Replaceable Lagging
Instruction Manual

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: Conveyors should not be cleaned during operation. It is extremely dangerous to be near the nip point when the pulley is in operation.

WARNING: Conveyors should not be operated without the necessary protective guards.

WARNING: Hands and feet should never come in contact with any conveyor component while the conveyor is in operation. Poking at or prodding material on the belt or any component is prohibited. Any work on conveyors or components must occur only with the equipment unloaded and stopped with the electrical equipment 'locked out'.

WARNING: Do not rely on backstop or brakes to prevent a loaded conveyor to rotate or move while stopped. Treat a stopped conveyor with load as a conveyor in motion.

CAUTION: Always observe the basic rules of safety when working around any conveyor or mechanical systems. Training and familiarity of the equipment is essential for safe operation. Read all manufacturer's manuals before working on any mechanical component.

PURPOSE

This procedure provides general direction and guidelines for the selection and installation of replaceable lagging.

PRE-INSTALLATION INSTRUCTIONS

1. Measure the actual pulley diameter prior to installation. Use Table 1 or use the following formulas to determine the number of pad rows needed. Round up the final number if the result is a fraction. (All dimensions are in inches.)

   a. Number of pad rows = $\frac{\text{Pulley Diameter}}{2}$

   b. Number of pads = $\frac{(\text{Number of rows} * \text{Face width}) + 6}{72}$

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.

2. The number of double retainers needed is the same as the number of pad rows.
3. The number of single retainers needed is one fourth (1/4) of the number of pad rows. Round up the final number if the result is a fraction.
4. Standard replaceable lagging is provided to fit standard pulley diameters up to 72", such as 10", 16", and 24". The number of pad rows needed is determined by dividing the pulley diameter by two. If the diameter is within 1/4" of an even number, the number of pad rows required can be rounded to the nearest even number. If a pulley diameter is metric or an odd number diameter, reference the section on Non-Standard Installation.
5. With center crowned pulleys, it is recommended to have a minimum of two pieces per pad row that meets at the center of the pulley face, in order to maintain the crown. One piece installations are not guaranteed to "track" the belt. Edge crowned pulleys will need a minimum of three pieces per pad row. The splits are to correspond with the sections in the pulley profile to maintain the crown. The minimum pad length that can be used is 4" long. The maximum number of pieces per pad row should never exceed four.
6. Determine how the pads will be fastened to the pulley. There are three options:
   a. Tack weld
   b. Bent retainer
   c. Slot lock

   For bolted retainers, reference the section on Retainer Bolting. If you choose Option A, the retainers can be cut to the same length as the pulley. However, if you choose Option B, you will need to allow the retainer to be one inch longer than the pulley face. Option B requires a full width tab at both ends and may require two pieces per retainer row.
7. Clean the pulley, removing rust and any imperfections before installing and welding.

Table 1 - Number of Pad Rows

OD	Number of Rows	Face Width (inches)														
		12	14	16	18	20	26	32	38	44	51	54	60	66	72	78
6	3	1	1	1	1	1	2	2	2	2	3	3	3	3	3	4
8	4	1	1	1	1	2	2	2	3	3	3	3	4	4	4	5
10	5	1	1	2	2	2	2	3	3	4	4	4	5	5	5	6
12	6	1	2	2	2	2	3	3	4	4	5	5	5	6	6	7
14	7	2	2	2	2	2	3	4	4	5	5	6	6	7	7	8
16	8	2	2	2	2	3	3	4	5	5	6	6	7	8	8	9
18	9	2	2	2	3	3	4	4	5	6	7	7	8	9	9	10
20	10	2	2	3	3	3	4	5	6	7	8	8	9	10	10	11
24	12	2	3	3	3	4	5	6	7	8	9	9	10	11	12	14
30	15	3	3	4	4	5	6	7	8	10	11	12	13	14	15	17
36	18	3	4	4	5	5	7	8	10	11	13	14	15	17	18	20
42	21	4	5	5	6	6	8	10	12	13	15	16	18	20	21	23
48	24	4	5	6	6	7	9	11	13	15	17	18	20	22	24	27
54	27	5	6	6	7	8	10	12	15	17	20	21	23	25	27	30
60	30	5	6	7	8	9	11	14	16	19	22	23	25	28	30	33
72	36	6	7	8	9	10	13	16	19	22	26	27	30	33	36	40

STANDARD INSTALLATION

1. Align the first double retainer across the pulley face while making it perpendicular to the edge of the pulley face. Once clamped in place, insert a lagging pad into the retainer and verify that the retainer is positioned correctly.
2. Remove the lagging pad and plug weld the double retainer into the pulley face through a minimum of three pre-punched holes using the procedures shown in Welding Procedures. If using Option B, the retainer should extend beyond the end of the pulley by one-half inch so that it can be hammered over to hold it in place (See Figure 2).

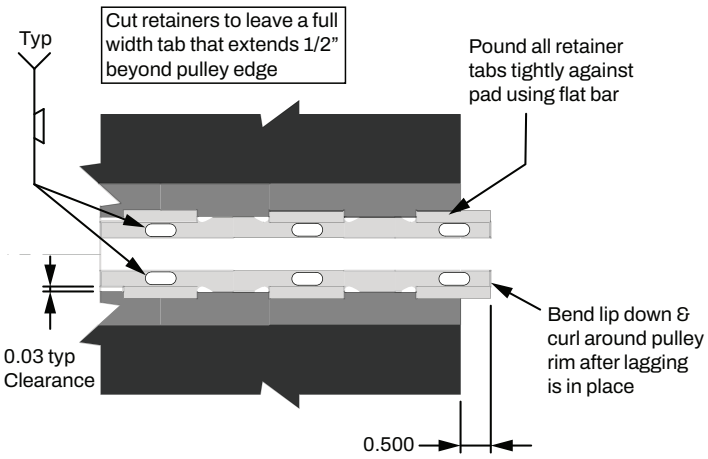

Figure 2 - Retainer for bent retainer method

3. Insert a pad into the retainer slots. Clamp down the pad while ensuring a 1/32" clearance referencing Figure 3. Place a new retainer on the opposite side from the first retainer. Secure the new retainer by plug welding through a minimum of 3 holes.

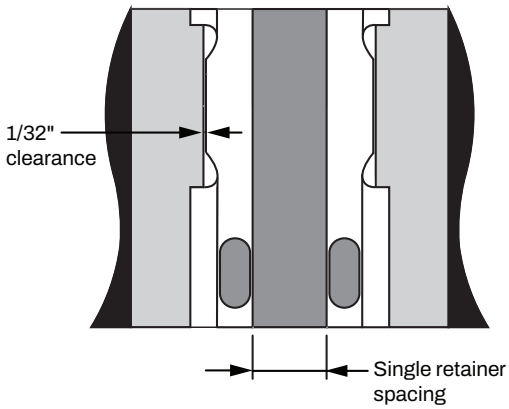

Figure 3 - Pad clearance

4. Repeat the above installation sequence until all pads except the last two are in place.
5. Place the two single retainers back-to-back in the gap between the first and last pads referencing Figure 3. Repeat Step 3. The space between the single retainers will vary slightly according to the actual pulley diameter. However, the gap should not exceed the limits found in the pre-installation instructions. Otherwise, non-standard installation is required.
6. Complete plug welding all of the remaining holes following the procedures shown in Welding Procedures.
7. Using a hammer and an appropriate bar or punch, bend the retainer lips down tight against the pad backing plates.
8. There are several ways of locking the pads in place to prevent them from moving during operation:
   a. **Tack weld** both ends of each pad row on the edge of the rim, this will allow for easy grinding of the weld for pad replacement later. Replacement pads should also be tacked in place at the edge of the rim after installation.
   b. **Bent retainer** method, requires the bending of the retainer lip down and curling around the pulley rim.
   c. **Slot-Lock** can be cut in the pad backing plate prior to installation to fit in the slots using slot-lock method with the retainers, if desired.

NON-STANDARD INSTALLATION

Non-standard installation procedures are used in the following scenarios:

d. Magnetic pulleys
e. Pulleys with odd diameters such as 16 7/8", 29", etc.
f. Pulleys that are larger or smaller by more than 1/4" from a "standard" even number diameter. These procedures will establish the number of pad rows to be used as well as the quantities of double and single retainers required and the sequence to be used for their installation.

Non-standard installation will require substituting additional single retainers in place of some of the double retainers that would normally be used.

This procedure provides the proper coverage for the types of pulleys described above. The calculations and procedures that are used allow this substitution to be done logically to achieve a balanced installation.

1. Enter the pulley diameter and face width in blanks A and B in the worksheet shown in Table 2. Check the actual pulley diameter to be certain that non-standard installation is necessary.
2. Divide the pulley diameter (OD) by 2 and round down to the nearest whole number and enter this on line C. This is the number of pad rows needed.
3. Multiply C by the face width B. This is the number of inches of pads needed. Enter the result on line D.
4. Divide the OD by 24. Then add 0.8 for OD less than 20" or 1.5 for OD equal to or greater than 20". Round down to the nearest whole number. Subtract this number from C. Enter the result on line E.
5. If you have a whole number diameter, in Step 2 or are within 1/4" of a whole number, you do not need the correction in line F and can enter the result E on line G and skip to Step 8.
6. Subtract 2*C from the OD of the pulley. Then multiply the result by 3.14. Round down to the nearest whole number. Compare this result to E, it should not be bigger than E. Enter the smaller of your result or E on line F.
7. Subtract F from C. This is the corrected (for non-whole number diameters) number of double retainers needed. Enter this result on line G.
8. Subtract the number of double retainers (G) from the number of pad rows (C). This is the number of pairs of single retainer rows needed.
9. Calculate the spacing between the pairs of single retainers. Take the OD and subtract twice the number of pad rows. Multiply this by 3.14 and divide by H (the number of pairs of single retainers). Round to the 1/16 of an inch.
10. Calculate the total inches of double retainers by multiplying G times B.
11. Calculate the total number of double retainers by dividing J by 72 and rounding up.
12. Calculate the total inches of single retainers by multiplying H times B and multiply by 2.
13. Calculate the total number of single retainers by dividing L by 72 and rounding up.
14. Fill in the information in Table 3. This chart is the guide to the proper sequence for installing the double retainers and single retainers. Using the number of single retainers from Step 5, fill in the blanks at the proper points in column 3 to indicate where the single retainers should go. Space them as equally as possible around the pulley circumference. The balance of the retainers will be doubles, and the chart should be filled in accordingly.

WELDING PROCEDURES

1. MIG and TIG welding may be used for attaching replaceable lagging.
2. If welding with a rod, use 3/32" diameter AWS E7018 to limit heat build-up and burn through. A welding rod meeting AWS E309 should be used to weld stainless steel pads or retainers to steel pulleys.
3. Use a welding rod meeting AWS A5.15 for attaching pads or retainers to cast iron pulleys.

   NOTE: Other standard cast iron welding procedures and cautions may also be necessary.

4. Always ensure good contact between the pad backing plate or retainer and the pulley surface at the weld by applying downward pressure during welding.
5. Avoid excessive heat transfer to the rubber portion of the pad by:
   a. Plug welding only one half of a retainer hole at a time, skipping from hole to hole and retainer to retainer until all welding is completed.
   b. Use a length of angle iron to cover the rubber in the welding area.
   c. Using a brass heat sink bar or a wet rag to cool the metal.

   In all cases, heat must be controlled to prevent damage to the rubber and the rubber-to-metal bond.
6. A good maintenance program will include periodic inspection of all welds to ensure that any damaged welds are promptly repaired.

RETAINER BOLTING

Lagging applications where welding is not appropriate are candidates for bolting retainers in place.

Note: Extra attention is needed to prevent the bolts from working loose. Regular inspection of the pads will prevent belt damage caused by loose bolts.

1. Use 3/8-16", hex head cap screws, Grade 5, finished 15/64" high head where the inside of the pulley and the bolt threads are accessible, plus self-locking nut. If the bolt threads are inaccessible, use 3/8-16, hex head, Grade 5 or better self-tapping or roll formed bolts (1/4" minimum rim thickness required). Be sure that sufficient thread engagement is provided and use some means of locking the bolts (self-locking threads, thread locking patches, etc.).

TROUBLESHOOTING AND MAINTENANCE

Occasionally, a combination of belt speed, belt construction and system design will cause belt vibration as it passes over the pads.

In these rare occurrences, it is possible to eliminate the vibration by installing pads that are one-half the pulley face width in off-set rows on each half of the pulley. The best option is to install without retainers.

Inspect pads and retainers periodically for wear and damage. The lagging pads should be replaced before they reach the thickness of the retainers. Damaged retainers should be replaced immediately.

After being in service for a number of years, replaceable pads may become more difficult to remove due to corrosion. If this occurs, drive a flat bar between the pulley rim and the backing plate from the end to break the pad free of the retainers. Clean the pulley, install the new lagging pads, and pound the retainer lips down again. Inspect the retainers and replace any that may be damaged.

Table 2 - Installation Worksheets		
Non-Standard Installation Worksheet (Pads & Retainers)		
Pulley Diameter	OD	A_____in
Face Width	FW	B_____in
Number of Pad Rows	= INT (OD ÷ 2)	C_____Pad Rows
Total Linear Inches of Pads Needed	= C x FW	D_____in
Number of Rows of Double Retainers	= C - INT (OD ÷ 24 + X)	E_____Rows Double (uncorrected)
Where X = 0.9 for OD less than 20" X = 1.5 for OD equal to or greater than 20"		
Correction (Doubles) for odd diameters	= INT (3.14 x (OD -2 x C)	F_____Correction (< = E)
Corrected Number of Rows of Double Retainers	= E - F	G_____Rows Double (> = 0)
Number of Pairs (Rows) of Single Retainers	= C - G	H_____Pair (Rows) Single
Single Retainer Spacing	= 3.14 x (OD - 2 x C) ÷	I_____(Round Down to 1/6")
Total Linear Inches of Double Retainers Needed	= G x B	J_____in
Number of Double Retainers	= J ÷ 72 (round up)	K_____
Total Linear Inches of Single Retainers Needed	= 2 x H x B	L_____
Number of Single Retainers	= L ÷ 72 (round up)	M_____

Non-Standard Installation Worksheet (Without Retainers)		
Pulley Diameter		A_____ in
Face Width		B_____in
Number of Pad Rows		C_____Pad Rows
Total Linear Inches of Pads Needed		D_____in
Circumference of pulley		E_____
Circumference covered by pads		F_____
Exposed Circumference		G_____
Spacing between pads		H_____
Spacing between pads		H_____

Table 3 - Retainer Installation Sequence		
Retainer Location Number	**Type of Retainer Used**	
	Double	**2 Singles**
1		
2		
3		
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