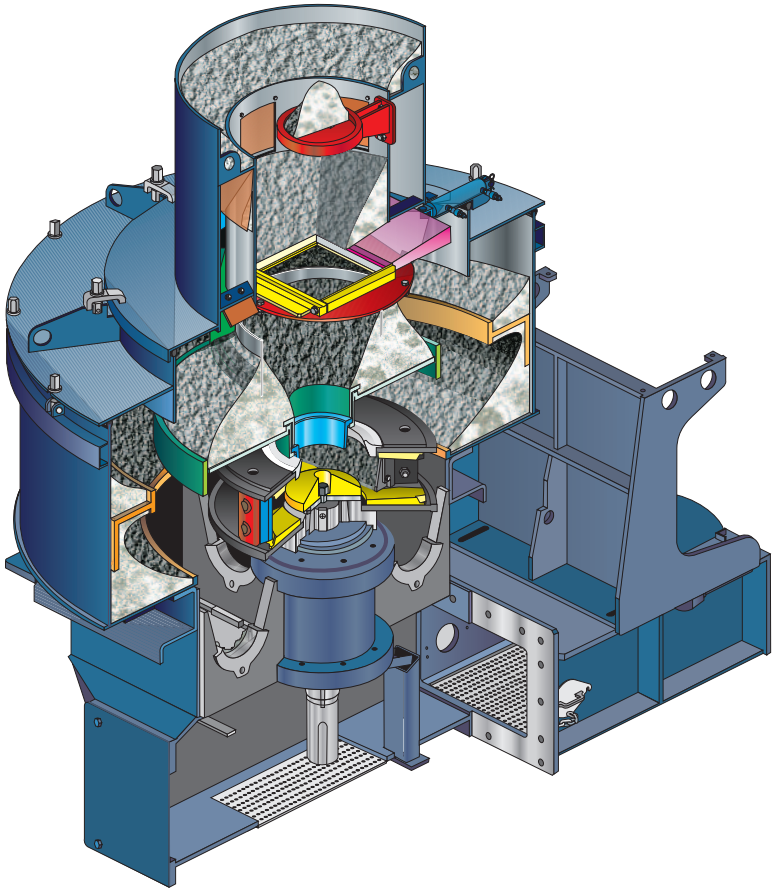
Barmac B1000 Series VSI Crusher



OPERATION & MAINTENANCE MANUAL

metso minerals

Barmac B1000 Series VSI Crusher

Manufacture and design of the Barmac B1000 Series VSI crusher is carried out under quality control systems certified to ISO 9001. Distributed worldwide under the following granted and pending patents and design applications:

New Zealand 198307, 201190, 213510, 217752, 217753, 250027, 22928, 22927, 22929, 23569, 25473, 25474, 231457, 248954, 248955, 248952, 248953, 250154, 227492, 238349
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AFTER SALES CONTACTS
(PLEASE QUOTE MACHINE REF. NO.)

Spare Parts		Service	
Technical		Crusher Sales	
Telephone		Fax	

Dealer:

PRINTED IN NEW ZEALAND

CONTENTS

Safety

GENERAL

During the design and manufacture of the equipment, a lot of effort is put into the avoidance of health and safety risks.

In a crushing and screening plant there are many potential risks and to avoid these it is important that:

- The recommendations in instruction manuals are studied and followed.
- Personnel are regularly given training on maintenance and safety.
- General and official safety regulations are followed.
- Dangerous areas are marked with warning signs.
- The appropriate equipment and tools are available.
- The owner and management live up to their responsibility to make sure that effective safety programmes and regulations are worked out and are followed by all personnel.

EXTRA SAFETY PRECAUTIONS

Our instruction manuals and other documentation contain important information which must be read and understood by all users before they operate the equipment. To make it easier to notice information in our instruction manuals directly concerning user safety and the avoidance of problems with the equipment, we use the terms shown below:

WARNING: Important information which describes how you avoid damage to a machine and its systems or how you avoid a situation which could cause personal injury.

NOTE: Advice about operation, inspection and maintenance of a machine and its systems.

GENERAL SAFETY PRECAUTIONS

The following list of general safety precautions should be considered as a guide only. There may be other conditions and variations in the operation of this equipment that are not covered in these general safety precautions. The purpose of the general safety precautions is to make all personnel aware of the general hazards and dangerous situations that exists around the equipment and the work area.

Personnel Safety

1. Read and understand each of the warnings, cautions and instructions in the instruction manual and on all signs and information plates on and around the equipment.
2. Report all accidents immediately to your supervisor. Consult a doctor or medical personnel as soon as possible if personal injury is involved.
3. Keep a list of emergency telephone numbers close to the telephone and inform all work area personnel about the location of the list.
4. Do not operate or work equipment while under the influence of alcohol, medicines, tranquillisers or other drugs that can make you less alert or affect your judgement.
5. Use hand grips, ladders, guard rails and other safety devices when getting on or off equipment and when moving around while on the equipment. Use a safety harness when necessary.
6. Take precautions to keep hair and loose fitting clothing from being caught on moving parts or controls.
7. Wear safety glasses whenever there is danger of flying debris, chips, objects or dust that could enter the eyes, and when required by operating regulations. Be extra safe — always wear eye protection. Look after your eyes!
8. Wear gloves whenever possible to protect hands and fingers from cuts, scrapes, burns and solvents.
9. Always wear a hard hat and safety shoes when appropriate for the work being done and always when required by local or national regulations.
10. Remove rings, watches, necklaces and bracelets before working in the plant.
11. In areas where noise levels are high, wear hearing protection devices.

Continued ▶

SAFETY

GENERAL SAFETY PRECAUTIONS

12. Wear breathing apparatus or a mask whenever appropriate, i.e. when painting or working with chemicals, solvents and other substances that may be hazardous to your health. Remember that there is a risk of silicosis when there is siliceous dust in the air.
13. Do not take chances with your back. Use lifting and moving devices to help you with your work. Always lift with your legs, not with your back.

WORK AREA SAFETY

1. Keep the general work area clean and free of debris. Avoid stone or other material build-ups on walkways, platforms, ladders and under conveyors.
2. Do not allow unauthorised personnel in or around the work area. Keep a check on who is in your work area at all the times. If necessary, keep a list.
3. Keep equipment surfaces that will be touched by hands and feet clean, dry and free of oil or grease.
4. Keep hand grips, guard rails, ladders and platforms clean, dry and free of oil or grease. Store parts and tools in the designated places when not in use.
5. Keep safety equipment in a designated place and ensure that work area personnel know the location and the proper use of the safety equipment.
6. Make a daily check of starting alarms and warning devices in the work area, and ensure that each device is working properly before starting or operating the equipment.
7. Do not stand under or allow anyone else to stand under equipment that is being hoisted or suspended. Use a safety hook or hook with a safety latch when hoisting equipment and use spreader bars when necessary.
8. Learn the weight limitations and clearances in and around your work area and for the equipment in use.
9. Do not overload walkways. They are intended for personnel, not for storing parts or tools!
10. Be alert to conditions that may obscure vision in and around your work area.

EQUIPMENT SAFETY

1. Do not alter, deface or remove warning and information signs.
2. Before setting up portable equipment, be sure that the ground surface is firm and level. Make sure that all supporting and locking devices are securely in place. Follow manufacturers' recommended procedures for supporting and locking the equipment when applicable.
3. Before moving portable equipment, check that the brakes and running lights operate properly. Ensure that supporting legs are raised high enough off the ground to provide sufficient clearance for safe transport. Check that there are no loose items that could fall off during transport.
4. Never climb aboard equipment while it is in transit or being hoisted, or allow anyone else to do so.
5. Inspect all equipment components before each operating shift to ensure that no parts are damaged or suspected of being damaged. Repair or replace damaged parts before starting or operating the equipment. Use only original parts.
6. Before starting or operating equipment, walk around the work area and the equipment to check that no personnel, animals, tools, parts or foreign objects are in, on, under or around equipment. Make sure that all guards and safety devices are properly installed and in good working condition.
7. Before starting equipment, make sure that all work area personnel and visitors know the equipment is going to be started. Use appropriate devices such as sirens or flashing lights to warn personnel and visitors.
8. When starting equipment, follow the manufacturer's recommended starting sequence. Do not allow unskilled persons to start or operate any equipment without the proper supervision of a skilled operator.
9. Never leave equipment controls unattended.

Continued ▶

SAFETY

GENERAL SAFETY PRECAUTIONS

Always have a qualified operator relieve you if you must leave.

10. During start-up and while equipment is operating be alert for improper readings, visual defects, odours or unusual sounds that could be a warning of a potential hazard. Shut down equipment immediately, following established shutdown procedures, if any unsafe condition should arise.
11. Use extreme caution whenever any equipment is required to be operating during an inspection, maintenance, lubrication or adjustment procedure. This may only be permitted if it is absolutely essential. Under normal circumstances the machine must be stopped and safety switches locked out before any work is carried out.
12. Perform all inspections, maintenance, lubrication and adjustment procedures with caution and in accordance with the manufacturer's recommended procedures.

ELECTRICAL SAFETY

1. Permit only trained and competent personnel to work on electrical components in the plant or on any equipment.
2. Always assume that an electrical circuit is live until it is proven dead by proper testing procedures.
3. Lock out and tag electrical controls before performing any inspection and maintenance. See details of the door safety interlock system recommended by Metso Minerals, section 1 - 5.
4. Repair or replace electrical wires, cables and connectors that are broken or damaged in any way.
5. Check the electrical ground wires, motor plugs and power cable connections are properly and securely connected before starting any equipment.
6. Know the location of all power lines and underground cables. Use extreme caution when working around these areas. Know the location of all main electrical isolating switches.
7. Never work on electrical equipment while it is raining or while standing in water or on wet surfaces unless you know the power is disconnected.
8. Be alert when working around or with electricity. Report any electrical hazard immediately to your supervisor.

FLAMMABLE & HAZARDOUS MATERIALS SAFETY

1. Store flammable, combustible or hazardous materials in a safe place and in containers specifically designed for the purpose and clearly marked in accordance with the relevant regulations.
2. Store used and oily cleaning rags in a properly designed container as required by national or local rules and regulations, and away from flammable and combustible materials.
3. Do not store flammable or combustible materials in, or around the equipment, electrical installations or personnel facilities.
4. Do not permit smoking or an open flame around fuel tanks or other storage facilities for combustible materials.
5. Keep several fully charged fire extinguishers located throughout the work area. Make sure that all personnel know their location and how to operate them. Have them readily available during fuelling operations or when other fire hazards are present. Check the charge on each fire extinguisher at least once a month or when otherwise specified.
6. Shut down all engines and motors when fuelling or transferring flammable, combustible or hazardous materials. Follow the recommended fuelling and transfer procedures for the substance or material being worked with.
7. Fill fuel storage tanks and other combustible materials storage facilities in a well ventilated area, well away from equipment which can cause sparks and thus ignite flammable materials.
8. When refuelling or transferring flammable or combustible materials, ground the nozzle or spout to prevent sparks caused by static electricity.
9. Never start a diesel or gasoline engine in an enclosed area unless there is adequate ventilation.

Continued ▶

SAFETY

GENERAL SAFETY PRECAUTIONS

10. Do not use flammable or combustible substances such as gasoline, kerosene or diesel fuel for cleaning parts. Always use a non-flammable solvent for cleaning.
11. When using epoxy-resin based materials, follow the manufacturer's recommended procedures and precautions. Mix and pour epoxy materials in an open or well ventilated area. Do not burn cured resin without adequate ventilation. Avoid skin contact with uncured epoxy-resin materials.
12. Always inspect and charge batteries in an open or well ventilated area. Do not permit smoking or open flames near batteries. Remember that batteries can contain explosive gas.
13. Properly dispose of waste, drain fluids and hazardous materials with due regard to and in full accordance with all national and local environmental, safety, transportation, and other regulations and ordinances. Make sure that all personnel are familiar with these regulations.
14. Wear the appropriate clothing and protection devices, and follow the recommended procedures when working with hazardous, flammable and combustible materials.

PRESSURISED SYSTEMS SAFETY (AIR & HYDRAULIC)

1. Do not perform maintenance on pressurised system components without first relieving all pressure in the system.
2. Do not make internal checks on pressurised oil or fluid systems reservoir or levels until all pressure in the system has been relieved. Pressurised oil and air are dangerous if released incorrectly. Oil and air pressure equipment can get very hot; use extreme caution and allow the system to cool before working on it.
3. Do not attempt to remove an air line or hydraulic line from a cylinder or other component unless all pressure to the system has been relieved.
4. Do not attempt to remove an air or hydraulic cylinder clevis from its attachment unless all pressure in the system has been relieved.
5. Do not operate pressurised systems with worn or damaged hoses, valves or fittings. Replace defective components before pressurising the system.
6. Do not attempt to disassemble air or hydraulic cylinders unless you have been trained and authorised for such maintenance.
7. Never adjust pressure relief valves beyond the recommended values.
8. Follow the manufacturer's recommended inspection and maintenance procedures for pressurised systems to ensure that safe operating conditions exist at all times.
9. Take extreme care when working with hydraulic accumulators. They must never be heated or subjected to welding or mechanical damage.

WELDING SAFETY

1. All welding or cutting operations should only be performed by experienced welders who are familiar with the welding equipment and the material to be welded.
2. Take all necessary precautions to avoid dropping sparks or welding splatter on belts, hoses, tanks or other parts of equipment, or on personnel in the work area. Always keep the risk of fire in mind.
3. Attach the welding ground cable as close as possible to the piece being welded to avoid damage to the equipment and potential injury to personnel.
4. Always consult with the manufacturers of the equipment to be welded before any welding operation.
5. Never weld vessels or pipework which is pressurised.

Caution: Do not attempt to weld on rotor while it is in the machine or arcing damage will cause premature failure of the bearings.

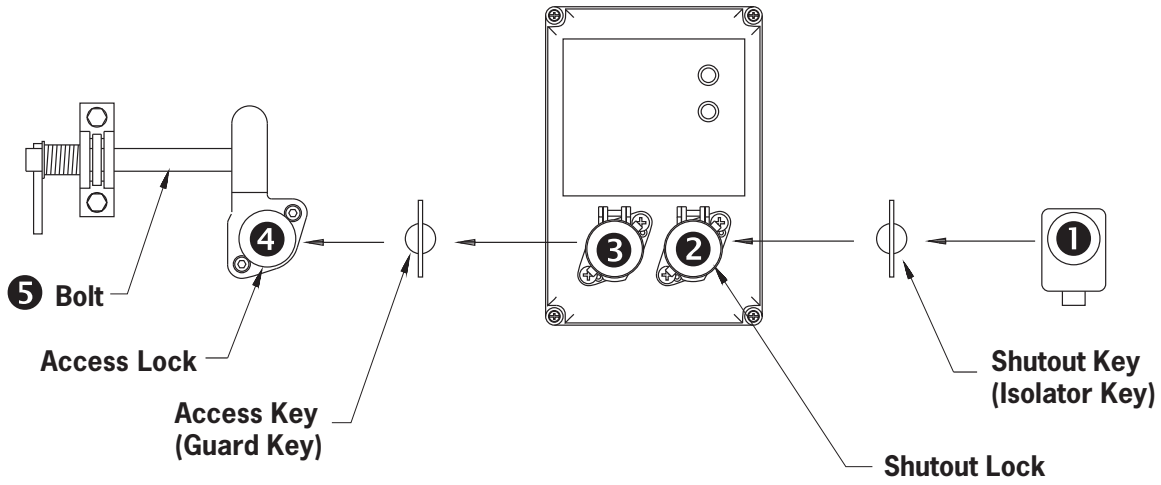
SAFETY

DOOR SAFETY INTERLOCK SYSTEM OPERATION

The Safety Interlock System is designed to prevent the crushing chamber service door from being opened while the machine is in operation or on shut-down before sufficient time has elapsed to allow the rotor to stop rotating.

The interlock also prevents accidental start-up while the crusher is being serviced, or when the door is left open.

SEQUENCE OF OPERATION



❶ Turn Shutout Key in Deadlock and remove key.

❷ Put Shutout Key in Shutout Lock and turn.

❸ After time delay has elapsed, turn and remove Access Key.

❹ Put Access Key in Access Lock and turn.

❺ Release Bolt and open door.

To close door, engage bolt and transfer keys through reverse sequence. (Time delay will not activate in reverse sequence).

• For further information See Door Safety Interlock Installation, Operation and Service Manual.

SAFETY

VIBRATION PROTECTION

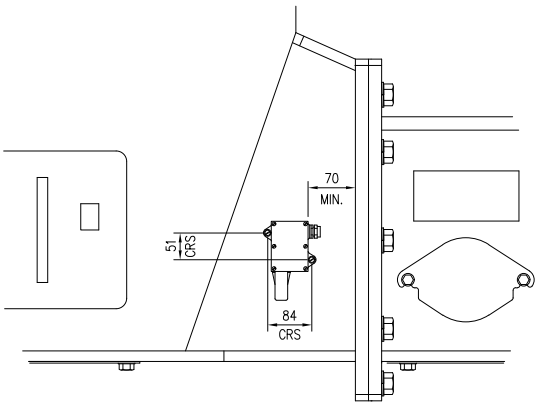
A vibration protection system protects the machine from the effects of severe vibration. With this installed the machine will be shut down and\or an alarm sounded if vibration becomes excessive.

In normal operation, the Barmac has a slight vibration which varies from time to time, due to the wear and replacement of material within the rotor. As material wears away it is continually replaced.

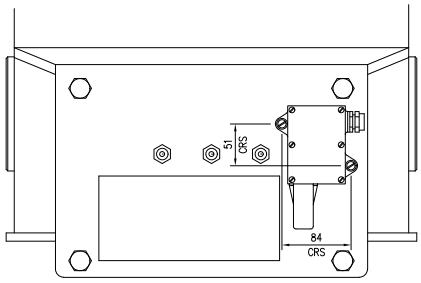
Consistent or excessive vibration should always be investigated. A likely cause is breakage of a rotor tip or uneven build-up within the rotor. High pitched vibration may be caused by poor rotor taper lock seating or a bent shaft.

Your Barmac dealer will set the vibration switch when commissioning the machine.

RECOMMENDED VIBRATION SWITCH POSITION



B9000, B8000, B7000 and B6000 machines.



B5000 and B3000 machines.

ALL MACHINES MUST HAVE A VIBRATION PROTECTION SYSTEM PROPERLY FITTED AND CONNECTED.

Full wiring instructions are supplied with the vibration protection system.

Machines without a vibration protection system will not be covered by warranty.

- For further information see Vibration Control Kit Installation, Operation and Service Manual.

SAFETY

TEN COMMANDMENTS OF SAFETY

1. **Support all efforts to make your workplace safe and healthful.**
2. **Act responsibly and with concern for the safety of others, as well as yourself.**
3. **Check all tools and protective equipment frequently, to make sure they are in safe working order.**
4. **Educate yourself and others in the hazards associated with your job so that they can be avoided in a safe manner.**
5. **To avoid injury and damage, familarise yourself in advance with the risk and safety aspects of procedures which are new to you.**
6. **Think over accident and injury possibilities before starting on any project. Take appropriate precautions to protect yourself and others. Revise and improve working procedures regularly.**
7. **Warn others of the possibility of accidents and injuries if you see them working unsafely or creating potential hazards.**
8. **Stay alert for changes in work conditions and the work process.**
9. **Report unsafe acts and conditions immediately to your supervisor.**

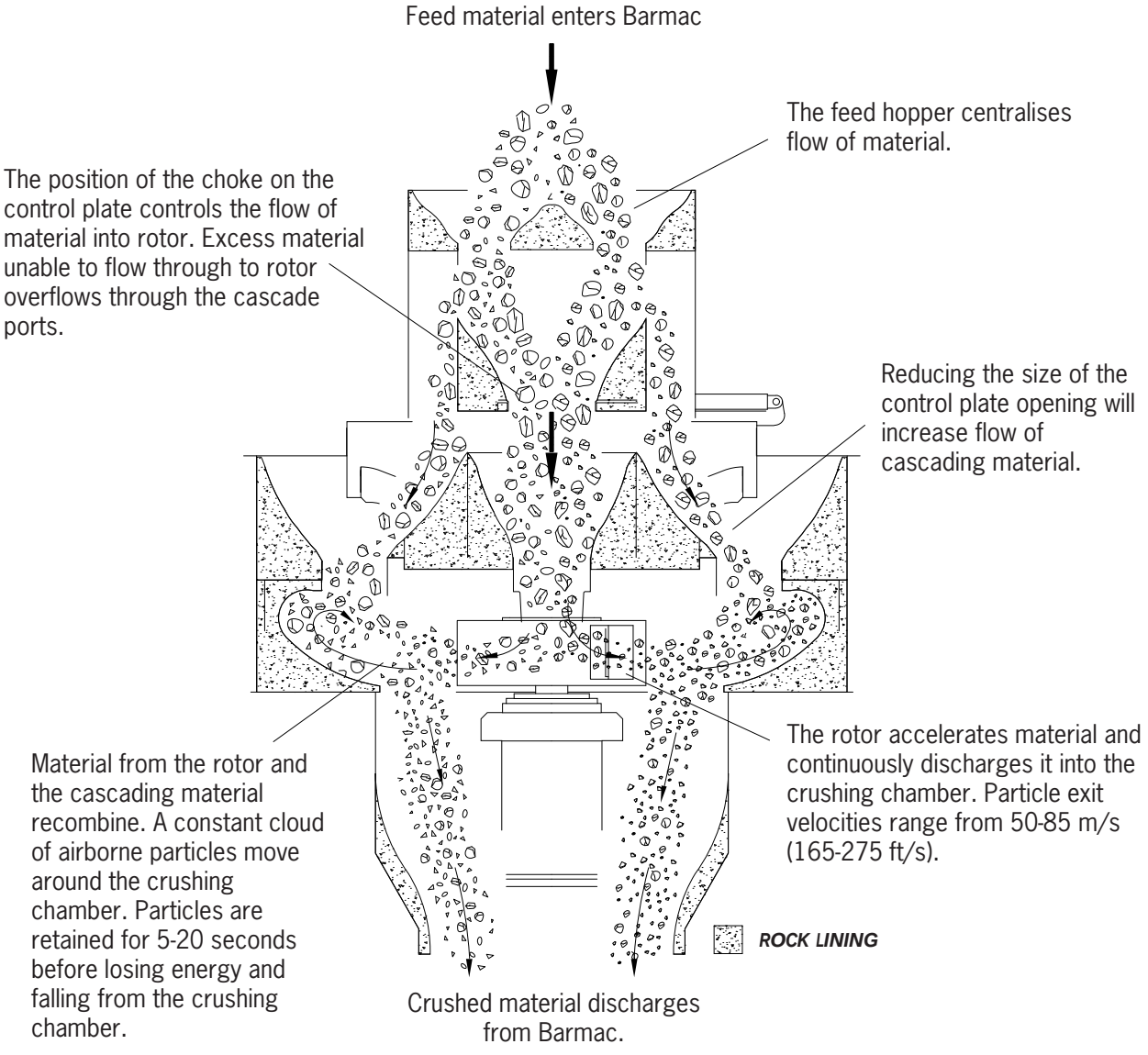
   Don't assume that someone else will do it.
10. **Keep your work area and your tools clean. Pick up tools and materials after use and return to the appropriate storage place.**

Principles of Operation

The Barmac rock-on-rock crusher uses a field proven rock lined rotor that acts as a high velocity dry stone pump hurling a continuous rock stream into a stone lined crushing chamber.

Material fed into the top of the machine is accelerated in the Barmac patented rock lined rotor, achieving exit velocities of up to 85 metres (275 feet) per second. The rotor continuously discharges into the crushing chamber. This process replenishes the rock lining, while at the same time maintains a rock-on-rock chain reaction of crushing and grinding.

A second stream of material in a controlled quantity can be cascaded into the crushing chamber turbulence causing a supercharging of the particle population within the chamber, improving the energy transfer. This, in combination with other variables of rotor diameter and speed and crushing chamber profile, enhances power efficiency, reduces wear, plus provides an efficient means of controlling the grinding and crushing action, to either maximise or minimise fines.



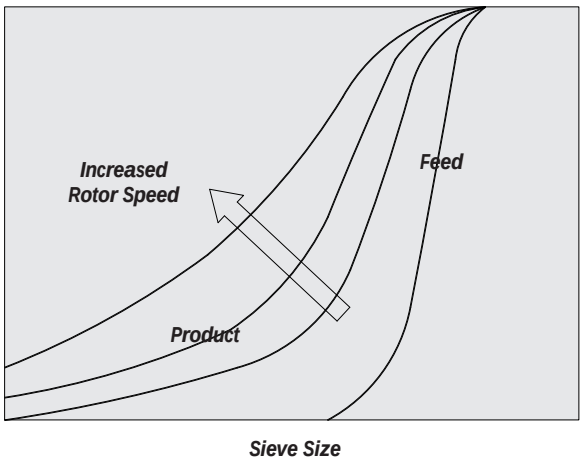
PRINCIPLES OF OPERATION

CONTROL OF CRUSHED PRODUCT SIZES

The Barmac offers a number of controllable variables which affect the final product grading.

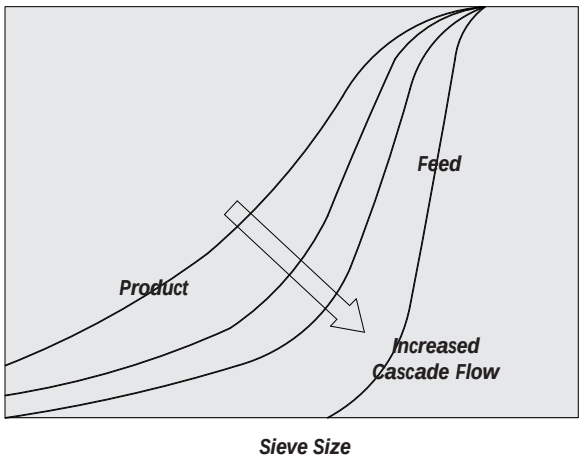
ROTOR SPEED

Increasing rotor speed increases the particles kinetic energy and increases the reduction achieved.



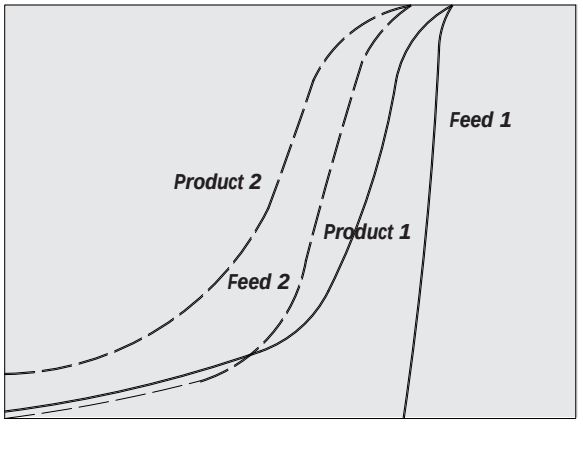
CASCADE

Increasing the cascade flow decreases the reduction ratio achieved whilst increasing the capacity of the crusher.



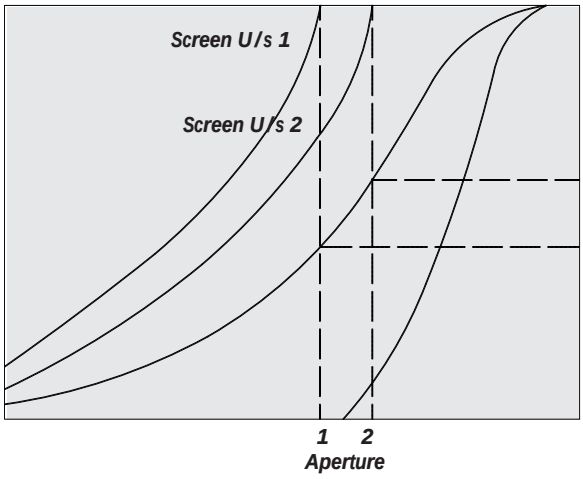
FEED GRADATION

Changing the size distribution of the feed to the Barmac will affect the size distribution of the crushed product.



SCREEN APERTURE

When operating in closed circuit the final product size produced by the Barmac is controlled by the screen aperture.



Crushing Chamber Profile: In some models, coarse and fine cavity rings are offered. The fine cavity ring increases particle retention time with the crushing chamber increasing the reduction achieved.

Rotor Diameter: Different rotor diameters are available for some models. Changing to a larger diameter rotor effectively increases the tip speed and the effect is similar to increasing the rotor speed with the addition that the longer grinding arm in the rotor produces more fines than a smaller diameter rotor with the same tip speed.

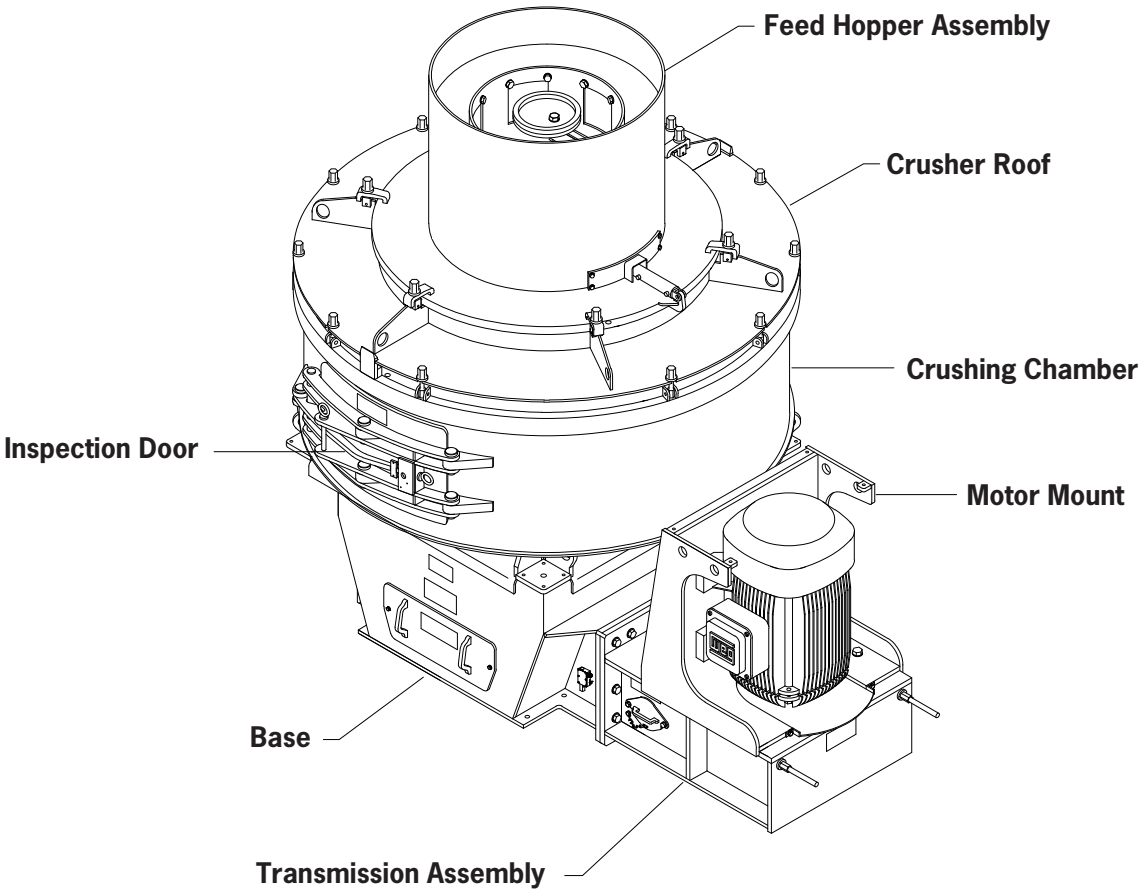
Know Your Barmac

This section has been included to introduce you to your Barmac. It will also serve to introduce you to the terms used to describe the various components and parts of your Barmac. These terms will be constantly used throughout the manual and parts listings that are provided.

VISUAL INDEX

The numbers that appear in brackets refer to the section of the manual that details the inspection and service instructions for each part or component.

General Description



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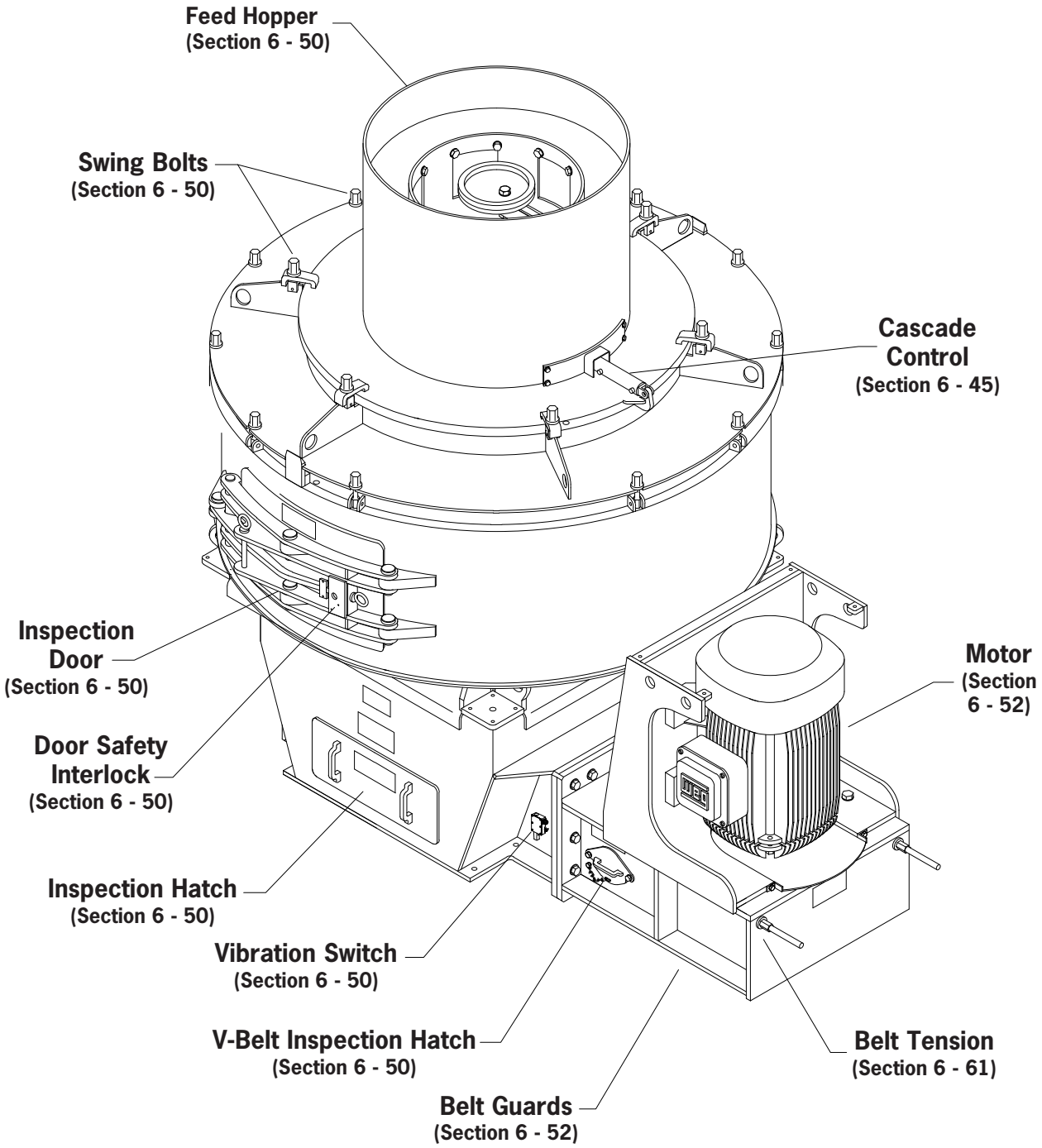
KNOW YOUR BARMAC

EXTERIOR OF THE CRUSHER



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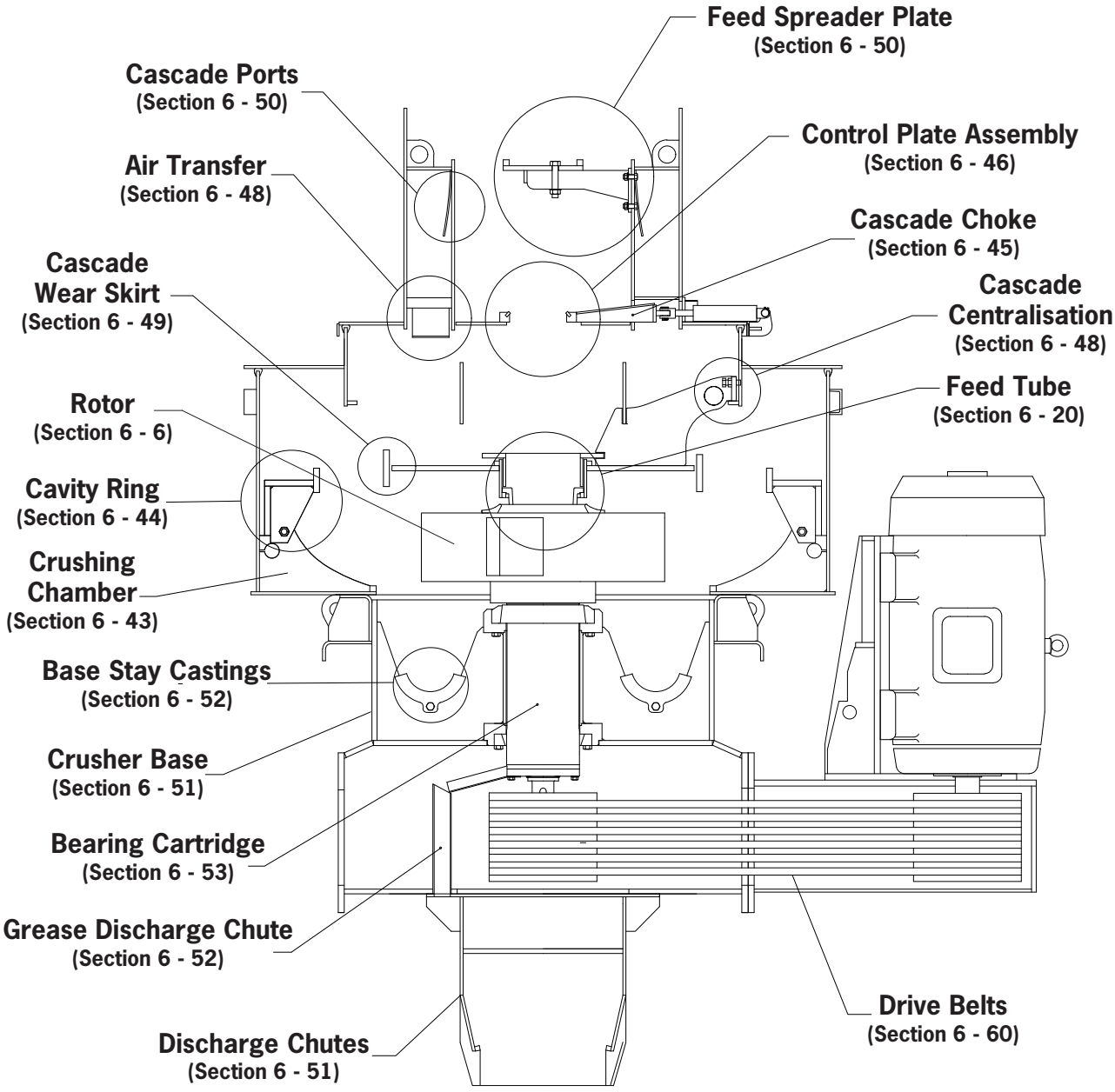
KNOW YOUR BARMAC

INTERIOR OF THE CRUSHER



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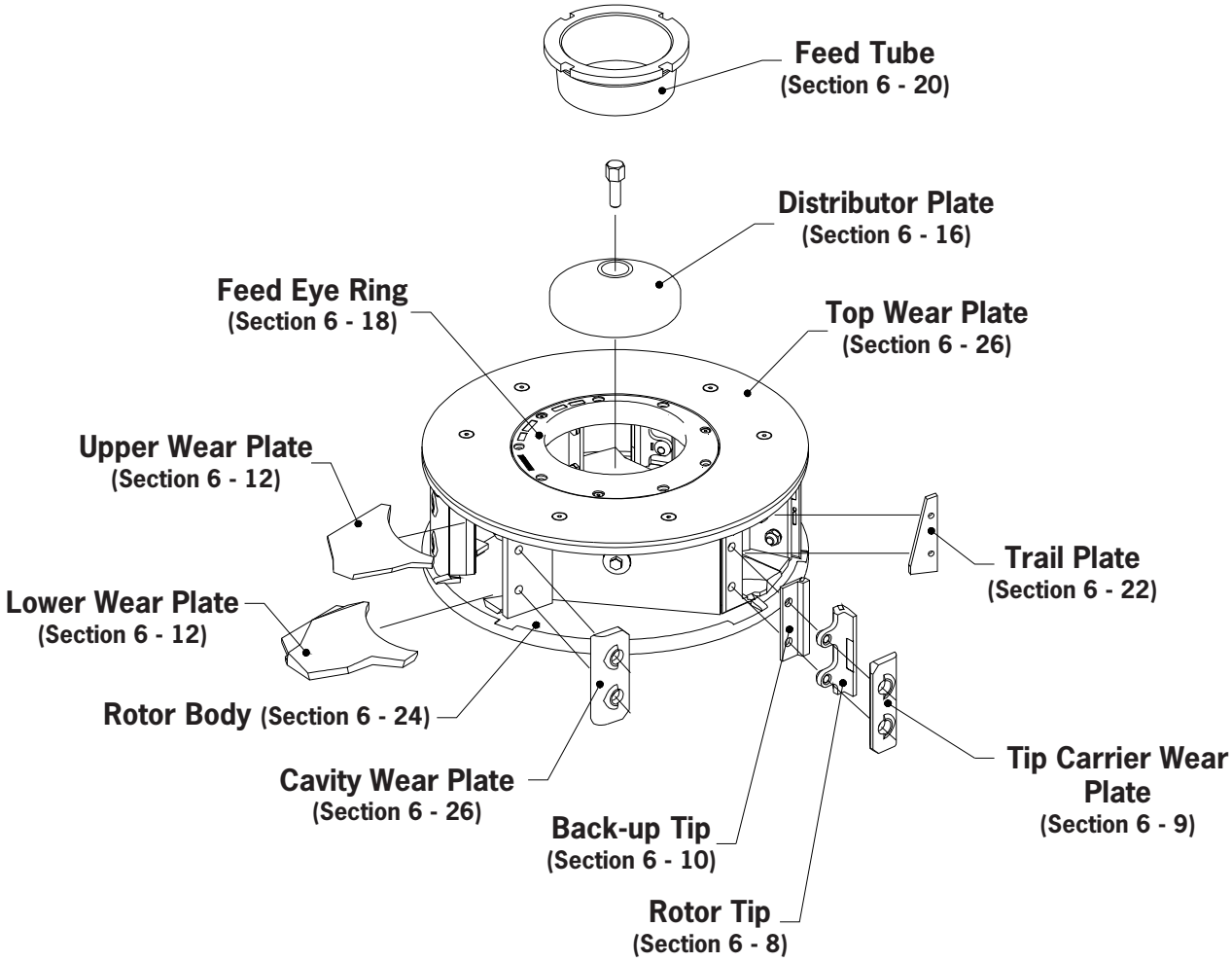
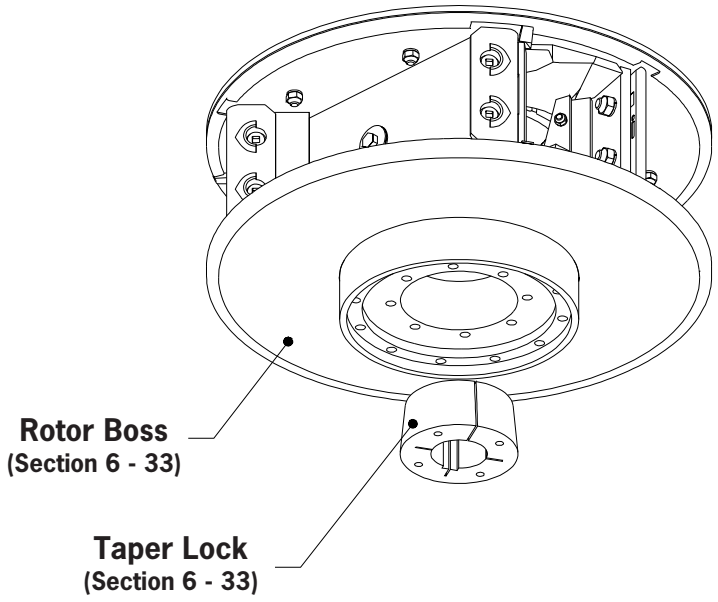
KNOW YOUR BARMAC

THE ROTOR AND WEAR PARTS





Start-up Procedure

This section describes the full start-up procedure, including the initial commissioning start-up. The start-up procedure should be used after a major repair such as bearing cartridge replacement or crushing chamber refurbishment has taken place.

BEFORE START-UP

1. Be completely familiar with the Barmac, take the time to read this manual.
2. Have all electrical connections checked, including the operation of the vibration switch.
3. Check pulley alignment and V-belt tensions. (See Belt Tensioning 6-60).
4. **Check rotor rotation – it must be counter-clockwise when viewed from above.** Severe damage to the rotor will result if the rotation is incorrect.
5. Check that a safety interlock device is connected and functioning.
6. Make sure all bolts in the rotor, crusher and main support frame are tightened to the correct torque. See installation book for correct torque details.
7. Ensure that the cascade assembly is centralised. (See section 6-48).
8. Check that all wear parts are correctly fitted in the rotor. (See section 6-6).
9. Remove all tools from on or within the crusher.
10. Ensure that all guards, doors, hatches and safety pins are in place.

INITIAL START-UP

1. Confirm ammeter is operating.
2. Run without load for 30 minutes. Grease bearing cartridge until grease flows from the grease discharge chute while the machine is running. (See greasing procedure section 6-2).
3. After 30 minutes running, stop the Barmac, remove belt guards and check bearing cartridge temperature. (Use a magnetic thermometer). The temperature should not exceed 70°C (160°F). If temperature exceeds this, continue to run Barmac with no load for a further 30 minutes and check again. If high temperatures continue contact your Barmac service centre for advice. If temperature is within normal range (see section 4-3), replace guards.
4. Inspect rotor and cascade assembly. Ensure that all rotor parts are in place. Ensure that the feed tube is still centralised in the feed eye ring. (See section 6-48).
5. Test vibration switch. (See Vibration Control System instruction manual).

Continued ▶

START-UP PROCEDURE

INITIAL FEEDING OF CRUSHER

1. The machine can now be run with a load. Feed material should be no larger than the maximum allowable feed size for the Barmac model being commissioned.
2. Feed a small sized chip or all-in product, preferably 5mm (¼ in.) for the first half minute or so. A few cubic metres/yards of material is enough. This allows an even build-up of stone in the rotor and promotes good balance.
3. If coarse feed must be used at the start, some vibration can be expected for several hours until fines are able to work their way through the voids in the initial rotor build-up and bring the density of each rotor build-up into equilibrium.
4. When first feeding the rotor there will usually be an 'out of balance' stage for about 30-60 seconds. Do not stop the feed to the rotor at this point but feed it as much as possible until the vibration settles down.

   In normal operation there is intermittent detectable vibration about 30% of the time. This can be felt when standing on the machine and is most noticeable with largest feed sizes. This is due to stone lodging by one rotor tip, causing a build-up and then being worn away. The condition is normal and no cause for concern provided the machine returns to normal running after a few seconds.

AFTER 10 MINUTES

1. Centre the spreader plate under conveyor discharge so feed falls in an even curtain around the spreader. The feed should fall squarely through the control plate feed opening (i.e. not at an angle). This stabilises rotor feed. Watch for involuntary cascading through material being directed towards the cascade ports in the feed hopper.
2. Check motor power draw. If motor(s) are overloaded, reduce feed volume or adjust cascade control until ammeter reading is corrected. If dual drive motors are running at different amps see belt tensioning (section 6-60).

AFTER 30 MINUTES

1. Stop machine and check build-up in rotor. For ideal build-up see rotor tuning (section 6-28).
2. Check crushing chamber build-up. (See section 6-43 for ideal build-up).
3. Make sure feed tube is in correct position in rotor, i.e. central in rotor feed hole and extending into rotor. (See section 6-20).
4. Check that rotor tip assemblies are intact and tight.
5. Check feed eye ring has not turned or lifted.
6. Check belt tensions. (See section 6-60).

Continued ▶

START-UP PROCEDURE

AFTER 4 HOURS

1. Check build-up in rotor, crushing chamber and base.
2. Check bearing temperatures. (See below).
3. Check belt tensions.
4. Grease at the end of the shift, and perform daily inspections as listed.
5. Once the machine has settled down to normal running, adjustment of the cascade can be undertaken. (See section 5-2).

BEARING OPERATING TEMPERATURE

Normal bearing temperature is 30° to 40°C (54° to 72°F) above feed material or ambient temperature. A short duration temperature rise of approximately 10°C (18°F) can be experienced when bearings are lubricated.

The maximum permissible bearing temperature for continuous running is:

70°C (160°F) – Normal temperature service.

150°C (300°F) – High temperature service.

Operation

During operation it is important that the operator pays attention to the following:

1. **AMMETER READING** – watch for major fluctuations.

   High amps could indicate high feed rates, extreme build-up in the chamber or the base, blocked discharge chutes, incorrect cascade adjustment, mechanical or electrical problems.

   Low amps could indicate low feed rates, incorrect cascade adjustment, V-belt slippage, electrical problems.

   Unbalanced amps in a dual drive unit could indicate incorrectly tensioned V-belts, electrical or mechanical problems.

2. **NOISE LEVELS**

   An increase in noise level could indicate bearing failure, V-belt slippage, scouring of build-up in crushing chamber, feed tube rubbing on feed eye ring.

3. **VIBRATION**

   An increase in vibration could indicate uneven wear on wear parts or rotor, unbalanced rotor due to uneven build-up in rotor, failure of anti-vibration pads, loose rotor or pulley taper lock.

   THE VIBRATION SWITCH FITTED TO THE BARMAC WILL, IF CORRECTLY ADJUSTED, SENSE OUT-OF-BALANCE VIBRATION AND SHUT DOWN THE CRUSHER BEFORE ANY DAMAGE OR DANGER TO PERSONNEL OCCURS.

4. **FLOW OF MATERIAL**

   Changes in feed conditions could require adjustment of the feed plate and control choke in the feed hopper. Increases in moisture content may increase build-up in the rotor, crushing chamber and base. Observing the discharge of the Barmac will often warn an operator of build-up problems.

5. **DUST EMISSION**

   The Barmac should not emit dust while being fed material. If the crusher is emitting dust the following points should be checked:

   Feed rate – Very low feed rates may cause the Barmac to discharge dust from the discharge chutes.

   Blocked air transfer – Moist feeds may promote the blocking off of the air transfer.

OPERATION

FEED CONTROL

The aim of feed control is to govern the rotor feed volume so that the motor(s) run at full load current. This is done by restricting the rotor feed with the cascade control unit. Any excess feed which does not go through the rotor will cascade.

Product grading can also be controlled by varying the percentage of cascade feed to rotor feed. As the volume of cascading material increases, the product grading will become coarser.

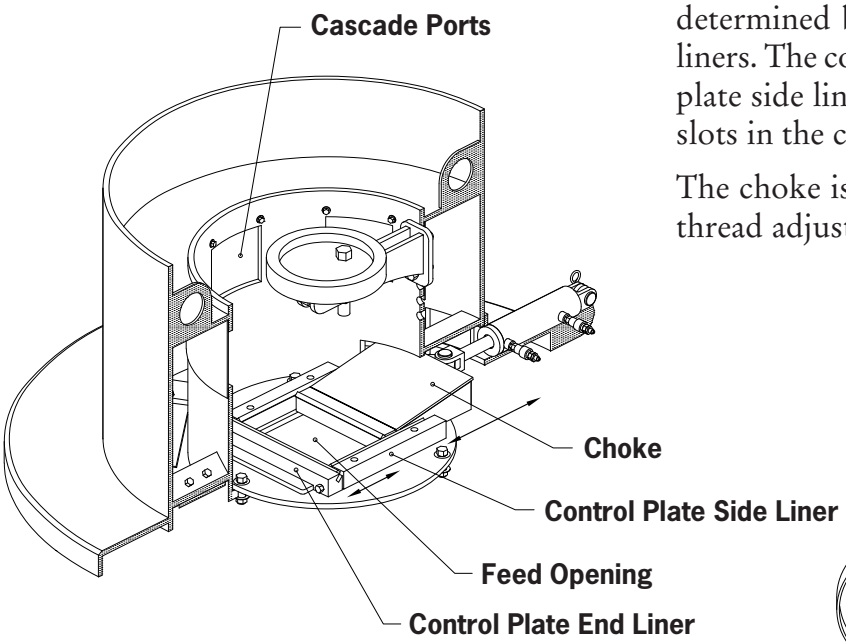
The cascade volume is varied by adjustment of the control plate feed opening choke, to increase or decrease the feed opening size.

The basic principles of cascade control are:

1. Increasing the opening size decreases or eliminates material flow to the cascade and results in more reduction.
2. Decreasing the opening size commences or increases material flow to the cascade and results in less reduction.

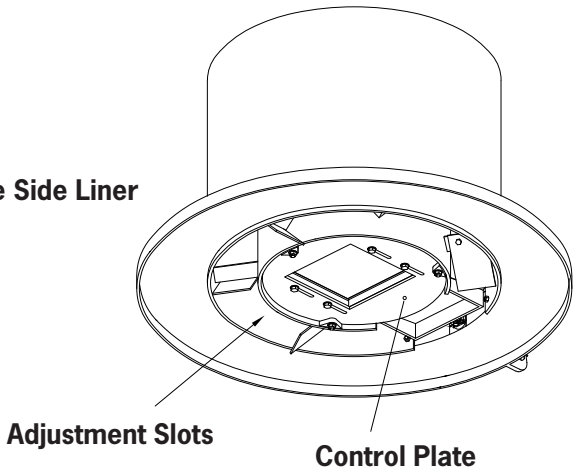
NOTE: The feed opening should not be reduced to a point where bridging of the feed opening may occur.

Use the feed spreader plate in the feed hopper by positioning it under the conveyor discharge so that feed material drops directly down the feed opening. If feed enters the hopper at an angle it may enter the cascade involuntarily.



The maximum feed opening size is determined by two adjustable feed opening liners. The control plate end liner and control plate side liner have an adjustment using the slots in the control plate, shown below.

The choke is adjusted by a two-way ram or thread adjuster in the small models.



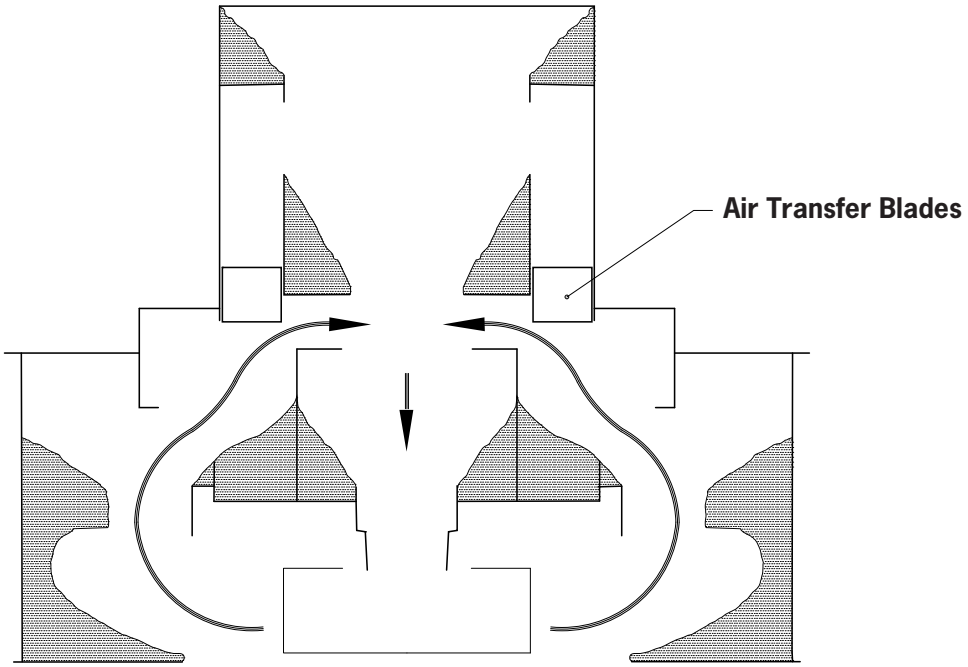
OPERATION

DUST CONTROL

When in operation, the rotor acts as a powerful fan. To control dust emissions from the crusher, the air transfer, which is incorporated in the hopper assembly, recycles air within the machine, minimising air being sucked in and discharged with the material.

The basic rule is that any air sucked in with the feed will be blown out with the product, so to minimise dust, the air transfer system has been developed to strike a balance, so that no air is sucked in and therefore little dust is blown out.

Under some conditions it may be necessary to tune the dust control system. For example, at high rpm and with very fine-grained materials the system may suck air in from the product discharge chutes and blow it out of the cascade ports to the atmosphere. By removing some of the air transfer blades, it is possible to achieve a satisfactory balance. (See section 6-48).



If dust is blowing out from the bottom of the machine, this indicates that the unit is being under-fed. If the feed rate cannot be increased, close off the control plate feed opening to minimise the rush of air.

While it is not generally necessary to suppress dust within a Barmac (either by dry dust collection or mist spray suppression), the turbulent activity within the Barmac crushing chamber makes it an ideal environment for the addition of small quantities of water by means of mist sprays to effectively control dust in other parts of the process plant downstream of the Barmac.

OPERATION

SHUT DOWN PROCEDURE

Extended periods of running out the circuit with low feed rates to the Barmac can result in undue wear to the crushing chamber and rotor body. If the crushing circuit and weather conditions permit, stop all conveyors before the Barmac fully loaded. At the very least be aware of the excessive wear that takes place and minimise the run-out time.

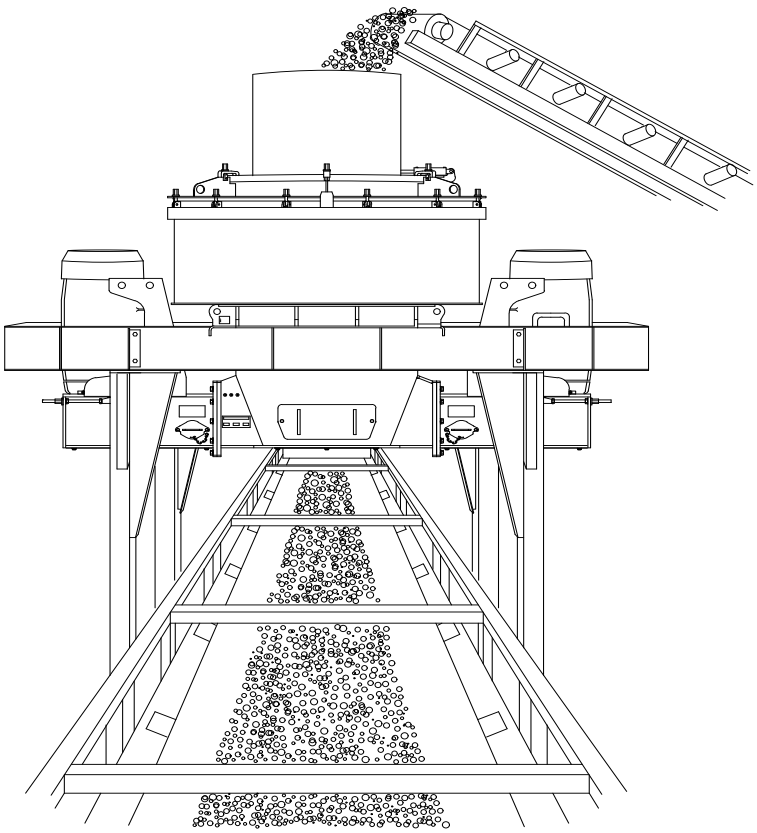
SHUT-DOWN

1. Shut down feed device (conveyor or feeder) before the Barmac.

2. Observe ammeter unload prior to disconnecting power from the Barmac.

3. Time run-down time of rotor and record in Daily Log Book. Measuring the run-down time of the rotor will provide a good guide to the condition of the bearing cartridge. The commissioning records for your unit will have the rotor run-down time recorded. This will be located in the owners manual. If you cannot locate this contact your Barmac Service Engineer.

4. Prior to any servicing or maintenance ensure that a safety interlock system provides you with control over the power supply to the crusher.



Inspection and Servicing

The Barmac is a rugged machine which is mechanically simple and extremely easy to maintain. The machine does however require ROUTINE and REGULAR inspections and attention.

The machine should not be ignored for lengthy periods, during which potentially serious damage to wear parts may remain undetected.

Long service and consistent trouble-free operation are the rewards of regular inspection.

IMPORTANT NOTE: Barmac rotor wear parts are designed to protect the rotor body from wear. They are not involved in the crushing action of the machine. Consequently it is not possible to determine the state of wear of these parts from the product discharging from the crusher.

regular basis

Metso Minerals recommend that you should carry out the following every 8 to 10 hours of operation:

1. **GREASE BEARING CARTRIDGE.**
2. **INSPECT EXTERIOR OF CRUSHER.**
3. **INSPECT INTERIOR OF CRUSHER.**
4. **INSPECT ROTOR**

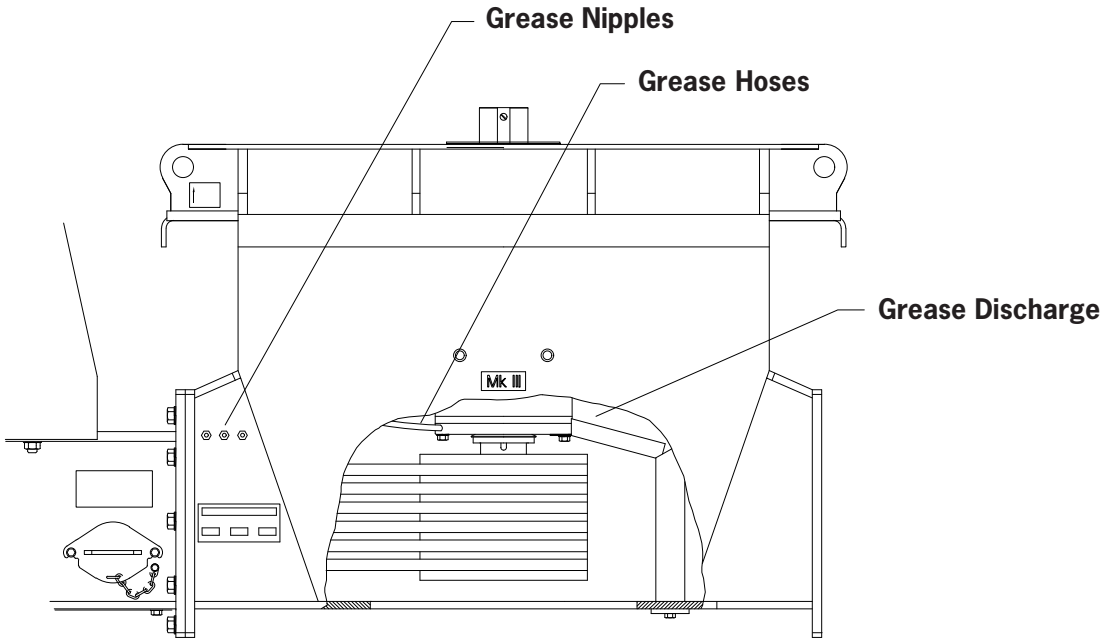
Metso Minerals recommends the use of a Barmac Daily Log Book to record inspection and replacement of parts. Service personnel will find the log book extremely helpful in assisting you to maximise the life of the wear components in your Barmac.

LUBRICATION

BEARING CARTRIDGE

THE BEARING CARTRIDGE MUST BE GREASED EVERY 8 TO 10 HOURS OF OPERATION

The best practice is to grease the bearings when the bearing cartridge is at operating temperature while the machine is running at the end of each production shift.



GREASE REQUIREMENT

The following amounts are recommended for every 8-10 hours of operation:

Barmac Duopactor Model	Each Nipple
B3000	5g (0.18 oz)
B5000	8g (0.28 oz)
B6000	10g (0.35 oz)
B7000	15g (0.53 oz)
B8000	15g (0.53 oz)
B9000	15g (0.53 oz)

Continued ▶

LUBRICATION

BEARING CARTRIDGE

RECOMMENDED GREASES

Feed Material Temperature °C (°F)	Barmac Model	Rotor Speed (RPM)	Grease Brand and Type
-20 to 65	B3000	3000 to 4200	Shell Alvania EP2
(-4 to 149)	B5000	2100 to 2800	Mobil Mobilux EP2
Normal Service	B6000	1400 to 2000	BP Energrease LS-EP2
Bearing Cartridge	B7000	1300 to 1700	Mobil Mobilith SHC100
(Low Speed)	B8000	1100 to 1700	Arcanol L135V
	B9000	1100 to 1400	Castrol Optimol Longtime PD2
-20 to 65	B3000	4200 to 5300	Mobil Mobilith SHC46
(-4 to 149)	B5000	2800 to 3600	Castrol Optimol Longtime PD2 ✔
Normal Service	B6000	2000 to 2500	Arcanol L135V
Bearing Cartridge	B7000	1700 to 2200	Kluber Isoflex Topas NB152 ✖
(High Speed)	B8000	1700 to 2000	
	B9000	1400 to 1800	
60 to 100	B3000	3000 to 5300	Mobil Mobilith SHC220 ✔
(140 to 212)	B5000	2100 to 3600	Shell Stamina U2 ✖
High Temp.	B6000	1400 to 2500	BP Synthetic HT-XP ✖
Bearing Cartridge	B7000	1300 to 2200	
(All Speeds)	B8000	1100 to 2000	
	B9000	1100 to 1800	

✔ Indicates preferred grease. Bearing cartridges are pre-lubricated with this grease type.

✖ Indicates that this type of grease is not compatible with any of the others. If this grease is used, the cartridge must first be completely stripped, cleaned and reassembled to ensure maximum bearing service life.

Continued ▶

LUBRICATION

BEARING CARTRIDGE

Please note that the bearing cartridge in the Barmac presents a very unique set of operating conditions for the bearings and for this reason, selection of alternative grease types is not a straight forward task. Grease properties to consider include thickener type, base oil viscosity and the inclusion of tackiness additives. Consideration must also be given to mixability of any new grease with the grease already in the bearing cartridge. Mixing (especially of different thickener types) causes unpredictable lubrication conditions and possibly premature failure of the bearing cartridge.

If you wish to use a grease that is not on the list, please consult your Barmac dealer to confirm its suitability for the specific application in question. This will be determined based on your particular application It is **not** recommended that you use an equivalent grease as promoted by various oil companies and organisations without first consulting Metso Minerals (Matamata), New Zealand.

OPERATING TEMPERATURE

Normal bearing temperature is 30° to 40°C (54° to 72°F) above feed material or ambient temperature. A short duration temperature rise of approximately 10°C (18°F) can be experienced when bearings are lubricated.

The maximum permissible bearing temperature for continuous running is:

70°C (160°F) – Normal temperature service.

150°C (300°F) – High temperature service.

GREASE DISCHARGE

Ensure that the grease discharge is away from the V-belts and grease hoses are undamaged.

It is also a good practice to perform a weekly inspection of the grease discharge to ensure that it is not blocked, which may lead to pressure build-up inside the cartridge; breakdown of grease inside, etc.

Continued ▶

LUBRICATION

BEARING CARTRIDGE

AUTOMATIC LUBRICATION

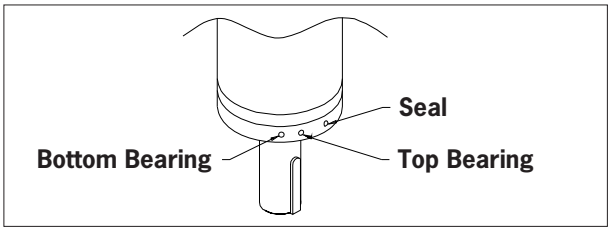
Whilst Metso Minerals make no particular recommendations for automatic lubrication, these systems can be used on the Barmac.

The total quantity of lubrication applied over an 8-10 hour operating period should not exceed the total quantity as for manual lubrication (page 6-2) over this same period.

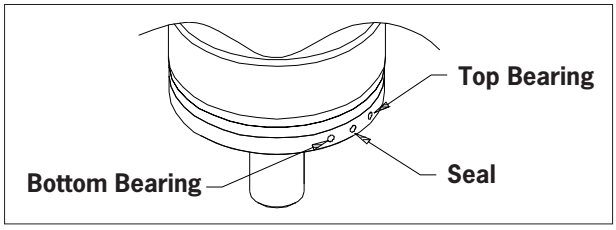
The top seal plate may benefit from a more frequent/higher quantity grease application. If contamination of the top seal is known to be a problem, an increase in quantity over the above that listed in the table can safely be applied.

NOTE: It is essential that the grease points are properly identified so that grease directed at the top seal is not mistakenly applied to the bearings.

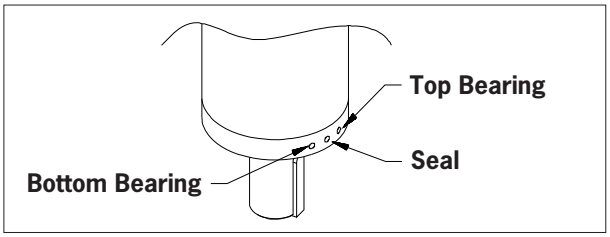
The grease points can be identified on the bearing housing as follows:



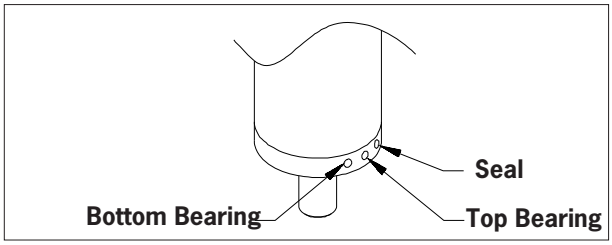
B9000



B8000, B7000, B6000



B5000



B3000

ROTOR SERVICING

Please observe the correct shut-down procedures. (See section 5-4 of this manual). Prior to any internal inspection/service ensure that a safety interlock system provides you with control over the power supply to the crusher.

The rotor assembly is the main wearing component of the Barmac, and regular and timely inspection of wear parts will extend the life of the rotor. If wear parts are not replaced when required, severe damage or even total destruction of the rotor body may result.

ACCESS

While wear patterns and wear rates can be observed with the rotor in place, it may be necessary or desirable to remove the rotor from the crusher to replace any worn wear parts.

In this manual we have assumed that the parts are being replaced with the rotor in the machine. The major problem with this can be the removal of the build-up of material in the rotor around the wear parts.

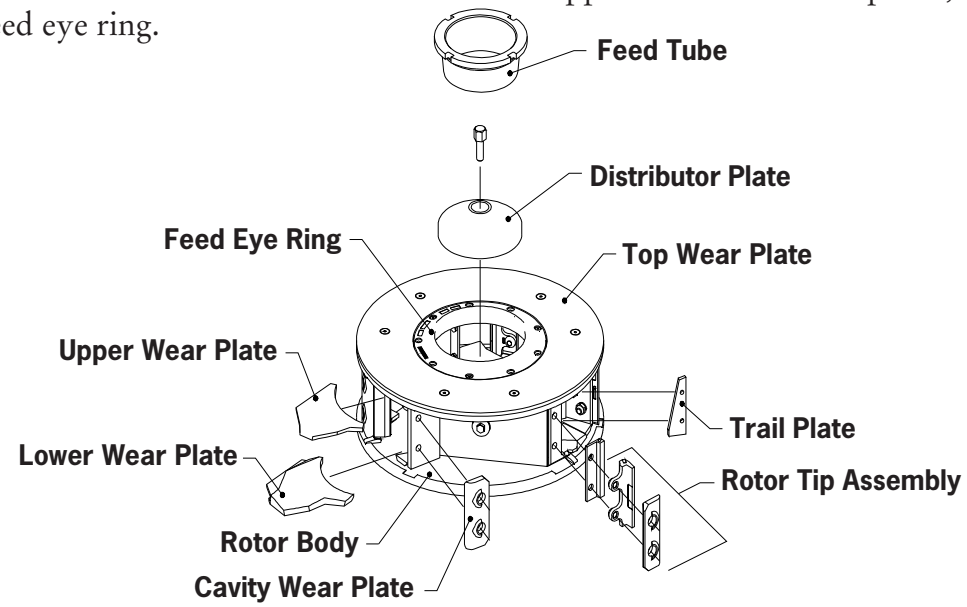
CLEANING OUT ROTOR

The most successful method of removing the build-up is by using water. If a hose pipe is available at the crusher it is quite in order to "wash out" the build-up by inserting the hose pipe into the hopper, directing the water into the rotor while the crusher is running.

WARNING: Do not insert the hose pipe into the rotor, **direct** the water flow only into the rotor.

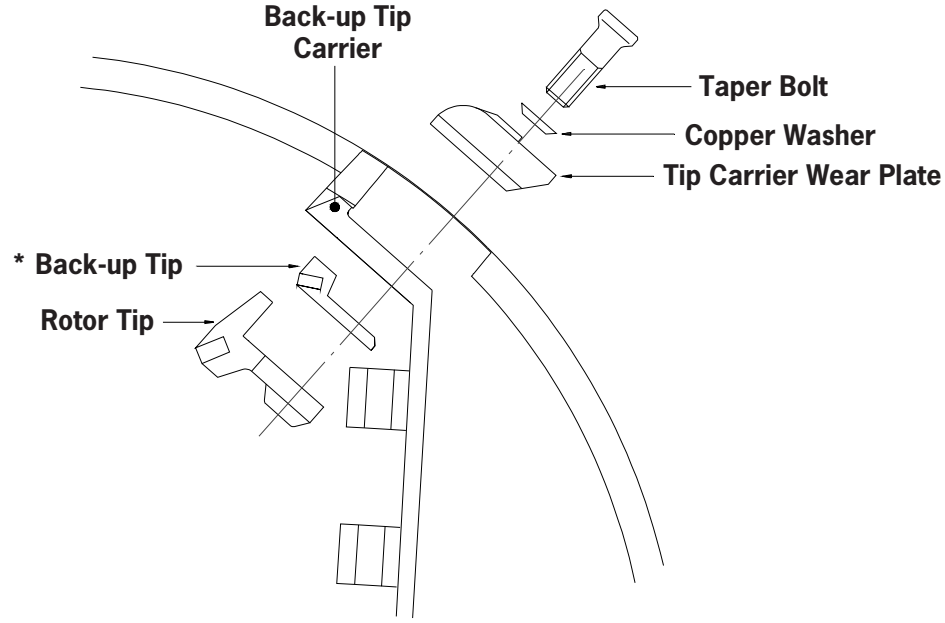
The use of water into the rotor may scour out the build-up in the crushing chamber. This in itself is not a problem but if the feed size is at the maximum, chamber gusset wear will result until the build-up in the crushing chamber is replaced on start-up.

If a hose pipe is not available near the crusher it may be possible to remove build-up with a podger bar. If this is not possible or too time consuming, then it will be necessary to remove the rotor from the crusher for the removal of the upper and lower wear plates, distributor plate and feed eye ring.



ROTOR SERVICING

ROTOR TIP ASSEMBLY

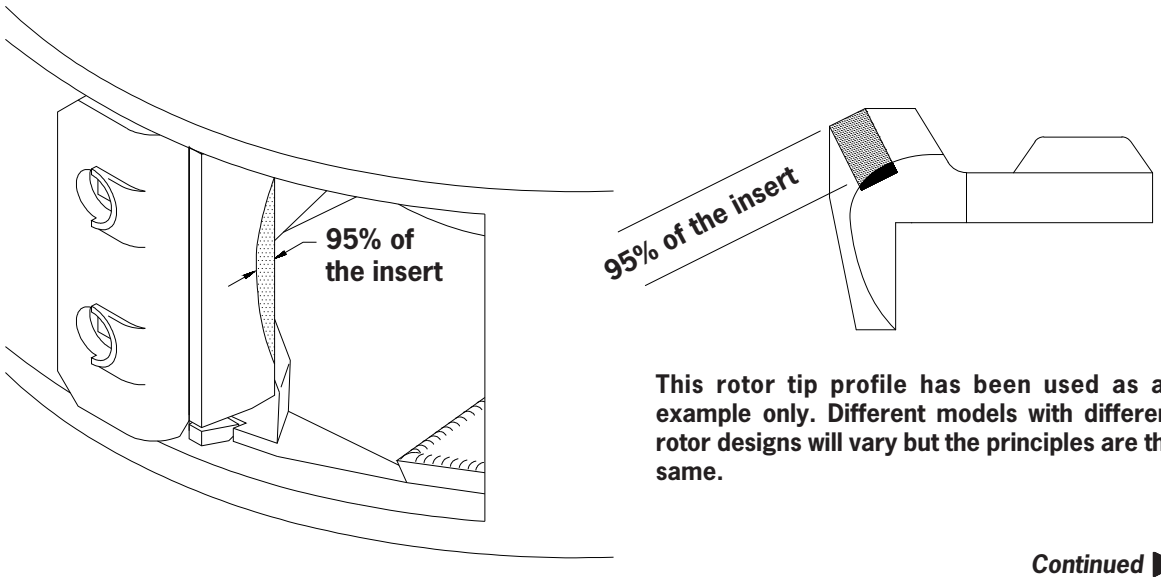


*** The smaller rotors do not have a back-up tip and the bolting arrangement is different but the assembly is similar.**

ROTOR TIPS

Rotor tips must be checked to determine the amount of wear on the inserts. Tips need to be replaced once 95% of the insert has been removed at the centre of the wear. **The back-up tip assembly will protect the rotor body from damage,** therefore a tip in this condition could be run for another shift. Experience will help the operator understand the wear performance of the tip.

Ensure that the rotor tips are tightly held and not broken, cracked or badly chipped.



This rotor tip profile has been used as an example only. Different models with different rotor designs will vary but the principles are the same.

Continued ▶

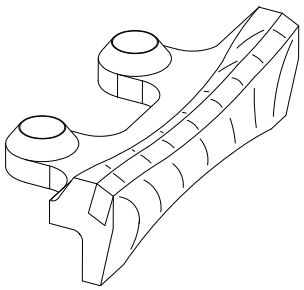
ROTOR SERVICING

ROTOR TIP ASSEMBLY

ROTOR TIPS

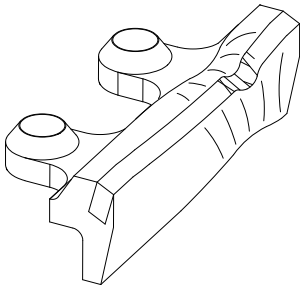
Normal Wear

The rotor tips are wearing normally. Replace when less than 3mm (⅛ in.) of insert remains at the centre of the wear, or if tip will not last another shift.



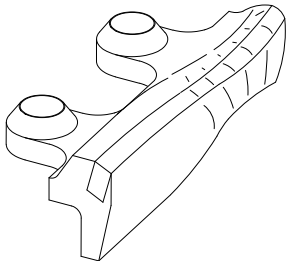
Cracked or Chipped Inserts

Tramp iron in feed. Remove tramp iron. Oversize feed material. Investigate cause of oversize. Reduce maximum feed size.



Off Centre Wear

The rotor tips are wearing at the top or bottom not in the centre. Trail plate angle may require altering (refer to rotor tuning section 6-28).



SELECTION OF ROTOR TIPS

A range of rotor tips is available to suit differing feed material characteristics and operating conditions. The rotor tips supplied with your machine have been carefully chosen to suit your requirements. However, changing feed material can require the re-selection of the rotor tips.

For information regarding rotor tip options, contact your Barmac representative.

Continued ▶

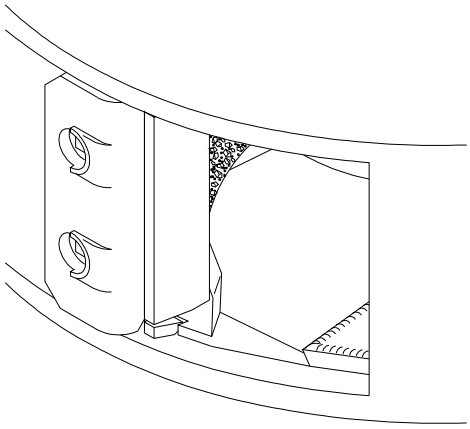
ROTOR SERVICING

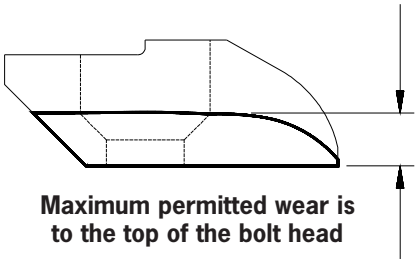
ROTOR TIP ASSEMBLY

TIP CARRIER WEAR PLATES

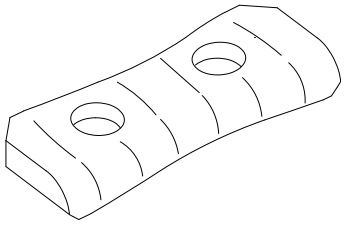
Initially, the tip carrier wear plates may wear quickly until they reach a certain profile governed by the application. This is quite normal and should not cause concern.

Tip carrier wear plates must be inspected for wear and be replaced when there is doubt they will last another shift, or as soon as wear appears on the top of the bolt head. Replace tip carrier wear plates which have cracked. Check that tip carrier wear plates are not loose.



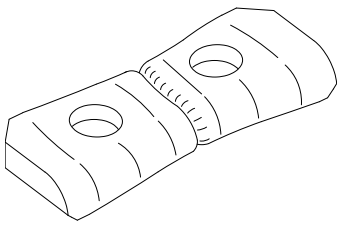


This tip carrier wear profile has been used as an example only. Different rotor designs have different tip carrier wear plates but the principles are the same.



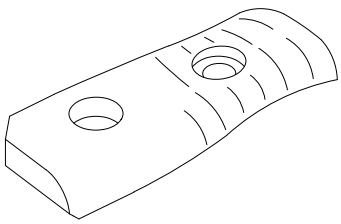
Normal Wear

The tip carrier wear plates are wearing normally. Replace when wear just starts to show on bolt head.



Cracked Tip Carrier Wear Plates

Caused by tramp iron, oversize feed, excess build-up with damp/sticky material or uneven mating surface. Remove tramp iron. Reduce feed size. Ensure that mating surfaces are flat, i.e. there is no spatter or grit between tip carrier wear plate and back-up tip. (See Rotor Tip Assembly Removal/Installation section 6-11).



Uneven Wear

Tip carrier wear plates are wearing at the top or bottom not in the centre. Adjust trail plate angle. (See rotor tuning, section 6-28).

Uneven wear can also be caused by excessive crushing chamber build-up.

Premature top wear can be indicative of a worn cavity ring and/or cascade wear skirt.

Premature bottom wear can be indicative of excessive build-up in the base.

Continued ▶

ROTOR SERVICING

ROTOR TIP ASSEMBLY

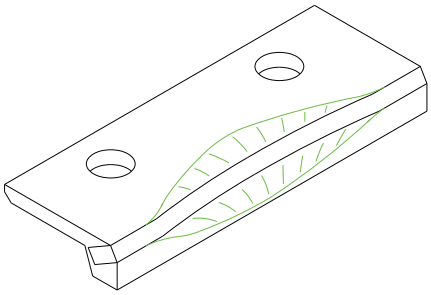
BACK-UP TIPS

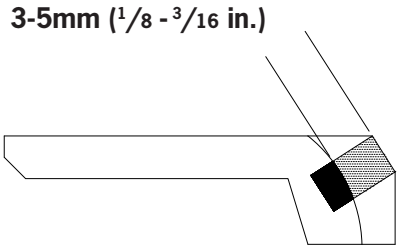
In normal operation the back-up tip should be unused and in many cases is not visible (depending on rotor tip and tip carrier wear plate style used).

Normal Wear

The back-up tip is only exposed to wear when the rotor tip has failed or worn out. In the event of emergency use of the back-up tips, they should be replaced once there is only 3-5 mm (⅛ - 3⁄16 in.) of insert remaining at the centre of the wear path.

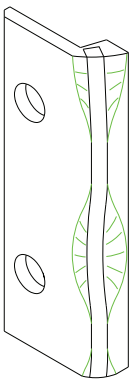
Back-up tips should also be replaced if the insert is cracked or badly chipped.





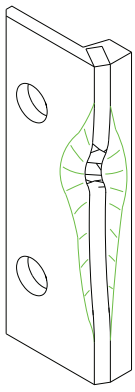
Irregular Wear

Rotor tips being left in place too long and wearing out.



Back-up Tips Breaking

Rotor tip failed, exposing back-up tip, usually caused by tramp iron or oversize feed or having been worn too thin.



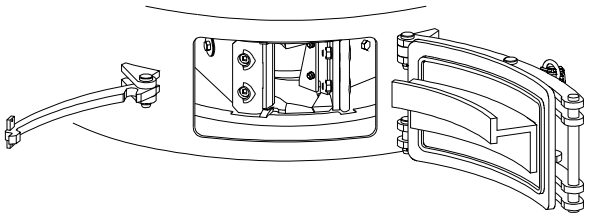
> ⚠ ***WARNING:*** **If the back-up tip fails or is worn out the flow of material will severely damage or even destroy the rotor body.**

Continued ▶

ROTOR SERVICING

ROTOR TIP ASSEMBLY

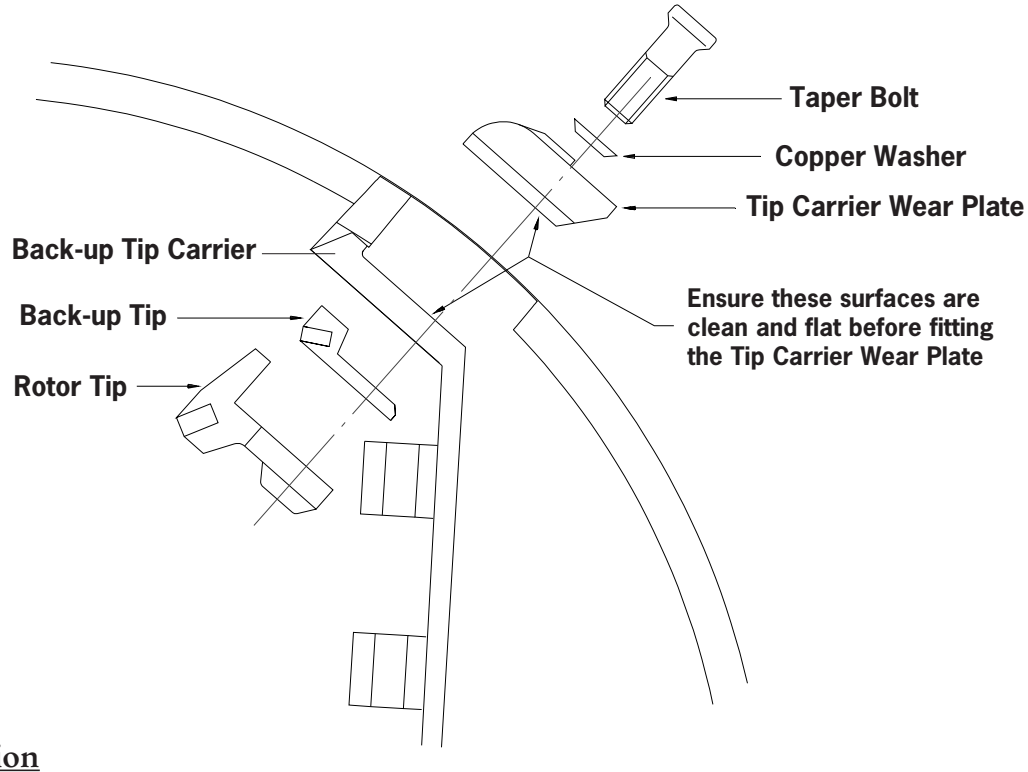
ACCESS: Through inspection door.



REMOVAL/INSTALLATION

Removal

Remove taper bolts. Tap rotor tip inward to break away build-up that will hold tip and back-up tip in place. It may be necessary to use a bar to chisel away very tightly compacted build-up. If this condition persists it is advisable to wash out build-up with water. (See 6-6).



Installation

Ensure that all mating surfaces on rotor tip, tip carrier wear plates and back up tips are free of any high spots (dirt, weld spatter, burrs).

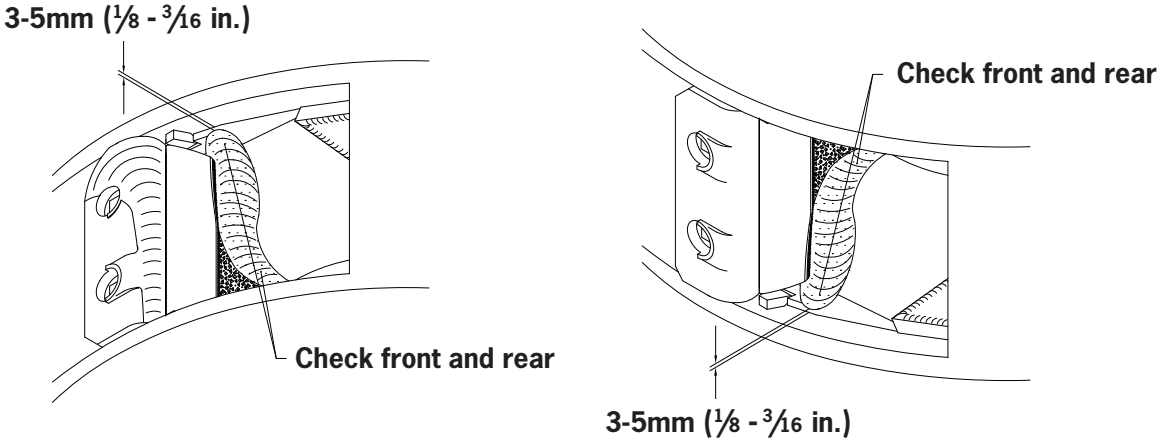
Position back up tip, rotor tip and tip carrier wear plate in rotor port. Insert taper bolts, ensure that copper washer is in place, and tighten. (Applying anti-lock compound to thread will make removal easier). Ensure that tip assembly is pulled up tight and that there is no movement in the parts. (See torque settings 6-64).

NOTE: ROTOR TIPS, TIP CARRIER WEAR PLATES AND BACK-UP TIPS MUST BE CHANGED AS SETS. DO NOT REPLACE SINGLE PARTS OR A ROTOR OUT-OF-BALANCE CONDITION MAY RESULT.

ROTOR SERVICING

UPPER AND LOWER WEAR PLATES

Replace upper and lower wear plates when it is obvious that they will not last another shift. Replace once there is less than 3-5 mm. (⅛ - 3⁄16 in.) of plate remaining at the centre of the wearpath at the discharge edge or inside edge.



Upper Wear Plate

Rapid upper wear plate wear is an indication that the feed tube and feed eye ring are worn. Replace worn parts.

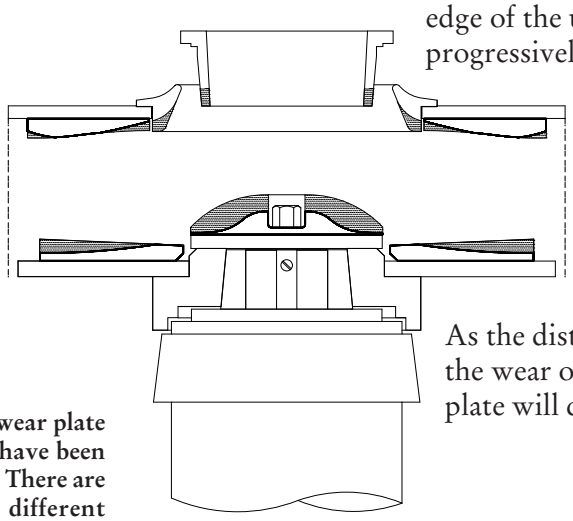
Upper wear plate wear accompanied by rotor tip top end wear is an indication that the trail plates are incorrectly shaped. Adjust trail plates as described in rotor tuning, section 6-28.

Lower Wear Plate

Lower wear plate wear accompanied by rotor tip bottom end wear is an indication that the trail plates are incorrectly shaped. Adjust trail plates as described in rotor tuning, section 6-28.

Other Influences

As the feed eye ring wears the leading edge of the upper wear plate is progressively exposed to wear.



As the distributor plate wears the wear on the lower wear plate will deepen.

The upper and lower wear plate profiles shown above have been used as examples only. There are different profiles for different rotors, but the principle is the same.

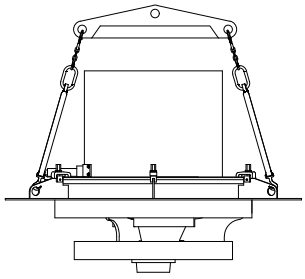
Continued ▶

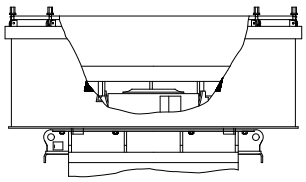
ROTOR SERVICING

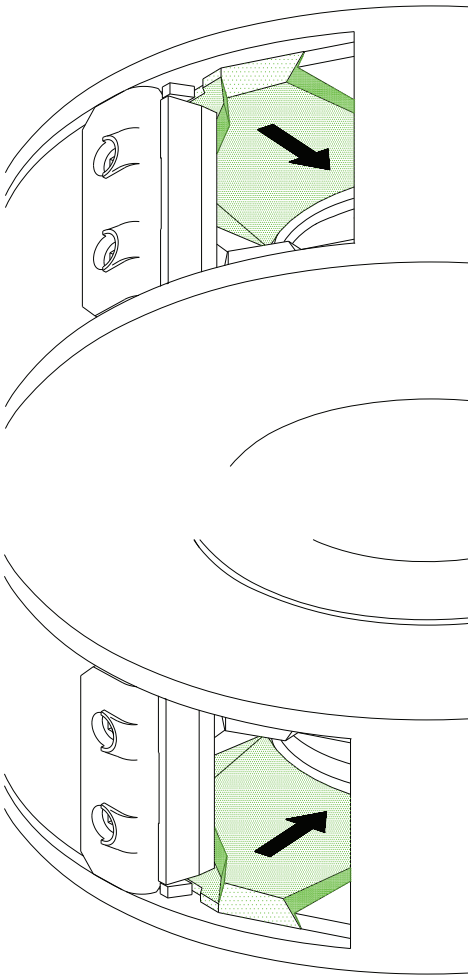
UPPER AND LOWER WEAR PLATES

REMOVAL/INSTALLATION

It is possible to remove and install the upper and lower wear plates while the rotor is in place, however it is necessary to clean out the build-up thoroughly. This can be done by using water as described in rotor servicing 6-6.







Removal

Upper Wear Plates

1. Remove hopper, crusher top and cascade assembly in one lift.
2. Remove rotor tips and tip carrier wear plates.
3. Remove feed eye ring.
4. Tap the wear plate towards the centre of the rotor to release it from the keepers.
5. Withdraw the plate through the feed hole.
6. Thoroughly scrub out the remaining build-up with a wire brush or hose pipe.

Lower Wear Plates

1. Remove rotor tips and tip carrier wear plates.
2. Remove the distributor plate.
3. Tap the wear plate towards the centre of the rotor to release it from the keepers.
4. Withdraw the plate through the feed hole.
5. Thoroughly scrub out the remaining build-up with a wire brush or hose pipe.

Installation

1. Ensure mating surfaces are clean and free of snags.
2. Insert new wear plate through the feed opening and slide into place.
3. Ensure the new plates are wedged under the keepers.

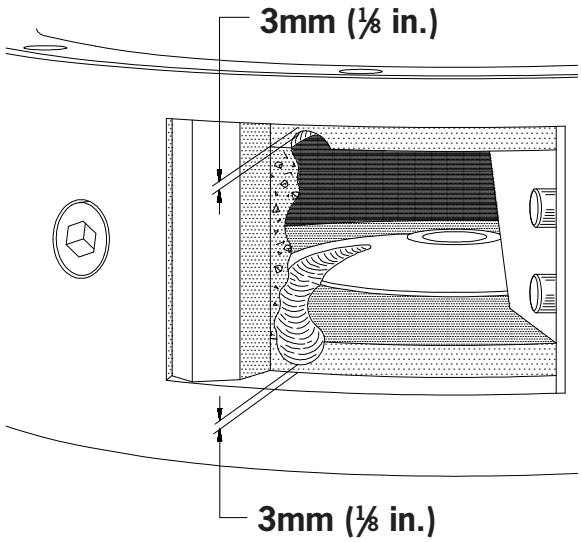
• See over for 300mm rotor instructions.

ROTOR SERVICING

300mm ROTOR UPPER AND LOWER WEAR PLATES

ADJUSTING / REPLACING UPPER WEAR PLATE

The 300mm rotor upper wear plate can be re-positioned three times for three lives before it is worn out. When worn as shown below:



1. Remove rotor from crusher.
2. Thoroughly clean wear plate and build-up in rotor, especially the bolting face of the wear plate.
3. Check the wear paths on the underside of the wear plate (fig. 1), they should be of even width, depth and position. If so, plate can be re-fitted. Uneven wear paths are caused by uneven trail plates. These should be checked. See rotor tuning 6-28.
4. Balance rotor with plates positioned so a new unworn area is next to the rotor tip.
5. Mark position of plate to rotor when balanced and remove plate.
6. When rotor body is refitted to shaft, position wear plate in correct balanced position as marked earlier, lubricate screw threads, fit aluminium taper washers and screws and torque to 30 Nm (15 lb ft).
7. If after re-starting and feeding a small amount of material, the rotor runs heavily out of balance, the wear plate is probably unbalanced and will have to be checked.

ROTOR SERVICING

300mm ROTOR UPPER AND LOWER WEAR PLATES

ADJUSTING / REPLACING LOWER WEAR PLATE

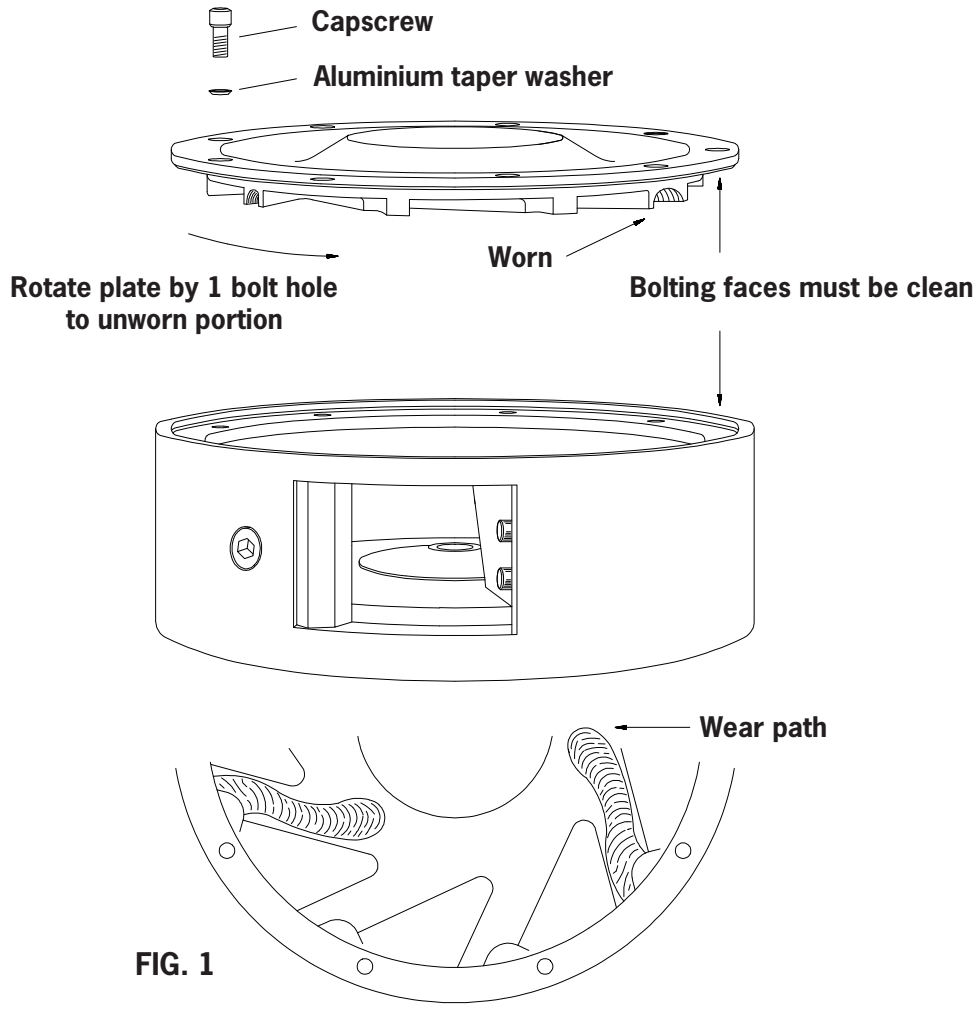


FIG. 1

As with the upper wear plate, the 300mm rotor lower wear plate can be re-positioned three times for three lives before it is worn out. To rotate or replace:

1. Remove rotor from crusher.
2. Remove upper wear plate, rotor tips and trail plates and clean out rotor (see changing upper wear plate).
3. Lift out lower wear plate and clean thoroughly. Check that wear paths on the wear plate are of even width, depth and position. If so, plate can be re-fitted. Uneven wear paths are caused by uneven trail plates. These should be checked.
4. Re-fit plate, positioned so a new unworn area is next to the rotor tip. Make sure the wear plate is sitting down flat and not resting on any grit, etc.
5. Rebalance rotor. (See section 6-36).

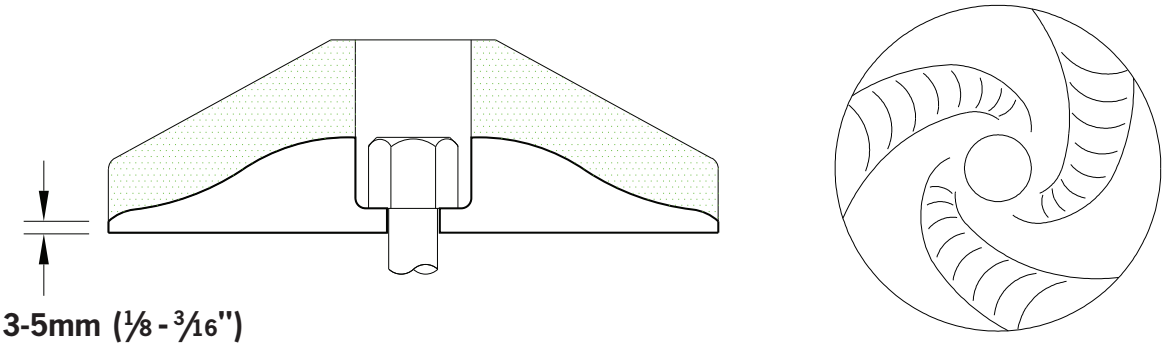
ROTOR SERVICING

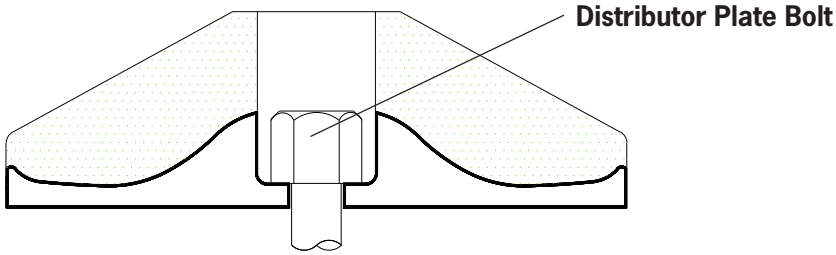
DISTRIBUTOR PLATE

The distributor plate wears in three places, opposite each rotor port.

Turn the distributor plate 1/6th of a turn when partly worn to ensure maximum usage.

Replace distributor plate once the bolt head starts to wear or once there is only 3-5mm (⅛ - 3⁄16") of casting left at the thinnest point.





Premature Wear

Generally caused by oversize feed or material dropping from a conveyor or screen chute directly onto the distributor plate.

Reduce feed size. Install or centralise spreader plate in feed hopper. Change distributor plate type.

SELECTION OF DISTRIBUTOR PLATE

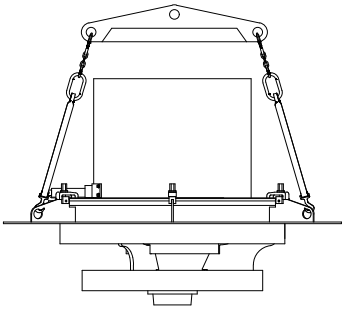
Different types and shapes of distributor plate are available. Please contact your dealer for more information.

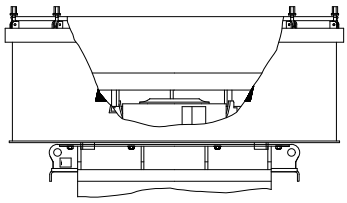
Continued ▶

ROTOR SERVICING

DISTRIBUTOR PLATE

REMOVAL/INSTALLATION





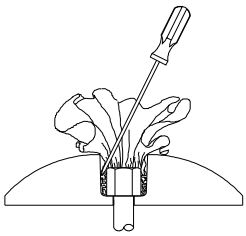
Removal

1. Remove hopper, crusher top and cascade assembly in one lift.
2. Remove feed eye ring. (See 6-19).
3. Remove stones and protective rag from distributor bolt hole.
4. Remove distributor plate bolt.
5. Distributor plate lifts out.

Refitting

1. Ensure the top plate surface is clear of obstructions before fitting the distributor plate to protect the distributor plate from breakage.
2. Place distributor plate in centre of rotor. Insert distributor plate bolt and tighten. (Refer to bolt torque table section 6-60 for correct torque).
   - The use of large impact wrenches should be avoided when tightening bolt.

Reassembly is a straight reversal of removal.



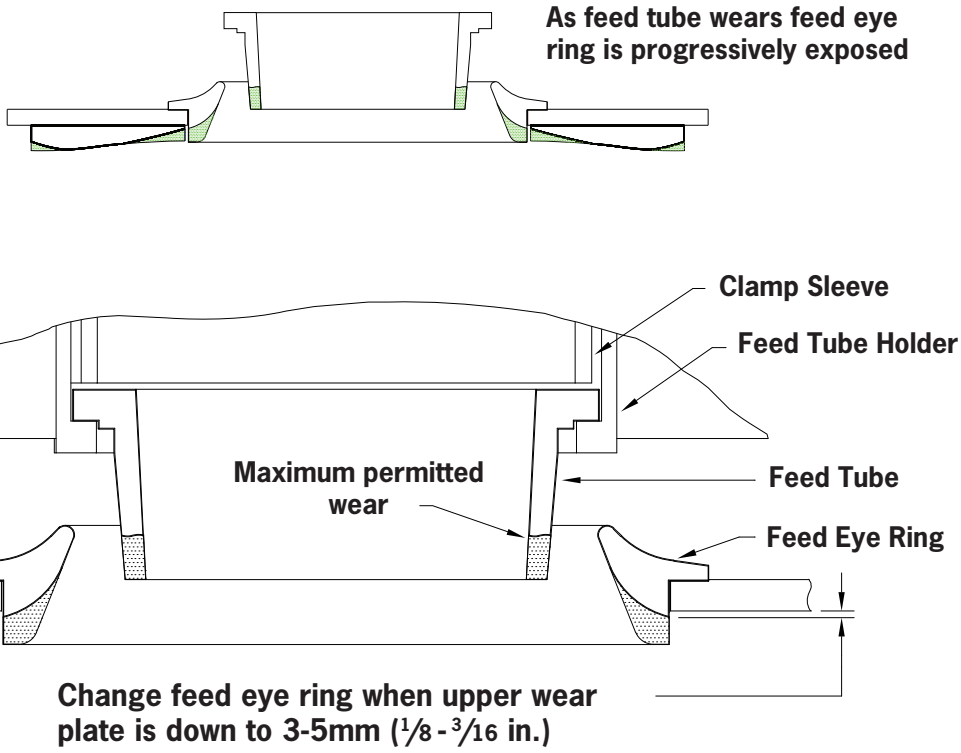
Insert a piece of rag into the distributor plate bolt hole and tamp firmly around bolt head. This will keep dirt from getting around the bolt head and will make removal much easier.

ROTOR SERVICING

FEED EYE RING

Wear on the feed eye ring is largely determined by the material flow from the feed tube. Thus as the feed tube wears the feed eye ring will be exposed to more wear.

To minimise the wear of the feed eye ring it is essential to maintain the feed tube in the correct position. (Refer to feed tube section 6-20).



The feed eye ring wears in three places opposite the rotor ports.

Replace the feed eye ring when the upper wear plate is worn to a thickness of 3-5mm (⅛ - 3/16 in.) at the inside edge.

The standard feed eye ring cannot be rotated. A two-life turnable feed eye ring is available for some models.

Premature Wear

Check feed tube is correctly positioned.

Feed Eye Ring Breakage

Material lodging between the feed tube and the feed eye ring. Check rotor build-up.

Feed Eye Ring Coming Loose

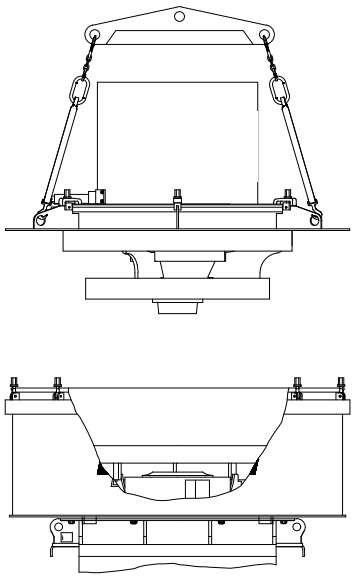
Check feed eye ring is correctly installed.

Continued ▶

ROTOR SERVICING

FEED EYE RING

REMOVAL/INSTALLATION



Removal

1. Remove hopper, crusher top and cascade assembly in one lift.
2. With a hammer hit the top of the rotor (not the feed eye ring) above the wear plates to loosen the build-up.
3. Turn the feed eye ring counter-clockwise until the locking tabs line up with the slots in the rotor top. If material build-up stops the worn feed eye ring from turning use a soft blow hammer to tap the feed eye ring counter-clockwise.
4. Lift the feed eye ring out.

Installation

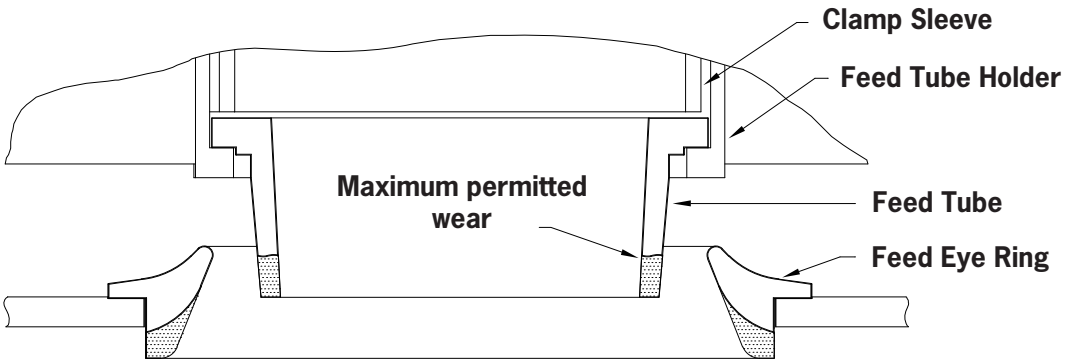
1. Ensure mating surfaces are clean and free of snags. If refitting upper and lower wear plates ensure these are in position.
2. Position feed eye ring so locking tabs and slots line up.
3. Lower feed eye ring and turn clockwise to lock in place.

ROTOR SERVICING

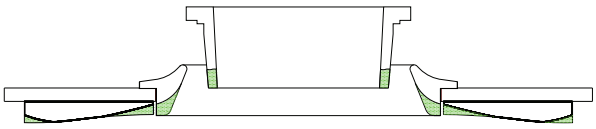
FEED TUBE

Replace feed tube just before the bottom lip is exposed above the feed eye ring.

The feed tube should wear evenly up the casting.



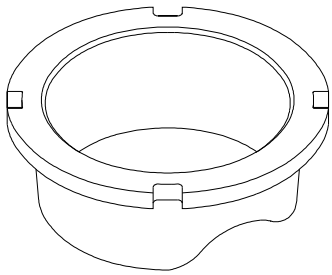
Maintaining the correct position of the feed tube in the rotor will result in increased life for the feed eye ring and upper wear plates.



Uneven Wear

Feed tube wearing on one side – feed tube not centralised.

Check feed tube and cascade assembly. (To centralise cascade assembly see section 6-48).

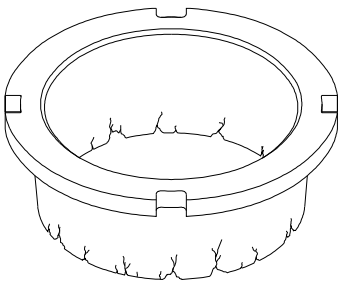


Cracking and Breakage

Feed tube cracking on bottom edge – excessive rotor build-up is rubbing on feed tube and causing overheating.

Adjust trail plates to reduce build-up.

Feed tube breaks – can be caused by excessive build-up in rotor, stones wedging between feed tube and feed eye ring, feed eye ring coming loose or the feed tube coming loose (check clamp sleeve).



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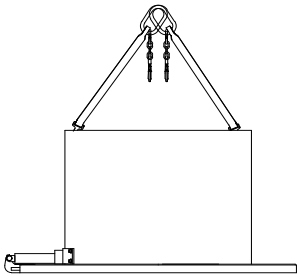
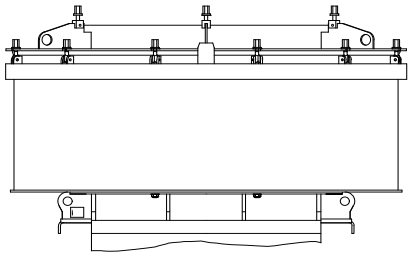
ROTOR SERVICING

FEED TUBE

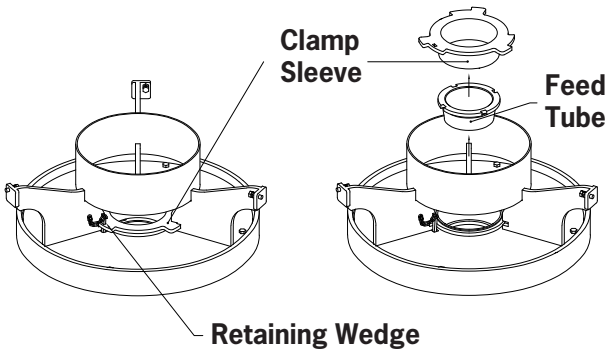
REMOVAL/INSTALLATION



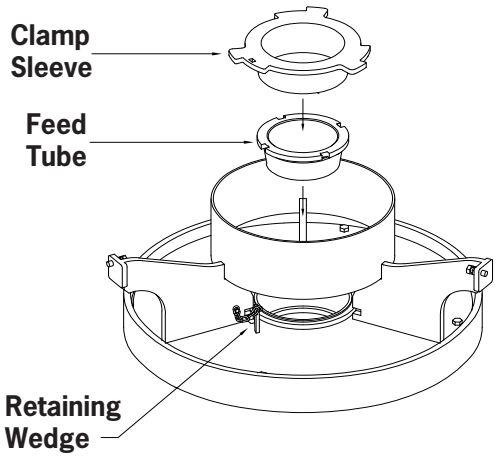


Removal

1. Remove the hopper from the crushing chamber assembly.



2. Clear stones from around feed tube, clamp sleeve and retaining wedge.
3. Remove retaining wedge and knock the clamp sleeve clockwise to release.
4. Lift clamp sleeve out.
5. Lift feed tube out.



Installation

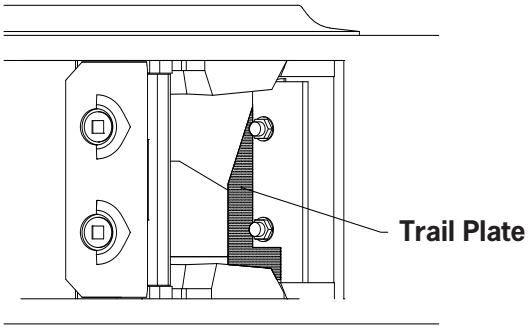
1. Ensure feed tube holder is free from stones, etc.
2. Lower feed tube into place.
3. Ensure it is centralised and level.
4. Refit clamp sleeve.
5. Turn clamp sleeve into locked position and insert retaining wedge.

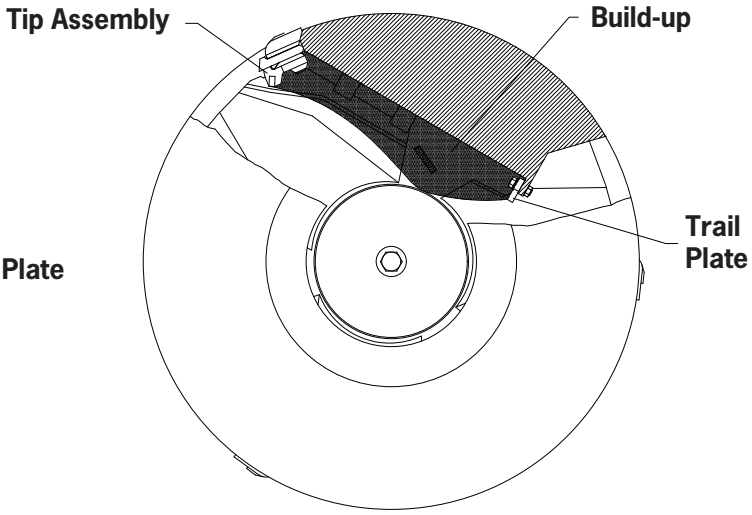
ROTOR SERVICING

TRAIL PLATES

Check trail plates for wear. Replace if badly worn or rotor build-up needs adjusting.

In some applications, trail plates are changed at the same time as the rotor tips – just to keep the stone bed profile constant. Regular change of trail plates maximises rotor tip life and is often very cost effective.





SELECTION OF TRAIL PLATES

The trail plates are the heart of the rotor. The size, position and angle of the trail plate controls the size of the rotor build-up and the flow of material through the rotor.

Incorrectly sized or shaped trail plates can result in premature wear on every rotor wear part. (See rotor tuning 6-28).

A number of trail plate profiles are available. For information regarding trail plate options, contact your Barmac representative.

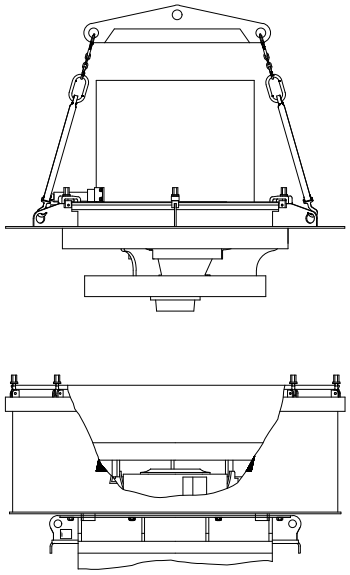
CAUTION: The use of different sized trail plates can create uneven build-up which may cause severe vibration. Ensure that trail plates are matched in size and shape. Differently positioned trail plates in each port may create uneven build-up which may cause vibration.

Continued ▶

ROTOR SERVICING

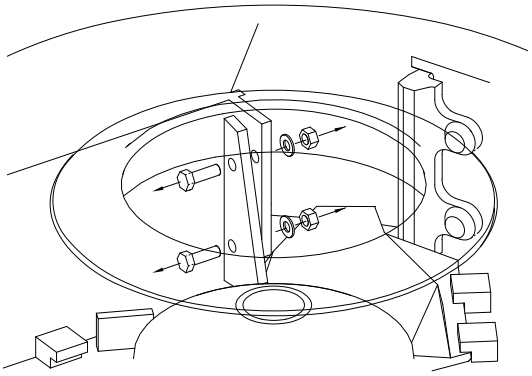
TRAIL PLATE

REMOVAL/INSTALLATION



Removal

1. Remove hopper, crusher top and cascade assembly in one lift.
2. Remove trail plate retaining bolts. Bolts will be covered with build-up and will have to be knocked out with a hammer and punch. Care should be taken not to damage threads.
3. If trail plate is held in by the build-up, a sharp blow with a hammer will break away the build-up and allow the trail plate to fall free.



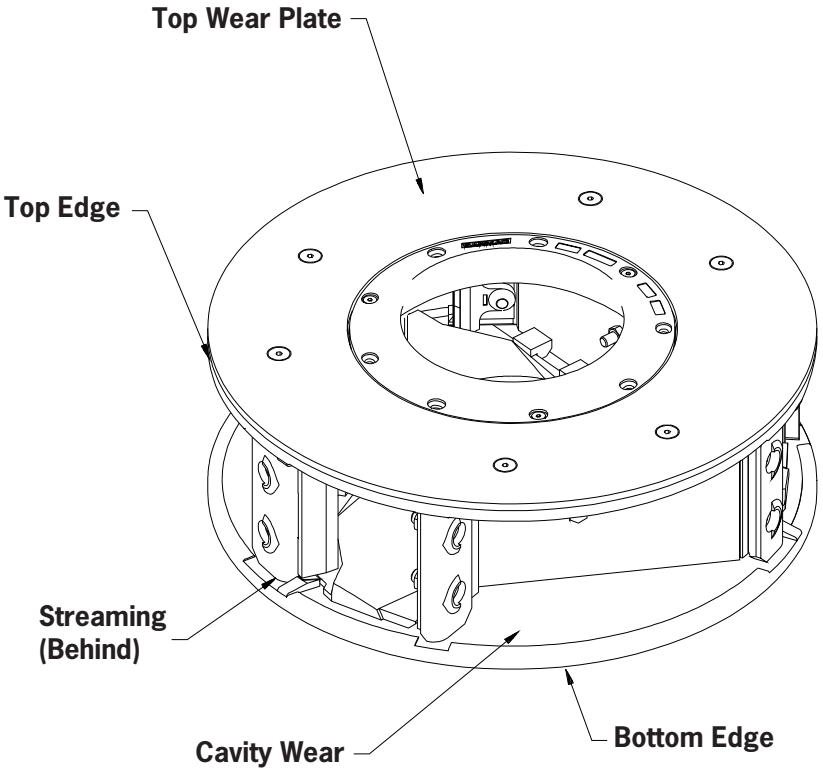
Installation

1. Clean out any remaining build-up.
2. Position trail plate and insert bolts.
3. Insert bolt from the inside of the rotor.
4. Tighten bolt to hand tight.

ROTOR SERVICING

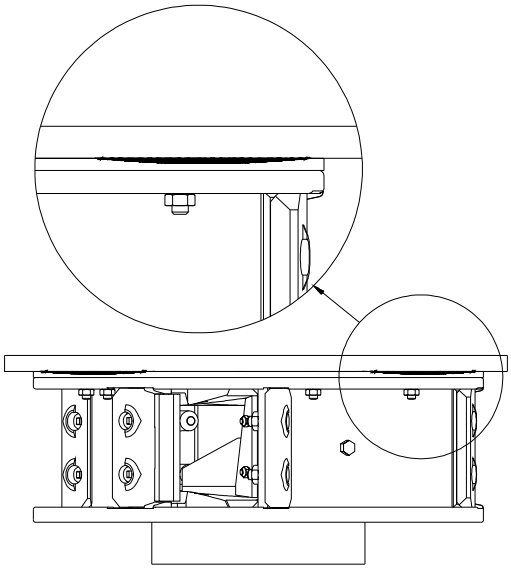
ROTOR BODY

The following areas are subject to normal wear – the comments provide a guide to causes of unusual rapid wear.



Top Wear Plate

Feed tube too short and material is discharging over the top of the rotor or dust has accumulated on the air transfer blades and is rubbing on the rotor. Replace feed tube or remove dust build-up. If the top wear plate continues to wear it may be necessary to replace the mild steel top wear plate with a more wear resistant material. Please contact your Barmac representative.



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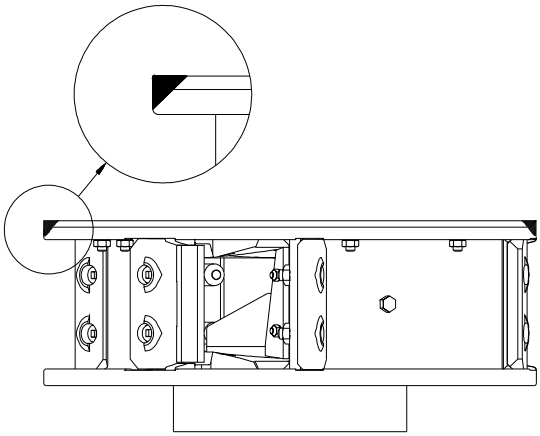
ROTOR SERVICING

ROTOR BODY

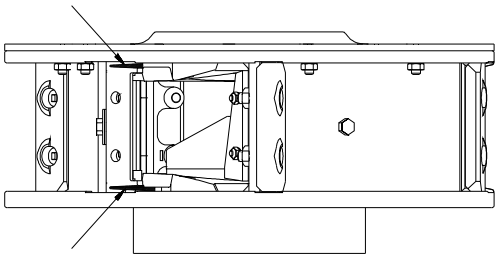
Top Edge Worn

Cascade wear skirt and/or cavity ring is worn. Replace worn parts. See section 6-49.



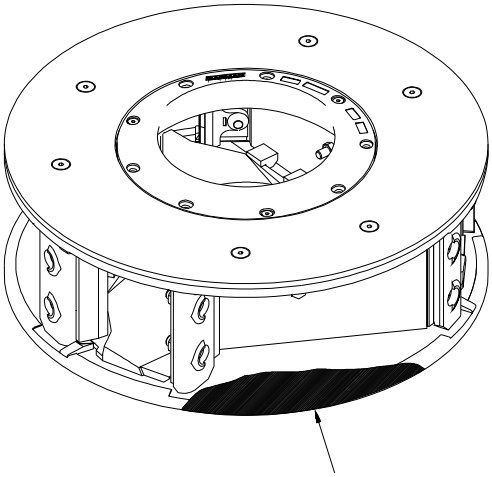
Streaming Wear

This is more prevalent in very abrasive fine applications, and is caused by dust streamlining around the tip carrier wear plate. Effects can be reduced by sealing the gap between the top and bottom edges of the tip carrier wear plate and the rotor with a silicone rubber or urethane sealant.



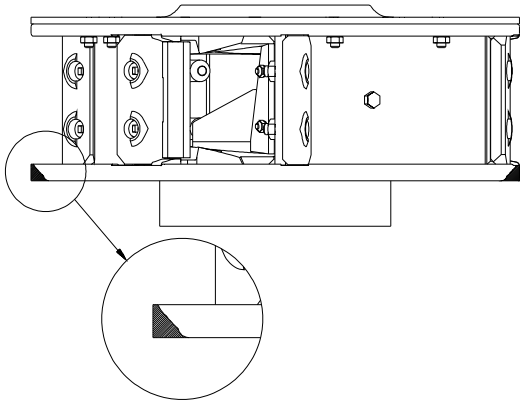
Cavity Wear

In very abrasive fine applications, this area can be subject to light wear. If it becomes a problem, wear resistant plates can be fitted to the base plate of the cavity. Please contact your Barmac representative.



Bottom Edge Worn

Can be a feature of high tonnage operation or indicative of excessive buildup in the base that is rubbing on the rotor. Reduce build-up by reducing moisture content of feed or introducing water spray system. See section 6-51.

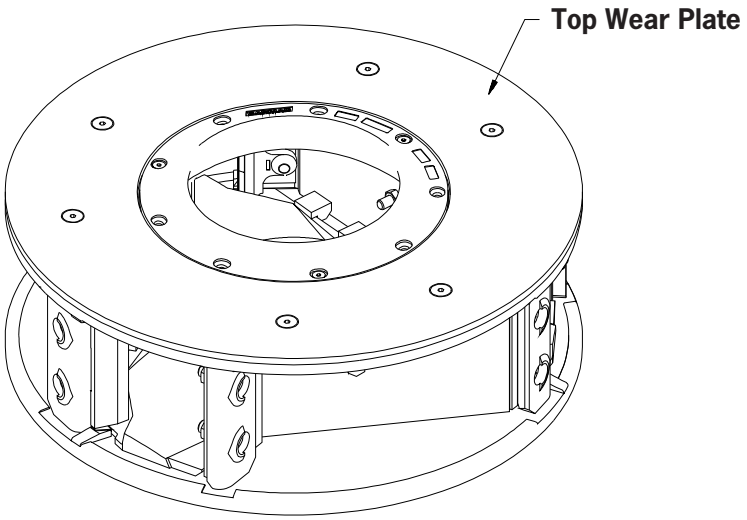


ROTOR SERVICING

ROTOR WEAR PROTECTION PLATES

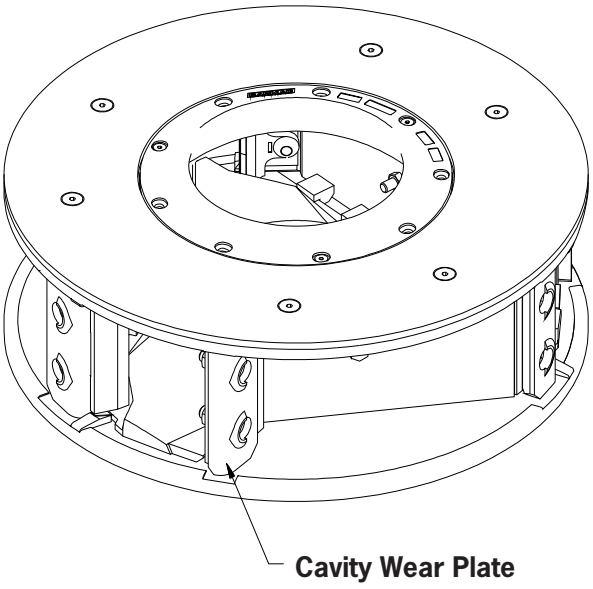
TOP WEAR PLATE

The top wear plate , although only mild steel, should not wear rapidly, but it should be inspected and replaced before the rotor body is damaged. If rapid wear occurs, wear resistant plates may be required. Contact your Barmac representative for details.



CAVITY WEAR PLATES

The cavity wear plates should be replaced before wear progresses to the body of the rotor. Remove the bolts and nuts holding the wear plate to the rotor body and replace. Always replace all three cavity wear plates with a matched set to maintain balance.

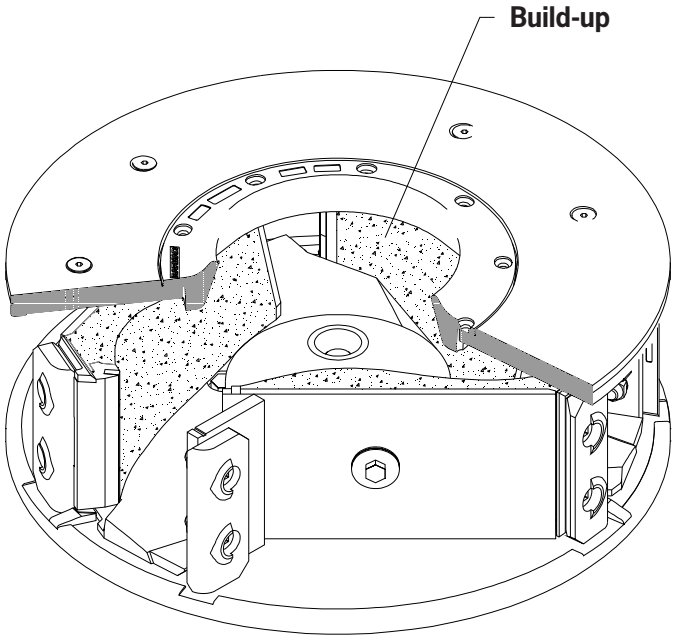


ROTOR SERVICING

ROTOR BUILD-UP

PRIMARY FUNCTION

The build-up in the rotor needs to protect the internal walls of the rotor and most importantly protect the rotor tip from direct wear and impact.



SECONDARY FUNCTION

The build-up in the rotor can influence the wear patterns of the wear parts in order of importance:

ROTOR TIPS

TIP CARRIER WEAR PLATES

UPPER AND LOWER WEAR PLATES

DISTRIBUTOR PLATE

FEED EYE RING

While large build-ups tend to assist in the protection of the above wear parts – particularly the rotor tips – they can greatly increase feed tube wear.

• See rotor tuning section 6-28.

ROTOR SERVICING

ROTOR TUNING

The success of the Barmac is centred around its rotor. If the rock build-up within the rotor is ideal, then wear on the upper and lower wear plates will be even, the rotor tips fully utilised, and the lowest consumables cost per tonne of product will be achieved.

DIFFERENT MATERIAL CHARACTERISTICS

Unfortunately, the build-up characteristics are never the same for any two materials, indeed the nature of the build-up will vary with rotor speeds, rotor sizes, feed rates, feed sizes, and feed moisture.

TUNING ON SITE

A factory delivered rotor will rarely work at optimum efficiency without some degree of tuning. It is normal that some tuning will be required as each rotor is placed into service. Tuning relates to controlling the build-up of material within the rotor. This is done by altering the size, position, shape, or style of the trail plates.

PRIMARY FUNCTION

The main purpose of tuning is to ensure that the build-up within the rotor extends from the trail plate to the inserts in the rotor tip, and that the wear is centralised across the rotor tips.

Insufficient build-up will result in tip exposure. This will lead to early failure of the rotor tips through the chipping of the inserts by direct contact with the larger stones in the feed. Insufficient build-up of material will expose the supporting metal of the rotor tips. This will also lead to premature failure of the inserts by direct abrasion from the stone flow through the rotor. This can also result in the rotor tips wearing in front of the inserts which will eventually lead to their falling out of the carrier plate.

BASIC PRINCIPLES

In tuning the rotor one should try to maximise the build-up within the rotor to achieve:

- A build-up of rock within the rotor to protect the wear parts and not restrict the feedpath through the crusher.
- A build-up that clears the side and bottom of the feed tube, preventing premature feed tube wear.
- An equal flow through each rotor port, equalising the wear on the rotor tips.

Continued ▶

ROTOR SERVICING

ROTOR TUNING

ADJUSTMENT OF ROTOR BUILD-UP

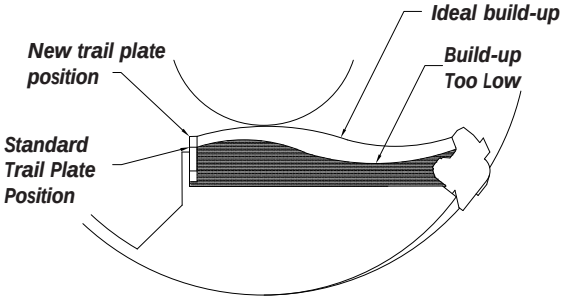
The width and position of the trail plates will control the amount and characteristics of the build-up in the rotor.

The following is meant only as a guide, as rotor build-up is dependent on many factors: material type, moisture content, rotor speed, etc., and trial and error will have to be employed to determine the correct trail plate position for each application.

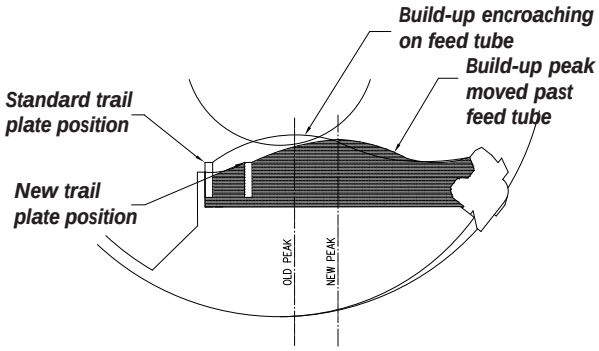
Generally –

- Wide trail plates make the material build-up deeper.
- Narrow trail plates make the material build-up shallower.
- Moving the trail plate away from the rotor tip makes the build-up shallower and moves the peak away from the tip.
- Moving the trail plate toward the rotor tip makes the build-up deeper and moves the peak toward the tip.

Lack Of Build-up

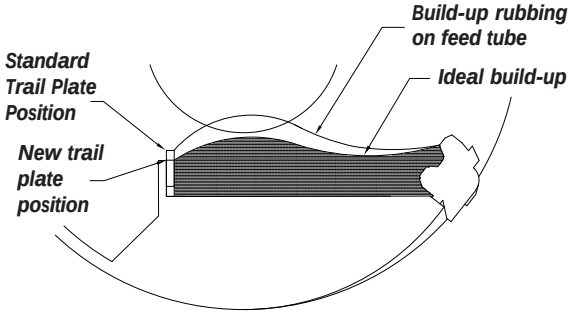


If build-up is not up to rotor tip — Increase trail plate width until build-up approaches rotor tip.

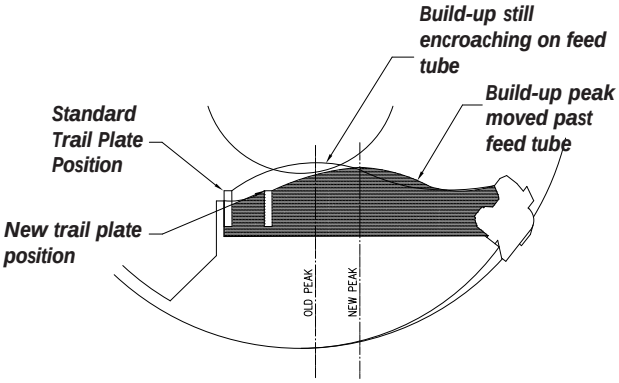


If build-up starts to encroach on feed tube — Pack trail plate toward tip. This will move the peak of the build-up past the feed tube without reducing rotor tip build-up.

Too Much Build-up



If build-up is rubbing on feed tube — Reduce trail plate width until build-up starts to pull back from rotor tip.



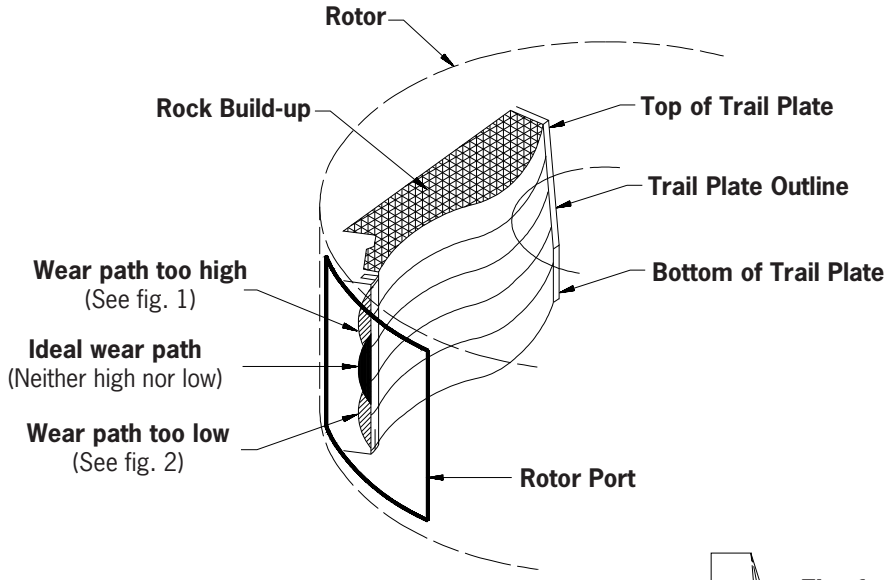
If build-up is still encroaching on feed tube, packing the trail plate forward will again move the build-up peak past feed tube without reducing tip build-up.

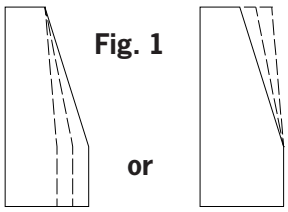
Continued ▶

ROTOR SERVICING

ROTOR TUNING

ADJUSTMENT OF ROTOR BUILD-UP

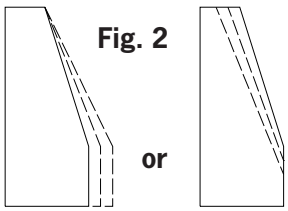




If wear path is too high—

1. Shorten bottom of trail plate by gradual increments.
   OR
2. Extend top of trail plate by gradual increments.

Ensure that rock build-up depth is maintained.



If wear path is too low—

1. Extend bottom of trail plate by gradual increments.
   OR
2. Shorten top of trail plate by gradual increments.

Increasing the width of the trail plate increases the depth of the rotor build-up. Decreasing the width of the trail plate decreases the depth of the rotor build-up. Increasing the trail plate thickness at the top increases the rotor build-up at the top and encourages material to move lower when leaving the rotor.

Increasing the trail plate thickness at the bottom increases the rotor build-up at the bottom and encourages material to move higher when leaving the rotor. The rotor build-up cross section will reflect the trail plate shape.

Adjustment of the trail plates should be made by cutting thin (6mm [¼"]) slices off. Large adjustments should not be made as the problem may simply move to the opposite extreme, i.e. top end tip wear may become bottom end tip wear.

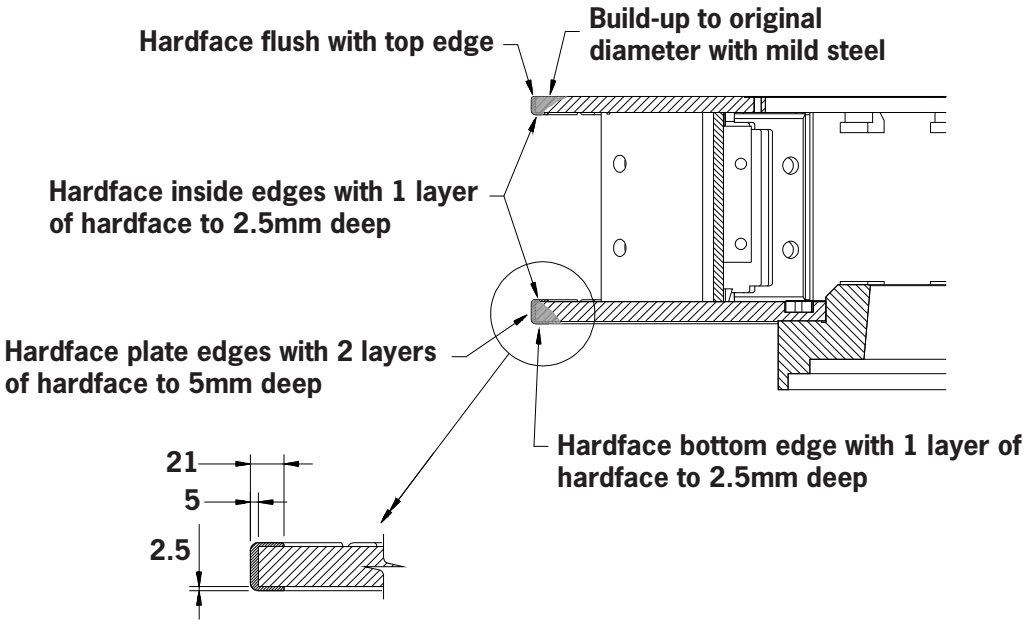
NOTE: ALL TRAIL PLATES SHOULD BE THE SAME SIZE AND SHAPE OR AN OUT-OF-BALANCE SITUATION MAY RESULT.

ROTOR SERVICING

ROTOR REBUILDING

WARNING: Do not attempt to weld on rotor while it is in the machine or arcing damage will cause premature failure of the bearings.

1. Remove rotor (see 6-32).
2. Clean out all wear parts and build-up.
3. Do not weld on balance machine.
4. Spin rotor on balance machine to check for low spots on periphery. Mark them.
5. Build-up top edge to original diameter and roundness.
6. Build-up bottom edge to original diameter and roundness.
7. Replace top plate as required.
8. Effect any internal repairs.
9. Balance rotor.

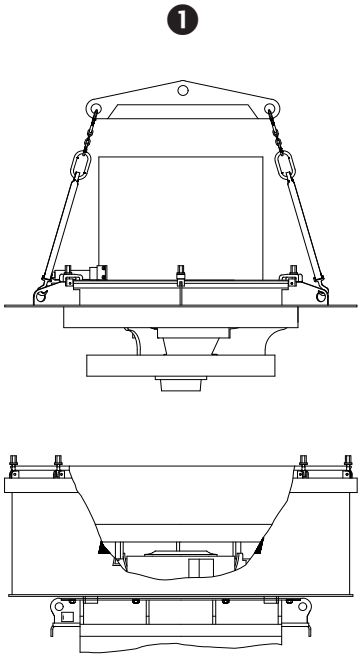


NOTE:

- Use electrodes with a hardness of 400-500 Brinell such as Vidalloy-30. For submerged arc machine welding use Lincoln 550 flux with L60 wire or equivalent. Use Low Hydrogen rods for structural repairs.
- Frequent minor rebuilding is cheaper than infrequent major rebuilding work.

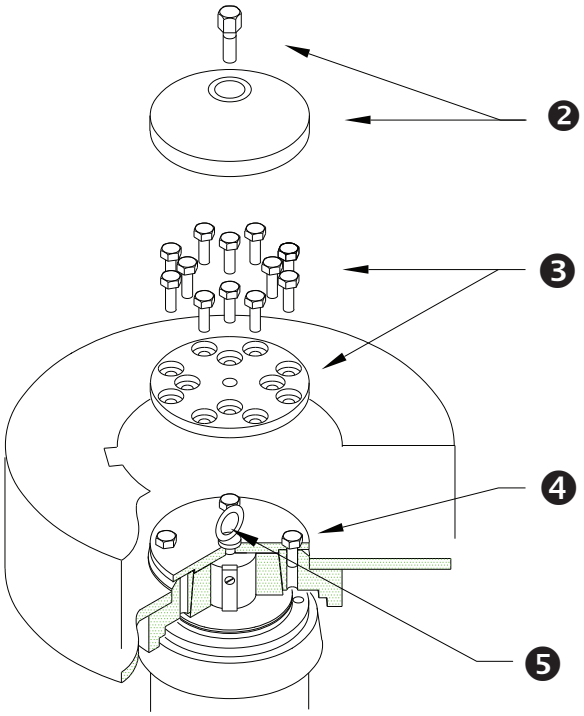
ROTOR SERVICING

ROTOR REMOVAL



1. Remove hopper, crusher top and cascade assembly in one lift.
2. Pick out material from the centre of the distributor plate and remove the rag or paper from around the distributor bolt. Remove the distributor bolt and take out the distributor plate.

   NOTE: Prevent any material falling down the threaded distributor bolt hole. Use a rag or put the distributor bolt back in.
3. Remove the top plate bolts and the top plate.
4. Attach the rotor lifting plate. Bolt down with four bolts and tighten bolts in series until fully screwed in to force rotor off taper lock.
5. Lift out rotor using eyebolt in rotor lifting plate.



ROTOR SERVICING

ROTOR INSTALLATION

The life of a Barmac bearing cartridge is greatly reduced when the rotor is running with excessive vibration for long periods. When this vibration is extreme, there is potential for catastrophic failure, i.e. shaft breakage.

One factor which has a direct influence on the smooth running of a Barmac is the fit between bearing cartridge and rotor. The correct procedure for securing a rotor to a bearing cartridge is as follows:–

1. **PREPARATION**

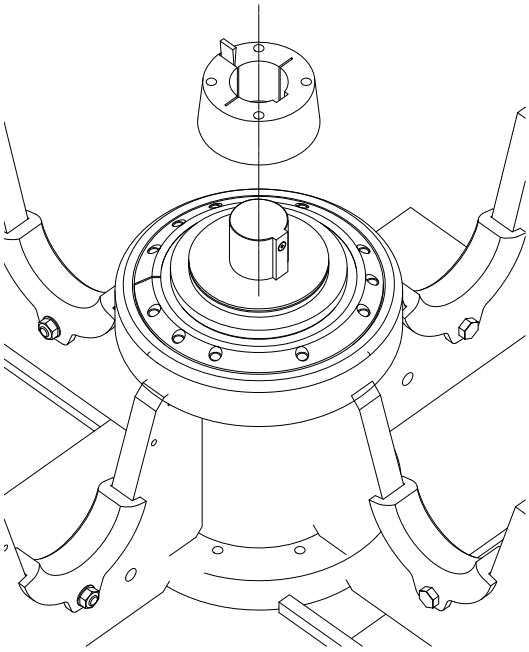
   Thoroughly clean the shaft, key, taper lock and rotor boss. Coat these surfaces with light oil or dewatering fluid and wipe down prior to assembly. Ensure the key screw is not proud of the outer face of the key.

2. **TAPER LOCK FITTING**

   Place a small wedge or screwdriver in the split on the **TOP** of the taper lock to expand it slightly. Place the taper lock, large end downward, on the shaft so that it sits hard down on the top seal plate.

   Remove the wedge or screwdriver and remove any burrs on the taper lock left behind.

   NOTE: Do not expand the taper lock any more than necessary to achieve a snug sliding fit onto the shaft. Excessive expansion of the taper lock can break it.



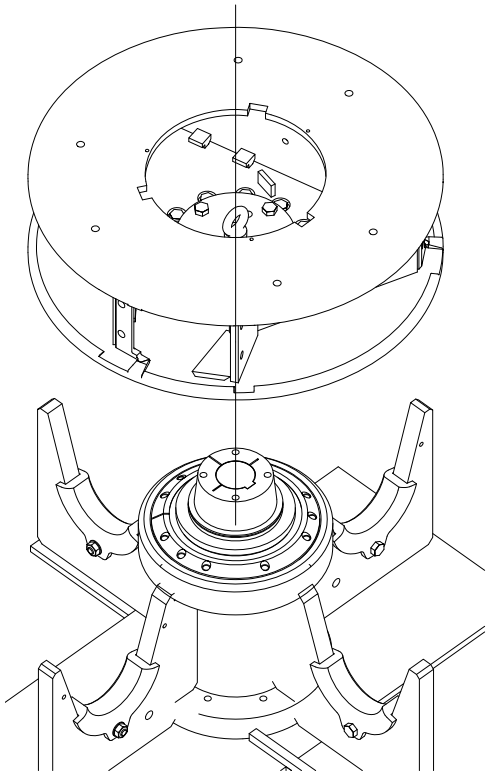
ROTOR SERVICING

ROTOR INSTALLATION

3. ROTOR TAPER CHECK

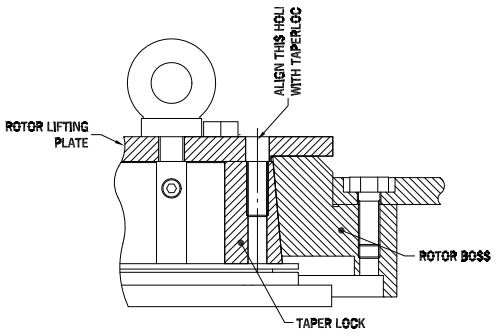
If the rotor being fitted has just been repaired and/or reconditioned around the taper area (i.e. has undergone extensive welding that may cause distortion), it is recommended that the fit between rotor and taper lock be checked prior to final fitting.

To do this, blue the bore of the rotor boss and lower onto the taper lock on the shaft. (Use the rotor lifting plate or, for the 300 rotor, the lifting sling supplied with the crusher). Ensure the taper is properly seated under the weight of the rotor and then remove. You should see a blue mark on the taper lock indicating contact with the rotor boss. This mark should cover at least 80% of the circumference and 80% of the length of the taper. Any less contact than this will require replacement of the rotor boss. If this is not practical (e.g. the boss is welded in), consult your Barmac representative for further advice.

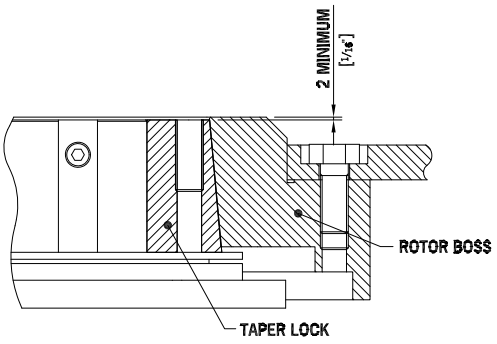


4. ROTOR FITTING

Fit the rotor lifting plate to the rotor boss and lower the rotor onto the taper lock. Before removing lifting plate, line up two spare holes in lifting plate with any holes in the taper lock.



Remove the lifting plate bolts evenly, allowing the rotor to slide onto the taper lock under its own weight. With the rotor firm on the taper lock there must be at least 2mm (1/16 in.) between the top of the taper lock and the top of the rotor boss.



NOTE: The rotor must be lowered square to the shaft onto the taper lock. Failure to do so may result in a poor mating of the tapered surfaces and hence vibration problems.

ROTOR SERVICING

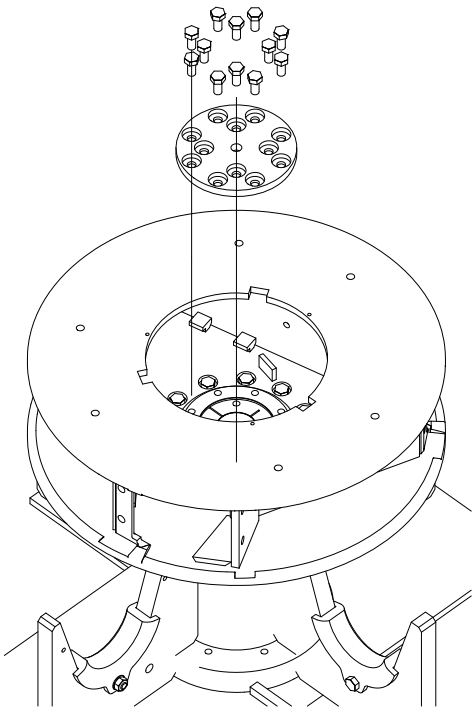
ROTOR INSTALLATION

5. SECURING BOLTS

Insert the bolts through the top plate into the taper lock and tighten evenly. This pulls the taper lock up tight on the shaft and rotor boss.

Model	Torque Nm (ft lbs)
B3000	34 (26)
B5000	60 (45)
B6000, B7000, B8000, B9000	250 (190)

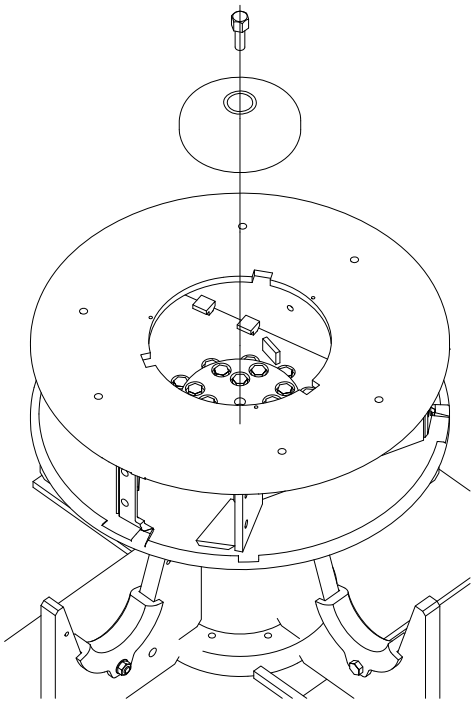
For the larger rotors, fit the additional 8 outer bolts through the top plate into the rotor boss and tighten. This fills the holes that are necessary for removal and provides positive drive between taper lock and rotor boss in addition to the friction fit of the taper. Torque to 250 Nm (190 ft lbs).



6. FINAL CHECK

Stand on top of the rotor (if possible) and try to rock it from side to side. If there is excessive movement or if you feel the rotor "settle" at all, recheck the torque on all bolts.

Note that there will be a small movement of the shaft within the bearings. This is normal. This check simply confirms that the rotor is properly seated on the taper lock.



7. DISTRIBUTOR PLATE FITTING

The distributor plate must now be fitted to protect the taper assembly. Note that the centre bolt of the distributor plate cannot be relied upon alone to secure the rotor to the shaft. (See 6-17).

ROTOR SERVICING

ROTOR BALANCING

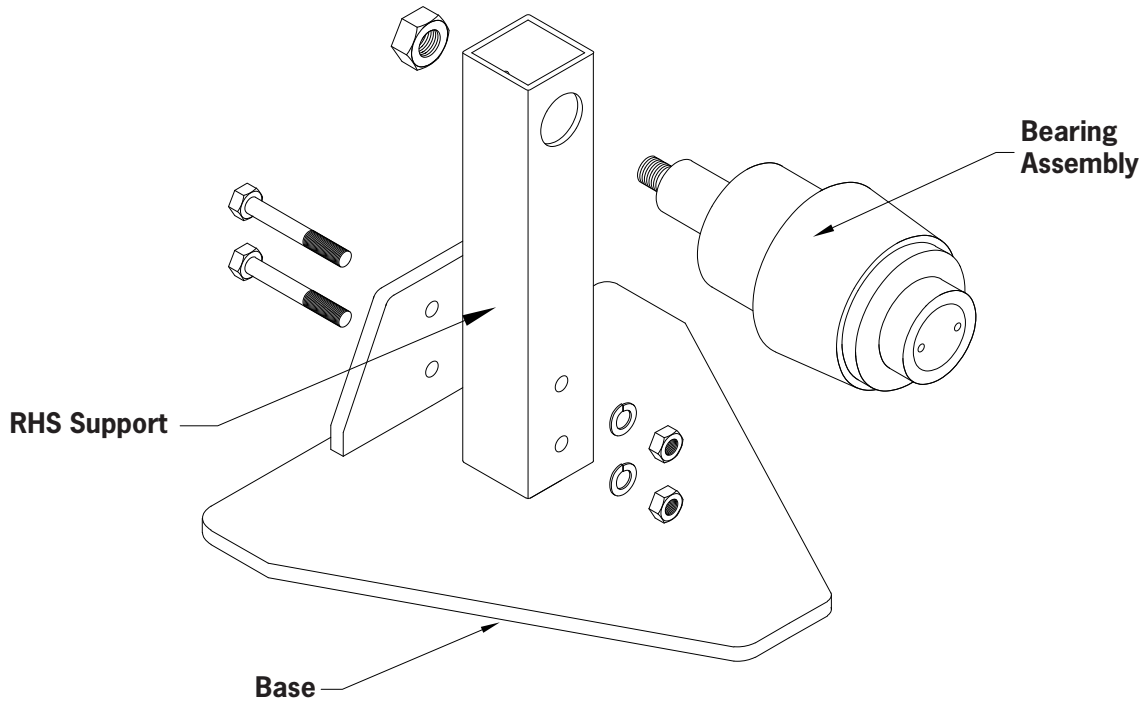
It is important that the Barmac rotor is properly balanced in order to provide the maximum trouble-free life of the bearing assembly in the crusher. Svedala manufactured rotor balance machines are designed specifically, and only, for this job.

To get the best results from the balance machine, it must be properly set up and in good mechanical order.

ASSEMBLY – SMALL ROTOR BALANCE MACHINES (300 and 500 rotors only)

The bearing assembly of these machines is supplied fully assembled. All that remains is to:

1. Assemble the RHS support to the base with the bolts provided.
2. Assemble the bearing assembly to the RHS support with the nyloc nut provided.



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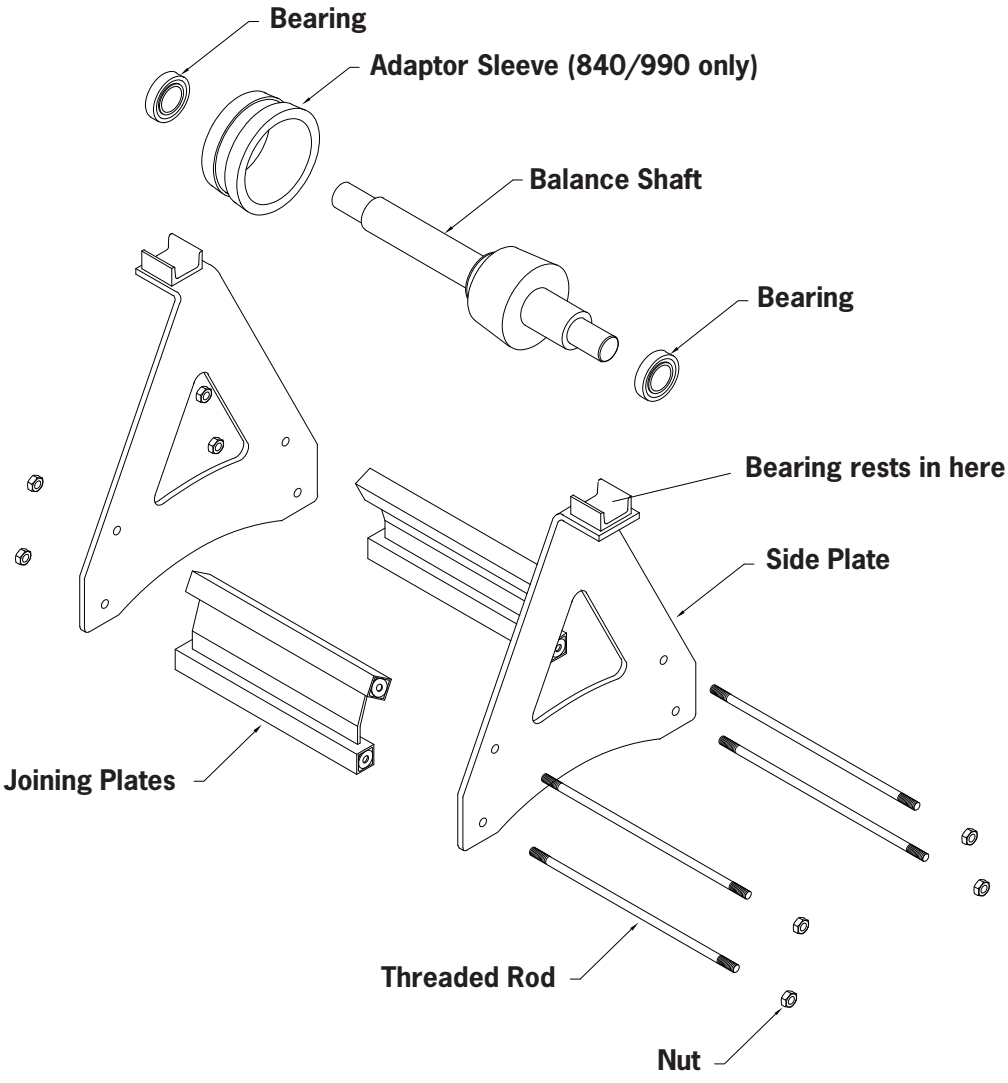
ROTOR SERVICING

ROTOR BALANCING

ASSEMBLY – LARGE ROTOR BALANCE MACHINES (690mm, 760mm, 840mm and 990mm rotors only)

These machines require full assembly as follows:

1. Assemble the two side plates of the frame with the joining plates, threaded rod and nuts supplied.
2. For 840mm and 990mm rotors only, fit the adapter sleeve to the balance shaft.
3. Clean the bearings in solvent to remove all traces of dirt, grease, oil, etc. Fit the bearings to the balance shaft and tighten the grubscrews.
4. Rest the shaft assembly on the frame. The shaft should rotate freely.



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ROTOR SERVICING

ROTOR BALANCING

WHEN TO BALANCE

- The rotor must be balanced after any repair work has been carried out, e.g. hardfacing.
- In the case of 300mm rotors, the rotor must be balanced after turning or changing the upper or lower wear plates.
- It is advisable to check the balance if the vibration switch trips out repeatedly and the wear plates appear to be in good condition.

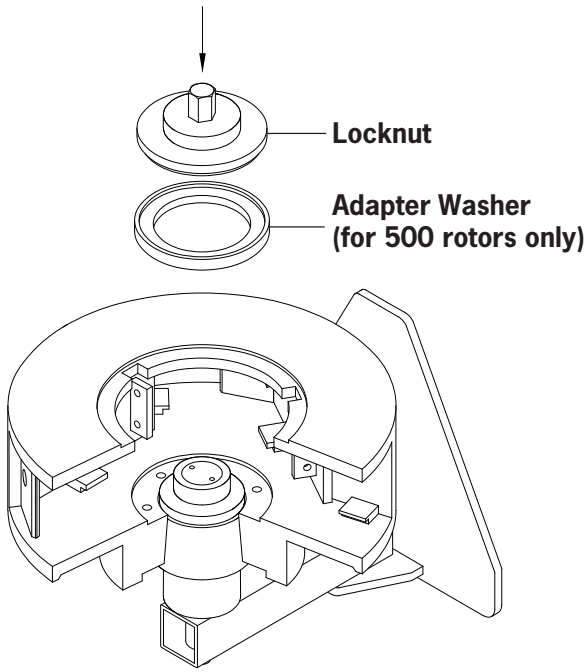
OPERATION

In all cases, remove rock build-up, dirt, old wear parts, etc. before attempting to rebalance the rotor.

- For 300mm rotors, re-fit clean wear parts in the new position ready for next period of operation.
- Make sure the taper in the rotor and on the rotor balancer are clean and free from damage.

SMALL ROTOR BALANCE MACHINES

1. Lay the rotor balance machine on its back and lower the rotor onto the taper.
2. In the case of 500mm rotors, assemble the adapter washer onto the the balancer housing.
3. Lock the rotor on with the locknut.
4. Tilt the rotor upright.
5. Make sure the balancer is level.



Proceed to BALANCING PROCEDURE.

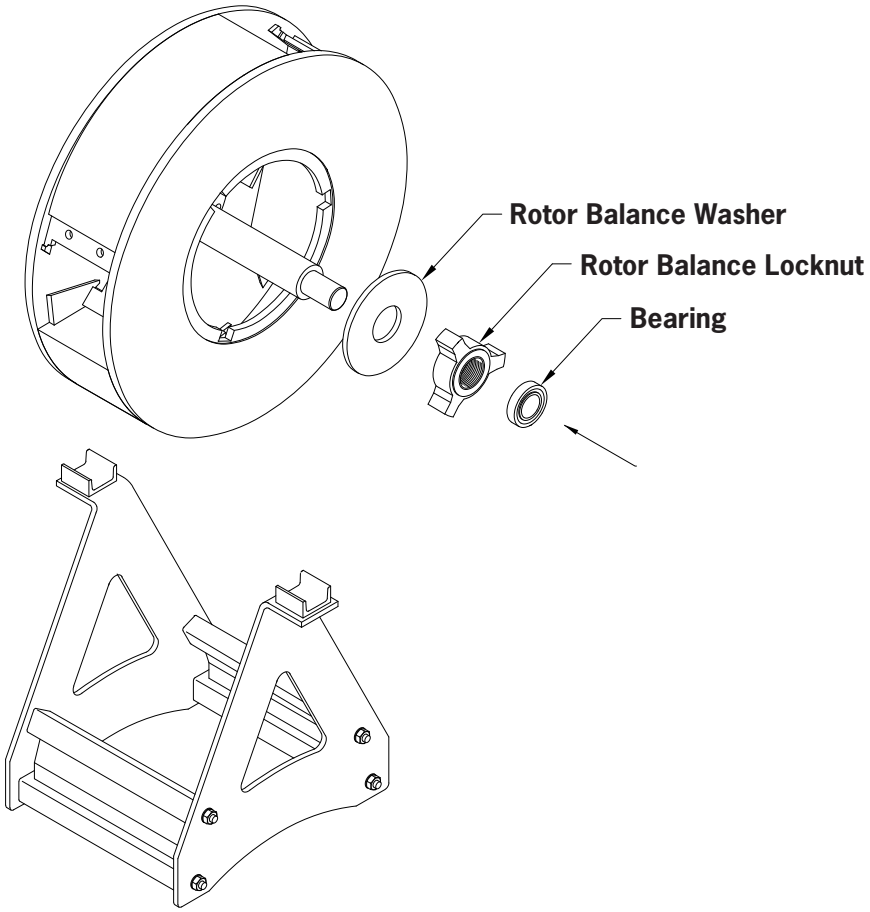
Continued ▶

ROTOR SERVICING

ROTOR BALANCING

LARGE ROTOR BALANCE MACHINES

1. Ensure the balance frame is level.
2. Remove bearing from the end of shaft that passes through the rotor.
3. Insert the balance shaft through the rotor.
4. Locate rotor on taper, ensure that the two tapers fit evenly, fit rotor balance washer and rotor balance locknut and tighten with hammer.
5. Fit bearing back onto shaft and tighten grubscrew.
6. Using suitable lifting apparatus, position the rotor and balance shaft on the support frame.



Proceed to BALANCING PROCEDURE.

Continued ▶

ROTOR SERVICING

ROTOR BALANCING

BALANCING PROCEDURE

1. Thoroughly clean out rotor of all rock, dirt, old wear parts and any old welded on weights from a previous balance (see fig. 3). Check for perforations in the inner and outer walls.
2. Check taper in rotor boss is clean and free from damage.
3. Remove weights from previous balance and set rotor up level in rotor balancing frame.
4. Gently rotate the rotor and allow it to wind down to a stop. The heaviest point on the rotor is now at the bottom.
5. With chalk mark the blades A, B, and C (see fig. 1).
6. Add weights to the blade A (fig. 1) until blade B is at top dead centre. Each time a weight is added give the rotor a gentle push in the direction you are working and allow the rotor to settle to the new balance point. This helps overcome bearing friction.
7. When blade B has settled at Top Dead Centre, pull it around 90° and hold it steady there by hand (fig. 2).
8. Add weights to the blade you are holding down (B) until it doesn't try to go up or down.
9. Sometimes the blade B won't take enough weights to balance the rotor. If this is the case cut a piece of 50mm x 12mm (2 in. x ½ in.) flat bar 200mm (8 in.) long and weld it onto the B section where indicated (fig. 3). Use a small tack weld so the weight is easy to remove for the next balance. Repeat the whole balancing exercise.
10. When you think the rotor is balanced, rotate the rotor in 90° steps four times. If the rotor does not move from each stop, it is balanced.
11. Tighten the balance bolts.
12. Keep spare weights in a safe place.

NOTE: To check that the rotor is now properly balanced, remove one balance weight and confirm that the rotor is out-of-balance.

IF SO: Replace the weight. The rotor is now balanced.

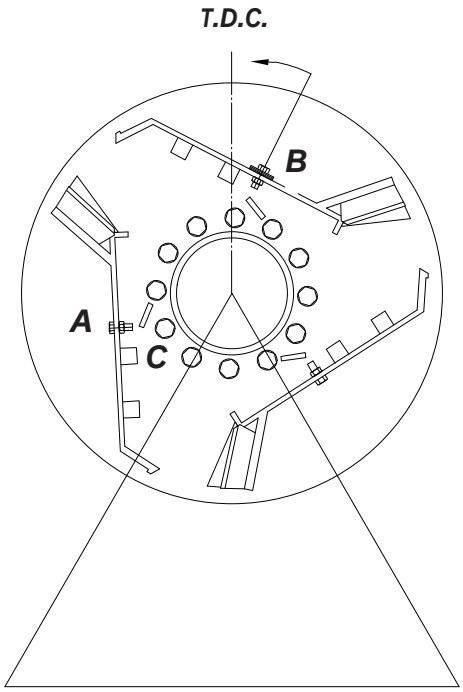
IF NOT: There may be a fault with the balance machine. The balance machine should be sensitive enough to detect an out-of-balance condition less than the effect of one balance weight.

- **Refer to Troubleshooting 6-40.**

Continued ▶

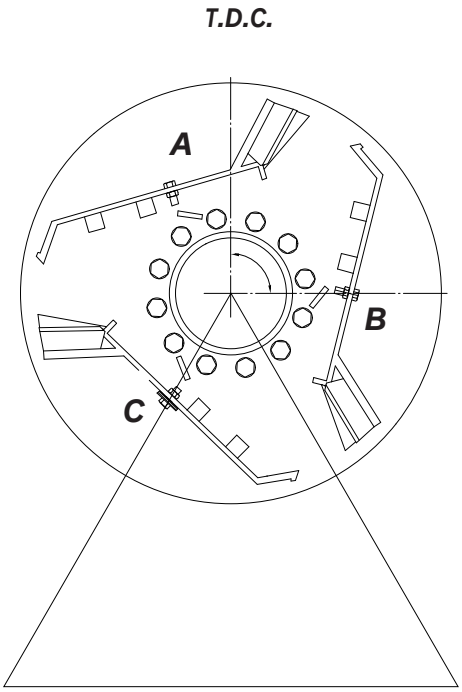
ROTOR SERVICING

ROTOR BALANCING



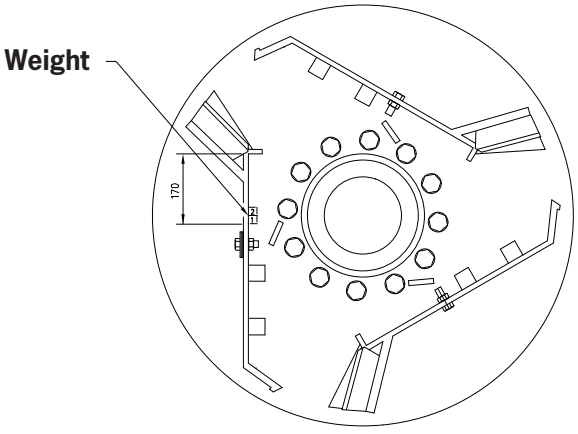
Typical rotor position after step 4. Add weights to 'A' until 'B' moves to T.D.C.

FIG. 1



Step 6: 'B' is pulled around 90° from T.D.C. Add weights to 'B' until rotor does not try to turn.

FIG. 2



Step 8: If you can't get enough weights into position B, weld flat weight inside rotor as shown and start again.

FIG. 3

Continued ▶

ROTOR SERVICING

ROTOR BALANCING

TROUBLESHOOTING

If the rotor fails to balance properly, check the following:

- Make sure there is no loose material in the rotor that could be moving as the rotor is turned.
- Make sure the rotor balance machine is level and the bearings are totally clean.
- Make sure the tapers are in good condition.
- Make sure the bearings are not damaged or worn.

After all checks have been made, attempt to balance the rotor again from stage 1.

MAINTENANCE

The rotor balance machine is designed to give many years of trouble-free operation. However, as with any precision machinery, proper care must be taken to ensure this is the case.

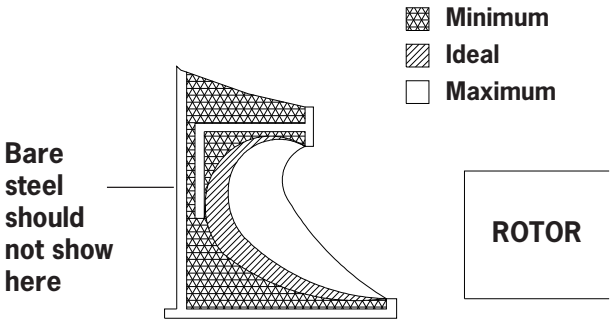
- Wrap a cloth around the taper on the balance machine when not in use.
- For the large balance machine, remove the bearings from the shaft and store in a container of light machine oil.
- Store all components in a clean environment.

CRUSHER SERVICING

CRUSHING CHAMBER

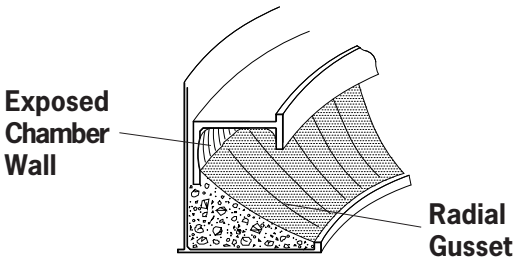
BUILD-UP

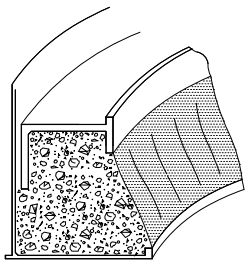
- The chamber should have a full rock lining covering all items of the structure except for the faces of the radial gussets (see below).
- The outer wall must not be exposed.
- The feed areas must be free of fines build-up and debris.
- Build-up should not be excessive, i.e. blocking material flow routes or encroaching on moving parts.



Initially, the bottom crushing chamber gussets may protrude through the build-up. These will soon wear to their ideal level. This is quite normal.

On stopping the crusher, if the time between shutting off the feed and the rotor stopping is more than 5 minutes, air movement in the crusher may blow away much of the lighter material from the stone bed, giving the impression of insufficient build-up. In these cases, stone beds will be re-instated shortly after starting to feed material again. This can be confirmed by 'crash-stopping' the plant, to minimise the chance of air blowing material away.





Chamber Wall Exposed

Caused by bony feed, very dry feed, or rounded feed. The addition of fines to a rounded or bony feed and or adding some water will enable the build-up to form.

Normally a good build-up is held but occasionally it erodes – caused by running with intermittent feed or by running empty for a period of time and blowing the build-up out.

Excessive Buildup

Feed moisture content too high and/or high fines content. Remove moisture and/or reduce fines content. Where this is not practicable a water spray system may be required.

In some instances, removal of some of the radial gussets is recommended. Please contact your Barmac dealer for advice.

Continued ▶

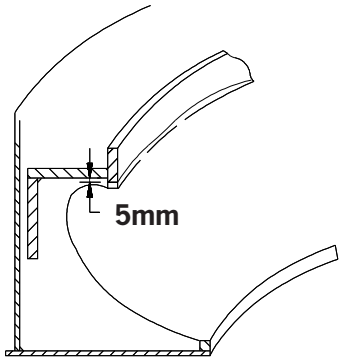
Frequent operation of the crusher running light/empty may reduce stability of the build-up and increase the likelihood of gusset and/or casing wear.

CRUSHER SERVICING

CRUSHING CHAMBER

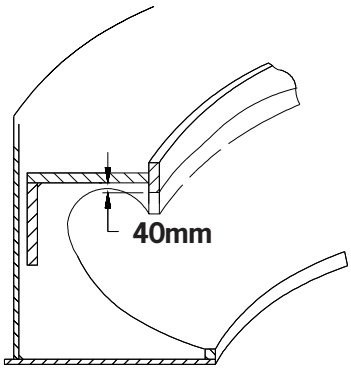
CAVITY RING

When the cavity ring becomes worn it must be replaced.



COARSE

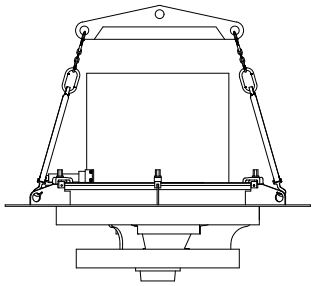
Replace when 5mm (¼ in.) left as shown.

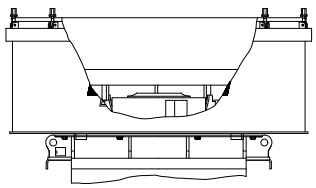


FINE (B9000 model only)

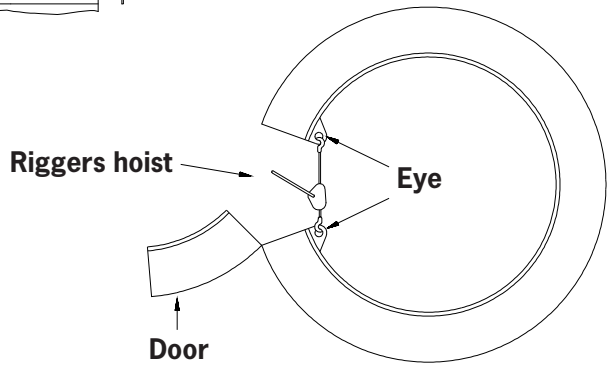
Replace when 40mm (1½ in.) left as shown.

Removal





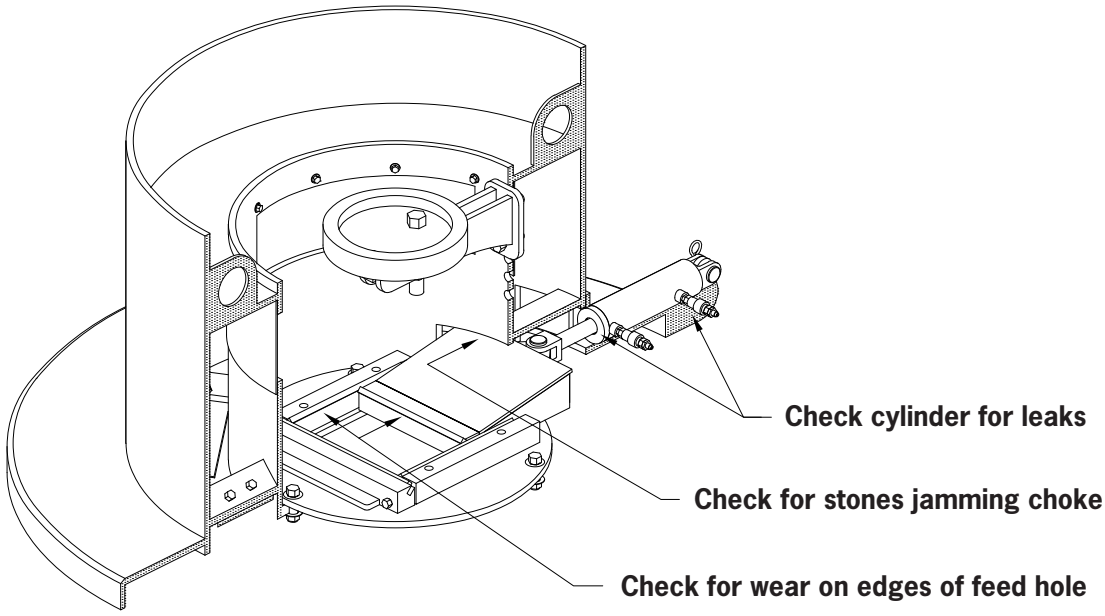
1. Remove hopper, crusher top and cascade assembly in one lift.
2. Open the door.
3. Weld an eye to the cavity ring on each side of the door opening.
4. Using a riggers hoist, pull the ring in until there is about 12mm (½ in.) gap all the way around.
5. Lift the ring off with a crane, or
6. Cut the old cavity ring up with a gas torch and remove it in sections.



CRUSHER SERVICING

CASCADE CHOKE

If the edges of the feed hole are excessively worn, it is necessary to replace these edges.



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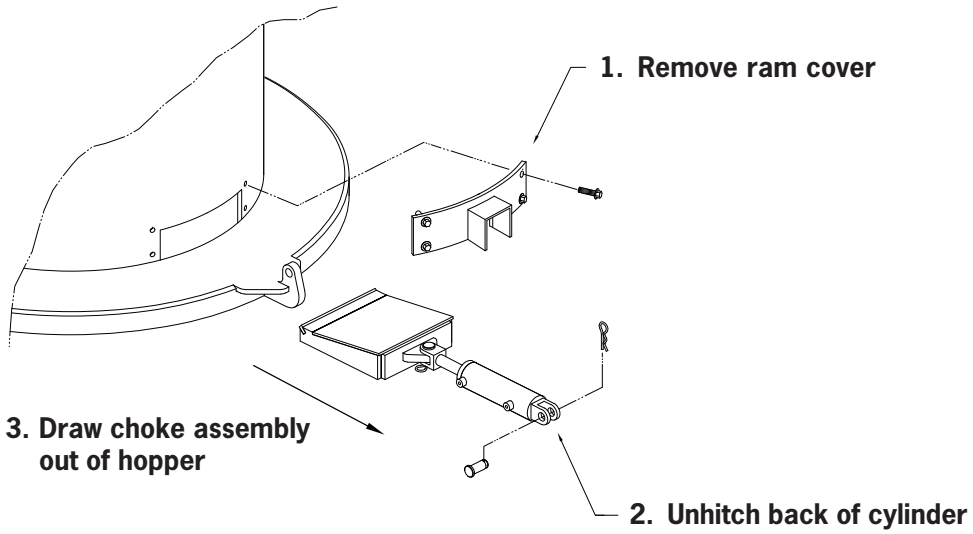
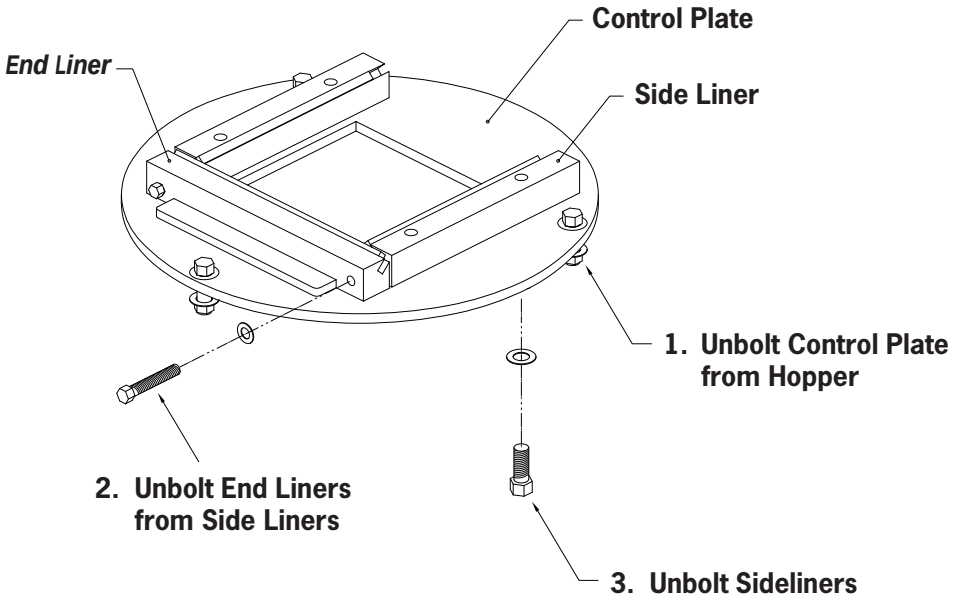
CRUSHER SERVICING

CASCADE CHOKE

REMOVAL/INSTALLATION



If cylinder requires service, unhitch from the back of the choke and refer to Cylinder Servicing on the following page.



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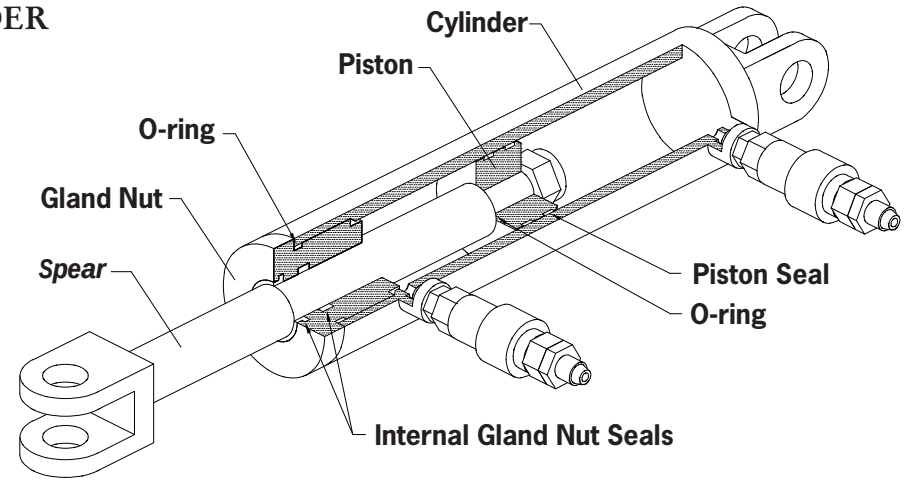
CRUSHER SERVICING

CASCADE CHOKE

CYLINDER



Disassembly

(Refer to drawing above).

All repair work should be carried out in a clean, dust free environment.

1. Fully clean outside of cylinder prior to disassembly.
2. Remove the gland nut and slide the spear and piston assembly from the cylinder.
3. Unscrew the piston and slide the gland nut off the spear.
4. Remove all the old seals.

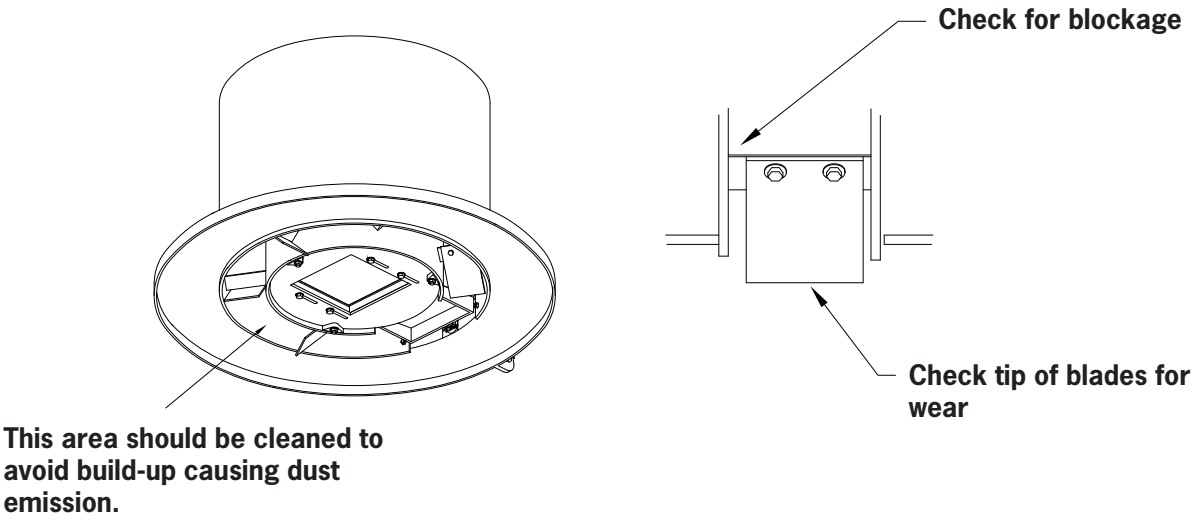
Assembly

(Refer to drawing above).

1. Clean all cylinder components.
2. Refit the internal seals into the gland nut.
3. Slide the gland nut over the spear.
4. Fit the o-ring onto the end of the spear and refit the piston.
5. Fit the piston seal and slide the piston into the cylinder.
6. Fit the external gland nut o-ring and refit into the cylinder.

CRUSHER SERVICING

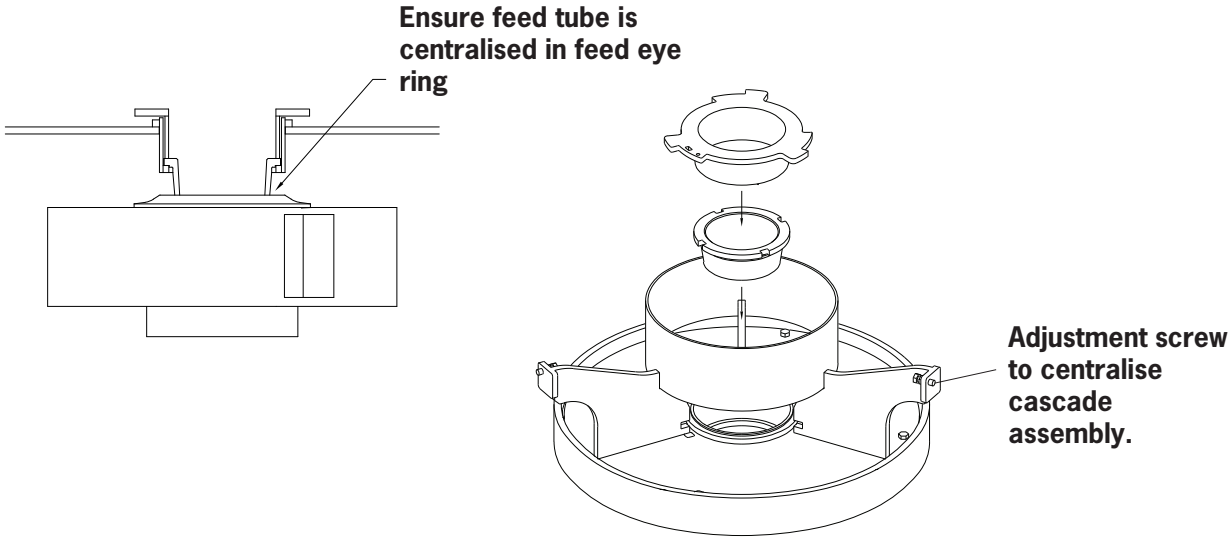
AIR TRANSFER



CASCADE CENTRALISATION

Every time the cascade assembly is removed from the crusher it is important to check that the feed tube is centrally located in the feed eye ring.

The position of the cascade assembly can be adjusted by the adjustment screws located on the arms of the cascade assembly.

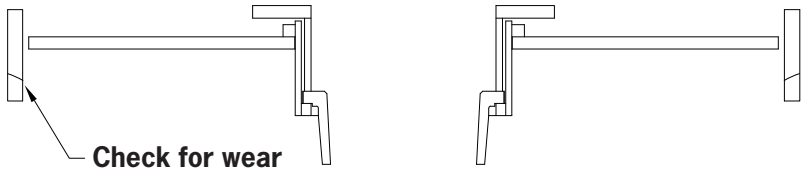


CRUSHER SERVICING

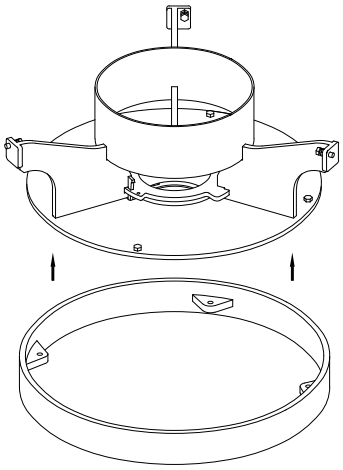
CASCADE WEAR SKIRT

Like the cavity ring, this is a secondary wear part and under normal conditions wears little, but needs checking. High cascade wear skirt wear rates could indicate low feed rates or a worn cavity ring.

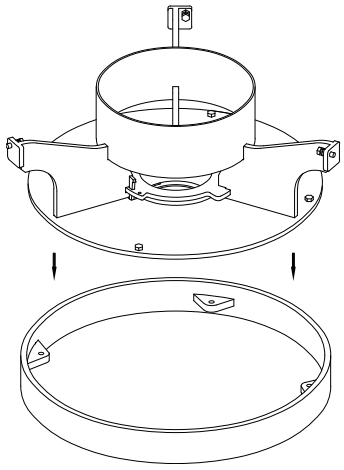
The cascade wear skirt should be replaced when wear on rotor top edge increases.



Removal



Installation



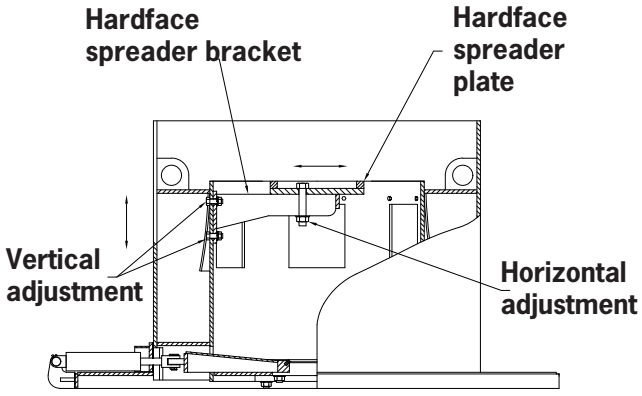
CRUSHER SERVICING

FEED HOPPER

It is important to check the general condition of the hopper. Material flow from the conveyor, feeder and/or chute work may create wear in the hopper structure. Adjust flow of material to correct.

FEED SPREADER PLATE

Changes in material flow may necessitate changing the position of the feed spreader plate. It is important that the material flow is centralised but not allowed to flow involuntarily through the cascade ports. The feed spreader plate will be subject to secondary wear. Replace or build-up with hardface welding in areas indicated.



CASCADE PORTS

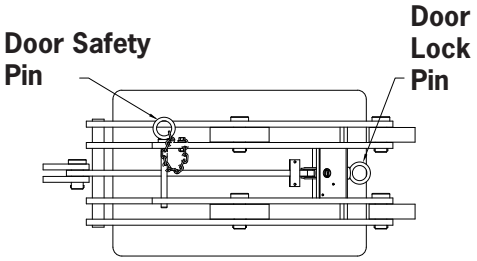
Check rubber skirt for damage or wear. Replace as required. Check edges of cascade ports for wear. Build-up with hardface weld as required.

SWING BOLTS

Check swing bolt threads and hinge action. Replace damaged swing bolts and/or swing bolt roll pins as required.

INSPECTION DOORS AND HATCHES

Ensure all inspection hatches, doors, guards and locks are secure. Ensure safety pin is in inspection door.



DOOR SAFETY INTERLOCK

Regularly check that the safety interlock device is offering the operator or maintenance staff adequate protection. If your Barmac has been fitted with a Door Safety Interlock, refer to the separate manual supplied with the machine for additional service information.

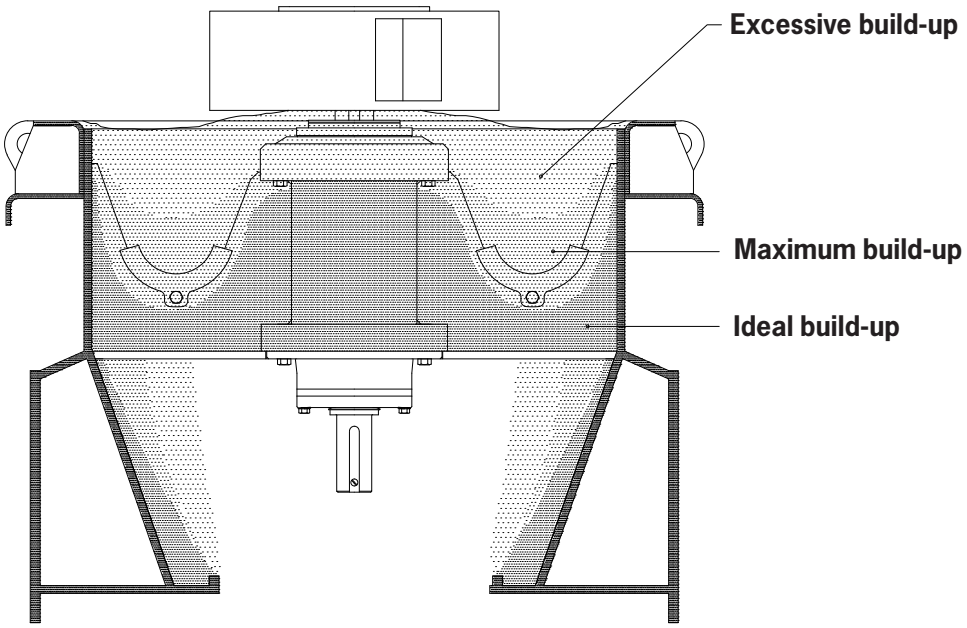
VIBRATION SWITCH

It is very important to check regularly that the vibration switch is operating. For detailed information refer to the Vibration Switch Manual provided with the machine for full testing and service instructions.

CRUSHER SERVICING

CRUSHER BASE

It is very important that material does not build-up under the rotor. This can cause severe wear and possibly damage bearings and/or the main shaft. Build-up should not impede flow of material to the discharge chutes.



Excessive Build-up

Excessive build-up can be caused by:
(1) Moisture content of feed too high
(2) High percentage of fine material in feed
(3) A combination of 1 and 2

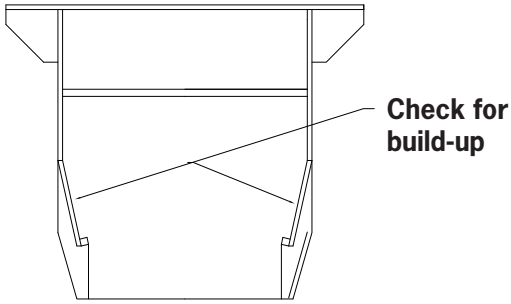
If the moisture or fines content cannot be lowered, please contact your Barmac dealer for advice. This problem can be overcome by fitting a water spray system and/or low friction liners in the base of the crusher. In extreme cases air cannons are recommended. Your Barmac dealer has access to recommended systems.

DISCHARGE CHUTES

Discharge chutes must be clear. In moist feed applications the discharge chutes need to be checked for possible build-up.

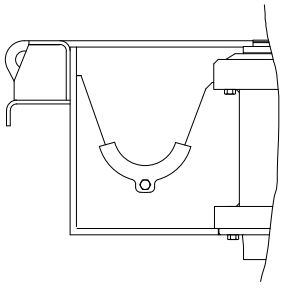
Check if the discharge chutes design restricts the flow, i.e. size or angle.

If moist material is creating a problem, consider lining with low friction material.



CRUSHER SERVICING

BASE STAY CASTINGS



Check wear castings on bearing cartridge gusset. Replace as required.

GREASE DISCHARGE CHUTE

Check regularly that the grease discharge chute is not building up with grease. Clean out as required. See 6-2.

WARNING: Excessive build-up of grease may cause an overflow of grease onto the V-belts, causing premature failure of the V-belts.

BELT GUARDS

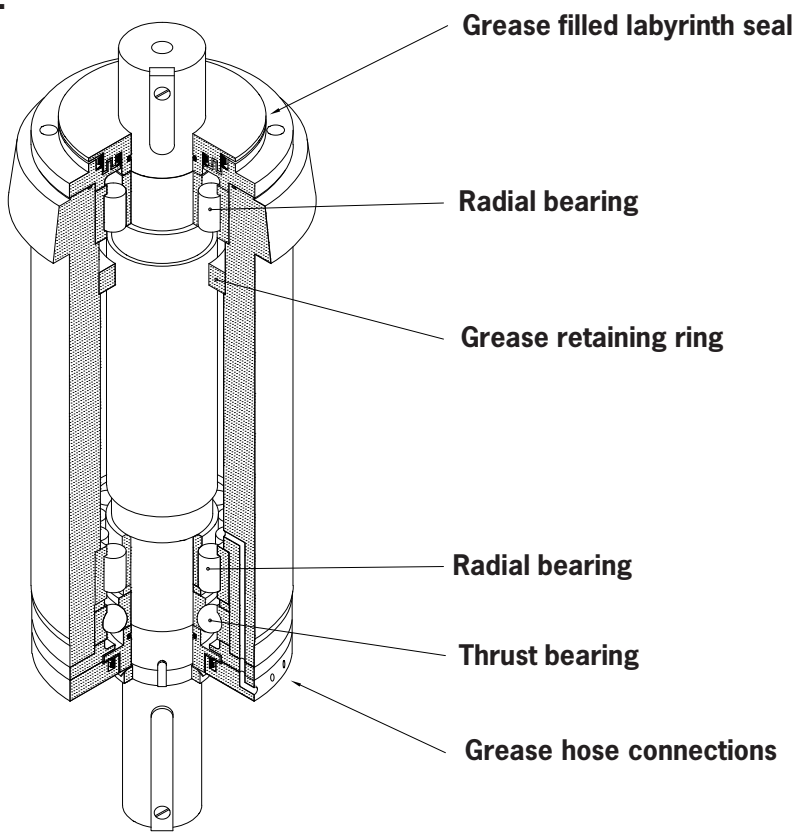
Ensure that all guards are in place and secure.

MOTORS

Check for missing bolts, bearing noise, excessive shaft float or damage and obstruction to fan cover. Grease according to manufacturer's instructions.

CRUSHER SERVICING

BEARING CARTRIDGE



The bearing cartridge is a grease filled, sealed bearing assembly which can be removed in one piece (shaft, bearings, seals and housing) for overhaul and inspection.

When the new bearing cartridge has run between 100 and 150 hours, begin a series of routine checks on the run down time of the rotor (time from power being cut to rotor stops turning).

A significant decrease in the run down time over a period will indicate that the bearings (crusher or motor) are deteriorating. Once the time falls below two minutes the bearings should be checked at the next routine service time.

Operators should become familiar with the sound of the bearings running. If this noise changes, especially if it begins rumbling, this will also indicate that the bearings are deteriorating.

If, when standing on top of the rotor during servicing, the shaft can be rocked from side to side with excessive float, then the radial bearings are worn.

If no-load current begins to increase slowly over a period of time, this is an indication that the crusher bearings are worn.

Upper seals should be replaced and labyrinth repacked with grease at yearly intervals.

Continued ▶

CRUSHER SERVICING

BEARING CARTRIDGE

BEARING CARTRIDGE SEALS

Many premature bearing cartridge failures can be attributed to failure of the upper seals within the cartridge. It is recommended these upper seals be inspected at least annually and replaced if found to be worn or broken. This inspection/replacement can be done with the bearing cartridge installed in the base of the crusher and with the rotor removed.

The lower seals cannot be inspected or replaced while the cartridge is installed in the base but are very unlikely to cause a premature failure of the cartridge. These seals are always replaced during the repair/reconditioning process.

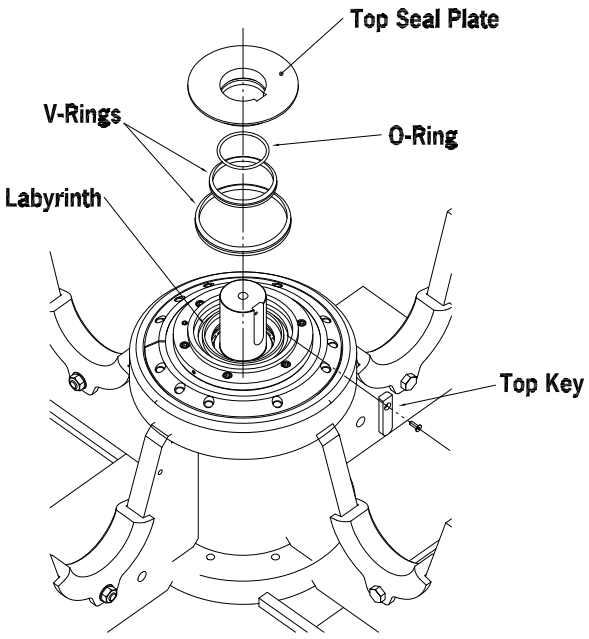
To inspect/replace upper seals:

1. Remove the top key and slide top seal plate off shaft.

2. Remove the o-ring from within the top seal plate. This is a static seal and may have a flat surface from contact against the shaft. If the seal is not broken or obviously damaged in any other way, it can be re-used.

3. Inspect the labyrinth between the bearing and the outermost seal. This should always be fully packed with clean grease. If the grease is not clean, the v-ring seals are not effective and must be replaced.

   If the labyrinth is not completely packed with grease, there could be a problem with the grease supply to the Barmac (check hoses, etc) or with the lubrication schedule. (See 6-2).

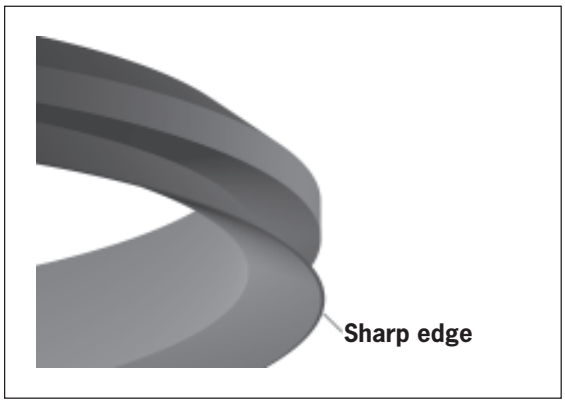


Continued ▶

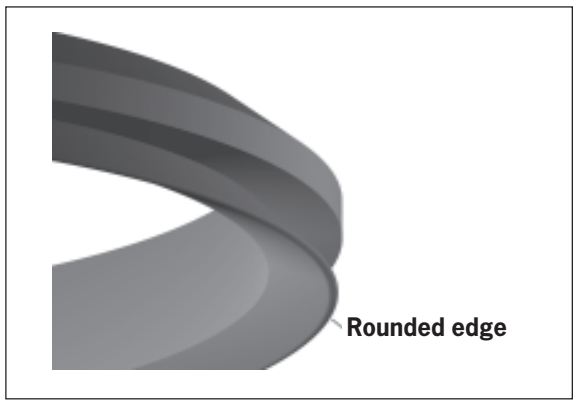
CRUSHER SERVICING

BEARING CARTRIDGE

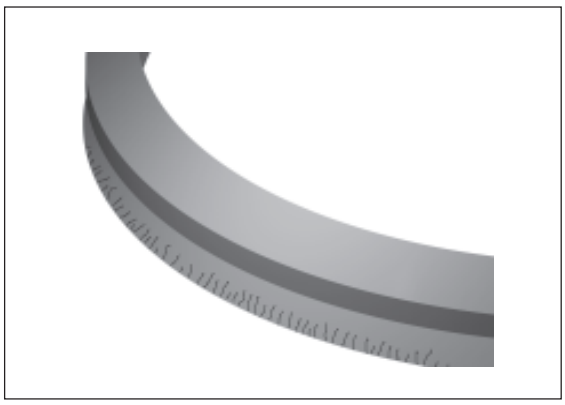
4. Remove the one or two v-ring seals (depending on the Barmac model) from the upper bearing retaining ring. These should not be worn, cracked or broken.



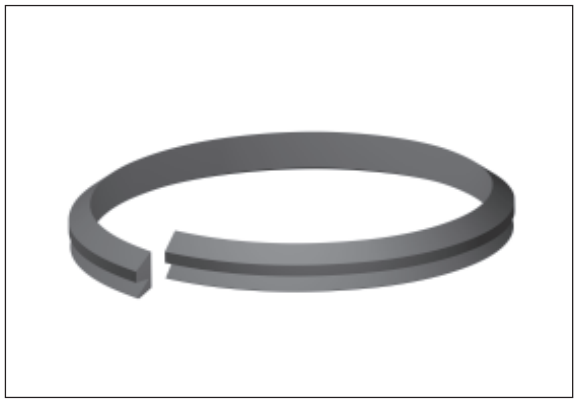
Normal Condition



Worn



Cracked



Broken

5. Refit/replace seals as necessary, pack the labyrinth with grease, refit top seal plate and key.

6. Refit the rotor and start the Barmac. Apply twice the normal amount of grease to each nipple and continue with normal operation.

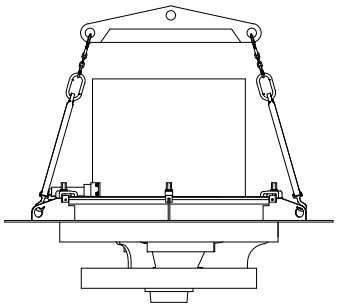
DO NOT RUN THE BARMAC WITHOUT ROTOR FITTED.

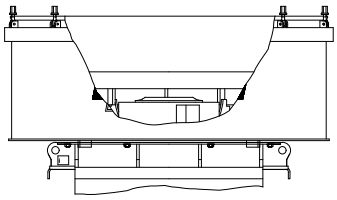
CRUSHER SERVICING

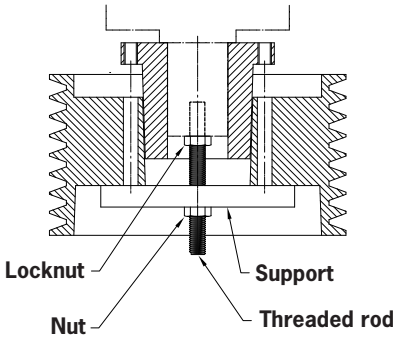
BEARING CARTRIDGE

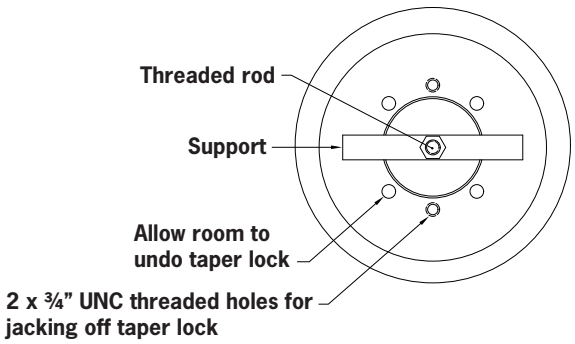
REMOVAL FROM BASE

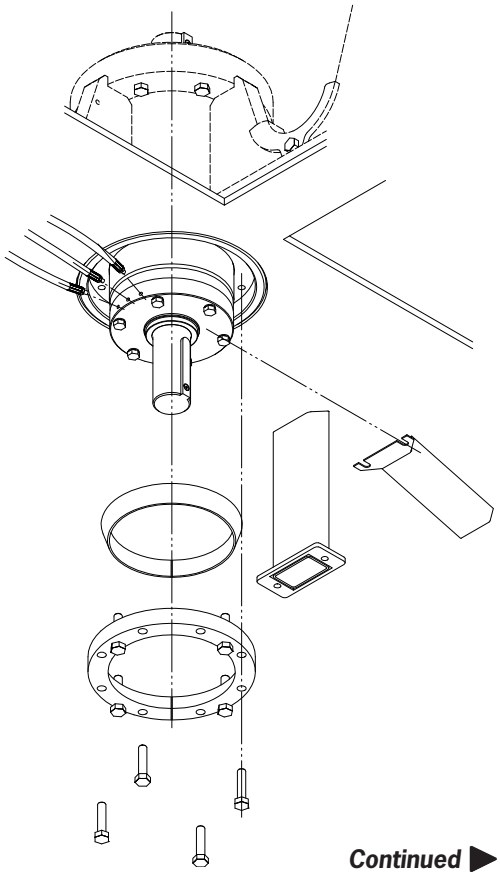
1. Remove hopper, crusher top and cascade assembly in one lift.
2. Remove the rotor. (See 6-56).
3. Loosen off belt tension and remove V-belts.
4. Remove Barmac pulley. In larger models, use a threaded rod (in the threaded hole in shaft) and support to assist in lowering pulley.











5. Remove grease hoses and grease chute.
6. Release the bottom taper ring by removing the taper ring bolts.
7. Screw half of these back into the top of the tapped extractor holes to force the outer taper ring off.
8. Remove the bottom inner taper ring.

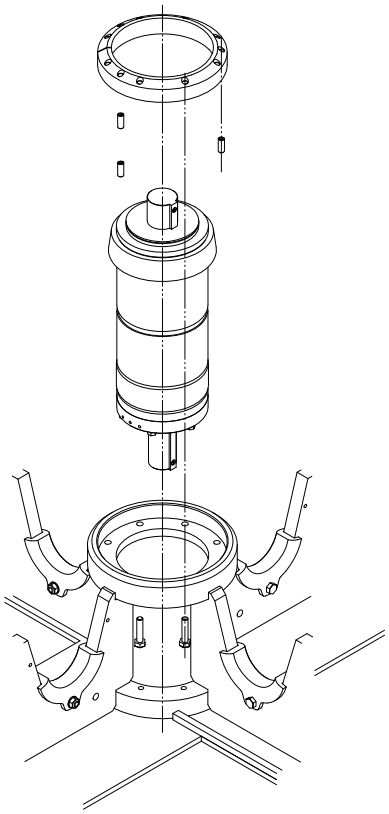
Continued ▶

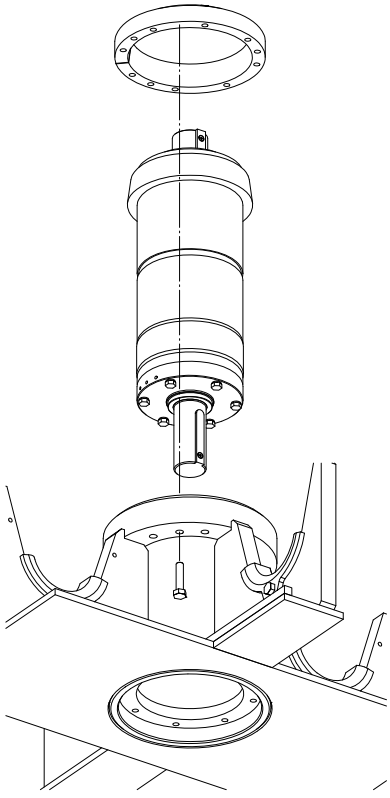
CRUSHER SERVICING

BEARING CARTRIDGE

REMOVAL FROM BASE

9. Remove the top taper ring bolts.
10. Use extractor grub screws to remove top taper ring.
11. Insert lifting eye bolt into the top of the shaft.
12. Lift out bearing cartridge.



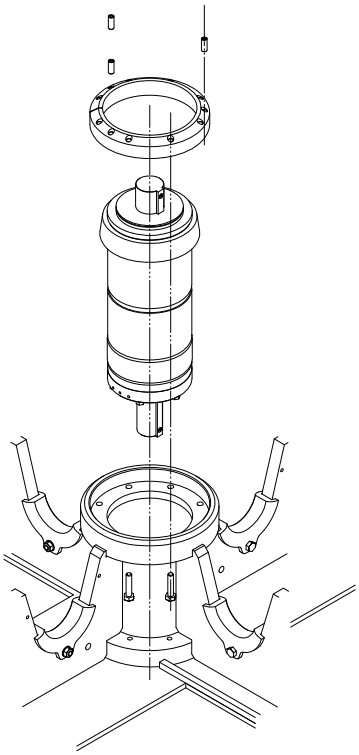


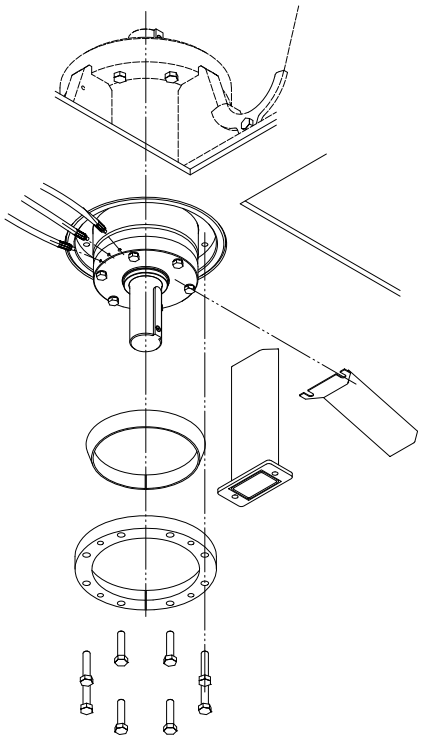
CRUSHER SERVICING

BEARING CARTRIDGE

REFITTING CARTRIDGE IN BASE

1. Remove all traces of grease, protectant, dust, etc, from machined surfaces using thinners or similar solvent.
2. Ensure all mating surfaces are free from rust, dents, scratches, etc.
3. Apply a thin layer of heavy machine oil to the mating surfaces of the bearing housing, cartridge housing and taper rings.
4. Lower bearing cartridge into top of cartridge housing and check to see that the three plastic grommets are still in place. This will ensure the grommets are not lodged in the cartridge housing.
5. Check orientation of cartridge. The grease discharge slot must align with the grease discharge chute.
6. Locate bearing cartridge centrally with top taper ring.
7. Fit bottom taper rings (inner and outer) and lightly screw in bottom taper ring bolts.
8. Fit grubscrews in until just below flush with top of taper rings and secure in place with silicone.
9. Refer to Bearing Cartridge Bolt Torque Settings (6-59).





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CRUSHER SERVICING

BEARING CARTRIDGE

REFITTING CARTRIDGE IN BASE

10. Starting on top taper ring, torque down bolts top and bottom in a "star" sequence (Fig.1) in two stages. Torque bolts in order from 1 to 8. Repeat for bottom taper ring.

Torque settings are as follows:

B3000, B5000

Stage 1 – 15Nm (11 ft lb)
Stage 2 – 30Nm (22 ft lb)

B6000, B7000, B8000, B9000

Stage 1 – 70Nm (55 ft lb)
Stage 2 – 130Nm (100 ft lb)

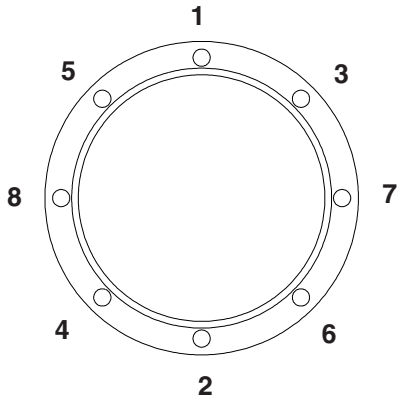


Fig.1

11. Refit grease hoses, making sure they are not twisted or blocked. See 6-5 for identification of grease points on bearing housing. Ensure that grease hoses are not able to fall onto V-belts during operation. **Note:** Some models have a bar to rest the grease hoses on.

12. Refit pulley and drive belts.

13. Refit rotor.

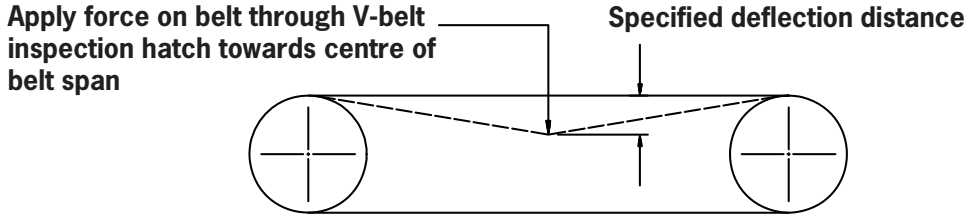
DRIVE BELT TENSIONING – B9000, B8000, B7000, B6000

Correct tensioning is the most important factor necessary for long, satisfactory drive belt operation. Too little tension will result in slippage, causing rapid belt and pulley wear, and poor efficiency. Too much tension results in excessive strain on belts, bearings (especially motor bearings), and shafts.

PROCEDURE

Measuring

1. Select the second belt from the bottom.
2. Measure the force required to deflect the belt the distance as set out below:



Force and deflection for each model and belt type can be found on the *Belt Tension/Deflection Chart*, overleaf.

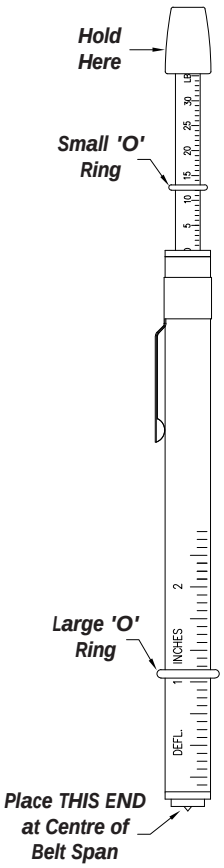
3. For measuring the force and deflection, Metso Minerals recommend the use of a tension gauge similar to the one represented.

   Using the belt tension gauge at the centre of the belt span, follow these instructions:

   (a) Set the large 'O' ring on the designated deflection as per the *Belt Tension/Deflection Chart.*

   (b) Push the belt tension gauge against the second to bottom belt until the large 'O' ring is even with the top of the next belt. Ensure that the gauge is in the centre of the belt section, and always test the belts on the tight (or driven) side of the belts.

   (c) Remove the gauge and observe that the small 'O' ring has moved from its original setting at zero to the number of kg (lb) required to deflect the belt.



Adjustment

1. Slightly loosen off motor mount bolts.
2. Tighten (or loosen) tension by adjusting belt tension adjuster nuts.
3. Adjust belt tension as per the *Belt Tension/Deflection Chart*. (For dual drive, adjust both exactly the same).

Continued ▶

DRIVE BELT TENSIONING – B9000, B8000, B7000, B6000

BELT TENSION/DEFELECTION CHART

Machine	Initial Installation Tension kg (lb)	Normal Running Tension kg (lb)	Deflection Distance mm (in.)
B6000	11 (24.25)	8 - 9 (17.50 - 19.75)	19 (3/4)
B7000	16 (35.25)	12 - 14 (26.50 - 30.75)	27 (1)
B8000	16 (35.25)	12 - 14 (26.50 - 30.75)	27 (1)
B9000	16 (35.25)	12 - 14 (26.50 - 30.75)	27 (1)

NOTE: The above belt tension/defelection values relate to SP, SPX, V and VX belt sections, and have been formulated to accommodate the various centre distances that motor frame sizes or sheave diameters will provide on each model. If V-belt life, tensioned to the above values, is not satisfactory, please contact your Barmac representative.

NEW BELTS (This includes the initial commissioning of the crusher).

New belts will take a little time to settle into the grooves, and will naturally stretch in the first days of operation. To accommodate this settling in process, it is recommended that the V-belts are tensioned some 20% above the optimum. Refer to the *Belt Tension/Deflection Chart* under **Initial Installation Tension** column for the recommended tension for the standard deflection for new belts.

Tension Range

Belt tension should be monitored regularly (at least weekly), but does not need adjustment unless it falls outside the range indicated in the **Normal Running Tension** column

RUNNING IN NEW BELTS (This includes the initial commissioning of the crusher).

After 30 Minutes

After thirty minutes running it is recommended that the tension should be checked and retensioned to the **Initial Installation Tension** values.

After 4 Hours

Re-tension to the **Initial Installation Tension** values.

Next 5 Days

Check tension at least once daily and you should observe a "settling", requiring minimum adjustment to maintain the tension as per the **Normal Running Tension**.

Continued ▶

DRIVE BELT TENSIONING – B9000, B8000, B7000, B6000

LOOSE BELTS

In the event of there being one or two belts being looser than the others, tension the belts normally, and measure the deflection force required on the loose belt. If this is 10% or more below the low range tension, then there is a danger that the loose belt could turn, or even jump off, taking the rest of the set with it. If the belt is one of a new set, then initially add an extra 1kg (2 lb) of pressure relative to tension to that particular side of the drive, to see if the belt will "settle in" on its own. If this has not happened within 5 days or if the loose belt does not tension up to the minimum, then the loose belt must be replaced.

DUAL DRIVE

Belt Tension/Balanced Motor Amps

On dual drive Barmacs, one motor may draw less current than the other, i.e. it appears lazy. For the motors to do equal work the belt drives must be set up with equal tension.

On dual drive Barmacs, a small difference in belt tension between drives can make a big difference in motor amps. For example, a dual drive 185 kW (250 hp) Duopactor under full load with 0.5% slip in one drive and 1.0% in the other will show a current draw of 170 amps in one motor and 120 in the other – a 50 amp difference.

Adjustment

Static

Follow normal static adjustment procedure as explained above, but make special effort to adjust the two drives to exactly the same values.

Dynamic

1. With the Barmac operating under load, prepare the low current motor for adjustment, ensuring that when the four motor mount bolts are loosened, the motor mount is held in place by the belt tension adjuster nuts. This is done by loosening off the two motor mount bolts that pass through the adjuster rods. (See **Important Note** below). Apply tension to these adjuster rods by turning the adjuster nuts approximately half a turn from hand tight.
2. Then loosen off the other two motor mount bolts. **Important Note:** Loosen only enough to permit the motor mount to be adjusted by means of the adjuster nuts.
3. Turn the adjuster nuts clockwise by one turn to tighten the belts. Retighten the four motor mount bolts and observe the current drawn by both motors for ten minutes.
4. Repeat until the currents drawn by the motors are within approximately 10 amps of each other.
5. After balancing amps in this way, belt tensions should be checked as soon as possible to ensure correct balanced belt tensions. If balanced amps are achieved with unbalanced tension, the cause should be investigated.

Continued ▶

DRIVE BELT TENSIONING – B9000, B8000, B7000, B6000

Other Causes Of Unbalanced Motor Amps

If the motors will not draw similar amps by altering belt tension, check–

1. **The motor or starter electric terminals.** Have a qualified electrician check motor or starter terminals. If dirty they will need cleaning and re-fitting.
2. **The starter has a fault.** To confirm starter fault exists, have a qualified electrician check the following:

   With the machine under load:

   (a) Read both ammeters and record amps on ammeter 1 and ammeter 2.

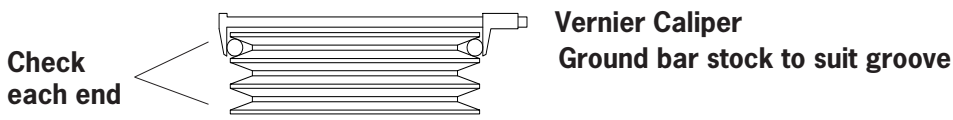
   (b) Stop the machine.

   (c) Swap motor wiring over at starter contactors.

   (d) Restart the machine. The ammeter readings should have swapped, i.e. No. 1 should read what No. 2 used to, and vice versa. If this doesn't happen, the electrician must check the function of the starter componentry.
3. **Belt alignment** – Make sure sheaves are in line using a straight edge or string line.
4. **Motors** – They should be of the same brand and type and preferably be manufactured in the same batch (check with motor manufacturer or agent). Different manufacturers and sometimes different batches of motors have different winding specifications.
5. **Belts** – The belts should be matched, i.e. all the same brand at least, and a matched set if possible.
6. **Pulleys –**

(a) Check pulley axes are parallel and grooves are properly aligned with one another – any dust build-up entering under the motor mount will cause the pulleys to be out of parallel, with higher tension on belts at one end of the pulley.

(b) Check pulley diameters. For equal power transmission, the pitch diameters of the driving pulleys must be within 0.5mm (0.02") of each other. This can be checked by measurement as shown. Check grooves at each end of the pulley – any taper in pulley length will cause problems.



(c) If after a period of satisfactory running the motors become difficult to match, check the pulleys for wear.

DRIVE BELT TENSIONING – B5000, B3000

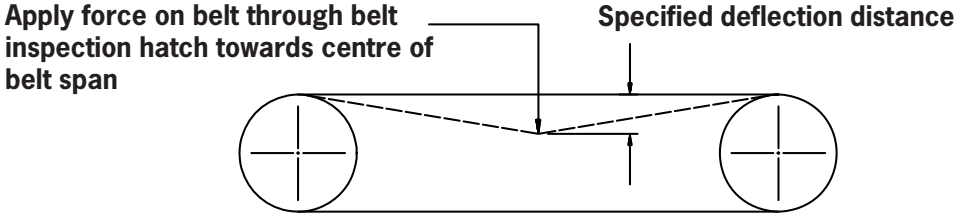
Belt tensioning follows a similar process as for v-belts.

Correct tensioning is the most important factor necessary for long, satisfactory drive belt operation. Too little tension will result in jumping of teeth, causing rapid belt and sprocket wear, and poor efficiency. Too much tension results in excessive strain on belts, bearings (especially motor bearings), and shafts.

PROCEDURE

Measuring

1. Select the centre of the belt.
2. Measure the force required to deflect the belt the distance as set out below:



Force and deflection for each model and size belt can be found on the *Belt Tension/Deflection Charts*, opposite.

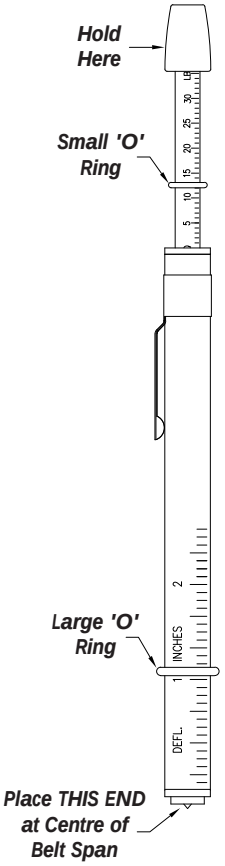
3. For measuring the force and deflection, Metso Minerals recommend the use of a tension gauge similar to the one represented.

   Using the belt tension gauge at the centre of the belt span, follow these instructions:

   (a) Set the large 'O' ring on the designated deflection distance as per the *Belt Tension/Deflection Chart.*

   (b) Place a straight edge between the sprockets. Push the belt tension gauge against the belt until the large 'O' ring is even with the straight edge. Ensure that the gauge is in the centre of the belt section, and always test the belts on the tight (or driven) side of the belts.

   (c) Remove the gauge and observe that the small 'O' ring has moved from its original setting at zero to the number of kg (lb) required to deflect the belt.



Adjustment

1. Slightly loosen off motor mount bolts.
2. Tighten (or loosen) tension by adjusting belt tension adjuster nuts.
3. Re-measure belt tension and if necessary re-adjust belt tension until figures correspond with *Belt Tension/Deflection Chart.*

Continued ▶

DRIVE BELT TENSIONING – B5000, B3000

BELT TENSION/DEFLECTION CHART

The following belt tension/deflection values relate to Gates Polychain belt section, and have been formulated to accommodate the various centre distances that motor frame sizes or sprocket diameters will provide on each model. If drive belt life, tensioned to the above values, is not satisfactory, please contact your Barmac representative.

B5000

Motor Size kw [hp]	Initial Installation Tension kg [lb]	Normal Running Tension kg [lb]	Deflection Distance mm [in.]
30 [40]	8.44 [18.6]	7.8 [17.2]	16.5 [0.65]
37.5 [50]	*12.07 [26.6]	*11.2 [24.7]	16.5 [0.65]
45 [60]	13.47 [29.7]	12.5 [27.5]	16.5 [0.65]
55 [75]	15.70 [34.6]	14.5 [32.0]	16.5 [0.65]

* **NOTE:** For a drive speed of 2273 rpm, use tension values as for 30 kW (40 hp) motor.

B3000

Motor Size kw [hp]	Initial Installation Tension kg [lb]	Normal Running Tension kg [lb]	Deflection Distance mm [in.]
7.5 [10]	2.27 [5.0]	2.09 [4.6]	10.9 [0.43]
11 [15]	3.58 [7.9]	3.36 [7.4]	10.9 [0.43]
15 [20]	4.35 [9.6]	4.04 [8.9]	10.9 [0.43]

NEW BELTS (This includes the initial commissioning of the crusher).

New belts will take a little time to settle into the grooves/sprockets, and will naturally stretch in the first days of operation.

TENSION RANGE

Belt tension should be monitored regularly (at least weekly), but does not need adjustment unless it falls below the figure indicated in the **Normal Running Tension** column.

RUNNING IN NEW BELTS (This includes the initial commissioning of the crusher).

After 30 Minutes

After thirty minutes running it is recommended that the tension should be checked and retensioned to the **Initial Installation Tension** values.

After 4 Hours

Re-tension to the **Initial Installation Tension** values.

Next 5 Days

Check tension at least once daily and you should observe a "settling", requiring minimum adjustment to maintain the tension as per the **Normal Running Tension**.

BOLT TORQUE SETTINGS

BARMAC BOLT TORQUE SETTINGS Nm (ft lbs)

Model	Rotor Size	Tip Assembly	Top Plate Bolts	Dist. Plate Bolt	Top Taper Ring Bolts	Bottom Taper Ring Bolts
B3000	300	100 (75)	34 (26)	40 (30)	30 (22)	30 (22)
B5000	500	100 (75)	60 (45)	40 (30)	30 (22)	30 (22)
B6000	690	130 (100)	250 (190)	200 (150)	130 (100)	130 (100)
B7000	760	130 (100)	250 (190)	200 (150)	130 (100)	130 (100)
B8000	840	130 (100)	250 (190)	200 (150)	130 (100)	130 (100)
B9000	990	130 (100)	250 (190)	200 (150)	130 (100)	130 (100)

NOTE: All threads must be lightly lubricated before assembly.