

Company Name:	Equipment/Job Identification: Nordberg Standard Cone Replacement Type of Equipment: Cone Crusher Make: Nordberg 4.25 foot Model: Year: Use:
Mine Name:	
Date of Analysis:	

Pre-Assessment

All MSHA Part 46 requirements must be met including Task Training
 Company policy requirements and SOPs
 Task training records must be on file prior to operating any mobile equipment

Duty 1: Preparation

Learner will explain the importance of preparation to begin the Nordberg Cone Replacement. The learner will explain each job step, why it is conducted, any associated risk, and how to implement appropriate controls. Preparation activities include the following steps:

Job Steps	Importance Narrative (Consider Safety, Production, Maintenance)	Importance Ranking	Satisfactory or Needs Work	Procedures/Risk Resolution/ Notes/Comments
		1=Important 2=Very Important 3=Critical		
Conduct Self Assessment	May contribute to poor job performance and/or may cause an accident	2		
Conduct Pre-job Meeting	Ensures that all employees are on the same page and there is understanding to what is required for this task	2		
<ul style="list-style-type: none"> • Review Safety Procedures 	Reinforces safety procedures	2		
<ul style="list-style-type: none"> <ul style="list-style-type: none"> ○ Crane hand signals 	Reinforces safety procedures	2		
<ul style="list-style-type: none"> <ul style="list-style-type: none"> ○ Lock-Out-Tag Out Procedures 	Reinforces safety procedures	2		
<ul style="list-style-type: none"> <ul style="list-style-type: none"> ○ Review Cutting/Grinding Safety 	Reinforces safety procedures	2		
<ul style="list-style-type: none"> <ul style="list-style-type: none"> ○ Overhead Load Safety 	Reinforces safety procedures	2		
<ul style="list-style-type: none"> <ul style="list-style-type: none"> ○ Ventilation 	Reinforces safety procedures	2		
<ul style="list-style-type: none"> <ul style="list-style-type: none"> ○ Discuss Weather Conditions 	Reinforces safety procedures	2		

Job Steps	Importance Narrative (Consider Safety, Production, Maintenance)	Importance Ranking	Satisfactory or Needs Work	Procedures/Risk Resolution/Notes/Comments
		1=Important 2=Very Important 3=Critical		
○ Review Emergency Response Procedures	Reinforces safety procedures	2		
● Review Manufacturers Manual	Failure to follow manual may cause equipment failure and or down time	2		Ensure that all recommended parts, equipment, tools are available
○ Check component weights of crusher to ensure that safe picks are made; refer to crane load charts	Failure to follow manual may cause equipment failure and or down time	2		
● Review Equipment Needs	Essential to get the job done in a timely manner	2		
○ Cranes	Essential to get the job done in a timely manner	2		Use only Certified Crane Personnel
○ Rigging	Essential to get the job done in a timely manner	2		Gloves for rigger
● Tag Line	Essential to get the job done in a timely manner	2		
● Ensure that someone inspects the rigging for defects	Essential to get the job done in a timely manner	2		
○ Loader	Essential to get the job done in a timely manner	2		
● 980 or larger	Essential to get the job done in a timely manner	2		
○ Service Truck	Essential to get the job done in a timely manner	2		
● Cutting Torch & Full Bottles	Essential to get the job done in a timely manner	2		
● Hand tools	Essential to get the job done in a timely manner	2		
● Welder	Essential to get the job done in a timely manner	2		
● Compressor	Essential to get the job done in a timely manner	2		
● Obtain Job Specific PPE		1		
○ Face shield		1		
○ Cutting Goggles		1		

Job Steps	Importance Narrative (Consider Safety, Production, Maintenance)	Importance Ranking	Satisfactory or Needs Work	Procedures/Risk Resolution/Notes/Comments
		1=Important 2=Very Important 3=Critical		
o Leathers		1		
o Welding Hood		1		
o Welding Gloves		1		
o Respirator		1		
o Fall Protection		1		
o Long Sleeve Shirts		1		
o Safety Glasses		1		As per company policy
o Hearing Protection		1		
o Hard Hats		1		As per company policy
o Safety Shoes		1		As per company policy
o Latex or Rubber Gloves		1		
• Ensure that the proper parts are on site and available	Will hamper the timely accomplishment of the job; loss of production	2		
o Mantle Liners		2		
o Bowl Liners		2		
o Torch Ring		2		
o O-Rings		2		
o Springs & Guide Kit		2		
o Felt		2		
o Insulation		2		
o Silicone		2		
o Backing Material (Minimum of 10)		2		
o Grease (5 gallon can)		2		
o Never seize		2		
o Cleaning solvent		2		
• Review past success and failures	Failure to do this may cause a repeat of a past failure	2		
• Assign Jobs		1		
o Upper		1		
o Lower		1		
o Crane Operator		1		
o Loader Operator		1		
Obtain tools, equipment, and materials	Will hamper the timely accomplishment of the job; loss of production	2		

Job Steps	Importance Narrative (Consider Safety, Production, Maintenance)	Importance Ranking	Satisfactory or Needs Work	Procedures/Risk Resolution/Notes/Comments
		1=Important 2=Very Important 3=Critical		
• Equipment	Will hamper the timely accomplishment of the job; loss of production	2		
○ Rigging		2		
• Gloves for rigger		2		Leather
• Tag line		2		
• Inspect wire rope for defects: frays, kinks, and broken wires		2		
• Inspect nylon straps for tears, oil, frays, cuts, and weather damage		2		
○ Service Truck		2		
• Cutting Torch & Full Bottles		2		
• Inspect gauges, hoses, flash back arrestor, tips, and torch head for defects		2		
• Hand Tools		2		Inspect all tools for defects
• Welder		2		Insure that all connections are guarded
• Inspect leads, electrode holder, grounding		2		

Job Steps	Importance Narrative (Consider Safety, Production, Maintenance)	Importance Ranking	Satisfactory or Needs Work	Procedures/Risk Resolution/Notes/Comments
		1=Important 2=Very Important 3=Critical		
clamp, all connections				
• Compressor		2		Check for fuel, hoses, gauges, pressure relief valve, and oil. Drain the moisture for the air tank.
• Pre-shift inspection		2		Use company form
○ Loader		2		
• Pre-Shift Inspection		2		Use company form Must be tasked trained
• 980 or larger		2		
○ Crane		2		Use only certified personnel
• Pre-Shift Inspection				Use company form
• Tools	Will hamper the timely accomplishment of the job; loss of production	2		
○ 1" Impact		2		
○ ½" Impact		2		
• Inspect all tools for defects		2		
○ ¾" Impact		2		
• Inspect all tools for defects		2		
○ Appropriate sockets		2		Plant specific
• Inspect all tools for defects		2		
○ 1" drive ratchet		2		
• Inspect all tools for defects		2		
○ Side Grinders		2		
• Inspect all tools for defects		2		
○ ½" Drill		2		
• Inspect all tools for defects		2		
○ Approved Extension Cord		2		

Job Steps	Importance Narrative (Consider Safety, Production, Maintenance)	Importance Ranking	Satisfactory or Needs Work	Procedures/Risk Resolution/ Notes/Comments
		1=Important 2=Very Important 3=Critical		
<ul style="list-style-type: none"> • Inspect all tools for defects 		2		
<ul style="list-style-type: none"> ○ Cheater Bar 		2		
<ul style="list-style-type: none"> • Inspect all tools for defects 		2		
<ul style="list-style-type: none"> ○ Pry Bar 		2		

<ul style="list-style-type: none"> • Inspect all tools for defects 		2		
<ul style="list-style-type: none"> • At least 3' long 		2		
<ul style="list-style-type: none"> ○ Sledge hammers (2) 		2		
<ul style="list-style-type: none"> • Inspect all tools for defects 		2		
<ul style="list-style-type: none"> ○ Nordberg Crusher Tools 		2		Refer to maintenance book
<ul style="list-style-type: none"> • Inspect all tools for defects 		2		
<ul style="list-style-type: none"> ○ Specialty head ball tools 		2		Plant Specific
<ul style="list-style-type: none"> • Inspect all tools for defects 		2		
<ul style="list-style-type: none"> ○ Caulking Gun 		2		
<ul style="list-style-type: none"> • Inspect all tools for defects 		2		
<ul style="list-style-type: none"> ○ Bowl cable 		2		
<ul style="list-style-type: none"> • Inspect all tools for defects 		2		
<ul style="list-style-type: none"> • ½" X 30' wire rope with eyes on each end 		2		Inspect cable for defects
<ul style="list-style-type: none"> ○ Slag Hammer 		2		
<ul style="list-style-type: none"> • Inspect all tools for defects 		2		
<ul style="list-style-type: none"> • Materials 	Will hamper the timely accomplishment of the job; loss of production	2		
<ul style="list-style-type: none"> ○ Rags 		2		
<ul style="list-style-type: none"> ○ Welding Rod 		2		
<ul style="list-style-type: none"> • Manganese or stainless 		2		
<ul style="list-style-type: none"> ○ Air Arc Rods 		2		
<ul style="list-style-type: none"> ○ Grinder wheels 		2		
<ul style="list-style-type: none"> • Inspect for cracks, chips and oil on wheels 		2		
<ul style="list-style-type: none"> ○ Wire Brushes 		2		
<ul style="list-style-type: none"> ○ First Aid Kit 		2		
<ul style="list-style-type: none"> • Check contents 		2		
<ul style="list-style-type: none"> ○ WD40 		2		
<ul style="list-style-type: none"> ○ Anti-Seize 		2		

o Silicone		2		
o Backing Material		2		
o Grease		2		
o Welding Curtains		2		
o Ventilation Fan		2		
o 1 gallon motor oil		2		
o Insulation		2		
• 3 ½" fiberglass bat		2		
o 10'x10' Tarp		2		
o Lid from 55 gallon grease barrel		2		
• Housekeeping	Will hamper the timely accomplishment of the job; loss of production	2		
o Crusher walkways		2		
o Liner Rebuild work areas		2		
o Crane staging area		2		

Duty 2: Dismantle Crusher

Learner will demonstrate how to properly dismantle the Nordberg Cone Crusher. Learner will also explain the job duties, why they are conducted, any associated risk, and how to implement appropriate controls. Safe and efficient crusher dismantling includes the following job steps:

Job Steps	Importance Narrative (Consider Safety, Production, Maintenance)	Importance Ranking	Satisfactory or Needs Work	Procedures/Risk Resolution/ Notes/Comments
		1=Important 2=Very Important 3=Critical		
Run Crusher		1		10-15 minutes for warm up. To prevent socket from sticking to shaft.
Lock-Out-Tag-Out per company policy	Could cause a sudden starting of crusher or surrounding components which could cause fatal injuries	3		
• Crusher		3		
• Feed Conveyor		3		
• Discharge Conveyor		3		
• All oil systems including heaters		3		
• All neighboring circuits surrounding work area		3		
Stage Crane in safe location	Overhead powerlines, exceeding load limit, counterweight clearance; and to ensure proper operation of the crane	3		
Remove all conveyors, chutes and/or hoppers	Will hamper the timely accomplishment of the job; loss of production	2		
Pull oil drain plug	Failure to do this will prevent you from cleaning contaminants from the machine	2		Recycle oil
Cut distributor plate bolts	Failure to do this will prevent the job from being conducted; loss of production	2		
Remove distributor plates	Failure to do this will prevent the job from being conducted; loss of production	2		
Relieve pressure on locking post	Failure to do this will prevent the job from being conducted; loss of production	2		

• Hydraulic		2		
○ Connect two way cable to cap		2		
○ Lift cap with crane to relieve hydraulic pressure		2		Watch sight glass for fluid level
○ Disconnect hydraulic lines		2		
○ Lower cap		2		
○ Disconnect two way cable from the cap		2		
○ Raise the two way cable out of the work area		2		
• Mechanical		2		
○ Remove pin and lock link		2		
○ Loosen the hold down bolts with socket and 1" ratchet		2		
○ Back out bolts approximately 6 inches		2		
Hook one end of the 1/2" X 30' wire rope onto the bowl ear	Failure to do this will prevent the job from being conducted; loss of production	2		
Wrap 1/2" 30' wire rope cable around crusher bowl in a counter clockwise manner	Failure to do this will prevent the job from being conducted; loss of production	2		
Attach the other end of the wire rope to the eye or hook on the loader bucket using an approved shackle	Failure to do this will prevent the job from being conducted; loss of production	2		
Un-screw crusher bowl with the loader	Failure to do this may cause catastrophic injuries or fatality	3		
• Raise the loader bucket to protect the loader operator while un-screwing bowl	Failure to do this may cause catastrophic injuries or fatality	3		In case cable breaks
• Ensure that all co-worker are in a safe location in case of cable failure	Failure to do this may cause catastrophic injuries or fatality	3		
• Only one person is used for designated hand signals	More than one person giving signals may cause the loader operator to be confused which may cause an injury	3		
• Back the loader up carefully until the end of the cable is reached watching the hand signals of the	More than one person giving signals may cause the loader operator to be confused which may cause an injury	3		

designated person				
<ul style="list-style-type: none"> Repeat this process until the end of threads are visible 	Failure to do this will prevent the job from being conducted; loss of production	3		Do not over-unscrew
Disconnect wire rope from loader and bowl	Failure to do this will prevent the job from being conducted; loss of production	2		
<ul style="list-style-type: none"> Store in a safe location for use during re-assembly 		1		
Attach two way cable to basket (hydraulic crusher only)	Failure to do this will prevent the job from being conducted; loss of production	2		
Lift basket up out of the bowl (hydraulic crusher only)	Failure to do this will prevent the job from being conducted; loss of production	2		
Place the basket on the ground	Failure to do this will prevent the job from being conducted; loss of production	2		
Attach two way cable to the bowl cap ears	Failure to do this will prevent the job from being conducted; loss of production	2		
Lift bowl out of the main frame in a slow manner	Failure to do this will prevent the job from being conducted; loss of production	2		Insure that all personnel are in a safe location during this step
Place bowl on the ground	Failure to do this will prevent the job from being conducted; loss of production	2		
Remove bowl	Failure to do this will prevent the job from being conducted; loss of production	2		
<ul style="list-style-type: none"> Hydraulic 		2		
<ul style="list-style-type: none"> <ul style="list-style-type: none"> Disconnect hold down rams by removing cotter pins, keepers, and washers 		2		
<ul style="list-style-type: none"> <ul style="list-style-type: none"> Lift the cap with the crane and inspect the hydraulic ram shaft and place it to the side 		2		If ram is found defective, repair or replace
<ul style="list-style-type: none"> <ul style="list-style-type: none"> Disconnect the two way cable from the cap 		2		
<ul style="list-style-type: none"> Mechanical 		2		
<ul style="list-style-type: none"> <ul style="list-style-type: none"> Remove the hold down bolts and washers 		2		
<ul style="list-style-type: none"> <ul style="list-style-type: none"> Set aside for cleaning 		2		
<ul style="list-style-type: none"> <ul style="list-style-type: none"> Remove cap with crane and set it aside 		2		
<ul style="list-style-type: none"> <ul style="list-style-type: none"> Disconnect the two way cable from the cap 		2		
Clean main frame threads with water hose or scraper	Failure to do this may cause poor performance and/or loss of production	1		
Place eye bolt in the head of the shaft ensuring that the eye bolt is properly	Failure to do this will prevent the job from being conducted; loss of production	2		

secured				
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Attach the two-way cable to the eye bolt with the correct shackle	Failure to do this will prevent the job from being conducted; loss of production	2		
Ensure that the cable is perfectly vertical	Damage may occur to equipment	2		
Hoist the shaft out of the main frame in a slow manner	May cause the socket sealing ring from coming out with the shaft causing damage to the socket sealing ring	2		
<ul style="list-style-type: none"> Ensure that all personnel are in a safe location during this step 	Could cause fatal injury because of overhead and/or swinging load	3		
<ul style="list-style-type: none"> Ensure the end of the shaft does not gouge socket liner 	Failure to do this step could cause severe damage	2		
Place shaft on the ground	Failure to do this will prevent the job from being conducted; loss of production	2		
Un-hook two way cable from shaft	Failure to do this will prevent the job from being conducted; loss of production	2		
Place cover on the eccentric bushing	Failure to do this will prevent the job from being conducted; loss of production	2		Must be able to support weight of persons working in the area (55 gallon barrel metal lid); prevents contaminants
Install eye bolts in the socket sealing ring	Failure to do this will prevent the job from being conducted; loss of production	2		Ensure that the eye bolts are properly secured
Attach the two way cable to the eye bolts with the proper shackle	Failure to do this will prevent the job from being conducted; loss of production	2		
Lift socket sealing ring with slight pressure	Failure to do this will prevent the job from being conducted; loss of production	2		
Check to ensure there is movement	Failure to do this may cause excessive pressure resulting in a recoil effect causing equipment damage and/or serious injury	3		If no movement, use penetrating oil and/or foot pressure to help it break the ring free
Lift the socket sealing ring out of main frame	Failure to do this will prevent the job from being conducted; loss of production	2		
Remove the three locking dowel keys and set aside for reinstallation	Failure to do this will prevent the job from being conducted; loss of production	2		
Place on clean surface		1		
Disconnect the two way cable	Failure to do this will prevent the job from being conducted; loss of production	2		
Raise cable out of the work area	Failure to do this will prevent the job from being conducted; loss of production	2		
Remove O-Ring and/or valves and springs from the top of the socket	Failure to do this will prevent the job from being conducted; loss of production	2		Discard all and do not reuse

Inspect the root clearance, back lash, and condition of bronze eccentric bushing, socket liner and step washers	Failure to do this may cause crusher failure	2		Per manufactures specifications Order parts if required
Inspect main-frame arms, main frame liners, and counter shafts liners for excessive wear	Failure to do this may cause crusher failure	2		Order parts if required
Inspect counter shaft box breathers	Failure to do this may cause crusher failure	2		Order parts if required
Cover crusher parts with a plastic tarp to prevent environmental damage	To prevent rust, corrosion, and contamination due to exposure	2		

Duty 3: Dismantle and Re-build Bowl

Learner will demonstrate how to safely and efficiently perform the dismantling and rebuilding of the crusher bowl. The learner will also explain the job duties, why they are conducted, any associated risk, and how to implement appropriate controls. Safe and efficient performance of the dismantling and rebuilding of the bowl includes the following steps:

Job Steps	Importance Narrative (Consider Safety, Production, Maintenance)	Importance Ranking	Satisfactory or Needs Work	Procedures/Risk Resolution/ Notes/Comments
		1=Important 2=Very Important 3=Critical		
Attach ring end of two way cable to loader bucket	Failure to do this will prevent the job from being conducted; loss of production	2		
Attach two way cable to bowl	Failure to do this will prevent the job from being conducted; loss of production	2		
<ul style="list-style-type: none"> • Hydraulic 		2		
<ul style="list-style-type: none"> <ul style="list-style-type: none"> ○ Place shackles in locking post holes 		2		
<ul style="list-style-type: none"> • Mechanical 		2		
<ul style="list-style-type: none"> <ul style="list-style-type: none"> ○ Using 2-1 ½” bolts from the lock down cap, screw back into the bowl opposite each other 	Failure to do this step will cause an uneven lift causing damage to equipment and injury to personnel	2		
<ul style="list-style-type: none"> <ul style="list-style-type: none"> ○ Place cables over the bolts and under the ears of the bowl 	To keep the cable from slipping off preventing damage and injury	2		
<ul style="list-style-type: none"> <ul style="list-style-type: none"> ○ Screw the bolts down to lock the cables in place (not tight) 	To ensure cables do not slip off of ears causing damage to equipment and injury to personnel	2		
Transport bowl to wash area using loader		1		
Wash outside threads	Failure to this step could cause poor performance and loss of production	2		
Wash U-bolt cover plates and/or U-bolts	Failure to this step could cause poor performance and loss of production	2		
Transport bowl to rebuild area	Failure to do this will prevent the job from being conducted; loss of production	2		
Disconnect two way cable from bowl	Failure to do this will prevent the job from being conducted; loss of production	2		

Remove U-bolt covers with 1/2" impact and 3/4" socket	Failure to do this will prevent the job from being conducted; loss of production	2		
Loosen and pry off U-bolt covers	Failure to do this will prevent the job from being conducted; loss of production	2		
Clean, inspect, and replace as necessary	Failure to this step could cause poor performance and loss of production	2		
Set aside for re-assembly		1		
Remove U-bolt locking plates with pry bar	Failure to do this will prevent the job from being conducted; loss of production	2		
Set aside for reassembly		1		
Remove U-bolt nuts using 1" impact and appropriate impact socket	Failure to do this will prevent the job from being conducted; loss of production	2		
Clean, inspect, and replace as necessary	Failure to this step could cause poor performance; loss of production	2		
Set side for reassembly		1		
Pull off thin steel top plate, rubbers, and thick steel bottom plate from each of 6 U-bolts	Failure to do this will prevent the job from being conducted; loss of production	2		Note position of narrow side and wide side of steel plates to ensure upright position of U-bolts upon re-assembly
Stack accordingly for reassembly in a safe place	Failure to do this will prevent the job from being conducted; loss of production	2		
Pull U-bolts out of bowl assembly	Failure to do this will prevent the job from being conducted; loss of production	2		May need to dig out insulation to remove U-bolts
Set aside for cleaning & reassembly	Failure to do this will prevent the job from being conducted; loss of production	2		
Attach ring on end of two way cable to loader/crane	Failure to do this will prevent the job from being conducted; loss of production	2		
Attach other ends of two way cable to the bowl as before	Failure to do this will prevent the job from being conducted; loss of production	2		
Raise bowl approximately 2" off ground	Failure to do this will prevent the job from being conducted; loss of production	2		
From the outside, beat on U-bolt lugs with a 3"x4' solid steel shaft	Failure to do this will prevent the job from being conducted; loss of production	2		Make sure you are wearing proper PPE Be careful of flying metal chips, and liner falling from bowl
Lift bowl assembly after liner separates	Failure to do this will prevent the job from being conducted; loss of production	2		
Place bowl assembly to the side	Failure to do this will prevent the job from being conducted; loss of production	2		
Reposition cables on the bowl from its previous points to a side by side position	Failure to do this will prevent the job from being conducted; loss of production	2		
Lift bowl and lower so that it is laying on its side	Failure to do this will prevent the job from being conducted; loss of production	2		

Chip excess backing material from bowl assembly using slag hammer	Failure to do this will prevent the job from being conducted or may cause backing leakage	2		
Buff seat area on bowl assembly with wire wheel	Failure to do this will prevent the job from being conducted or may cause backing leakage	2		
Inspect seat area looking for cracks, excess wear per manufactures specifications	Failure to do this step could cause poor performance and backing leakage	2		
Apply oil or grease from above the seat area to the top of the bowl	To keep backing from sticking to bowl on future rebuilds	2		
Lift bowl assembly and set upright	Failure to do this will prevent the job from being conducted; loss of production	2		
Reposition the two way cables opposite each other on the bowl assembly	Failure to do this will prevent the job from being conducted; loss of production	2		
Buff paint from the seat area of the new bowl liner using the wire wheel or gator pads	Failure to do this step could cause poor performance and backing leakage	2		
Apply to beads of silicone on seat of new bowl liner	Failure to do this step could cause poor performance and backing leakage	2		
Cut 6-6"x6" squares of insulation	Failure to do this step could cause backing leakage loss of time and money	2		
Slice a hole in the center of each square of insulation big enough to fit over the lugs on the bowl liner	Failure to do this step could cause backing leakage loss of time and money	2		
Place insulation squares over the lugs on the new liner	Failure to do this step could cause backing leakage loss of time and money	2		
Lift the bowl assembly and place it over the lugs on the new bowl liner	Failure to do this will prevent the job from being conducted; loss of production	2		
<ul style="list-style-type: none"> • Pry with bar to center lugs in the holes 	Failure to do this will prevent the job from being conducted; loss of production	2		
Disconnect two-way cables from the bowl	Failure to do this will prevent the job from being conducted; loss of production	2		
Move crane/loader out of the way	Failure to do this will prevent the job from being conducted; loss of production	2		
Pack insulation firmly around lugs using small pry bar or large screwdriver	Failure to do this step could cause backing leakage loss of time and money	2		To prevent backing from leaking into the U-bolt chamber
Pack insulation to the point where you can still firmly install the U-bolt under the lugs	Failure to do this step could cause backing leakage loss of time and money	2		
Clean U-bolts with a wire wheel, wire brush, and/or thread chase, with lots of WD40. Replace as needed	Failure to do this step could cause backing leakage loss of time and money	2		

Install U-bolts under lugs	Failure to do this will prevent the job from being conducted; loss of production	2		
Pack insulation firmly around U-bolts using small pry bar or large screwdriver until the U-bolt chambers are full and tight	Failure to do this step could cause backing leakage loss of time and money	2		
Install thick steel bottom plate, rubbers, and thin steel top plate over U-bolt threads (6 total installations)	Failure to do this will prevent the job from being conducted; loss of production	2		Make sure to position steel and rubber plates so that U-bolts are upright when reassembled
Apply never seize to U-bolt threads		1		
Install all nuts on U-bolts, hand tight		1		
Partially tighten nuts using 1" impact and proper socket utilizing cross pattern sequence	Failure to do this would cause an misalignment of the liner which may cause backing leakage, poor performance, and premature wear	2		Make sure that the liner stays centered and level with the bowl. This will take several rounds to bring liner up to bowl level making sure that both seating surfaces are aligned to manufactures specifications and nuts are properly tightened
Re-install U-bolt locking plates on all 6 U-bolts		1		
Place a square of insulation over U-bolt end and nuts		1		
Re-install U-bolt covers		1		
Pour backing materials in conjunction with or at the same time when pouring backing material with the mantle		1		

Duty 4: Disassemble and Rebuild the Mantle

Learner will demonstrate how to safely and efficiently perform the disassembling and rebuilding of the mantle. The learner will also explain the job duties, why they are conducted, any associated risk, and how to implement appropriate controls. Safe and efficient performance of the disassembling and rebuilding of the mantle includes the following steps:

Job Steps	Importance Narrative (Consider Safety, Production, Maintenance)	Importance Ranking	Satisfactory or Needs Work	Procedures/Risk Resolution/ Notes/Comments
		1=Important 2=Very Important 3=Critical		
Attach the two-way cable to the loader using an approved shackle	Failure to do this will prevent the job from being conducted; loss of production	2		
Attach the other ends of the two-way cable to the lifting eye on the stem	Failure to do this will prevent the job from being conducted; loss of production	2		
Lift the shaft off the ground just high enough so as the shaft does not make contact with the ground	Failure to do this will prevent the job from being conducted; loss of production	2		
Transport shaft to the work area	Failure to do this will prevent the job from being conducted; loss of production	2		
Lower shaft into the assembly hole and rest on the floor	Failure to do this will prevent the job from being conducted; loss of production	2		
Remove two-way cable from shaft	Failure to do this will prevent the job from being conducted; loss of production	2		
Remove lifting eye	Failure to do this will prevent the job from being conducted; loss of production	2		
Cut the torch ring using the torch with a scarfing tip. Cut the torch ring horizontally in the center, all the way around and all the way through	Failure to cut the torch ring would prevent the splined nut from being removed	2		
Place Nordberg splined wrench into the splined nut on top of the shaft	Failure to do this will prevent the job from being conducted; loss of production	2		
Pound Nordberg wrench in a counter clockwise direction using a sledge hammer to loosen the splined nut	Failure to do this will prevent the job from being conducted; loss of production	2		
Remove the Nordberg wrench from the splined nuts	Failure to do this will prevent the job from being conducted; loss of production	2		
Install eye bolts into the distributor plate holes on the splined nut	Failure to do this will prevent the job from being conducted; loss of production	2		

Remove the two-way cable from the loader bucket	Failure to do this will prevent the job from being conducted; loss of production	2		
Attach the ring on the two-way cable to the crane hook	Failure to do this will prevent the job from being conducted; loss of production	2		
Attach the two-way cable to the eye bolts on the splined nut using approved shackles	Failure to do this will prevent the job from being conducted; loss of production	2		
Take up the tension on the cable	Failure to do this will prevent the job from being conducted; loss of production	2		
Continue to remove nut by grasping cable and eye bolts and turning counter clockwise	Failure to do this will prevent the job from being conducted; loss of production	2		
Apply Nordberg wrench to loosen until free if the nut is too tight	Failure to do this will prevent the job from being conducted; loss of production	2		
<ul style="list-style-type: none"> Keep tension on the cable with crane 		2		
Place the splined nut on the ground in a safe place	Failure to do this will prevent the job from being conducted; loss of production	2		
Disconnect the two-way cable from the splined nut	Failure to do this will prevent the job from being conducted; loss of production	2		
Clean and inspect the nut	Failure to do this will prevent the job from being conducted; loss of production	2		
Set aside for reassembly	Failure to do this will prevent the job from being conducted; loss of production	2		
Remove the remainder of the torch ring from the shaft and discard	Failure to do this will prevent the job from being conducted; loss of production	2		
Remove silicone from eye bolt holes in the shaft sleeve	Failure to do this will prevent the job from being conducted; loss of production	2		
Install the eyebolts into the shaft sleeve	Failure to do this will prevent the job from being conducted; loss of production	2		
Attach the two-way cable to the shaft sleeve	Failure to do this will prevent the job from being conducted; loss of production	2		
Lift and remove the shaft sleeve using the crane	Failure to do this will prevent the job from being conducted; loss of production	2		
Clean and inspect the shaft sleeve	Failure to do this will prevent the job from being conducted; loss of production	2		
Set aside for reassembly	Failure to do this will prevent the job from being conducted; loss of production	2		
Un-hook the two-way cable from the shaft sleeve	Failure to do this will prevent the job from being conducted; loss of production	2		

Weld two pad eyes on the mantle liner opposite of each other	Failure to do this will prevent the job from being conducted; welds may fail by lifting causing serious injury and/or equipment damage	2		Must use manganese or stainless welding rod
Attach the two-way cable to the pad eyes on the mantle liner	Failure to do this will prevent the job from being conducted; loss of production	2		
Lift mantle liner off of the shaft and place on ground to discard	Failure to do this will prevent the job from being conducted; loss of production	2		
Disconnect two-way cable from mantle liner	Failure to do this will prevent the job from being conducted; loss of production	2		
Lift cables for the working area	Failure to do this will prevent the job from being conducted; loss of production	2		
Clean the old backing materials from the shaft	Failure to do this will prevent the job from being conducted; loss of production	2		Proper cleaning may require wire wheel, brush or chipping hammer
Clean the seat area on the shaft	Failure to do this will prevent the job from being conducted; loss of production	2		Cleaning using a wire brush, gator pad, or a wire wheel
Oil the shaft where the backing is to be installed	Failure to do this will prevent the job from being conducted; loss of production	2		
Clean and inspect the threads at the top of the shaft where the splined nut goes	Failure to do this will prevent the job from being conducted; loss of production	2		Clean using a wire brush
Apply two beads of silicone to seat area of the shaft	Failure to do this will prevent the job from being conducted; loss of production	2		
Weld two pad eyes approximately 3" below the notches on the new mantle liner	Failure to do this will prevent the job from being conducted; welds may fail by lifting causing serious injury and/or equipment damage	2		Must use manganese or stainless welding rod. Work in a well ventilated area and wear an appropriate respirator
Enlarge the backing pour notches on mantle liner	Failure to do this will prevent the job from being conducted; loss of production	2		Using the torch at a 45 degree angle enlarge the notches approximately 3" in width. Work in a well ventilated area and wear an appropriate respirator
Cut off the three casted lifting lugs at the bottom of mantle liner	Failure to do this will prevent the job from being conducted; loss of production	2		Work in a well ventilated area and wear an appropriate respirator
Attach the two-way cable to one pad eye on the new mantle liner	Failure to do this will prevent the job from being conducted; loss of production	2		
Lift the mantle liner and turn the mantle liner over so the seat side is up	Failure to do this will prevent the job from being conducted; loss of production	2		Watch for unexpected movement
Inspect and clean the seat	Failure to do this step could cause backing leakage loss of time and money	2		Clean using a wire brush, gator pad, or a wire wheel
Lift the mantle liner and turn the mantle liner over so the seat side is down	Failure to do this will prevent the job from being conducted; loss of production	2		
Re-attach both cables to pad eyes	Failure to do this will prevent the job from being conducted; loss of production	2		

Lift the new mantle liner up	Failure to do this will prevent the job from being conducted; loss of production	2		
Center the new mantle liner on the shaft and lower	Failure to do this will prevent the job from being conducted; loss of production	2		
Disconnect two-way cable from mantle liner	Failure to do this will prevent the job from being conducted; loss of production	2		
Attach two-way cable to the shaft sleeve	Failure to do this will prevent the job from being conducted; loss of production	2		
Lift and place sleeve over shaft and lower into position on top of new mantle liner	Failure to do this will prevent the job from being conducted; loss of production	2		
Remove the two-way cable and eye bolt from the shaft sleeve	Failure to do this will prevent the job from being conducted; loss of production	2		
Fill eye bolt holes in shaft sleeve with silicone		1		
Attach the two-way cable to the splined nut	Failure to do this will prevent the job from being conducted; loss of production	2		
Install new torch ring by hand	Failure to do this will prevent the job from being conducted; loss of production	2		
Apply never seize to the shaft threads		1		
Lift the splined nut onto the shaft threads	Failure to do this will prevent the job from being conducted; loss of production	2		
Start splined nut onto thread of shaft using cables and eye bolts to turn while lowering with crane until snug	Failure to do this will prevent the job from being conducted; loss of production	2		
Ensure that the torch ring is centered on the sleeve while turning the nut into place	Failure to do this will prevent the job from being conducted; loss of production	2		
Remove the two-way cable and eye bolts from the splined nut	Failure to do this will prevent the job from being conducted; loss of production	2		
Tighten the splined nut using the Nordberg splined wrench	Failure to do this will prevent the job from being conducted; loss of production	2		Refer to the Nordberg manual
Remove the Nordberg wrench after proper tightening	Failure to do this will prevent the job from being conducted; loss of production	2		
Construct a pour trough/birds nest around the pour holes in the mantle liner	Failure to do this will prevent the job from being conducted; loss of production	2		
Pour backing material in conjunction with or at the same time when pouring backing materials with the bowl		1		

Duty 5: Pouring Backing Material

Learner will demonstrate how to safely and efficiently pour backing material. The learner will also explain the job duties, why they are conducted, any associated risk, and how to implement appropriate controls. Safe and efficient performance pouring backing material includes the following steps:

Job Steps	Importance Narrative (Consider Safety, Production, Maintenance)	Importance Ranking	Satisfactory or Needs Work	Procedures/Risk Resolution/ Notes/Comments
		1=Important 2=Very Important 3=Critical		
Ensure that the proper tools, equipment, MSDS, and PPE are at the pour site per the preparation meeting		1		
Ensure that the backing material warmed to a proper temperature for easy pouring		1		Place inside or in the sun if needed. Never warm material with an open flame
Ensure that the mantle and the bowl are on a level surface prior to pouring		1		
Install the ventilation fans into place		1		
Don proper PPE	Failure to do this step may cause serious injury	3		
Remove the lids from the backing materials	Failure to do this will prevent the job from being conducted; loss of production	2		
Place the mixing paddle into the drill	Failure to do this will prevent the job from being conducted; loss of production	2		
Mix the epoxy to ensure a consistent blend	Failure to do this will prevent the job from being conducted; loss of production	2		Ensure that the sides and bottom is mixed
Remove the lid from the hardener		1		
Add, slowly, the hardener to the epoxy while mixing with drill and paddle	Adding the hardener too fast may cause chemical splashes which may cause serious injury	3		
Ensure that the material is mixed to a consistent color	Improper mixing may cause weak joints within the backing	2		Refer to the manufacturers mixing procedure
Pour mixed backing material into the cavities of the mantle and bowl liners	Failure to do this will prevent the job from being conducted; loss of production	2		As pouring continues new batches of material is being mixed
Repeat as necessary until filled	Failure to do this will prevent the job from being conducted; loss of production	2		Refer to the manufactures specifications on the proper quantity

Ensure proper backing levels	Failure to do this will prevent the job from being conducted; loss of production	2		
• Mantle	Failure to do this will prevent the job from being conducted; loss of production	2		
○ Backing material will be poured to the bottom of the pour holes	Failure to do this will prevent the job from being conducted; loss of production	2		
• Bowl	Failure to do this will prevent the job from being conducted; loss of production	2		
○ Backing material will be poured to the top of the bowl liner	Failure to do this will prevent the job from being conducted; loss of production	2		
Leave the mantle and bowl stand until backing is completely cured	Not doing this step may cause backing to crack and/or allow liner shift which causes loss of production and premature wear	2		Refer to the manufacturers recommendations

Duty 6: Reassemble and Test Crusher

Learner will demonstrate how to safely and efficiently reassemble and test the crusher. The learner will also explain the job duties, why they are conducted, any associated risk, and how to implement appropriate controls. Safe and efficient performance of the reassemble and testing of the crusher includes the following steps:

Job Steps	Importance Narrative (Consider Safety, Production, Maintenance)	Importance Ranking	Satisfactory or Needs Work	Procedures/Risk Resolution/ Notes/Comments
		1=Important 2=Very Important 3=Critical		
Conduct a pre-shift inspection on all mobile equipment	To ensure that no equipment defects exist on mobile equipment	2		Follow company policy
Inspect backing	Failure to do this will prevent the job from being conducted; loss of production	2		
<ul style="list-style-type: none"> Check for hardness and leakage 				
Cut pad eyes off of mantle	Would not be able to install the bowl	2		
Remove the tarp carefully insuring that no debris fall into the stem hole		1		
Clean off socket assembly	Failure to do this will prevent the job from being conducted; loss of production	2		
Remove excess oil, dirt, and grease from the socket assembly using rags, and minimum solvent	Failure to do this will prevent the job from being conducted; loss of production	2		
Clean the surface of the o-ring, valves, and springs with a scraper and/or grease rag including spring holes	Failure to do this will prevent the job from being conducted; loss of production	2		
Clean bronze with rags only	To prevent scratching and damaging the bronze	2		
Remove the lid from the hole		1		
Ensure that no debris are inside the hole	Failure to do this will prevent the job from being conducted; loss of production	2		
Install the oil drain plug	Failure to do this step would cause oil system failure which causes loss of production	2		
Re-install the cover over the hole		1		
Lubricate valves and springs with oil		1		This step done if valves and springs are used
Install the O-ring and/or valves and springs	Failure to do this will prevent the job from being conducted; loss of production	2		

Hook the two-way cable to the crane	Failure to do this will prevent the job from being conducted; loss of production	2		
Install eye bolts into the socket sealing ring	Failure to do this will prevent the job from being conducted; loss of production	2		
Attach the two-way cable to the eye bolts attached to the socket sealing ring	Failure to do this will prevent the job from being conducted; loss of production	2		
Pick up socket sealing ring approximately waist high with the crane	Failure to do this will prevent the job from being conducted; loss of production	2		
Clean out cavity with scraper and gloved hand	Failure to do this will prevent the job from being conducted; loss of production; and hand injury	2		Be careful of sharp edges and slippery surfaces because of grease
Wipe top surfaces down with solvent and rags	Failure to do this will prevent the job from being conducted; loss of production	2		Follow company HazCom policy when working with chemicals
Raise socket sealing ring up approximately chin high	Failure to do this will prevent the job from being conducted; loss of production	2		
Remove the old felt with a screwdriver and/or scraper	Failure to do this will prevent the job from being conducted; loss of production	2		Do not work under a suspended load
Discard the old felt		1		
Dunk new felt in oil	Failure to properly seal causing loss of production	2		
Install the new felt into the groove by pushing firmly until seated	Failure to do this will prevent the job from being conducted; loss of production	2		
Cut off excess felt with a utility knife	Will cause improper assembly which may cause loss of production	2		
Lower socket sealing ring approximately waist high	Failure to do this will prevent the job from being conducted; loss of production	2		Do not work under a suspended load
Pack grease cavity by gloved hand with grease ensuring that no air pockets exist	Failure to do this step would cause improper sealing of mantle and socket assembly which causes loss of production; hand injury due to chemicals	2		Be careful of sharp surfaces. Follow company HazCom policy when working with chemicals
Ensure that the dowel keyways are clear of grease	Failure to do this will prevent the job from being conducted; loss of production	2		
Ensure that the dowel keys, inside the crusher main frame, are in the proper vertical position in socket	Failure to do this will prevent the job from being conducted; loss of production	2		Refer to the Nordberg manual
Lower, slowly, the socket sealing ring while aligning the locking keys with the keyways until seated ensuring that the socket sealing ring has movement and is not binding	Failure to do this will prevent the job from being conducted; loss of production	2		
Disconnect two-way cables from socket sealing ring	Failure to do this will prevent the job from being conducted; loss of production	2		

Remove the eye bolts from the socket sealing ring	Failure to do this will prevent the job from being conducted; loss of production	2		
Attach the ring of the two-way cable on the loader bucket if transporting mantle by loader	Failure to do this will prevent the job from being conducted; loss of production	2		
Install the eyebolts into the top of the mantle shaft	Failure to do this will prevent the job from being conducted; loss of production	2		
Attach two-way cable to eye bolt on the top of the mantle shaft	Failure to do this will prevent the job from being conducted; loss of production	2		
Raise the mantle shaft up out of the hole	Failure to do this will prevent the job from being conducted; loss of production	2		
Lower mantle shaft on cribbing ensuring that the shaft is approximately 1" above the ground. If cribbing is not available, lower shaft onto its side on a soft clean surface	Failure to do this will prevent the job from being conducted; loss of production	2		
Ensure that the main shaft is clean by using a rag (if necessary)	Failure to do this will prevent the job from being conducted; loss of production	2		
Clear oil passage with water or compressed air by inserting air or water into the hole located at the bottom of the shaft	Failure to do this will prevent the job from being conducted; loss of production	2		
Raise the shaft off of the cribbing or clean surface keeping shaft clean	Failure to do this will prevent the job from being conducted; loss of production	2		
Transport mantle to the crusher	Failure to do this will prevent the job from being conducted; loss of production	2		
Lower mantle onto cribbing or clean surface	Failure to do this will prevent the job from being conducted; loss of production	2		
Disconnect two way cable ring from the loader	Failure to do this will prevent the job from being conducted; loss of production	2		
Connect the two way cable ring to the crane hook	Failure to do this will prevent the job from being conducted; loss of production	2		
Raise the mantle carefully ensuring cleanliness	Failure to do this will prevent the job from being conducted; loss of production	2		
Remove the lid from the socket	Failure to do this will prevent the job from being conducted; loss of production	2		
Inspect socket area for cleanliness (visually)	Failure to do this will prevent the job from being conducted; loss of production	2		
Douse the bronze with 5 gallons of oil ensuring that all bronze surfaces are coated	Failure to do this will prevent the job from being conducted; loss of production	2		
Position the shaft over the main frame	Failure to do this will prevent the job from being conducted; loss of production	2		Ensure that all personnel are at a safe location

Slowly lower the mantle all the way down until it sits on the socket leaving slight tension of the cable	Failure to do this will prevent the job from being conducted; loss of production	2		Position someone on the outside of the main frame to watch and guide the lowering process, to ensure that the end of shaft does not contact the bronze socket liner
Pull the lockout-tag out on the crusher and any interlocked systems that will allow the crusher to be started with oil pressure	Failure to do this will prevent the job from being conducted; loss of production	2		Removal of Lockout-tag out will be site specific
Remove all tools, materials and non-essential personnel from immediate area of the crusher		1		
Energize the motor just enough to bump the crusher ensuring that the mantle is seated on the socket liner	Failure to do this step may cause damage to internal crusher parts (Socket assembly)	2		Refer to manufacturer's manual
Lower the crane to remove tension on the two-way cable	Failure to do this will prevent the job from being conducted; loss of production	2		
Energize the motor approximately 15 seconds ensuring that the shaft is seated in the socket liner	Failure to do this will prevent the job from being conducted; loss of production	2		Refer to manufacturer's manual
Lockout-tag out all crusher systems previously energized for the seating of the mantle	To prevent serious injury or death caused by accidental startup	3		
Remove the two way cables from the mantle	Failure to do this will prevent the job from being conducted; loss of production	2		
Remove eye bolt from the shaft	Failure to do this will prevent the job from being conducted; loss of production	2		
Stuff the splined nut with rags up to the top	Failure to do this will prevent the job from being conducted; loss of production	2		
Remove the two way cable from the crane hook and attach to the loader	Failure to do this will prevent the job from being conducted; loss of production	2		
Attach two way cable to the eye bolts on the bowl	Failure to do this will prevent the job from being conducted; loss of production	2		
Clean the hold down bolts holes and threads in the hold down bolt holes in the crusher bowl using wire wheel and tap as necessary	Failure to do this will prevent the job from being conducted; loss of production	2		For mechanical crusher only
Lift bowl approximately waist high	Failure to do this will prevent the job from being conducted; loss of production	2		
Apply ample amounts of grease to outside threads of bowl with gloved hands	Failure to do this will prevent the job from being conducted; loss of production	2		Be careful of sharp edges
Transport bowl to crusher main frame area	Failure to do this will prevent the job from being conducted; loss of production	2		

Lower bowl to clean surface	Failure to do this will prevent the job from being conducted; loss of production	2		
Detach two way cable ring from loader	Failure to do this will prevent the job from being conducted; loss of production	2		
Attach two way cable ring to crane hook	Failure to do this will prevent the job from being conducted; loss of production	2		
Detach the two way cable from the bowl	Failure to do this will prevent the job from being conducted; loss of production	2		
Remove the two hold down bolts from the bowl that were used to transport it and set aside	Failure to do this will prevent the job from being conducted; loss of production	2		For mechanical crusher only
Attach two way cable to the lugs on the adjustment cap	Failure to do this will prevent the job from being conducted; loss of production	2		
Raise the adjustment cap	Failure to do this will prevent the job from being conducted; loss of production	2		
Move, position, and lower the adjustment cap onto the bowl	Failure to do this will prevent the job from being conducted; loss of production	2		
<ul style="list-style-type: none"> For the mechanical crusher, make sure the holes on the adjustment cap line up with the threaded holes on the bowl 	Failure to do this will prevent the job from being conducted; loss of production	2		
<ul style="list-style-type: none"> For the hydraulic crusher, lower the adjustment cap just enough so that the slotted keeper ends of the cylinders clear the lock post holes 	Failure to do this will prevent the job from being conducted; loss of production	2		
Attach adjustment cap to the bowl	Failure to do this will prevent the job from being conducted; loss of production	2		
<ul style="list-style-type: none"> For mechanical crusher, add two to three washers to bolts and screw in at least 6" making sure that all bolts are equal in height 	Failure to do this will prevent the job from being conducted; loss of production	2		
<ul style="list-style-type: none"> For hydraulic crusher, reinstall the beveled washers (2 for each shaft) over the cylinder shafts and install the keepers through the slots on the cylinder shafts. Reinstall cotter pins (2 for each keeper) through holes in the keepers. Total of 6 cylinder shafts 	Failure to do this will prevent the job from being conducted; loss of production	2		
Raise bowl	Failure to do this will prevent the job from being conducted; loss of production	2		

<ul style="list-style-type: none"> Mechanical, ensure that the bowl remains level. If not, set down and readjust bolt heights 	Failure to do this will prevent the job from being conducted; loss of production	2		
Ensure that all unnecessary personnel are in a safe place	Failure to do this step may cause serious injury or death	3		
Position over the crusher main frame	Failure to do this will prevent the job from being conducted; loss of production	2		
Lower the bowl until 6-12" above the main frame	Failure to do this will prevent the job from being conducted; loss of production	2		
Locate the starter threads on the bowl and main frame	Failure to do this will prevent the job from being conducted; loss of production	2		
Align starter threads on bowl and main frame	Failure to do this will prevent the job from being conducted; loss of production	2		
Lower bowl and spin simultaneously into threads on main frame using as many people as necessary	Failure to do this will prevent the job from being conducted; loss of production	2		The crane keeps the threads in a neutral position for threading into the main frame. If hand threading becomes too difficult, refer to disassembly procedures in reverse using cable. Refer to manufacturer's manual
Thread in to desired closed side opening	Failure to do this will prevent the job from being conducted; loss of production	2		See manufacturer's manual
Lower adjustment cap	Failure to do this will prevent the job from being conducted; loss of production	2		
Attach lock link to the closest hole and pin it	Failure to do this will prevent the job from being conducted; loss of production	2		For mechanical only
Disconnect two way cable from adjustment cap	Failure to do this will prevent the job from being conducted; loss of production	2		
Tighten cap bolts in a crossing pattern using 1" ratchet, appropriate socket and 3-5' cheater bar	Failure to do this will prevent the job from being conducted; loss of production	2		For mechanical only. Go around at least 3 times to ensure tightness, refer to manufacturer's manual.
Attach quick disconnect hydraulic hose to rams and pull clamp down lever	Failure to do this will prevent the job from being conducted; loss of production	2		For hydraulic only
Attach two way cable to basket	Failure to do this will prevent the job from being conducted; loss of production	2		For hydraulic only
Lower basket into place	Failure to do this will prevent the job from being conducted; loss of production	2		For hydraulic only
Disconnect two way cable from basket	Failure to do this will prevent the job from being conducted; loss of production	2		For hydraulic only
Attach two way cable to eye bolts on distributor plate	Failure to do this will prevent the job from being conducted; loss of production	2		For hydraulic only
Lift and position over shaft nut	Failure to do this will prevent the job from being conducted; loss of production	2		

Lower distributor plate into place	Failure to do this will prevent the job from being conducted; loss of production	2		
Disconnect two way cables from eye bolts	Failure to do this will prevent the job from being conducted; loss of production	2		
Raise cable and remove crane from work area	Failure to do this will prevent the job from being conducted; loss of production	2		
Remove eye bolts from distributor plate	Failure to do this will prevent the job from being conducted; loss of production	2		
Align bolt holes in the distributor plate with the holes in the shaft nut	Failure to do this will prevent the job from being conducted; loss of production	2		
Install 4 new bolting hardware sets using appropriate amounts of lock washers	Failure to do this will prevent the job from being conducted; loss of production	2		Bolts in from the bottom, nuts on top.
Tighten and secure all bolts with ¾" impact gun and appropriate socket and wrench	Failure to do this will prevent the job from being conducted; loss of production	2		
Weld or double nut hardware		1		
Reinstall chutes, belts, conveyors, hoppers as per site requirements in reverse order of disassembly procedure	Failure to do this will prevent the job from being conducted; loss of production	2		
Remove the lockout tagout on the crusher and any interlocked systems that will allow the crusher to be started with oil pressure	Failure to do this will prevent the job from being conducted; loss of production	2		Removal of lockout tagouts will site specific
Start the crusher	Failure to do this will prevent the job from being conducted; loss of production	2		
Verify 2500 PSI clamping pressure on the hydraulic rams	Failure to do this will prevent the job from being conducted; loss of production	2		For hydraulic only
Check the oil pressure and for leaks	Failure to do this will prevent the job from being conducted; loss of production	2		Should be 7-12 PSI, or in accordance with the manufacturer's specifications
Ensure that there is proper oil return back to the tank	Failure to do this will prevent the job from being conducted; loss of production	2		
Inspect and listen for any unusual noises and conditions	Failure to do this will prevent detection of obvious problems with the crusher; loss of production	2		
Check head spin and ensure that it's spinning in accordance with manufacturer's specifications	Failure to do this will prevent the job from being conducted; loss of production	2		Visual check
Turn off crusher and check coast down time	Failure to do this will prevent the job from being conducted; loss of production	2		In accordance with manufacturer's specifications
Lock out tag out all crusher systems previously energized	To prevent serious injury or death caused by the sudden starting of the crusher systems	3		

Recheck the crusher adjustment/tolerance by observing the gap on the closed side	Failure to do this will prevent the job from being conducted; loss of production	2		
Remove all lock-out tag out equipment	Required to test the crushing system	2		
Start the crusher		1		
Take an amp reading	Failure to do this will prevent the job from being conducted; loss of production	2		No load amp reading
Start the plant including all related feed belts and discharge belts (Plant Operator)		1		Plant operator will make all through-put adjustment
Take a full load amp reading	Failure to do this will prevent the job from being conducted; loss of production	2		Wait for the crusher to fill up with material Proper amp readings are crusher motor specific
Gather all tools, equipment, and materials and ensure that the area is clean	To ensure all tools are stored, accounted for, and work areas are clean	2		Store cables and rigging equipment in its proper place. Equipment and tools replaced to its proper storage areas
Release to production		1		