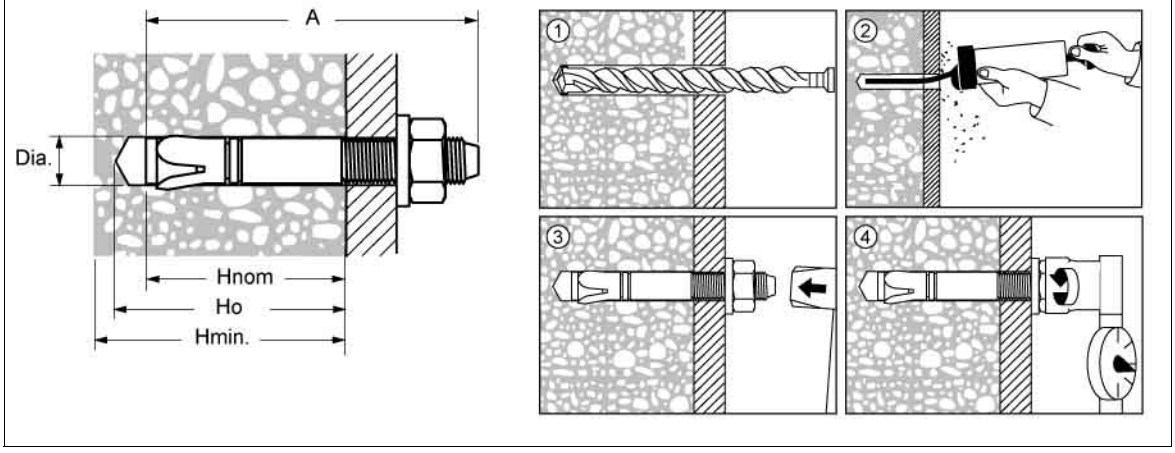
	Description	Purpose
	Wrench set	To tighten bolts.
	Ratchet tool set	To tighten bolts.
	Hammer drill	To drill holes in the concrete floor required for anchor bolts.
	Concrete drill bit	To drill holes in the concrete floor required for anchor bolts.
	Hammer	To insert anchor bolts
	Allen wrenches Pulleys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

7.5 Packing material disposal

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

7.6 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)**	Hnom + 1/4” [6mm]	Hnom + 1/4” [6mm]	Hnom + 3/8” [10mm]	Hnom + 1/4” [6mm]	Hnom + 1/4” [6mm]
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 (1).
- Remove the particles inside the holes (2).
- Insert the anchor bolts. Keep 1 ½” exceeding from the concrete surface.
- Place a washer (3) and nut on each anchor bolt. Screw the nut until it is even with the top of the bolt (3).
- Tap the anchor bolt using a hammer until it firmly secures the component.
- Tighten the assembly to appropriate torque. Refer to the following table.
- Cut the exceeding threads of the bolts when specified.

7.7 Handling

7.7.1 Handling the drive unit

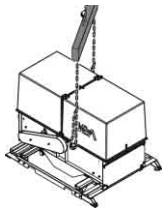
Warning!
Do not stand under suspended loads. Falling loads can cause fatal injuries!

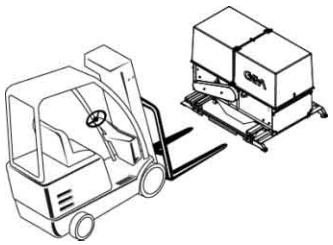
Attention!
Keep the grey lifting supports bolted to the drive unit until the drive is properly anchored on the concrete floor.

Attention!
To lift this product use a lifting device with a minimum lifting capacity of 2500 lb [1135 kg]. The lifting capacity only includes the weight of the product.

Attention!
Ensure each lifting rings of this product is in reliable condition to avoid an accidental fall causing injuries and/or damages.

Note!
If necessary, remove the safety guards from the drive unit to avoid damaging the guards.





Attention!
Before handling the equipment, protect the lifting rings with rubber or clothing material to avoid scratching the paint. This will prevent premature corrosion of the equipment.

Note!
Use safety chains to move the drive unit in a recess.

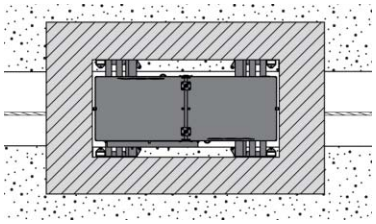
- Attach safety chains to the lifting rings located on each side of the drive unit or insert the forks of a forklift truck in the grey lifting supports.
- Move the drive unit to the installation area.
- Choose among the types of installation and follow the instructions.

7.8 Installation of the drive unit in a recess

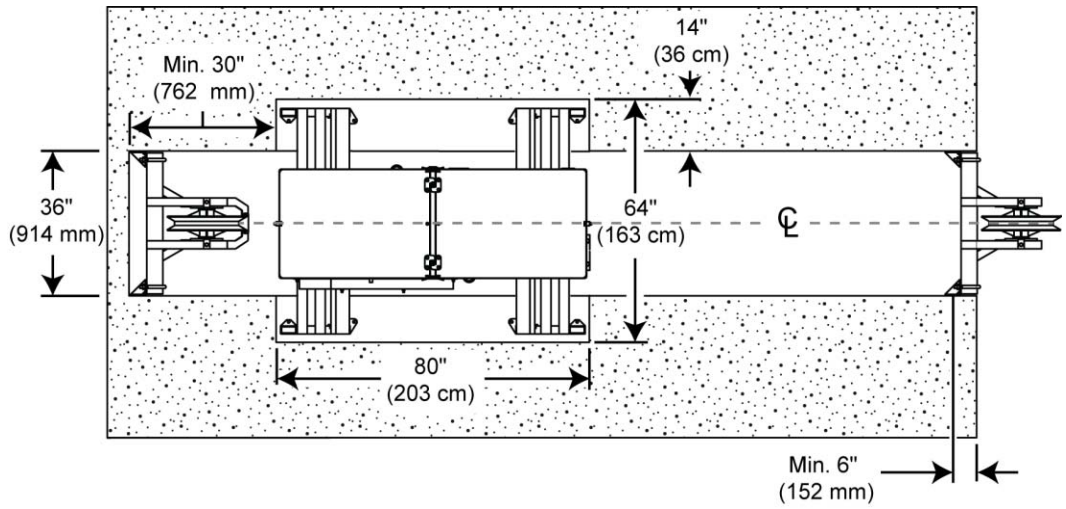
Note!
To facilitate installation, it is recommended to position the scraper(s) before positioning the drive unit. Refer to section: Handling and installation - Scraper positioning.

7.8.1 Drive unit

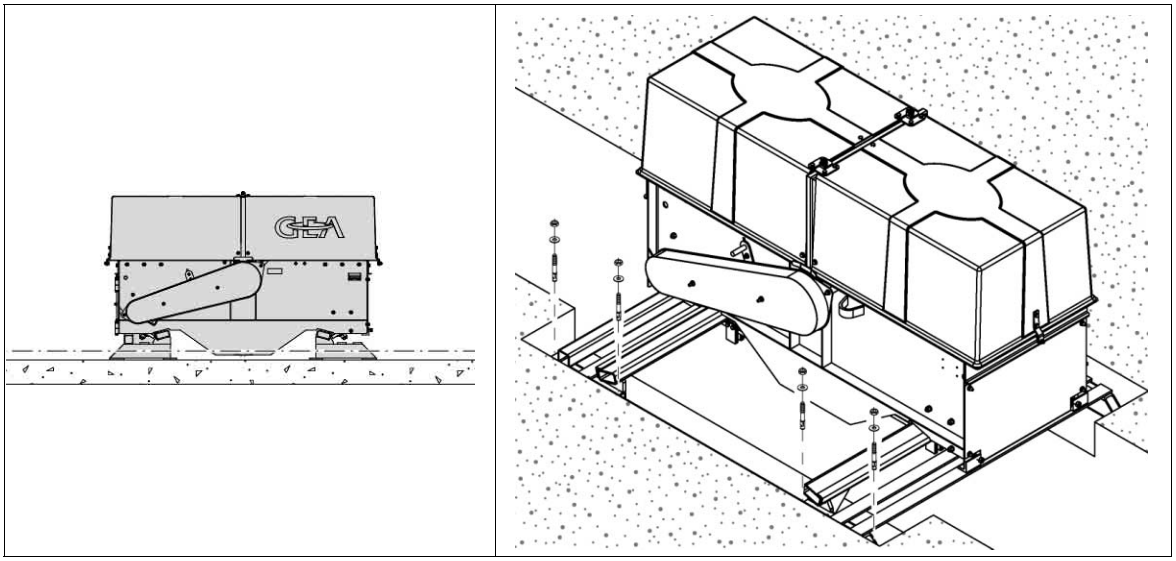
Warning!
For safety purposes, keep a clearance zone around the drive unit. Refer to section: Technical data - Drive unit geometric data. If the barn does not allow observing this requirement, the owner must restrain access to the drive unit by means of safety fences.



Top view



- Place the drive unit in the recess.
- Center the drive unit frame over the gutter, as illustrated.



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

Attention!
The drive unit must be anchored in at least 6” [152 mm] of concrete.

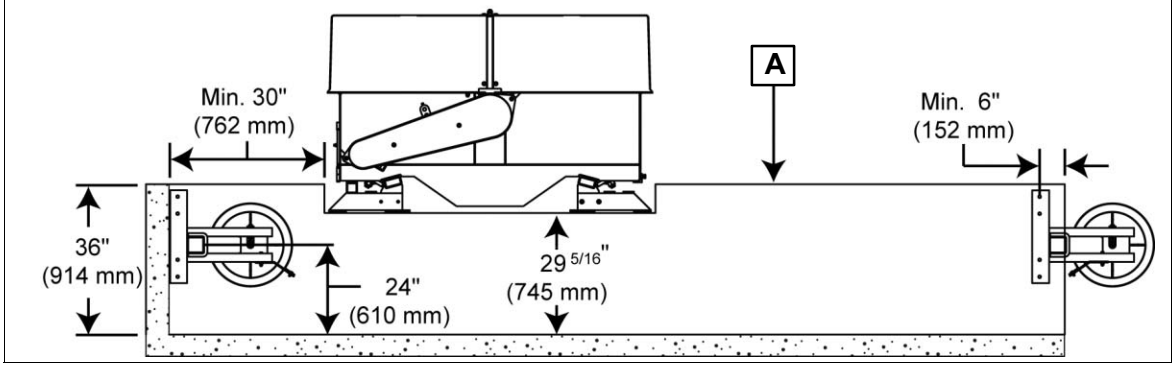
- Level the drive unit in all directions.
- Drill through the holes of the drive unit frame.
- Mount the drive unit with 8 stainless steel anchor bolts 1/2” x 3 3/4” [13 x 95mm].

Follow the anchor bolt installation procedure.

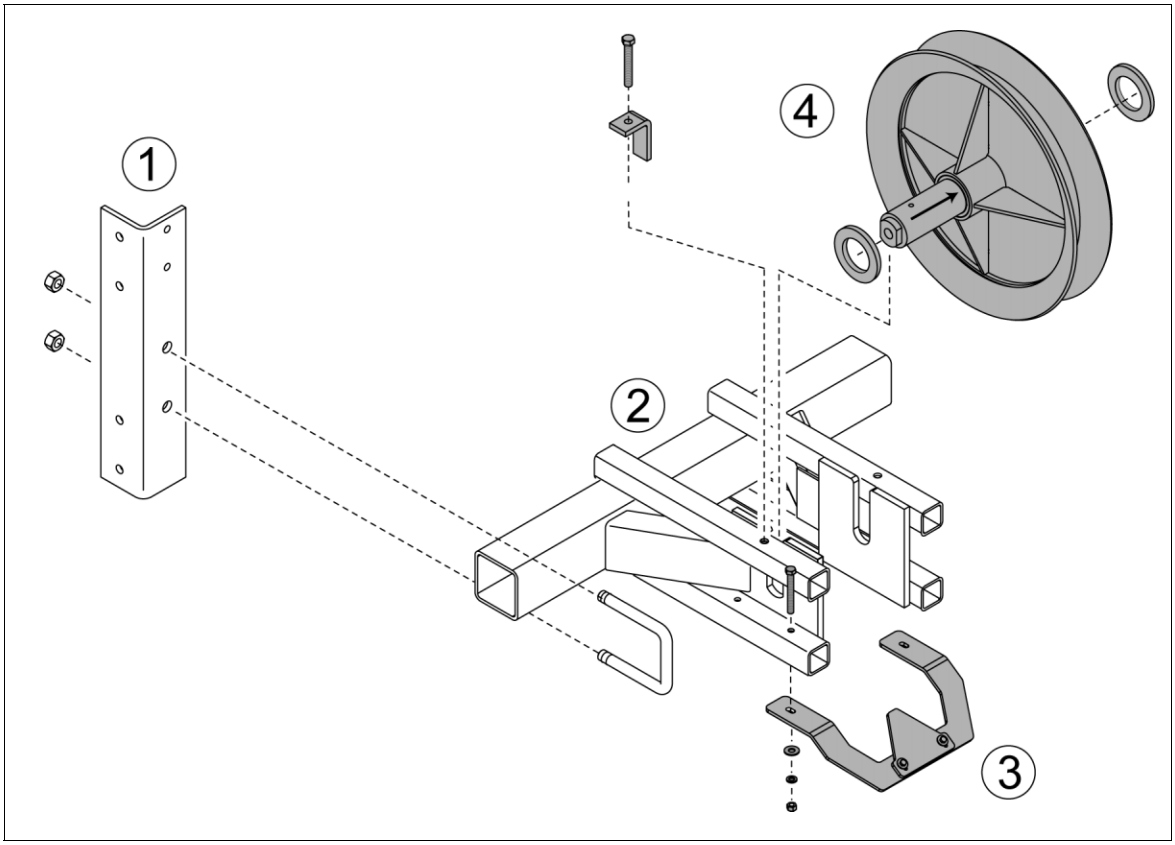
For proper torque, refer to section: Technical data - Bolt torque chart.

7.8.2 Gutter wheels

Side view



Note!
The floor (A) used as a reference in the drawings is the manure alleys level where the free stall cleaners operate.



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

Attention!
The gutter wheels must be anchored in at least 6” [152 mm] of concrete.

- Assemble parts (1) and (2), for each gutter wheel.
- Position each assembly inside the gutter, as illustrated.
  Make sure the assemblies are perfectly levelled.
- To anchor each assembly, drill through the holes of the angles.
- Mount each assembly with 8 stainless steel anchor bolts 1/2” x 3 3/4” [13 x 95mm].
- Add parts (3) and (4) to each assembly.
  Before tightening the U-bolts, align the gutter wheels to the center of the drive unit.
- Secure the position.

Follow the anchor bolt installation procedure.

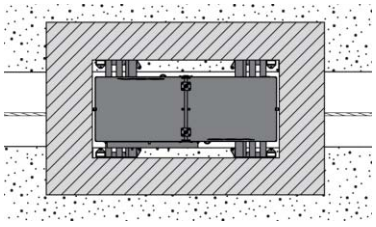
For proper torque, refer to section: Technical data - Bolt torque chart.

7.9 Installation of the drive unit on stands (1 wheel)

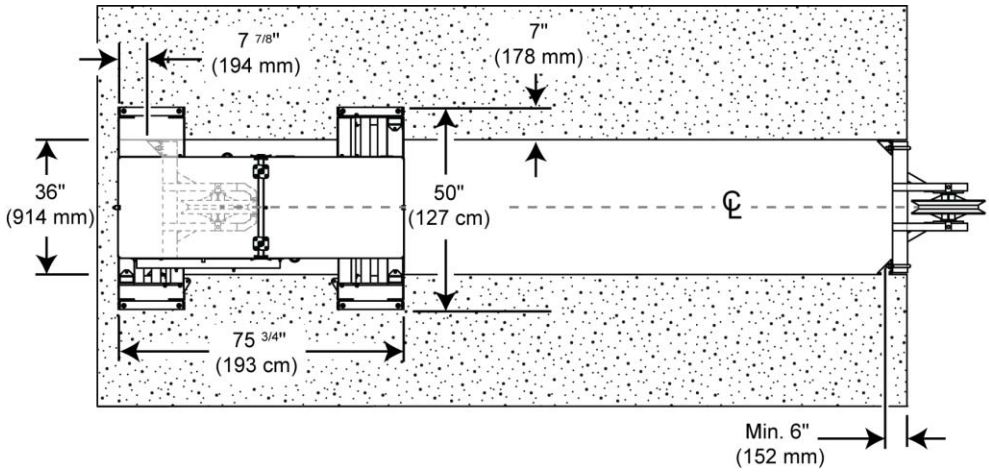
Note!
To facilitate installation, it is recommended to position the scraper(s) before positioning the drive unit. Refer to section: Handling and installation - Scraper positioning.

7.9.1 Drive unit

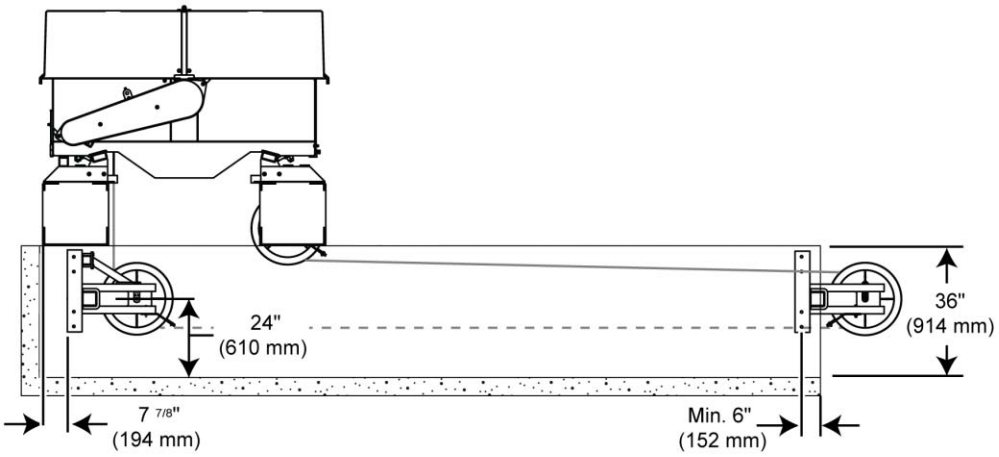
Warning!
For safety purposes, keep a clearance zone around the drive unit. Refer to section: Technical data - Drive unit geometric data. If the barn does not allow observing this requirement, the owner must restrain access to the drive unit by means of safety fences.



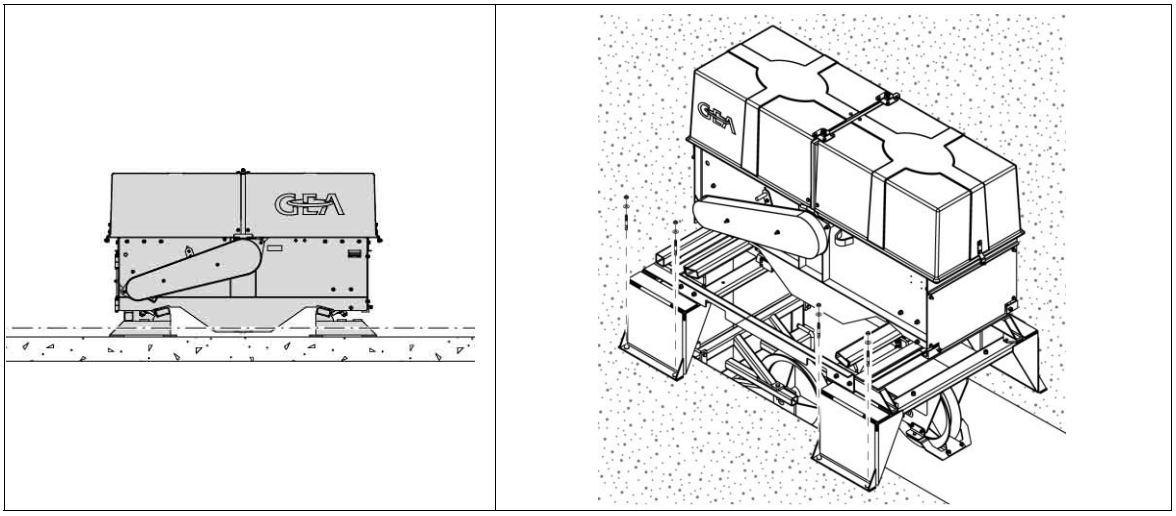
Top view



Side view



- Center widthwise the drive unit over the gutter and the gutter wheel, as illustrated.



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

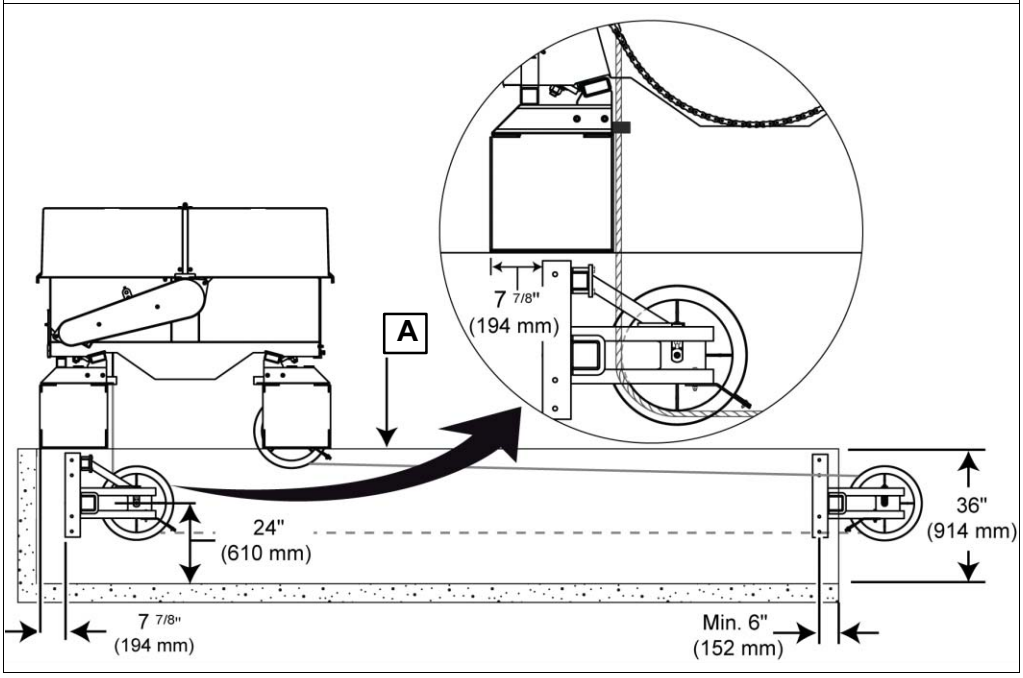
Attention!
The drive unit must be anchored in at least 6” [152 mm] of concrete.

- Level the drive unit in all directions.
- Drill through the holes of the drive unit frame.
- Mount the drive unit with 8 stainless steel anchor bolts 1/2” x 3 3/4” [13 x 95mm].

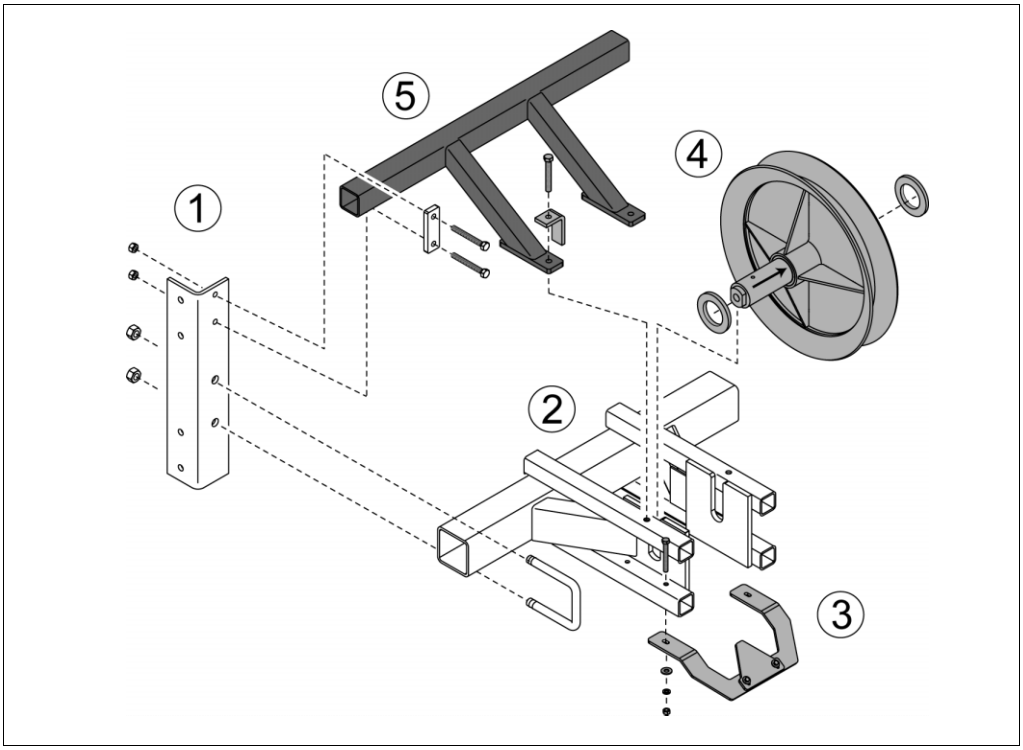
Follow the anchor bolt installation procedure.

7.9.2 Gutter wheels

Side view



Note!
The floor (A) used as a reference in the drawings is the manure alleys level where the free stall cleaners operate.



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

Attention!
The gutter wheels must be anchored in at least 6” [152 mm] of concrete.

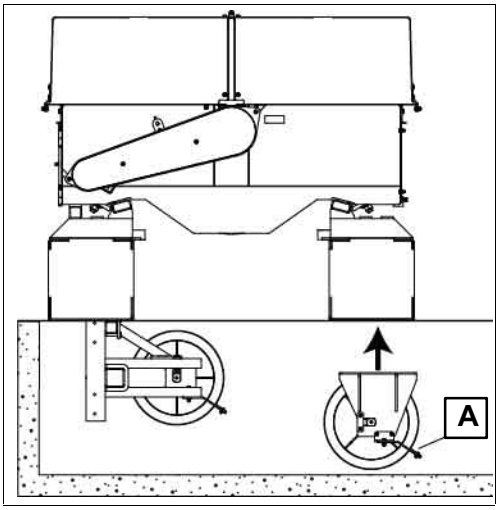
- Assemble parts (1) and (2), for each gutter wheel.
- Position each assembly inside the gutter, as illustrated.
  Make sure the assemblies are perfectly levelled.
- To anchor each assembly, drill through the holes of the angles.
- Mount each assembly with 8 stainless steel anchor bolts 1/2” x 3 3/4” [13 x 95mm].
- Assemble parts (3), (4) to each wheel assembly.
  Assemble the strengthening support support (5) to the gutter wheel located under the drive unit.
  Before tightening the U-bolts and the retaining plates, align the wheels to the center of the drive unit.
- Secure the position.

Follow the anchor bolt installation procedure.

For proper torque, refer to section: Technical data - Bolt torque chart.

7.9.3 Drive unit wheel installation

- Bolt the drive unit wheel under the frame using 4 bolts and the hardware provided. Make sure the wheel cleaner (A) faces the gutter end.

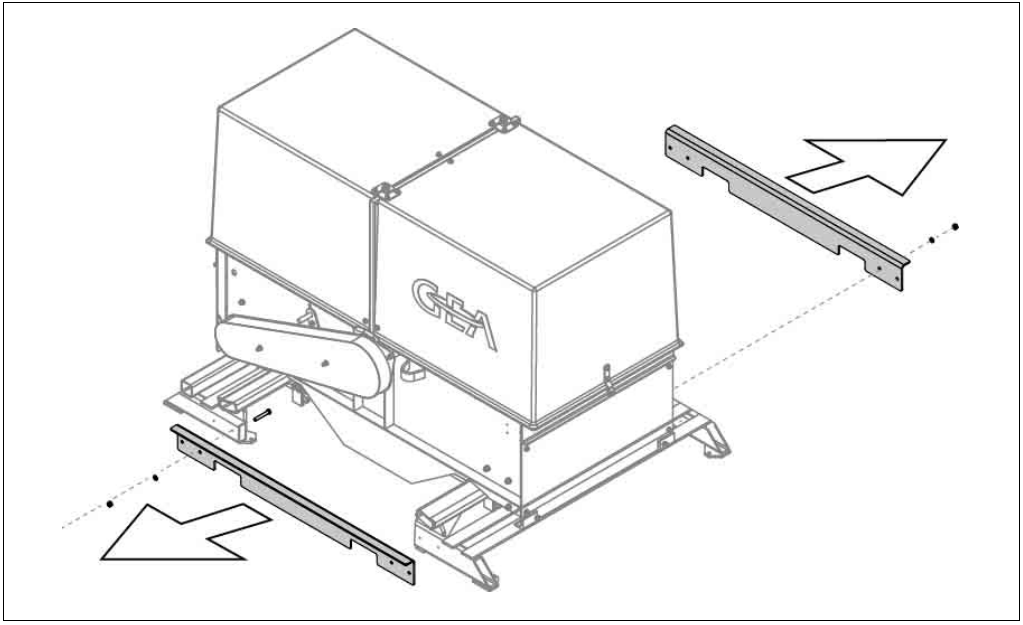


7.9.4 Removing the grey lifting supports

Warning!
Remove the grey lifting supports from the drive unit.
Omitting to remove the lifting supports exposes any person, animal and object to a risk of being crushed between the support.

- When the drive unit is anchored on the concrete floor, remove the supports, as illustrated.
- Keep and store the supports in case it requires moving the drive unit in the future.

Follow the instructions in section: Drive unit motor installation and adjustment.

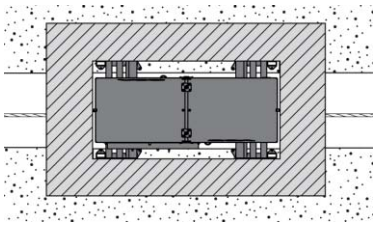


7.10 Installation of the drive unit on stands (2 wheels)

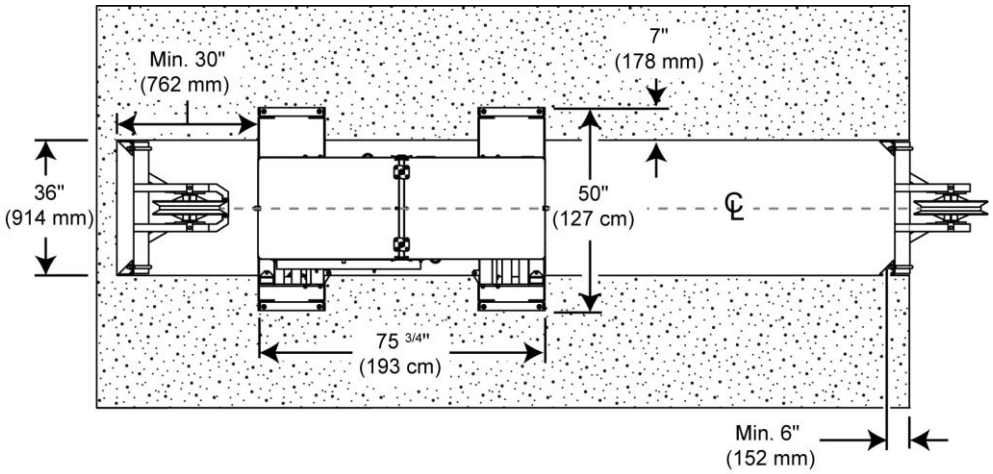
Note!
To facilitate installation, it is recommended to position the scraper(s) before positioning the drive unit. Refer to section: Handling and installation - Scraper positioning.

7.10.1 Drive unit

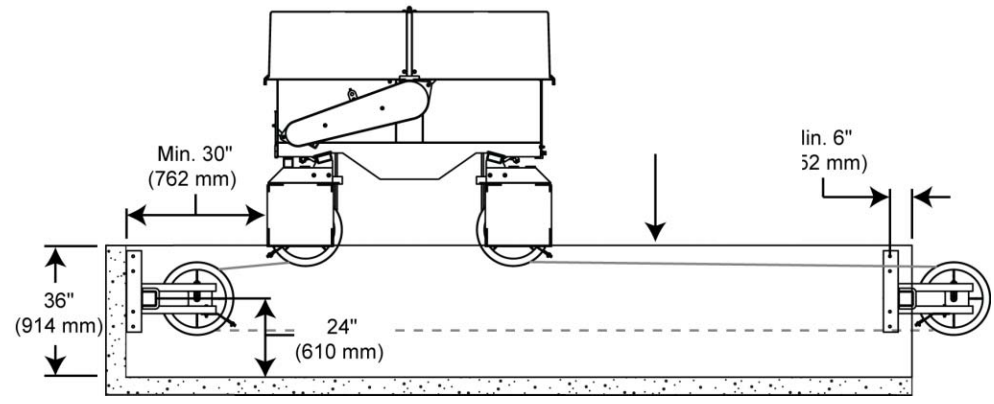
Warning!
For safety purposes, keep a clearance zone around the drive unit. Refer to section: Technical data - Drive unit geometric data. If the barn does not allow observing this requirement, the owner must restrain access to the drive unit by means of safety fences.



Top view



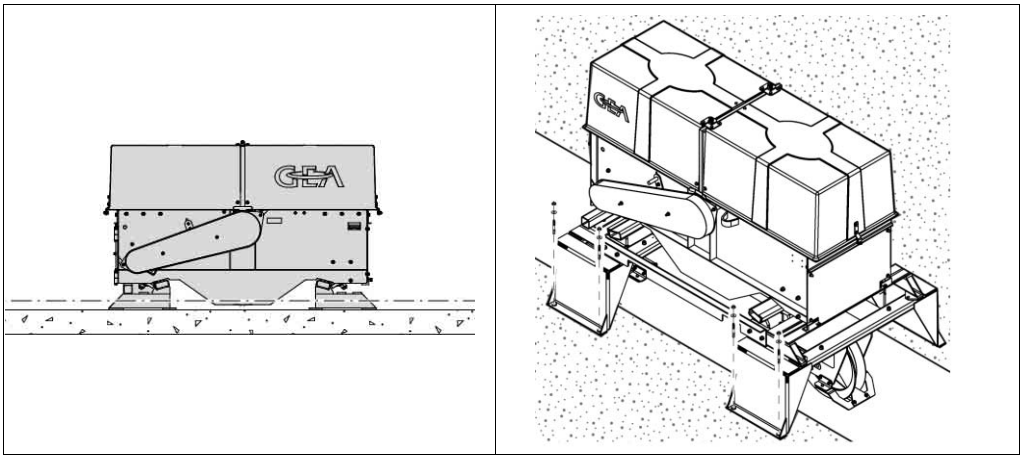
Side view



- Center widthwise the drive unit over the gutter and the gutter wheel, as illustrated.

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

Attention!
The drive unit must be anchored in at least 6” [152 mm] of concrete.

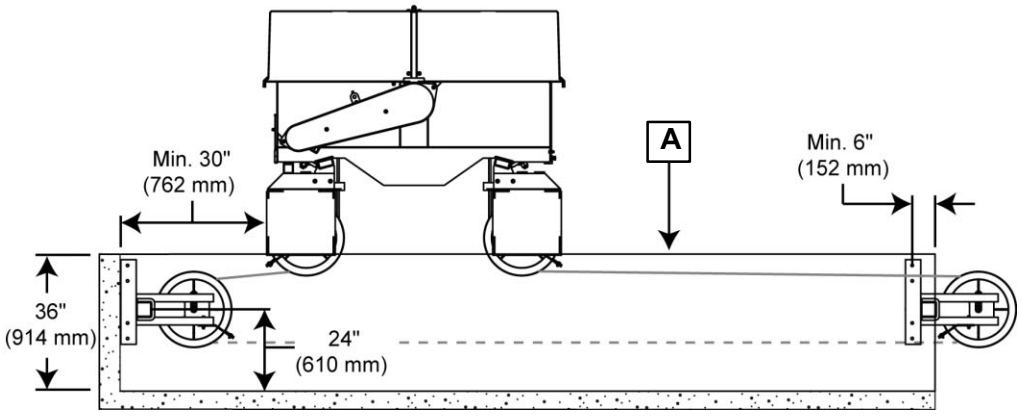


- Level the drive unit in all directions.
- Drill through the holes of the drive unit frame.
- Mount the drive unit with 8 stainless steel anchor bolts 1/2” x 3 3/4” [13 x 95mm].

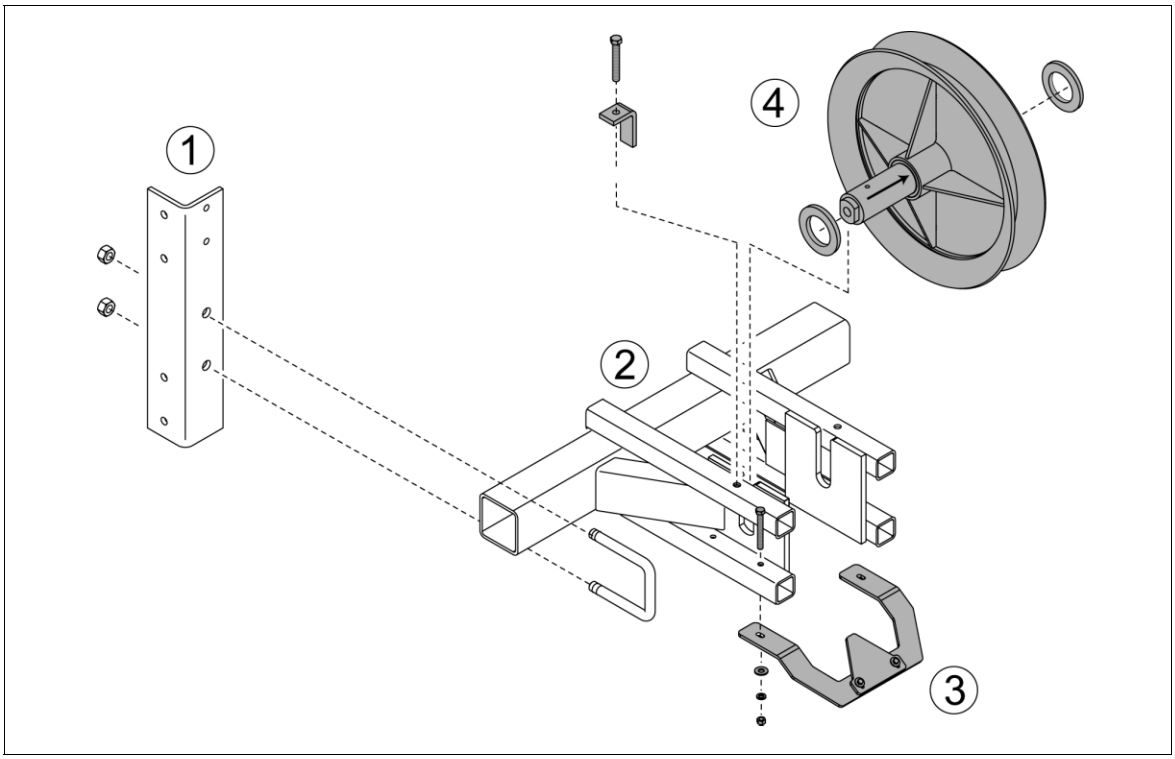
Follow the anchor bolt installation procedure.

7.10.2 Gutter wheels

Side view



Note!
The floor (A) used as a reference in the drawings is the manure alleys level where the free stall cleaners operate.



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

Attention!
The gutter wheels must be anchored in at least 6” [152 mm] of concrete.

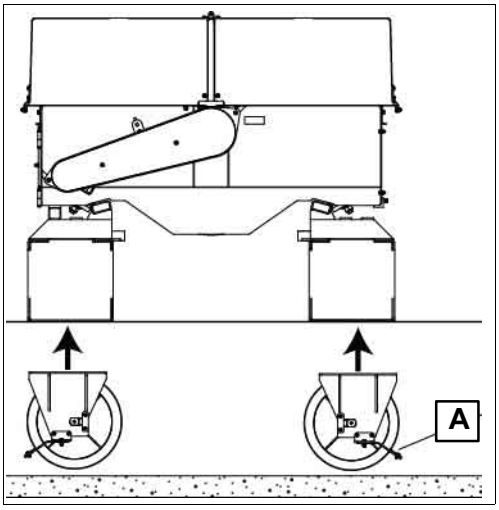
- Assemble parts (1) and (2), for each gutter wheel.
- Position each assembly inside the gutter, as illustrated.
  Make sure the assemblies are perfectly levelled.
- To anchor each assembly, drill through the holes of the angles.
- Mount each assembly with 8 stainless steel anchor bolts 1/2” x 3 3/4” [13 x 95mm].
- Add parts (3) and (4) to each assembly.
  Before tightening the U-bolts, align the gutter wheels to the center of the drive unit.
- Secure the position.

Follow the anchor bolt installation procedure.

For proper torque, refer to section: Technical data - Bolt torque chart.

7.10.3 Drive unit wheel installation

- Bolt the drive unit wheels under the frame using 8 bolts and the hardware provided. Make sure the wheel cleaners (A) faces the gutter ends.

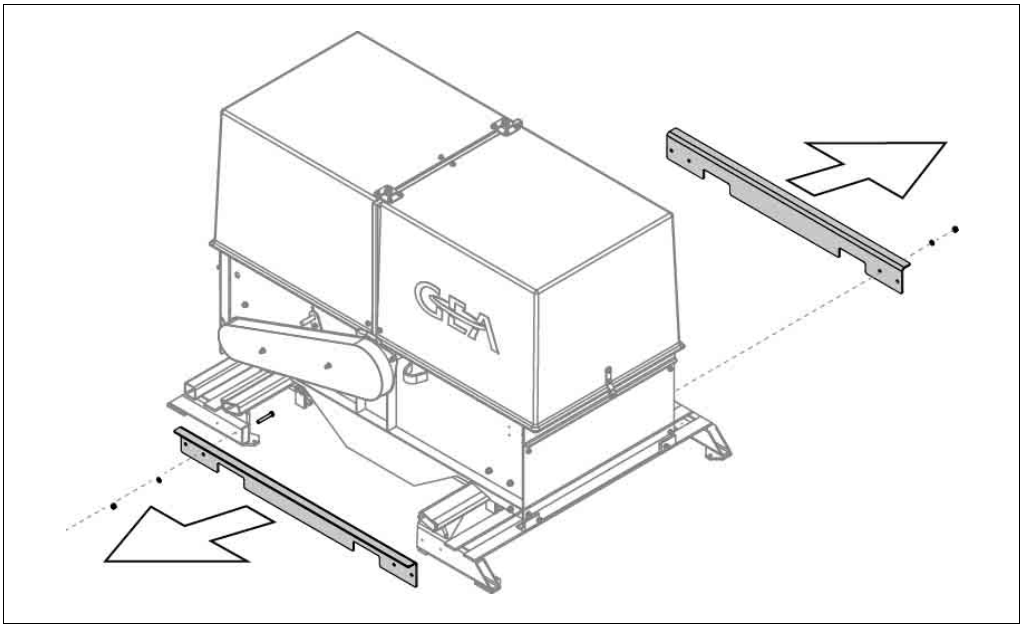


7.10.4 Removing the grey lifting supports

Warning!
Remove the grey lifting supports from the drive unit.
Omitting to remove the lifting supports exposes any person, animal and object to a risk of being crushed between the support.

- When the drive unit is anchored on the concrete floor, remove the supports, as illustrated.
- Keep and store the supports in case it requires moving the drive unit in the future.

Follow the instructions continuing in section: Drive unit motor installation and adjustment.



7.11 Scraper positioning

Caution!
Beware of the scraper mobile parts, they can pinch fingers.

Attention!
Before handling components, protect them with rubber or clothing material to avoid scratching the paint. This will prevent premature corrosion of the component

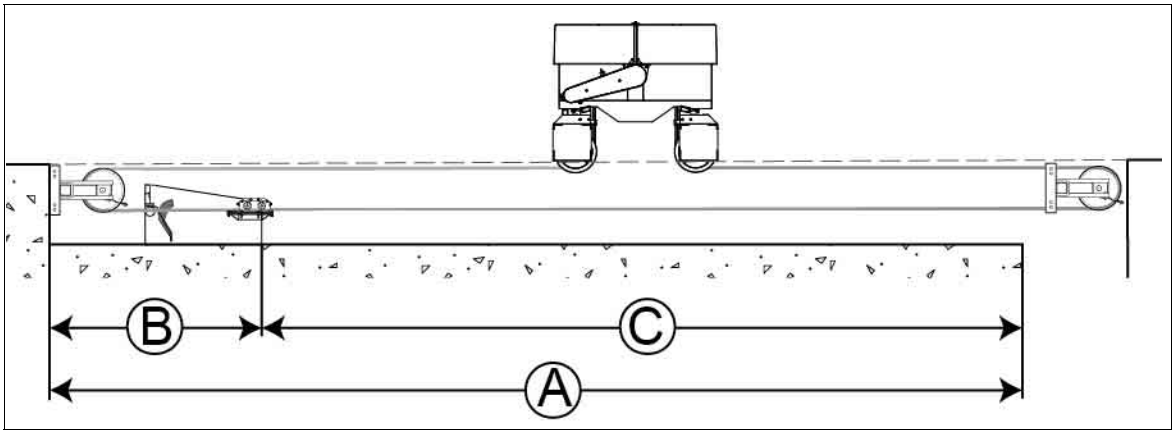
Attention!
To lift this product use a lifting device with a minimum lifting capacity of 500 lb [227 kg]. The lifting capacity only includes the weight of the product.

Note!
The drive unit can perform a maximum cleaning stroke of 120' [36.5m].

Note!
The position of the drive unit does not affect the position of the scraper(s).

Note!
It requires a minimum length of 10' [3 m] between the beginning of the cross gutter and the first scraper.

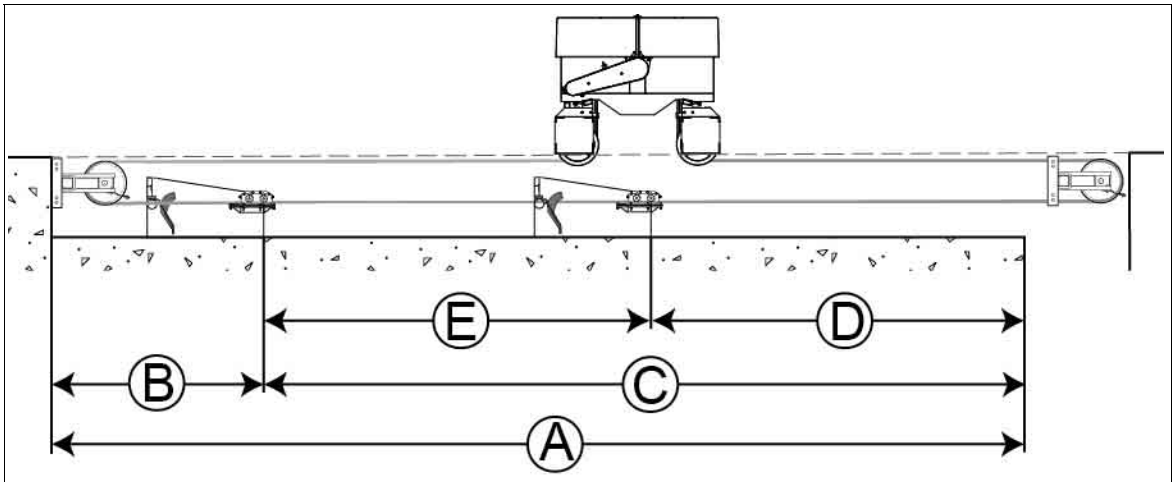
7.11.1 Single scraper



A	Length of the cross gutter	**-**	130' [40m]
B	Park position of the scraper (min. 10' [3.05m])		10' [3.05m]
C	Cleaning zone (stroke) = (A-B)	**=**	120' [36.5m]

7.11.2 Two shuttle scrapers

Note!
The cross gutter length can range from 120' [36.5m] to 224' [68m].

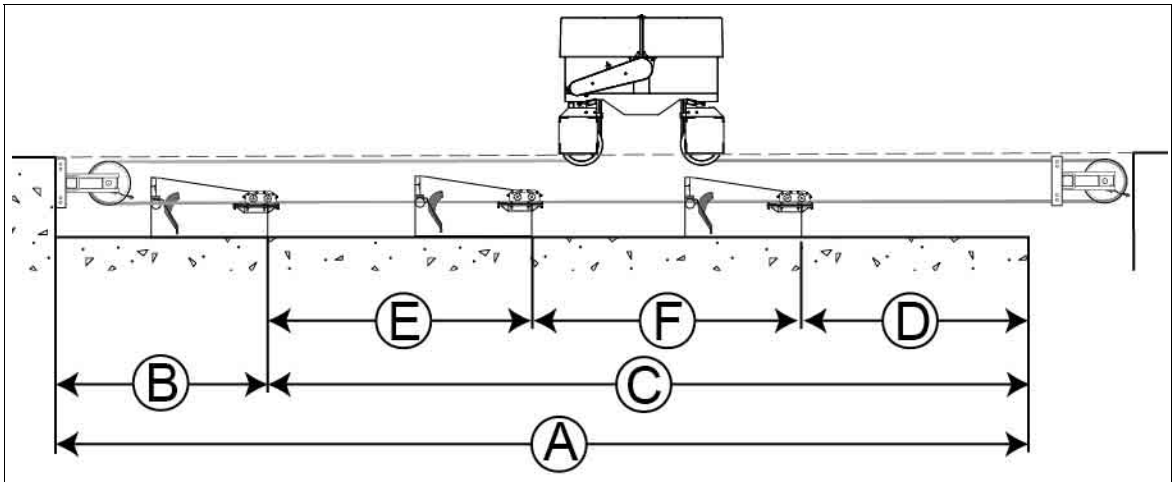


A	Cross gutter length	**-**	224' [68m]
B	Park position of the first scraper (min. 10' [3.05m])		10' [3.05m]
C	Cleaning zone	**=**	214' [65m]
D*	Stroke = C÷2 + 8' [2.4m]	**=**	115' [35m]
E	The distance between the scrapers = C-D	**=**	99' [30.1m]

* The stroke formula considers the number of scrapers and the overlapping distance required for proper cleaning.

7.11.3 Three shuttle scrapers

Note!
The cross gutter length can range from 224' [68m] to 330' [101m].

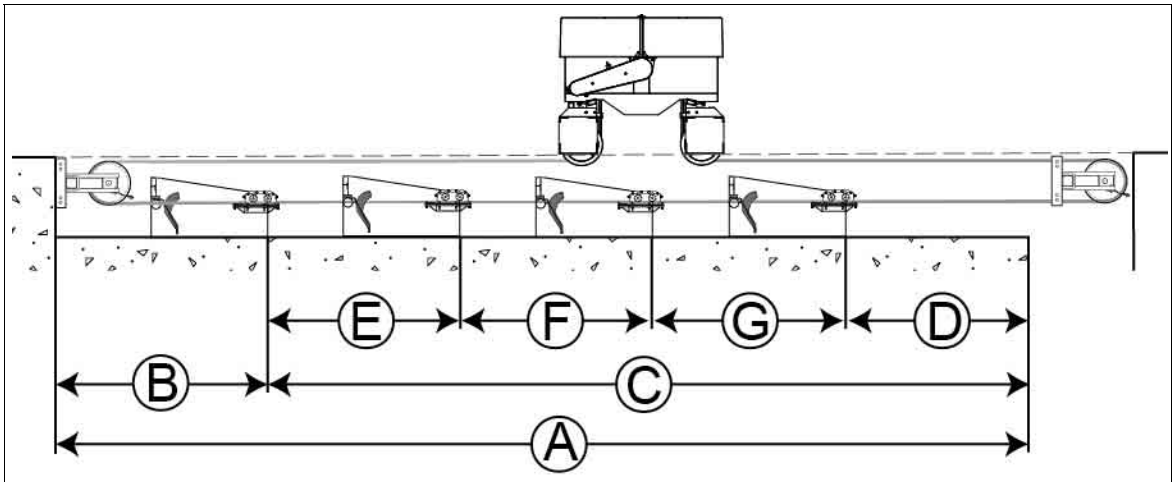


A	Cross gutter length	**-**	250' [68m]
B	Park position of the first scraper (min. 10' [3.05m])		10' [3.05m]
C	Cleaning zone	**=**	240' [73m]
D*	Stroke = C÷3 + 10' [3.05m]	**=**	90' [27.4m]
E-F	The distance between the scrapers = C-D÷2	**=**	75' [23m]

* The stroke formula considers the number of scrapers and the overlapping distance required for proper cleaning.

7.11.4 Four shuttle scrapers

Note!
The cross gutter length can range from 330' [101m] to 430' [131m].

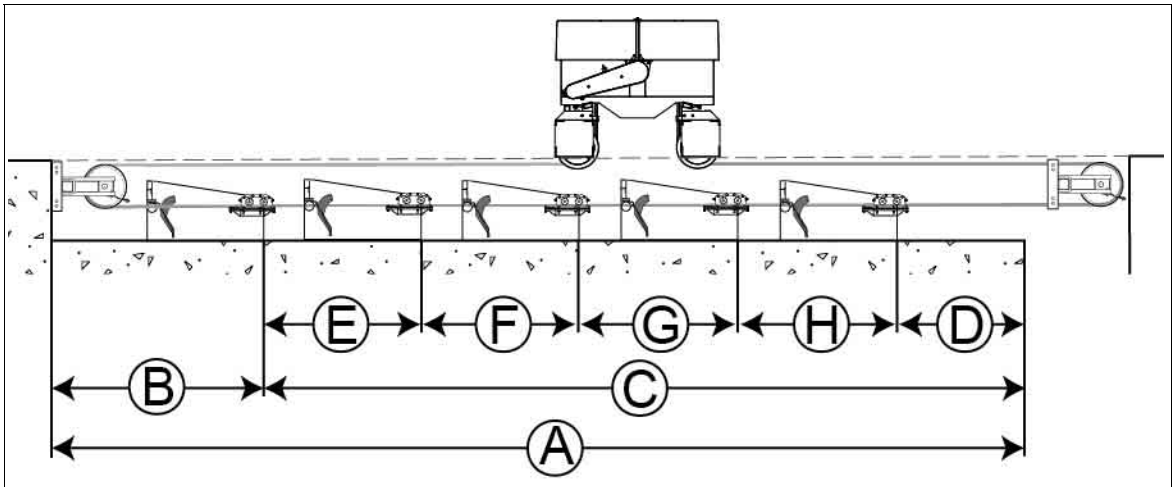


A	Cross gutter length	**-**	400' [68m]
B	Park position of the first scraper (min. 10' [3.05m])		10' [3.05m]
C	Cleaning zone	**=**	390' [119m]
D*	Stroke = C÷4 + 12' [3.6m]	**=**	110' [33.5m]
E-F-G	The distance between the scrapers = C-D÷3	**=**	93' [28m]

* The stroke formula considers the number of scrapers and the overlapping distance required for proper cleaning.

7.11.5 Five shuttle scrapers

Note!
The cross gutter length can range from the 430' [131m] to 540' [165m].



A	Cross gutter length	**-**	490' [149m]
B	Park position of the first scraper (min. 10' [3.05m])		10' [3.05m]
C	Cleaning zone	**=**	480' [146m]
D*	Stroke = C÷5 + 12' [3.6m]	**=**	108' [33m]
E-F-G-H	The distance between the scrapers = C-D÷4	**=**	93' [28m]

* The stroke formula considers the number of scrapers and the overlapping distance required for proper cleaning.

7.12 Drive unit motor installation and adjustment

Warning!
Shut off and lock the power supply before connecting this equipment.

Warning!
Close and lock the safety guards on the equipment after completing the steps included in this section.

Caution!
Wear protective boots, eye gear and gloves for all steps included in this section.

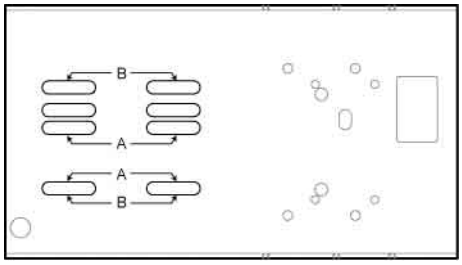
Caution!
No one stands near this product unless they are performing instructions included in this section.

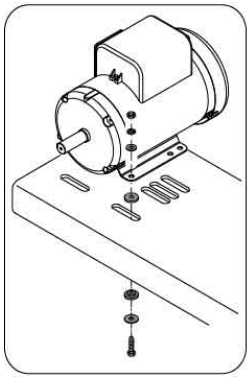
Attention!
Electric wiring and connection must be performed by a certified electrician.

Read the section: Safety.

7.12.1 Step 1: Installing the motor on the drive unit motor support

Bolt pattern





	Motor			
	Power		Type	
	HP	KW	NEMA	IEC
B	1	0.75	56H	90
	1 1/2	1.1	143T - 145T	90

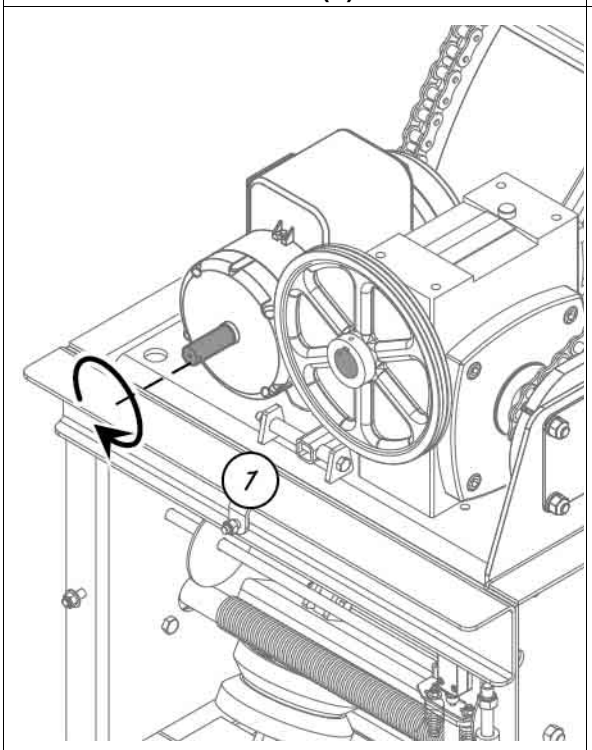
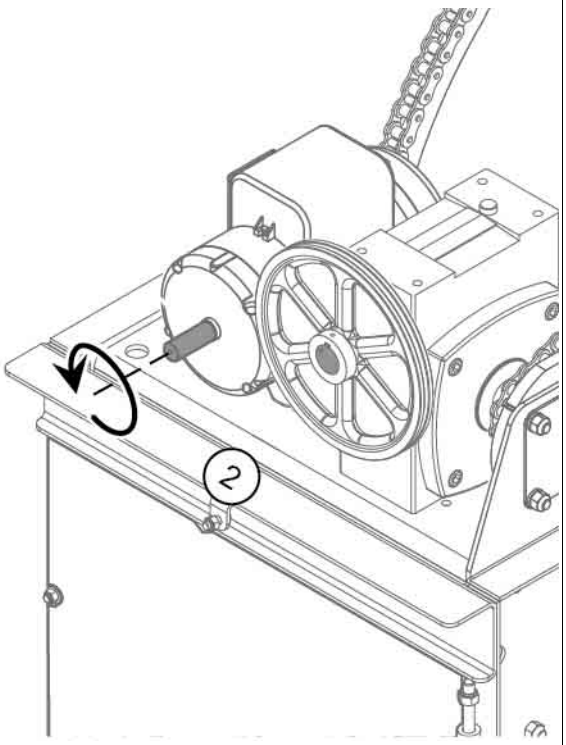
- Position the motor in the right bolt pattern.
- Bolt the motor in place with the hardware provided. Do not tighten yet.
- Install the second motor, if applicable.
- The electrician must connect the motor(s) to the control panel.

7.12.2 Step 2: Checking the motor(s) sense of rotation

Attention!
Electric wiring and connection must be performed by a certified electrician.

Attention!
In some cases, the sense of rotation of a motor is unpredictable. Always have a certified electrician verify the sense of rotation before installing the motor belt and pulley.

Attention!
Each motor is identified with a label, as illustrated.

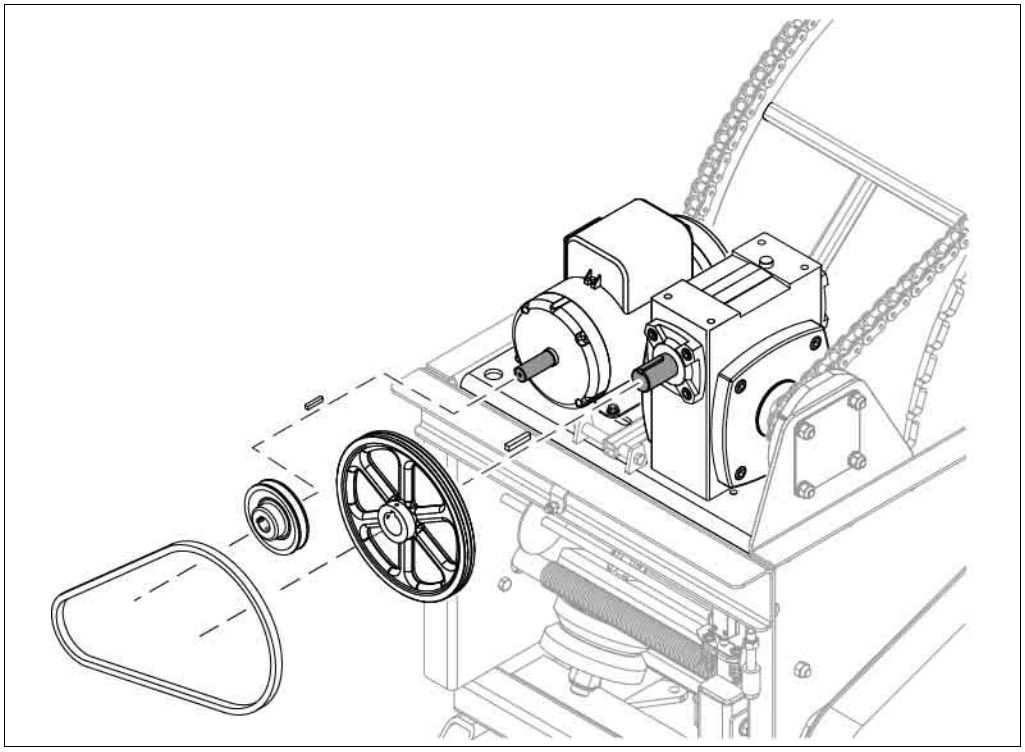
Reverse mode	
Motor (1)	**Motor (2)**
	
When the control panel is set in reverse mode, the motor (1) must rotate clockwise and the motor (2) must rotate counterclockwise when standing in front of the motor and the speed reducer.	

Attention!
If the motor(s) do not rotate in proper direction, have a certified electrician verify the wiring.

7.12.3 Step 3: Installing the belt and pulleys

Warning!
Shut off and lock the power supply before proceeding with the following steps.

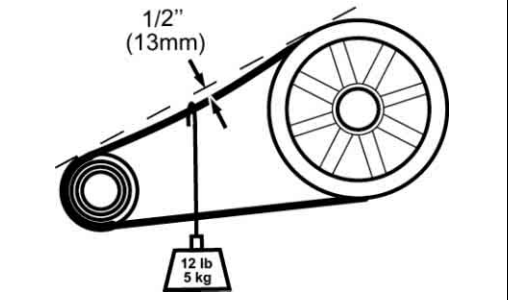
Caution!
Beware of the drive belts and pulleys, they can pinch fingers.

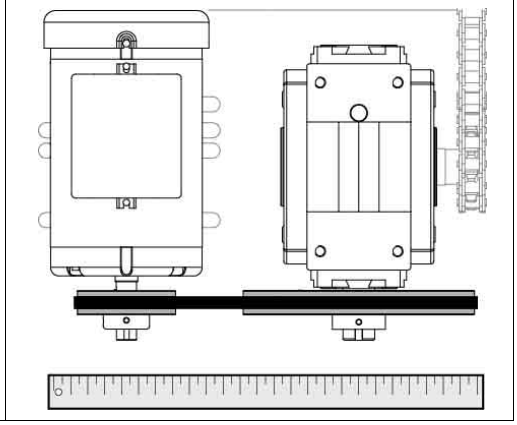


- Make sure the main supply is shut and locked. An inadvertent start will cause serious injuries.
- Place a key over the motor shaft.
- Install the pulley on the shaft.
- Hold the assembly using a set screw. Do not tighten yet.
- Install the belt over the motor pulley and reducer pulley.

Attention!
Make sure both pulleys are perfectly aligned.

Note!
The belt must roughly deflect 1/2” (13mm) when applying 12 lb [5 kg] of pressure halfway between the pulleys.





- Position the motor to obtain a belt deflection of ½” [13 mm]. Make sure the motor stays parallel to the speed reducer.
- Secure further the bolts of the motor to hold the position. Do not tighten yet.
- Place a straight edge on the side of both pulleys to check the alignment.
- To align the pulleys, reposition the motor or move the pulley on the shaft.
- When aligned, tighten the set screw of the pulley.
- Verify the deflection and the alignment once again, readjust, if necessary.
- Tighten the motor bolts.

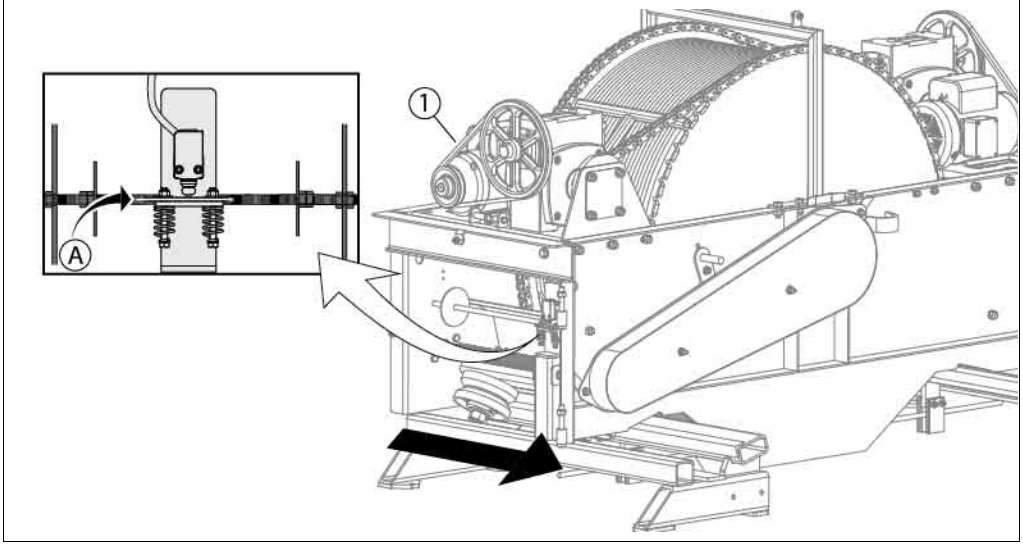
Refer to section: Technical data - Bolt torque chart.

7.12.4 Step 4: Verifying the stroke limit switch

Caution!
Use extreme caution when the drive unit hood is open. The pulleys can cause entanglement resulting in serious injuries.

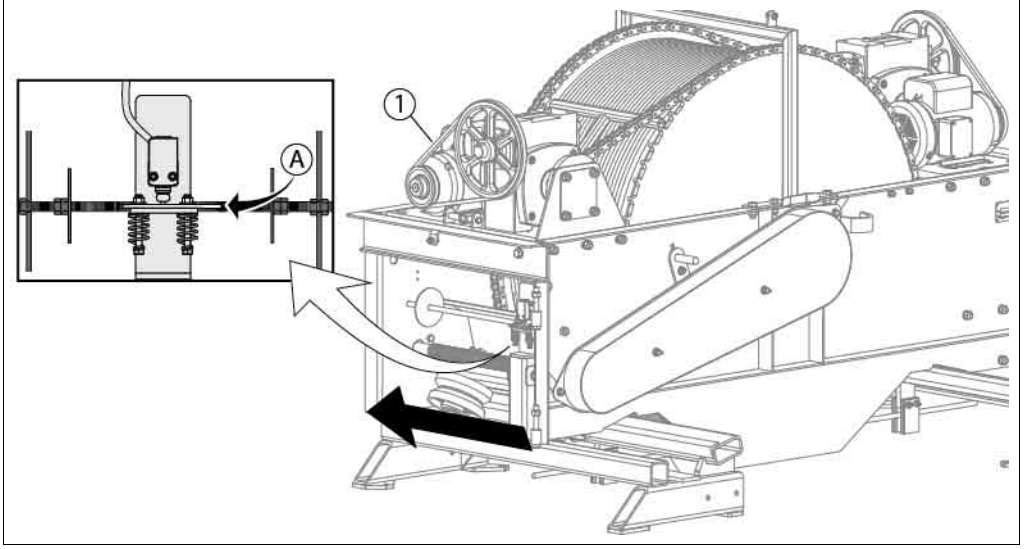
Attention!
Electric wiring and connection must be performed by a certified electrician.

- Set the control panel in manual mode.

In reverse mode
The drive unit moves to the right when standing in front of the motor (1) and the speed reducer.


- Push the sliding plate to the right (A).
- Engage the drive unit in reverse mode.
- The drive unit should operate. If the drive unit does not operate, this indicates that the stroke limit switch is not connected properly. Have a certified electrician reconnect the switch.

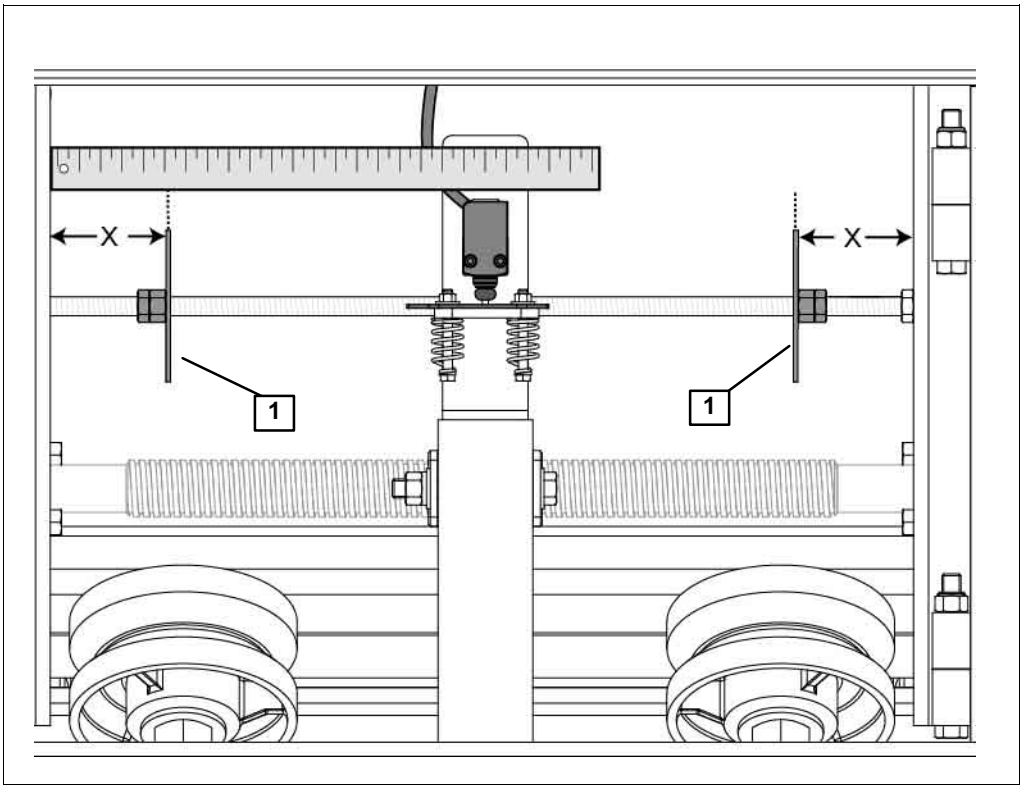
In forward mode
The drive unit moves to the left when standing in front of the motor (1) and the speed reducer.



- Push the sliding plate to the left (A).
- Engage the drive unit in forward mode.
- The drive unit should operate. If the drive unit does not operate, this indicates that the stroke limit switch is not connected properly. Have a certified electrician reconnect the switch.
- Close and lock the access door and hood.

7.13 Stroke washers initial setting

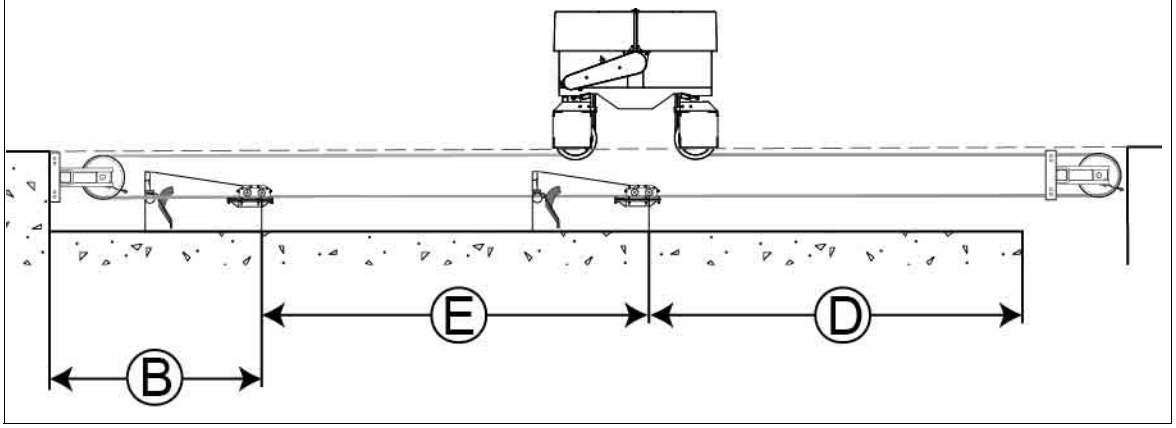
Warning!
Always shut off and lock the power supply before performing the following steps.



The stroke washers purpose is to define the stroke of the scraper(s).

- Make sure the power supply is shut off and locked.
- Unlock and open the access door.
- Place the stroke washers (1) according to the measure (X). Follow the example to determine the measure (X).
- Lightly tighten the nuts to secure the position of the stroke washers.
- After setting the washers, close and lock the access door.

Example



B = minimum space required to position the first scraper.

D = stroke length.

E = distance between the scrapers.

For example, when using the SW300-HD, the maximum stroke length is 120' [37 m].
If the stroke length (D) measures 100' [30.5 m], the measure (X) equals to 3.025” [7.7 cm].
See detailed calculation in imperial and metric

Example (imperial)	**Example (metric)**
X = 120' - D ÷ 10.275' x 0.539” ÷ 2 + 6.7”	X = 37m - D ÷ 3.13m x 1.37cm ÷ 2 + 17.02cm
X = 120' - 100' ÷ 10.275' x 0.539” ÷ 2 + 6.7”	X = 37m - 30.5m ÷ 3.13m x 1.37cm ÷ 2 + 17.02cm
X = 7.2”	**X = 18.5 cm**

7.14 Cable installation for drive unit in a recess

Warning!
Close and lock the safety guards on the equipment after completing the steps included in this section.

Warning!
When using the wrench to apply or release tension on a cable, a significant load is applied on the wrench. Make sure the tensioner is locked before releasing the wrench, otherwise releasing the wrench can cause serious injuries.

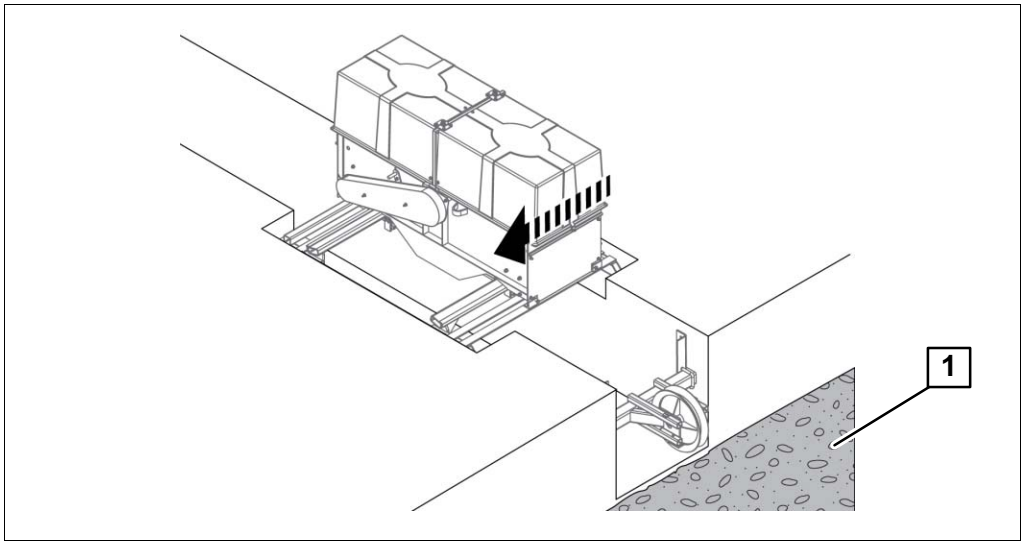
Caution!
Use extreme caution when the drive unit hood is open. The pulleys can cause entanglement resulting in serious injuries.

Caution!
Keep body parts and clothing away from moving parts.

Caution!
Wear protective boots, eye gear and gloves for all steps included in this section.
Use heavy duty gloves when handling the steel cable to prevent injuries.

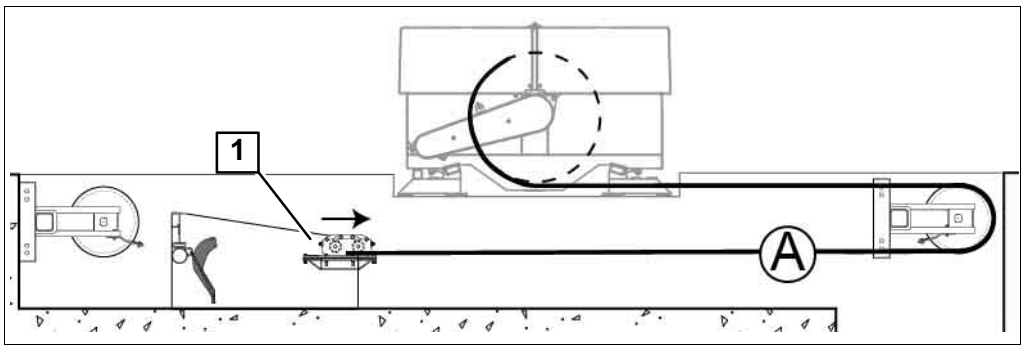
Note!
For all steps, apply electric tape on the cable before cutting the cable in order to facilitate installation and prevent splitting ends.

7.14.1 Step 1: Drum positioning



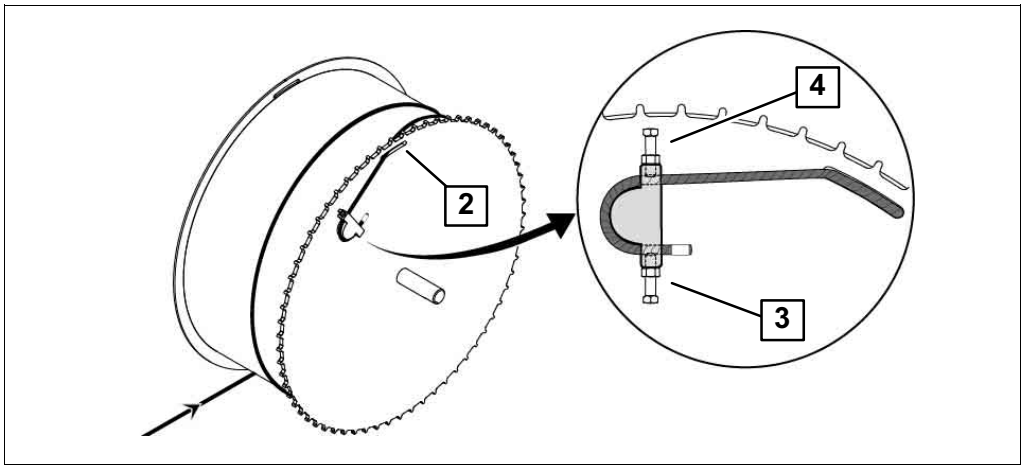
- Before starting the cable installation, the drive unit must be in proper position. Note the location of the reception pit (1) in relation to the drive unit.
- Set the control panel on manual mode and engage the drive unit to position the drum on the left side, as illustrated.
- When the drive unit stops, shut off the control panel.

7.14.2 Step 2: Cable A installation



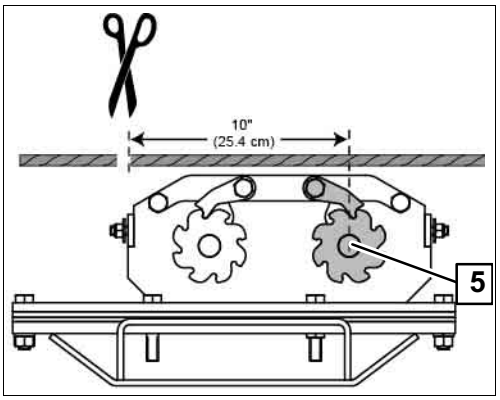
Warning!
Always shut off and lock the power supply before installing the cable on the drum.

- Make sure the scraper(s) is in starting position. Refer to section: Handling and installation - Scraper positioning.
- Make sure the power supply is shut off and locked.
- Slide each scraper tensioner (1) to the right.
- Remove the cover over each tensioner.
- Begin the cable installation starting with the scraper located next to the drop point.
- Insert cable (A) through the pulley and pass the cable inside the drive unit. As illustrated above, the cable must pass under the drive unit drum.

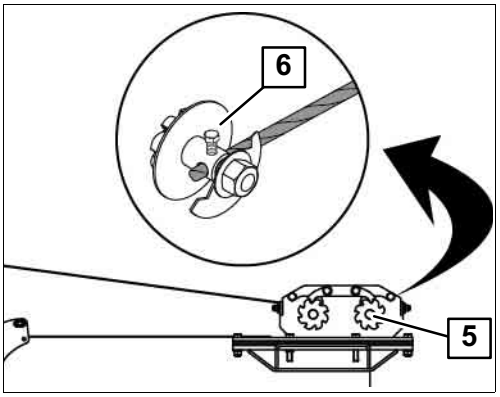


- Roll the cable 1 ½ turns on the drum, make sure the rolls do not touch each other.
- Reeve the cable in the slot (2) located on the side of the drum.
- Pass the cable through the cable attachment keeping 2” [51 mm] of cable out of the attachment.
- Tighten the bolt and nut (3).
- Firmly pull the cable before tightening the bolt and nut (4).

- Once the cable is secured on the drum, pull the cable over the scraper tensioner.
- Before cutting the cable, keep an additional cable length of 10” [25.4cm] from the tensioner shaft (5).

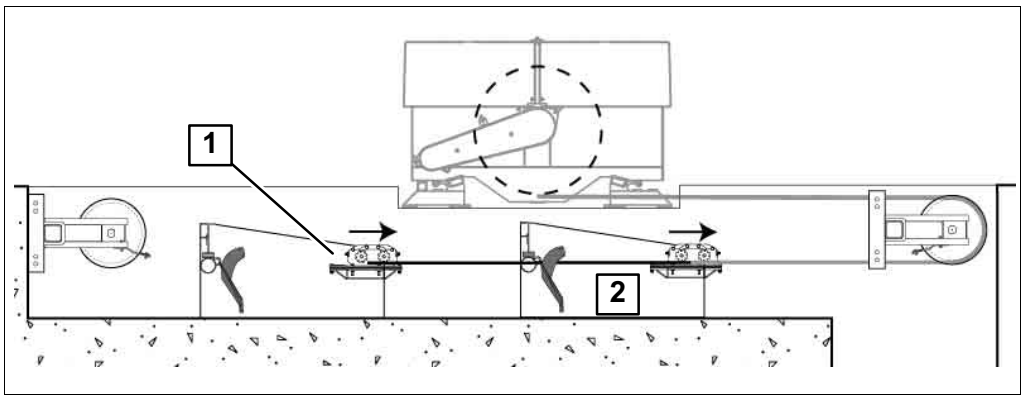


- Loosen the bolt (6).
- Insert the cable through the tensioner shaft (5) keeping ½” [13mm] of cable out of the shaft.
- Tighten the bolt (6).
- Using the wrench, wind the cable until the scraper tends to move.

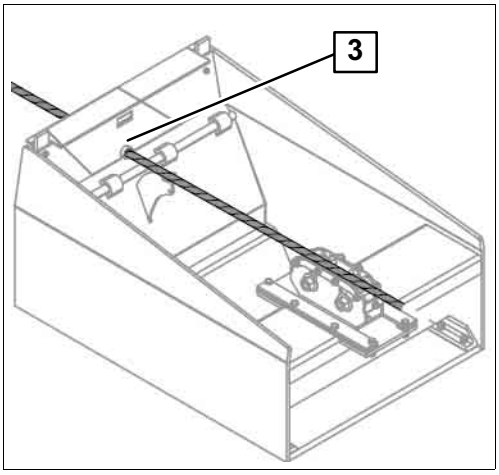


7.14.3 Step 3: Shuttle scrapers cable installation

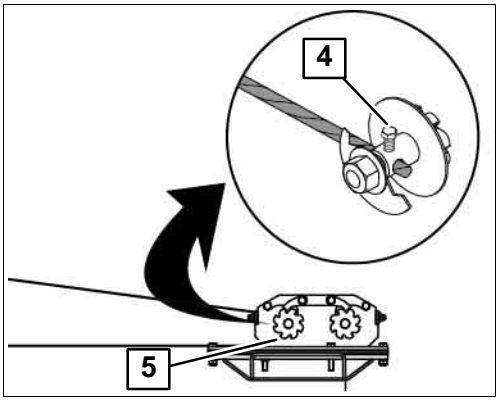
Note!
Perform the following steps when having shuttle scrapers otherwise perform the next steps: Cable B installation.



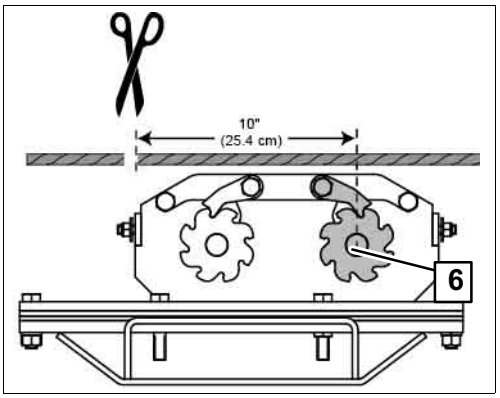
- Make sure the tensioners (1) are placed on the right
- To attach the scrapers to one another, start with the scraper (2) located near the drop point.
- Pass the cable through the scraper bushing (3).



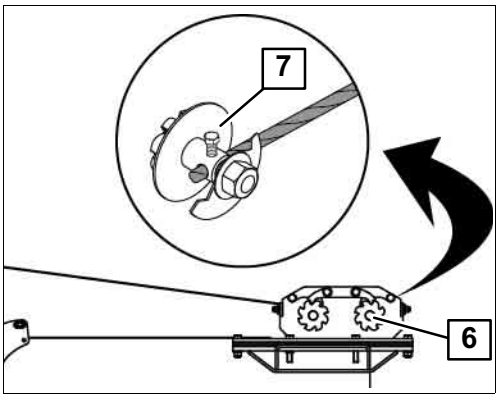
- Loosen bolt (4) and insert the cable through the tensioner shaft (5) keeping ½" [13mm] of cable out of the shaft.
- Tighten the bolt (4).
- Using the wrench, wind 2 rolls of cable.



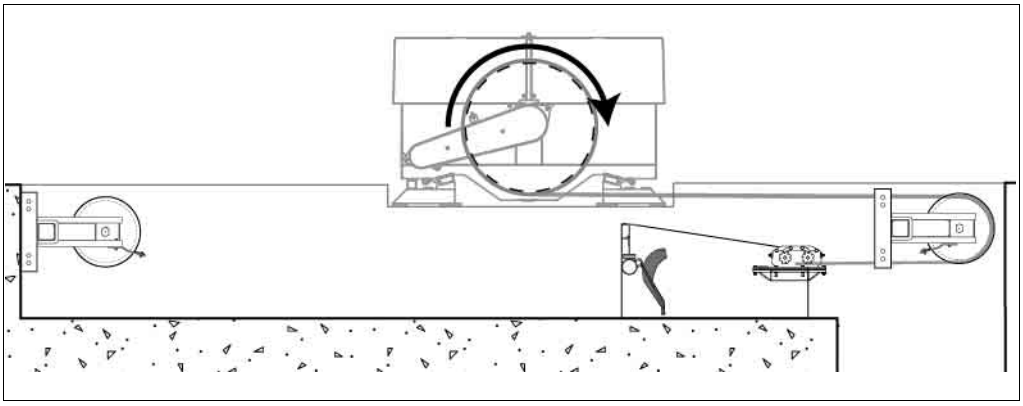
- Pull the cable over the preceding scraper tensioner.
- Before cutting the cable, keep an additional cable length of 10” [25.4cm] from the tensioner shaft (6).



- Loosen the bolt (7) and insert the cable through the tensioner shaft (6) keeping ½” [13mm] of cable out of the shaft.
- Tighten the bolt (7).
- Using the wrench, wind the cable until the scraper tends to move.
- Repeat steps to link all scrapers to one another.

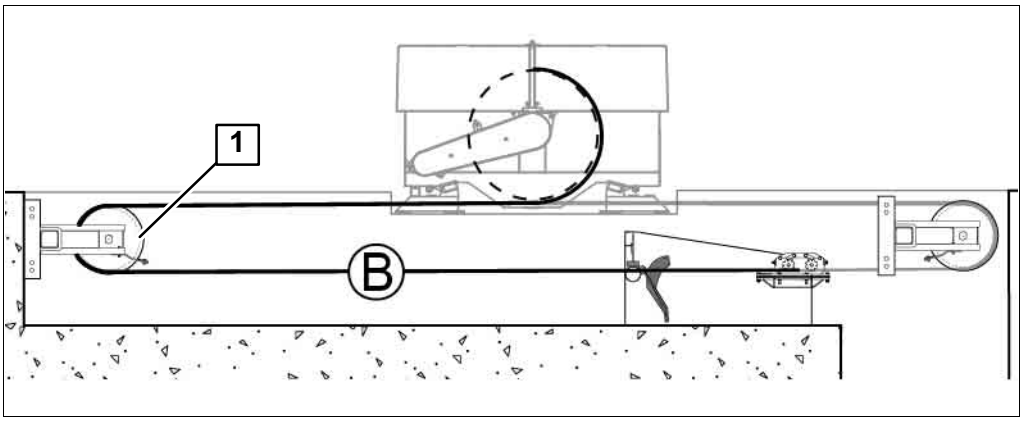


7.14.4 Step 4: Cable B installation



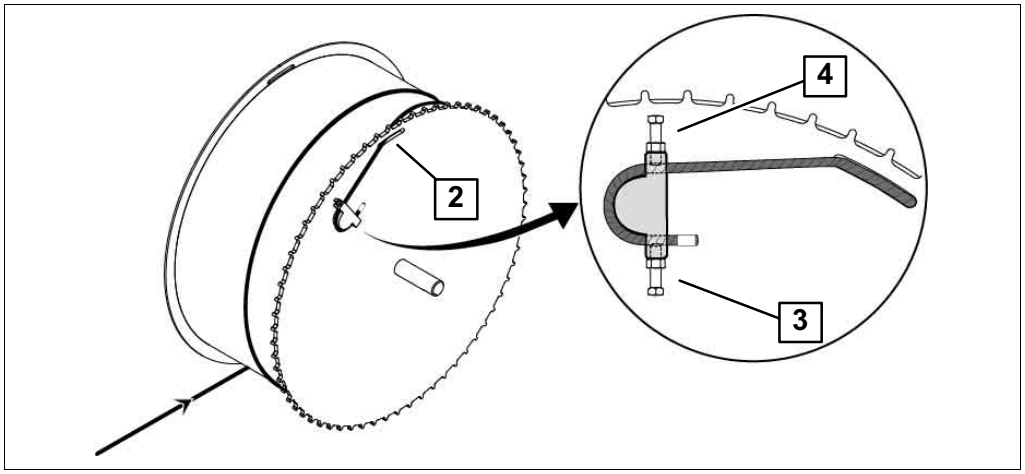
Attention!
In the event that there are no animals in the barn yet, wet the new concrete cross gutter before operating the drive unit and scraper(s).

- Unlock and activate the power supply.
- Manually operate the drive unit to wind the cable on the drum until the last scraper reaches its position near the drop point.
- When the drive unit stops, shut off the control panel.



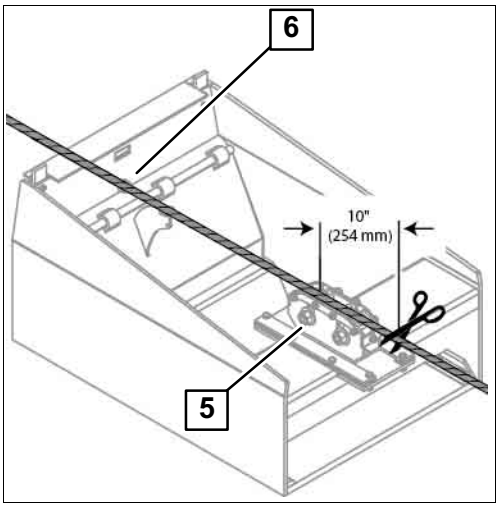
Warning!
Always shut off and lock the power supply before installing the cable on the drum.

- Insert cable (B) through the pulley (1) and pass the cable inside the drive unit. As illustrated above, the cable must pass under the drive unit drum.

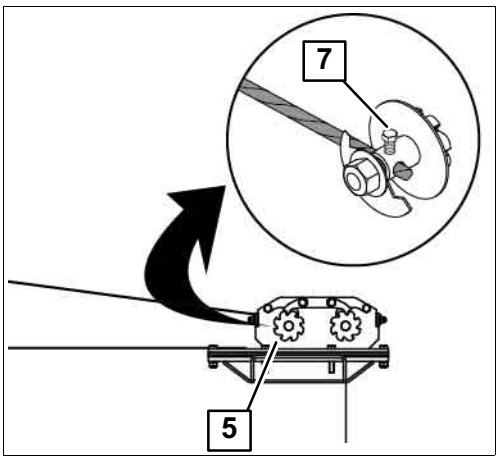


- Roll the cable 1 ½ turns on the drum, make sure the rolls do not touch each other.
- Insert the cable in the slot (2) located on the side of the drum.
- Pass the cable through the cable attachment keeping 2” [51 mm] of cable out of the attachment. Tighten the bolt and nut (3).
- Firmly pull the cable before tightening the bolt and nut (4).

- Pull the cable over the tensioner of the scraper located near the beginning of the cross gutter.
- Before cutting the cable, keep an additional cable length of 10” [254mm] from the tensioner shaft (5).
- Pass the cable through the scraper bushing (6).



- Loosen the bolt (7) and insert the cable through the tensioner shaft (5) keeping ½” [13mm] of cable out of the shaft.
- Tighten the bolt (7).
- Using the wrench, wind the cable until the scraper tends to move.
- Adjust the cable tension. Refer to section: Cable tension adjustment.



7.15 Cable installation for drive unit on stands (1 wheel / 2 wheels)

Warning!
Close and lock the safety guards on the equipment after completing the steps included in this section.

Warning!
When using the wrench to apply or release tension on a cable, a significant load is applied on the wrench. Make sure the tensioner is locked before releasing the wrench, otherwise releasing the wrench can cause serious injuries.

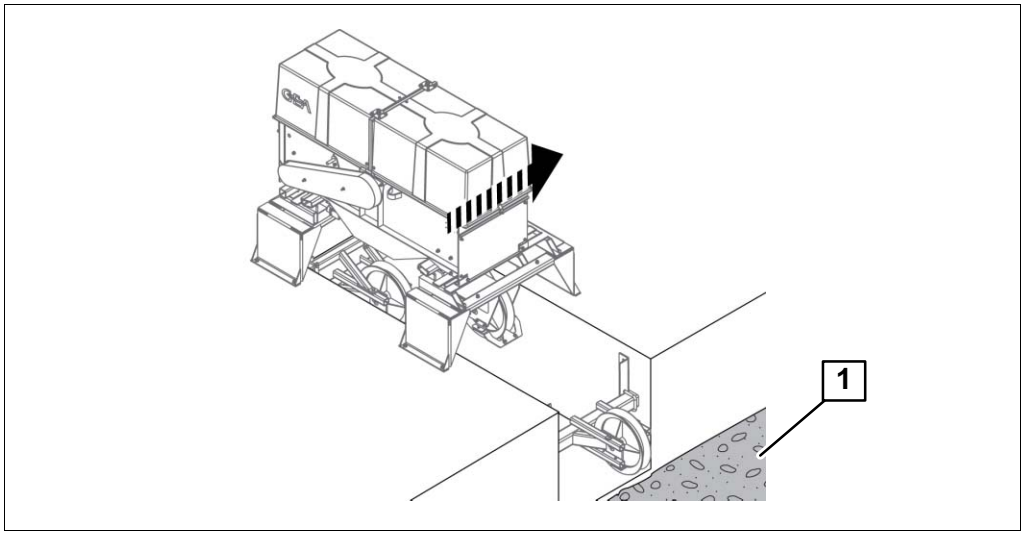
Caution!
Use extreme caution when the drive unit hood is open. The pulleys can cause entanglement resulting in serious injuries.

Caution!
Keep body parts and clothing away from moving parts.

Caution!
Wear protective boots, eye gear and gloves for all steps included in this section.
Use heavy duty gloves when handling the steel cable to prevent injuries.

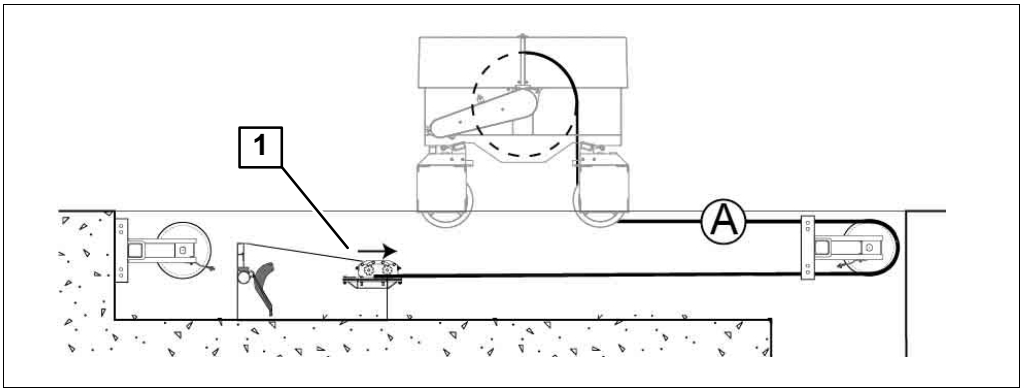
Note!
For all steps, apply electric tape on the cable before cutting the cable in order to facilitate installation and prevent splitting ends.

7.15.1 Step 1: Drum positioning



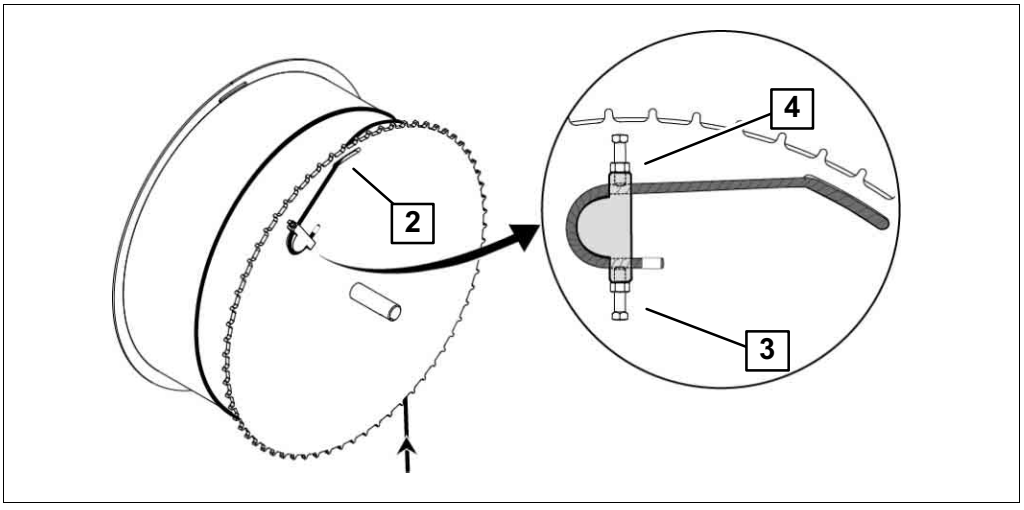
- Before starting the cable installation, the drive unit must be in proper position. Note the location of the reception pit (1) in relation to the drive unit.
- Set the control panel on manual mode and engage the drive unit to position the drum on the right side, as illustrated.
- When the drive unit stops, shut off the control panel.

7.15.2 Step 2: Cable A installation



Warning!
Always shut off and lock the power supply before installing the cable on the drum.

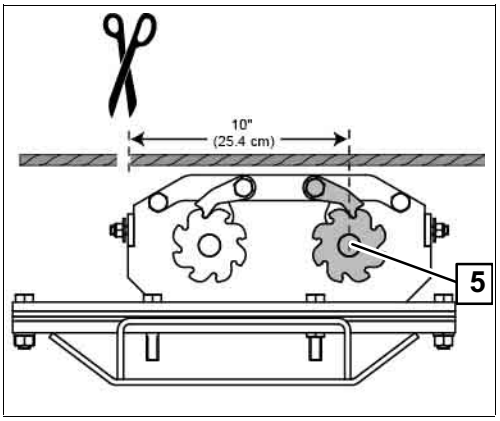
- Make sure the scraper(s) is in starting position. Refer to section: Handling and installation - Scraper positioning.
- Make sure the power supply is shut off and locked.
- Slide each scraper tensioner (1) to the right.
- Remove the cover over each tensioner.
- Begin the cable installation starting with the scraper located next to the drop point.
- Insert cable (A) through the pulley and pass the cable inside the drive unit. As illustrated above, the cable must pass over the drive unit drum.



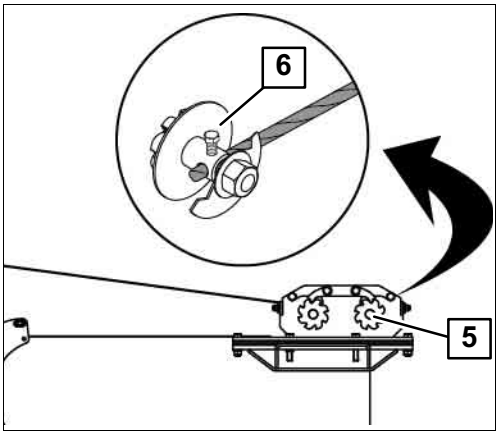
- Roll the cable 1 ½ turns on the drum, make sure the rolls do not touch each other.
- Insert the cable in the slot (2) located on the side of the drum.
- Pass the cable through the cable attachment keeping 2” [51 mm] of cable out of the attachment. Tighten the bolt and nut (3).

- Firmly pull the cable before tightening the bolt and nut (4).

- Once the cable is secured on the drum, pull the cable over the scraper tensioner.
- Before cutting the cable, keep an additional cable length of 10” [25.4cm] from the tensioner shaft (5).

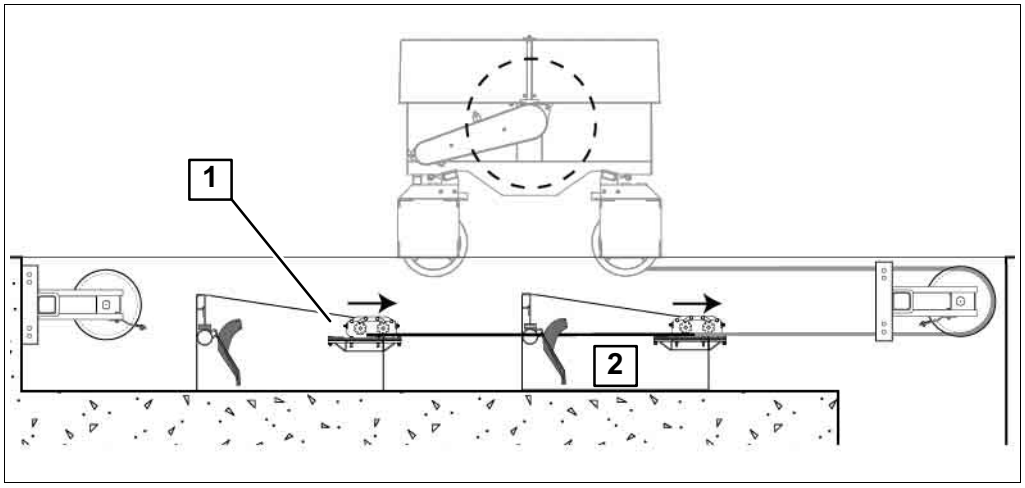


- Loosen the bolt (6).
- Insert the cable through the tensioner shaft (5) keeping ½” [13mm] of cable out of the shaft.
- Tighten the bolt (6).
- Using the wrench, wind the cable until the scraper tends to move.

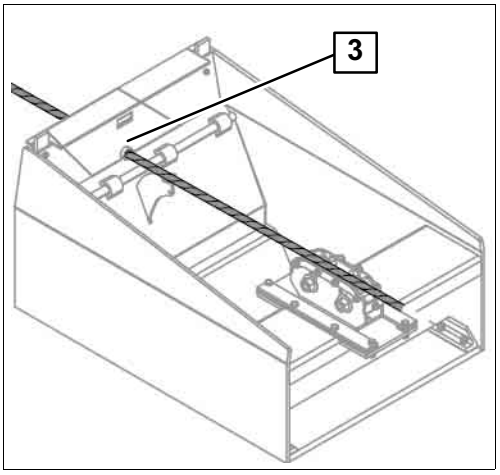


7.15.3 Step 3: Shuttle scrapers cable installation

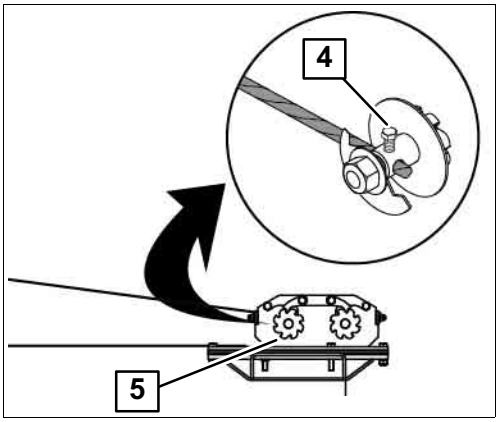
Note!
Perform the following steps when having shuttle scrapers otherwise perform the next steps: Cable B installation.



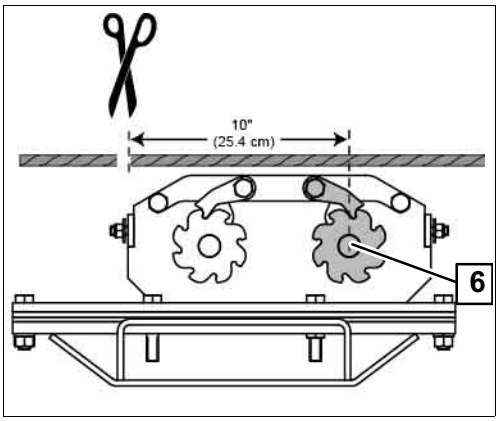
- Make sure the tensioners (1) are placed on the right
- To attach the scrapers to one another, start with the scraper (2) located near the drop point.
- Pass the cable through the scraper bushing (3).



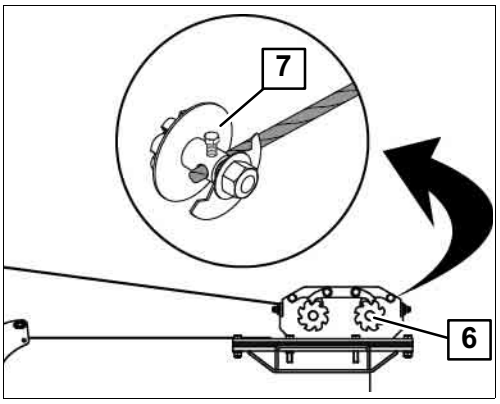
- Loosen bolt (4) and insert the cable through the tensioner shaft (5) keeping ½" [13mm] of cable out of the shaft.
- Tighten the bolt (4).
- Using the wrench, wind 2 rolls of cable.



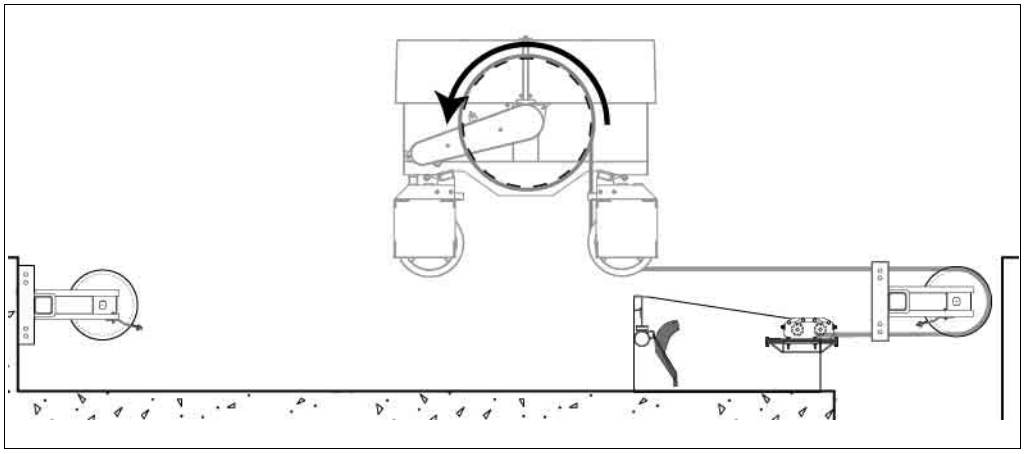
- Pull the cable over the preceding scraper tensioner.
- Before cutting the cable, keep an additional cable length of 10” [25.4cm] from the tensioner shaft (6).



- Loosen the bolt (7) and insert the cable through the tensioner shaft (6) keeping ½” [13mm] of cable out of the shaft.
- Tighten the bolt (7).
- Using the wrench, wind the cable until the scraper tends to move.
- Repeat steps to link all scrapers to one another.

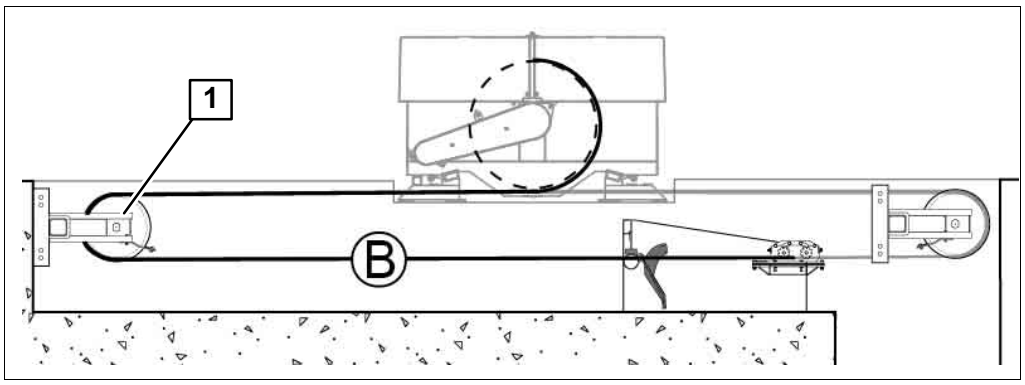


7.15.4 Step 4: Cable B installation



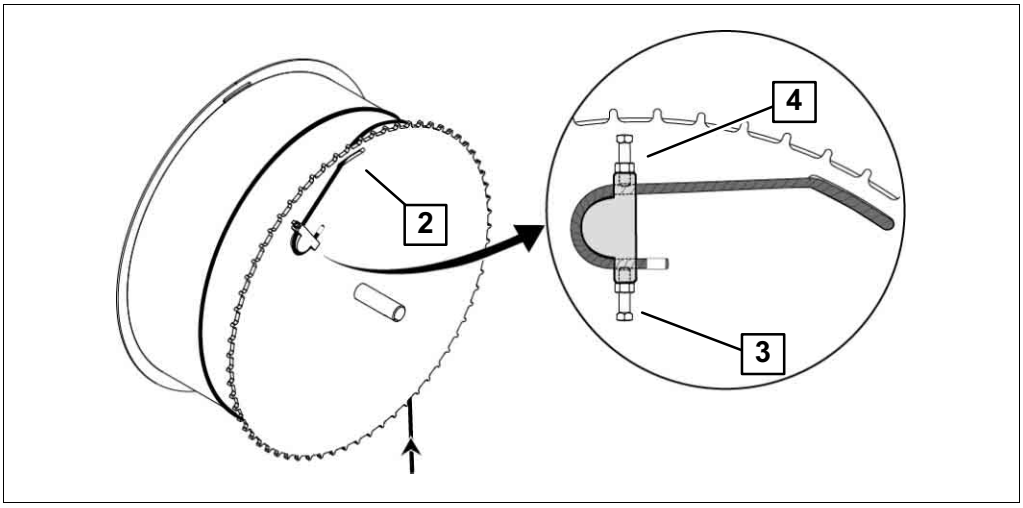
Attention!
In the event that there are no animals in the barn yet, wet the new concrete cross gutter before operating the drive unit and scraper(s).

- Unlock and activate the power supply.
- Manually operate the drive unit to wind the cable on the drum until the last scraper reaches its position near the drop point.
- When the drive unit stops, shut off the control panel.



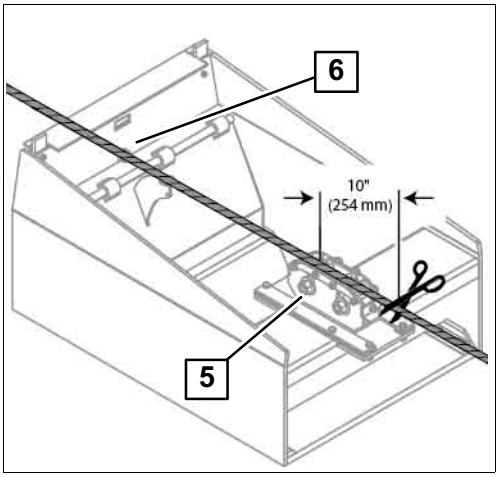
Warning!
Always shut off and lock the power supply before installing the cable on the drum.

- Insert cable (B) through the pulley (1) and pass the cable inside the drive unit. As illustrated, the cable must pass under the drive unit drum.

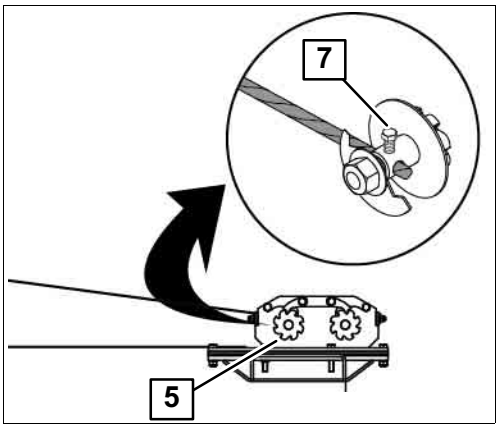


- Roll the cable 1 ½ turns on the drum, make sure the rolls do not touch each other.
- Insert the cable in the slot (2) located on the side of the drum.
- Pass the cable through the cable attachment keeping 2” [51 mm] of cable out of the attachment. Tighten the bolt and nut (3).
- Firmly pull the cable before tightening the bolt and nut (4).

- Pull the cable over the tensioner of the scraper located near the beginning of the cross gutter.
- Before cutting the cable, keep an additional cable length of 10” [254mm] from the tensioner shaft (5).
- Pass the cable through the scraper bushing (6).



- Loosen the bolt (7) and insert the cable through the tensioner shaft (5) keeping ½” [13mm] of cable out of the shaft.
- Tighten the bolt (7).
- Using the wrench, wind the cable until the scraper tends to move.
- Adjust the cable tension. Refer to section: Cable tension adjustment.



7.16 Cable tension adjustment

Warning!
Always shut off and lock the power supply.

Warning!
When using the wrench to apply or release tension on a cable, a significant load is applied on the wrench. Make sure the tensioner is locked before releasing the wrench, otherwise releasing the wrench can cause serious injuries.

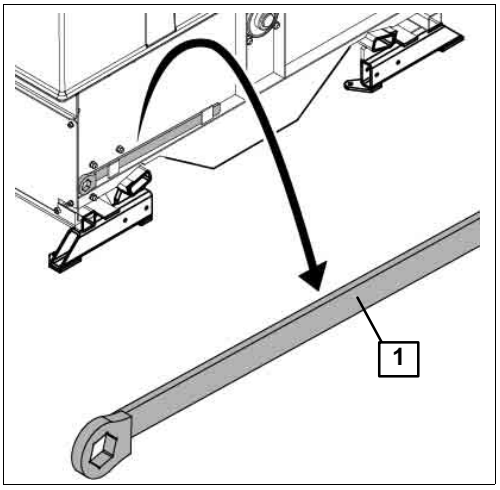
Attention!
While performing the following steps, make sure the scrapers remain in position when tensionning the cables.

Attention!
Improper cable tension will cause malfunction of the load detection system.

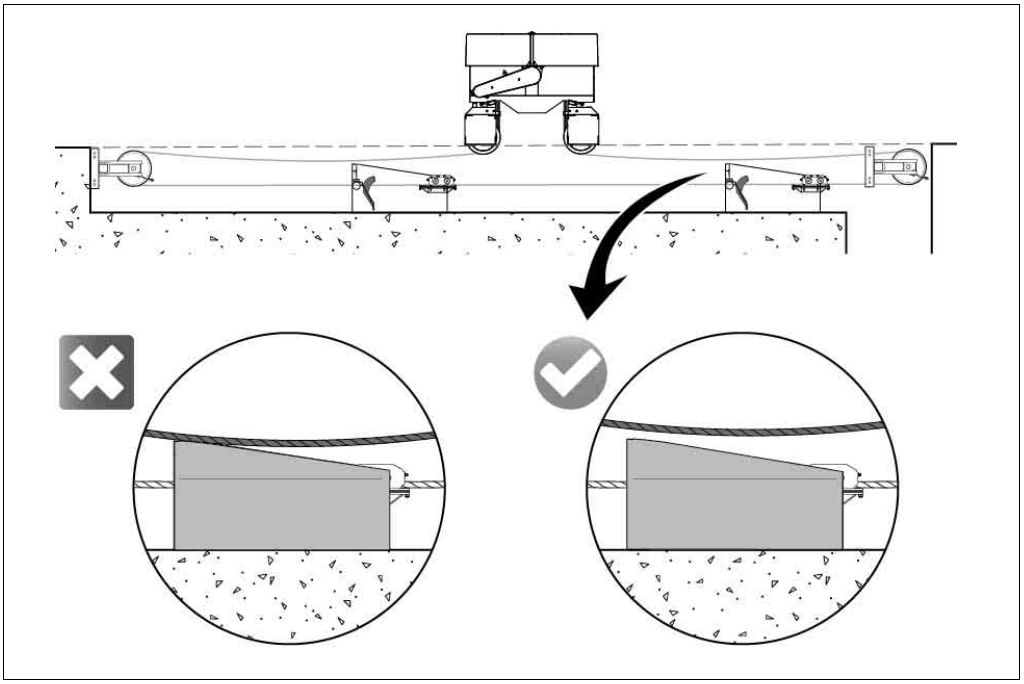
Attention!
Always apply equal tension on all cables to prevent the scrapers from shifting position.

7.16.1 Step 1: Tensionning

- Using the wrench (1) located on the side of the drive unit, roll one catch on each scraper tensioner.
  Proceed scraper by scraper until the scraper(s) tend to move. Repeat to apply significant tension on all cables.
- Manually engage the drive unit.
- When the drive unit stops, shut off the control panel.
- Shut off and lock the power supply.



7.16.2 Step 2: Tension verification



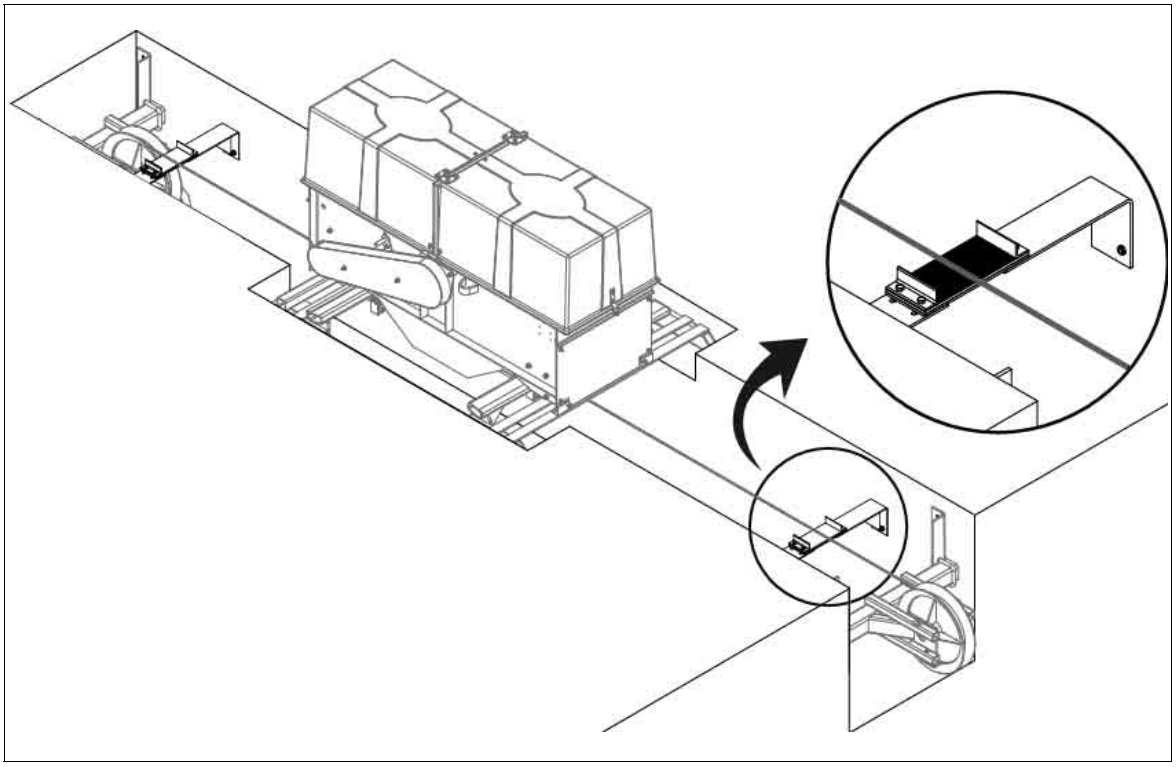
Nylon rope

- Verify the rope tension. The rope must not contact the scraper(s), as illustrated above. If so, repeat step 1: Tensionning.

Steel cable

- Verify the tension to make sure the cable is tighten as much as possible. Most likely, the cable will still contact the scraper(s) due the its weight.

7.17 Steel cable supports installation

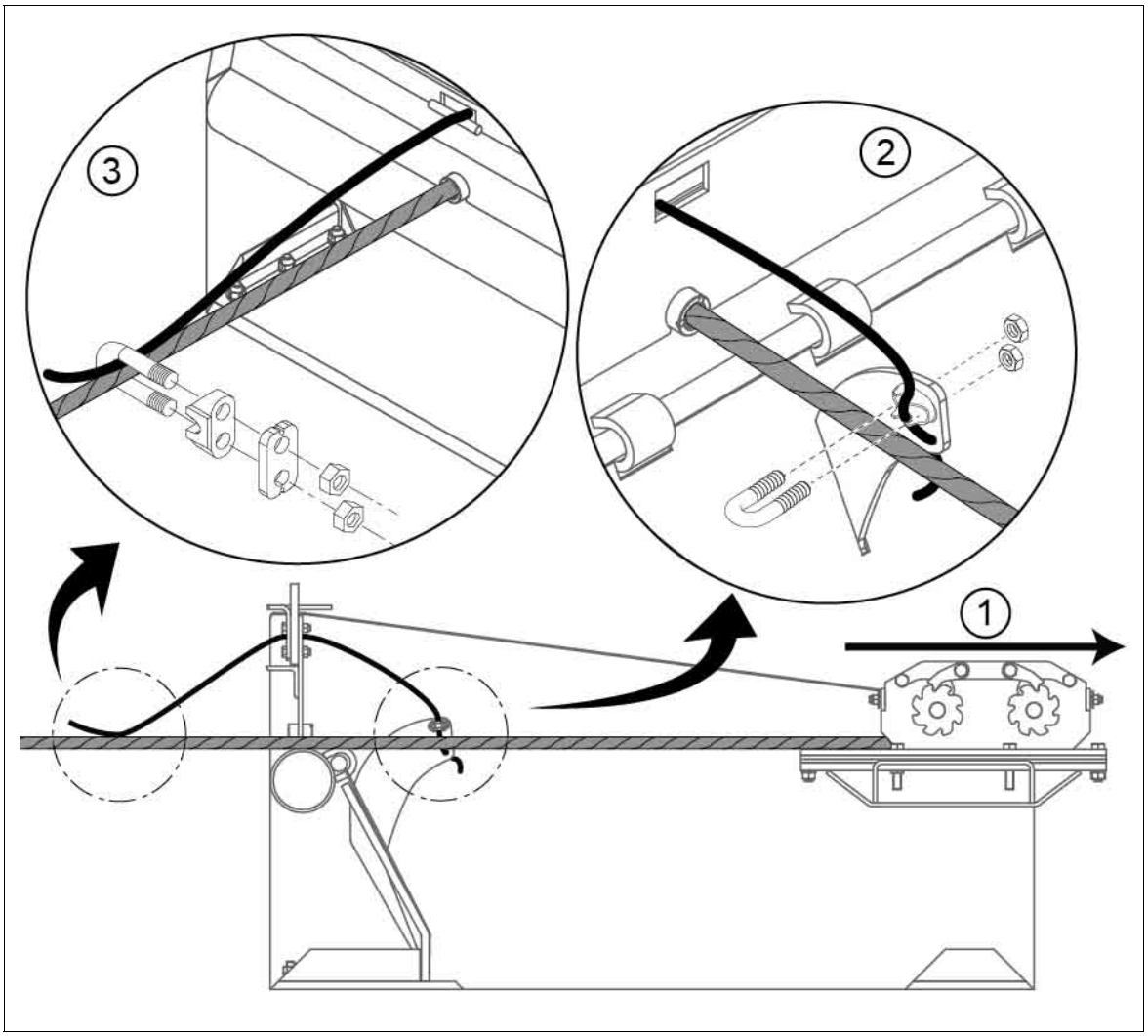


Warning!
Always shut off and lock the power supply.

Attention!
Always install steel cable supports to prevent the steel cable from contacting the scraper(s).

- Install cable supports every 100' [30.5 m] from the drive unit.
- Level the supports with the wheels sheave located at each gutter end.
- Use anchor bolts and hardware to secure the supports.

7.18 Flapper wire installation



Warning!
Always shut off and lock the power supply.

Install the flapper wire on each scraper, as follows:

1	• Engage the drive unit to move the scraper(s) a few feet toward the reception pit.
2	• Insert the wire in the bottom hole of the flapper arm. • Secure the wire by bolting a U-bolt clamp on the flapper arm. • Make sure the wire passes between the cable and the flapper arm.
3	• Reeve the cable through the square opening on the scraper. • String the wire and hold in place by bolting a U-bolt clamp on the cable.

7.19 Optional equipment

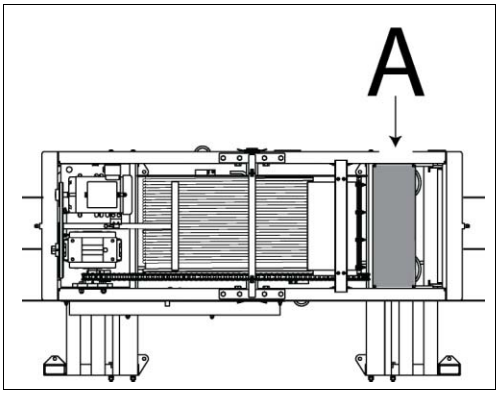
Steel cable lubricator (optional)

Warning!
Always shut off and lock the power supply.

Note!
Any section of cable that do not pass through the lubricator must be manually lubricated at regular intervals. Refer to section: Maintenance - Visual inspection.

Note!
Use biodegradable oil. Refer to the local rules and regulations on the environmental product.

- Shut off and lock the power supply.
- Open the hood and fill the reservoir with biodegradable oil.



Note!
This cable lubricator is pre-installed on the drive unit at the plant.

Note!
The drive mount cable lubricator can be added to an existing drive unit.

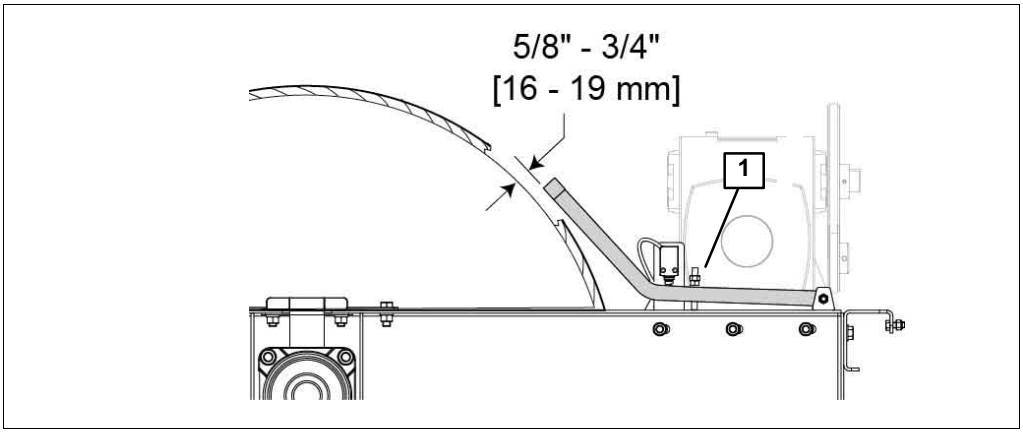
7.20 Adjustment and verification

7.20.1 Adjustment of the misrolled cable switch

Warning!
Always shut off and lock the power supply.

Warning!
Close and lock the safety guards on the equipment after completing the steps included in this section.

Attention!
When using a nylon cable, readjust height of the detection arm and cable switch each time the cable tension is adjusted.



- Make sure the main power supply is shut off and locked.
- Unlock and open the hood.
- Lift the detection arm at:
  - ⅝” [16mm] from the drum, when using a 3/8” [10mm] cable.
  - ¾” [19mm] from the drum, when using a 1/2” [13mm] cable.
  - 11/16” [17.5mm] from the drum, when using a 7/16” nylon rope.
- Place the tip of the switch on the detection arm so that the switch triggers immediately.
- Lock the detection arm position by tightening the bolts (1).
- Unlock and activate the power supply and set the control panel on manual mode.
- Engage the drive unit on either forward or reverse mode.

Caution!
Use extreme caution when the drive unit hood is open. The pulleys can cause entanglement resulting in serious injuries.

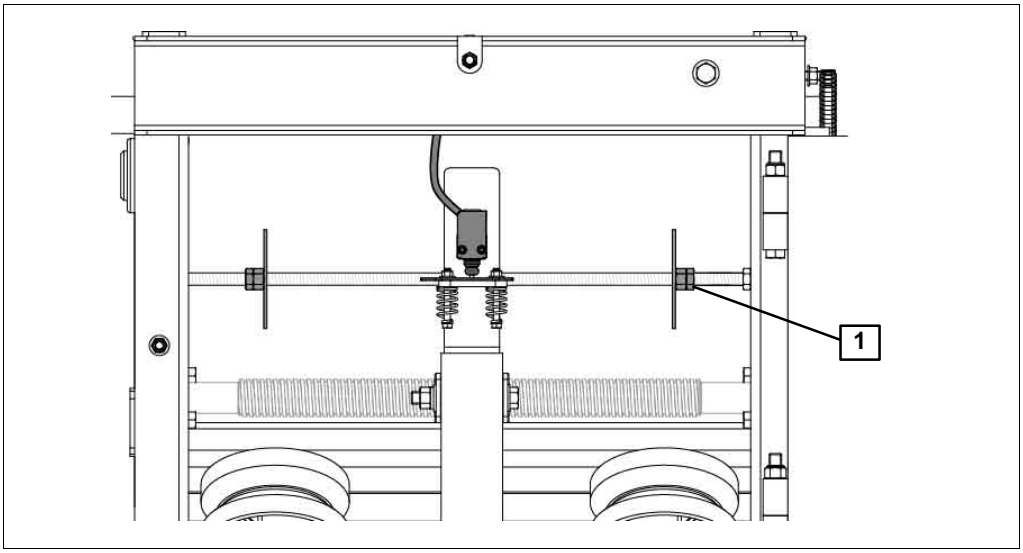
- Lift the detection arm to confirm that the switch triggers correctly.
- Shut off and lock the power supply.
- Tighten the bolts to hold the switch in position.

7.20.2 Stroke washers fine tuning

Warning!
Close and lock the safety guards on the equipment after completing the steps included in this section.

Attention!
Keep one person stationed at the control panel during all steps included in this section.

Attention!
Be ready to press the emergency button to stop the drive unit in case the limit switch does not stop the drive unit before the scraper hits the corner wheels.



- Set the control panel on manual mode.
- Engage the drive unit in forward mode.
- When the scraper stops, shut off the control panel.
- Measure how far the scraper is positioned from the desired stop point.
- 26” [66cm] of stroke equals to one complete turn of a washer (1).
- Adjust the stroke washer for the scraper to reach the desired stop point.
- Engage the drive unit in reverse mode until the scraper has backed off.
- Engage the drive unit in forward mode to see if the washer was properly adjusted, repeat to get the exact desired stop point.
- Repeat all steps to adjust the other washer.
- When the fine tuning steps are completed, tighten the jam nut to lock the end of stroke washers in place.

Refer to section: Handling and installation - Stroke washers initial setting.

8 Starting for the first time

8.1 Special qualifications required for initial commissioning

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

Read the section: Safety - Personnel qualifications.

8.2 Initial commissioning checklist

This checklist must be completed by the dealer and the customer to validate that the product is assembled and/or installed according to the manufacturer's instructions and safe for use.

Note!
Additional information necessary to complete the checklist can be found in this instruction manual.

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.		
A visual inspection is performed to ensure there are no leaks, signs of distortion or defective parts.		
The safety guards and safety labels are installed.		
The lubrication points are lubricated.		
The oil levels are adequate.		
All bolts are torqued.		
All connections are secured.		
The drive unit has clearance space around for safety purposes. If not, there are fences surrounding the drive unit to restrain access. All the warning signs notifying of a potential risk of crushing are visible.		
The drive unit is anchored on the concrete floor.		
The grey lifting supports are removed from the drive unit (when required) and kept in case it requires moving the unit.		
The cable is installed and secured on the drum.		
The cable does not contact any object other than the cable supports (when applicable).		
The cable tension is adjusted.		
Misrolled cable detector is adjusted.		
The stroke limit switch and the stroke washers are adjusted.		
Each cross gutter scraper is assembled and installed in the gutter.		
Each flapper wire is installed and adjusted.		
The motor(s) is wired properly and rotate in the right direction.		
The tension on the belt(s) is adjusted.		
The tension of each chain is adjusted.		
The gutter wheels are anchored.		
The equipment/component provided by the owner comply with the specifications contained in section: Technical data.		

Options general	**DONE**	**N/A**
The owner is instructed on how to operate and adjust the options of the system.		
The cable lubricator is installed and filled with oil.		

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

Dealer's signature: _____

Owner's signature: _____

Date: _____

8.3 First start

Caution!
Do not start this product until the initial commissioning checklist is completed.

The first start steps intend to test the product in order to validate its functionality and efficiency before handing it over to the customer. Therefore, the authorized dealer along with the customer must operate the product as well as the operating elements.

- Remove all objects from the gutter;
- Wet the new concrete gutter in the event that there are no animals in the barn yet.

Follow the steps in section: Operating.

8.4 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: Description - Technical data - Bolt torque chart;
- each gutter scraper stop at their respective stop points.
- the cable tension is adequate.
- each belt tension is adequate.
- each chain tension is adequate.
- the product works perfectly;

8.5 Handing over to the owner

Hand over warranty registration form

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

9 Operating

9.1 Special qualifications required for operating

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

Read the section: Safety - Personnel qualifications.

9.2 Safety instructions for operating

Warning!
Keep safety devices in place.

Warning!
Never stand within 20” [508 mm] from the drive unit.

Caution!
Keep body parts and clothing away from moving parts.

Caution!
Wear protective boots, eye gear and gloves for all steps included in this section.

Attention!
Remove any obstructing devices, objects, etc., from the gutter.

Read the section: Safety.

9.3 Operating the system

9.3.1 Programming the control panel

Use the instruction manual of the control panel to set the parameters and operate this product either on automatic or manual mode.

10 Operating faults

10.1 Special qualifications required for troubleshooting

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

Read the section: Safety - Personnel qualifications.

10.2 Safety instructions for troubleshooting

Warning!
Always shut off and lock the power supply before opening the access door, the hood and removing a guard.

Warning!
Close and lock the safety guards on the equipment after completing the steps included in this section.

Caution!
No one stands near this product unless they are performing instructions included in this section.

Caution!
Use extreme caution when the drive unit hood is open. The pulleys can cause entanglement resulting in serious injuries.

Caution!
Keep body parts and clothing away from moving parts.

Caution!
Wear protective boots, eye gear and gloves for all steps included in this section.

Read the section: Safety.

10.3 Troubleshooting possible faults

Fault	Possible cause	Solution
All scrapers operate in one direction. After completing one stroke, they stop.	The control panel is not programmed correctly.	Refer the instruction manual of the control panel
	The control panel detected a fault.	Find the fault number indicated on the control panel and refer to the instruction manual supplied with the control panel.
	The sliding plate of the stroke limit switch does not toggle.	Manually engage the sliding plate to check operation. Lubricate the plate, as indicated in section: Maintenance - Lubricate the stroke switch sliding plate.
	The stroke limit switch does not operate properly.	Manually engage the stroke limit switch to check operation. Check wires and connection. Change the switch, if defective.
	A disconnected or broken electric wire.	Have an electrician reconnect or change the electric wire.

Fault	Possible cause	Solution
The scrapers do not reach their stop point or suddenly stop.	The control panel has detected a fault.	Find the fault number indicated on the control panel and refer to the instruction manual supplied with the control panel.
	Wrong programming of the control panel.	Refer to the instruction manual of the control panel.
	The misrolled cable switch is activated.	Refer to section: Maintenance - Misrolled cable procedure.
	The stroke washers are not adjusted properly.	Proceed with the steps included in section: Handling and installation - Stroke washers fine tuning.
	A disconnected or broken cable.	Change or reconnect the cable. Refer to section: Handling and installation and choose the corresponding section.
	A disconnected or broken electric wire.	Have an electrician reconnect or change the wire.
	The circuit protection is defective.	Have an electrician replace the defective circuit.

Fault	Possible cause	Solution
The scraper does not clean the gutter properly.	The scraper carries too much manure on each cleaning	Have the scraper clean the gutter more often. Reprogram the control panel. Refer to the instruction manual of the control panel
	The scraper flapper does not open and close properly.	Adjust the flapper wire. Refer to section: Handling and installation -

Fault	Possible cause	Solution
Nothing operates, neither the scraper(s), the drive nor the motor(s).	The power supply is shut off.	Turn on the power supply and have an electrician check all wires.
	The emergency stop button of the control panel is activated or the control panel is turned off.	Deactivate the emergency stop button. Turn on the control panel.
	The control panel has detected a fault.	Find the fault number indicated on the control panel and refer to the instruction manual supplied with the control panel.
	Wrong programming of the control panel.	Refer to the instruction manual of the control panel.
	The misrolled cable detection switch is activated.	Refer to section: Maintenance - Misrolled cable procedure.

☞ **Note!**
For any other faults, please contact your authorized dealer.

11 Maintenance

11.1 Special qualifications required for maintenance work

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

Read the section: Safety - Personnel qualifications.

11.2 Safety instructions for maintenance

Warning!
Always shut off and lock the power supply before working on the equipment. Do not operate the product unless otherwise instructed.

Warning!
Close and lock the safety guards on the equipment after completing the steps included in this section.

Caution!
Use extreme caution when the drive unit hood is open. The pulleys can cause entanglement resulting in serious injuries.

Caution!
No one stands near this product unless they are performing instructions included in this section.

Caution!
Beware of leaks and spills such as grease, oil, water, etc. They can make a surface slippery causing injuries.

Caution!
Keep body parts and clothing away from moving parts.

Caution!
Wear protective boots, eye gear and gloves for all steps included in this section.

Note!
Have within reach containers to collect all substances potentially harmful such as oils, coolants, cleaning and disinfecting agents, etc.

Read the section: Safety.

11.3 Schedule maintenance responsibilities

11.3.1 GEA Farm Technologies Canada Inc. / Division GEA Houle Maintenance Schedule

Task	First 50hours of operation	First 100 hours of operation	Every week	Every month	Every 3 months	Every 6 months	Action by
Check and adjust the tension of the nylon rope	**Refer to the corresponding maintenance section**						Trained personnel
Check and adjust the tension of the steel/galvanized cable							
Visual inspection	x	x			x		
Check the bolts and anchor bolts torque	x	x				x	
Check and adjust the drive belt tension and pulley alignment		x			x		
Change oil of the speed reducer(s)		x				x	
Inspect the steel cable supports			x				
Lubricate the threaded rod			x				
Lubricate the stroke switch sliding plate			x				
Grease the bearings			x				
Grease the wheels			x				
Grease the scraper tensioner				x			
Inspect the scraper blades				x			
Pressure wash the wheel cleaner				x			
Purge air and check the speed reducer oil level.					x		
Inspect and adjust tension of #40 and #80 chain		x		x			
Lubricate the #40 and #80 chain					x		
General cleaning						x	
Lubricate the ½" threaded rod						x	
Visual inspection of the sealed bearings						x	

Attention!
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.

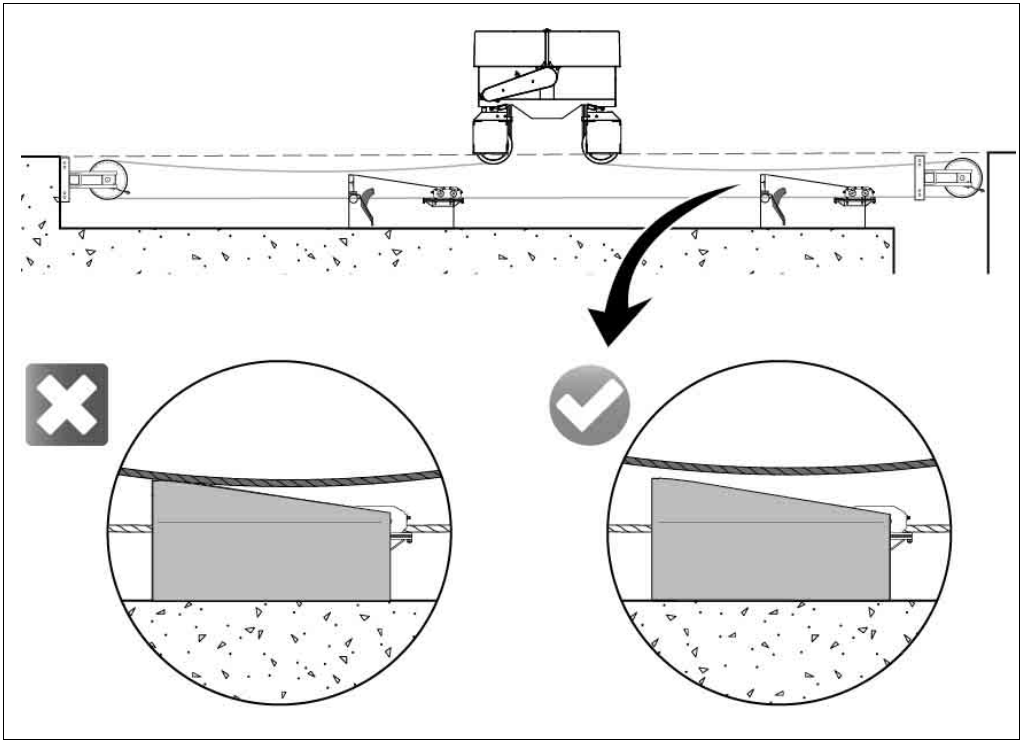
11.4 Check and adjust the tension of the nylon rope

Every hour during the first day of operation
Every day during the first week of operation
Every week during the first month of operation
Every month during the first six months of operation

Warning!
When using the wrench to apply or release tension on a cable, a significant load is applied on the wrench. Make sure the tensioner is locked before releasing the wrench, otherwise releasing the wrench can cause serious injuries.

Caution!
Wear protective boots, eye gear and gloves for all steps included in this section.

Attention!
Improper cable tension affects the load detection system. It causes the system to malfunction.



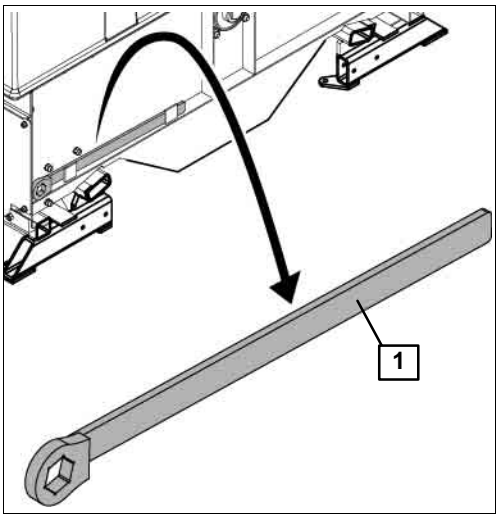
- Engage the drive unit in one direction.
- Stop the drive unit. If the cable contacts the scraper(s): follow the tensionning step below.
- Engage the drive unit in the opposite direction.
- Stop the drive unit. If the cable contacts the scraper(s): follow the tensionning steps below.

Attention!
When using a nylon cable, readjust height of the detection arm and cable switch each time the cable tension is adjusted.

Attention!
Always apply equal tension on all cables to prevent the scraper(s) from shifting position.

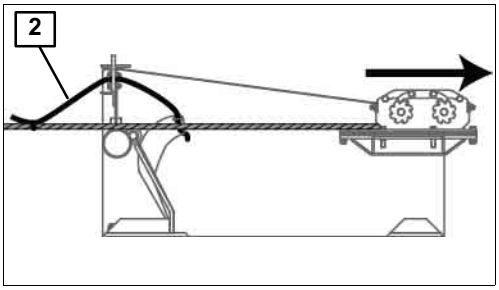
Tensionning

- Shut off the control panel.
- Shut off and lock the power supply.
- Use the wrench (1) located on the side of the drive unit, roll one catch on each scraper tensioner.
- Proceed scraper by scraper until the cable(s) no longer contact the scraper(s).



Flapper wire tensionning

- Manually operate the drive unit in forward.
- Check the flapper wire tension. The flapper wire must be tight (2) when the tensioners are flipped to the right.
- Retighten the wire, if necessary.



- After adjusting the cable tension, it might require adjusting the stroke of the scraper(s). Refer to section: Handling and installation - Adjustment and verification - Stroke washers fine tuning.

Misrolled cable switch adjustment

- Perform the misrolled cable switch adjustment.

Refer to section: Handling and installation - Adjustment and verification - Adjustment of the misrolled cable switch.

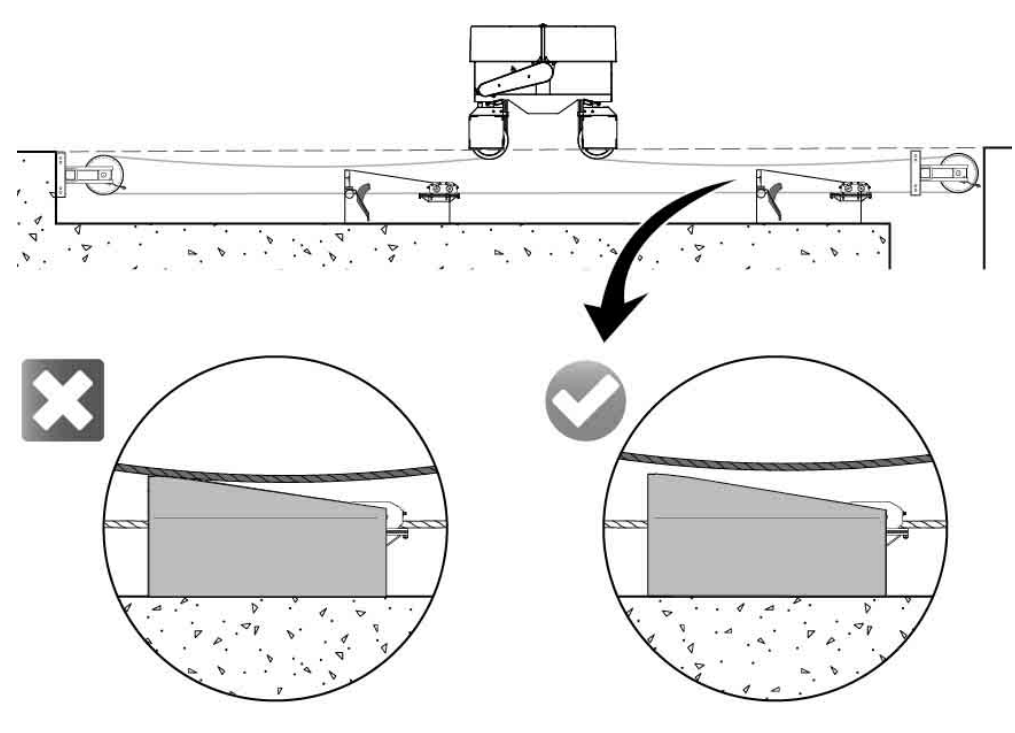
11.5 Check and adjust the tension of the steel/galvanized cable

Every day during the first week of operation
Every week during the first three months of operation

Warning!
When using the wrench to apply or release tension on a cable, a significant load is applied on the wrench. Make sure the tensioner is locked before releasing the wrench, otherwise releasing the wrench can cause serious injuries.

Caution!
Wear protective boots, eye gear and gloves for all steps included in this section.

Attention!
Improper cable tension affects the load detection system. It causes the system to malfunction.

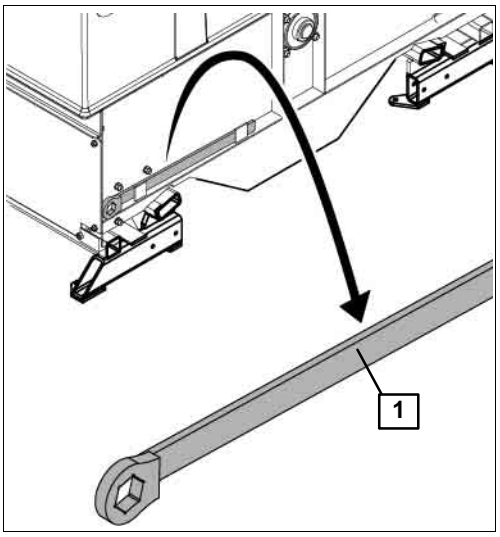


- Engage the drive unit in one direction.
- Stop the drive unit. If the cable contacts the scraper(s): follow the tensionning step below.
- Engage the drive unit in the opposite direction.
- Stop the drive unit. If the cable contacts the scraper(s): follow the tensionning steps below.

Attention!
Always apply equal tension on all cables to prevent the scraper(s) from shifting position.

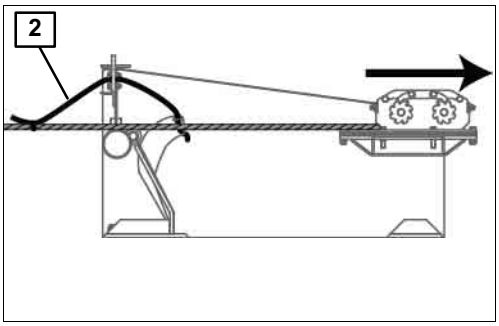
Tensionning

- Shut off the control panel.
- Shut off and lock the power supply.
- Use the wrench (1) located on the side of the drive unit, roll one catch on each scraper tensioner.
- Proceed scraper by scraper until the cable(s) no longer contact the scraper(s).



Flapper wire tensionning

- Manually operate the drive unit to move the scraper toward the drop point.
- Check the flapper wire tension. The flapper wire must be tight (2) when the tensioners are flipped to the right.
- Retighten the wire, if necessary.



- After adjusting the cable tension, it might require adjusting the stroke of the scraper(s). Refer to section: Handling and installation - Adjustment and verification - Stroke washers fine tuning.

11.6 Visual inspection

The first 50 hours of operation
The first 100 hours of operation
Every 3 months

Inspect the system to find any defective part or signs of abnormal wear on the:

- Cables, end wheels, pulleys, belts, scrapers, motor and speed reducer.

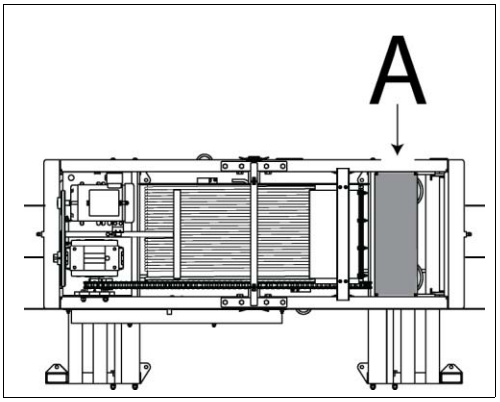
Remove accumulated manure:

- On the drum, the misrolled detection arm, the drive unit and the wheels, etc.

Add oil in the cable lubricators (optional)

☞ **Note!**
Use biodegradable oil. Refer to the locate rules and regulations on environmental product.

- When using cable lubricator, check the oil level (A), add oil if necessary.
- Apply oil to the cable sections that do not get lubricated by the lubricators.
- Repeat steps more often, if necessary.



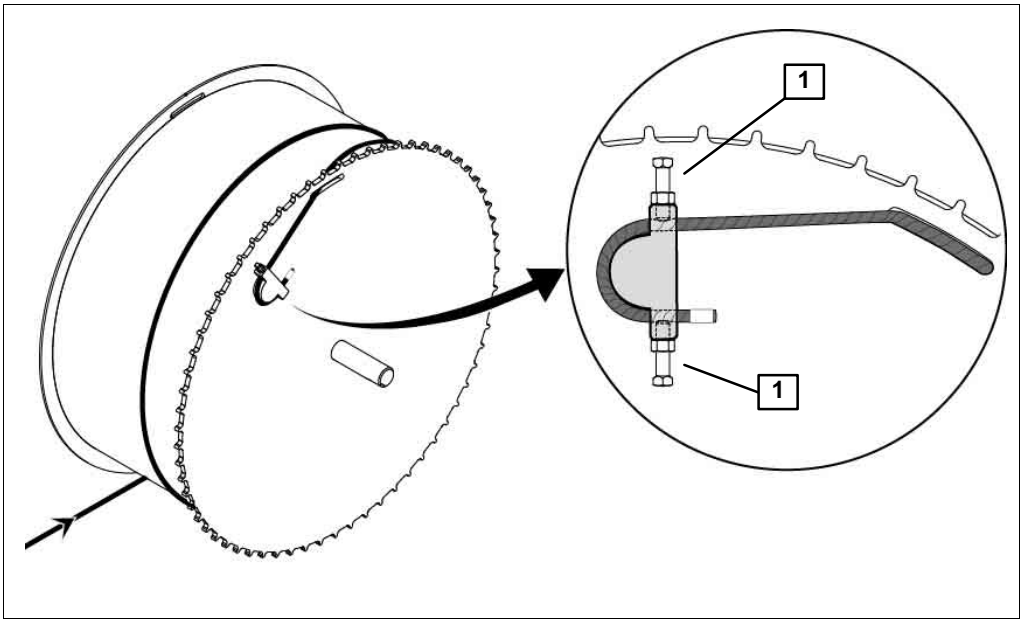
11.7 Check the bolts and anchor bolts torque

The first 50 hours of operation
The first 100 hours of operation
Every 6 months

Warning!
Always shut off and lock the power supply before working on this equipment.

Note!
Refer to section: Technical data - Bolt torque chart.

- Make sure the power supply is shut off and locked.
- Check that all bolts and anchor bolts are secure, re-torque when required or change, when necessary.
- In particular, re-tighten the bolts and nuts (1) that hold both cables on the drum.



11.8 Check and adjust the drive belt tension and pulley alignment

The first 100 hours of operation
Every 3 months

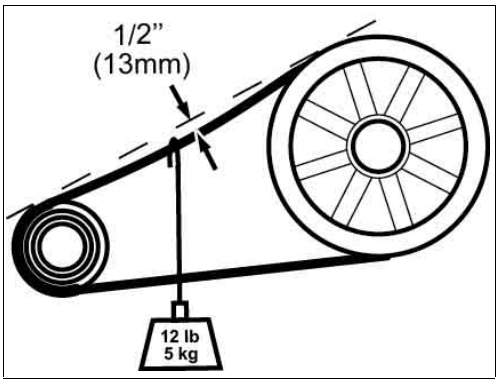
Warning!
Always shut off and lock the power supply.

Caution!
Beware of the drive belts and pulleys, they can pinch fingers.

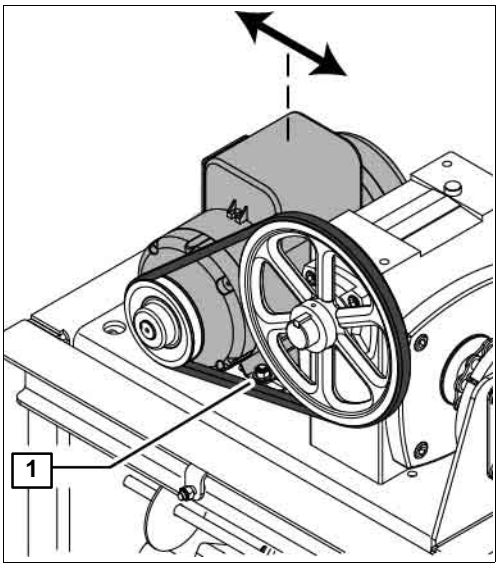
Attention!
Make sure both pulleys are perfectly aligned.

Note!
The belt must deflect roughly 1/2” (13mm) when applying a 12 lb (5kg) pressure halfway between the pulleys.

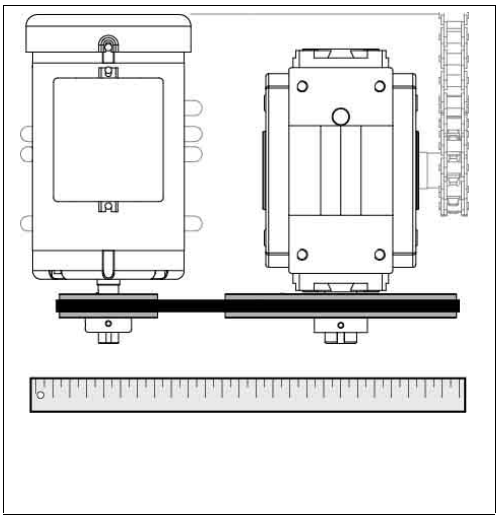
- Make sure the power supply is shut off and locked.
- Check the belt deflection by placing a straight edge over the belt. When applying by hand a 12lb [5 kg] pressure on the belt, the deflection should approximately be ½” [13mm].



- To adjust the deflection, loosen the 4 bolts of the motor base (1).
- Position the motor to obtain the right deflection.
- Lock the position, do not tighten the bolts yet.



- Place a straight edge on the side of both pulleys to check the alignment.
- Reposition the motor, if required or move the pulley on the shaft.
  To move the pulley on the shaft, loosen the set screw of the pulley.
- Once the deflection and the alignment are perfect, tighten the motor bolts and the set screw of the pulley.
- Repeat all steps for the second motor and speed reducer, when applicable.



11.9 Change oil of the speed reducer(s)

First 100 hours of operation
Every 6 months

Warning!
Always shut off and lock the power supply.

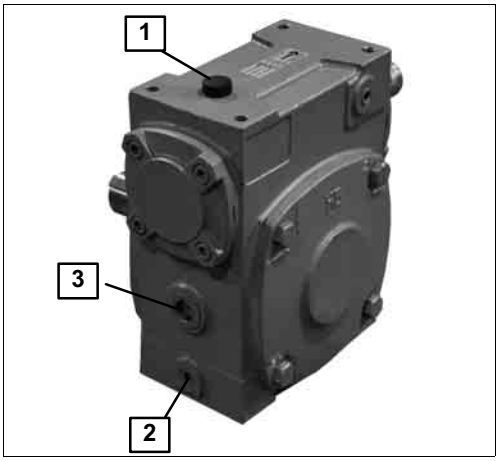
Caution!
Wear protective boots, eye gear and gloves for all steps included in this section.

Attention!
Wipe out spills and dispose of used oil according to the local and/or state regulations.

Note!
Only use Petro Canada Ultima G220 synthetic oil;
or Exxon SHC 629 synthetic oil.

Note!
Have within reach containers to collect all substances potentially harmful such as oils, coolants, cleaning and disinfecting agents, etc.

- Make sure the power supply is shut off and locked.
- Remove the oil filling plug (1) on top of the speed reducer.
- Place a container under the speed reducer to recover the used oil.
- Remove the drain plug (2).
- When completely drained, reinstall the drain plug.



- Fill the speed reducer through the filling plug (1) until the oil level indicator (3) is full.
- Repeat these steps to change the oil of the second speed reducer, if applicable.

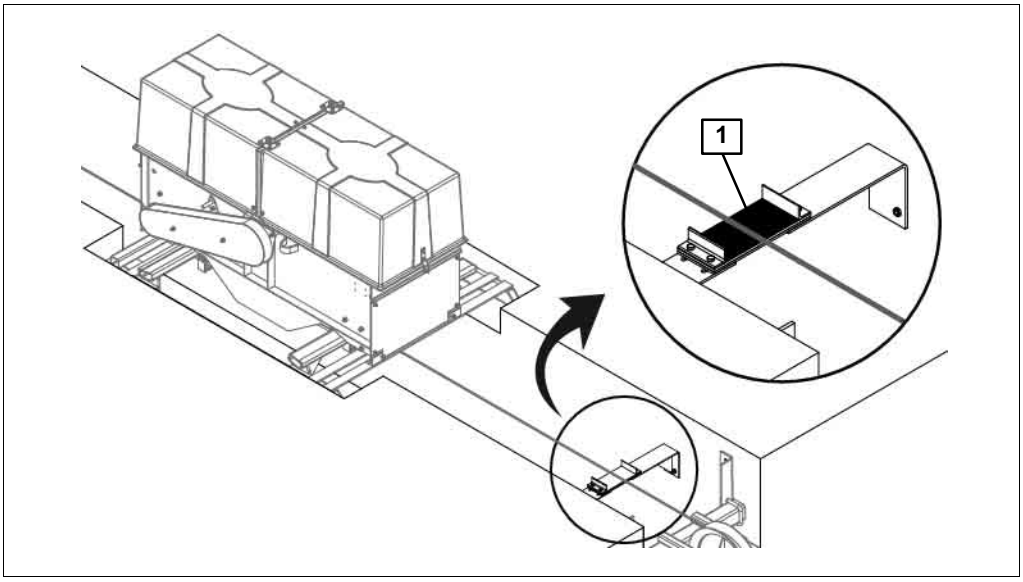
For more information on lubricants, refer to section: Technical data - Lubricant specifications.

11.10 Inspect the steel cable support

Every week

Warning!
Always shut off and lock the power supply.

Caution!
Wear protective boots, eye gear and gloves for all steps included in this section.



- Make sure the supports are anchored.
- Inspect the the urethane blades. Change the blade (1) when urethane is worn to the steel plate.

Part No.	Description
2005-3901-058	Urethane blade

11.11 Lubricate the threaded rod

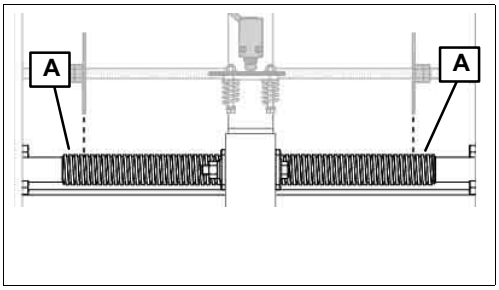
Every week

Warning!
Always shut off and lock the power supply before opening the access door.

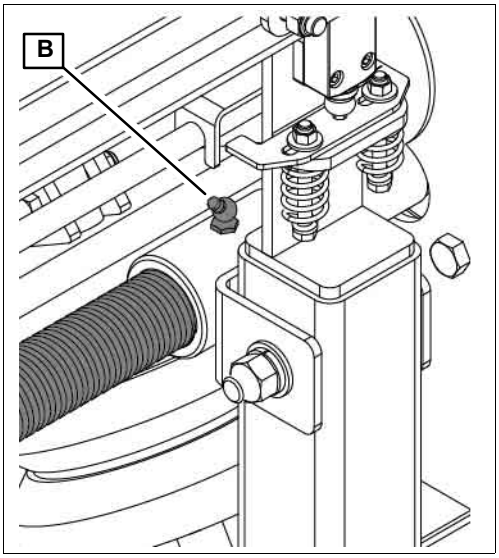
Caution!
Wear protective boots, eye gear and gloves for all steps included in this section.

Note!
Use EP2 mineral grease

- Make sure the power supply is shut off and locked
- Unlock and open the access door.
- Using a brush, grease the threaded sections (A), between the end of stroke washers and the drive unit frame.



- Use a grease gun to grease the threaded rod through the grease fitting (B).
- Close and lock the access door.



For more information on lubricants, refer to section: Technical data - Lubricant specifications.

11.12 Lubricate the stroke limit switch sliding plate

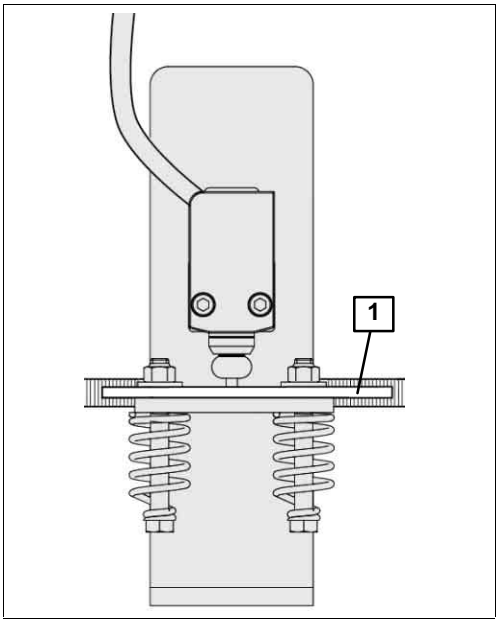
Every week

Warning!
Always shut off and lock the power supply before opening the access door.

Caution!
Wear protective boots, eye gear and gloves for all steps included in this section.

Note!
Use EP2 mineral grease.

- Make sure the power supply is shut off and locked.
- Unlock and open the access door.
- Apply grease on the stroke limit switch sliding plate (1).
- Toggle the sliding plate a few times.
- Close and lock the access door.



For more information on lubricants, refer to section: Technical data - Lubricant specifications.

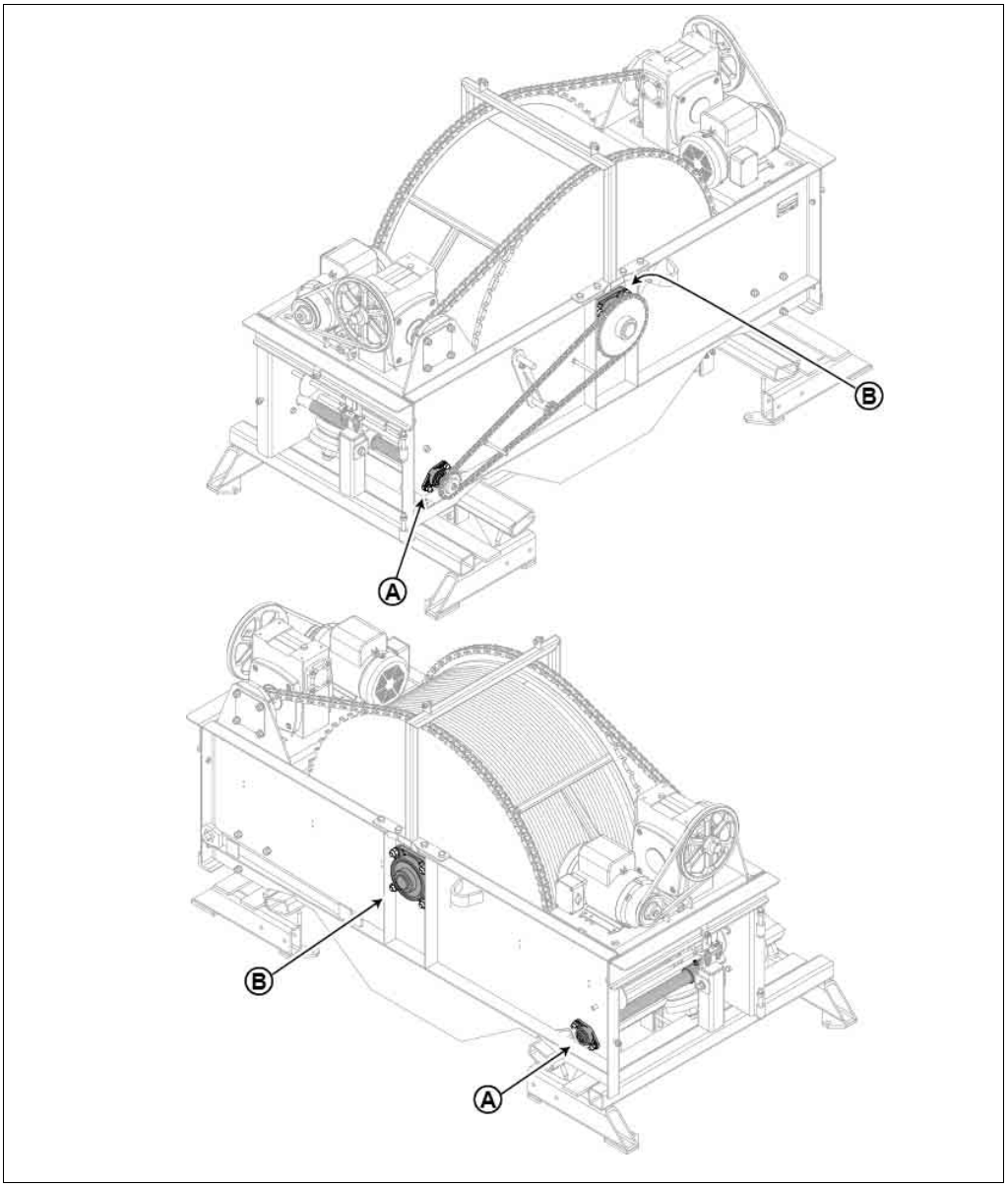
11.13 Grease the bearings

Every week

Warning!
Keep the safety guards in place.

Caution!
Wear protective boots, eye gear and gloves for all steps included in this section.

Note!
Use EP2 mineral grease.



- Grease all bearings through the grease fittings.

For more information on lubricants, refer to section: Technical data - Lubricant specifications.

11.14 Grease the wheels

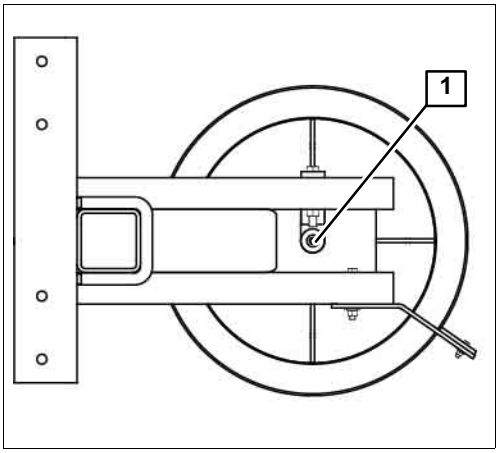
Every week

Warning!
Always shut off and lock the power supply.

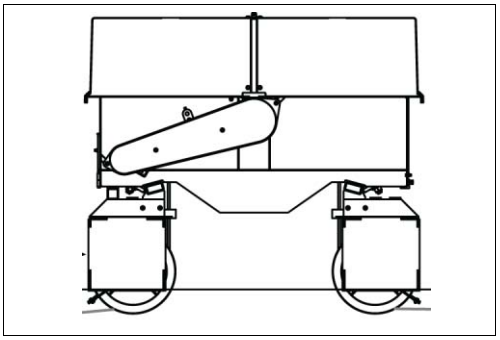
Caution!
Wear protective boots, eye gear and gloves for all steps included in this section.

Note!
Use EP2 mineral grease.

- Make sure the power supply is shut off and locked.
- Grease the gutter wheels through the grease fittings (1).



- Grease the drive unit wheels through the grease fitting



For more information on lubricants, refer to section: Technical data - Lubricant specifications.

11.15 Grease the scraper tensioner

Every month

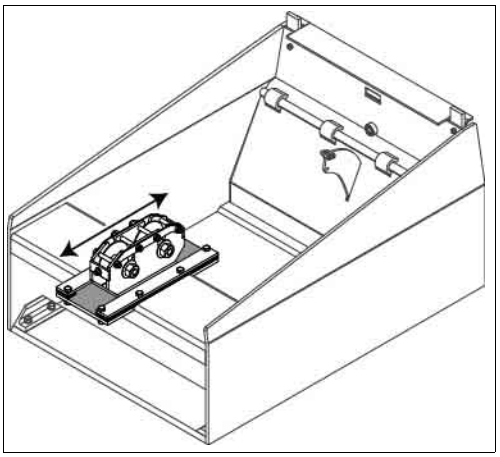
Warning!
Always shut off and lock the power supply.

Caution!
Wear protective boots, eye gear and gloves for all steps included in this section.

Note!
Use EP2 mineral grease.

Note!
Greasing the scraper tensioner is required only if the tensioner is not constantly immersed in manure.

- Empty and clean the cross gutter, if required.
- Shut off and lock the power supply.
- Using a brush, grease the plate located under the tensioner.
- Slide the tensioner back and forth a few times.



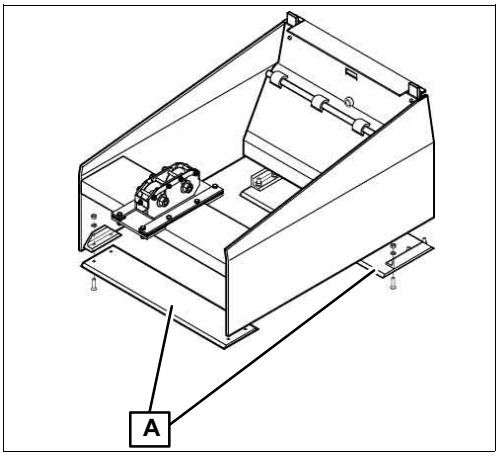
For more information on lubricants, refer to section: Technical data - Lubricant specifications.

11.16 Inspect the scraper blades

Every month

Warning!
Always shut off and lock the power supply.

- Clean and empty the cross gutter.
- Make sure the power supply is shut off and locked.
- Inspect the scraper blades (A).
- Replace the blades when worn.



11.17 Pressure wash the wheel cleaner

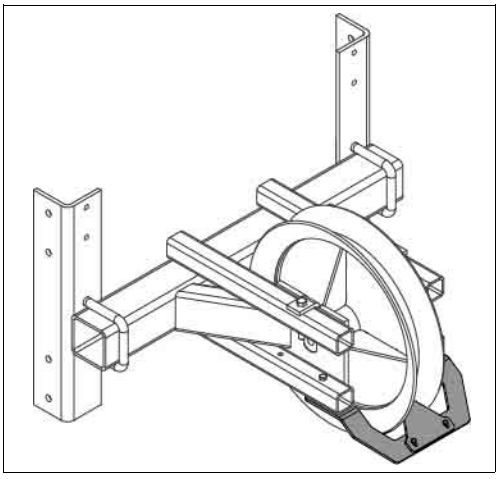
Every month

Warning!
Always shut off and lock the power supply.

Caution!
Wear protective boots, eye gear and gloves for all steps included in this section.

Attention!
Use tap water to clean this product. Do not exceed 2000 psi [105 bar] when using a pressure washer and keep the nozzle at a distance of 1ft [30cm] from the surface to be cleaned.

- Make sure the power supply is shut off and locked.
- Pressure wash the wheel cleaner to remove manure build up.



11.18 Purge air and check the speed reducer(s) oil level

Every 3 months

Warning!
Always shut off and lock the power supply.

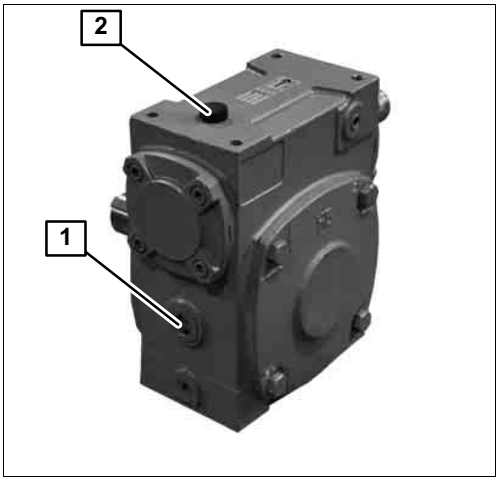
Caution!
Wear protective boots, eye gear and gloves for all steps included in this section.

Attention!
Wipe out spills and dispose of used oil according to the local and/or state regulations.

Note!
Only use Petro Canada Ultima G220 synthetic oil;
or Exxon SHC 629 synthetic oil.

Note!
Have within reach containers to collect all substances potentially harmful such as oils, coolants, cleaning and disinfecting agents, etc.

- Make sure the power supply and locked.
- Check the oil level through the indicator (1) located behind the speed reducer. Make sure the indicator is full.
- Remove the filling plug (2) on the top in order to release pressure inside the speed reducer.
- Repeat these steps to check the oil level of the second speed reducer, if applicable.



For more information on lubricants, refer to section: Technical data - Lubricant specifications.

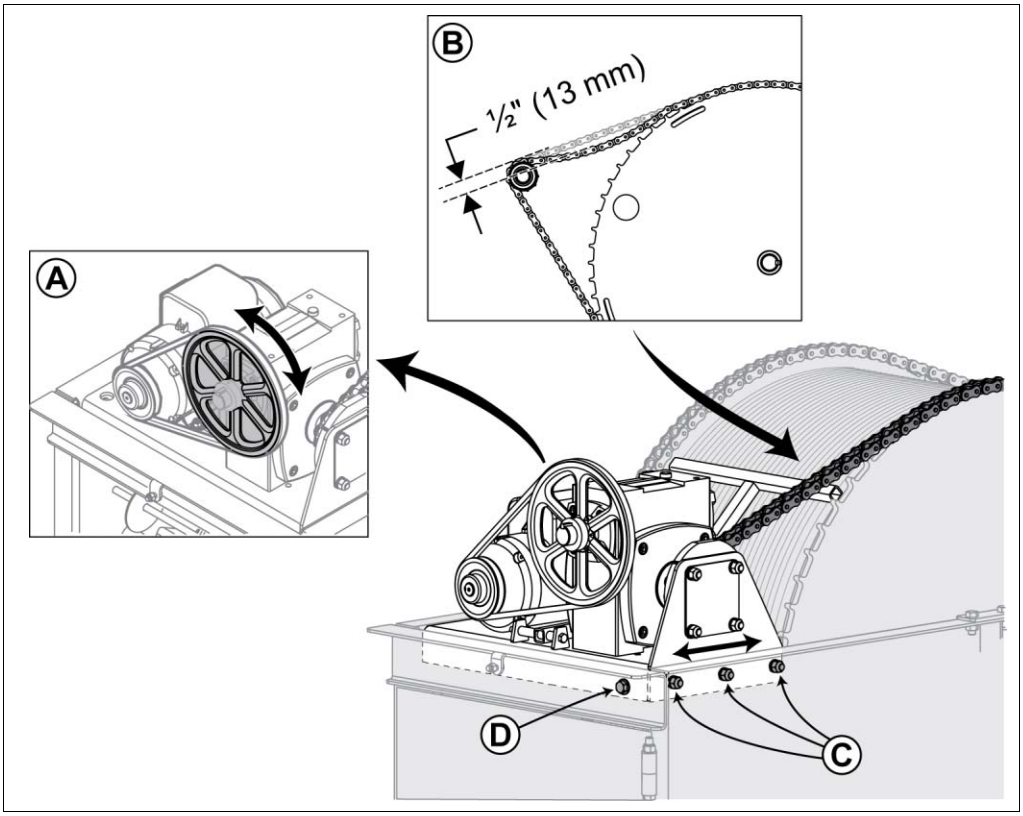
11.19 Inspect and adjust the tension of #40 and #80 chain

The first 100 hours of operation
Every month

Warning!
Always shut off and lock the power supply.

#80 chain

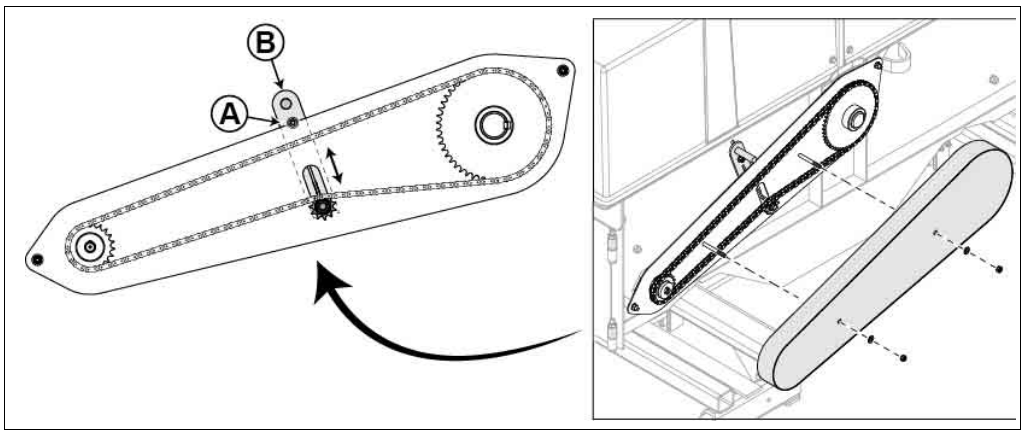
Attention!
Make sure the chain tension is equal on both chain sections (over and under the drum) before adjusting the deflection. Perform the following steps.



- Shut off and lock the power supply.
- Unlock and open the hood.
- By hand, rotate the speed reducer pulley (A) to obtain the maximum deflection on the chain section located over the drum, as shown in illustration (B).
- Mesure the chain deflection by placing a straight edge over the large gear and the drive unit drum, as illustrated in (B). The chain must deflect ½" [13 mm].
- To adjust the chain deflection, rotate by hand the speed reducer pulley in either direction to find the midpoint. Place the pulley on the midpoint in order to apply equal tension on the chain sections (chain over and under the drum).

- Loosen bolts and nuts (C) on each side of the drive unit.
- Screw the adjustment bolt (D) to reduce the deflection or unscrew the bolt to increase the deflection.
- Hold the position by tightening one bolt and nut (C) on each side of the drive unit.
- Rotate by hand the speed reducer pulley (A) to obtain the maximum deflection on the chain section located over the drum, as shown in illustration (B).
- Repeat steps until proper deflection is achieved.
- Make sure the large gear and the drum align perfectly.
- Tighten all bolts and nuts (C) on each side of the drive unit.
- When applicable, perform all steps to check the tension on the #80 chain located on the opposite side of the drive unit.

#40 chain



- While keeping the safety guard on the #40 chain, loosen the bolt of the tensioner (A).
- Pull on the tensioner (B) by hand to increase tension on the chain.
- Tighten the bolt of the tensioner (A).

11.20 Lubricate the #40 and #80 chain

Every 3 months

Warning!
Always shut off and lock the power supply.

Caution!
Wear protective boots, eye gear and gloves for all steps included in this section.

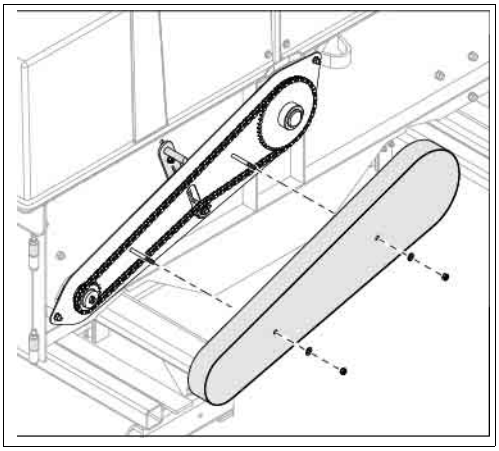
Attention!
Lubrication can occur every three months only when using a high performance chain lubricant. When using another type of lubricant, follow the manufacturer specifications.

Note!
Use a high performance chain lubricant such as ”Chaingang” brand.

For more information on lubricants, refer to section: Technical data - Lubricant specifications.

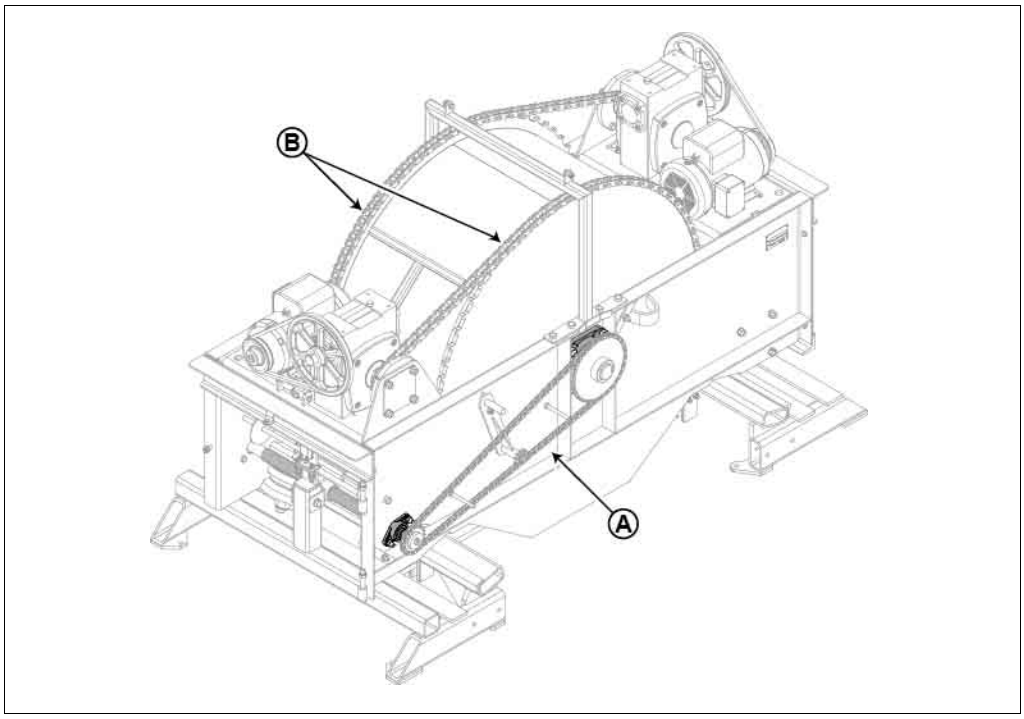
A - Chain #40

- Shut off and lock the power supply.
- Remove the safety guard, as illustrated.
- Lubricate the chain.
- Reinstall the safety guard.



B - Chain #80

Warning!
Always shut off and lock the power supply.



- Shut off and lock the power supply.
- Unlock and open the hood.
- Lubricate the section of the chain that is accessible.
- Close and lock the hood.
- Unlock and activate the power supply.
- Set the control panel on manual mode.
- Engage the drive unit on either forward or reverse mode.
- Operate the drive unit for 5 minutes to expose the non-lubricated portion of the chain.
- Stop the control panel.

Warning!
Always shut off and lock the power supply.

- Open the hood.
- Lubricate the chain section that is accessible.
- Close and lock the hood.

11.21 General cleaning

Every 6 months

Warning!
Always shut off and lock the power supply.

Caution!
Wear protective boots, eye gear and gloves for all steps included in this section.

Attention!
Use tap water to clean this product. Do not exceed 2000 psi [105 bar] when using a pressure washer and keep the nozzle at a distance of 1ft [30cm] from the surface to be cleaned.

Attention!
Never pressure wash the limit stroke switch, the electric motor and the speed reducer.

- Clean manure buildup on the scrapers, the wheels, the alleys, etc.
- Remove manure build up in and out of the drive unit.

11.22 Lubricate the ½" threaded rod

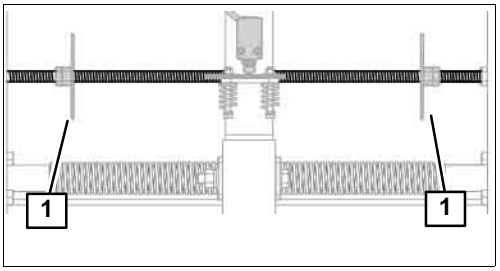
Every 6 months

Warning!
Always shut off and lock the power supply.

Caution!
Wear protective boots, eye gear and gloves for all steps included in this section.

Note!
Use EP2 mineral grease.

- Shut off and lock the power supply.
- Unlock and open the access door.
- Using a brush, lubricate the ½" [13 mm] threaded rod on each side of the stroke washers (1), as illustrated.
- Close and lock the access door.



For more information on lubricants, refer to section: Technical data - Lubricant specifications.

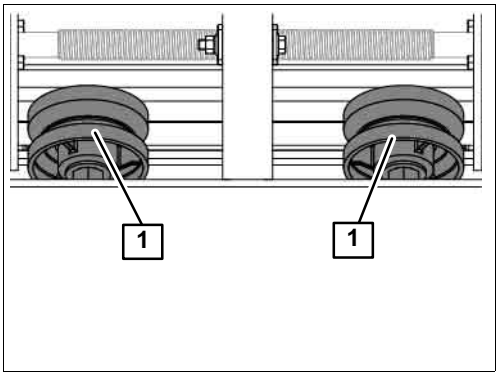
11.23 Visual inspection of the sealed bearings

Every 6 months

Warning!
Always shut off and lock the power supply.

Attention!
Sealed bearings do not require greasing.

- Make sure the power supply is shut off and locked.
- Unlock and open the access door.
- Inspect the sealed bearings (1) to find if there are signs of grease leaks.
- If a bearing leaks, it requires changing the steel wheel. Contact your dealer.



11.24 Misrolled cable procedure

Attention!
Always keep the misrolled cable switch in place to avoid damaging the drive unit, the cable and/or other components in case of double enrollment.

In general, the misrolled cable switch triggers when a cable has shredded wires or when the cable tension is loose or when manure has build up inside the drive unit.

Determine the cause and follow the corresponding steps.

11.24.1 Shredded wires

Warning!
Always shut off and lock the power supply.

Caution!
Wear protective boots, eye gear and gloves for all steps included in this section.
Use heavy duty gloves when handling the steel cable to prevent injuries.

Note!
The shredded wires of a cable can trigger the switch without causing a double enrollment.

- Shut off and lock the power supply.
- Inspect the cable.
- Find all damaged cable section(s).
- Unlock and activate the power supply.
- Wind or unwind the cable to access the damaged section.

Warning!
Always shut off and lock the power supply.

- Remove the cable section from the drive unit and from the scraper tensioner.
- Replace the cable. Refer to section: Handling and installation. Follow the steps corresponding to the cable section that requires installation.

11.24.2 Loose cable

Warning!
Always shut off and lock the power supply.

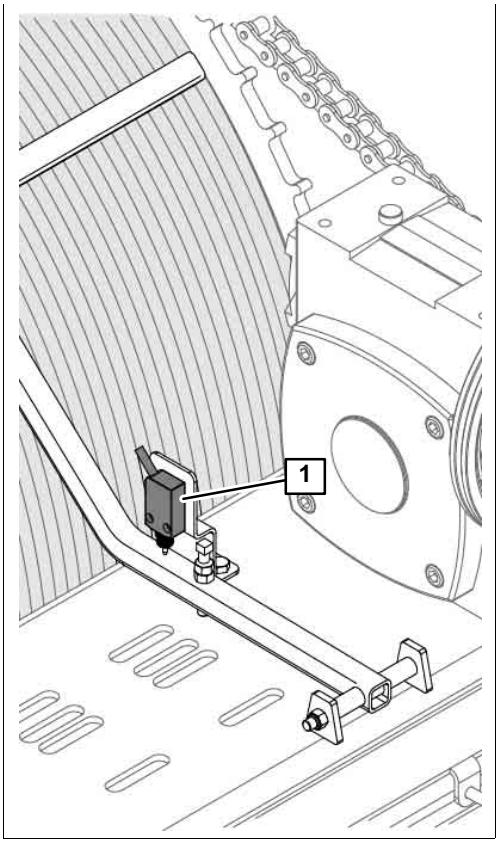
Caution!
Wear protective boots, eye gear and gloves for all steps included in this section.
Use heavy duty gloves when handling the steel cable to prevent injuries.

Caution!
Use extreme caution when the drive unit hood is open. The pulleys can cause entanglement resulting in serious injuries.

Note!
Have an assistant to help perform the following steps.

Step 1 - Unwind the cable

- Shut off and lock the power supply.
- Unlock and open the hood.
- Loosen the bolts holding the switch (1).
- Lift the switch and lightly tighten the bolts.
- Unlock and activate the power supply.
- Set the control panel on manual mode.
- Have an assistant pull the cable while jogging the drive unit to unwind the cable until the double enrollment is free.
- Have the assistant align the cable while jogging the drive unit to wind the cable properly. Make sure the cable is aligned in the cable guide locate under the drive unit.



Step 2 - Tighten the cable tension

- Adjust the cable tension. Refer to section: Maintenance - Check and adjust the tension of the nylon or steel cable.
  Follow the steps corresponding to the cable used (nylon or steel/galvanized).

Step 3 - Reposition the switch

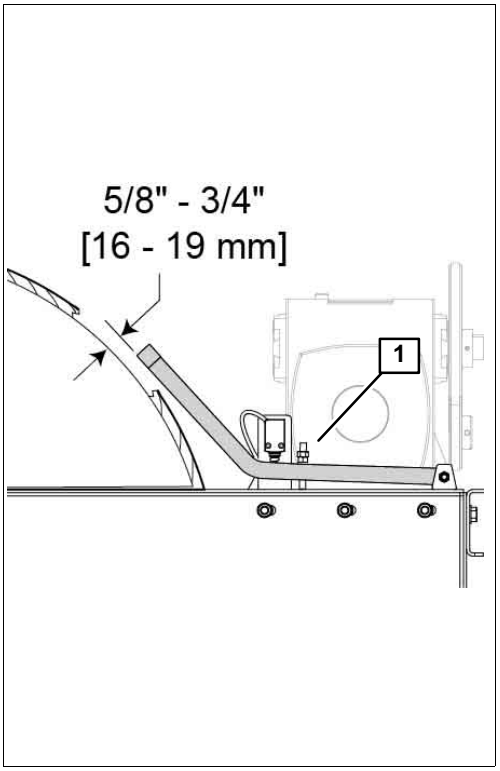
Warning!
Always shut off and lock the power supply.

Caution!
Use extreme caution when the drive unit hood is open. The pulleys can cause entanglement resulting in serious injuries.

Caution!
No one stands near this product unless they are performing instructions included in this section.

Caution!
Keep body parts and clothing away from moving parts.

- Shut off and lock the main supply.
- Lift the detection arm at:
  - ⅝” [16mm] from the drum, when using a 3/8” [10mm] cable.
  - ¾” [19mm] from the drum, when using a 1/2” [13mm] cable.
  - 11/16” [17.5mm] from the drum, when using a 7/16” nylon rope.
- Place the tip of the switch on the detection arm so that the switch triggers immediately.
- Lock the detection arm position by tightening the bolts (1).
- Unlock and activate the power supply.
- Set the control panel on manual mode.
- Engage the drive unit on either forward or reverse mode.



- Lift the detection arm to confirm that the switch triggers correctly.
- Repeat all steps, if necessary to adjust the switch.
- Stop the control panel.
- Tighten the bolts to hold the switch in position.
- Close and lock the hood.

11.24.3 Manure build up

Warning!
Always shut off and lock the power supply.

Caution!
Wear protective boots, eye gear and gloves for all steps included in this section.

Attention!
Use tap water to clean this product. Do not exceed 2000 psi [105 bar] when using a pressure washer and keep the nozzle at a distance of 1ft [30cm] from the surface to be cleaned.

Attention!
Never pressure wash the limit stroke switch, the electric motor and speed reducer.

- Shut off and lock the power supply.
- Unlock and open the hood.
- Remove all trace of manure build up.
- Close and lock the hood.
- Reset the system to operate normally. Refer to the control panel instruction manual.

12 Appendix

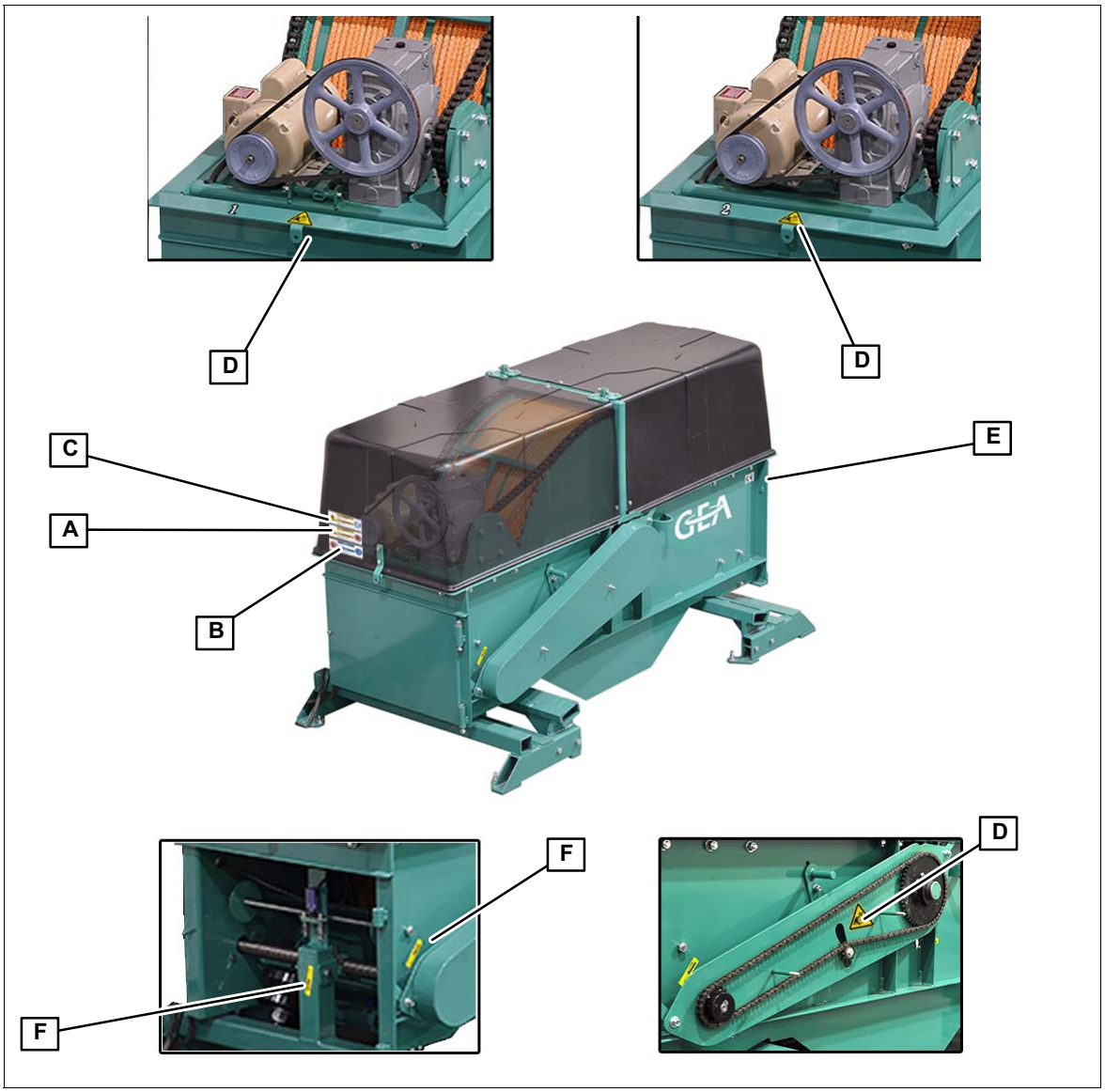
12.1 Abbreviations

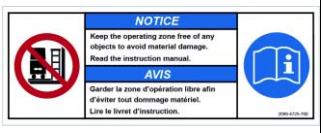
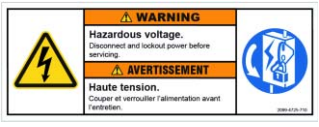
Terms	Explanation	Terms	Explanation
@	at	Ø	Diameter
CE / EC	European Union	CW	clockwise
CCW	counterclockwise	fax	facsimile
I.D.	inside diameter	Inc.	Incorporated
NC	national coarse thread	O.D.	outside diameter
PTO	power take-off	PVC	polyvinyl chloride
QC / qc	Quebec	SAE	Society of Automotive Engineers
Us / USA	United States of America	www	world wide web

Units	Explanation	Units	Explanation
A	Amperage (electrical current)	kW	kilowatt
bar	bar pressure	km/h	kilometres per hour
cm	centimeters	LPM	liters per minute
°	degree angle	lb	pounds
°C	degree centigrade/ Celsius (temperature)	m	meter
°F	degree Fahrenheit (temperature)	min	minute
' / ft	Feet	mph	miles per hour
ft-lb	foot-pound	mm	millimeters
gal.	gallon	N/m	Newton metre
GPM	gallons per minute	psi	pounds per square inch (pressure)
Hp	horsepower	RPM	revolutions per minute
hrs	hours	s	second
Hz	Hertz	V	volt (voltage)
” / in	inch (= 25.4 mm)	VDC	volts of direct current
kg	kilograms	VAC	volts of alternative current
kPa	kilo Pascal		

12.2 Label position

12.2.1 Safety labels and lubrication labels



A	 2099-4725-690	B	 2099-4725-700	C	 2099-4725-710
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