



BUCKET ELEVATOR

Assembly and Owner's Manual

Sukup Manufacturing Co.

1555 255th Street, Box 677

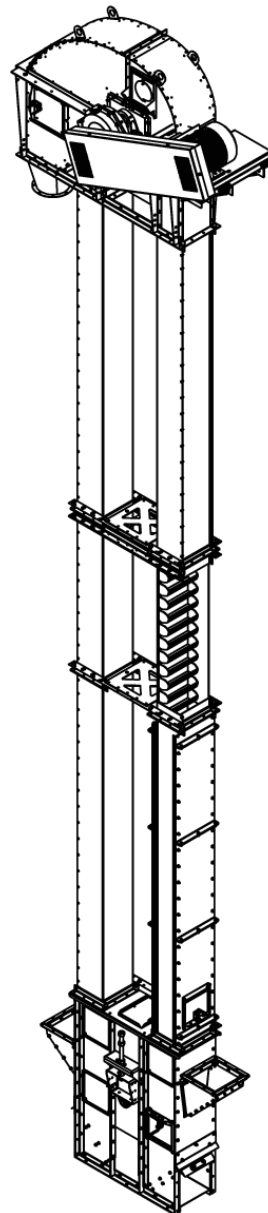
Sheffield, Iowa, USA 50475-0677

Phone: 641-892-4222

Fax: 641-892-4629

Website: www.sukup.com

E-mail: info@sukup.com



<u>DATE</u>	<u>REVISION</u>	<u>PAGE</u>
09/08/2022	Added references to 48" dia. pulley elevator-----	16-20, 23, 25, 26, 33-36, 52, 55 & 56
	Updated inlet dimensions table-----	17
	Added references to supporting elevator by a support tower-----	21, 28, 41 & 60
	Added note on confirming rotation of specialty boot pulley-----	24
	Updated shovel pocket hopper location drawing to show locations of rub block areas-----	27
	Added squaring plate & tie angles for inspection sections-----	30, 32, 33 & 35
	Adjusted introduction to guidance on use of guy wire brackets-----	41
	Added reference to attachment of torque arm bracket V013270-----	52
	Updated Step 7 to check connections between elevator & support tower-----	60
	Updated Dodge bearing & speed reducer pages-----	61-62, 69-75
	Updated pressure relief vent closure replacement instructions-----	63
12/08/2021	Updated safety icons as needed-----	5-6
	Updated dimensions drawing & table-----	16
	Added note on location of bolted flanges on legs-----	36
	Updated drawings to improve legibility-----	41

Table of Contents

Introduction-----	3
Receiving and Inspection -----	3
Equipment Information -----	3
Limited Warranty-----	4
Safety-----	5
Safety Decal Placement-----	12
Electrical Wire Clearances -----	13
Bolt Identification and Torque Ratings-----	14
Component Identification -----	15
Dimensions-----	16
Pre-Installation Information-----	21
Elevator Location -----	21
Electrical Requirements -----	21
Foundation -----	21
Boot Footing Loads -----	22
Guy Wires and Anchors-----	22
Guy Wire Loading -----	23
General Installation Procedures-----	24
Boot Installation -----	24
Boot Inlet Location -----	26
Shovel Pocket Hopper-----	27
Leg Trunking Stacking Guidelines-----	28
Trunking for 16" to 36" Pulley Elevator -----	29
Trunking for 42" & 48" Pulley Elevator -----	33
Trunking Assembly-----	36
Cable Lengths -----	43
Attaching Head Section -----	44
Belt & Buckets Installation Overview-----	46
Attaching Buckets -----	47
Belt Installation-----	48
Attaching Hood-----	51
Drive Installation -----	52
Adjusting V-Belt Tension-----	57
Reducer Oil -----	58
Final Check -----	58
Initial Test Run -----	58
Maintenance -----	59
Bearing Lubrication -----	61
Pressure Relief Vent Closure Replacement-----	63
Troubleshooting-----	64
Dodge Torque Arm II Speed Reducers -----	69
Contact Information -----	76

Introduction

Introduction

This bucket elevator was carefully designed to give years of dependable service and was manufactured with the finest materials available. This manual includes information relating to safety, installation, maintenance and troubleshooting, and should be thoroughly read prior to installation of bucket elevator. Due to the scope of projects involving material handling equipment and the wide variety of situations, this manual cannot cover all aspects. Qualified civil engineers and contractors should be relied upon for site design, layout and construction. This manual is to be used as a guide only. The reliability, safety and good service life of this equipment depends to a very large extent on level of care taken in installing and preparing this equipment for its intended use.

Receiving and Inspection

Carefully inspect the shipment for damage as soon as it is received. Verify quantity of parts or packages actually received corresponds to the quantity shown on the packing slip. Report any damage or shortage to delivering carrier as soon as possible. Sukup Manufacturing's responsibility for damage to equipment ended with acceptance by delivering carrier. Refer to bill of lading. Save all paperwork and documentation furnished with elevator components.

Equipment Information

Record bucket elevator information in space provided below and keep it on file. This information will help identify equipment should you need to contact your dealer with any questions.

Model number	_____
Serial number	_____
Head pulley diameter	_____
Discharge height	_____
RPM	_____
Grain type(s)	_____
Horsepower	_____
Dealer	_____
Date purchased	_____

Serial number plate is located on inspection section.

**Sukup Manufacturing Co.**

PO Box 677 Sheffield, IA USA 50475

Phone: 641-892-4222 Fax: 641-892-4629

E-mail: Info@sukup.com Visit us at: www.sukup.com

GRAIN HANDLING & MATERIAL HANDLING LIMITED WARRANTY

SUKUP MANUFACTURING CO. (Sukup) warrants to original retail purchaser that within time limits set forth, new equipment shall be free from defects in material and workmanship. A part will not be considered defective if it substantially fulfills performance specifications, such as cosmetic (appearance) issues that will not affect life of product. Should any part prove defective within the warranty period, the part will be replaced without charge F.O.B. Sukup Manufacturing Co., Sheffield, Iowa USA or Distribution Centers - Arcola, Illinois; Aurora, Nebraska; Defiance, Ohio; Jonesboro, Arkansas; Cameron, Missouri; Watertown, South Dakota. To obtain warranty, a copy of original invoice is required, see reverse side.

THE FOREGOING LIMITED WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE AND OF ANY OTHER TYPE, WHETHER EXPRESS OR IMPLIED. Sukup neither assumes nor authorizes anyone to assume for it any other obligation or liability in connection with said part, and will not be liable for incidental or consequential damages. THE REMEDIES STATED HEREIN SHALL BE THE EXCLUSIVE REMEDIES AVAILABLE UNDER THIS LIMITED WARRANTY.

Sukup reserves the right to change specifications, add improvements or discontinue manufacture of any of its equipment without notice or obligation to purchasers of its equipment. This warranty gives you specific legal rights. You may also have other rights which vary according to state or province.

WARRANTY EXCLUSIONS - Labor, transportation, or any cost related to a service call is not provided by Sukup. This Limited Warranty does not apply to damage resulting from misuse, neglect, normal wear, accident or improper installation or maintenance. ITEMS NOT MANUFACTURED BY SUKUP (e.g. tires, belts, motors) ARE COVERED UNDER WARRANTIES OF THEIR RESPECTIVE MANUFACTURERS AND ARE EXCLUDED FROM COVERAGE UNDER THE SUKUP WARRANTY. Since the stirring down augers are so critical to the successful operation of the stirring machine, Sukup Manufacturing Co. will not warranty any machines unless they are equipped with Sukup down augers. SUKUP MANUFACTURING CO. MAKES NO WARRANTY, EXPRESS OR IMPLIED, WITH RESPECT TO DOWN AUGERS LONGER THAN 20', INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY AND WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

Upon taking delivery of product, purchaser (dealer and/or end user) assumes responsibility for proper storage of all materials. Proper storage includes dry, temperature and humidity controlled facilities, which eliminate the potential of moisture, including condensation, from causing white rust and/or corrosion of any sort. Warranty does not extend to defects, damage or cosmetic (appearance) issues caused by improper storage, handling or erection.

BASIC WARRANTY - All Sukup manufactured products are warranted for one year from date of purchase. Part(s) must be returned to Sukup within 30 days in event of failure.

EXTENDED STIRRING MACHINE WARRANTY - Sukup warrants stirring machines for two years from date of purchase.

EXTENDED STIRRING AUGER WARRANTY - Sukup warrants stirring down augers for two years from date of purchase. Must return top 18" of down auger to obtain credit.

EXTENDED FAN WARRANTY - Sukup warrants fans for two years from date of purchase.

EXTENDED HEATER CIRCUIT BOARD WARRANTY - Sukup warrants heater circuit boards for three years from date of purchase.

EXTENDED MATERIAL HANDLING WARRANTY - Sukup warrants Material Handling, excluding structural support systems, for two years from date of purchase.

REPLACEMENT PARTS WARRANTY PERIOD - Sukup warrants replacement parts (e.g. belts, sensors, rotating contacts, gearmotors, switches) purchased from Sukup for one (1) full drying season following purchase.

ELECTRIC MOTOR WARRANTY - The manufacturers of electric motors warranty their motors through authorized service centers for a 2 year period from motor date code. Contact motor manufacturer for nearest location. If motor warranty is refused by a service center based upon date of manufacture, use the following procedure: Have motor repair shop fill out warranty report form as if they were providing warranty service. State on report reason for refusal. Send report, motor nameplate, and proof of purchase date (invoice from Sukup and invoice for your customer) to Sukup. If electric motor warranty is not satisfactorily handled by motor service center, contact Sukup for assistance. Sukup will attempt to obtain warranty from motor manufacturer, any credit obtained will be passed on. Warranty may also be obtained by returning motor to Sukup Manufacturing Co. or Distribution Centers with prior authorization. **NOTE:** Sukup will not be responsible for unauthorized motor replacement or repair. Labor for removal of motor from fan not included.

WARRANTY CERTIFICATION - Warranty registration card should be mailed within one month of product delivery to certify warranty coverage.

UNAPPROVED PARTS OR MODIFICATION - All obligations of Sukup under this warranty are terminated if unapproved parts such as stirring augers longer than 20' are used, or if equipment is modified or altered in any way not approved by Sukup.

Safety



Read manual before installing or using product. Failure to follow instructions and safety precautions in manual can result in death or serious injury. Keep manual in a safe location for future reference.



They indicate potential hazards and levels of intensity.



RED - DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



ORANGE - WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



YELLOW - CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.



BLUE - NOTICE alerts you to practices unrelated to personal injury, such as messages related to property damage.

IMPORTANT: To prevent serious injury or death to you or your family, it is essential that safety decals are clearly visible, in good condition, and applied to the appropriate equipment.

FOLLOW MANUAL & SAFETY DECAL MESSAGES

Carefully read this manual and all safety decals on your equipment.

Safety decals must be kept in good condition. Replace missing or damaged safety decals by contacting Sukup Manufacturing Co. via mail at PO Box 677, Sheffield, Iowa USA, 50475; by phone at 641-892-4222; or by e-mail at info@sukup.com.



It is the responsibility of the owner/operator to know what specific requirements, precautions, and work hazards exist. It is also the responsibility of the owner/operator to inform anyone operating or working in the area of this equipment of hazards and safety precautions that need to be taken to avoid personal injury or death. Always keep children away from bins and vehicles with flowing grain.

Make no unauthorized modifications to machine. Modifications may endanger function and/or safety of unit. Keep unit in good working condition. Keep shields in place. Replace worn or missing shields free of charge by contacting Sukup Manufacturing Co.

GRAIN BIN SAFETY

Owners/operators are responsible for developing site-specific confined space entry procedures. OSHA's confined space entry procedures (29CFR 1910.146) can be found at www.osha.gov.

If you must enter bin for repair or maintenance:

- Use a safety harness, safety line and respirator
- Station another person outside of bin
- Avoid the center of the bin
- Wear appropriate personal protective equipment
- Keep clear of all augers and moving parts



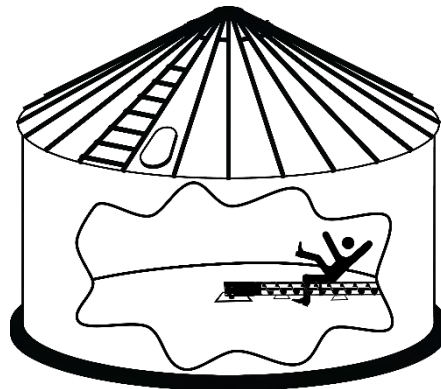
DANGER: Never enter bin unless all power is locked out and another person is present.



Rotating augers can kill or dismember!

NEVER enter bin when augers are running!

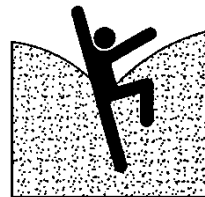
When bin is nearly empty, sweep auger will travel at an increasingly fast speed. Keep away from sweep and sump augers to avoid entanglement.



Failure to follow precautions above will result in death or serious injury.



DANGER: Flowing grain may trap and suffocate. If you enter a bin of flowing grain you can be completely submerged in grain in about 8 seconds.



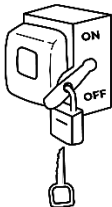
Failure to heed this warning will result in death or serious injury.

Safety

To avoid electric shock or electrocution, all equipment must be properly wired and grounded according to electrical codes. Have unit wired by qualified electrician.



Have an electrician install a main power disconnect switch capable of being locked only in OFF position. Mark disconnect clearly as to equipment it operates. Always lock out main power disconnect switch whenever equipment is not in use.



WARNING: When servicing equipment, never enter bin unless all power is locked out and another person is present. Always LOCK OUT all power and always check with voltage meter before servicing.



Failure to do so could result in death or serious injury.

Owners/operators are responsible for developing site-specific Lockout/Tagout procedures based on equipment at their work site. See OSHA's typical minimal lockout procedures (29CFR 1910.147 App A) at www.osha.gov.



WARNING: KEEP CLEAR OF ALL MOVING PARTS.

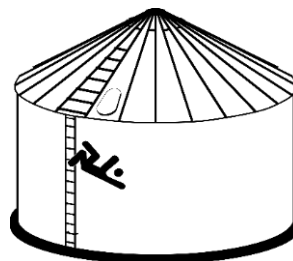
Keep people (ESPECIALLY YOUTH) away from equipment, particularly during operation.

Keep away from all moving parts. Keep all shields in place. **SHUT OFF AND LOCK OUT** all power before servicing.

Failure to follow precautions above could result in death or serious injury.



WARNING: Metal is slippery when wet. To avoid falls, never carry items if climbing on bin. Maintain secure hand and foothold if climbing on bin. Failure to do so could result in death or serious injury.



CAUTION: Metal edges are sharp. To avoid injury, wear protective clothing and handle equipment and parts with care.

Failure to do so may result in minor or moderate injury.

PERSONAL PROTECTIVE EQUIPMENT



Owners/Operators are responsible for developing site-specific personal protective equipment standards. OSHA's personal protective equipment standards (29CFR 1910.132) can be found at www.osha.gov.

EMERGENCIES – KNOW WHAT TO DO

Have emergency numbers and written directions to work site readily available in case of emergency. An area for emergency phone numbers to be recorded is provided below and at end of this manual.

Ambulance • Fire • Police: 9-1-1

Bin rescue team: _____

Emergency medical squad: _____

Address of work site: _____

Directions to work site: _____

IMPORTANT – A bucket elevator is generally used to move grain for storage in grain bins. Be aware of dangers inherent in grain bins. Do not enter a bin if grain has stopped flowing normally or has bridged, as shown in Fig. 1. Grain can collapse without warning and trap, bury and cause suffocation.

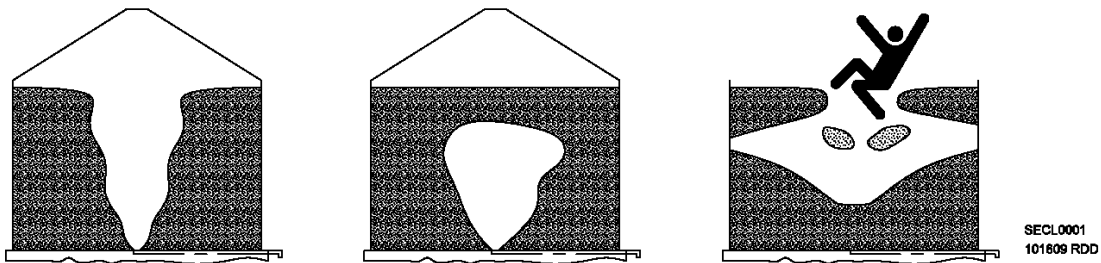


Fig. 1 – Obstructed-flow, bridged grain, collapsed bridge of grain in bin

Basic Safety Rules

1. Be certain that all covers, grates and guards are in place and securely fastened.
2. Never step or walk on conveyor covers, grates or guards.
3. Lock out all power before removing covers, grates or guards. Before working on any part of bucket elevator or conveyor, secure all chains and belts to prevent movement.
4. Do not modify or redesign bucket elevator without first obtaining written approval from Sukup Manufacturing Co. Unauthorized modifications to components may impair the function and/or safety and affect machine life.



FOLLOW A PROPER LOCKOUT PROCEDURE

This suggested procedure must be performed **EVERY TIME** bucket elevator is to be worked on. Following these steps will assist in preventing accidents.

- Each worker must have his/her own lock and the only key to that lock.
- Make sure elevator is not operating before turning off power.
- Notify all affected employees that elevator will be locked out for service.
- Authorized employee shall refer to the facility procedure referencing the power source for the elevator.
- Shut down bucket elevator in a normal manner.
- All energy sources that could activate elevator must be de-activated.
- Each person who will be working on bucket elevator must put a lock on all energy sources that could provide any power to elevator.
- Confirm that power has been deactivated by trying to re-start elevator.
- Turn all controls for elevator back to “off” position.
- **NO ONE** is to return power to bucket elevator until all work on it has been completed and all locks have been removed.

Facility management needs to proactively train employees to ensure use of proper lockout procedures while working on bucket elevator. Management also needs to inspect unit for any covers or guards not in their proper place. It is everyone's responsibility to report any missing grates, guards, equipment failures or failures of others to lock out. Make certain that no cover is removed unless power is locked out.

Grain Dust Explosions

Any facility that stores and handles any type of grain is susceptible to a grain dust explosion. Grain dust is not dirt. It is not inert, but highly flammable and can be very explosive in a confined area. Seven elements may work together and produce a potentially deadly explosion:

Air - Air must be present to provide the oxygen necessary for combustion.

Fuel - In this case the fuel is the grain dust. Finer dust will provide easier ignition.

Suspension - A pile of grain dust will not explode, it must be suspended in air to provide proper fuel/air concentration.

Minimum Concentration - There must be a minimum concentration of grain dust suspended in air. Current tests indicate that minimum concentration is about 0.4 oz./ft.³.

Low Moisture - Grain dust must be of relatively low moisture content. Ambient air moisture, or relative humidity, has no bearing on potential for an explosion.

Ignition Source - Ignition source could be a fire, overheated bearing, welding or cutting sparks, debris, hot metal or electrical failure.

Confined Area - An explosive action must take place within a confined area.

Recognizing this hazard, Sukup Manufacturing Co. believes that we all need to work together to prevent grain dust explosions in order to protect lives, jobs, property and profits. Preventive measures should be taken to reduce the likelihood of an explosion. Following are some suggestions.

CONTROL DUST

- Employ methods to clean grain to reduce fines.
- Use equipment to minimize breakage, such as decelerators. Corn that is broken exposes grain starch. NOTE: Starch is the most explosive element of grain.
- Use an outside bag filter to capture dust.
- Use an air system on bucket elevator to reduce dust inside elevator and conveyors.
- Spraying edible mineral oil on grain significantly reduces airborne dust when handling grain.
- Equipment finishes in grain facility should be provided with slick coatings in order to prevent dust accumulation.
- Enclose all conveyors in an effort to keep dust from escaping.

CONTROL IGNITION SOURCE

- A “no smoking” policy shall be implemented in all potentially hazardous areas.
- Only explosion-proof lights shall be used.
- All welding and cutting shall take place outside of facility.
- Properly lubricate bearings on all equipment at required intervals.
- Use magnets to trap metal that might be mixed in with grain.
- Check lagging on bucket elevator head pulley and replace it if it is showing signs of wear or is smooth.
- Use recommended safety devices such as heat detectors on bearings, motion sensors on boot shaft, belt alignment sensors, or limit switches to shut down system if leg is choked. Make certain all electrical wiring, lights and outlets meet local codes.



WARNING: Do not repeatedly start and stop elevator to remove obstruction. Doing so could overheat belt or head pulley, possibly causing an explosion resulting in death or serious injury.

GRAIN DUST EXPLOSION MYTHS

Several myths have surfaced in regard to grain dust explosions. These are some of the most common:

Myth: Grain dust explosions do not occur in times of high humidity.

FACT: Dust explosions have been known to occur during rainstorms.

Myth: Grain dust explosions do not occur in wooden elevators.

FACT: Wooden elevators are no less susceptible to grain dust explosions than any other construction type.

Myth: Grain dust explosions do not occur in small country elevators.

FACT: 70% - 80% of grain elevator explosions occur in small country terminals.

Myth: There are only two (2) explosions that occur, a primary and a secondary.

FACT: Up to thirteen (13) explosions have been documented during one (1) single incident.

PRESSURE RELIEF VENTING

Pressure relief vents for trunking can be supplied as optional equipment for all models of bucket elevators. Pressure relief vents for heads are standard on all models with a 36" pulley and larger, and optional on smaller units. These vents, should an explosion occur within a leg, may minimize damage to leg and prevent a secondary explosion.

Remember: Good housekeeping practices and correct safety procedures will help protect lives, jobs, property and profits.

<p>IMPORTANT: When changing head pulley assembly or motor, do not set on platform if total weight on platform will exceed 500 lbs. Total weight on any platform cannot exceed 500 lbs. unless otherwise noted.</p>

Bucket Elevator Safety Decals

It is essential that the following safety decals be mounted on your bucket elevator to warn and remind of potential hazards. Decals on Sukup bucket elevators are factory-mounted, but may need to be replaced if they become damaged or unreadable.

Order replacement safety decals or shields free of charge by contacting Sukup Manufacturing Co. by mail at PO Box 677, Sheffield, Iowa 50475; by phone at 641-892-4222; or by e-mail at info@sukup.com. Please specify decal number. Use drawing on Page 12 to determine location of decal(s) if replacement is necessary.

1. **Decal L0112 – DANGER:** Explosion release will cause serious injury or death!



2. **Decal L0113 – WARNING:** Falling from heights may cause serious injury or death.



3. **Decal L0271 – DANGER:** Shield missing, do not operate!



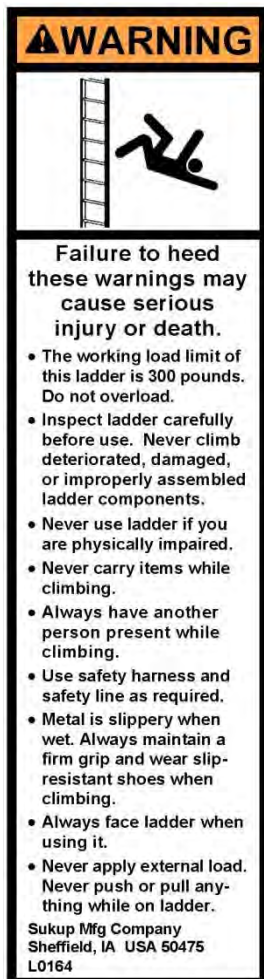
4. **Decal L01135 – WARNING:** Platform collapse can cause serious injury or death.



5. **Decal L0114 - WARNING:** Exposed buckets or flights may cause serious injury or death.



6. **Decal L0164 – WARNING:** Failure to heed these warnings may cause serious injury or death.



7. **Decal L0917 – WARNING:** Crush hazard



8. **Decal L0281 - WARNING:** To avoid serious injury or death:



9. **Decal L0284 - WARNING:** Keep away from all moving parts



10. **Decal L02612 – WARNING:** Flying material can cause serious injury!



Bucket Elevator Safety Decal Placement

Check that all safety decals are in place according to Fig. 2 and are legible after elevator is installed.

NOTE: These decals must never be removed, tampered with, painted over or obscured in any way. If decal replacement becomes necessary, use locations below. Make sure location for decal is free from grease, oil and dirt. Remove backing from decal and place in proper position.

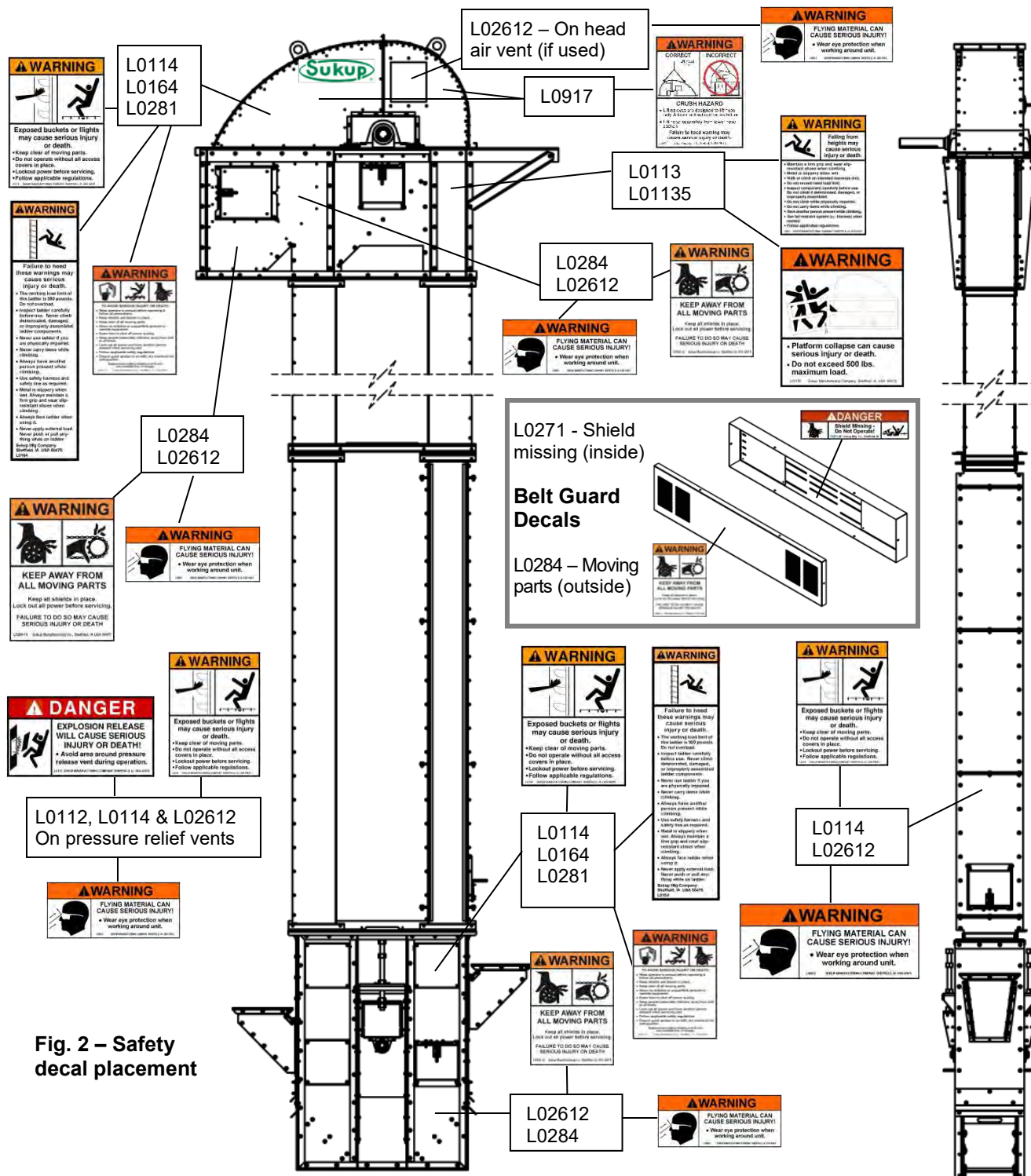


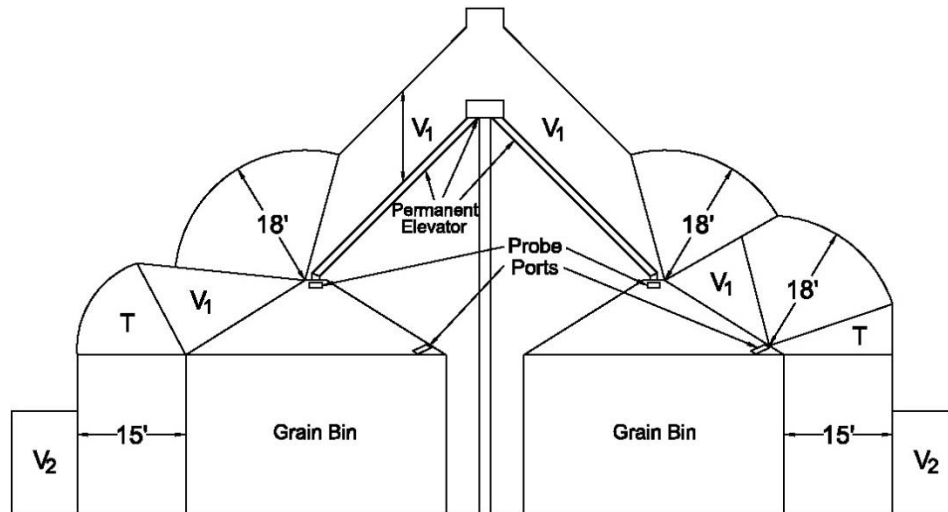
Fig. 2 – Safety decal placement

Electrical Wire Clearances

Your local electric utility may be able to provide assistance in planning a safe environment for working around grain bins. State codes may vary regarding specific clearances for electrical lines around grain bins. Be certain your local electric utility is in accordance with your state's regulations. **To prevent overhead safety issues, bury electrical lines.**

The American National Standards Institute (ANSI) provides clearance envelopes, shown in Fig. 3, for grain bins filled by permanently installed augers, conveyors or elevators in (ANSI) C2 2007 "National Electrical Safety Code," Rule 234, Page 120.

NOTE: An electric utility may refuse to provide electrical service to any grain bin built near an existing electric line that does not provide clearance required by ANSI and the National Electrical Safety Code.














V_1 = Vertical clearance above a building required by Rule 234C (Table 234-1)

V_2 = Vertical clearance above land required by Rule 232

T = Transition clearance

Fig. 3 – Electrical wire clearances

UNIFIED INCH BOLT AND CAP SCREW TORQUE VALUES

SAE Grade and Head Markings	1 or 2 ^b 	5  5.1  5.2 	8  8.2 
SAE Grade and Head Markings	2 	5  	8  

Size	Grade 1				Grade 2 ^b				Grade 5, 5.1, or 5.2				Grade 8 or 8.2			
	Lubricated ^a		Dry ^a		Lubricated ^a		Dry ^a		Lubricated ^a		Dry ^a		Lubricated ^a		Dry ^a	
	N.m	lb-ft	N.m	lb-ft	N.m	lb-ft	N.m	lb-ft	N.m	lb-ft	N.m	lb-ft	N.m	lb-ft	N.m	lb-ft
1/4	3.7	2.8	4.7	3.5	6	4.5	7.5	5.5	9.5	7	12	9	13.5	10	17	12.5
5/16	7.7	5.5	10	7	12	9	15	11	20	15	25	18	28	21	35	26
3/8	14	10	17	13	22	16	27	20	35	26	44	33	50	36	63	46
7/16	22	16	28	20	35	26	44	32	55	41	70	52	80	58	100	75
1/2	33	25	42	31	53	39	67	50	85	63	110	80	120	90	150	115
9/16	48	36	60	45	75	56	95	70	125	90	155	115	175	130	225	160
5/8	67	50	85	62	105	78	135	100	170	125	215	160	240	175	300	225
3/4	120	87	150	110	190	140	240	175	300	225	375	280	425	310	550	400
7/8	190	140	240	175	190	140	240	175	490	360	625	450	700	500	875	650
1	290	210	360	270	290	210	360	270	725	540	925	675	1050	750	1300	975
1-1/8	470	300	510	375	470	300	510	375	900	675	1150	850	1450	1075	1850	1350
1-1/4	570	425	725	530	570	425	725	530	1300	950	1650	1200	2050	1500	2600	1950

DO NOT use these values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only. Check tightness of fasteners periodically.

Shear bolts are designed to fail under pre-determined loads. Always replace shear bolts with identical grade.

Fasteners should be replaced with the same or higher grade. If higher-grade fasteners are used, these should only be tightened to the strength of the original.

Make sure fastener threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

Tighten plastic insert or crimped steel-type lock nut to approximately 50 percent of the dry torque shown in the chart, applied to the nut, not to the bolt head. Tighten toothed or serrated-type lock nuts to the full torque value.

^a "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated without any lubrication.

^b Grade 2 applies for hex cap screws (not hex bolts) up to 152 mm (6-in.) long. Grade 1 applies for hex cap screws over 152 mm (6-in.) long, and for all other types of bolts and screws of any length.

Fig. 4 & Table 1 – Torque values

Component Identification

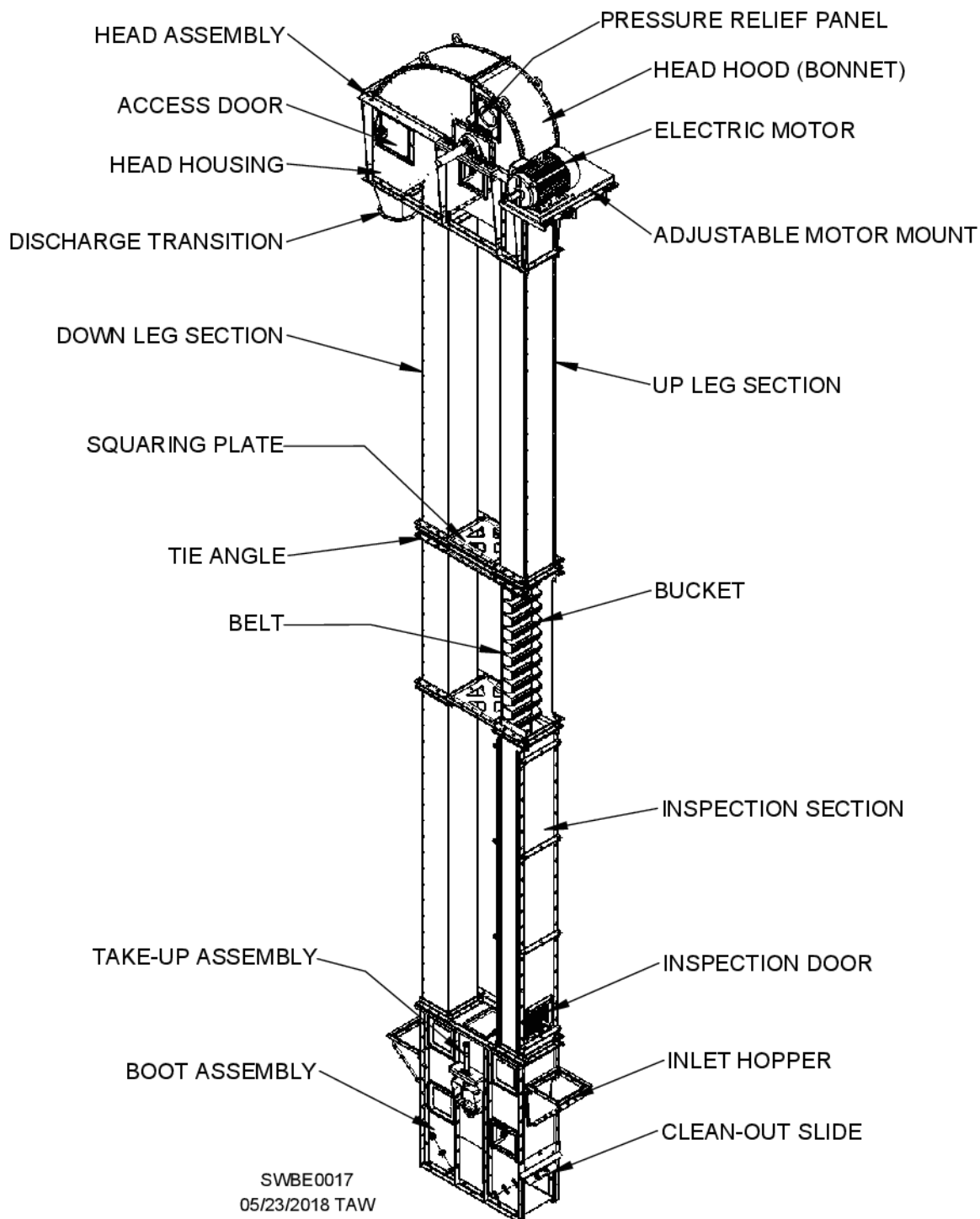
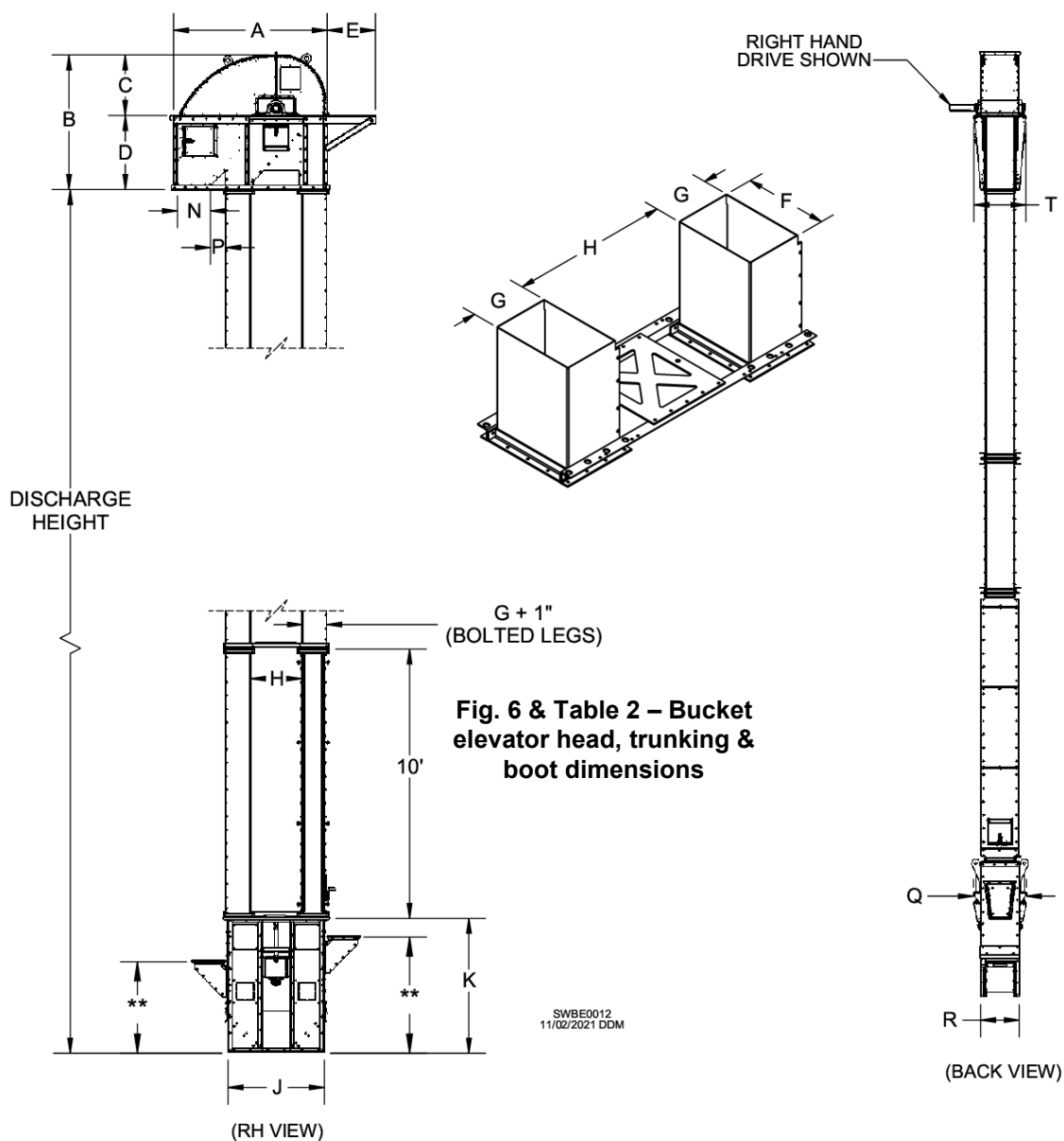


Fig. 5 – Bucket elevator components

Dimensions

Dimensions



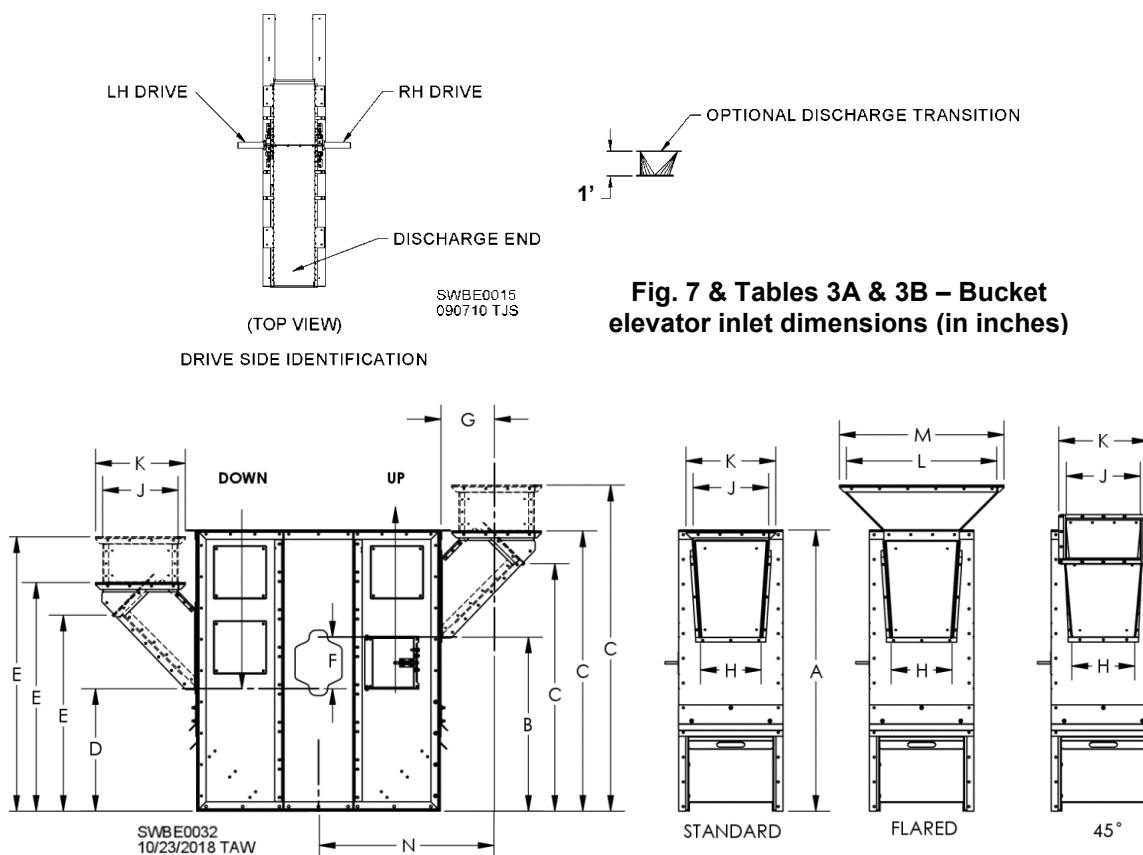
** See Table 3A on next page for boot inlet height based on inlet design – Standard, Flared or 45°.

PULLEY DIA.	BPH Range	A	B	C	D	E	CASING F x G	H	J	K	N	P	Q	R	T
16"	1000-2000	53-7/16	45-5/16	18-13/16	26-1/2	21-1/2	11 x 8	14	30	60	11	10	23-3/4	15	21-3/16
24"	1500-5000	68-1/2	60	26-3/4	33-1/4	21-1/2	13 x 10	23	43	60	13	9	23-5/8	17-1/4	23-3/16
30"	4000-7500	85-3/8	75-1/4	33-1/2	41-3/4	32-5/8	18 x 12	28	52	60	17-5/8	12	28-5/8	22-1/4	30-5/16
36"	6000-10000	98-3/8	87-3/8	37	50-3/8	32-5/8	18 x 12	34	58	60	17-5/8	19	28-5/8	22-1/4	30-5/16
42"	8000-17000	110-3/4	101-1/8	41-1/8	60	32-5/8	22 x 14	40	68	72	22	18	32-3/4	26	38-5/16
48"	15,000-20,000	122-15/16	107-1/2	47-1/2	60	32-13/16	22 x 14	46	74	72	22	24	32-3/4	26	38-5/16

All dimensions are in inches.

Dimensions

Dimensions



PULLEY SIZE	TRUNKING WIDTH	A	MINIMUM							
			B	C STD.	C FLARED	C 45°	D	E STD.	E FLARED	E 45°
16	11	60	29	45-1/8	53	38-1/4	17	33-1/8	41	26-1/4
24	13	60	32-1/2	48-3/4	56-1/2	43-1/8	21-1/2	37-3/4	45-1/2	32-1/8
30	18	60	37	59-3/4	69-1/2	52-3/4	26	48-3/4	58-1/2	41-3/4
	22 *	60	37	59-3/4	69-1/2	52-3/4	26	48-3/4	58-1/2	41-3/4
	32 *	60	37	59-3/4	69-1/2	52-3/4	26	48-3/4	58-1/2	41-3/4
	40 *	60	37	59-3/4	69-1/2	52-3/4	26	48-3/4	58-1/2	41-3/4
36	44 *	60	37	59-3/4	69-1/2	52-3/4	26	48-3/4	58-1/2	41-3/4
	18	60	40	62-3/4	72-1/2	55-3/4	29	51-3/4	61-1/2	44-3/4
	22	72	43-1/4	72	82-3/4	63-1/4	32-1/4	61	71-3/4	52-1/4
	32	72	43-1/4	72	82-3/4	63-1/4	32-1/4	61	71-3/4	52-1/4
42	40	72	43-1/4	72	82-3/4	63-1/4	32-1/4	61	71-3/4	52-1/4
	22	72	43	74	84-3/4	62-1/2	36	65	75-3/4	56-1/4
	32	72	43	74	84-3/4	62-1/2	36	65	75-3/4	56-1/4
	40	72	43	74	84-3/4	62-1/2	36	65	75-3/4	56-1/4

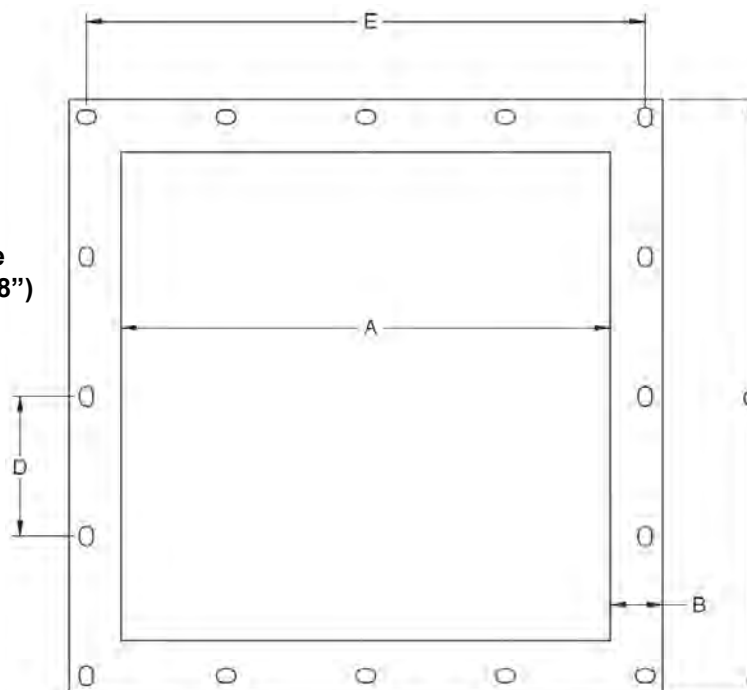
*For peanut elevators

PULLEY SIZE	TRUNKING WIDTH	F	G	H	J	K	L	M	N
16	11	12	7-3/8	6	10	13	22	25	22-1/2
24	13	11	8-3/8	8	12	15	24	27	30
30	18	11	11-7/8	13	16	19	32	35	38
	22 *	11	11-7/8	17	20	23	36	39	38
	32 *	11	11-7/8	27	30	33	46	49	38
	40 *	11	11-7/8	35	38	41	54	57	38
36	44 *	11	11-7/8	39	42	45	58	61	38
	18	11	11-7/8	13	16	19	32	35	41
	22	11	14-7/8	15-1/2	22	25	40	43	49
	32	11	14-7/8	25	32	35	50	53	49
42	40	11	14-7/8	33	40	43	58	61	49
	22	11	14-7/8	15-1/2	22	25	40	43	52
	32	11	14-7/8	25	32	35	50	53	52
	40	11	14-7/8	33	40	43	58	61	52

Dimensions

See Fig. 8 and Tables 4 and 5 for dimensions of square flanges on inlets.

Fig. 8 – Square flange
(All holes are 7/16" X 5/8")



SWBE0075
7/18/2019, TAW

Pulley (in)	Casing	A	B	C	D	E	Hole Qty.
16	11X8	9-3/4	1-11/16	13-1/8	4	12	12
24	13X10	11-3/4	1-11/16	15-1/8	4-21/32	14	12
30	18X12	15-3/4	1-11/16	19-1/8	4-1/2	18	16
36	18X12	15-3/4	1-11/16	19-1/8	4-1/2	18	16
42	22X14	21-3/4	1-11/16	25-1/8	4	24	24
48	22X14	21-3/4	1-11/16	25-1/8	4	24	24

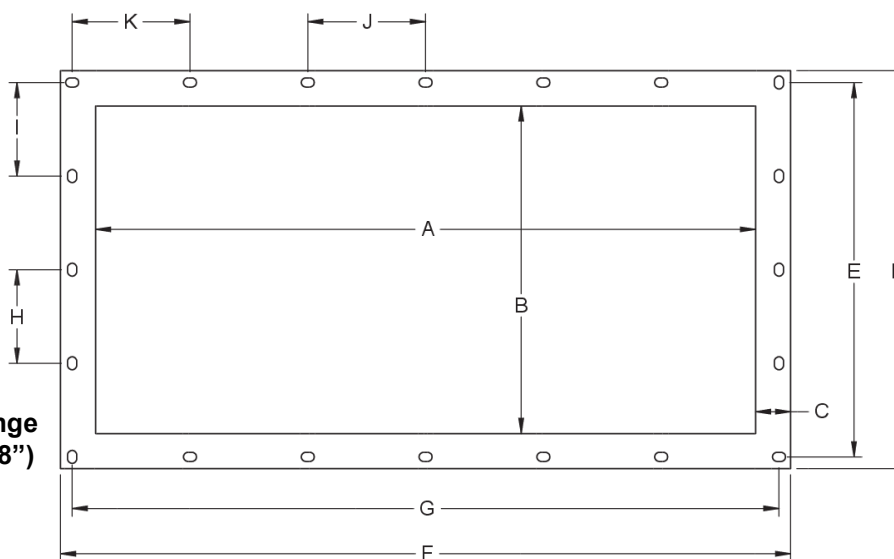
Table 4 – Dimensions for standard inlet square flange

Pulley (in)	Casing	A	B	C	D	E	Hole Qty.
16	11X8	9-3/4	1-11/16	13-1/8	4	12	12
24	13X10	11-3/4	1-11/16	15-1/8	4-21/32	14	12

Table 5 – Dimensions for 45° inlet square flange

Dimensions

See Fig. 9 and Tables 6 and 7 for dimensions of rectangular flanges on inlets.



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Fig. 9 – Rectangular flange
(All holes are 7/16" X 5/8")

Pulley (in)	Casing	A	B	C	D	E	F	G	H	I	J	K	Hole Qty.
16	11X8	21-3/4	9-3/4	1-11/16	13-1/8	12	25-1/8	24	4	4	3-15/16	4-11/32	18
24	13X10	23-3/4	11-3/4	1-11/16	15-1/8	14	27-1/8	26	4-21/32	4-21/32	4-11/32	4-11/32	18
30	18X12	31-3/4	15-3/4	1-11/16	19-1/8	18	35-1/8	34	4-1/2	4-1/2	5-21/32	5-21/32	20
36	18X12	31-3/4	15-3/4	1-11/16	19-1/8	18	35-1/8	34	4-1/2	4-1/2	5-21/32	5-21/32	20
42	22X14	39-3/4	21-3/4	1-11/16	25-1/8	24	43-1/8	42	4	4	5-1/4	5-1/4	28
48	22X14	39-3/4	21-3/4	1-11/16	25-1/8	24	43-1/8	42	4	4	5-1/4	5-1/4	28

Table 6 – Dimensions for flared inlet rectangular flange

Pulley (in)	Casing	A	B	C	D	E	F	Hole Qty.
30	18X12	15-25/32	11-7/16	1-11/16	14-13/16	13-11/16	19-5/32	16
	22X14	19-3/4	11-13/32	1-11/16	14-25/32	13-21/32	23-1/8	14
	32X14	29-3/4	11-13/32	1-11/16	14-25/32	13-21/32	33-1/8	18
	40X14	37-3/4	11-13/32	1-11/16	14-25/32	13-21/32	41-1/8	22
	44X14	41-3/4	11-13/32	1-11/16	14-25/32	13-21/32	45-1/8	22
36	18X12	15-25/32	11-7/16	1-11/16	14-13/16	13-11/16	19-5/32	16
42	22X14	21-3/4	17-5/8	1-11/16	21	19-7/8	25-1/8	22
48	22X14	21-3/4	17-5/8	1-11/16	21	19-7/8	25-1/8	22

Table 7A – Dimensions A-F for 45° inlet rectangular flange

Pulley (in)	Casing	G	H	I	J	K	Hole Qty.
30	18X12	18-1/32	4-9/16	4-9/16	4-1/2	4-1/2	16
	22X14	22	4-9/16	4-9/16	5-1/2	5-1/2	14
	32X14	32	4-9/16	4-9/16	5-11/32	5-5/16	18
	40X14	40	4-9/16	4-9/16	5	5	22
	44X14	44	4-9/16	4-9/16	5-1/2	5-1/2	22
36	18X12	18-1/32	4-9/16	4-9/16	4-1/2	4-1/2	16
42	22X14	24	3-31/32	3-31/32	4	4	22
48	22X14	24	3-31/32	3-31/32	4	4	22

Table 7B – Dimensions G-K for 45° inlet rectangular flange

Dimensions

Discharge Dimensions

See Fig. 10 and Table 8 for bolt hole pattern of head discharge based on size of leg casing.

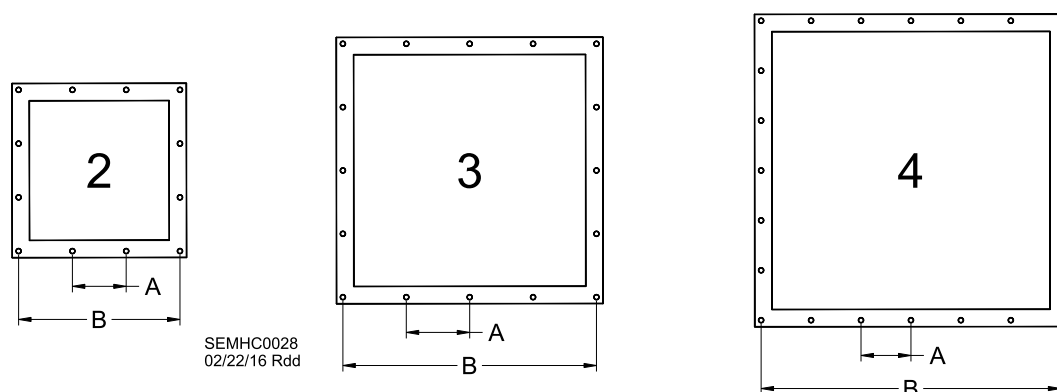


Fig. 10 & Table 8 – Head discharge bolt hole patterns, quantities & spacing

SIZE	PATTERN	HOLE QTY.	A	B
11"	2	12	4-13/32"	13-1/4"
13"	3	16	3-3/4"	15"
18"	3	16	5"	20"
22"	4	24	4"	24"

Sizes of square flanges that fit elevators are as follows: 11" for elevator with 16" head pulley (11" x 8" leg casing); 13" for elevator with 24" head pulley (13" x 10" leg casing); 18" for elevator with 30" or 36" head pulley (18" x 12" leg casing); 22" for elevator with 42" or 48" head pulley (22" x 14" leg casing).

NOTE: All bolt holes are 7/16" diameter.

Pre-Installation Information

Bucket Elevators are designed to be vertically self-supporting when erected, but must be supported against wind loads. This elevator has not been designed to support other equipment such as cleaners, distributors, spouting, etc. Separate structures must be provided to support any accessory equipment. Sukup Manufacturing Co. is the provider of this elevator and has supplied certain optional accessories only, and does not assume responsibility for the installation. Installation recommendations in this manual are general guidelines only. It is the responsibility of user and/or installer to consult a civil or structural engineer regarding installation, including but not limited to construction, supervision, foundation, guying or bracing for specific site.

NOTE: The **MOST IMPORTANT** preparations are retaining a licensed engineer to plan installation and a qualified millwright or contractor to erect elevator and accompanying equipment and structures.

Elevator Location

Elevator must be properly located to receive incoming material and discharge it at desired location. This requires an exact location for boot section. Determine whether boot is to be fed from down or up side, or from both sides of elevator. The down-leg side is recommended for light material that tends to dust, such as flour or feeds. The up-leg side is recommended for heavier materials such as whole grains. Check planned locations for boot, head, spouting, guy cables or support tower for clearance from other structures. Driveways, overhead power lines and buildings can present special hazards and obstructions and will need to be considered. See Fig. 3 for electrical wire clearance requirements.

Electrical Requirements

A qualified electrician should make all electrical connections. Check local codes before installation. A lockable external line disconnect switch, in compliance with local codes, must be provided and located as close as possible to elevator. When elevator is connected to other machinery, electrical interlock priorities should be maintained so that if any other equipment fails, all preceding equipment would stop.

NOTE: Local authority with jurisdiction should be contacted prior to and during planning and installation.

NOTE: If a dual-drive system is used, additional equipment may be needed to balance load between motors. It is customer's responsibility to identify this situation and supply such equipment. Customers can contact Sukup Manufacturing Co. for load-balancing options if a dual-drive system is required.

Foundation

DISCLAIMER: It shall be the sole responsibility of the customer to obtain actual foundation drawings designed by and constructed to the specifications of a licensed professional structural engineer with knowledge of the actual soil and load specific to the project and location. Consideration should also include, but not be limited to, live loads, dead loads, wind loads, soil bearing loads, seismic zone, proper moisture run-off on top of base, and types of aeration applied for the project.

Sukup Manufacturing Co. will not be responsible for any damage to a product, including, but not limited to, any damage that results from poor soil conditions or inadequate concrete type, grade, bearing strength, and construction method. Soil bearing tests must be performed by a competent, independent, engineering firm. Concrete foundation construction must be done by a competent concrete contractor.

If boot is installed in a pit or other structure, adequate clearance must be provided to service elevator. Enough clearance should be provided to remove boot pulley and to fully remove clean-out slides, as well as perform all other forms of maintenance. On outdoor installations, pit will require a sump pump or drain.

Estimated boot footing load (lbs.)	
60	12,251
80	14,589
100	17,366
120	19,846
140	22,409
160	24,889
180	27,368

**Table 9 – Footing loads
for elevator supported
by tower**

Boot Footing Loads for Elevators Supported by Guy Wires

	Estimated boot footing load (lbs.)				
	16"	24"	30"	36"	42"
150'	45,730	53,800	66,900	70,300	82,200
140'	37,400	44,000	55,500	58,800	69,000
120'	32,385	38,100	48,400	51,600	60,900
100'	27,540	32,400	41,400	44,600	53,100
80'	22,695	26,700	34,600	37,700	45,300
60'	14,705	17,300	24,700	27,700	34,000

Table 10 – Footing loads for elevator supported by guy wires

Guy Wires & Anchors

Bucket elevator must be braced every 20' from head section to top of boot. Guy cables are generally used for bracing above ground level. For legs extending into pits (below ground level) bracing near ground level is recommended to obtain maximum overhead guy cable clearance. Four guy cables, 90° apart, are installed to each guy wire bracket. Anchors must be designed by a structural engineer to match soil conditions.

CABLE ANCHOR LOCATIONS

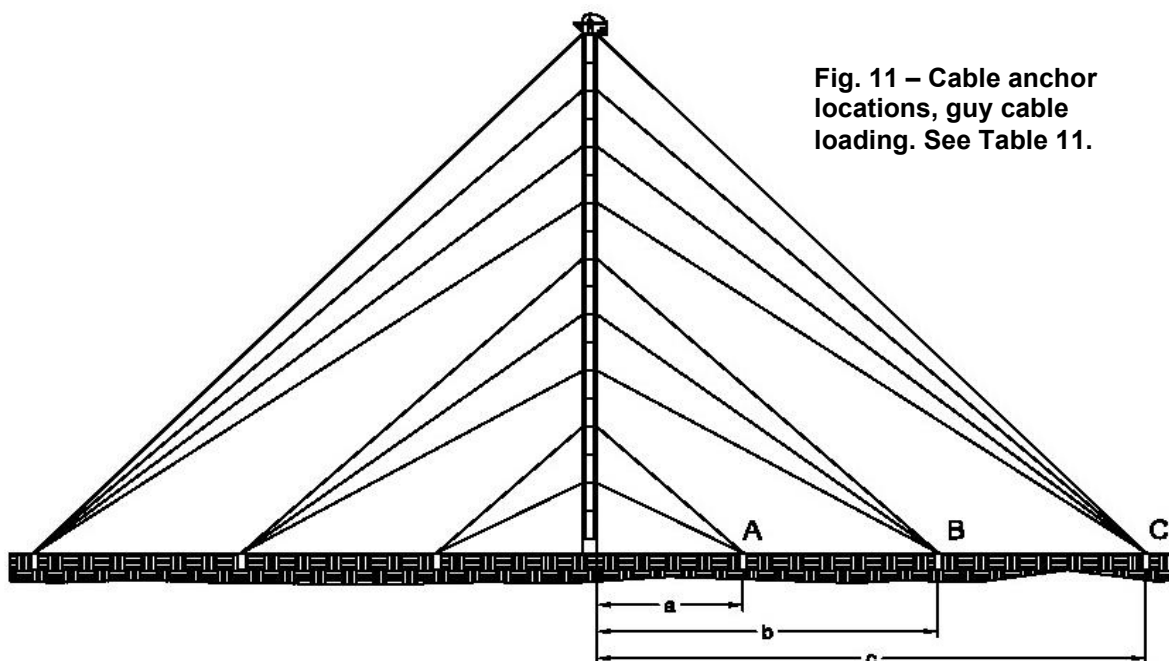
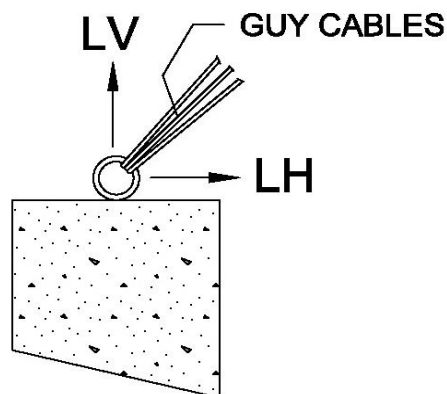
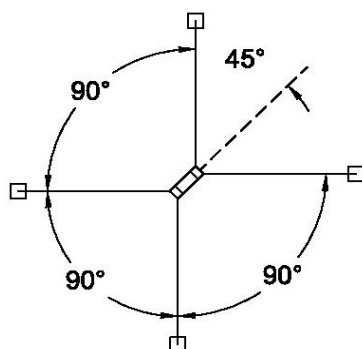


Fig. 11 – Cable anchor locations, guy cable loading. See Table 11.

Guy Wire Loading

Guy Wire Loading

NOTE: Elevator with 48" pulleys and all elevators taller than 150' must be supported by a tower. Otherwise see Table 12 for anchoring.

Pulley & Trunking Size (in)	Height (ft.) H	Anchor (A)				Anchor (B)				Anchor (C)			
		No. of Sets N	Horiz. Dist. (ft.) (a)	Horiz. Load (lbs.) LH	Vert. Load (lbs.) LV	No. of Sets N	Horiz. Dist. (ft.) (b)	Horiz. Load (lbs.) LH	Vert. Load (lbs.) LV	No. of Sets N	Horiz. Dist. (ft.) (c)	Horiz. Load (lbs.) LH	Vert. Load (lbs.) LV
16 8x11	40	2	40	6149	4576								
	60	3	60	9884	6527								
	80	2	40	6163	4410	2	80	6797	5938				
	100	2	40	6384	4568	3	100	10638	8487				
	120	2	40	6572	4702	4	120	14672	10964				
	140	3	60	10603	6743	4	140	15062	11805				
	150	2	40	6855	4904	2	80	6783	5826	4	150	15203	12904
24 13x10	40	2	40	7235	5384								
	60	3	60	11628	7679								
	80	2	40	7251	5189	2	80	7996	6986				
	100	2	40	7510	5374	3	100	12515	9985				
	120	2	40	7732	5532	4	120	17261	12899				
	140	3	60	12474	7933	4	140	17720	13888				
	150	2	40	8065	5770	2	80	7980	6854	4	150	17886	15181
30 & 36 18x12	40	2	40	8315	6194								
	60	3	60	13378	8846								
	80	2	40	8334	5962	2	80	9234	8069				
	100	2	40	8642	6182	3	100	14454	11536				
	120	2	40	8905	6370	4	120	19941	14909				
	140	3	60	14382	9147	4	140	20495	16069				
	150	2	40	9388	6715	2	80	9303	7988	4	150	20961	17004
42 22x14	60	3	60	15924	10544								
	80	2	40	9910	7088	2	80	11035	9645				
	100	2	40	10287	7357	3	100	17276	13793				
	120	2	40	10611	7589	4	120	23841	17834				
	140	3	60	17157	10914	4	140	24532	19241				
	150	2	40	11204	8012	2	80	11119	9845	4	150	25112	20377

Table 12 – Guy wire loading

General Instructions

General Installation Procedures

There are many methods for erecting bucket elevators and they will vary depending on conditions at job site, kind of hoisting equipment available, crew experience, personal preference and, of course, size and rigidity of elevator casing. However, Sukup Manufacturing Co. suggests the following procedure:

1. Set boot on footing.
2. Position crane so leg and all spouting can be constructed in one (1) set-up.
3. Assemble leg sections in 30' segments, with (as applicable) ladders, safety cages and any platforms. (Refer to separate manual for ladder and platform construction).
4. Lift elevator and continue to add assembled leg sections until legs are complete.
5. Securely brace and plumb elevator as trunking is added.
6. Assemble head section including work platform, drive components and a minimum of one 10' leg section. Lift assembly into place.
7. Install belt and make a temporary splice.
8. Fasten buckets to belt and make a permanent splice.
9. Check for loose fasteners and check operation of elevator without material.

Boot Installation

NOTE: If boot has spiral wing or herringbone wing pulley, confirm that pulley will rotate in proper direction before boot installation. See sticker on pulley that indicates rotation direction.

Boot of an elevator must be set on a firm and level foundation. A boot that is not level makes elevator very difficult to plumb. Shim and grout as required to level boot section. Use a carpenter's level on flanges to verify that boot is level and plumb. When this has been accomplished – and only then – secure boot by tightening down anchor bolts. Care must be exercised not to disturb alignment of boot section.

One of two methods may be used to anchor boot to foundation. In the first, holes in frame are used. In the second option, a clamp plate (not supplied by Sukup Manufacturing Co.) is used to hold down boot. Anchor bolt size should be 1/2" diameter minimum.

After boot is positioned and leveled, it must be anchored to prevent shifting. Recheck boot level after tightening bolts and nuts securely. **BOOT MUST BE LEVEL AND PLUMB.** A boot that is 1/16" per foot out of level will cause 6" deviation from plumb at 100' elevation. Boot base dimension information is provided on next page for use in setting anchor bolts.

OPTION # 1 - ANCHORS IN BOOT FRAME						
PULLEY DIA.	A	B	C	D	E	F
16"	11	N/A	22	13-3/4	30	15-1/4
24"	17-1/2	NA	35	15-1/2	43	17-1/4
30"	11-3/4	20-1/2	44	20-3/8	52	22-1/4
36"	11-3/4	26-1/2	50	20-3/8	58	22-1/4
42"	11-3/4	36-1/2	60	24-1/8	68	26
48"	11-3/4	36-1/2	60	24-1/8	74	26

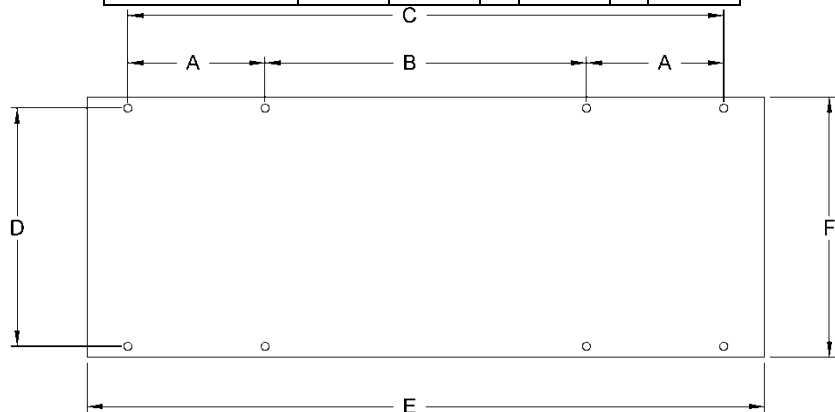


Fig. 12 & Table 13 – Anchoring boot frame with bolts

OPTION # 2 - USING CLIPS TO ANCHOR BOOT						
PULLEY DIA.	A	B	C	D	E	F
16"	11	N/A	22	16-1/2	30	15-1/4
24"	17-1/2	NA	35	18-1/4	43	17-1/4
30"	11-3/4	20-1/2	44	23-1/4	52	22-1/4
36"	11-3/4	26-1/2	50	23-1/4	58	22-1/4
42"	16-1/4	27-1/2	60	27	68	26
48"	16-1/4	33-1/2	63	27	74	26

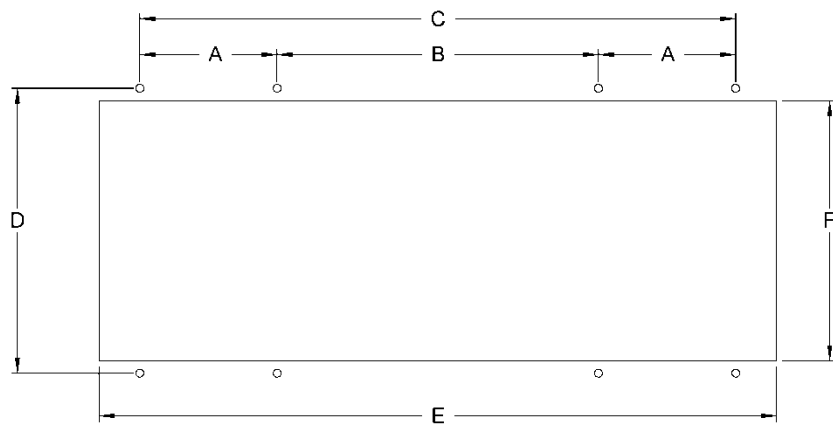
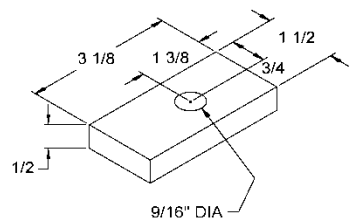


Fig. 13 & Table 14 – Anchoring boot frame with clips



(NOT SUPPLIED BY SUKUP MFG CO.)

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All dimensions are in inches

Boot Inlet Location

Once boot is installed, inlet hopper can be attached on either upside (high position) or downside (low position) of boot. Most free-flowing materials such as grain are best fed into boot on up-leg side in a high position. Feeds or light materials that tend to dust can be fed on down-leg side in a low position. Sometimes this will help obtain maximum fill level of buckets. When mounting hopper on up leg in high position, bottom of hopper should be no lower than centerline of pulley in its highest position. If hopper is mounted on downside low position, hopper inlet should be no lower than centerline of pulley in its lowest position. Boot hoppers are shipped separately and need to be installed to boot end panels.

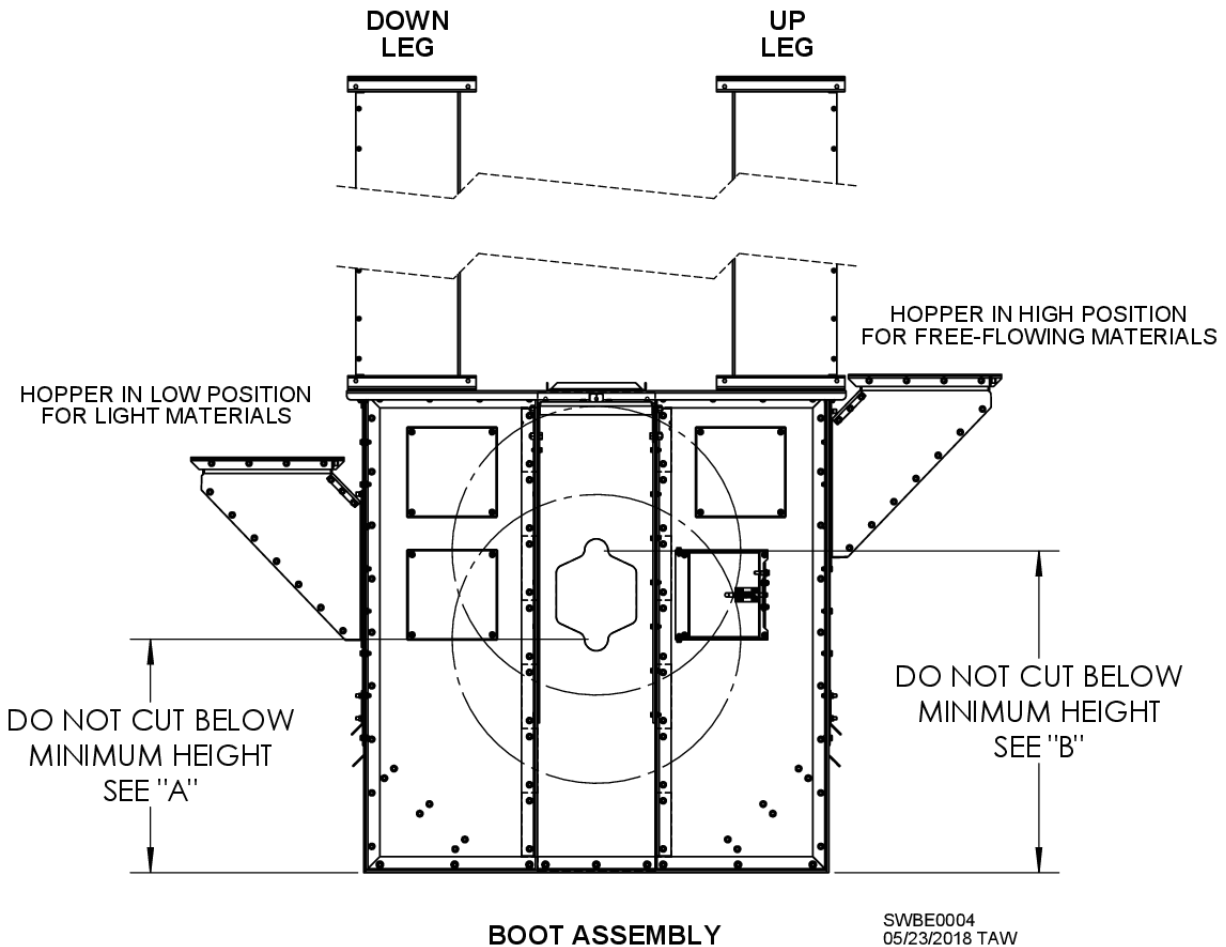


Fig. 14 & Table 15 – Positioning boot inlet

PULLEY DIA.	MINIMUM CUT HEIGHT ON BOOT	
	"A" - DOWN LEG	"B" - UP LEG
16"	17"	29"
24"	21-5/8"	32-5/8"
30"	26-1/8"	37-1/8"
36"	29-1/8"	40-1/8"
42"	32-3/8"	43-3/8"
48"	36"	47"

General Instructions

Proper positioning and size of inlet hopper is critical to performance of bucket elevator. Loss of elevator capacity will occur if buckets are not properly fed with incoming material. If inlet is too small, material must be fed into boot at excessive speed. Excess velocity of incoming material causes damage. Buckets do not fill properly and material backs up in boot, clogging inlet. Grinding and churning in boot area will damage product and excessive power will be required to operate system.

When feeding on up-leg side, device that feeds elevator (auger, belt conveyor, spout, hopper, etc.) must feed material into boot ABOVE centerline of pulley. Every effort should be made when designing feeding equipment or spouting that direction of flowing material is perpendicular to buckets. This will reduce or eliminate any off-center loading of buckets. Achieving bucket elevator's rated capacity cannot happen without even and consistent bucket fill.

Before cutting hole into backside of boot for inlet hopper, use a marker to trace inside dimensions of inlet hopper onto boot. This will help ensure inlet's inside walls are flush with hole where inlet will be mounted, preventing blockage to incoming grain.

Shovel Pocket Hopper

On left side of boot, on both sides, is an area that has been designed for field installation of an optional shovel pocket hopper. The cover, attached at factory, should not be removed if a shovel pocket hopper is not installed. The same is true for factory-attached covers over areas designed for optional rub block.

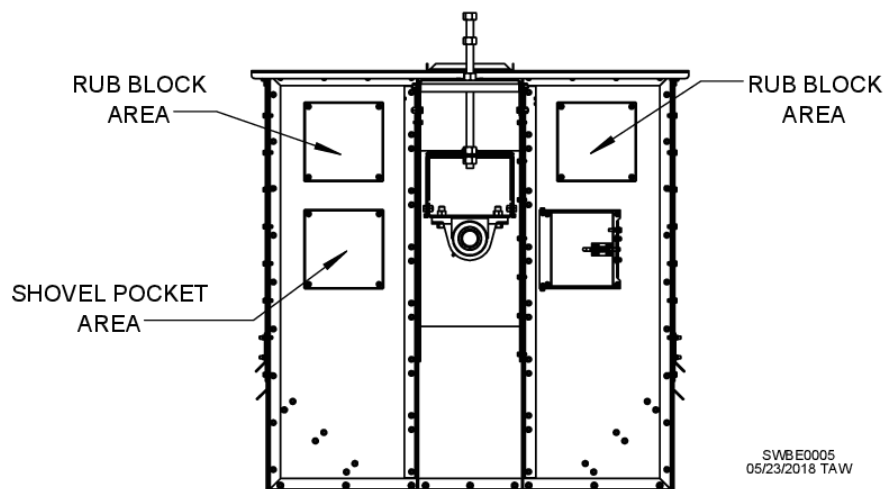


Fig. 15 – Shovel pocket hopper location

Leg Trunking Stacking Guidelines

There are several factors that affect the sequence of trunking sections. A major factor is the site. An elevator installed at ground level, or grade, will have a different trunking stacking arrangement than an elevator installed in a pit or sump. Another factor is overall height. A third factor is model of bucket elevator.

The following guidelines pertain to Sukup bucket elevators:

1. Trunking sections of equal length are to be stacked across from each other in adjoining legs of a bucket elevator.
 - a. A regular 5-ft. section in “down leg” is to be placed across from a 5-ft. section in “up leg,” and so on.
2. Trunking is manufactured in lengths of 1 ft. through 10 ft.
3. Trunking sections should be positioned so fasteners on long seams are on outside edges of elevator legs. This is preferable in all cases, but mandatory when pressure-relief vents are used.
4. External supports are required at 20-ft. intervals and attach to guy wire or support tower brackets or trunking section flanges. This distance is measured starting at grade and continuing upward.
Unless otherwise instructed, never weld supports directly to sheet metal.
5. Trunking sections are stacked so there are joints at 20-ft. intervals. This distance is also measured starting at grade and continuing upward. This is to coincide with external support requirements.
 - a. Depending on model and type of site installation, a section of 1 ft. through 9 ft. may need to be stacked directly on top of boot assembly or inspection section to arrive at the initial 20-ft. interval. See stacking table(s) for specific information on your size of elevator
 - b. Additional short section (less than 10 ft.) is used if needed on upper end of elevator.
6. Squaring plates and sets of tie angles are installed at both ends of most regular trunking sections. See Tables 16-21 for locations of squaring plates and tie angles depending on head pulley diameter and location of elevator boot (pit or ground level). **NOTE:** If ladder will be used, one tie angle will be attached at bottom of inspection section to mount ladder.
7. Two thicknesses of sheet metal are used for 10-ft. trunking. See below. Both thicknesses are not necessarily used on each bucket elevator. See stacking arrangement table for your size of bucket elevator for specific information.
 - a. Trunking sections are labeled before they leave factory. These labels show gauge number of sheet metal used in manufacturing trunking.
 - b. Sheet metal thickness is measured by gauge number. Smaller numbers indicate thicker material.
 - (1) 10-gauge-galvanized material measures approximately 0.138”.
 - (2) 12-gauge-galvanized material measures approximately 0.108”.

ALWAYS PLACE 10-FT. TRUNKING SECTIONS MADE OF THINNER SHEET METAL ABOVE

10-FT. TRUNKING SECTIONS MADE OF THICKER SHEET METAL.

(Only exception is if pressure relief vents are used. Trunking section with pressure relief vent may be made of thicker metal than section below it. See applicable note on Page 36.)



WARNING: Not stacking trunking sections according to above recommendations could result in collapse of bucket elevator, causing death or serious injury.

16" and 24" Dia. Pulley Bucket Elevator Trunking

Only 12-gauge sheet metal is used for 10-ft. trunking sections used for 16" pulley bucket elevators, which use 11" x 8" trunking.

Two gauges of sheet metal are used for 10-ft. trunking sections used for 24" pulley bucket elevators, which use 13" x 10" trunking. A maximum of 26 pieces of 12-gauge (0.108" thickness) trunking can be used. As height of bucket elevator increases, up to an additional 12 pieces of 10-ft. trunking sections made of 10-gauge sheet metal can be added. **Ten-foot trunking sections made of 12-gauge sheet metal are always placed above 10-ft. trunking sections made of 10-gauge sheet metal. See exception noted on Page 28.**

30" and 36" Dia. Pulley Bucket Elevator Trunking

Two gauges of sheet metal are used for 10-ft. trunking sections used for 30" and 36" pulley bucket elevators, both of which use 18" x 12" trunking. A maximum of 26 pieces of 10-ft. trunking made of 12-gauge sheet metal (0.108") can be used. As height of bucket elevator increases, up to an additional 12 pieces of 10-ft. trunking sections made of 10-gauge sheet metal can be added. **Ten-foot trunking sections made of 12-gauge sheet metal are always placed above 10-ft. trunking sections made of 10-gauge sheet metal. See exception noted on Page 28.**

Trunking for 16" - 36" Pulley Elevator

Table 16 shows general trunking stacking arrangement for **ground level** installations of 16" pulley bucket elevators with 11" x 8" trunking, 24" pulley bucket elevators with 13" x 10" trunking, and 30" and 36" pulley bucket elevators with 18" x 12" trunking.

TRUNKING & BRACING WITH BOOT AT GROUND LEVEL

	HEAD																				
Sections from 20' Ht. to Head Section												— 1 × <th>— 2 ×<th>— 3 ×<th>— 4 ×<th>— 5 ×<th>— 6 ×<th>— 7 ×<th>— 8 ×<th>— 9 ×<th>— 10 ×</th></th></th></th></th></th></th></th></th>	— 2 × <th>— 3 ×<th>— 4 ×<th>— 5 ×<th>— 6 ×<th>— 7 ×<th>— 8 ×<th>— 9 ×<th>— 10 ×</th></th></th></th></th></th></th></th>	— 3 × <th>— 4 ×<th>— 5 ×<th>— 6 ×<th>— 7 ×<th>— 8 ×<th>— 9 ×<th>— 10 ×</th></th></th></th></th></th></th>	— 4 × <th>— 5 ×<th>— 6 ×<th>— 7 ×<th>— 8 ×<th>— 9 ×<th>— 10 ×</th></th></th></th></th></th>	— 5 × <th>— 6 ×<th>— 7 ×<th>— 8 ×<th>— 9 ×<th>— 10 ×</th></th></th></th></th>	— 6 × <th>— 7 ×<th>— 8 ×<th>— 9 ×<th>— 10 ×</th></th></th></th>	— 7 × <th>— 8 ×<th>— 9 ×<th>— 10 ×</th></th></th>	— 8 × <th>— 9 ×<th>— 10 ×</th></th>	— 9 × <th>— 10 ×</th>	— 10 ×
		— 1 × <th>— 2 ×<th>— 3 ×<th>— 4 ×<th>— 5 ×<th>— 6 ×<th>— 7 ×<th>— 8 ×<th>— 9 ×<th>— 10 ×<th>×<th>×<th>×<th>×<th>×<th>×<th>×<th>×<th>×</th></th></th></th></th></th></th></th></th></th></th></th></th></th></th></th></th></th>	— 2 × <th>— 3 ×<th>— 4 ×<th>— 5 ×<th>— 6 ×<th>— 7 ×<th>— 8 ×<th>— 9 ×<th>— 10 ×<th>×<th>×<th>×<th>×<th>×<th>×<th>×<th>×<th>×</th></th></th></th></th></th></th></th></th></th></th></th></th></th></th></th></th>	— 3 × <th>— 4 ×<th>— 5 ×<th>— 6 ×<th>— 7 ×<th>— 8 ×<th>— 9 ×<th>— 10 ×<th>×<th>×<th>×<th>×<th>×<th>×<th>×<th>×<th>×</th></th></th></th></th></th></th></th></th></th></th></th></th></th></th></th>	— 4 × <th>— 5 ×<th>— 6 ×<th>— 7 ×<th>— 8 ×<th>— 9 ×<th>— 10 ×<th>×<th>×<th>×<th>×<th>×<th>×<th>×<th>×<th>×</th></th></th></th></th></th></th></th></th></th></th></th></th></th></th>	— 5 × <th>— 6 ×<th>— 7 ×<th>— 8 ×<th>— 9 ×<th>— 10 ×<th>×<th>×<th>×<th>×<th>×<th>×<th>×<th>×<th>×</th></th></th></th></th></th></th></th></th></th></th></th></th></th>	— 6 × <th>— 7 ×<th>— 8 ×<th>— 9 ×<th>— 10 ×<th>×<th>×<th>×<th>×<th>×<th>×<th>×<th>×<th>×</th></th></th></th></th></th></th></th></th></th></th></th></th>	— 7 × <th>— 8 ×<th>— 9 ×<th>— 10 ×<th>×<th>×<th>×<th>×<th>×<th>×<th>×<th>×<th>×</th></th></th></th></th></th></th></th></th></th></th></th>	— 8 × <th>— 9 ×<th>— 10 ×<th>×<th>×<th>×<th>×<th>×<th>×<th>×<th>×<th>×</th></th></th></th></th></th></th></th></th></th></th>	— 9 × <th>— 10 ×<th>×<th>×<th>×<th>×<th>×<th>×<th>×<th>×<th>×</th></th></th></th></th></th></th></th></th></th>	— 10 × <th>×<th>×<th>×<th>×<th>×<th>×<th>×<th>×<th>×</th></th></th></th></th></th></th></th></th>	× <th>×<th>×<th>×<th>×<th>×<th>×<th>×<th>×</th></th></th></th></th></th></th></th>	× <th>×<th>×<th>×<th>×<th>×<th>×<th>×</th></th></th></th></th></th></th>	× <th>×<th>×<th>×<th>×<th>×<th>×</th></th></th></th></th></th>	× <th>×<th>×<th>×<th>×<th>×</th></th></th></th></th>	× <th>×<th>×<th>×<th>×</th></th></th></th>	× <th>×<th>×<th>×</th></th></th>	× <th>×<th>×</th></th>	× <th>×</th>	×	
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To reach 20'	— 5 ×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	
Inspection Section (ft)	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	
10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Boot Ht (ft)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
Discharge Height (ft)	20'	21'	22'	23'	24'	25'	26'	27'	28'	29'	30'	31' ... 220'									

 = 1 SQUARING PLATE w/ 2 TIE ANGLES	 = 1 TIE ANGLE	 = NOTHING REQUIRED	* = INSERT REMAINING 10' SECTIONS UNTIL DESIRED ELEVATOR HEIGHT IS ATTAINED
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NOTE: Single tie angle at top of section just below head section is for ladder connection only.

NOTE: Single tie angle at bottom of inspection section is for ladder connection only.

Table 16 – Trunking from ground-level boot to discharge (No pit)

Trunking for 16" - 36" Pulley Elevator

16", 24", 30" & 36" Dia. Pulley Bucket Elevator Trunking - Below Ground Level Installations

Tables 17-18 apply to 16", 24", 30" and 36" dia. pulley bucket elevators in pits, sumps, and other below-ground-level installations. **NOTE:** If ground-level deck over 15' or 25' pit is planned but a joint between trunking sections would interfere, install 5' section before 10' section.

TRUNKING & BRACING WITH BOOT IN PIT

	Use this table to stack elevator from boot to ground level. See Table 18 for stacking from Inspection Section to Head Section																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
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 = 1 SQUARING PLATE w/ 2 TIE ANGLES	— = 1 TIE ANGLE	 = NOTHING REQUIRED
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NOTE: Single tie angle at bottom of Section 1 is for ladder connection only.

Table 17 – Pit trunking (boot to bottom of inspection section)

Trunking for 16" - 36" Pulley Elevator

Once trunking is above top of pit structure, stacking sequence needs to follow Table 18.

Stacking sequence shown in Table 18 is based on bottom of inspection section being 5 ft. above grade for optimum visibility of, and access to, elevator belting and cups. Any adjustment to inspection section height will require changes to stacking arrangement shown.

TRUNKING & BRACING ABOVE PIT

	HEAD																				
Sections from 20' Ht. to Head Section												— 1 ⊠	— 2 ⊠	— 3 ⊠	— 4 ⊠	— 5 ⊠	— 6 ⊠	— 7 ⊠	— 8 ⊠	— 9 ⊠	— 10 ⊠
		— 1 ⊠	— 2 ⊠	— 3 ⊠	— 4 ⊠	— 5 ⊠	— 6 ⊠	— 7 ⊠	— 8 ⊠	— 9 ⊠	— 10 ⊠	⊠ *	⊠ *	⊠ *	⊠ *	⊠ *	⊠ *	⊠ *	⊠ *	⊠ *	
To reach 20'	— 5 ⊠	⊠ 5 ⊠	⊠ 5 ⊠	⊠ 5 ⊠	⊠ 5 ⊠	⊠ 5 ⊠	⊠ 5 ⊠	⊠ 5 ⊠	⊠ 5 ⊠	⊠ 5 ⊠	⊠ 5 ⊠	⊠ 5 ⊠	⊠ 5 ⊠	⊠ 5 ⊠	⊠ 5 ⊠	⊠ 5 ⊠	⊠ 5 ⊠	⊠ 5 ⊠	⊠ 5 ⊠	⊠ 5 ⊠	
Inspection Section (ft.)	⊠ 10 ⊠	⊠ 10 ⊠	⊠ 10 ⊠	⊠ 10 ⊠	⊠ 10 ⊠	⊠ 10 ⊠	⊠ 10 ⊠	⊠ 10 ⊠	⊠ 10 ⊠	⊠ 10 ⊠	⊠ 10 ⊠	⊠ 10 ⊠	⊠ 10 ⊠	⊠ 10 ⊠	⊠ 10 ⊠	⊠ 10 ⊠	⊠ 10 ⊠	⊠ 10 ⊠	⊠ 10 ⊠	⊠ 10 ⊠	
Elevation Above Grade (Discharge Height minus Pit Depth)	20'	21'	22'	23'	24'	25'	26'	27'	28'	29'	30'	31' ... 220'									

⊠ = 1 SQUARING PLATE w/ 2 TIE ANGLES	— = 1 TIE ANGLE	□ = NOTHING REQUIRED	* = INSERT REMAINING 10' SECTIONS UNTIL DESIRED ELEVATOR HEIGHT IS ATTAINED
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NOTE: Single tie angle at top of section just below head section is for ladder connection only.

Table 18 – Trunking above pit from inspection section to discharge

Trunking for 42" - 48" Pulley Elevator

42" & 48" Dia. Pulley Bucket Elevator Trunking

Two gauges of sheet metal are used for 10-ft. trunking sections used for 42" and 48" pulley bucket elevators, which use 22" x 14" trunking. A maximum of 26 pieces of 10-ft. trunking made of 12-gauge sheet metal (0.108" thickness) can be used. As height of bucket elevator increases, an additional 22 pieces of 10-gauge (0.138" thickness) trunking can be added. **Ten-foot trunking sections made of 12-gauge sheet metal are always placed above trunking sections made of 10-gauge sheet metal. See exception noted on Page 28.**

Table 19 shows general trunking stacking arrangement for **ground level** installations of 42" and 48" pulley bucket elevators using 22" x 14" trunking.

TRUNKING & BRACING WITH BOOT AT GROUND LEVEL

	HEAD																				
Sections from 20' Ht. to Head Section												— 1 ×	— 2 ×	— 3 ×	— 4 ×	— 5 ×	— 6 ×	— 7 ×	— 8 ×	— 9 ×	— 10 ×
		— 1 ×	— 2 ×	— 3 ×	— 4 ×	— 5 ×	— 6 ×	— 7 ×	— 8 ×	— 9 ×	— 10 ×	×	×	×	×	×	×	×	×	×	×
													*	*	*	*	*	*	*	*	*
To reach 20'	— 4 ×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Inspection Section (ft)	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	10 —	10 —	10 —	10 —	10 —	10 —	10 —	10 —	10 —	10 —	10 —	10 —	10 —	10 —	10 —	10 —	10 —	10 —	10 —	10 —	10 —
Boot Ht (ft)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Discharge Height (ft.)	20'	21'	22'	23'	24'	25'	26'	27'	28'	29'	30'	31' ... 220'									

× = 1 SQUARING PLATE w/ 2 TIE ANGLES |

— = 1 TIE ANGLE

□ = NOTHING REQUIRED

* = INSERT REMAINING 10' SECTIONS UNTIL
DESIRED ELEVATOR HEIGHT IS ATTAINED

NOTE: Single tie angle at top of section just below head section is for ladder connection only.

NOTE: Single tie angle at bottom of inspection section is for ladder connection only.































































































Table 19 – Trunking from ground-level boot to discharge (No pit)

Trunking for 42" - 48" Pulley Elevator

42" & 48" Dia. Pulley Bucket Elevator Trunking - Below Ground Level Installation

Tables 20-21 apply to 42" and 48" pulley bucket elevators in pits, sumps, and other below-ground-level installations. **NOTE:** If ground-level deck over 16' or 26' pit is planned but a joint between trunking sections would interfere, install 6' section before 10' section.

TRUNKING & BRACING WITH BOOT IN PIT

	Use this table to stack elevator from boot to ground level. See Table 21 for stacking from Inspection Section to Head Section																														
Section 3																															
																				1	2	3	4	5	6	7	8	9	10		
																															
Section 2																															
											1	2	3	4	5	6	7	8	9	10	10	10	10	10	10	10	10	10	10	10	
																															
Section 1																															
	1	2	3	4	5	6	7	8	9	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Boot (ft.)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Pit Depth (ft.)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	

 = 1 SQUARING PLATE w/ 2 TIE ANGLES	— = 1 TIE ANGLE	 = NOTHING REQUIRED
--	-----------------	--

NOTE: Single tie angle at bottom of Section 1 is for ladder connection only.

Table 20 – Pit trunking (boot to bottom of inspection section)

Trunking for 42" - 48" Pulley Elevator

Once trunking is above top of pit structure, stacking sequence needs to follow Table 21.

Stacking sequence shown in Table 21 is based on bottom of inspection section being 6 ft. above grade for optimum visibility of, and access to, elevator belting and cups. Any adjustment to inspection section height will require changes to stacking arrangement shown.

TRUNKING & BRACING ABOVE PIT

	HEAD																				
Sections from 20' Ht. to Head Section												— 1 ⊗	— 2 ⊗	— 3 ⊗	— 4 ⊗	— 5 ⊗	— 6 ⊗	— 7 ⊗	— 8 ⊗	— 9 ⊗	— 10 ⊗
		— 1 ⊗	— 2 ⊗	— 3 ⊗	— 4 ⊗	— 5 ⊗	— 6 ⊗	— 7 ⊗	— 8 ⊗	— 9 ⊗	— 10 ⊗	⊗ *	⊗ *	⊗ *	⊗ *	⊗ *	⊗ *	⊗ *	⊗ *	⊗ *	
To reach 20'	— 4 ⊗	⊗ 4 ⊗	⊗ 4 ⊗	⊗ 4 ⊗	⊗ 4 ⊗	⊗ 4 ⊗	⊗ 4 ⊗	⊗ 4 ⊗	⊗ 4 ⊗	⊗ 4 ⊗	⊗ 4 ⊗	⊗ 4 ⊗	⊗ 4 ⊗	⊗ 4 ⊗	⊗ 4 ⊗	⊗ 4 ⊗	⊗ 4 ⊗	⊗ 4 ⊗	⊗ 4 ⊗	⊗ 4 ⊗	⊗ 4 ⊗
Inspection Section (ft.)	⊗ 10 ⊗	⊗ 10 ⊗	⊗ 10 ⊗	⊗ 10 ⊗	⊗ 10 ⊗	⊗ 10 ⊗	⊗ 10 ⊗	⊗ 10 ⊗	⊗ 10 ⊗	⊗ 10 ⊗	⊗ 10 ⊗	⊗ 10 ⊗	⊗ 10 ⊗	⊗ 10 ⊗	⊗ 10 ⊗	⊗ 10 ⊗	⊗ 10 ⊗	⊗ 10 ⊗	⊗ 10 ⊗	⊗ 10 ⊗	⊗ 10 ⊗
Elevation Above Grade (Discharge Height minus Pit Depth)	20'	21'	22'	23'	24'	25'	26'	27'	28'	29'	30'	31' ... 220'									

⊗ = 1 SQUARING PLATE w/ 2 TIE ANGLES	— = 1 TIE ANGLE	□ = NOTHING REQUIRED	* = INSERT REMAINING 10' SECTIONS UNTIL DESIRED ELEVATOR HEIGHT IS ATTAINED
---	-----------------	----------------------	--

NOTE: Single tie angle at top of section just below head section is for ladder connection only.

Table 21 – Trunking above pit from inspection section to discharge

Trunking Assembly Overview

If elevator has pressure-relief vents in trunking, they should be spaced at 20' increments starting at second section down from elevator head. See Fig. 16. Hinges should be on bottom of vent so door stays open after a pressure release.

NOTE: Legs must be assembled with pressure-relief vents on outside as shown.

Trunking sections containing pressure relief vents are made of the following gauges of metal:

11" x 8" trunking for 16" pulley elevator -12ga
13" x 10" trunking for 24" pulley elevator - 12ga
18" x 12" trunking for 30" and 36" pulley elevator - 10ga
22" x 14" trunking for 42" and 48" pulley elevator - 10ga

NOTE: Trunking with pressure relief vent may have lighter-gauge trunking below it depending on height of elevator and whether gauge was upgraded at time of order.

See Leg Trunking Stacking Guidelines on Page 28 and tables on Pages 30-35 for specific stacking order depending on size of trunking.

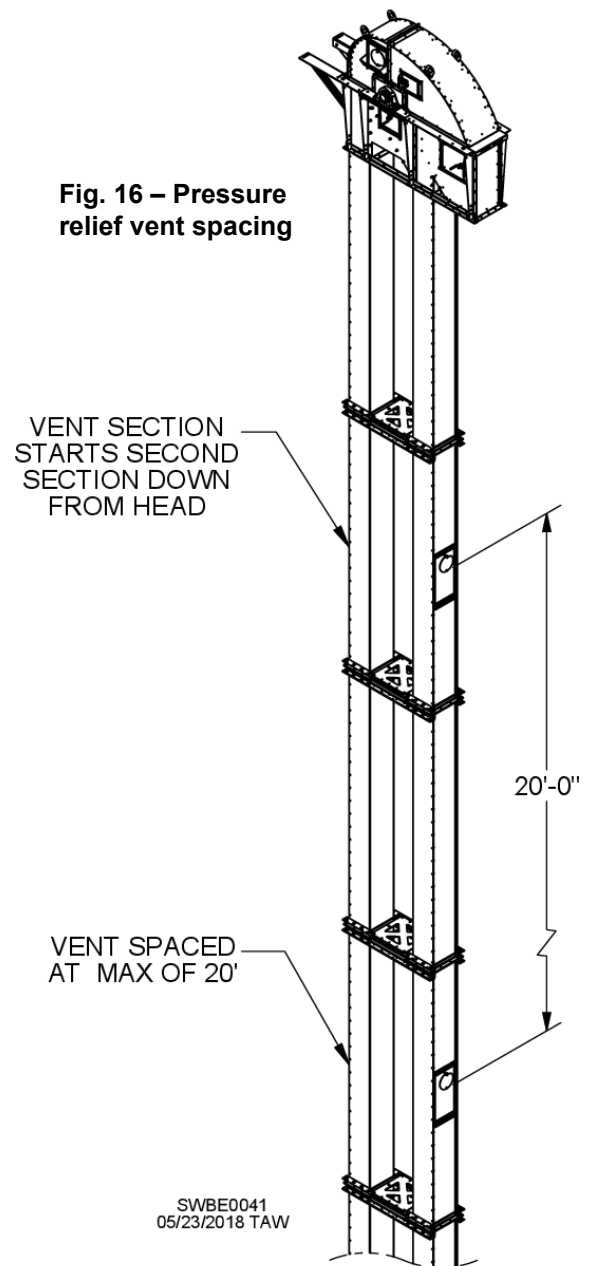
IMPORTANT: For best results, follow instructions carefully to build 30' sections of trunking. Trunking assembly instructions begin on next page.

If leg is not supported by a tower, be sure to install guy wire brackets during trunking assembly. See Figs. 20 & 21 for guy wire bracket installation.

Normally, 30' of leg section is pre-assembled on ground with (if applicable) platforms, ladders and safety cages, and then lifted into place. Refer to separate manual on platforms, ladders and cages for proper assembly of these components.

Use of squaring plates with alignment pins will make erection of elevator legs easier, safer, and will result in a more square and rigid final assembly.

Bolted flanges on trunking should be on outsides of assembled elevator legs as shown in Fig. 16.



General Instructions

Assembly of Trunking Sections

On level ground, position three pairs of 10' trunking sections on pallets or other flat, level surface(s). See Image 1. **NOTE:** Before bolting sections of trunking together, apply silicone caulk to flanges of lower section to help create a watertight seal. Bolt flanges of one leg together to create a 30' section. Use 3/8" flange bolts (J0611) and 3/8" nuts (J1017). Flanges of other leg will be bolted together later. **NOTE:** Bolts should be inserted so their heads will be on top side of end flanges when section is stacked.



Image 1 – Positioning 10' trunking sections & bolting flanges



Image 2 – Bolting tie angle to flanges

Adjust 10' section so bolt holes in tie angle will line up with bolt holes of flanges in both leg sections. Bolt tie angle to flanges. See Image 2. **NOTE:** Standard 3/8" hex-head cap screws (J0606) and 3/8" nuts (J1017) are used to connect angles to trunking. This provides clearance for socket.



Image 3 – Bolting flanges of second leg together



Image 4 – Bolting tie angles to flanges

Bolt flanges of other leg together loosely. See Image 3.

Bolt one tie angle to other end of 30' sections, then attach two tie angles at each flange connection. Use drift punch as needed to ensure alignment. See Image 4.

Once all six tie angles have been attached to top side of 30' section, tighten bolts in flanges.

General Instructions



Image 5 – Lifting 30' section



Image 6 – Bolting flanges together

Use fork lift to position sections as shown in Image 5. Tightly bolt together flanges that were inaccessible when trunking was lying down. See Image 6.



Images 7-10 – Attaching tie angles, squaring plates & alignment pins

Attach tie angles to ends as in Image 7 and at flange connections as shown in Image 8. Use J0606 bolts. Attach squaring plates as shown in Images 8 & 9 using J0611 bolts. **NOTE:** Bolts should be inserted so their heads will be on top side of flanges when section is stacked.

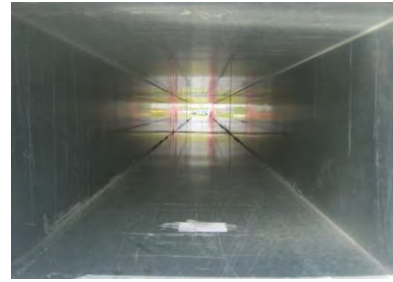


Images 11-13 – Attaching alignment pins

Attach alignment pins using one nut above and one below squaring plate. See Images 11 & 12. Attach pins to bottom squaring plate of 30' section as shown in Image 13 to ease stacking later.

General Instructions

Use string and look through trunking to check alignment. If needed, loosen tie bar and squaring plate bolts and realign. Retighten bolts and recheck.



Images 14 & 15 – Checking alignment

Stacking Procedure

Attach crane to top end of bottom section assembly and lift it into position on boot. When lifting a section assembly, do NOT drag free end on ground. Use a telehandler or loader to lift other end. See Fig. 17 for proper lifting of assembled 30' trunking sections.

NOTE: Bottom section will be the one needed to stack up to 20' of elevation. Be sure inspection door is positioned properly to view cups on up-leg side.

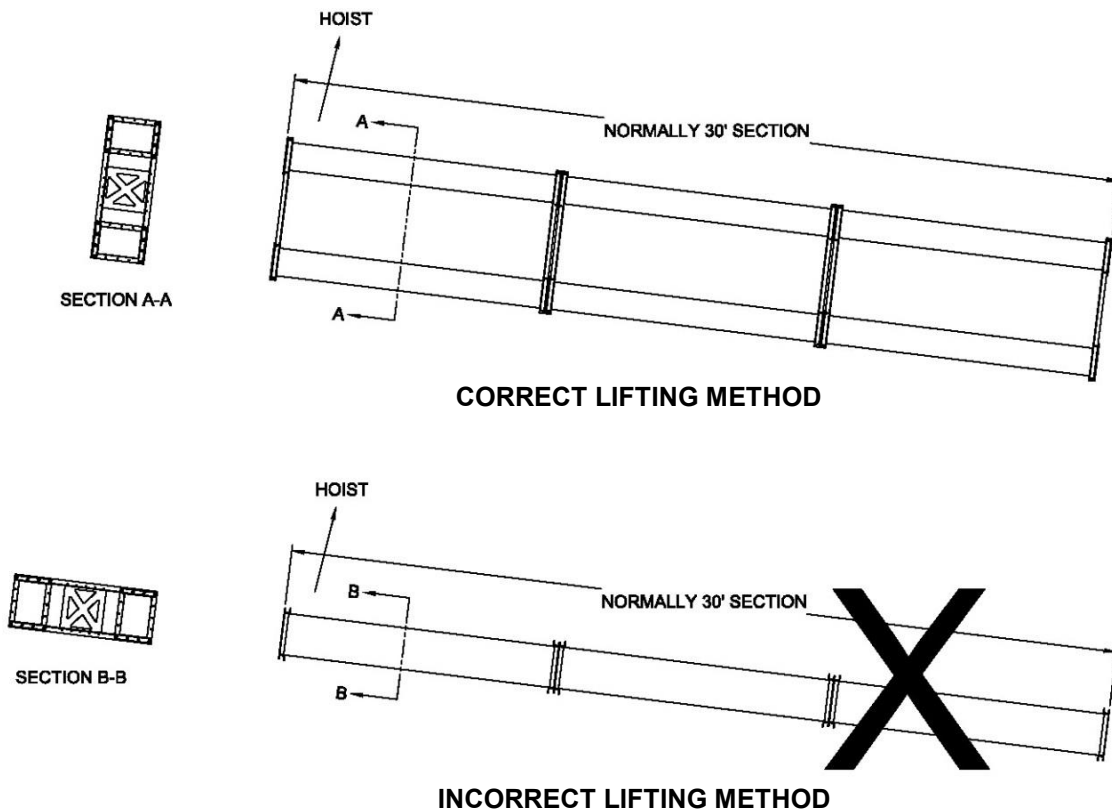


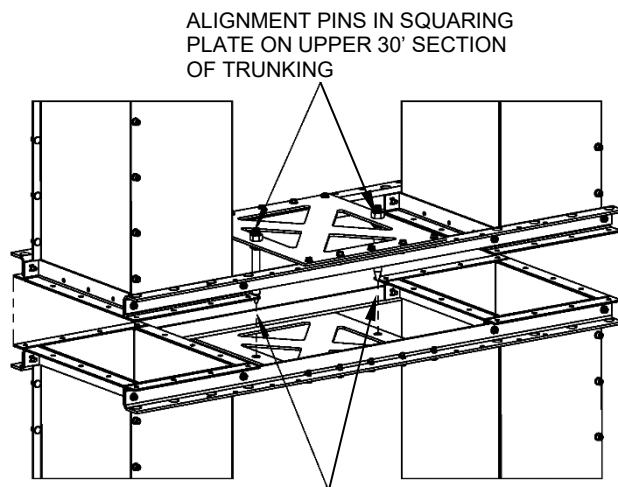
Fig. 17 – Lifting assembled leg sections

General Instructions

As each trunking section is lowered onto one below, align pins with matching holes of squaring plate on lower section of trunking. Once upper section is in place and aligned, bolt the two sections together.



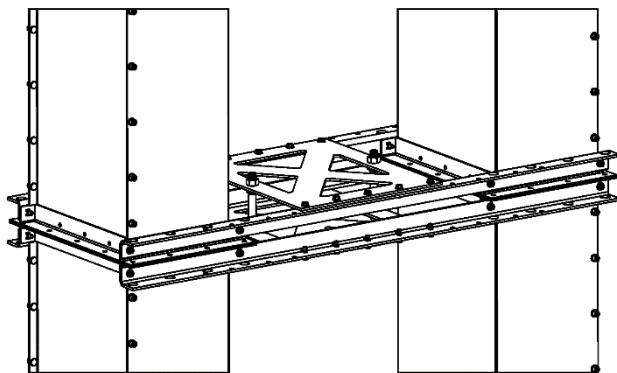
DANGER: Only an experienced aerial worker using an approved fall restraint system should bolt assembled sections together. Never detach crane until trunking section is secure and completely supported. Fall will result in death or serious injury.



**Fig. 18 – Using pins
to align trunking
sections during
stacking**

SWBE0027
11/09/11 DJB

GUIDE ALIGNMENT PINS INTO
MATING HOLES IN SQUARING
PLATE OF LOWER SECTION.



**Fig. 19 – Assembled
trunking sections**

Install flange bolts at lower connection and tighten. Leave crane attached and plumb section assembly at top. Do this by pulling trunking with a strap from support tower or using guy cables. Once trunking is plumb, tighten all bolts using torque specifications provided in this manual.

NOTE: Hardware for tie angles and squaring plates may need to be loosened at top and intermediate seams to allow trunking to be plumbed. DO NOT remove any hardware; only loosen if needed to allow for slip between components.

Lift and install remaining assembled sections. Plumb and secure each section as it is assembled using method specified above.

General Instructions

Guy Wire Brackets

Unless elevator will be supported by a support tower (See note on Page 23), guy wire brackets should be located every 20' in height, starting approximately 20' above grade. Except for uppermost brackets, all should be positioned above a tie angle as shown in Fig. 20.

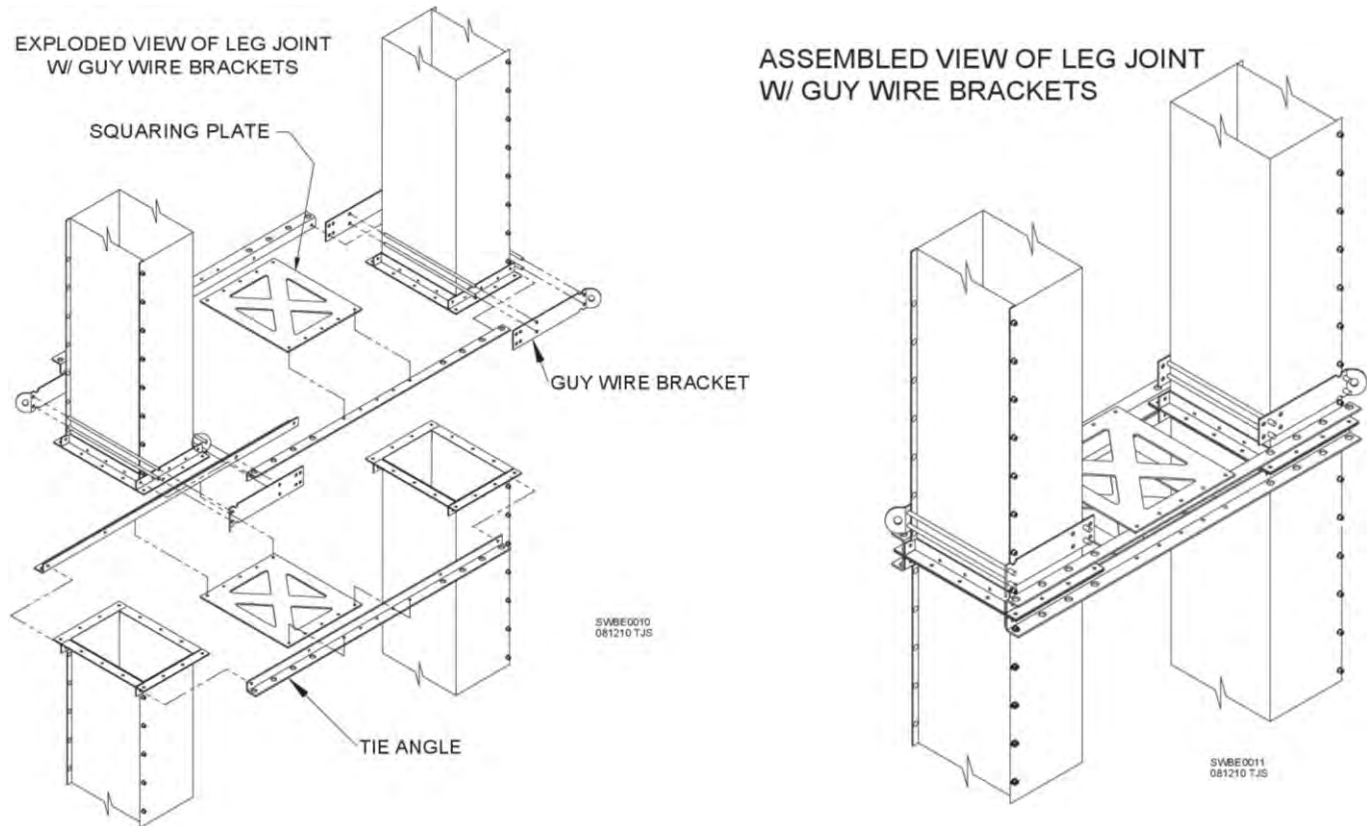


Fig. 20 – Positioning of guy wire brackets above tie angles

DISCLAIMER: It shall not be the responsibility of Sukup Manufacturing Co. to determine suitable guying and/or bracing methods and materials. Customer (or its retained engineer or construction supervisor) is responsible and should give consideration to include the following, but not be limited to, live loads, dead loads, wind loads, soil bearing loads, seismic zone, and moisture run-off on top of base.

Sukup Manufacturing Co. will not be responsible for any damage to a product, including, but not limited to, any damage that results from inadequate or improper guying and/or bracing methods and materials.

General Instructions

Uppermost guy wire brackets must be field-welded to trunking as shown in Fig. 21.

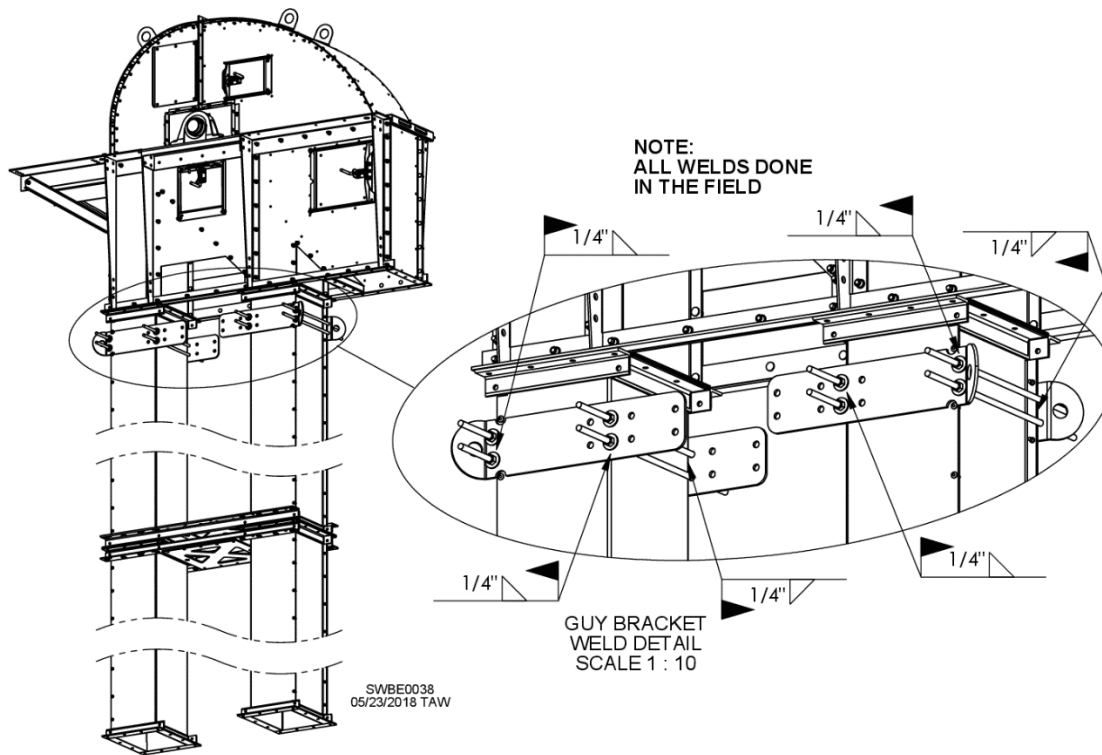


Fig. 21 – Field-welding top guy wire brackets to trunking

Attach guy wires to elevator only by means of four-wire bolt-on brackets shown in Figs. 20 and 21.



WARNING: Incorrect attachment of guy wires to elevator or bracing from an adjoining structure could result in collapse of elevator and death or serious injury.

Follow sequence shown in Fig. 22 for proper clamping of guy wires. Both clamps must be positioned as shown.

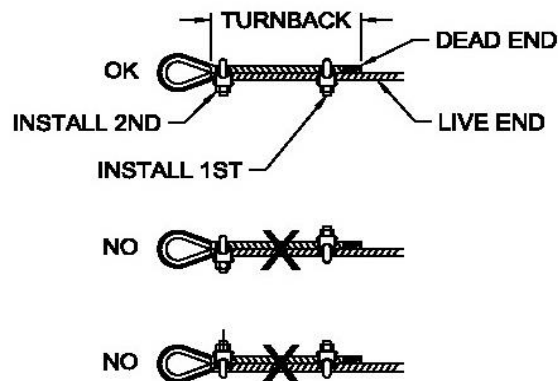


Fig. 22 – Order of installation and positioning of cable clamps

Protecting guy wires

- Consider placing curbs or guards around anchors to prevent damage from traffic.
- Guy wires near ground level must be guarded and visible to prevent injuries.

General Instructions

Drawings in Fig. 23 give proper guying arrangement at various heights. Cable lengths shown are straight-line lengths from ground level to connecting point on guy wire bracket. No allowance in length is made for sag, cable clamping, turnbuckles or off-level anchors.

Cable Lengths

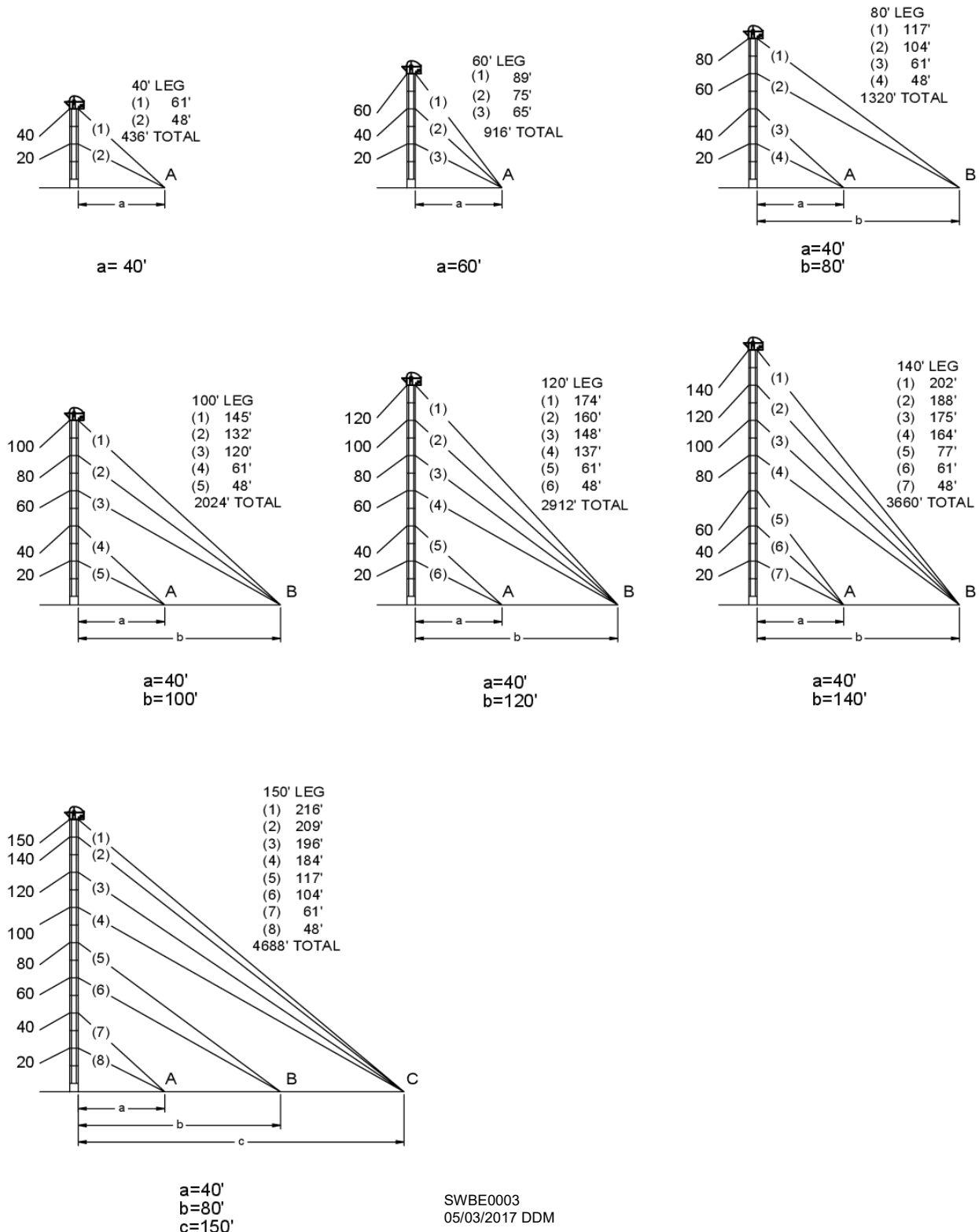


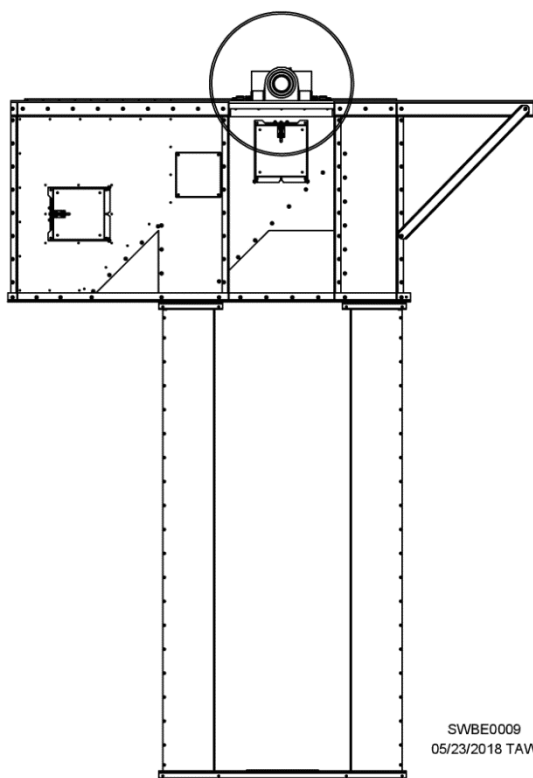
Fig. 23 – Guying positions, cable lengths

Attaching Head Section

Head section should always be assembled with a minimum 10' of securely braced and supported trunking. (Hood is not assembled until belt and cup installation is complete). Carefully lift head and set it on trunking as shown in Fig. 24.



WARNING: Do not lift head unit of elevator using lifting eyes provided on hood (bonnet). Lifting eyes are not designed for weight of head unit. Failure to heed this warning could result in fall of equipment causing death or serious injury.



SWBE0009
05/23/2018 TAW

Fig. 24 – Assembling head section

General Instructions

Attach discharge hopper and uppermost leg sections. If elevator has a work/service platform and/or a distributor platform, they should be installed at this time. See instructions in Platform and Ladder manual, L25005. Lift completed head assembly onto top elevator section. DO NOT install hood at this time. After head assembly is attached to elevator and guy wires are installed, or elevator is secured to support tower, double check that entire unit is plumb with a laser, transit (taking several measurements) or a plumb line. Fig. 25 illustrates plumb line method. Maximum out-of-plumb tolerance should not exceed 1/4".

NOTE: Depending on lifting equipment and platforms, it may be best to attach drive components such as speed reducer and motor before head section is lifted onto top of elevator. See Drive Installation instructions beginning on Page 52.

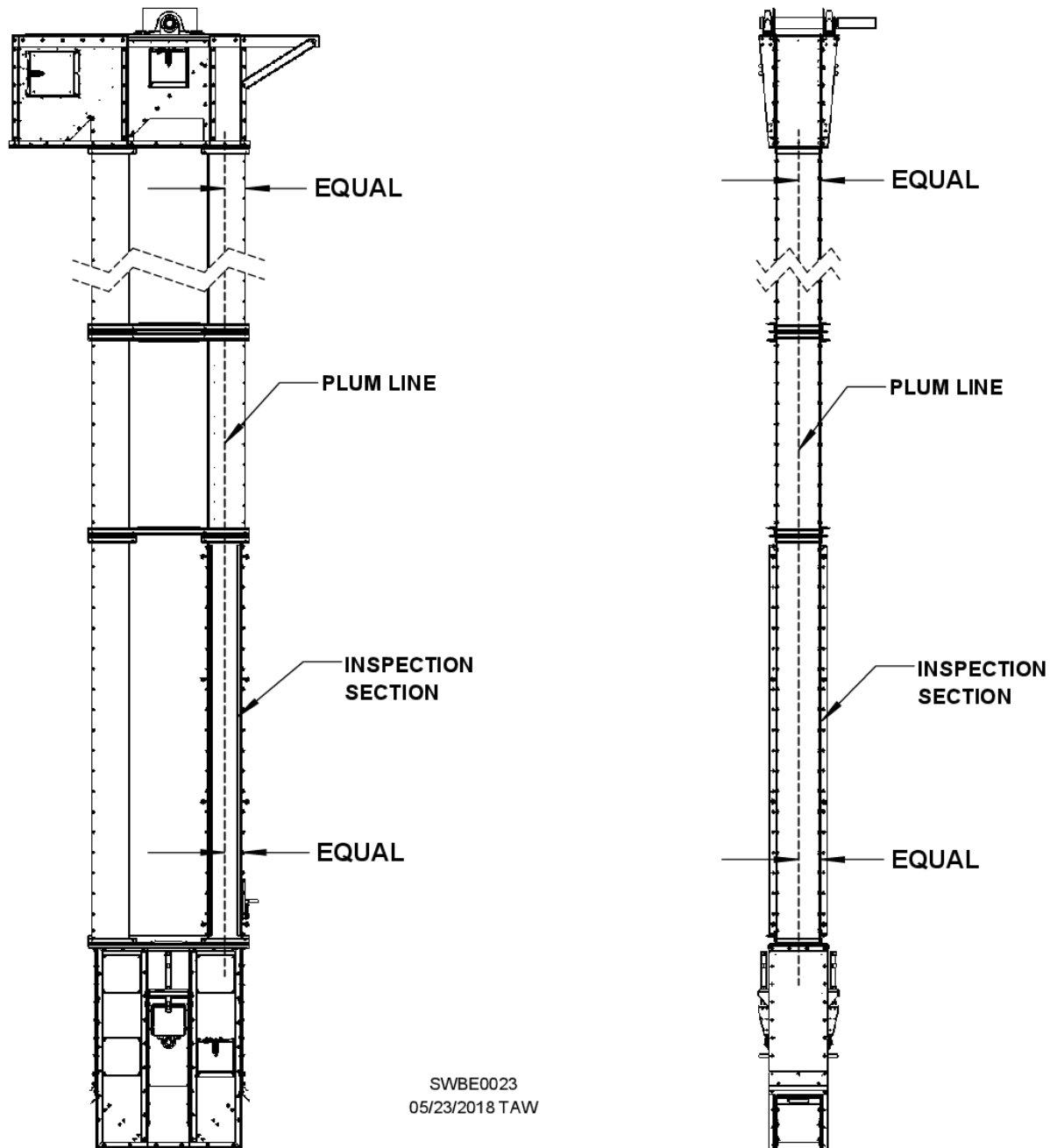


Fig. 25 – Using plumb line to ensure proper alignment

Belt & Buckets Installation Overview

1. Adjust boot pulley to its highest position to allow for maximum belt adjustment. If unit has a gravity take-up it must be properly supported to prevent it from slipping and causing serious injury or damage. Take-ups on each side of boot must be evenly raised to prevent damage to bearings.
2. Remove cleanout slides at bottom of boot.
3. Remove front and back panels of inspection section.
4. Rig a rope or cable (haulage line) through inspection section of UP leg through which belt will be pulled into elevator. See Fig. 31. Rope or cable is then hauled up the **UP** leg side, over the head pulley, and down the **DOWN** elevator leg. Usually, rope or cable can be passed around boot take-up pulley and out of cleanout to a winch so belt can be pulled into elevator. A spreader bar should be fabricated to connect rope or cable to belt.
5. For shorter elevators, buckets can be pre-assembled to belt. However, additional weight of buckets and connecting hardware make belt more difficult to install on tall elevators when buckets are pre-installed. If buckets are pre-assembled, be sure not to install buckets in splice area. Choose method that is safest for you.
6. If drive belts were previously installed, remove them to allow head pulley to rotate freely. However, be careful that buckets belt does not run away when belt in down leg is longer than belt in up leg.
7. Once belt is threaded through both sides of leg, let belt hang for at least 24 hours. This will relieve stress from belt being rolled up and achieve the initial stretch common to belting.
8. Pull ends of belt together using a come-along and splice belt using your preferred method. It is vitally important that splice be perfectly aligned. Belt edges must be parallel to permit tracking of belt and satisfactory elevator operation. Splicing methods (See Fig. 32) include:
 - a. Lap splice – This is easiest splicing method. Make sure belt ends overlap as shown so inner belt end does not have to “climb” over pulleys. Sukup Manufacturing recommends six-bucket spacing at splice.
 - b. Butt splice – This is stronger and smoother when running than a lap splice, and is most often recommended on heavier belts. Re-splicing takes more time than a lap splice due to number of buckets involved. Sukup Manufacturing recommends 12-bucket spacing at splice.
 - c. Mechanical splice – This splice is smoothest when running and is a superior splice. It is also the most difficult splice to make properly.
9. After splice is made, remove any slack in belt by lowering boot pulley. It is important that boot pulley and shaft are checked and maintained to be level.
10. If buckets are attached after belt is spliced, fasten a bucket (or row of buckets) to pre-punched holes in belt. Skip five- or 10-hole patterns and attach next bucket(s). Multiple buckets in same row will be staggered as shown in Fig. 29. Continue this until one complete revolution is made through elevator. Start fastening buckets in center of gap between previously installed buckets.
11. This procedure uses buckets as counterweights. If buckets are attached to belt in consecutive rows, the strand of belt in UP leg will carry appreciably more weight than strand in DOWN leg. Considerable backward pull on head pulley would result and it would make it much more difficult to advance belt. Continue sequence for as many revolutions as necessary until full complement of buckets has been fastened to belt.

General Instructions

12. Trim front lip of cups at splice section. (This is not required when using a mechanical splice.) Trim off an amount equal to belt thickness.
13. Adjust throat wiper (Fig. 30) so there is approximately 1/8" to 1/4" distance between lip of cup and edge of wiper.
14. Attach hood to head section (See Page 51) and attach drive belts (See Page 57).

Attaching Buckets

Figs. 26-29 show attachment of buckets. They can be attached either before or after belt is installed (See Fig. 31) depending on height of elevator and lifting equipment (crane) availability. In either case, be sure to position fanged bolts as shown in Fig. 27. Tighten bolts from center of bucket and work toward ends, alternating sides as shown in Fig. 27. This will help keep bucket centered on belt and ensure proper belt tracking. Nuts should be torqued to 4 ft. lbs. for 1/4" bolts and 6 ft. lbs. for 5/16" bolts. Belt comes pre-punched as determined at time of order. Contact Sukup Manufacturing Co. if belt was supplied by others.

IMPORTANT: Review Belt & Buckets Installation Overview beginning on previous page before attaching.

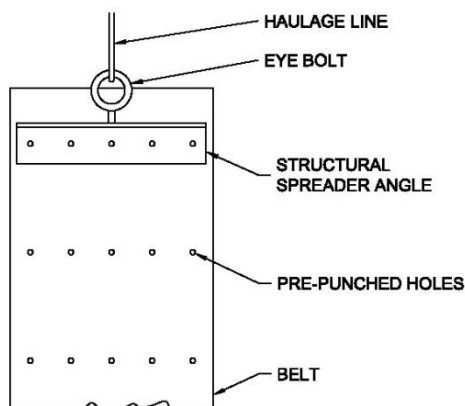


Fig. 26 – Haulage line connection to belt

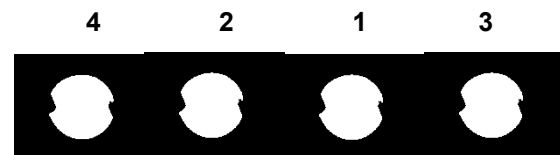


Fig. 27 – Positioning of fanged bolts

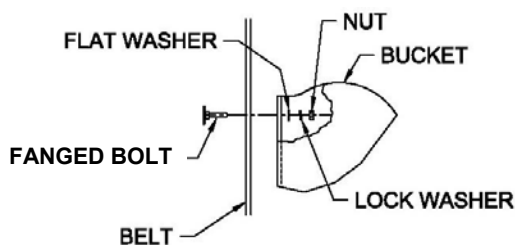


Fig. 28 – Attaching buckets to belt

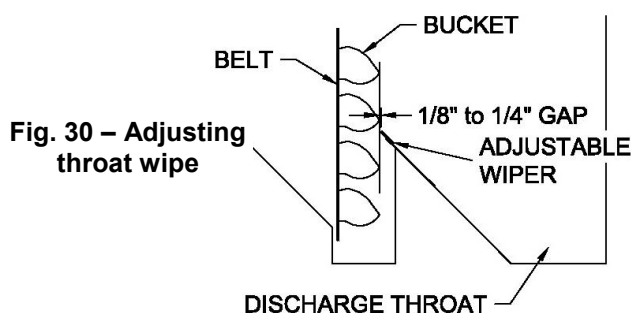


Fig. 30 – Adjusting throat wiper

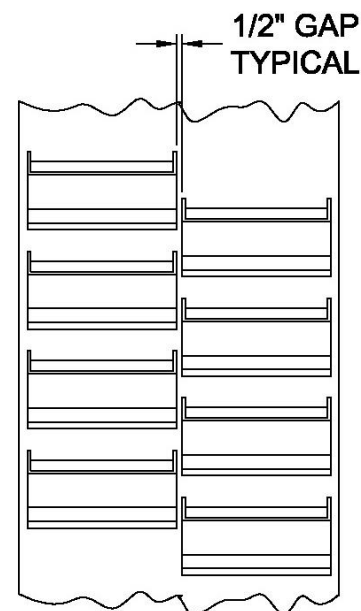


Fig. 29 – Staggered buckets

General Instructions

Belt Installation

There are two basic methods of installing belt in an elevator (with cups attached or without) depending on height of elevator and lifting equipment (crane) available. See Fig. 31.

Any of three styles of belt splice can be selected. See Fig. 32. **IMPORTANT:** Review Belt & Buckets Installation Overview beginning on Page 46 before starting installation.

IMPORTANT: Let belt hang for at least 24 hours before splicing ends.

NOTE: Contact dealer/installer and/or see instructions on Page 50 for belt-tightening weight specifications.



WARNING: End panels should never be removed from a boot section after erection of elevator. Removal could cause elevator to collapse, resulting in death or serious injury.

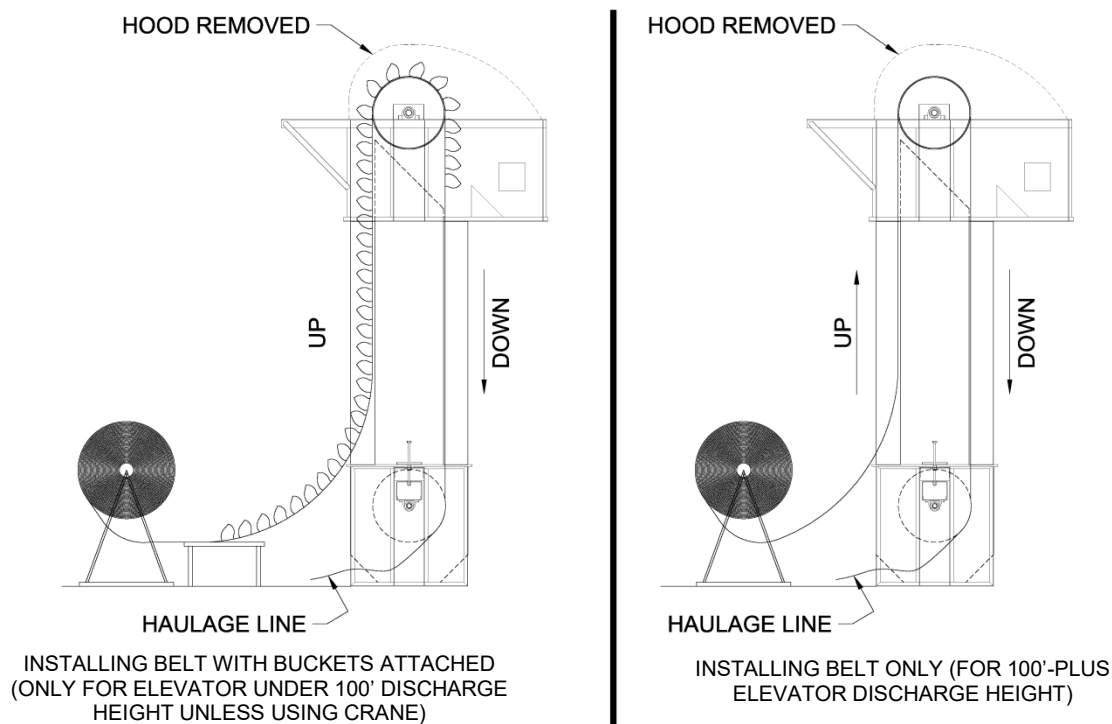


Fig. 31 – Installing belt with cups (left) or without cups attached (right)

NOTE: If installing rub blocks to shut down elevator in case of incorrect tracking of belt, see Assembly Instructions document L1888.

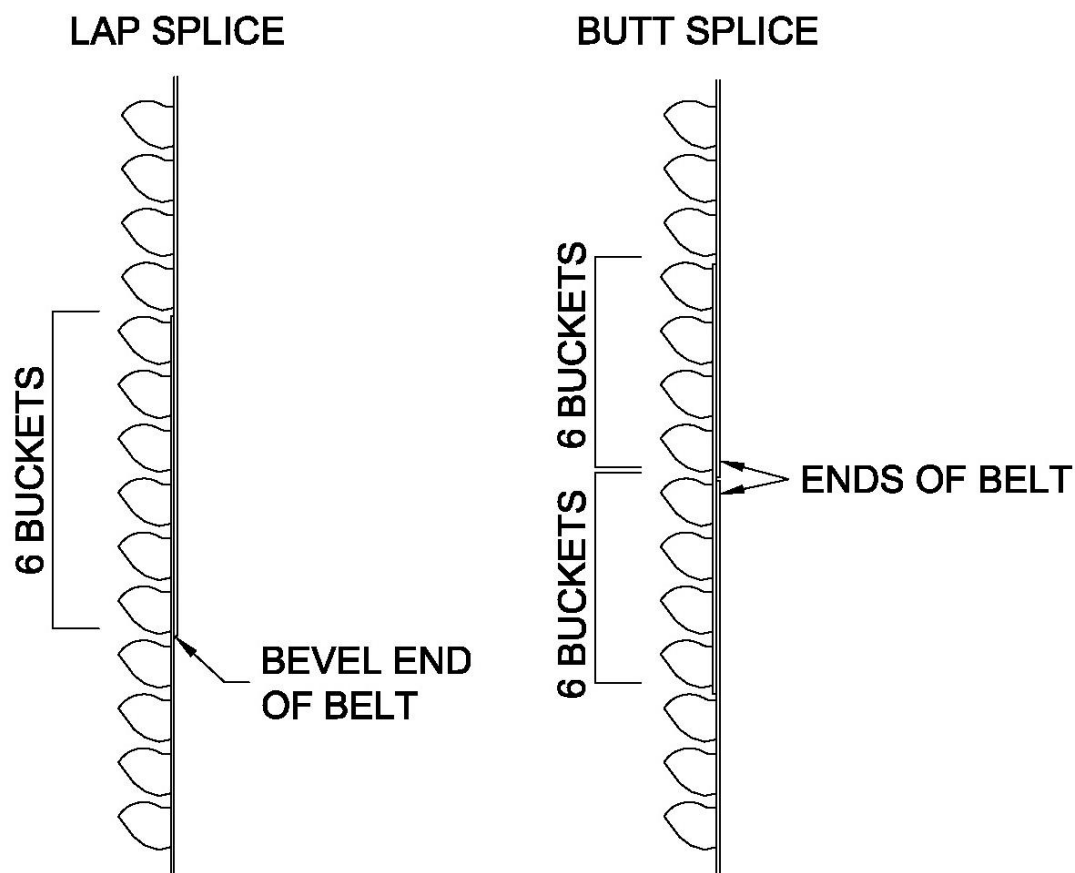
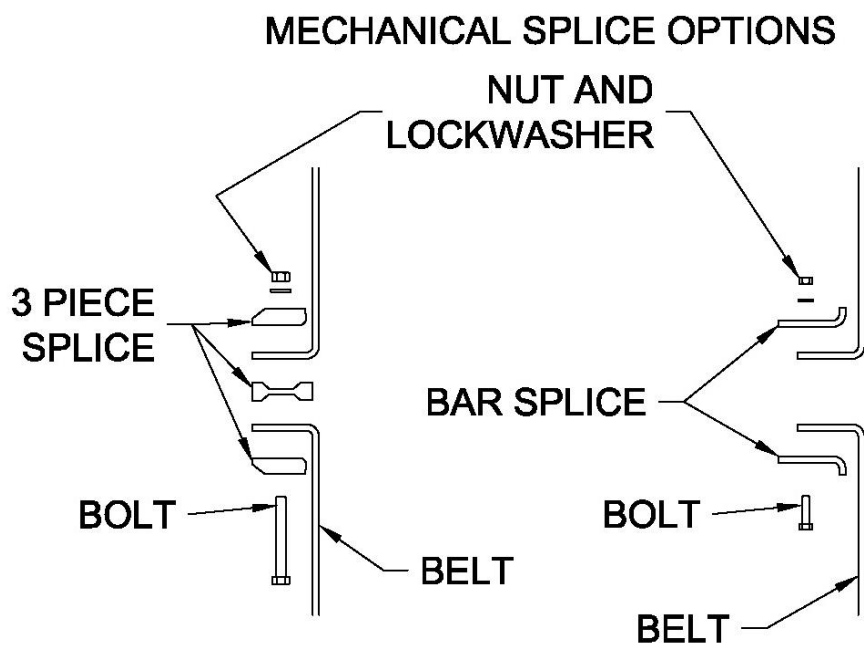


Fig. 32 – Belt splicing options



NOTE: Lap and butt splice specifications are for legs up to 249'. If discharge height is 250' or more, increase to seven-bucket overlap.

General Instructions

NOTE: If using automatic take-up, this formula can be used to estimate how much weight to put in box to keep belt tracking properly: $(\text{HP Constant} \div \text{Belt Speed}) - \text{Gravity Constant}$. See Tables 22-24. This is the suggested weight to keep belt tracking properly. Be sure to evenly distribute weight in weight box.

HP	HP CONSTANT
2	33000
3	49500
5	82500
7-1/2	123750
10	165000
15	247500
20	330000
25	412500
30	495000
40	660000
50	825000
60	990000
75	1237500
100	1650000
125	2062500
150	2475000
200	3300000

ELEVATOR MODEL	GRAVITY CONSTANT
PD16	120
PD24	676
PD25	676
PD30	894
PD31	894
PD32	1071
PD33	1263
PD34	1396
PD35	1541
PD36	1022
PD42	1300
PD46	1725
PD48	1422
PD50	1767
PD53	2609

Tables 22-24 – Estimating weight for proper belt tracking

BELT SPEED						
RPM	PULLEY DIAMETER					
	16"	24"	30"	36"	42"	48"
RV40	168	251	314	377	440	503
RV50	209	314	393	471	550	628
RV60	251	377	471	565	660	754
RV70	293	440	550	660	770	880
RV80	335	503	628	754	880	1005
RV90	377	565	707	848	990	1131

NOTICE: Overtightening belt can result in damage to elevator. Tighten only until belt conforms to crowns of pulleys and tension is sufficient for proper belt tracking.

Attaching Hood

See Fig. 33 for attachment of hood to head section. Ensure shaft seals are in place on outside of each side of hood and are held in place by seal retainers.

Use fixed and adjustable hood clamps on top of hood flanges to secure hood to head section with 3/8" hardware. Use corresponding holes in top of head section base angles.

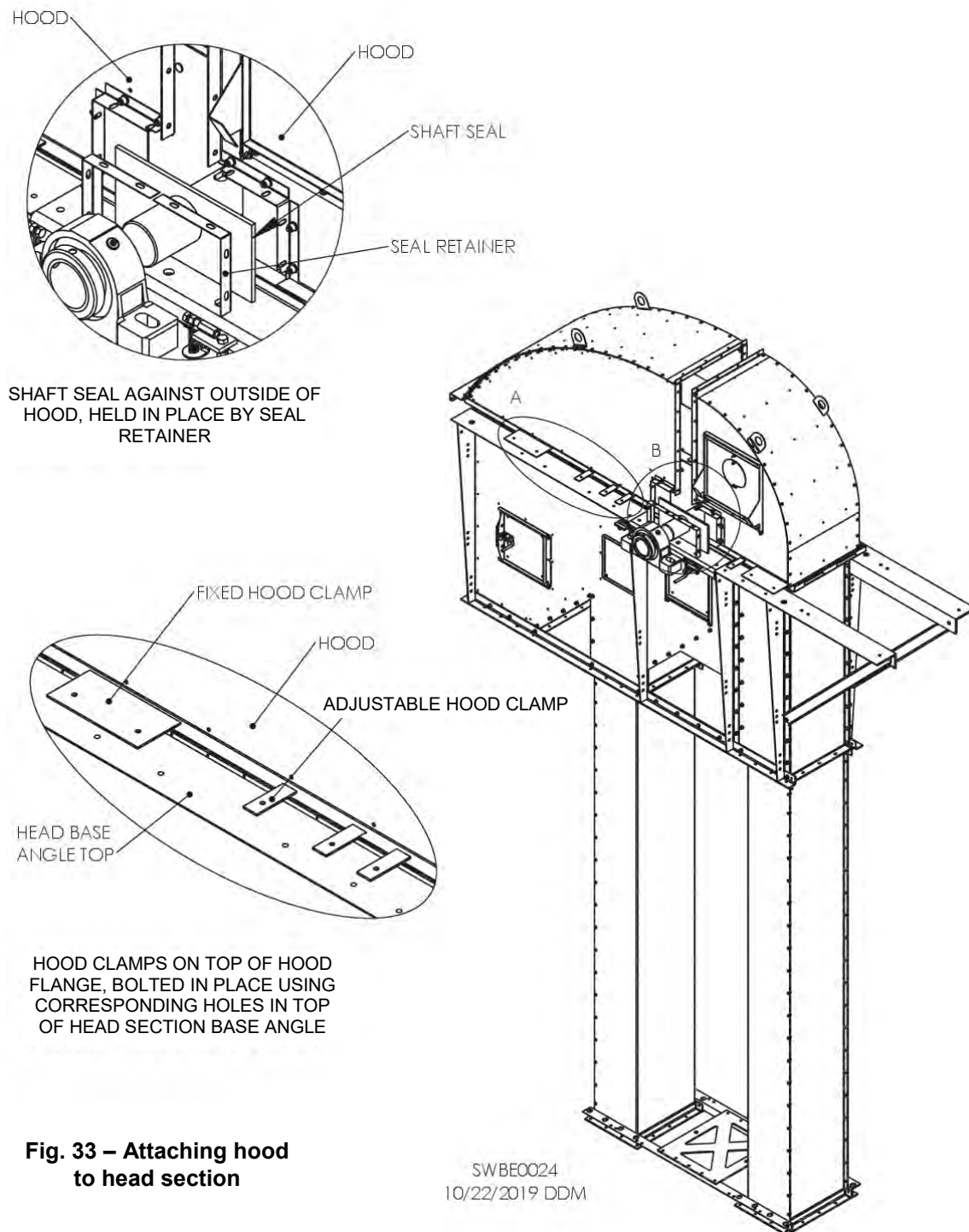


Fig. 33 – Attaching hood to head section

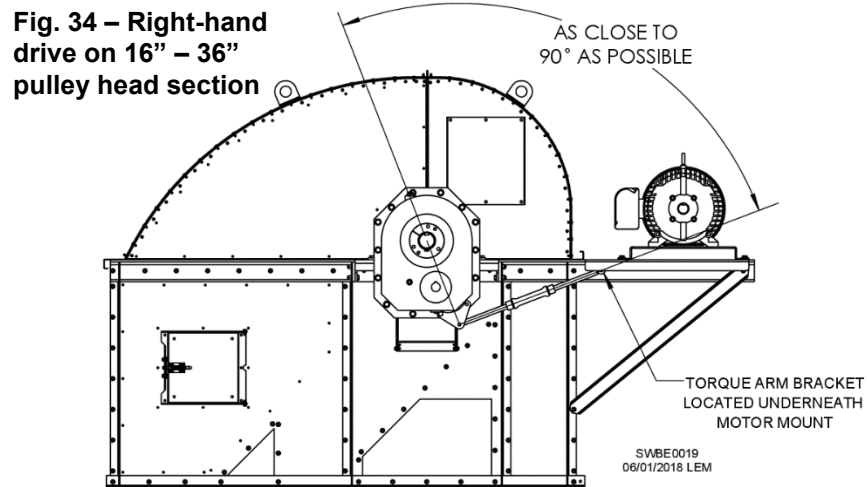
Drive Installation

While head section is still on ground (ideally, depending on lifting equipment), remove hood sub-assembly if necessary and install drive assembly. See Dodge speed reducer installation instructions on Page 69.

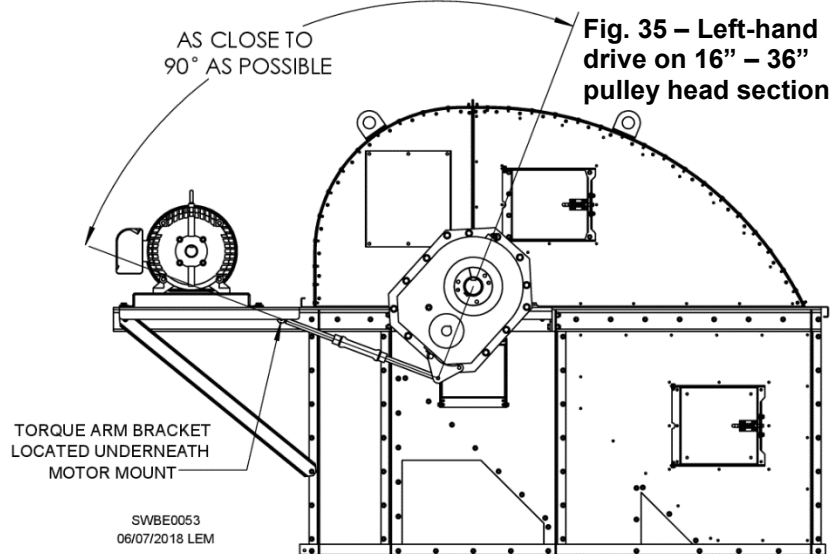
NOTICE: Reducer is shipped without oil. Prior to operation, oil must be added. See Pages 58 and 72.

Attach motor using mounting holes provided. Align with reducer shaft using adjustment slots.

NOTICE: On all drive systems, smaller diameter pulley (sheave) must be mounted to motor drive shaft and larger pulley to reducer shaft. Failure to mount in this manner will cause capacity issues, increased wear and increased risk of gear reducer failure.



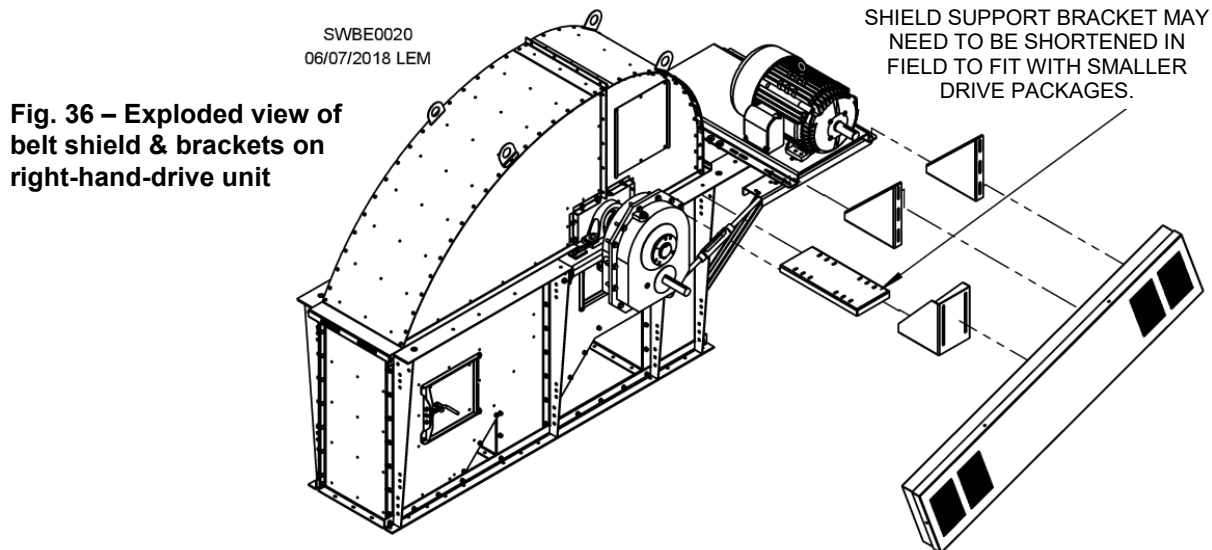
Bracket at end of torque arm (turnbuckle) must mount to reducer so angle formed by torque arm and imaginary line from end of torque arm through output shaft on reducer is close to 90 degrees. See Figs. 34 and 35. Bracket mounting position is usually at lower right of reducer for most right-hand drive models, as shown in Fig. 34, but bracket can be mounted using other adjacent holes on lower portion of reducer. **NOTE:** See Fig. 41 for attachment of torque arm bracket V013270 on 42" or 48" pulley head.



For left-hand mounting, note angle of reducer needed for 90-degree orientation and mount reducer and bracket accordingly. See Fig. 35.

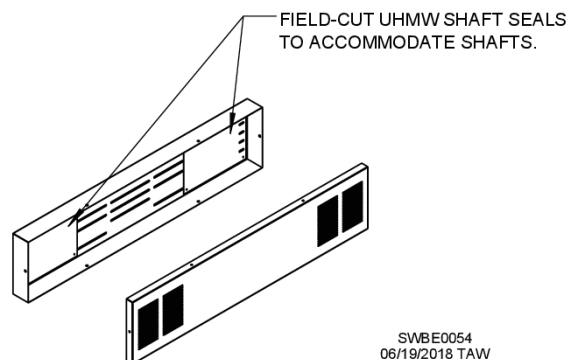
General Instructions

As shown in Fig. 36, support bracket that goes under belt shield bracket may need to be field-shortened to adjust for smaller drive packages.



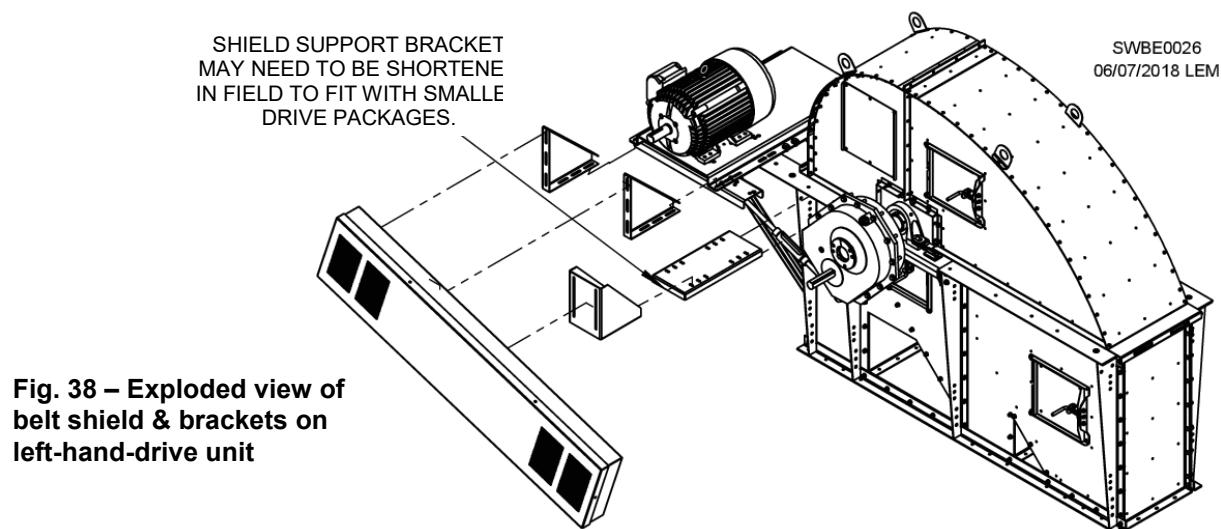
NOTE: Inner section of belt shield has UHMW plates that must be field-cut for shafts. See Fig. 37. Motor shaft location is determined by motor horsepower and reducer size. Hole for reducer shaft must accommodate movement for belt tensioning.

Fig. 37 – Field-cutting UHMW seals to accommodate shafts.



SWBE0054
06/19/2018 TAW

Note tilted angle of reducer on left-hand drive in Fig. 38. As described previously, mount torque arm so angle formed by torque arm and imaginary line from end of torque arm through output shaft on reducer is close to 90 degrees. Ensure torque arm rod does not hit bottom of reducer. Drive belt(s) will be installed later.



General Instructions

NOTE: Belt shield mounting bracket for 30" head pulley assembly using TA1107 or TA2115 gear reducer may need to be trimmed as shown in Fig. 39 so it will fit on support bracket.

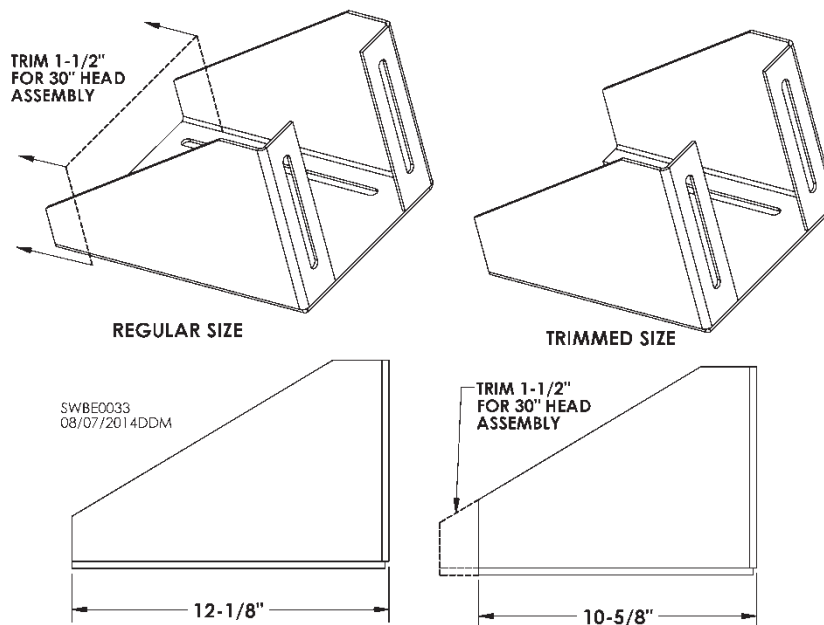


Fig. 39 – Trimming belt shield mounting bracket for 30" pulley head w/ TA1107 or TA2115 reducer

Belt shield used on elevator with 16" head pulley is mounted as shown in Fig. 40.

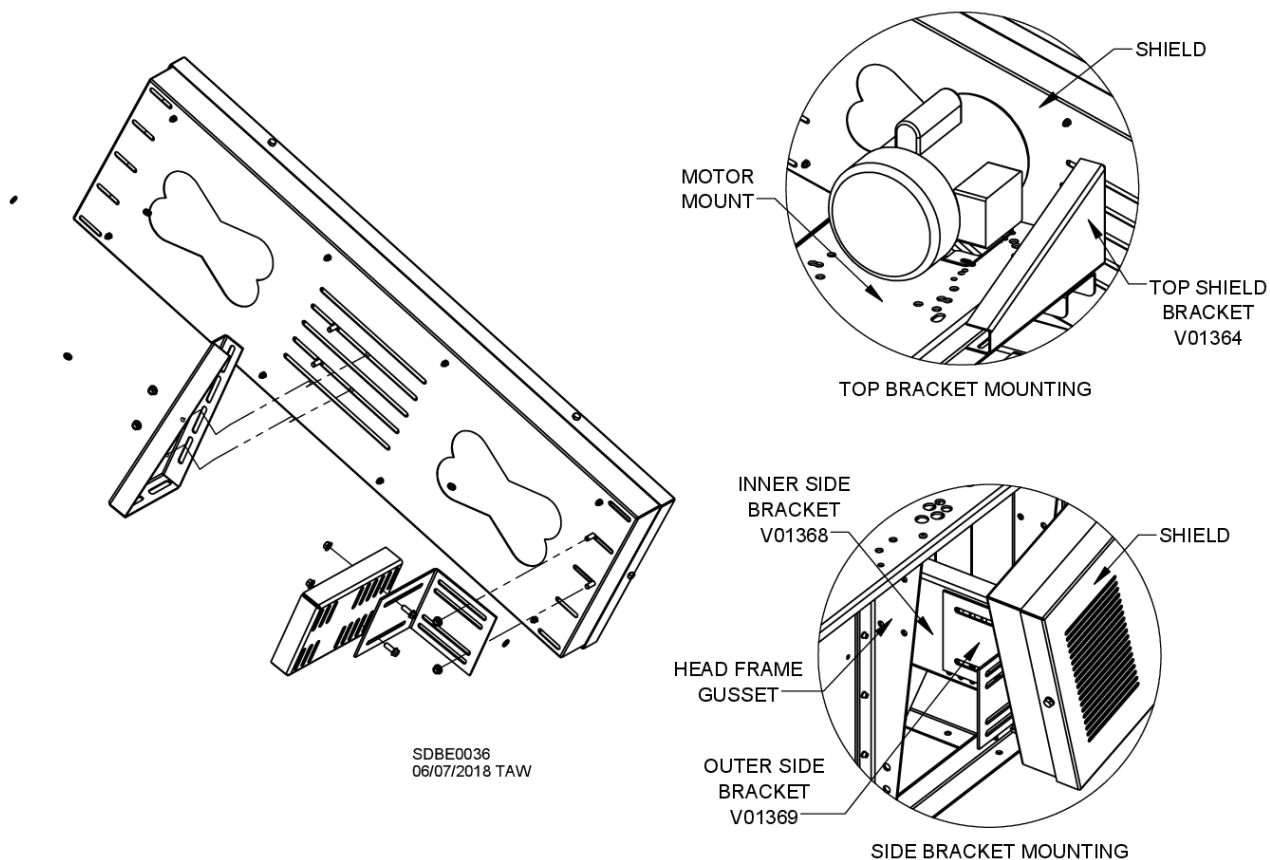


Fig. 40 – Belt shield for 16" head pulley

General Instructions

On elevator with 42" or 48" head pulley, attach torque arm bracket V013270 as shown in Fig. 41.

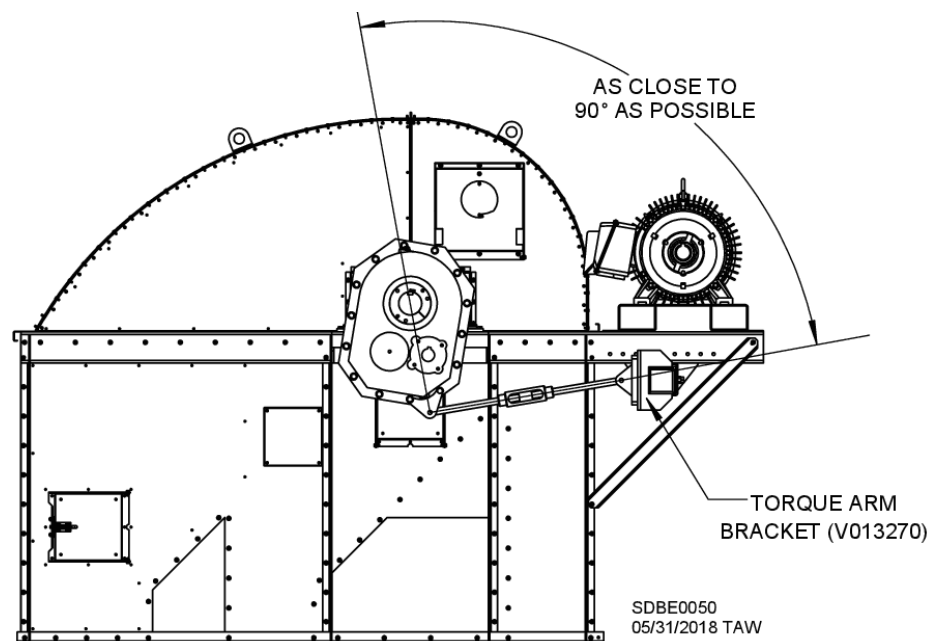


Fig. 41 – Torque arm bracket on 42" or 48" pulley head drive

Belt shield used on elevator with 42" or 48" head pulley is mounted as shown in Fig. 42. Remove belt shield shipping brackets first, if present. See next page for location and removal.

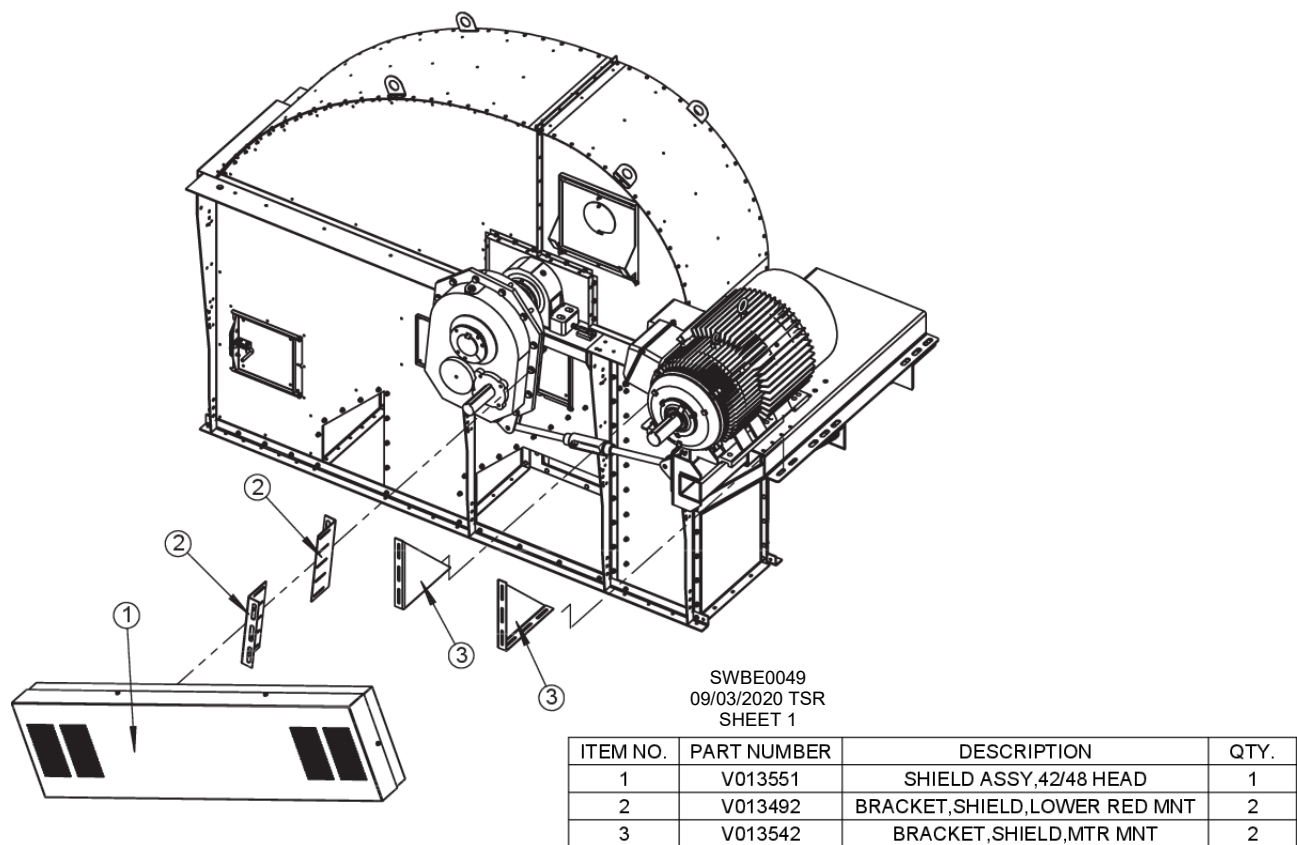


Fig. 42 & Table 25 – Belt shield for 42" or 48" head pulley motor & reducer

General Instructions

For 42" or 48" pulley elevators without factory-installed drive, brackets V013493 and V013494 (both used to hold shield in place during shipping) must be removed to allow correct installation of speed reducer. Detail A of Fig. 43 shows view from behind shield. Detail B shows brackets to be removed after removal of shield.

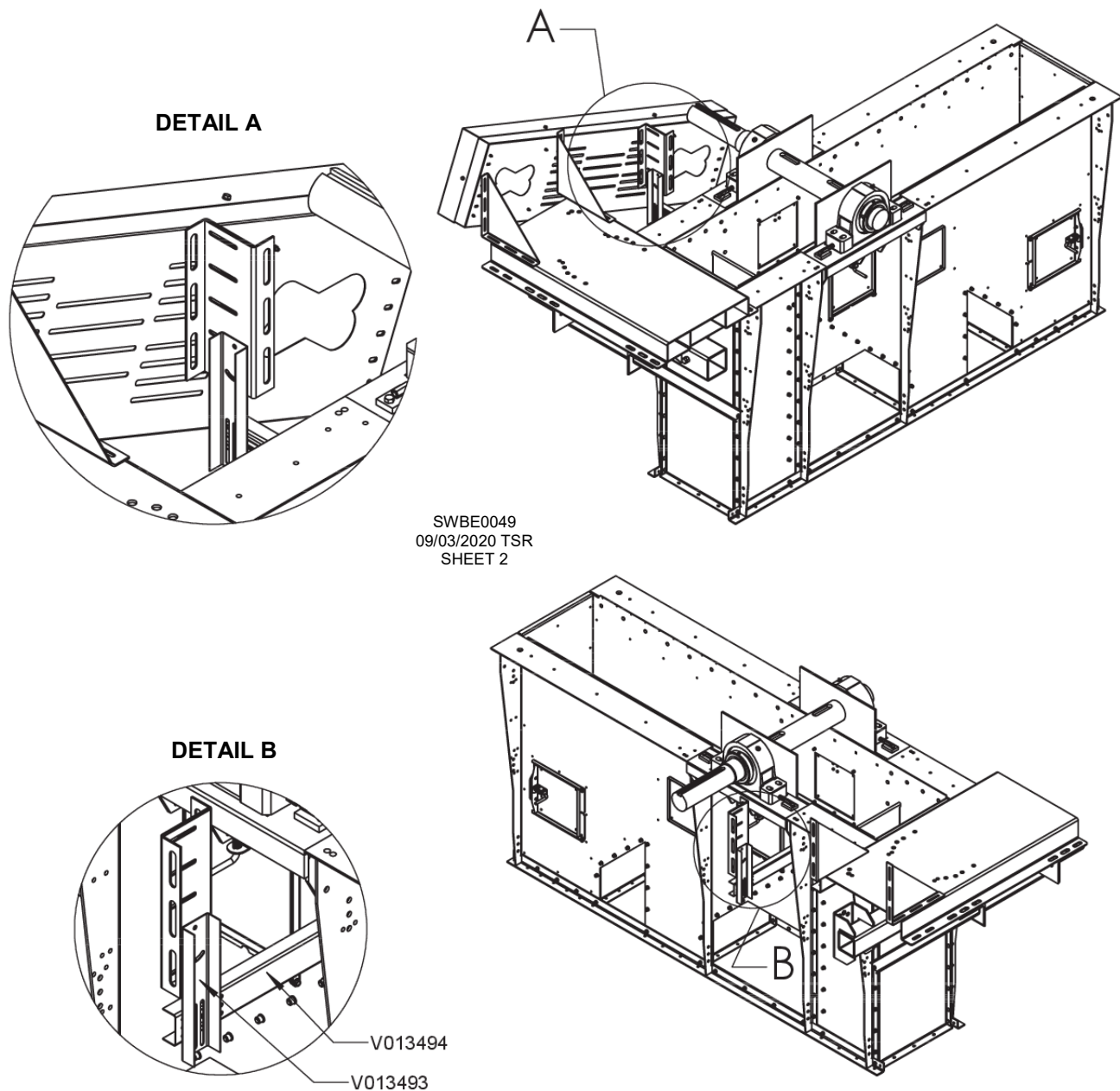


Fig. 43 – Belt shield shipping brackets removal for 42" or 48" pulley drive

After removal of brackets V013493 and V013494 and installation of reducer and motor, re-attach back of shield as shown in Fig. 43. Front panel of shield should be left off until after attachment of belts.

General Instructions

Adjusting V-Belt Tension

Place belt(s) in pulley grooves and tighten by adjusting motor mount. Follow these steps to tension belt.

1. Measure span length. See Fig. 44.
2. At center of span, apply enough force to deflect belt $1/64$ " for every 1" of belt span. If span is 32", deflection amount should be $32/64$ ", or $1/2$ ".
3. Use Table 26 to determine pounds of force to apply to gauge proper deflection per belt.

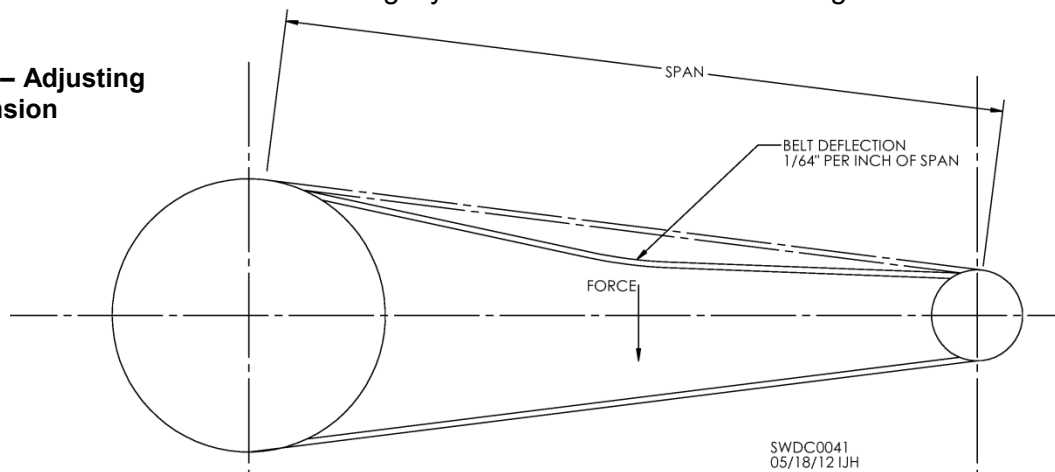
Belt Cross Section	Smallest Pulley Diameter Range	RPM Range	Belt Deflection Setting			
			Deflection = $1/64$ of belt span			
			Uncogged Single V-Belts & Uncogged Banded V-Belts		Cogged V-Belts & Cogged Banded V-Belts	
			Used Belt	New Belt	Used Belt	New Belt
A, AX	3.0 – 3.6"	1,000 – 2,500	3.6	5.4	4.0	6.0
		2,501 – 4,000	2.8	4.1	3.3	4.9
	3.8 – 4.8"	1,000 – 2,500	4.4	6.6	4.9	7.3
		2,501 – 4,000	3.7	5.7	4.3	6.4
	5.0 – 7.0"	1,000 – 2,500	5.3	7.8	5.7	9.2
		2,501 – 4,000	4.6	6.8	5.1	7.6
B, BX	3.4 – 4.2"	860 – 2,500	---	---	4.8	7.2
		2,501 – 4,000	---	---	4.1	6.2
	4.4 – 5.6"	860 – 2,500	5.2	7.9	7.1	10.5
		2,501 – 4,000	4.5	6.6	7.1	9.1
	5.8 – 8.6"	860 – 2,500	6.2	9.4	8.4	12.4
		2,501 – 4,000	6.0	6.8	7.3	10.7
5V, 5VX	4.4 – 6.7"	500 – 1,749	---	---	10	15.2
		1,750 – 3,000	---	---	8.9	13.2
		3001 – 4000	---	---	5.6	8.5
	7.1 – 10.9"	500 – 1,740	12.6	18.9	14.8	22.1
		1,741 – 3,000	11.2	16.5	13.7	20.1
	11.8 – 16.0"	500 – 1,740	15.5	23.4	17.1	25.5
		1,741 – 3,000	14.5	21.8	16.8	25

Table 26 – Belt deflection settings, in pounds, for Bestorq belts

Sukup products use belts made by Bestorq. Sukup recommends using a Bestorq tension meter to measure belt deflection. Go to www.bestorq.com or call (402) 423-3077 for more information.

After adjusting tension to desired level by adjusting motor mount, remove any foreign material from inside of belt guard. Check that all fasteners are tightly secured. Close and latch belt guard.

Fig. 44 – Adjusting belt tension



IMPORTANT: Check and adjust belt tension after first five (5) and 24 hours of operation, then during regular maintenance (at least twice yearly).

Reducer Oil

Gear reducers are shipped without oil. Use high-grade petroleum-based, rust- and oxidation-inhibiting (R & O) gear oil. See oil recommendations in Dodge Torque Arm II Speed Reducers section to determine correct viscosity of oil for reducer. Follow instructions on reducer nameplate, warning tags and in installation instructions attached to reducer. Oil should be changed after an initial operation of about two weeks. After initial break-in period, lubricant should be drained, magnetic drain plug cleaned, and gear case flushed and refilled every 2,500 hours of operation. Change oil every one to three months when operating in conditions of extreme dirt and temperature.

Before filling reducer with oil, install magnetic drain plug in hole closest to bottom of reducer (as mounted on elevator). Remove tape covering filter/ventilation plug in shipment and install plug in topmost hole. Of two remaining plugs on sides of reducer; lower one is the minimum oil level plug; upper one is the level to which oil should be filled.

NOTICE: Proper amount of oil must be added to reducer prior to running elevator. Too much oil will cause overheating and too little will result in gear failure. Check oil level regularly.

Final Check

Check all parts to ensure no foreign objects or tools have been left in elevator. All guards, inspections doors and removable plates should be checked for proper placement. Check for loose or missing buckets. Drive should be turned by hand to check for proper rotation and clearance. Rotate belt a full rotation to check for any obstructions. Make any necessary adjustments. Check all setscrews and pulley hub bolts to ensure they are tightened.

IMPORTANT: Do not operate bucket elevator until all bolts are fully tightened.

Initial Test Run

Elevator **should be run without load for approximately eight hours**. During this time, particular attention should be given to:

1. Loud or unusual noise – Check for loose buckets, an improperly adjusted throat wiper, or trash materials/tools inside elevator.
2. Excess vibration – Drive equipment may not be adequately braced or elevator may not be plumb.
3. Bearings overheating – Check bearing lubrication; check for extreme shaft misalignment at head and boot shafts, for a severe overhung load condition at the drive, or that take-ups are too tight.
4. Drive unit over-heating – **Reducer is shipped without oil. It must be filled prior to operation.** Check belt alignment. Motor may be improperly wired or there may be incorrect voltage going to motor.
5. Evidence of belt not tracking in center of pulleys – Check that elevator is plumb, that pulley shafts are level, take-ups are properly adjusted, and head bearings are shimmed appropriately.

Once material is run through elevator, belt tracking needs to be checked again. Make sure material is flowing properly into boot. Improperly flowing material can push belt to one side and make it very difficult to properly track the belt. Final tensioning of belt will be done under load.

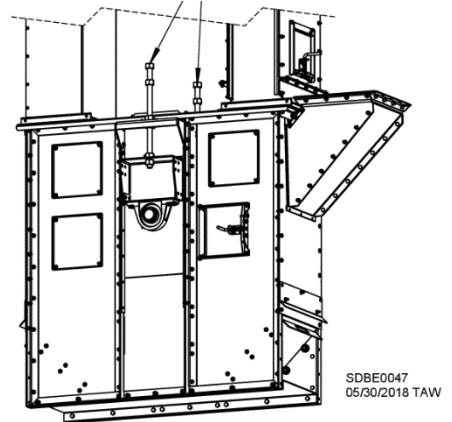
Maintenance

Belt will stretch after installation and may need further adjustment. Expect some stretching during first few weeks of operation. On manual take-up boots, belt tension should be maintained by turning boot take-up screws (Fig. 45) slowly and evenly to maintain proper tracking. When screw adjustment is completely used, belt will have to be re-spliced. Good belt tension is critical for proper traction on head pulley and optimum performance. Refer to Fig. 46 to ensure proper belt tracking.

NOTE: Contact dealer/installer and/or see instructions on Page 50 for belt-tightening specifications if using automatic take-up.

NOTICE: Overtightening belt can result in damage to elevator. Tighten only until belt conforms to crowns of pulleys and tension is sufficient for proper belt tracking.

Fig. 45 – Take-up screws



Belt Tracking

Rubbing pulleys are a serious condition and should be corrected immediately. Follow steps shown below to make any minor adjustments. A qualified millwright should correct serious defects.

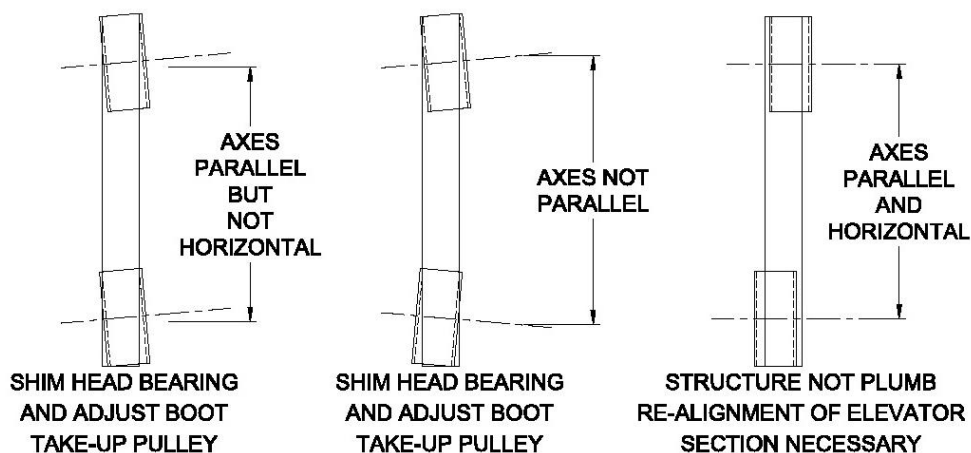
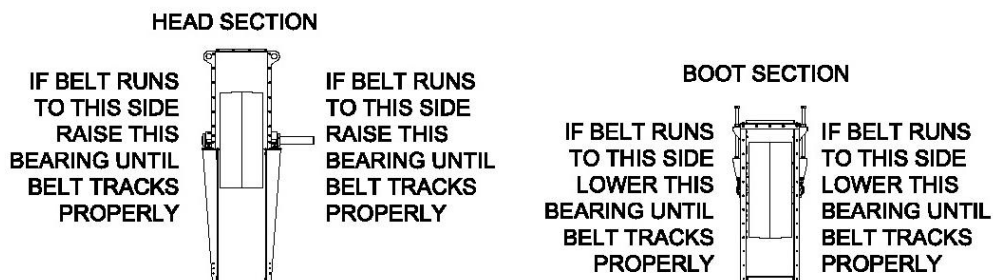


Fig. 46 – Maintaining proper belt tracking



If remedies above do not correct misalignment issue, look for these conditions as well:

- Loose hub screws allowing pulley to move laterally on shaft
- Loose bearings or bearing supports
- Weak or bent head pulley shaft
- Grain entering boot at an angle – pushing belt to one side
- Head or boot pulley not plumb

Maintenance

Regularly scheduled maintenance can greatly increase equipment life and reduce downtime. A good maintenance program includes general housekeeping, regular lubrication and regular inspection. Check bucket elevator immediately if any unusual noise or vibration is observed.

Following is a list of things to check at specified intervals.



WARNING: Never remove or loosen one or more cables or connection to support tower without providing other means of support to elevator leg. Failure to heed this warning could result in collapse of elevator, causing death or serious injury.

1. Check belt frequently to make certain it is running in center of leg. Check belt alignment every hour for first 10 hours and daily thereafter. A rubbing belt could quickly cut a hole in side of leg or cause sparks.
2. Check bucket bolts for tightness after 10, 30, and 100 hours of operation and every 200 hours thereafter.
3. Bearings are greased at factory and do not need to be greased prior to start-up. Grease all bearings every 800 to 1,000 hours after start-up. While unit is running, use only enough grease so fresh grease can be seen at seals. If bearings cannot be lubricated while unit is running, do it immediately upon shutdown while bearing is still warm. See bearing lubrication information on next two pages.
4. Be certain to maintain reducer as specified by manufacturer. Follow manufacturer's instructions for regular oil level inspection and oil changes. See Dodge speed reducer and lubrication information beginning on Page 72.
5. Check head pulley and V-belt drive assembly after 10, 30, 100 and every 300 hours, or twice yearly thereafter. The best belt tension for a V-belt drive is the lowest tension at which belts will not slip under the highest load condition. See belt adjusting instructions on Page 57.
6. Oil motor every 1,000 hours or once yearly if equipped with oil holes or grease unit if zerks are available.
7. Check guy cables, turnbuckles and cable clips every three months for damage or loosening. If elevator is supported by a tower, check connections between tower and elevator every six months for damage or loosening. **NOTE:** Any change in cable tensions or support tower connections may cause leg to go out of plumb, resulting in belt not running straight or even in structural damage to leg.
8. Check for deterioration or looseness of any bolts or fasteners and for secure attachment of all ladders. Tighten any loose fasteners.
9. Check for damaged or missing cups.
10. Check belt for frays, tears or cracks, as well as for damage from bolts or oil. Also check for glazing of belt, which could lead to slippage and overheating.

BEARING LUBRICATION

NOTE: Following are instructions from Dodge on lubrication of bearings used in Sukup elevators.

DODGE S-2000 BEARING

From Dodge S-2000 Spherical Roller Bearings Instruction Manual, MN3033, dated 02/2022:

LUBRICATION INSTRUCTIONS

OPERATION IN PRESENCE OF DUST, WATER OR CORROSION VAPORS

This bearing is factory lubricated with No. 2 consistency lithium complex base grease which is suitable for most applications. However, extra protection is necessary if bearing is subjected to excessive moisture, dust, or corrosive vapor. In these cases, bearing should contain as much grease as speed will permit (a full bearing with consequent slight leakage through the seal is the best protection against contaminant entry).

In extremely dirty environments, the bearing should be purged daily to flush out contaminants. For added protection, it is advisable to shroud the bearing from falling material.

HIGH SPEED OPERATION

At higher operation speeds, too much grease may cause overheating. In these cases, the amount of lubrication can only be determined by experience. If excess grease causes overheating, remove grease fittings and run for ten minutes. This will allow excess grease to escape. Then wipe off excess grease and replace grease fittings.

In higher speed applications, a small amount of grease at frequent intervals is preferable to a large amount at infrequent intervals. However, the proper volume and interval of lubrication can best be determined by experience.

AVERAGE OPERATIONS

The following table is a general guide for normal operating conditions. However, some situations may require a change in lubricating periods as dictated by experience. If the bearing is exposed to unusual operating conditions, consult a reputable grease manufacturer.

Lubrication Guide

Read Preceding Paragraphs Before Establishing Lubrication Schedule

Table 2 - Suggested Lubrication Period in Weeks								
Hours run per day	1 to 250 rpm	251 to 500 rpm	501 to 750 rpm	751 to 1500 rpm	1001 to 2000 rpm	1501 to 2000 rpm	2001 to 2500 rpm	2501 to 3000 rpm
8	12	12	10	7	5	4	3	2
16	12	7	5	4	2	2	2	1
24	10	5	3	2	1	1	1	1

OPERATING TEMPERATURE

Abnormal bearing temperatures may indicate insufficient lubrication. If the housing is too hot to touch for more than a few seconds, check the temperature by applying a thermometer at the top of the pillow block with the thermometer tip surrounded by putty.

Because the thermometer reading will be approximately 10°F lower than the actual bearing temperature, add ten degrees to the reading and compare to the temperature rating of your grease. If the bearing temperature reading is consistent and operating within the recommended limits of your grease, the bearing is operating satisfactorily. The recommended maximum operating temperature for S-2000 Spherical Roller Bearings is 200 °F.

STORAGE OR SPECIAL SHUT DOWN

If equipment will be idle for some time, before shutting down, add grease to the bearing until grease purges from the seals. This will ensure protection of the bearing, particularly when exposed to severe environmental conditions. After storage or idle period, add fresh grease to the bearing before starting.

Table 3 - Set Screw Torque Table		
Shaft Size	Socket Set Screw Size	Tightening Torque
1-3/8 – 1-3/4 in.	5/16 in.	165 Inch Pounds
1-15/16 – 2-7/16 in.	3/8 in.	290 Inch Pounds
2-11/16 – 3-7/16 in.	1/2 in.	620 Inch Pounds
3-15/16 – 4-15/16 in.	5/8 in.	1325 Inch Pounds

Table 4 - Recommended Shaft Tolerance Table		
Normal Shaft Size	Low to Normal Equivalent Load and Catalog Speed*	
Up to 1-1/2 in.	+ .000 in.	– .0005 in.
Over 1-1/2 to 2-1/2 in.	+ .000 in.	– .001 in.
Over 2-1/2 to 4 in.	+ .000 in.	– .001 in.
Over 4 to 5 in.	+ .000 in.	– .0015 in.

*Normal equivalent load .08C to .18C.

On severe applications and where dynamic balance and minimum runout are important, a snug to light press fit may be required to obtain optimum bearing performance. Consult Dodge Product Support.

DODGE IMPERIAL & ISAF BEARING

From Dodge Imperial & ISAF Bearing Instruction Manual, MN3009, dated 03/2022:

GREASE LUBRICATION

Dodge IP and ISAF bearings are pre-packed with NLGI #2 Lithium Complex grease. For relubrication, select a grease that is compatible with a #2 Lithium Complex grease. Relubricate in accordance with Table 3.

STORAGE OR SPECIAL SHUTDOWN

If exposed to wet or dusty conditions or to corrosive vapors, extra protection is necessary. Add grease until it shows at the seals; rotate the bearing to distribute grease; cover the bearing. After storage or idle period, add a little fresh grease before running.

Table 3—Re-Lubrication Intervals (Months) Based on 12 hours per day, 150° F M

Shaft Size (inches)	RPM								
	250	500	750	1000	1250	1500	2000	2500	>3000
1-1/8 to 2	4	3	2	2	1	0.5	0.25	0.25	0.25
2-3/16 to 2-1/4	3.5	2.5	1.5	1	0.5	0.5	0.25	0.25	0.25
2-3/8 to 3	3	2	1.5	1	0.5	0.25	0.25	0.25	0.25
3-3/16 to 3-1/2	2.5	1.5	1	0.5	0.25	0.25	0.25	0.25	-
3-11/16 to 4-1/2	2	1.5	1	0.5	0.25	0.25	0.25	-	-
4-15/16 to 5-1/2	1.5	1	0.5	0.25	0.25	0.25	-	-	-
5-15/16 to 6	1	0.5	0.5	0.25	0.25	0.25	-	-	-
6-7/16 to 7	1	0.5	0.25	0.25	0.25	-	-	-	-

DODGE SC & SCM BEARING

From Dodge bearings manual MN3016, dated 02/2022:

Lubrication

Food safe bearings cannot be re-lubricated.

High Speed Operation - In the higher speed ranges, too much grease will cause over-heating. The amount of grease that the bearing will take for a particular high speed application can only be determined by experience. If excess grease in the bearing causes overheating, it will be necessary to remove grease fitting to permit excess grease to escape. The bearing has been greased at the factory and is ready to run. When establishing a relubrication schedule, note that a small amount of grease at frequent intervals is preferable to a large amount at infrequent intervals.

Table 2 - Lubrication Guide
Use a No. 2 Lithium complex base grease or equivalent*

Hours Run Per Day	Suggested Lubrication Period in Weeks							
	1 to 250 RPM	251 to 500 RPM	501 to 750 RPM	751 to 1000 RPM	1001 to 1500 RPM	1501 to 2000 RPM	2001 to 2500 RPM	2501 to 3000 RPM
8	12	12	10	7	5	4	3	2
16	12	7	5	4	2	2	1	1
24	10	5	3	2	1	1	1	1

*For E-Z Kleen/Ultra Kleen series bearings, use an aluminum complex base grease.

Lubrication recommendations are intended for standard products applied in general operating conditions. For modified products, high temperature applications, and other anomalous applications contact product engineering at 864-284-5700.

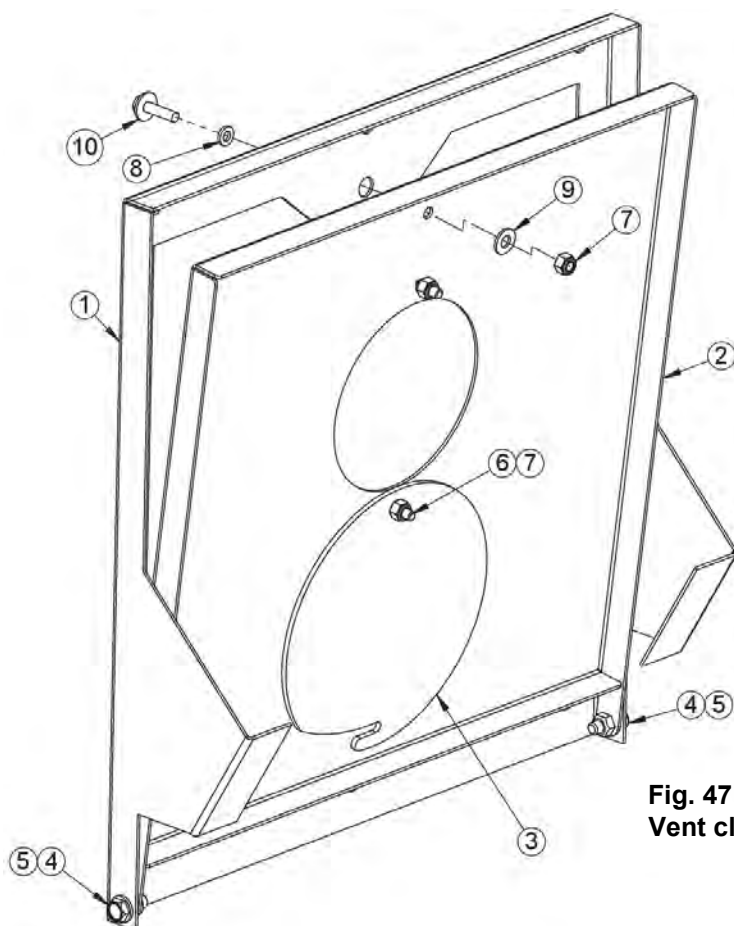
Successful operation is dependent upon adequate lubrication. Precaution should be taken during handling and recycling grease, oil or water glycol mixtures.

Pressure Relief Vent Closure Replacement

NOTICE: Factory-installed screw with rubber-backed deformable washer, as well as centering washer, flat washer and lock nut, **MUST NOT** be reused after a pressure release.

Follow these instructions for replacement of vent closure following a pressure release:

1. Close pressure relief door against frame and open access plate (V001332).
2. Slide centering washer (J8919) onto 1/4 - 20 x 1" screw (J8920 or J89201) with rubber-backed deformable washer. Reach through access hole and insert screw and centering washer into hole in door frame as shown in Fig. 47. **IMPORTANT:** Centering washer **MUST** be flush in hole.
3. Secure screw with flat washer (J1105) and lock nut (J0992) as shown.
4. Close pressure relief door access plate (V001332) and tighten lock nuts to secure.



ITEM #	PART #	DESCRIPTION	QTY.
1	*	Frame	1
2	*	Door panel	1
3	V001332	Access panel	1
4	J0536	Screw, 5/16 – 18 x 3/4"	2
5	J1010	Lock nut, 5/16" – 18	2
6	J05051	Bolt, 1/4 – 20 x 3/4"	2
7	J0992	Lock nut, 1/4" – 20	3
8	J8919	Washer, 1/4" 14ga	1
9	J1105	Flat washer, 1/4"	1
10	*	Screw, 1/4 – 20 x 1"	**

*Part # varies w/ trunking size. See Table 28.

**Qty. varies w/ size of door

Fig. 47 & Tables 27 & 28 –
Vent closure replacement

DOOR ASSY. PART #	DOOR FRAME	DOOR PANEL	PULLEY DIA./ TRUNKING SIZE	SCREW PART #	QTY. PER DOOR	WASHER COLOR
V01537	V01538	V01539	16"	J8920	1	Green
V00080	V00079	V00077	24"	J8920	1	Green
V00086	V00087	V00088	30-36"	J89201	1	Tan
V00019	V00034	V00033	42-48"	J89201	1	Tan
V00121	V00123	V00122	13x10"	J89201	1	Tan
V00039	V00072	V00049	18x12"	J89201	1	Tan
V00039S	V00072S	V00049S	18x12"	J89201	1	Tan
V00135	V00134	V00133	22x14"	J89201	2	Tan
V80001	V70003	V70002	27x14"	J89201	2	Tan

Troubleshooting, General

Problem	Cause	Remedy
Back-legging	Adjustable throat wiper not properly adjusted	Gap should be about 1/8" to 1/4" between wiper and front lip of cups. See Fig. 30.
	Improper head shaft speed	Be sure pulleys are properly installed. Check speed reducer for proper reduction ratio. Check Sukup literature for proper speeds.
	Obstruction in head discharge, distributor or spouting	Inspect all areas for foreign material such as paper, wood, bags, tools, metal scrap, etc. Check for missing buckets.
	Late discharge from cup (typically lighter, low density materials)	Check for proper cup venting
	Loose buckets	Securely tighten all bucket bolts. Determine cause of bucket damage.
	Buckets being overfilled	Verify with a strobe light. Check head pulley speed. Check how elevator is being loaded. Check conveyor output. Reduce feed at inlet.
	Improper spouting design	Is spouting too flat (40° for dry grain and 45° for wet grain)? Is spout large enough to match elevator capacity? Does spouting have any sharp bends that reduce flow?
	Pressure build-up	Venting may be needed at head, distributor, spouting or bins.
	Loose belt	Tighten belt with take-up screws or re-splice belt as required.
Running noise in head	Cups hitting adjustable throat wiper	Gap should be about 1/8" to 1/4" between the wiper and the front lip of the cups. See Fig. 30.
Running noise in boot	Foreign object in boot housing	Remove clean-out slides in boot and inspect for foreign objects.
	Shaft rubbing on UHMW dust seal	Lubricate dust seal with grease or WD-40®.

Troubleshooting, General

Problem	Cause	Remedy
Running noise in trunking	Cups hitting on inside of trunking	Belt is loose; tension the leg belt. Check leg for plumbness and/or any bowing.
	Grain displacement in up leg	This is a normal condition for first 20' or so of up-side legging. Grain will be thrown upward by cup action. Also, material will start to level off in cup, causing some grain to come back down the up leg. Do not confuse this with back legging.
Missing or damaged buckets	The belt is loose	Adjust take-up tension, or shorten the belt.
	Leg is not plumb	Re-plumb the leg.
	Obstruction within leg	Repair or remove obstruction.
	Build-up on pulley	Remove build-up.
Leg belt running to one side of head and/or boot pulley. Belt rubbing side of head, boot or casing.	Pulley misalignment	See Page 59 for detailed instructions on correcting belt tracking.
	Bad bearing	Replace bearing.
	Product built up on pulley face	Clean pulley and check crown. May need to use wing pulley for some materials.
	Grain flow pushing cups	Make a baffle to direct grain into cups.
	Head pulley lagging worn	Replace with slide lagging kit.
	Not enough or no crown on head pulley	Replace pulley.
	Head shaft not level	Shim bearings. See Page 59.
	Elevator casing out of plumb, bent or twisted	Re-plumb leg. Replace damage or twisted sections.
	Belt too loose	Adjust take-up tension, or shorten belt.
	Belt splice crooked or loose	Re-splice belt.
Build-up on buckets	Material wet, sticky or sluggish	Check application. Bucket elevators are best suited for fine, free-flowing material.
Elevator being overloaded	Feed conveyor is running at a higher capacity than bucket elevator	Check conveyor speed. Adjust pit conveyor baffle.
	Head pulley running too slow	Check specifications for elevator. Check pulley arrangement, reducer and motor to determine cause of slow speed.
		Check for belt slippage at head. This is a dangerous condition and must be corrected immediately.
		Drive belts may be slipping.

Troubleshooting

Troubleshooting, General

Problem	Cause	Remedy
Low capacity	Cups not full (as a rule of thumb, product should cover cup bolts)	Check feeding device.
		Improper position of inlet hopper(s). See Page 26.
		Belt speed is too high and/or cup spacing is too close (not allowing material to enter cup).
		Check for obstruction in inlet(s) and/or feed conveyor.
		Inlet opening too small.
		Material may not be free-flowing.
		Product may be building up in cups, reducing individual cup capacity. Check application. Bucket elevators are best suited for fine, free-flowing material.
	Belt speed too slow	Check specification for elevator. Check pulley arrangement, reducer and motor to determine cause of slow speed.
		Check for belt slippage at head. This is a dangerous condition and must be corrected immediately.
		Drive belts may be slipping.
	Inadequate discharge spouting	Check discharge throat under full load. If material fills to throat plate, spout is poorly designed and must be corrected to get full capacity.
	Incorrect cups and/or cup spacing	Replace cups with type, size and spacing per original order.
	Air lock (usually only a problem with light, fluffy material)	Use vented cups.
		Provide venting in distributor, spouting or bin.
	Excessive back legging	Adjust wiper plate in discharge throat.

Troubleshooting, Electrical

Problem	Cause	Remedy
Low capacity	Low voltage in power source	Check voltage at motor input. Voltage in power lines may be low. Consult power company.
Speed too slow	One fuse blown on three phase circuit	Check fuses.
High amperage	Defective motor	Check motor for short or open circuited condition. Repair or replace motor.

Troubleshooting, Buckets & Belting

Problem	Cause	Remedy
Bucket bolts pull through belt or belt tears at bolt hole	Bucket and bolts not kept tight	Periodically check buckets and tighten as required.
	Jammed boot	Clean out boot. See elevator overloaded section.
	Inadequate belt design	Replace belt with proper design. In addition to withstanding proper tension, belt must also have the proper holding power for the bucket projection.
	Improper clearance or obstruction in boot, leg casing or head	Inspect elevator for any obstructions. Check belt tracking. Check casing for proper belt clearance.
	Pulleys too small or incorrect splice.	Install larger head pulley if possible. Check possibility of using thinner belt.
	Lump size or material weight has increased from original design.	Change to heavier belt. Change feed design to handle larger lumps.
Belt cover wearing excessively on pulley side	Material getting between boot pulley and belting (lumps or abrasive material).	Change from steel rim to wing pulley. Change speed to get better discharge.
	Fine, abrasive material between bucket and belt.	Install rubber washers or bucket pad between bucket and belt.
	Cover gauge is too light.	Upgrade belting.
	Cover distortion caused by bucket bolt head.	Upgrade belting.
	Belt slippage	Tighten belt with take-up screws or re-splice belt as required.
Belt carcass breaking	Operating tension too high for existing belt.	Replace belt with proper design.
	Lumps dropping between belt and boot pulley	Change from steel rim to wing pulley.
	Carcass weakened by mildew	Change to mildew-resistant belt.
Damaged buckets	Loose belt tension (bucket lip worn with sharp edges)	Tighten belt with take-up screws or re-splice belt as required.
	Obstruction in elevator (front lip stretched out or broken)	Check for obstructions in elevator. Tighten belt with take-up screws or re-splice belt as required.
	Product sticking to bucket	Switch to urethane resin bucket.
	Belt not tracking properly (buckets are worn or scored on the side).	See Page 59 for detailed instructions on correcting belt tracking.

Troubleshooting

Troubleshooting, Speed Reducer

Problem	Cause	Remedy
Overheating	Under-sized reducer	Check rated capacity of drive.
	Insufficient oil	Check oil level and adjust. Check for leakage.
	Wrong grade of oil	Flush and refill with proper grade of oil. See Pages 72 & 73 for recommendations.
	Inadequate cooling	Check rated capacity of drive. Add cooling fan if required.
	Excessive speed	Check output speed against nameplate rating.
Noise and vibration	Improper installation	Check and tighten all mounting bolts. Inspect for any broken or cracked parts.
	Bearing failure	Replace worn bearings. Check for excessive loads.

Troubleshooting, V-Belt Drive

Problem	Cause	Remedy
Belts slip (shiny pulley grooves)	Not enough tension	Increase tension.
	Overloaded drive	Redesign drive.
Drive squeals	Improper tension	Increase tension.
	Not enough arc of contact	Increase center distance.
Belt turned over	Broken cord caused by prying on pulley	Replace set of belts correctly.
	Misalignment of pulley & shaft	Realign drive.
	Worn pulley grooves	Replace pulleys.
	Excessive belt vibration	Check drive design. Check equipment for solid mounting.
Mismatched belts	New belts installed with old belts	Replace all belts.
	Pulley shafts not parallel (gives appearance of mismatched belts)	Align drive.
Belt breaks	Belt pried over pulleys	Replace set of belts correctly.
	Foreign objects in drive	Replace belt guard.
Belt wears rapidly	Pulley grooves worn	Replace pulleys.
	Pulley diameter too small	Redesign drive – Check for split along pitch line and/or cracking along bottom of belt.
	Belt slips	Increase tension.
	Pulleys misaligned	Align pulleys.

NOTE: Information on this and following pages is from Dodge Torque-Arm II Speed Reducers manual MN1601, dated 02/2022. It can be found at www.dodgeindustrial.com
For speed reducer warranty information, call Dodge Industrial at 864-297-4800.



Torque-Arm® II Speed Reducers Ratios 5, 9, 15, 25, and 40:1 Instruction Manual

TA0107L
TA1107H
TA2115H

TA3203H
TA4207H
TA5215H

TA6307H
TA7315H
TA8407H

TA9415H
TA10507H
TA12608H

These instructions must be read thoroughly before installation or operation. This instruction manual was accurate at the time of printing. Please see dodgeindustrial.com for updated instruction manuals.

WARNING: To ensure the drive is not unexpectedly started, turn off and lock-out or tag power source before proceeding. Failure to observe these precautions could result in bodily injury.

WARNING: All products over 25 kg (55 lbs) are noted on the shipping package. Proper lifting practices are required for these products.

WARNING: Torque-Arm II product exceeding 13.5 kg (30 lbs) should be lifted using lift-assist equipment rated for the weight of the product. Weight values for all Torque-Arm II products are listing in the Gearing Engineering Catalog. Lifting brackets provided on the Torque-Arm II should be used when connecting to the lift-assist equipment.

WARNING: Depending on operating conditions, sound levels for Torque-Arm II products may exceed 70 dB. Protective measures such as hearing protection may be needed when in close proximity to a Torque-Arm II.

INSTALLATION

1. Use lifting bracket to lift reducer.
2. Determine the running positions of the reducer (see Figure 1). Note that the reducer is supplied with six plugs—four around the sides for horizontal installations and one on each face for vertical installations. These plugs must be arranged relative to the running positions as follows:

Horizontal Installations—Install the magnetic drain plug in the hole closest to the bottom of the reducer. Throw away the tape that covers the filter/ventilation plug in shipment and install plug in topmost hole. Of the two remaining plugs on the sides of the reducer, the lowest one is the minimum oil level plug.

Vertical Installations—Install the filter/ventilation plug in the hole provided in the upper face of the reducer housing as installed. If space is restricted on the upper face, install the vent in the highest hole on the side of the reducer per Figure 1. Install a plug in the hole in the bottom face of the reducer. Do not use this hole for the magnetic drain plug. Of the remaining holes on the sides of the reducer, use the plug in the upper housing half for the minimum oil level plug.

This reducer is compatible with the Dodge Smart Sensor that can be installed in the adapter plug labelled "smart sensor." The plug and sensor can be moved to different locations as required by mounting position.

WARNING: Because of the possible danger to person(s) or property from accidents which may result from the improper use of products, it is important that correct procedures be followed. Products must be used in accordance with the engineering information specified in the catalog. Proper installation, maintenance and operation procedures must be observed. The instructions in the instruction manuals must be followed. Inspections should be made as necessary to assure safe operation under prevailing conditions. Proper guards and other suitable safety devices or procedures as may be desirable or as may be specified in safety codes should be provided, and are neither provided by Dodge® nor are the responsibility of Dodge. This unit and its associated equipment must be installed, adjusted and maintained by qualified personnel who are familiar with the construction and operation of all equipment in the system and the potential hazards involved. When risk to persons or property may be involved, a holding device must be an integral part of the driven equipment beyond the speed reducer output shaft.

Dodge Torque Arm II Speed Reducers

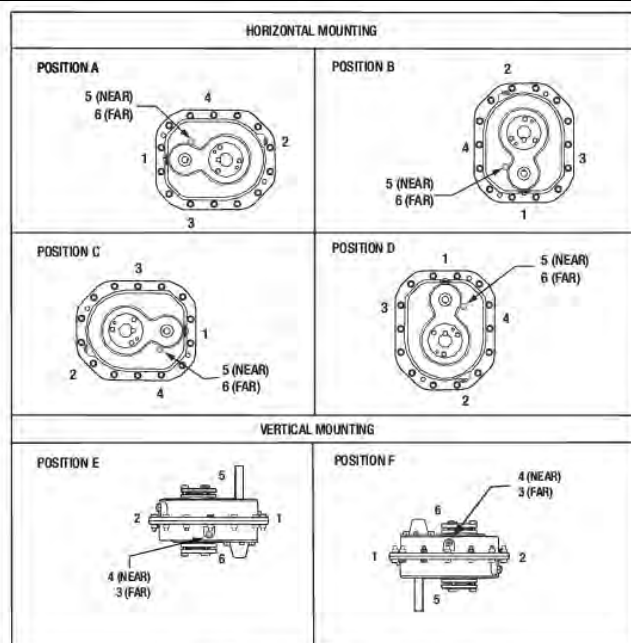


Figure 1 - Mounting Positions

Table 1-Output Speeds

Output Speeds Above 15 RPM						
Mounting Position	Vent and Plug Locations					
	1	2	3	4	5	6
Position A	Level	Plug	Drain	Vent	Plug	Plug
Position B	Drain	Vent	Level	Plug	Plug	Plug
Position C	Plug	Level	Vent	Drain	Plug	Plug
Position D	Vent	Drain	Level	Plug	Plug	Plug
Position E	Level	Plug	Plug	Drain	Vent	Plug
Position F	Plug	Drain	Level	Plug	Plug	Vent

Output Speeds Above 15 RPM and Below*						
Mounting Position	Vent and Plug Locations					
	1	2	3	4	5	6
Position A	Plug	Level	Drain	Vent	Plug	Plug
Position B	Drain	Vent	Plug	Level	Plug	Plug
Position C	Level	Plug	Vent	Drain	Plug	Plug
Position D	Vent	Drain	Level	Plug	Plug	Plug
Position E	Level	Plug	Plug	Drain	Vent	Plug
Position F	Plug	Drain	Level	Plug	Plug	Vent

* Below 15 RPM output speed, oil level must be adjusted to reach the highest oil level plug. If reducer position is to vary from those shown in Figure 1, either more or less oil may be required. Consult Product Support in Simpsonville, SC.

The running position of the reducer in a horizontal application is not limited to the four positions shown in Figure 1. However, if running position is over 20° in position B and D or over 5° in position A and C—either way from sketches—the oil level plug cannot be used safely to check the oil level unless during the checking, the torque arm is disconnected and the reducer is swung to within 5° for position A and C or 20° for position B and D of the positions shown in Figure 1. Because of the many possible positions of the reducer, it may be necessary or desirable to make special adaptations using the lubrication filling holes furnished along with other standard pipe fittings, stand pipes and oil level gauges as required.

If mounting the Torque-Arm II reducer on an inclined angle, consult Product Support for proper oil level.

- Mount reducer on driven shaft as follows:

For Taper Bushed Reducer: Mount reducer on driven shaft per instruction in Torque-Arm II Bushing Installation section of this manual.

- Install sheave on input shaft as close to reducer as practical (Figure 2).
 - If a Dodge Torque-Arm II motor mount is not being used, install motor and V-belt drive so belt will approximately be at right angles to the center line between driven and input shaft (Figure 3).
 - This will permit tightening the V-belt with the torque arm.
 - Install torque arm and adapter plates reusing the reducer bolts. The adapter plates will fit in any position around the input end reducer.
 - Install torque arm fulcrum on a flat and rigid support so that the torque arm will be approximately at right angles to the center line through the driven shaft and the torque arm anchor screw (Figure 4). Make sure that there is sufficient take-up in the turnbuckle for belt tension adjustment when using V-belt drive.
- CAUTION:** Unit is shipped without oil. Add proper amount of recommended lubricant before operating. Failure to observe this precaution could result in damage to or destruction of the equipment.
- Fill gear reducer with recommended lubricant (Table 3).

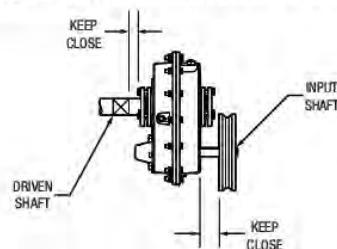


Figure 2 - Reducer and Sheave Installation

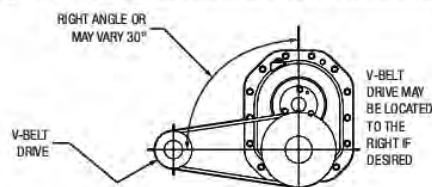


Figure 3 - Angle of V-Drive

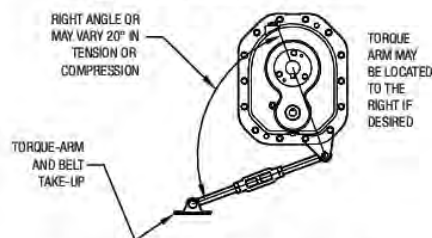


Figure 4 - Angle of Torque-Arm

TORQUE-ARM II BUSHING INSTALLATION

WARNING: To ensure that drive is not unexpectedly started, turn off and lock out or tag power source before proceeding. Remove all external loads from drive before removing or servicing drive or accessories. Failure to observe these precautions could result in bodily injury.

The Torque-Arm II reducer is designed to fit both standard and short length driven shafts. The Standard Taper Bushings series is designed where shaft length is not a concern. The Short Shaft Bushing series is to be used where the driven shaft does not extend through the reducer.

Dodge Torque Arm II Speed Reducers

Standard Taper Bushings

1. One bushing assembly is required to mount the reducer on the driven shaft. An assembly consists of two tapered bushings, bushing screws and washers, two bushing backup plates and retaining rings, and necessary shaft key or keys. The driven shaft must extend through the full length of the reducer. If the driven shaft does not extend through the reducer do not use the standard tapered bushings; instead use the short shaft bushings as described in the Short Shaft Bushings section that follows. The minimum shaft length, as measured from the end of the shaft to the outer edge of the bushing flange (Figure 6), is given in Table 1.
2. Install one bushing backup plate on the end of the hub and secure with the supplied retaining ring. Repeat procedure for other side.
3. Place one bushing, flange end first, onto the driven shaft and position per dimension A as shown in Table 2. This will allow the bolts to be threaded into the bushing for future bushing and reducer removal.
4. Insert the output key in the shaft and bushing. For easy of installation, rotate the driven shaft so that the shaft keyseat is at the top position.

NOTE: In most cases the keys that are supplied with the bushing kit are NOT square keys and the orientation of the key is important. Install the key so that it fits snugly in the width of the keyseat. The keys are marked with a part number and some keys are also etched with "THIS SIDE UP"—these markings should be showing on the top of the key when it is installed in the shaft keyseat. See Figure 5 below.

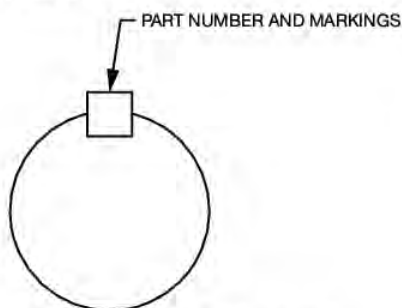


Figure 5 - Key Marking

5. Mount the reducer on the driven shaft and align the shaft key with the reducer hub keyway. Maintain the recommended minimum distance A from the shaft bearing.
6. Insert the screws, with washers installed, in the unthreaded holes in the bushing flange and align with the threaded holes in the bushing backup plate. If necessary, rotate the bushing backup plate to align with the bushing screws. Tighten the screws lightly. If the reducer must be positioned closer than dimension A, place the screws with washers installed in the unthreaded holes in the bushing before positioning reducer making sure to maintain at least $\frac{1}{4}$ " between the screw heads and the bearing.
7. Place the second tapered bushing in position on the shaft and align the bushing keyway with the shaft key. Align the unthreaded holes in the bushing with the threaded holes in the bushing backup plate. If necessary, rotate the bushing backup plate to align with the bushing holes. Insert bushing screws, with washers installed in the unthreaded holes in the bushing. Tighten screws lightly.
8. Alternately and evenly tighten the screws in the bushing nearest the equipment to the recommended torque given in Table 2. Repeat procedure on outer bushing.

Short Shaft Bushings

1. One bushing assembly is required to mount the reducer on the driven shaft. An assembly consists of one long tapered bushing, one short tapered bushing, one tapered bushing wedge, bushing screws and washers, two bushing backup plates and retaining rings, and necessary shaft key or keys. The driven shaft does not need to extend through the reducer for the short shaft bushing to operate properly. The minimum shaft length, as measured from the end of the shaft to the outer edge of the bushing flange (see Figure 6), is given in Table 1.

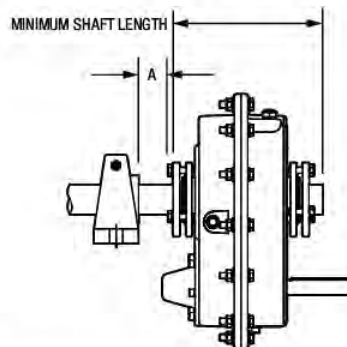


Figure 6 - Minimum Recommended Dimensions

Table 2—Minimum Mounting Dimensions and Bolt Torques

Minimum Required Shaft Length			
Reducer Size	Standard Taper Bushing (in)	Short Shaft Bushing (in)	
TA0107L	6.83	4.32	
TA0107L	6.83	4.32	
TA1107H	6.95	4.43	
TA2115H	7.80	4.80	
TA3203H	8.55	5.46	
TA4207H	8.94	5.66	
TA5215H	10.33	6.35	
TA6307H	10.82	6.72	
TA7315H	11.87	7.62	
TA8407H	12.82	8.10	
TA9415H	13.74	8.56	
TA10507H	15.46	9.67	
TA12608H	18.32	11.60	
Bushing Screw Information and Minimum Clearance for Removal			
Reducer Size	Fastener Size	Torque (lb-ft)	A (in)
TA0107L	5/16-18	20-17	1.08
TA1107H	5/16-18	20-17	1.20
TA2115H	3/8-16	20-17	1.20
TA3203H	3/8-16	20-17	1.20
TA4207H	3/8-16	26-23	1.48
TA5215H	1/2-13	77-67	1.81
TA6307H	1/2-13	77-67	1.81
TA7315H	1/2-13	77-67	2.06
TA8407H	1/2-13	77-67	2.06
TA9415H	5/8-11	86-75	2.39
TA10507H	5/8-11	86-75	2.39
TA12608H	5/8-11	86-75	2.39

- The long bushing is designed to be installed from the side of the reducer opposite the driven equipment as shown in Figure 7. The long bushing, when properly installed, is designed to capture the end of the customer shaft that does not extend through the reducer. Normally the reducer would be mounted such that the input shaft extends from the side of the reducer opposite the driven equipment however the reducer design allows installation of the reducer to be mounted in the opposite direction.
- Install the tapered bushing wedge into the hollow bore of the reducer from the same side as the long bushing will be installed. When installing the tapered bushing wedge into the reducer hub, install the flange end first so that the thin taper is pointing outwards towards the long bushing as shown in Figure 7. The wedge is properly installed when it snaps into place in the reducer hub.

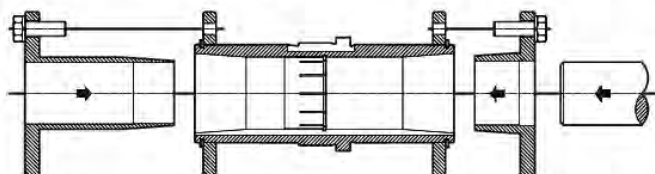


Figure 7 - Short Shaft Bushing and Output Hub Assembly

- Align the tapered bushing wedge keyway with the reducer hub keyway. The keyway in the wedge is slightly wider than the keyway in the reducer hub allowing for easier installation.
- Install one bushing backup plate on the end of the hub and secure with the supplied retaining ring. Repeat procedure for other side.
- Install the short bushing, flange first, on the driven shaft and position per dimension A as shown in Table 3. This will allow the bolts to be threaded into the bushing for future bushing and reducer removal.
- Insert the output key in the shaft and bushing. For easy of installation, rotate the driven shaft so that the shaft keyseat is at the top position.

NOTE: In most cases the keys that are supplied with the bushing kit are NOT square keys and the orientation of the key is important. Install the key so that it fits snugly in the width of the keyseat. The keys are marked with a part number and some keys are also etched with "THIS SIDE UP"—these markings should be showing on the top of the key when it is installed in the shaft keyseat. See Figure 8 below.

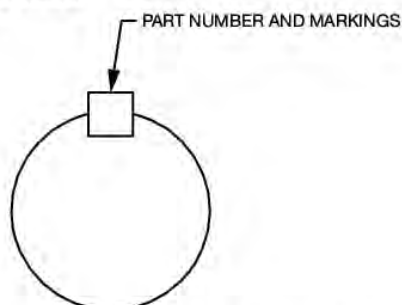


Figure 8 - Key Marking

- Mount the reducer on the driven shaft and align the shaft key with the reducer hub keyway. Maintain the recommended minimum distance A from the shaft bearing.
- Insert the screws, with washers installed, in the unthreaded holes in the bushing flange and align with the threaded holes in the bushing backup plate. If necessary, rotate the bushing backup plate to align with the bushing screws. Tighten the screws lightly. If the reducer must be positioned closer than dimension A, place the screws with washers installed in the unthreaded holes in the bushing before positioning reducer making sure to maintain at least $\frac{1}{4}$ " between the screw heads and the bearing.
- Place the long bushing in position on the shaft and align the bushing keyway with the shaft key. Use care to locate the long bushing with the tapered bushing wedge installed earlier. Align the unthreaded holes in the bushing with the threaded holes in the bushing backup plate. If necessary, rotate the bushing backup plate to align with the bushing holes. Insert bushing screws, with washers installed in the unthreaded holes in the bushing. Tighten screws lightly.
- Alternately and evenly tighten the screws in the bushing nearest the equipment to the recommended torque given in Table 1. Repeat procedure on outer bushing.

BUSHING REMOVAL FOR STANDARD TAPER OR SHORT SHAFT BUSHINGS

- Remove bushing screws.
- Place the screws in the threaded holes provided in the bushing flanges. Tighten the screws alternately and evenly until the bushings are free on the shaft. For ease of tightening screws make sure screw threads and threaded holes in the bushing flanges are clean. If the reducer was positioned closer than the recommended minimum distance "A" as shown in Table 2, loosen the inboard bushing screws until they are clear of the bushing flange by $\frac{1}{8}$ ". Locate two (2) wedges at 180 degrees between the bushing flange and the bushing backup plate. Drive the wedges alternately and evenly until the bushing is free on the shaft.
- Remove the outside bushing, the reducer, and then the inboard bushing.

LUBRICATION

NOTE: Because reducer is shipped without oil, it is necessary to add the proper amount of oil before operating reducer. Use a high-grade petroleum base rust and oxidation inhibited (R&O) gear oil (Tables 3 and 4). Follow instructions on reducer warning tags, and in the installation manual.

For average industrial operating conditions, the lubricant should be changed every 2500 hours of operation or every 6 months, whichever occurs first. Drain reducer and flush with kerosene, clean magnetic drain plug and refill to proper level with new lubricant.

CAUTION: Too much oil will cause overheating and too little will result in gear failure. Check oil level regularly. Failure to observe this precaution could result in bodily injury.

Under extreme operating conditions, such as rapid rise and fall of temperature, dust, dirt, chemical particles, chemical fumes, or oil sump temperatures above 200°F, the oil should be changed every one to three months, depending on severity of conditions.

Dodge Torque Arm II Speed Reducers

Table 3—Oil Volumes

Approximate Reducer Size		Volume of Oil to Fill Reducer to Oil Level Plug ^{① ④}											
		② Position A		② Position B		② Position C		② Position D		② Position E		② Position F	
		③ Quart	Liter	③ Quart	Liter	③ Quart	Liter	③ Quart	Liter	③ Quart	Liter	③ Quart	Liter
TA0107L	Single	0.7	0.6	0.5	0.5	0.7	0.6	1.4	1.3	1.3	1.2	1.5	1.4
	Double	0.7	0.6	0.5	0.5	0.6	0.6	1.3	1.3	1.2	1.2	1.4	1.3
TA1107H	Single	1.3	1.3	0.7	0.7	0.7	0.6	1.7	1.6	1.5	1.4	1.9	1.8
	Double	1.3	1.3	0.7	0.7	0.6	0.6	1.7	1.6	1.5	1.4	1.9	1.8
TA2115H	Single	2.1	2.0	1.2	1.2	1.1	1.0	2.7	2.5	2.3	2.2	3.1	2.8
	Double	2.1	2.0	1.1	1.1	1.0	1.0	2.6	2.5	2.4	2.3	3.0	2.9
TA3203H	Single	2.8	2.7	1.6	1.6	1.8	1.7	4.1	3.9	3.3	3.1	4.4	4.2
	Double	2.8	2.7	1.5	1.4	1.7	1.6	4.0	3.8	3.4	3.3	4.2	4.0
TA4207H	Single	4.4	4.2	2.6	2.5	2.9	2.8	7.4	7.0	6.3	6.0	7.8	7.3
	Double	4.4	4.2	2.5	2.4	2.8	2.6	7.3	6.9	6.4	6.0	7.5	7.1
TA5215H	Single	7.4	7.0	4.9	4.7	5.8	5.5	13.2	12.5	11.6	11.0	13.1	12.4
	Double	7.4	7.0	4.7	4.4	5.5	5.2	12.9	12.2	11.4	10.8	12.6	11.9
TA6307H	Single	8.8	8.4	5.8	5.5	6.6	6.2	16.1	15.3	13.2	12.5	16.1	15.3
	Double	8.8	8.4	5.5	5.2	6.2	5.9	15.8	15.0	13.9	13.1	15.3	14.5
TA7315H	Single	8.4	8.0	11.8	11.1	13.9	13.2	22.5	21.3	22.1	20.9	25.1	23.7
	Double	8.4	8.0	10.8	10.3	13.2	12.5	22.0	20.9	22.4	21.2	23.1	21.8
TA8407H	Single	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Double	7.7	7.3	11.7	11.1	13.7	12.9	25.1	23.8	24.0	22.7	25.8	24.4
TA9415H	Single	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Double	17.0	16.1	16.8	15.9	18.1	17.1	33.2	31.4	33.2	31.4	38.6	36.5
TA10507H	Single	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Double	38.0	36.0	27.6	26.1	25.8	24.4	53.5	50.6	53.8	50.9	56.1	53.0
TA12608H	Single	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Double	53.0	50.2	41.5	39.3	37.1	35.1	70.7	66.9	72.2	68.3	80.4	76.1

① Oil quantity is approximate. Service with lubricant until oil runs out of oil level hole.

② Refer to Figure 1 for mounting positions.

③ US measure: 1 quart = 32 fluid ounces = .94646 liters.

④ Below 15 RPM output speed, oil level must be adjusted to reach the highest oil level plug. If reducer position is to vary from those shown in Figure 1, either more or less oil may be required. Consult Product Support in Simpsonville, SC.

⑤ Reducers with a 5:1 ratio are single-reduction. All other ratios are double-reduction.

Dodge Torque Arm II Speed Reducers

Table 4—Oil Recommendations

Output RPM	ISO Grades For Ambient Temperatures of 50°F to 125°F * (10°C to 51°C)											
	Torque-Arm II Reducer Size											
	TA0107L	TA1107H	TA2115H	TA3203H	TA4207H	TA5215H	TA6307H	TA7315H	TA8407H	TA9415H	TA10507H	TA12608H
301–400	320	320	320	220	220	220	220	220	220	220	220	220
201–300	320	320	320	220	220	220	220	220	220	220	220	220
151–200	320	320	320	220	220	220	220	220	220	220	220	220
126–150	320	320	320	220	220	220	220	220	220	220	220	220
101–125	320	320	320	320	220	220	220	220	220	220	220	220
81–100	320	320	320	320	320	220	220	220	220	220	220	220
41–80	320	320	320	320	320	220	220	220	220	220	220	220
11–40	320	320	320	320	320	320	320	320	320	320	220	220
1–10	320	320	320	320	320	320	320	320	320	320	320	320

Output RPM	ISO Grades For Ambient Temperatures of 15°F to 60°F * (-9.4°C to 15°C)											
	Torque-Arm II Reducer Size											
	TA0107L	TA1107H	TA2115H	TA3203H	TA4207H	TA5215H	TA6307H	TA7315H	TA8407H	TA9415H	TA10507H	TA12608H
301–400	220	220	220	150	150	150	150	150	150	150	150	150
201–300	220	220	220	150	150	150	150	150	150	150	150	150
151–200	220	220	220	150	150	150	150	150	150	150	150	150
126–150	220	220	220	150	150	150	150	150	150	150	150	150
101–125	220	220	220	220	150	150	150	150	150	150	150	150
81–100	220	220	220	220	220	150	150	150	150	150	150	150
41–80	220	220	220	220	220	150	150	150	150	150	150	150
11–40	220	220	220	220	220	220	220	220	220	220	150	150
1–10	220	220	220	220	220	220	220	220	220	220	220	220

Notes:

1. Assumes auxiliary cooling where recommended in the catalog.
2. Pour point of lubricant selected should be at least 10°F lower than expected minimum ambient starting temperature.
3. Extreme pressure (EP) lubricants are not necessary for average operating conditions. When properly selected for specific applications, Torque-Arm II backstops are suitable for use with EP lubricants.
4. Special lubricants may be required for food and drug industry applications where contact with the product being manufactured may occur. Consult a lubrication manufacturer's representative for his recommendations.
5. For reducers operating in ambient temperatures between -22°F (-30°C) and 20°F (-6.6°C) use a synthetic hydrocarbon lubricant, 100 ISO grade or AGMA 3 grade (for example, Mobil SHC627). Above 125°F (51°C), consult Product Support, Simpsonville, SC for lubrication recommendation.
6. Mobil SHC630 Series oil is recommended for high ambient temperatures.

GUIDELINES FOR TORQUE-ARM II REDUCER LONG-TERM STORAGE

During periods of long storage or when waiting for delivery or installation of other equipment, special care should be taken to protect a gear reducer to have it ready to be in the best condition when placed into service.

By taking special precautions, problems such as seal leakage and reducer failure due to lack of lubrication, improper lubrication quantity, or contamination can be avoided. The following precautions will protect gear reducers during periods of extended storage.

Preparation

1. Drain oil from the unit. Add a vapor phase corrosion inhibiting oil (VCI-105 oil by Daubert Chemical Co.) in accordance with Table 5.
2. Seal the unit airtight. Replace the vent plug with a standard pipe plug and wire the vent to the unit.
3. Cover all unpainted exterior parts with a waxy rust preventative compound that will keep oxygen away from the bare metal. (Non-Rust X-110 by Daubert Chemical Co. or equivalent).
4. The instruction manuals and lubrication tags are paper and must be kept dry. Either remove these documents and store them inside, or cover the unit with a durable waterproof cover which can keep moisture away.
5. Protect reducer from dust, moisture, and other contaminants by storing the unit in a dry area.
6. In damp environments, the reducer should be packed inside

a moisture-proof container or an envelope of polyethylene containing a desiccant material. If the reducer is to be stored outdoors, cover the entire exterior with a rust preventative.

When Placing the Reducer into Service

1. Fill the unit to the proper oil level using a recommended lubricant. The VCI oil will not affect the new lubricant.
2. Clean the shaft extensions with petroleum solvents.
3. Assemble the vent plug into the proper hole.

Follow the installation instructions provided in this manual.

Table 5—Quantities of VCI #105 Oil

Reducer Size	Quantity (Ounces / Milliliter)
TA0107L	1 / 30
TA1107H	1 / 30
TA2115H	1 / 30
TA3203H	1 / 30
TA4207H	1 / 30
TA5215H	2 / 59
TA6307H	2 / 59
TA7315H	3 / 89
TA8407H	3 / 89
TA9415H	4 / 118
TA10507H	6 / 177
TA12608H	8 / 237

VCI #105 and #10 are interchangeable.
VCI #105 is more readily available.

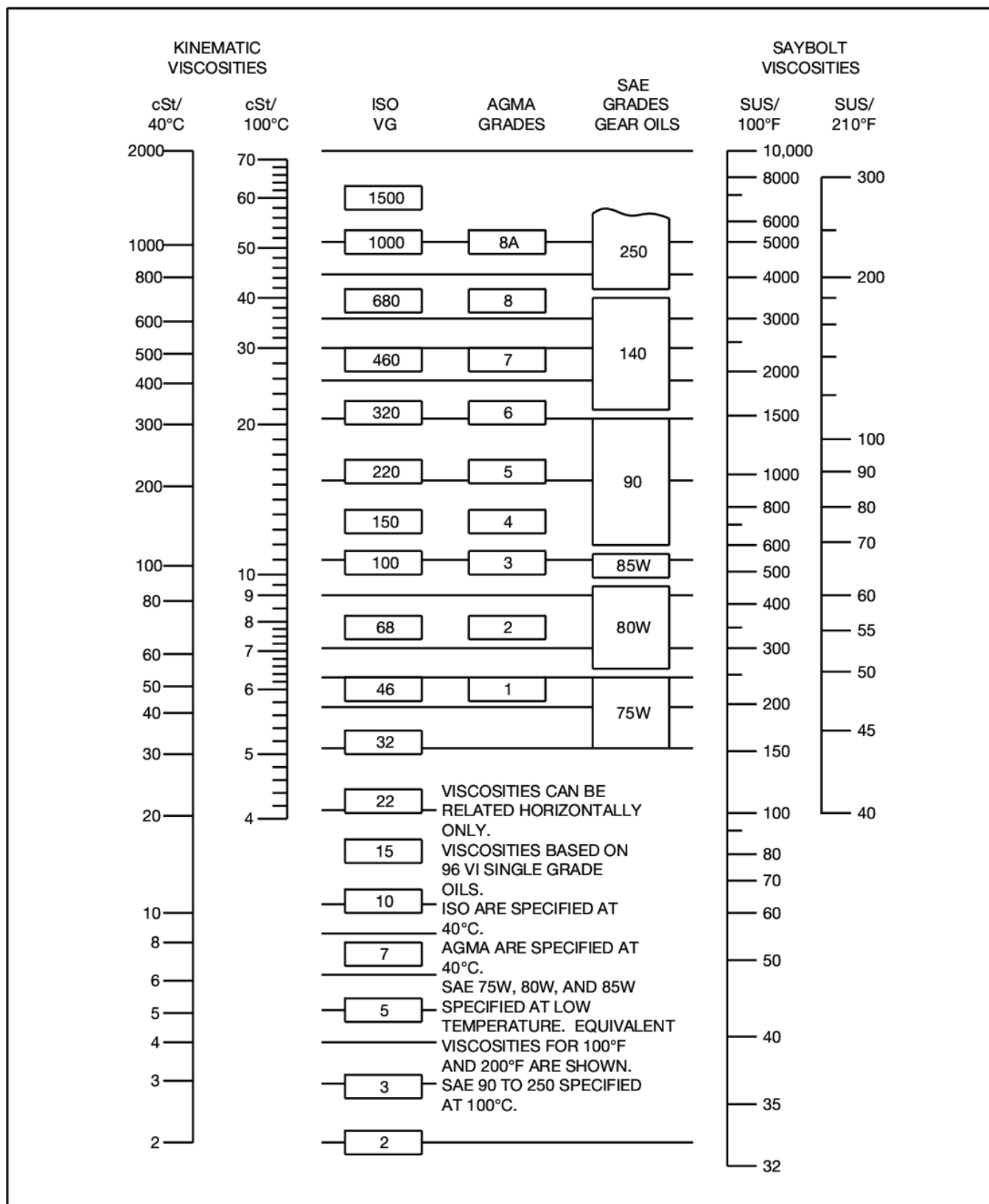


Figure 9 - Oil Viscosity Equivalency Chart

Contact Information

Contact Information

Owner's manuals are available from Sukup and additional copies can be requested at the address, phone number, or e-mail address shown below. Please indicate manual number L2500 when requesting the Bucket Elevator Assembly and Owner's Manual.

Sukup Dealer Information

Dealer name:	_____
Address:	_____
Cell phone:	_____
Office phone:	_____
Fax:	_____

Emergencies – Know What to Do

Have emergency numbers and written directions to work site readily available in case of emergency. A place for emergency phone numbers to be recorded has been provided below.

Ambulance • Fire • Police: 9-1-1
Bin rescue team: _____
Emergency medical squad: _____
Address of work site: _____
Directions to work site: _____



Sukup Manufacturing Co.

1555 255th Street, Box 677

Sheffield, Iowa, USA 50475-0677

Phone: 641-892-4222

Fax: 641-892-4629

Website: www.sukup.com

Email: info@sukup.com