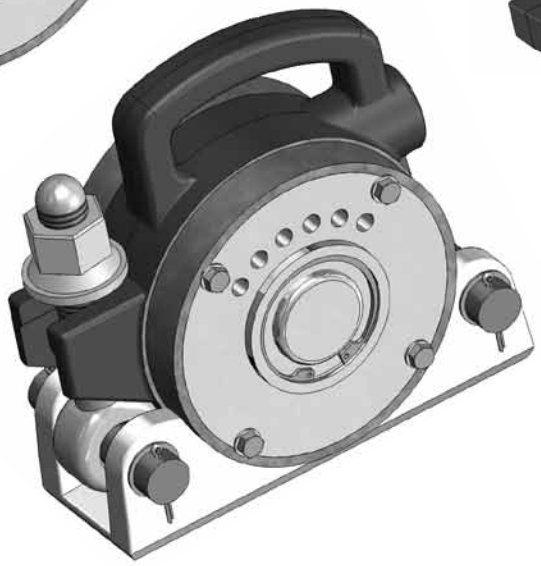
Turboviber®

Operating Instructions

Global® Pneumatic TCL Turbine Vibrators

Models

TCL-2500
TCL-4000
TCL-6000



TCL Vibrators are designed for use with Universal Cradle Lug Brackets.

Global® VIBRATORS Viber® VIBRATORS Global® AIR BLASTERS

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I. Introduction

You have purchased a TCL-2500, TCL-4000, or TCL-6000 Turboviber® high-speed turbine vibrator that uses patented Silver Sonic Turbine® technology available only on products manufactured by Global Manufacturing, Inc.®. This technology makes these vibrators the most efficient and lightweight pneumatic rotary vibrators available today. They are excellent replacements for roller style high frequency pneumatic vibrators frequently used on forms for pre-cast concrete products. While the TCL model Turboviber® vibrators fit the standard cradle lug brackets commonly used on concrete forms, they are up to 30% lighter, produce up to 35% more vibrations per minute, and consume 20-30% less air than comparable roller vibrators. They can operate on as little as 10 psi and can easily handle dirty, non-lubricated air that will stop a roller vibrator in a matter of days.

For optimum performance, cycle the vibrator on and off. The vibrator acts as a friction reducer and once the bulk solid is set into motion, gravity should do the rest. Do not operate the vibrator on an empty hopper as this may cause structural damage to the hopper.

Vibrators should be operated only when discharge gates are open. Operating the vibrator with the discharge gate closed will cause the material inside the structure to compact.

Vibration has two important elements – Frequency and Amplitude. Frequency is the speed (RPM) or the number of vibrations per minute. It is controlled by the air flow to a pneumatic vibrator. Amplitude is the unbalance or amount of force produced by the eccentric weight. The faster the eccentric weights turn the more force output generated. Force and frequency work together. It is not necessary to use a lot of force when you have the proper frequency.

⚠ SAFETY PRECAUTIONS

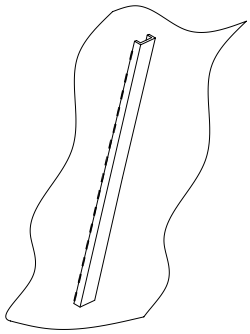
- Follow all mounting instructions.
- Always use a safety cable or chain for support.
- Do not operate vibrators when structure is empty.
- Do not operate vibrators when gate is closed or conveyor is stopped unless consolidation of material is desired.
- Wear ear protection for 90+ decibel levels.
- Do not operate vibrators without side covers.
- Do not operate the pneumatic vibrators above 100 psi.
- To prevent explosive hazard, do not use combustible gases to drive the pneumatic vibrator.
- Always operate pneumatic vibrator with a Filter - Regulator.
- Always disconnect air line before maintenance.

II. Installation Procedures

⚠ Caution!

Do not mount the vibrator directly to the structure wall. Use a channel iron stiffener for proper mount rigidity and as the transducer of the vibrational energy.

The key to successful vibration is a proper mount because rotary vibration resonates the material inside the structure, when the vibrator is mounted correctly. The vibrator should appear motionless. There should not be a large amount of motion or noise.



Stitch Weld the Channel Iron

Channel Irons - Size & Mounting

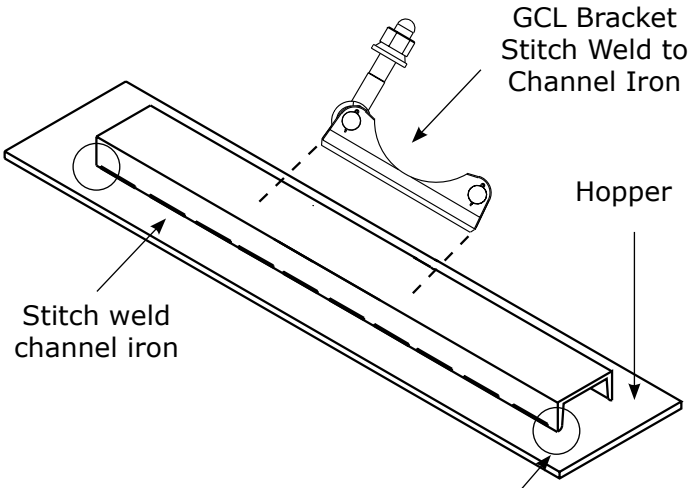
Important!

The channel iron should be at least two-thirds of the height of the sloped portion of the hopper but no greater than 10 feet (3 m).

The channel iron should be at least two-thirds the height of the sloped portion of the hopper, but not less than 6 feet (1.83 m) in length. The channel iron width should not be less than the base width of the vibrator. See chart below for recommended channel sizes. DO NOT install more than one vibrator on the same channel iron or use a channel iron shorter than the recommended length. A short channel may flex the bin wall.

Channel Iron Designation				
Model	Channel Width	Web Thickness	Weight per foot	Minimum Length
	in	in	lb/ft	ft
	mm	mm	kg/m	m
TCL-2500	6″	.437	13	6
	152	11	19	1.5
TCL-4000	6″	.437	13	6
	152	11	19	1.5
TCL-6000	6″	.437	18.75	6
	152	11	28	1.5

Attach the vibrator to the channel iron. Stitch weld a GCL Bracket to the back of the channel iron. Do not weld the ends. Mount the vibrator in the bracket by sliding the foot into the GCL Bracket, lowering the latch bolt into the fingers on the vibrator housing, and securely tighten the nut.



Do not weld the ends of the channel iron - this allows the vibrational force to "escape". Solid welded ends trap the force which can cause stress cracks.

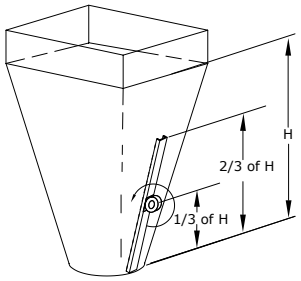
Stitch weld the channel iron vertically to the sloped portion of the bin wall. Weld 3 inches (7.5 cm), skip 1 inch (2.5 cm), weld 3 inches (7.5 cm), etc... Leave 1 inch (2.5 cm) un-welded on the ends and corners. This allows the vibration to dissipate out the ends of channel without causing stress cracks to the hopper or bin. By doing so, should the weld fail, the entire mount will not fall off. Do not mount the channel iron horizontally.

If your vibrator is mounted for a permanent application, attach a safety cable to a stronghold, independent of the channel mount, which is higher than the mounted vibrator and capable of holding the weight of the vibrator.

III. Mounting Locations

Single Vibrator

Install a channel iron stiffener on the outside of the sloping wall 1/3 the distance above the discharge opening.

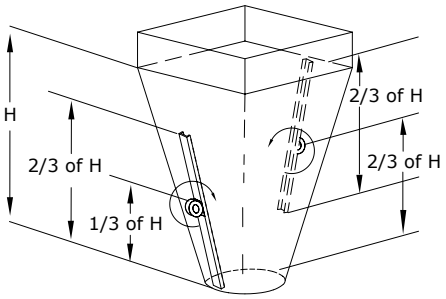


Multiple Vibrators

Use more than one vibrator when the diameter or width of any wall is greater than 12 feet (3.66 m). Always mount the vibrators on different planes.

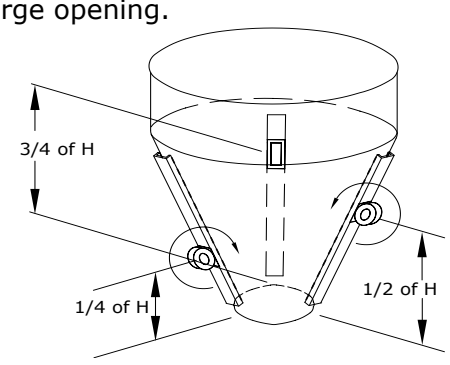
Two Vibrators on Round or Square Hoppers

Install channel iron stiffeners 180° apart. Install one vibrator on the outside of the sloping wall 1/3 the distance above the discharge opening. Install the second vibrator on the outside of the opposite sloping wall 2/3 the distance above the discharge opening.



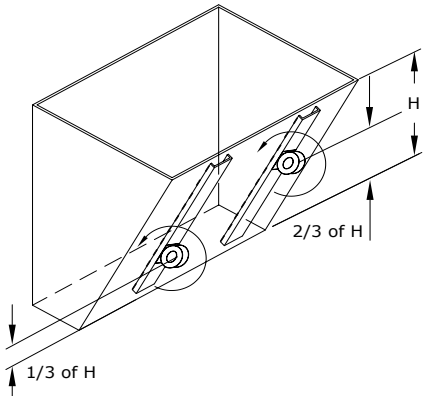
Three Vibrators

Install channel iron stiffeners mounted 120° apart. Install the first vibrator on the outside of the sloping wall 1/4 the distance above the discharge opening. Install the second vibrator on a separate channel iron at 1/2 the distance above the discharge opening. Install the third vibrator on the remaining channel iron at 3/4 the distance above the discharge opening.



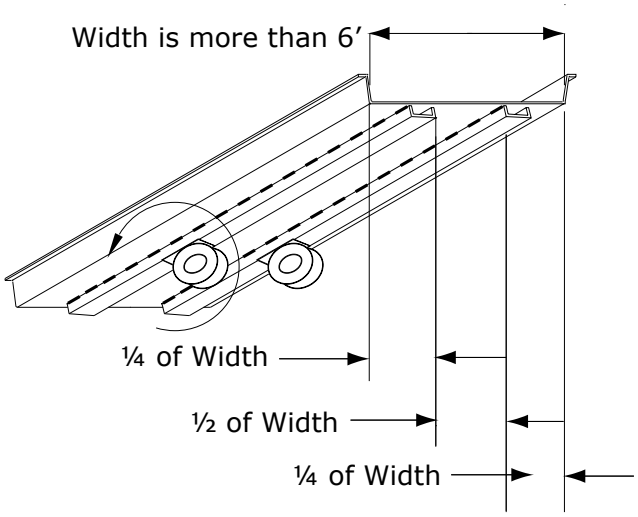
Two Vibrators on Rectangular Hoppers

Install channel iron stiffeners on opposite sides of the long walls. Install one vibrator on the outside of the sloping wall 1/3 the distance from the discharge opening. Install the second vibrator on the outside of the opposite sloping wall 2/3 the distance above the discharge opening. When only one wall slopes, mount both stiffeners on it. Equally space the stiffeners on the wall. Place one vibrator 1/3 above the discharge opening on one channel iron and the other vibrator 2/3 above the bin's discharge opening on the second channel.



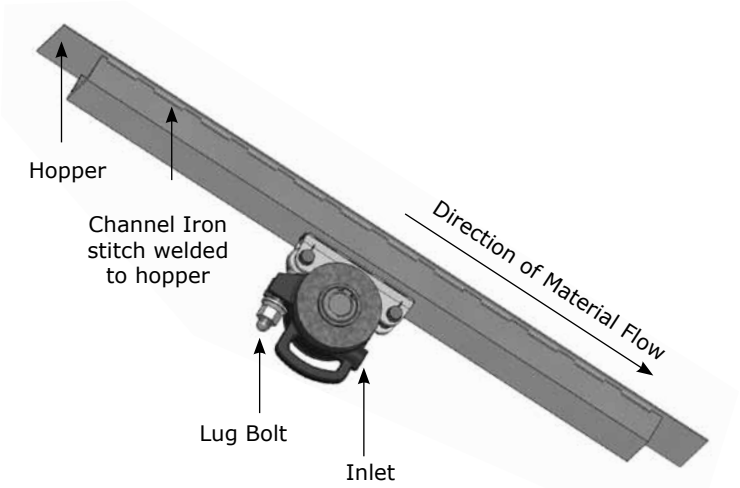
Installation on Chutes and Flow Pipes

Mount channel iron stiffeners vertically or in the direction of material flow. Center the channel if the chute is less than 6 feet (1.83 m) in width. If the chute is greater than 6 feet in width, use two vibrators on separate channel irons. To maximize each vibrator's radius of influence; center each channel iron in each half of the chute. Each channel iron should be located ¼ of the chute width from the edge and ½ of the chute width apart. (e.g. – a chute 8' wide, the channel iron locations would be 2' from each edge and 4' apart.) When wall thickness is less than 1/8", additional reinforcement may be required.



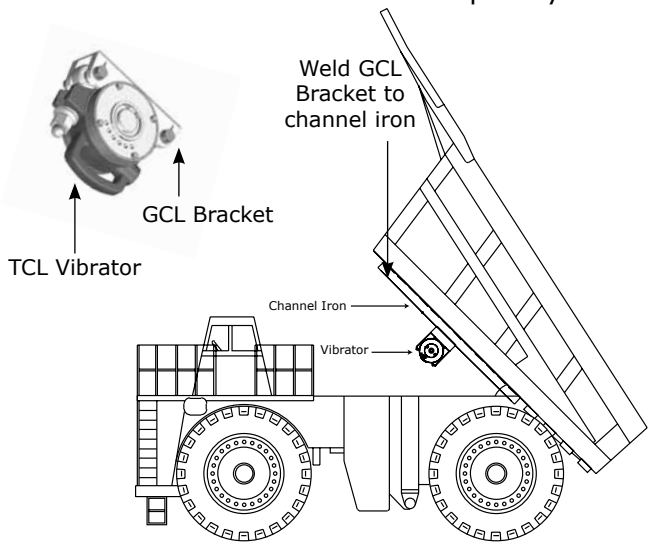
Placement on Channel Iron

The axis of rotation of the turbine wheel for all rotary vibrators should be oriented in the direction of material flow. Position lug bolt on the high side (uphill side) of the channel iron. The shaft of the vibrator should ideally be in a horizontal position to prolong bearing life.



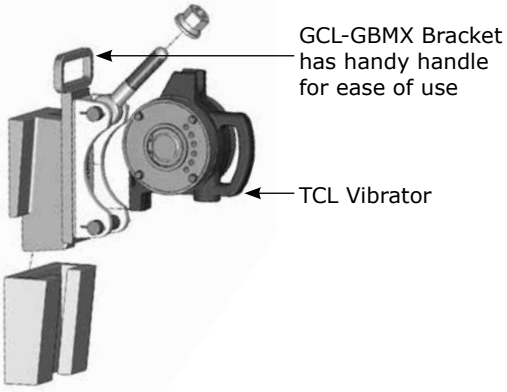
Mounting on Truck Bed

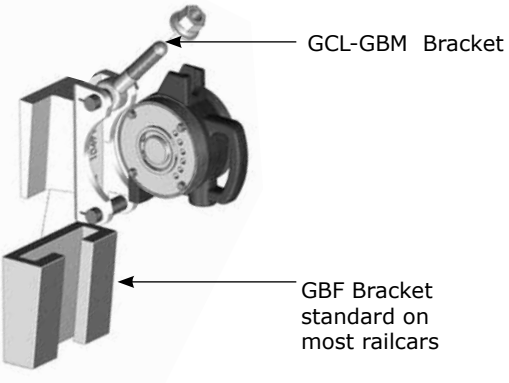
Weld GCL bracket to an independent channel iron. TCL vibrator inserts quickly into bracket. Locate the channel iron as close as possible to the material flow problem area. The most common problem areas are in the corners of the dump body.



Installation on Railcars

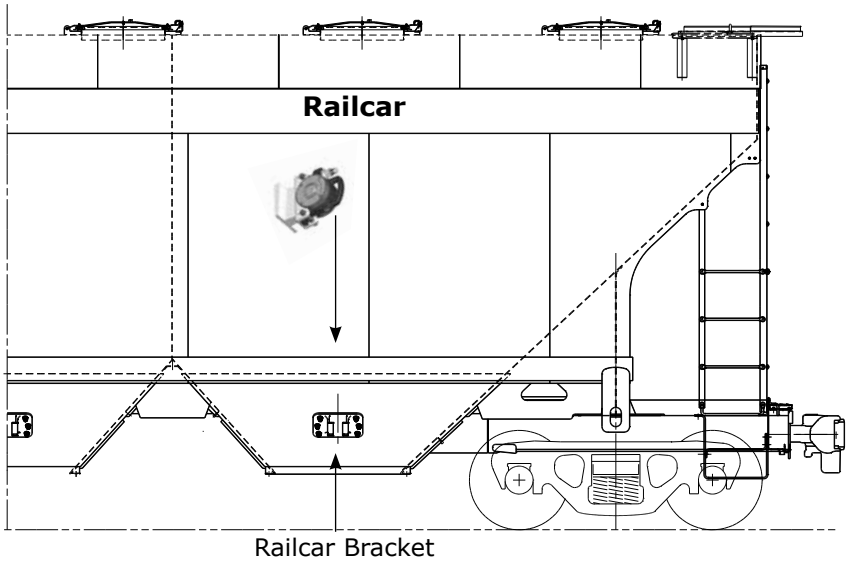
Place TCL vibrator in "GCL-GBMX Bracket" or "GCL-GBM Bracket". The vibrator on the bracket slides into the standard railcar bracket on the hopper car.





Securing Vibrator to GCL Bracket

Attach the vibrator to the cradle lug bracket by placing the tab at the base of the vibrator under the free bar on the bracket. Rotate the vibrator towards the bracket until it is fully seated. Rotate the bracket bolt until it fits between the two fingers on the vibrator housing and secure it using the special cradle lug nut. It is recommended that the nut be tightened by hand using a standard open-end or box wrench. Repeated tightening with an air wrench as the vibrator is moved from bracket to bracket will eventually cause excessive wear to the fingers on the vibrator housing. Periodically check for loosening of the mount.

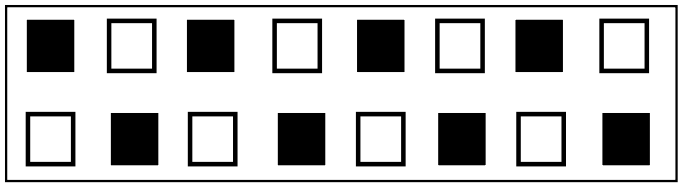


Concrete Consolidation Applications

Spacing of the vibrators is based on the consistency of the concrete. Refer to the following table:

Vibrator Spacing for Concrete Consolidation		
Consistency	**Slump**	**Distance Between Vibrators**
Very Stiff or Stiff Concrete	< 1.0"	5' apart
	< 25 mm	1.5 m
Stiff Plastic Concrete	1.0 - 2.0"	6' apart
	25 mm - 50 mm	1.8 m
Plastic Concrete	2.0 - 5.0"	7' apart
	50 mm - 127 mm	2.1 m
Flowing Concrete	> 5.0"	8' apart
	> 127 mm	2.4 m

For large applications, alternate vibrators on opposite form walls. For instance, the first vibrator is placed on the front wall and the next is 5' (1.5 m) away but on the back wall. See illustration below:



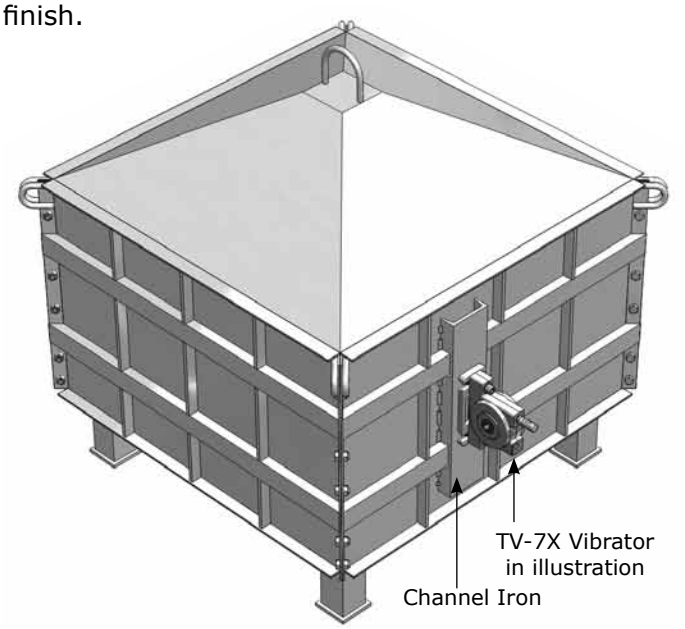
■ Vibrators on the near side of the form.

□ Vibrators on the opposite side of the form.

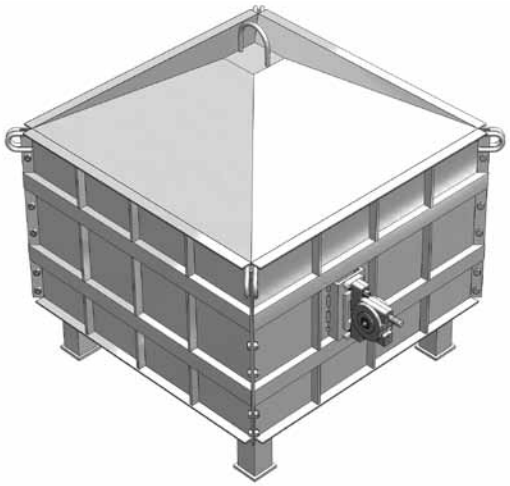
Orientation of the TCL Vibrator

The vibrator should be mounted with the shaft horizontal, the lug bolt on top, and the turbine wheel rotating to encourage the air bubbles to migrate towards the surface of the concrete.

Proper selection, placement, mounting, and orientation can mean the difference between strong, well-finished concrete, and poor quality concrete. Use a 5' (1.5 m) channel iron to distribute vibration over a larger area for optimal concrete finish.



Do not cut structural members to fit channel iron on form. Cut channel to fit over the horizontal stiffeners. Do not weld channel to horizontal stiffeners - stitch weld only to the form wall. If there is absolutely no way to fit a long channel iron on form or over any structural members, use a short channel. A channel iron is important to help keep your form from oil canning.



IV. Operation - Air Requirements

Air Requirements

Lubricated air is NOT required for TCL vibrators. Operate these vibrators on filtered (150 micron), regulated air between 20 and 80 psi (1.36-5.44 bar). Lubrication might collect dirt that will impair proper vibrator operation.

Hose Connections

The air inlet shaft is threaded to accept a 3/8" hose barb. The hose should be securely clamped to the barb fitting with a Band-It®, or Punch-Lok®, or similar type clamp. A worm driven type clamp is not recommended since the vibration may cause the clamp to loosen and allow the hose to blow off the barb fitting.

Quick Disconnect Coupling

If the vibrator will be moved or disconnected frequently, a hose whip could be added to the airline before the vibrator. The hose whip is a piece of hose 12 - 18" (305 - 457 mm) in length, attached to the air inlet shaft with a clamp as described above. A quick coupling, such as a Dixon® hose end coupling, should be attached to the free end of the hose whip. A ball valve should be added to the supply airline to control the air and to permit the quick disconnection of the Dixon® type coupling.

Controlling Vibrator Speed

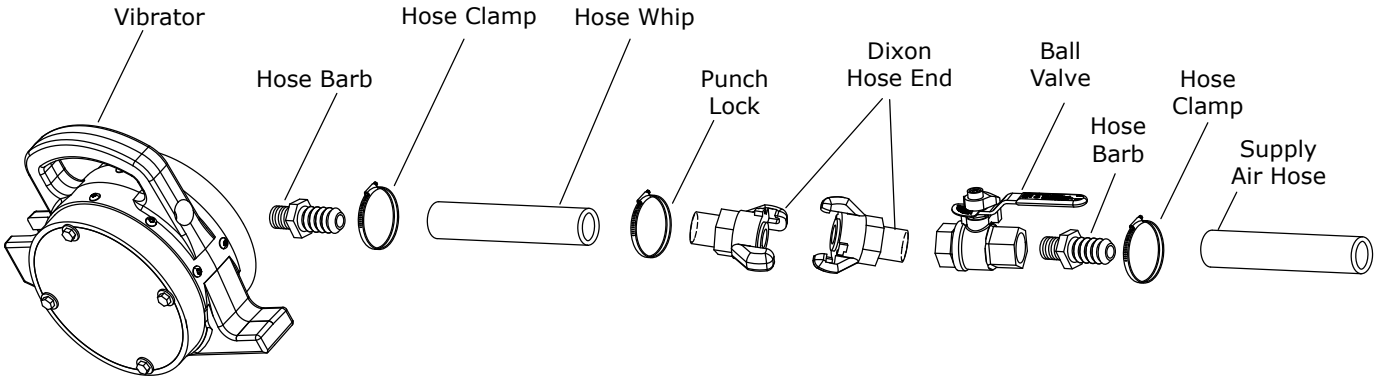
An air regulator can be used to control the vibrator speed. Operating the vibrator at pressures higher than necessary will reduce bearing life (a 10% increase in speed reduces the bearing life by 50%).

Material Flow Applications

Adjust the airflow until material flow occurs. More air is not always better. Cycle the vibrator on and off. The vibrator can run continuously, but this is usually not necessary. Once the material is set in motion, gravity will keep it moving.

Concrete Consolidation Applications

Adjust the airflow to achieve 10,000-14,000 vibrations per minute (same as rpm of vibrator). This can be done by referring to the performance data on page 13 of this manual and adjusting the regulator to the desired air pressure. Since the speed of the vibrator can vary depending on the rigidity of the mount and the forms, a more accurate way of assuring the desired frequency of vibration is to use a Vibra-Tachometer (available from your distributor pn #490010), to measure the actual operating frequency for your application. Use the air regulator to adjust the air pressure until the desired frequency is achieved.



Break-in Period

This vibrator is equipped with shielded roller bearings that are permanently lubricated at the factory with special grease for high-speed operation. Reduced speed and speed variations might occur during the first 30-60 minutes of operation until the grease is evenly distributed in the bearings.

V. Maintenance

The Turboviber® pneumatic turbine vibrators require very little maintenance. As long as the air supply is relatively clean (150 micron filtered recommended) and the air pressure is not excessive, the vibrators will give high performance for many hours of use. These vibrators are equipped with shielded roller bearings that are ***permanently*** lubricated at the factory. ***No lubrication is required.*** Reduced speed and speed variations might occur during the first 30-60 minutes of operation until the grease is evenly distributed in the bearings. Bearing life will depend on the speed at which the vibrator is run. It is important to keep in mind that a 10% increase in speed decreases the bearing life by 50%. Because these bearings are filled with a special lubricant designed especially for high speed applications, replacement bearings should be purchased from Global Manufacturing through your Global distributor or Viber® dealer.

NOTE

Inspect the shaft for wear. If wear is visible, it should be replaced.

NOTE

The bearings in Turboviber® vibrators contain a special lubricant for high-speed applications. Always use replacement bearings supplied by Global Manufacturing. They can be purchased through your Global distributor or Viber dealer. Bearings with standard lubrication may greatly reduce the performance of the vibrator and will greatly shorten the bearing life.

Disassembly and Assembly

Kits Available:

TRK-63 TCL Bearing Replacement Kit #519063: Includes one set of replacement bearings and two guide screws.

TRK-61 TCL Rebuild Kit #519061: Includes one set of replacement bearings, two guide screws, and one shaft.

Tools Required:

- Arbor press with minimum throat clearance of 7 inches
- 7/16" box end wrench
- 2" long 1" diameter steel rod
- Small gear or battery terminal puller
- Press bushing – 1.3" O.D. X 1" I.D. X 2" long
- Press bushing or rod – 2.25” in diameter X 2" long
- Medium internal retaining ring pliers
- 2 ea. 1/4”–20 X 1 1/2" alignment bolts (provided in both kits)

1. Disconnect airline and remove unit from its mount.

2. Clean dirt and debris from the outside of the vibrator, do not immerse.

3. Lay the vibrator on its side with the four cover bolts facing downward.

4. Remove the bearing cap retaining ring.

5. Remove the bearing cap. It will be necessary to lightly scrape away any paint that would impede bearing cap removal.

6. Remove the o-ring that seals the bearing cover.

7. Lay the vibrator on the other side with the four cover bolts facing upward.

8. Remove the retaining ring, bearing cap, and o-ring from the side cover as in steps 4-6.

9. Remove the four cover bolts.

10. Block the vibrator up on the arbor press so the press can engage 1" X 2" rod when set on the now exposed shaft end. Be sure the cover will clear the support blocks underneath the vibrator.

11. Press the side cover and wheel assembly free of the housing with the 1" rod and the arbor press.

12. Lift the wheel assembly free of the pressed-out side cover.

13. Using a small gear or battery terminal puller, remove the inner bearing races from both ends of the wheel shaft. Note that the inner race is positioned with the race flange towards the wheel.

14. Place the inner races back in the bearings.

15. Using the 1.3" O.D. X 1" I.D. press bushing, press the bearing out of the side cover.

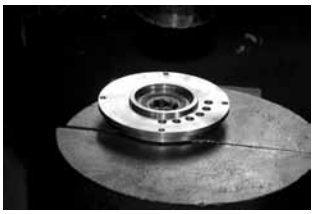
Repeat the process to remove the bearing from the housing bearing bore.

16. Clean the wheel assembly, housing, cover, and bearing bores thoroughly.

Important!

Cleanliness is important to prevent any foreign particles from contaminating the new bearings.

17. Using 2" O.D. press rod, press a new pre-lubricated bearing into the bearing bore on the side cover. Be sure the lettering on the bearing outer race faces in towards the back of the bearing bore.



18. Repeat the process to install a new pre-lubricated bearing into the bearing bore on the housing. Again, make sure the lettering on the bearing outer race faces inward.

19. Using 1.3" O.D. X 1" I.D. press bushing, press the inner races onto the wheel shaft with their flanges facing inward toward the wheel.

20. Re-install O-rings, bearing caps, and retaining rings to secure the bearings in the side cover and housing.

21. Re-install the wheel into the housing. Note the proper orientation of the wheel. The arrow stamped on the wheel showing the direction of rotation should be visible and pointing in a counter-clockwise direction.

The offset wheel buckets should be on the side closest to the back of the housing. Spin the wheel. It should turn freely.

22. Position the cover over the wheel shaft and orient the exhaust ports toward the handle. Install the two 1/4"- 20 X 1 1/2" bolts through the cover and into the threaded holes in the housing. These bolts hold cover alignment during the press-in operation.

23. Block-up the housing so that the side cover bearing cap boss is not bearing press force when reinstalling side cover into housing. Press the side cover into the vibrator housing until it seats completely in the housing.

24. Remove the two alignment bolts and re-install the four side cover bolts using Loctite® on the threads.

25. Apply air to the inlet port. The wheel should turn freely.

26. Remount and hook up air supply. Check operation. Note: new bearings will need to break in for 30-60 minutes to distribute the grease before the vibrator will reach full speed.

Instructions for replacing the wheel shaft in the TCL vibrators:

Tools required:

Conventional oven or suitable source of heat and Mallet and drift of brass or hardwood

1. Disassemble vibrator and remove inner bearing races from the shaft ends. Note how shaft is positioned within the aluminum wheel.

2. Place shaft/wheel assembly in an oven and heat to 350-400ºF. The wheel can also be heated with a torch. Concentrate the flame near the center of the aluminum wheel NOT on the steel shaft.

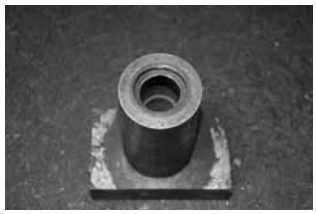
3. Once the wheel assembly has reached adequate temperature, the old shaft can be easily removed or tapped from the wheel. If the wheel is blocked up, the shaft can even fall out under the force of gravity.

⚠ Caution!

Wheel and shaft will be extremely hot. Wear proper hand protection.

4. Place the wheel back into the oven to reheat. This can also be done with a torch by carefully heating the wheel in the area around the center bore. Cool the new shaft in a freezer for easier fitting.

5. Remove the wheel from oven and place on its side on an elevated surface that will allow the shaft to extend through the opening in the center of the wheel.



6. Slide the cold shaft through the hot wheel until the shoulder of the shaft is flush with the wheel side.

Position of the shaft is critical. The shoulders of the shaft should not extend out beyond either side of the wheel.

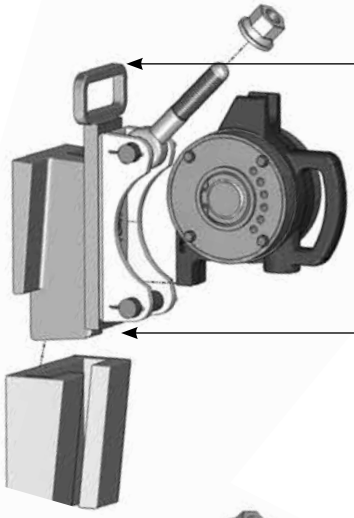
7. Allow assembly to cool. Check that the weights do not need re-staking to re-secure them (they may have come loose during the heating and cooling process).

8. Install new inner races on the shaft ends and replace in the vibrator as described in #21 above. Complete the re-assembly of the vibrator as detailed above.

VI. Brackets

Specialty mount brackets are available from Global Manufacturing for attaching the TCL vibrators in other settings. A GCL Bracket is typically welded to a form or hopper application. A GCL/GBM (pn #167020) bracket is a wedge adaptor bracket for use in the wedge pocket commonly found on railcar hoppers. The GCL/GBM-X Bracket (pn #167120) is also used in railcar applications. The GBM-X Bracket has an unitized construction, which helps it hold up to abuse. It also has a hammer strike plate to help when bracket gets stuck in railcar bracket. There is a handle for ease of portability. Contact your distributor for availability.

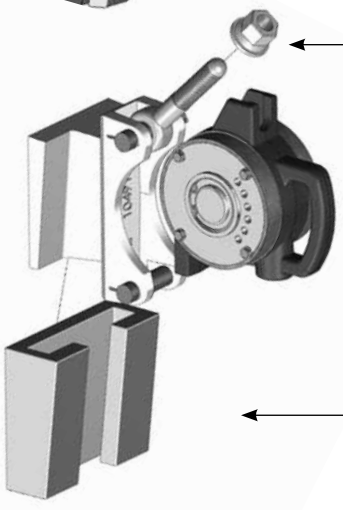
GCL Bracket



GCL-GBMX Bracket has handle for ease of use

TCL Vibrator

Strike plate for hammering when stuck in railcar pocket



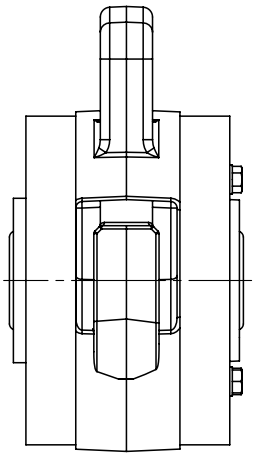
GCL-GBM Bracket

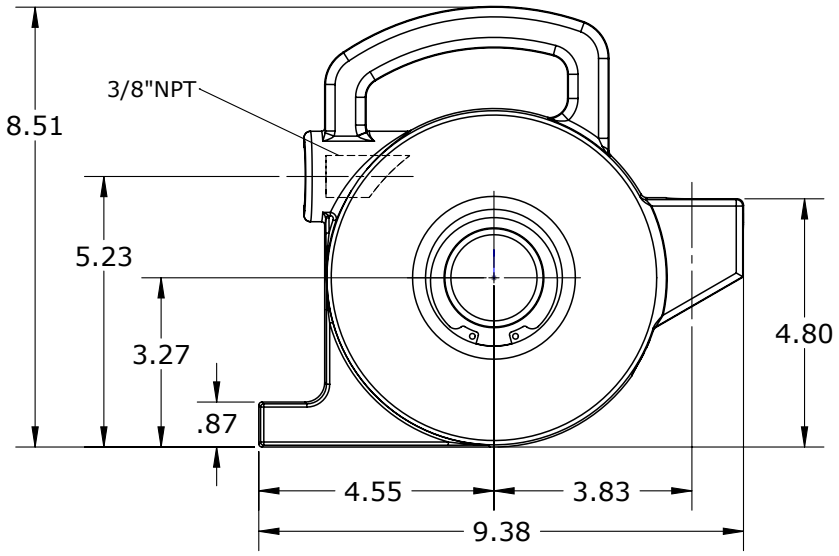
GBF Bracket standard on most railcars

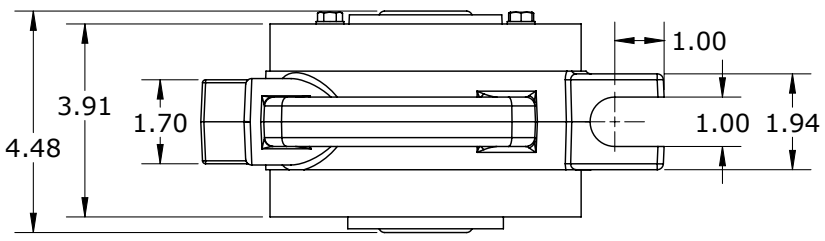
VII. TCL Turbine Vibrators Performance Data

TCL Turbine Vibrators Performance Data										
PRESSURE		TCL-2500			TCL-4000			TCL-6000		
		SPEED	FLOW	FORCE	SPEED	FLOW	FORCE	SPEED	FLOW	FORCE
		RPM	CFM	LB	RPM	CFM	LB	RPM	CFM	LB
PSI	BAR		LPM	N		LPM	N		LPM	N
20	1.38	10,500	< 20	1,428	10,500	< 20	2,297	10,500	< 20	3,131
			< 566	6,351		< 566	10,217		< 566	13,928
40	2.76	12,000	28	1,865	12,000	28	3,000	12,000	28	4,090
			793	8,295		793	13,345		793	18,191
60	4.14	13,400	38	2,325	13,400	38	3,741	13,400	38	5,100
			1,076	10,344		1,076	16,641		1,076	22,684
80	5.52	14,500	50	2,723	14,500	50	4,380	14,500	50	5,971
			1,416	12,112		1,416	19,485		1,416	26,561
UNBALANCE		lb-in	0.456		0.734			1.000		
		kg-mm	52.54		84.52			115.21		
START-UP PRESSURE		psi	5		5			5		
		bar	0.34		0.34			0.34		

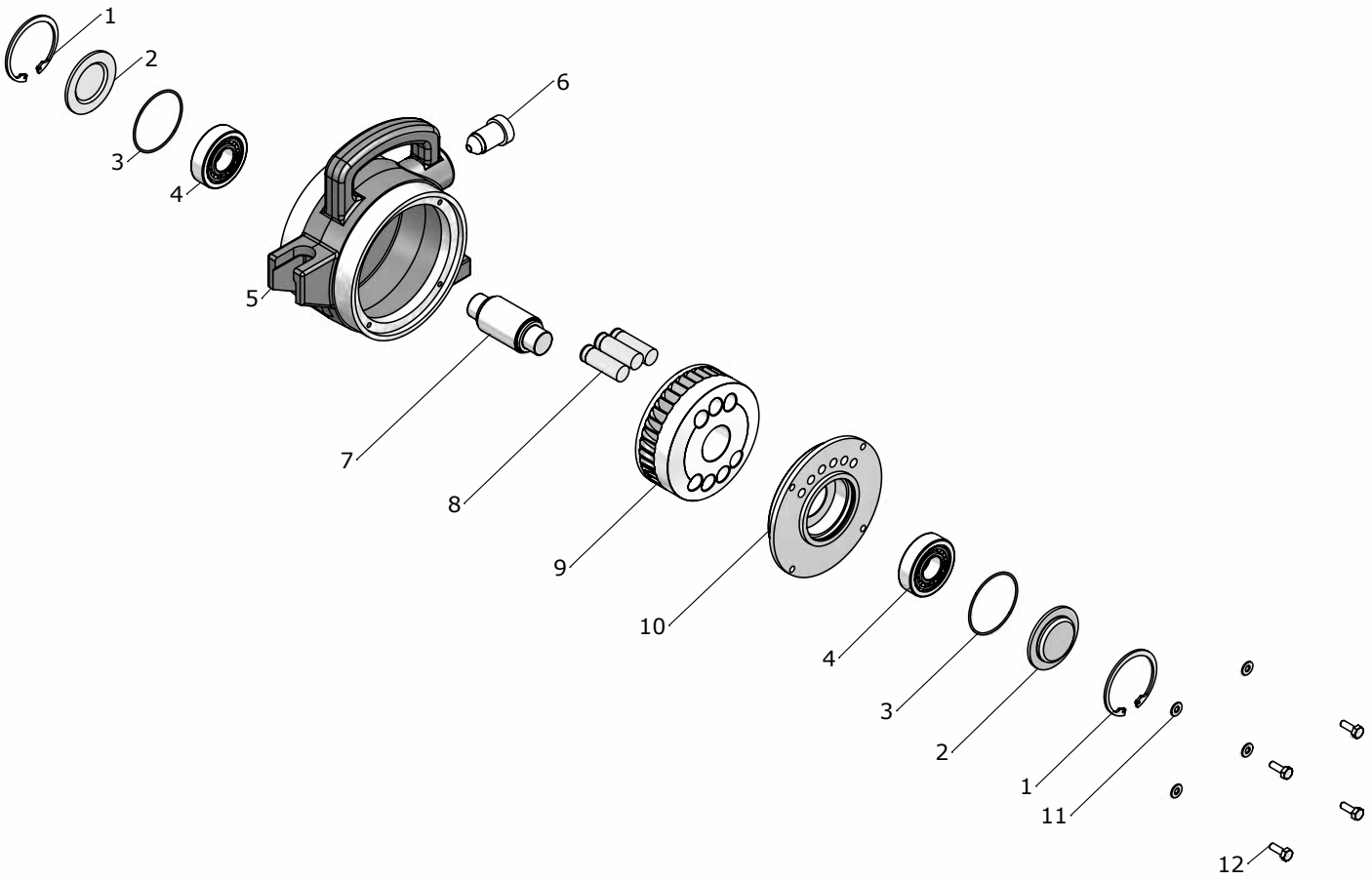
VIII. Dimensions for TCL Vibrator







IX. Parts List and Drawing - TCL - all models



TCL Turbine Vibrators Parts List					
TCL-2500 (pn 514025), TCL-4000 (pn 514040), TCL-6000 (pn 514060)					
NO.	**PART Number**	**PART DESCRIPTION**	**TCL-2500 QTY**	**TCL-4000 QTY**	**TCL-6000 QTY**
1	347262	Retaining Ring 5000-262	2	2	2
2	119958	Bearing Cover	2	2	2
3	385037	O-Ring 568-037	2	2	2
4	383305	Bearing NJ305	2	2	2
5	149955	Housing	1	1	1
6	490432	Nozzle	1	1	1
7	209952	Shaft	1	1	1
8	199854	Weight	1	2	3
9	199955	Wheel (not sold separately)	1	1	1
10	119956	Side Cover	1	1	1
11	338203	Flat Washer 3/16"	4	4	4
12	330007	Hex Bolt 1/4"	4	4	4
Kit	1999559	Turbine Wheel Assembly - wheel, shaft, and desired weights			
Kit	519061	Rebuild Kit - 2 bearings and shaft			
Kit	519063	Bearing Replacement Kit - 2 bearings			

X. Troubleshooting

Problem	Probable Cause	Solution
Vibrator runs slowly or Vibrator does not operate.	Restricted airline.	Check for kinked or clogged airline.
	Inadequate air supply.	Check to make sure airline filter is equal to or larger than vibrator inlet port (3/8" NPT).
	Contamination in vibrator, airline, exhaust ports, or air filter.	Disassemble and clean vibrator. Blow out airline. Clean airline filter.
	Bearings have excessive wear.	Replace bearings. Order TRK-63 Bearing Replacement Kit (pn #519063) or TRK-61 - Rebuild Kit (pn #519061).
	Excess grease in bearings.	The bearings need to be properly greased (this is done at the factory). Excess grease will prevent the vibrator from reaching its full performance specifications.
	Improper assembly after cleaning or changing bearings. Turbine wheel installed with buckets facing away from inlet jet.	Check the turbine wheel placement. The buckets in the wheel must face the air jet in the inlet port. Reverse wheel to correct.
Vibrator runs slowly or Vibrator speed is not constant.	Break-in period for bearings.	The shielded roller bearings are permanently lubricated at the factory. It may require 30 - 60 minutes of operation for the grease to become evenly distributed through the bearings.
Vibrator makes excessive noise.	Mounting is not rigid.	Check for loose bolts, broken welds, signs of separations or fatigue in structure.
	Structure is empty.	Turn off vibrator. Do NOT run when structure is empty.
	Bearings have excessive wear.	Replace bearings. Order TRK-63 Bearing Replacement Kit (pn #519063) or TRK-61 TCL Rebuild Kit (pn #519061).