



Crusher safety and hazard recognition

2016

Hello, My name is Bill Compton

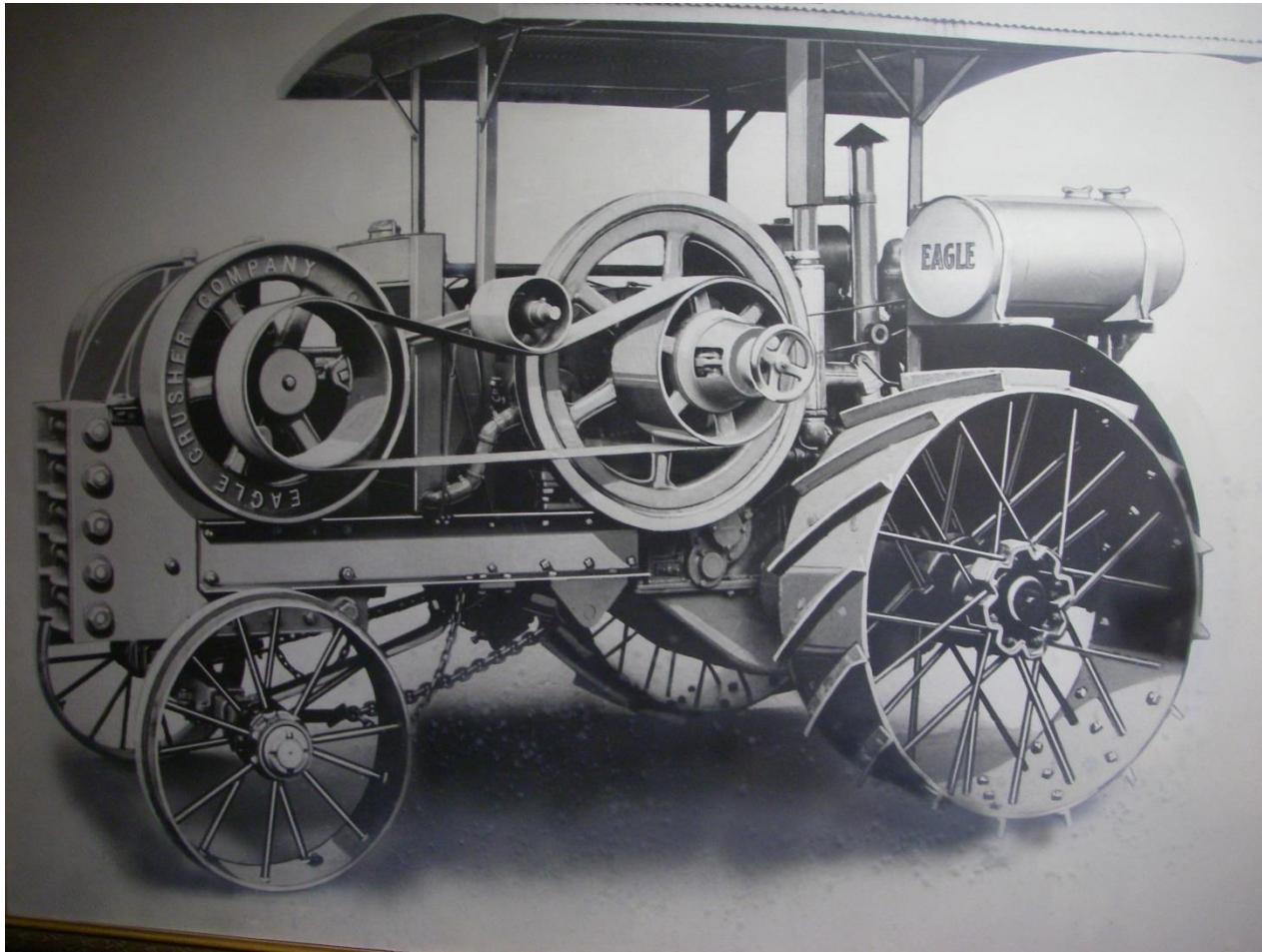
- I work for Eagle Crusher Co., Inc and we are a manufacturer of portable aggregate, concrete and asphalt crushing and screening plants
- I have been with Eagle for 34 years now and have held positions from welder, assembly person, assembly lead man, assembly foreman, service technician, service manager since 1993, and a 2 year stint as manufacturing director in the 1990's.

I am here today to talk to you about crusher safety and about some of the hazards associated with crushers.

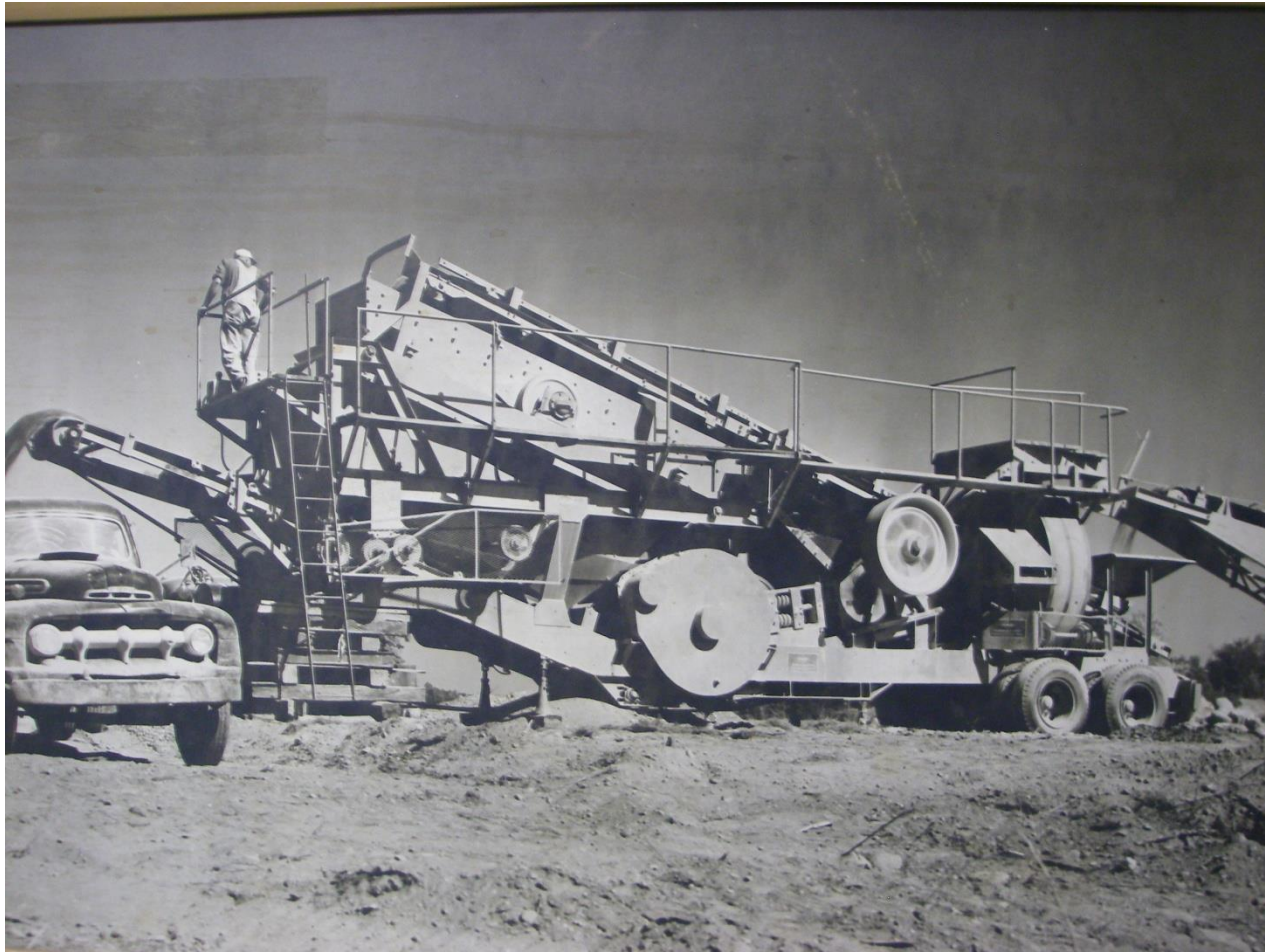
We will also talk about how to recognize and avoid those hazards and avoid injuries in a crushing environment.

Designs in equipment and in guarding practices have evolved drastically over the years.

This is from the late 1800's



1950's era. Guarding is evolving more



2015 era. Guarding is intense



2015 era. Opposite side



One of the most important preventative measures of accidental injuries is to Lock-Out / Tag-Out a piece of equipment before performing any maintenance or adjustments.

LOCK OUT/TAG OUT LOCK OUT/TAG OUT LOCK OUT/TAG OUT

READ THIS FIRST

Lock Out/Tag Out Safety Information

For Eagle Portable Processing Plants

To the users of this Eagle Portable Plant:

This plant is shipped with a set of locks and tags that are to be used to **LOCK OUT** and **TAG OUT** this machine whenever maintenance work, inspection work, or any other operation is being done that would require any part of the machine to be open.

Prior to doing any of the types of work listed above, the user of this equipment is responsible for taking the following steps:

- Step 1:** LOCK OUT the Diesel Power Unit and the Control Panel with locks provided. Mark and install the TAG OUT tags. Keep the keys to the LOCK OUT locks separate from the locks during the time work is being done.
- Step 2:** Perform the maintenance work, inspection work or any other operation required.
- Step 3:** Check to make sure that all parts of the plant that were opened during the work period have been closed.
- Step 4:** Check to make sure that all tools and equipment used during the work have been removed from the plant.
- Step 5:** Check to make sure that all personnel are away from the plant prior to starting the plant. Allow at least five minutes of running time before resuming the feed of materials to the plant.
- Step 6:** Remove all locks and tags after the work has been completed and store the locks, keys, and tags for the next time needed.

NOTE: The owners, users, or operators of this equipment may have procedures that require additional steps to be taken when work is being done on the equipment. The instructions given here should be considered the *minimum requirements* for a LOCK OUT/TAG OUT procedure.



DANGER: The LOCK OUT / TAG OUT procedure must be followed! Failure to do so creates a serious safety hazard that will most likely seriously injure you or kill you.

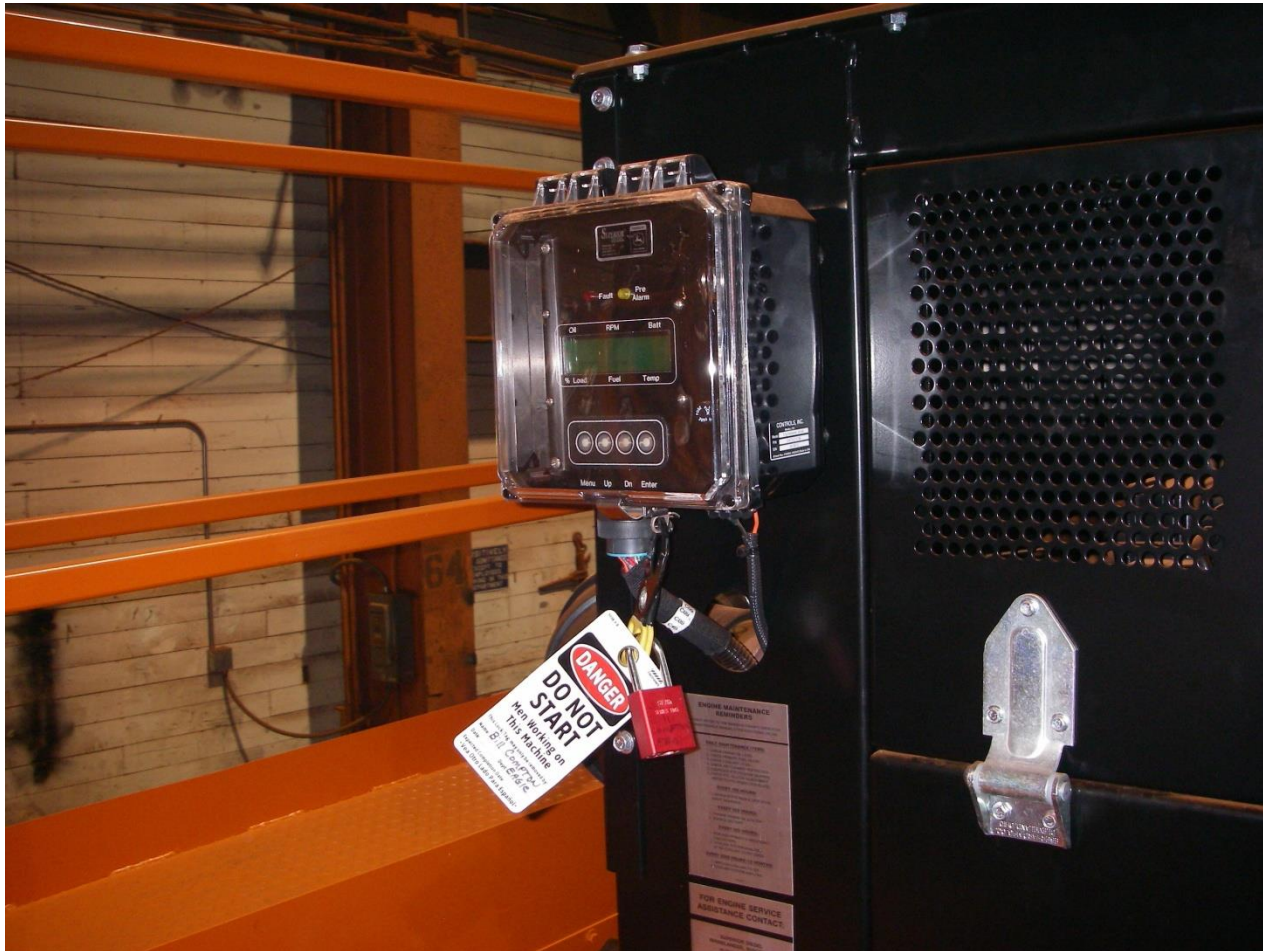
Turn off the main electric panel disconnect and lock it out to prevent un-intentional energizing of the panel.



ALWAYS double check the circuit once it has been disconnected to assure that the breaker is functioning correctly and power is truly isolated/disconnected.



Most “portable” crushing equipment is powered by a diesel engine. The control panel for the diesel engine must be locked-out to prevent unintentional starting of the engine.



- Today's standards require that we alert you of potential hazards whenever they exist.
- This is accomplished by all those warning labels you see on everything from the plastic Wal-Mart bag that you carried your groceries home in, to the rock crusher that processed the aggregate that built the road you drove here on.

SECTION 1

DANGER / WARNING / CAUTION LABEL SET

 	⚠ WARNING Read and understand operator's manual before starting this machine. Maintain placement of all guarding. Additional guarding may be necessary. Consult local, state, or federal regulations. Be sure all personnel are at a safe distance from all components before starting.	 
	⚠ ADVERTENCIA Lea y entienda el manual del operador antes de arrancar esta máquina. Mantenga en su sitio todos los protectores. Podrían requerirse protectores adicionales. Consulte las regulaciones locales, estatales o federales. Cerórese que todo el personal está a una distancia segura de todos los componentes antes de arrancar.	

P/N 32B961

⚠ CAUTION Noise hazard. Operating this equipment may require ear protection to comply with local, state or federal regulations. Respiratory hazard. Personal respiratory equipment may be necessary when operating this equipment.	 	⚠ PRECAUCIÓN Peligro por ruido. Operar este equipo podría requerir protección auditiva para cumplir las regulaciones locales, estatales o federales. Peligro respiratorio. Podría ser necesario utilizar equipo respiratorio personal cuando se opera este equipo.
--	---	--

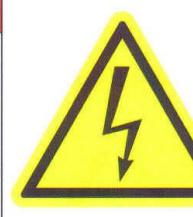
P/N 32B960

CAUTION Possible electronic damage. Disconnect wiring from engine ECU and disconnect battery cables before performing any welding on plant.		PRECAUCIÓN Posible daño electrónico. Desconecte el cableado del motor ECU y desconecte los cables de la batería antes de realizar cualquier soldadura en la planta.
---	---	---

P/N 32A948

⚠ WARNING Hazardous voltage. Establish and maintain proper earth ground before operating plant.		⚠ ADVERTENCIA Voltaje peligroso. Establezca y mantenga una conexión a tierra apropiada antes de operar la planta.
---	---	---

P/N 32A951

⚠ DANGER Hazardous voltage. This unit is to be serviced by trained personnel, only.		⚠ PELIGRO Voltaje peligroso. Esta unidad sólo debe recibir servicio por personal capacitado.
---	--	--

P/N 32B949

CAUTION		PRECAUCIÓN
Avoid machinery damage. Plant legs may require shims to achieve a level operating position. Plant will not function properly if unlevel.		Evite dañar la maquinaria. Las patas de la planta podrían requerir cuñas para lograr una posición operativa nivelada. La planta no funcionará apropiadamente si está desnivelada.

P/N 32B950

! DANGER
Crush hazard. Do not place feet or other body parts under moving legs. Serious injury can occur.

! PELIGRO
Peligro de aplastamiento. No coloque los pies u otras partes del cuerpo debajo de las patas en movimiento. Pueden ocurrir lesiones graves.

P/N 32A954

! WARNING
Projectile and falling material hazard. Wear hardhat and safety glasses when using this equipment.

! ADVERTENCIA
Peligro por proyectiles y caída de material. Use casco y anteojos de seguridad mientras utiliza este equipo.

P/N 32A955

T:\Operator's\Masters All\Sec01\Rev081406\Decal 03.cdr

1 - 16

! DANGER		! PELIGRO
Crush hazard. Stand clear of crusher door when opening or closing. Impact hazard. Stay clear of spindles when crusher is operating.		Peligro de aplastamiento. Permanezca alejado de la puerta del triturador mientras ésta se abre o cierra. Peligro de impacto. Permanezca alejado de los vástagos cuando el triturador esté en operación.

P/N 32B953

! WARNING		! ADVERTENCIA
Do not open inspection doors while rotor is turning. Internal parts or moving debris can cause injury or death. Do not clean, lubricate, or adjust any part of this machine while it is in motion. Rotor will remain in motion after drive power supply has been disengaged. Consult manual for detailed information.		No abrir las puertas de inspección mientras el rotor está girando. Las piezas internas o los desechos en movimiento pueden causar lesiones o la muerte. No limpie, lubrique, ni ajuste ninguna pieza de esta máquina mientras está en movimiento. El rotor seguirá moviéndose después de desconectar la fuente de energía de la transmisión. Consulte el manual para obtener información detallada.

P/N 32B952

! DANGER		! PELIGRO
Entanglement hazard. Keep all guards in place. Avoid contact with rotating parts.		Riesgo de enredamiento. Mantenga en su sitio todos los protectores. Evite hacer contacto con las piezas giratorias.

P/N 32A958

1 - 17

All manuals- section 1 safety section pages 1-16 & 1-17

⚠ DANGER		⚠ PELIGRO
Climbing, sitting, walking or riding on conveyor at any time may cause severe injury or death.		Subirse, sentarse, caminar o viajar sobre el transportador en cualquier momento podría causar lesiones graves o la muerte.
KEEP OFF.		MANTÉNGASE ALEJADO.

P/N 32A963

⚠ WARNING		⚠ ADVERTENCIA
Drawing in and crush hazard.		Peligro de arrastre hacia adentro y aplastamiento.
Keep hands clear while conveyor is operating.		Mantenga alejadas las manos mientras el transportador está en operación.
Lockout/tagout before cleaning or servicing.		Bloquee/Etiqueta antes de limpiar o suministrar servicio.

P/N 32A957

⚠ DANGER		⚠ PELIGRO
Moving parts can crush and cut.		Las piezas en movimiento pueden aplastar y cortar.
Do not operate with guard removed.		No operar sin el protector en su sitio.
Follow lockout/tagout procedure before servicing.		Siga el procedimiento de bloqueo/etiquetado antes de suministrar servicio.

P/N 32A959

⚠ WARNING		⚠ ADVERTENCIA
Loss of control can occur.		Puede ocurrir pérdida del control.
Maximum travel speed 40 mph on paved roads. Use slower speeds on unpaved roads.		La máxima velocidad de viaje es 64.5 kph en caminos pavimentados. Utilice velocidades menores en caminos no-pavimentados.
Travel restricted to daylight hours and when visibility exceeds 500 ft.		Los desplazamientos están restringidos a horario diurno y cuando la visibilidad es mayor de 152 mt.

P/N 32A962

⚠ WARNING		⚠ ADVERTENCIA
Crush hazard.		Peligro de aplastamiento.
Keep hands clear while conveyor is operating.		Mantenga alejadas las manos mientras el transportador está en operación.
Lockout/tagout before cleaning or servicing.		Bloquee/Etiqueta antes de limpiar o suministrar servicio.

P/N 32A956

T:\Operator's\Masters All\Sec01\Rev081406\Decal 05.cdr

T:\Operator's\Masters All\Sec01\Rev081406\Decal 06.cdr

- Most accidents involving product operation, maintenance and repair are caused by failure to observe basic safety rules or precautions.

- An accident can often be avoided by recognizing hazards.
- The person operating the equipment or performing the maintenance and repair should also have the necessary training, skills and tools to perform these functions properly and safely.

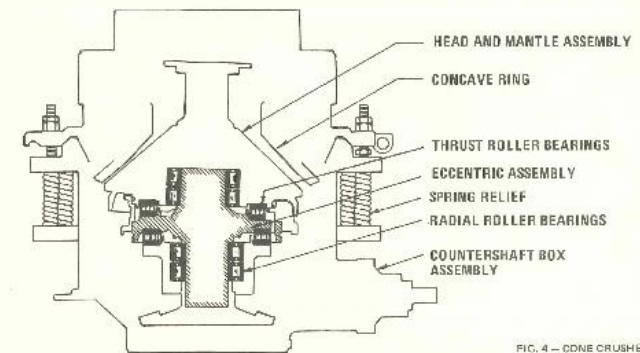
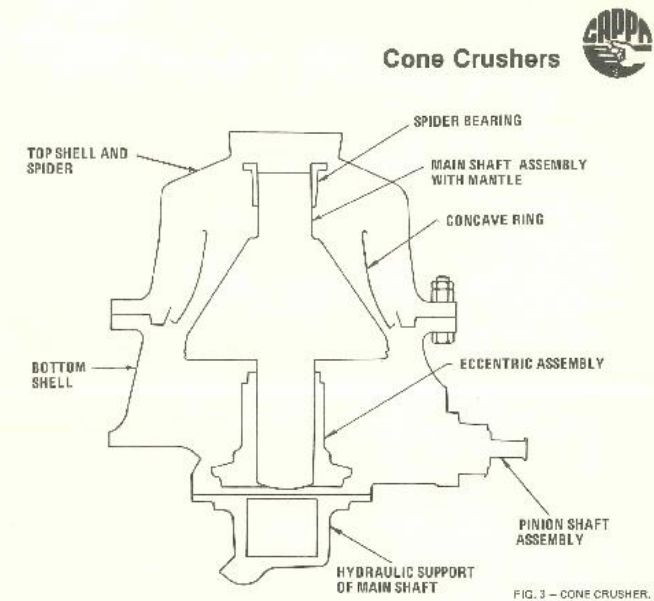
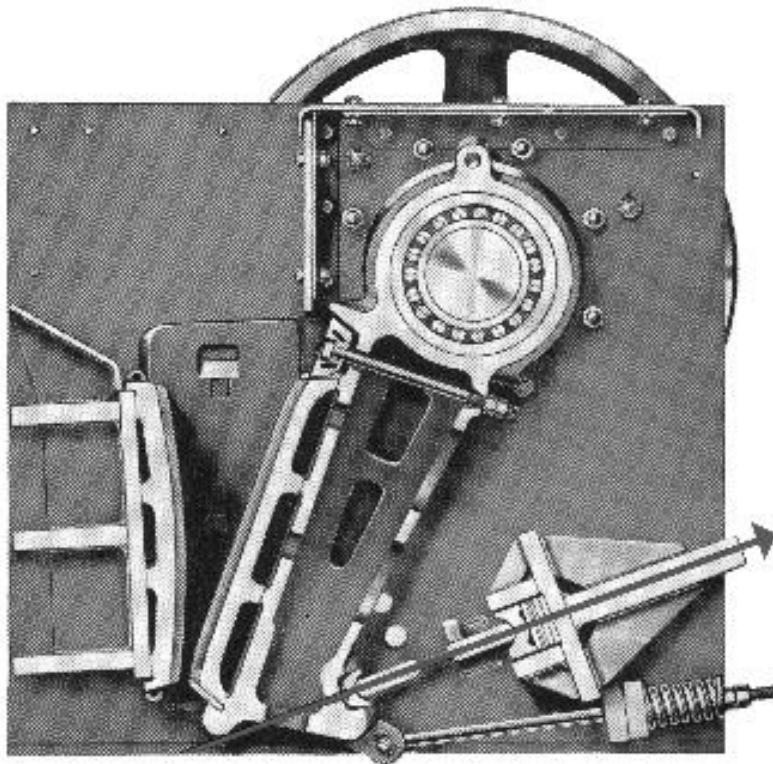
- DO NOT perform any lubrication, maintenance, or repair to any piece of equipment while it is in operation!

Always wear your personal protective equipment (PPE)

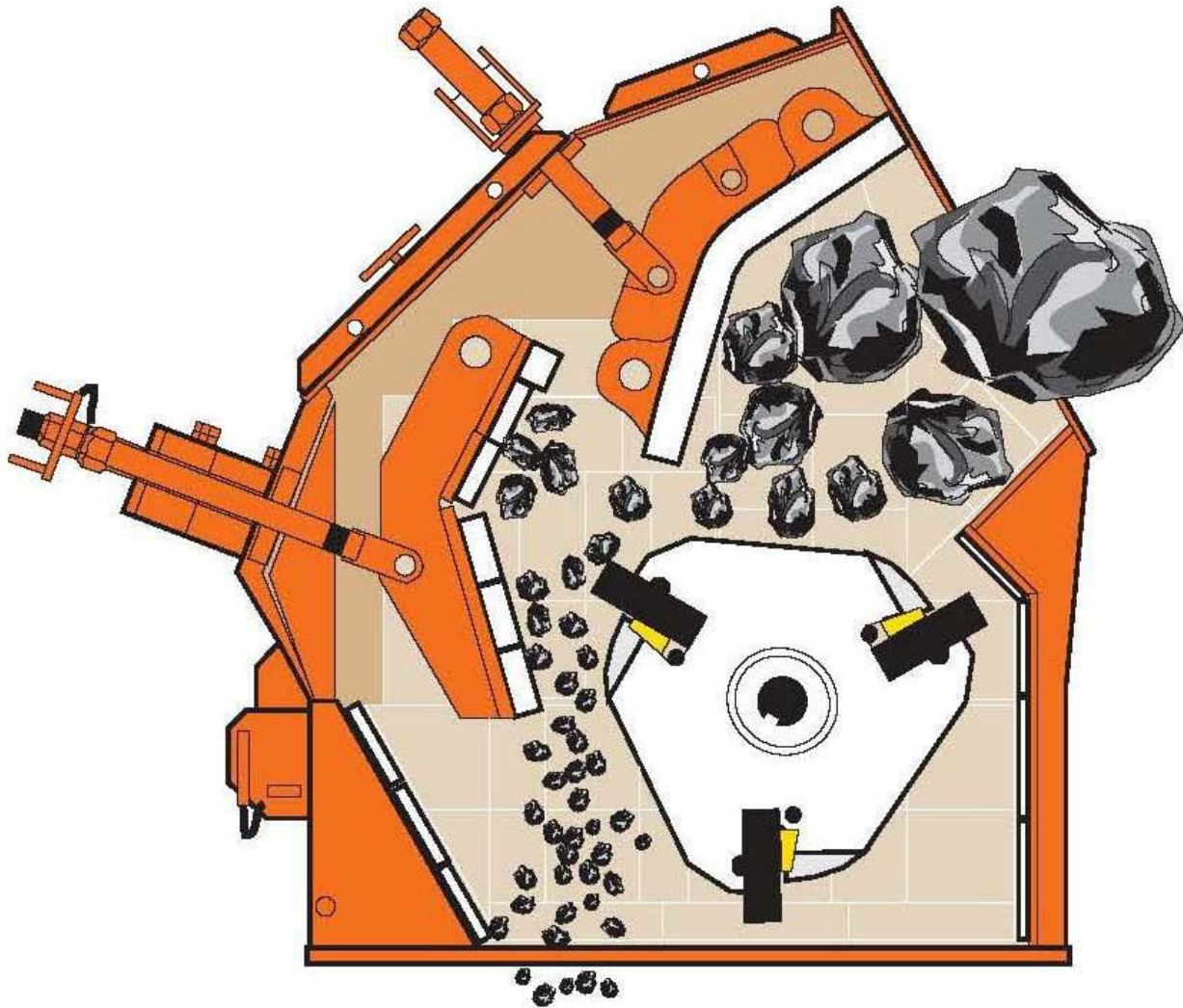
- This includes: Hardhat, Safety Glasses, Gloves, Hearing Protection, Safety Shoes, Dust Mask or Respirator, Hi Visibility clothing or vest.
- Always wear your fall protection when necessary. Use EXTREEM caution if using fall protection with lanyards around rotating equipment.
- DO NOT wear loose, torn or frayed clothing that could get caught up in moving components such as conveyor idler rollers.
- Be cautious of wearing “hooded” type jackets and shirts as they may block your peripheral vision as well as be a loose, hanging item that might get caught in moving components such as idler rollers and rotating shafts

- Crushers **CAN NOT** stop immediately once power is turned off due to a flywheel affect still rotating it for a few seconds to several minutes.
- Different designs of crushers will vary in their “coast down” times.
- Eagle Crusher impact crusher rotors weigh anywhere from 2 ½ tons to 13 tons with the average at 6 ½ tons.
- Our average rotor tip speed is 6000 FPM or 68 MPH.

A jaw or a cone crusher might only coast for 10 to 15 seconds.



A impact crusher could coast for 5 to 10 minutes.



Accidents involving conveyors are very common and not confined to just the crushing industry

- In three separate accidents involving conveyors in sawmills, one worker had a leg amputated, one young worker lost his arm, and another worker's hand was broken.
- In a fish processing plant, a worker's glove was caught on the moving belt conveyor, resulting in cuts when his hand was drawn into a shear point.
- A worker was removing debris from the tail drum of a chain conveyor in a rubber recycling plant. When the conveyor was started from the control station, the worker's foot was pulled around the tail drum, resulting in crushing injuries to the leg and foot.
- A worker in the airline catering services received crushing injuries to two fingers when her gloved hand was caught in the nip point between the belt and the roller.

Avoid hazards associated with rotating conveyor rollers or shafts.

⚠ DANGER Entanglement hazard. Keep all guards in place. Avoid contact with rotating parts.		⚠ PELIGRO Riesgo de enredamiento. Mantenga en su sitio todos los protectores. Evite hacer contacto con las piezas giratorias. 1110 04/2010
⚠ WARNING Crush hazard. Keep hands clear while conveyor is operating. Lockout/tagout before cleaning or servicing.		⚠ ADVERTENCIA Peligro de aplastamiento. Mantenga alejadas las manos mientras el transportador está en operación. Bloquee/Etiquete antes de limpiar o suministrar servicio. 1110 04/2010
⚠ WARNING Drawing in and crush hazard. Keep hands clear while conveyor is operating. Lockout/tagout before cleaning or servicing.		⚠ ADVERTENCIA Peligro de arrastre hacia adentro y aplastamiento. Mantenga alejadas las manos mientras el transportador está en operación. Bloquee/Etiquete antes de limpiar o suministrar servicio. 1110 04/2010

Standard guarding practices require that “in running pinch points” be guarded to help prevent getting drawn in.



These guards prevent someone falling into the pinch point areas.



These guards prevent someone from putting their hands inside of springs of vibrating feeders and screens



This type of guard keeps you from accessing the pinch point where the belt runs under rubber flashing but allows adjustments without removing any part of the guarding.



In an effort to keep people from removing a guard to clean it out and never re-install it; we have designed this guard to allow material to fall out at the rubber flap.



AGAIN: Commandment # 1

- DO NOT perform any lubrication, maintenance, or repair to any piece of equipment while it is in operation!

- Accidents happen because people are “cleaning” or working on a piece of equipment while it is operating and they aren’t paying attention to what is going on around them.
- People get too close to moving rollers and their clothing, themselves or their tools get caught up.

Mining Fatality

- On October 29, 2001, a 36-year-old laborer, with 5 weeks of mining experience, was **fatally injured** at a surface sand and gravel mine when he became entangled in a conveyor tension roller. The victim had been assigned to do miscellaneous clean up throughout the plant and became entangled while carrying out his duties.



Mining Fatality

- On August 1, 2005, a 30-year old laborer, with eight weeks mining experience, was **fatally injured** at a sand and gravel operation. The victim was using a shovel to remove clay that had built up on a return idler nearest to the head pulley when he was caught by the conveyor belt.



Mining Fatality

- On January 25, 2005, a 49-year-old quarry operator, with 14 years mining experience, was **fatally injured** at a cement operation. The victim was cleaning loose material and pumping water from the primary crusher conveyor belt basement. He contacted an unguarded return idler that was about four feet above the ground and was trapped between the conveyor belt and the return idler.



Mining Fatality

- On Sunday, September 26, 2004, a 46-year old utility man with 12 years mining experience was **fatally injured** when he contacted a moving underground belt conveyor system. The victim was attempting to install a belt scraper at a tailpiece while the belt was in motion. A chain attached to the scraper was caught by the belt, dragging it and the victim into the tailpiece roller.



Mining Fatality

- On Thursday, April 19, 2001, a belt foreman, with over 22 years of mining experience, was **fatally injured** in a machinery accident. The victim was making an examination of a 54" belt conveyor drive take-up unit while the belt conveyor was still in motion. The victim's left arm was detached by the rotating rollers of the belt conveyor take-up unit. There were no eyewitnesses to the accident.



Mining Fatality

- On July 21, 2005, a 31-year old plant operator with two years mining experience was **fatally injured** at a sand and gravel operation. The victim made a splice on a conveyor belt and was making adjustments to the belt. He was found entangled in the tail pulley of the conveyor.



Accidents I have heard of regarding rotation equipment

- Bib overall strap caught in a drill press. -fatal
- Shirt or jacket caught by a rotating shaft. - fatal
- Return rollers grabbing a hand or arm. - both
- Head or tail pulleys grabbing a hand. – loss of limb
- Stray items (wire, rebar, cable, etc) laying in or near belts can grab you. – loss of limb
- Mans fall harness got caught on a conveyor and he was pulled in - fatal

- Practice “good housekeeping” in your work area.
- Don’t let clutter collect on platforms and walkways.
- Don’t leave your tools laying on walkways when finished.
- Don’t leave tools such as shovels, hoes and rakes laying where you or someone might trip over them.
 - Someone could trip and fall into a moving conveyor.

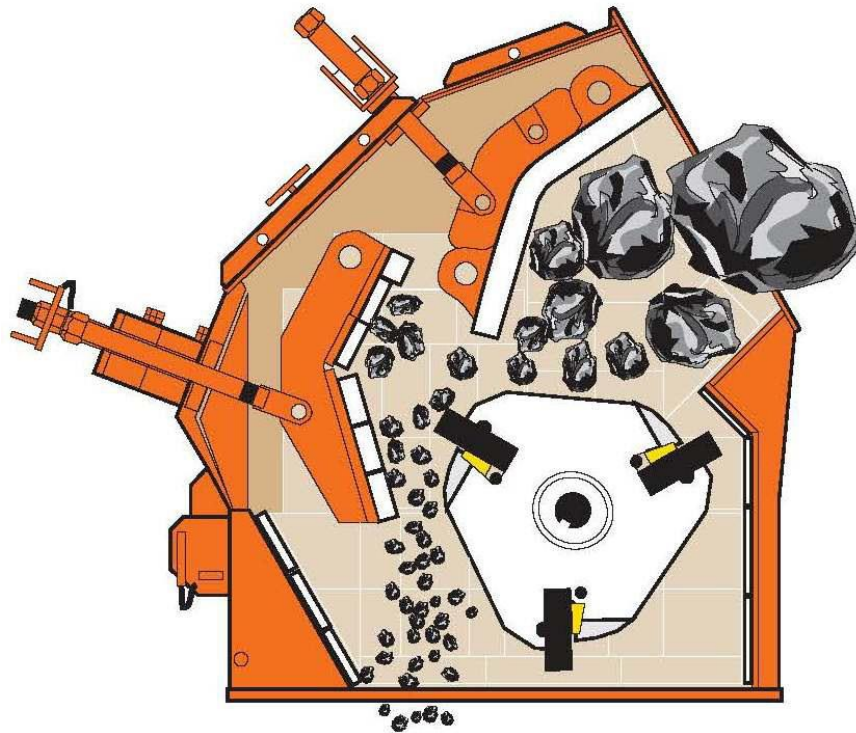
Be cautious of wearing jewelry

- Rings can get caught on ladder rungs, and edges of walkways.
- Watches, bracelets and necklaces can get caught on items or caught on something if reaching into a tight space.
- Rings and watches can short out near electricity, for example a starting battery.

Stored energy

- Be careful around crushing equipment that has been jammed or plugged as they could contain stored energy.
- When clearing the jamb or plug, this energy might be released unexpectedly.

In the instance of an “impact crusher” that has a spinning rotor, plugging the crusher could stop the rotor in a position, that when a piece of material is moved; it could allow the rotor to move or spin unexpectedly.



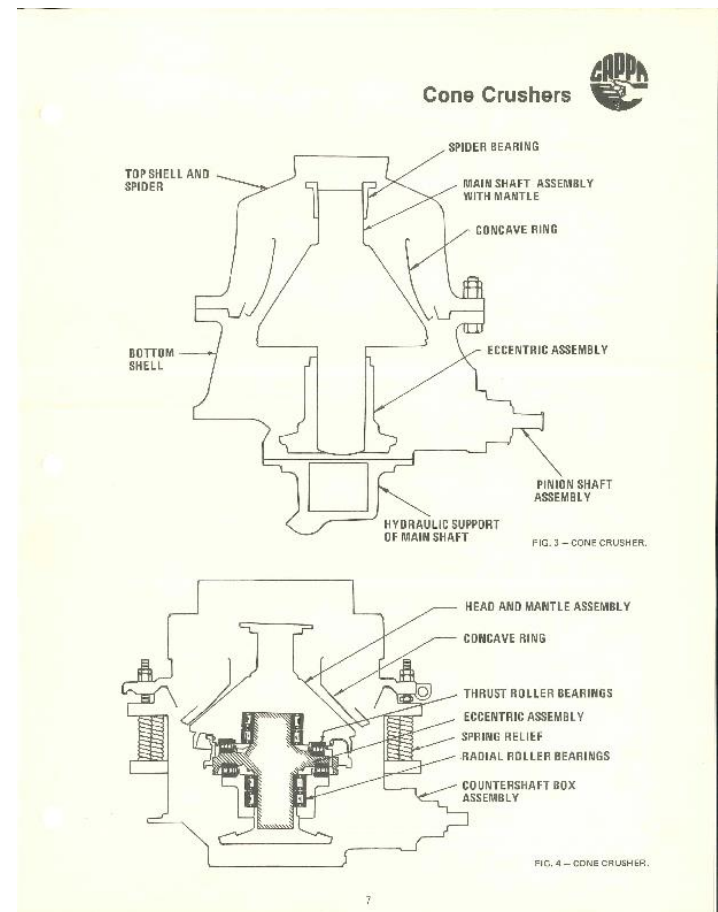
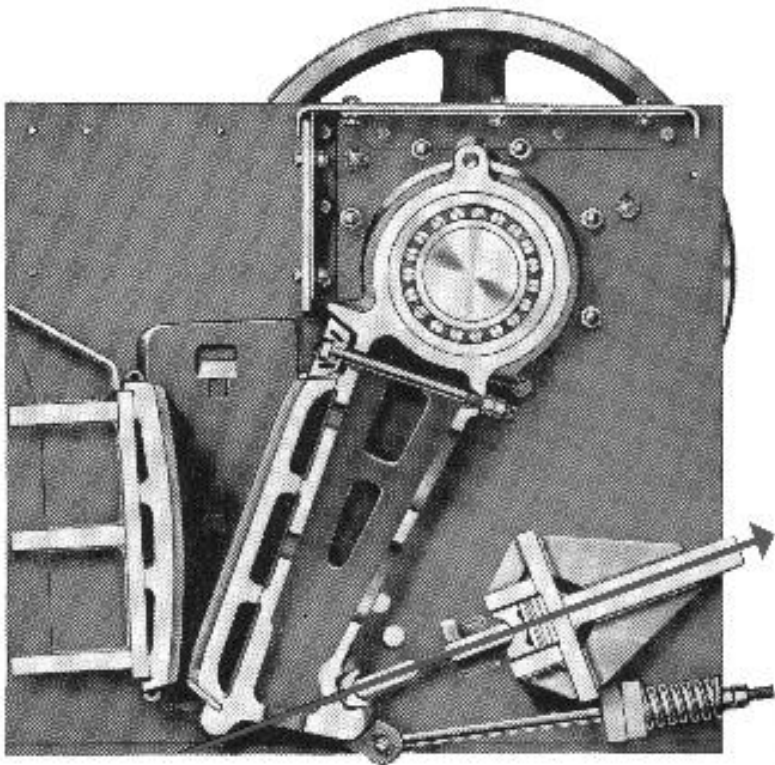
When entering the crushing chamber of a impact crusher, ALWAYS secure the housing safety lock pins to prevent un-intentional closure of the housing and the rotor lock pins to prevent un-intentional movement of the rotor.



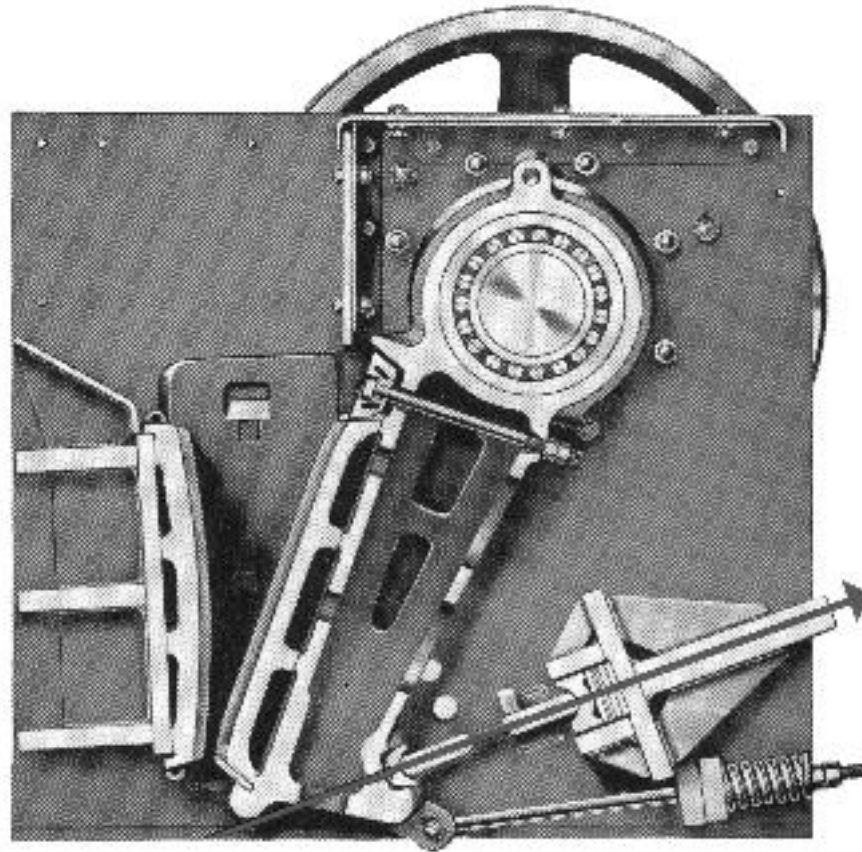
If for some reason it is not possible to insert the rotor lock pin because the rotor cannot be aligned with the pin holes; secure the crusher flywheel to prevent un-intentional movement of the rotor.



“Compression” style crushers like jaws and cones have a “funnel shaped” opening. In the case of an un-crushable, the farther down into the crusher it moves, the more pressure is applied to it.



This extreme pressure and the funnel shaped opening make items want to spit upwards like squeezing a pumpkin seed between your fingers. Whenever possible, release some of the pressure before attempting to clear the jamb.



Mining Fatality

- On September 23, 2002, a 43 year-old plant operator with 17 months experience was **fatally injured** at a crushed stone operation. The victim was removing fines that had packed around a winged tail pulley of a belt that had been buried by spillage. As the spillage was removed, the bound conveyor belt moved backward a short distance and caught the victim's arm between the belt and the tail pulley.



Before starting a piece of crushing equipment:

- Follow the daily pre-start up inspection for your piece of equipment.
- Know where your fellow employees are (head count)
- Check to be sure that no person is in, or on, any part of the plant.
- Make sure that any tooling that has been used for repairs has been removed from any equipment getting ready to start.
- Remove any other foreign objects that may be in the hopper feeder or any other area of the plant.
- Always sound the start up warning alarm.

While a piece of equipment is operating

- DO NOT enter into the running feeder of a crushing plant.
- DO NOT “pick” off or from a conveyor that was not designed for that purpose.
- DO NOT position a plant operator where he will be in harms way during the loading process. Keep them away from falling and flying materials as well as the loading device.

While a piece of equipment is operating

- Try not to allow pieces of material that are too large for a particular machine to be introduced into the feed hopper.
 - A) This just causes an operation of trying to remove that piece and adds to the possibility of injury.
 - B) ALWAYS shut down the equipment before attempting to remove unwanted materials.
 - C) NEVER lift a piece of material over someone's head.

OK everyone,

When you go to work again and are doing your daily job, remember that old gray haired guy from today!

And remember that he told you about some poor souls doing the same things you are about to do and that some of them weren't able to go home to their family one day because they let their guard down and lost their life!

Think twice about what you are about to do, don't get careless and go home safe to YOUR family!

Thank you for your attention today!
QUESTIONS?

