STANDARD OPERATING PROCEDURE
KOMATSU 930E -3SE -4SE HAUL TRUCKS

Effective Date: 09-05-2014	Document Number: MNSOP160-0011	Rev: 12

PURPOSE:

The purpose of this SOP is to establish an operating standard for the safe inspection and operation of the Komatsu 930E/SE haul truck. This SOP shall be reviewed and followed in combination with any equipment specific OEM procedures.

SCOPE:

This SOP applies to Rio Tinto Kennecott Utah Copper – Bingham Canyon Mine employees who have completed Haul Truck Driver Training and have obtained both isolation and operational training along with the appropriate MSHA 5000-23 certificate.

RESPONSIBILITY:

It is the responsibility of the haul truck operator to inspect the truck properly and safely before its operation. A mid-shift inspection should also be conducted. It is the operator's responsibility to report any defective, damage or unusable equipment that may affect the haul truck's safe operation to their immediate supervisor. Each operator is responsible to safely follow all applicable operating and isolation procedures and to maintain truck cleanliness. Your supervisor may occasionally require a task, which may not specifically be mentioned in this SOP. Keep safety first and use TRACK in all tasks.

A haul truck driver is responsible to transport the maximum quantity of material while operating the haul truck safely and without subjecting the equipment to damage.

Isolation Officer (IO): The IO is responsible for understanding the provisions of Safety and Health Standard 16.12, Lockout/Tagout (Isolation), and ensuring that they, and the provisions of this SOP, are incorporated. The IO is responsible for ensuring that all Hazardous Energy and Hazardous Substances that could potentially harm a person working on the system or damage equipment are isolated, locked out.

HEALTH HAZARDS

- Hazards may include slips, trips, and falls while inspecting the equipment. Do a thorough area inspection prior to performing any task. Surfaces may become slick due to wet or oil/lube spills.
- Fall hazards exist. Exercise caution when climbing ON and OFF the truck. Always use three-points of contact.
- Be aware of the extending distance of the bed and canopy protruding in front/behind of the equipment, it has the potential to cut, penetrate, or otherwise damage your surroundings.
- Crushing hazards exist. Be careful of rear end swing and hindered visibility on the blind side of the equipment. Always maintain a safety perimeter around the machine and never allow any personnel with-in this area.
- Pressurized Systems: Hydraulic cylinder and hoses retain pressure. Also, hot coolant can spray if the radiator cap is opened while the cooling system is pressurized. These items may pose a fluid penetration hazard.
- Hot Surfaces/Parts/Components pose burn potentials. Do not allow hot parts or components to contact your skin.
- Rotating Parts: Stop and isolate the engine prior to coming with-in close proximity to any movable part.
- Diesel exhaust inhalation.
- During normal operations, noise levels may exceed 85db. Hearing protection may be required.
- Always wear the proper PPE, stay focused, use TRACK and ensure that you are fit-for-duty.

- Be alert for falling debris from the undercarriage and/or dump bed.

Proper PPE:

- Hard hat
- Safety glasses or goggles
- Work gloves
- Steel toe boots
- Hearing protection (where applicable)
- Isolation equipment

ENVIRONMENTAL:

Ensure that wastes/oily wastes are properly disposed of in a safe and environmentally sound manner. Report all fuel and/or fluid spills that are outside the containment area to Mine Care and your supervisor immediately. Follow KUCC Environmental Procedures and ISO Environmental Standards.

In accordance with Idle Management policy, while on tie lines or in line at the crusher during a crusher down, shut it off. When cab temperature moves out of reasonable, range operator may re start equipment to restore normal temperature range.

DEFINITIONS:

LOTO – Lock Out Tag Out

PPE – Personal Protective Equipment

RA – Risk Analysis

SOP – Standard Operating Procedure

UTM – Unintentional Movement Feature

RSC – Retarder Speed Control

DID – Diagnostic Information Display

PSC – Propulsion System Controller

SWI – Standard Work Instruction

TRACK acronym for:
Think through the Task
Recognize the Hazards
Assess the Risk
Control the Hazards
Keep Safety First in all Tasks

REFERENCES:

Level 1 Pre-Task Hazard Assessment: 5818 Standard procedures for operating Komatsu Haul Truck models: 785F, 930E-3SE, 930E-4SE.

Level 1 Pre-Task Hazard Assessment: 4896 HME isolation haul trucks

Level 1 Pre-Task Hazard Assessment: 7112 Unintentional Haul Truck Movement Logic

Risk Analysis: 4711 Procedure to Start-Stop haul truck

Risk Analysis: 4670 Haul truck isolation

Risk Analysis: 4168 Komatsu 930 Fire suppression equipment shut down

Risk Analysis: 4221 Komatsu 930 fire suppression system shutdown sequence

OEM Operation and Maintenance Manual 930E-4SE Dump Truck CEAM024501

Level 1 Pre-Task Hazard Assessment ID #8536 HME Idle Management

Risk Analysis: 8984 Park Brake Test

Risk Analysis: 9089 Pre-Op

SWI160.0011.1 LOTO

MNSWI 160-0011.2 Pre-Operation Inspection

Rio Tinto KUC requires all personnel to wear seatbelts while operating company and private vehicles on KUC property.

Startup Procedure:

1. Ensure the park brake is engaged, transmission shift lever is in NUETRAL or PARK, and the dump lever is in the float position.

2. Ensure the retarder control lever is at the released position.

3. Ensure the mode switch is in "REST" position.

4. Ensure that the emergency stop is in the run position.

5. Honk the horn 1 time. Wait 3-5 seconds and assess the situation.

6. Turn the key to the "ON" position. (DO NOT START).

7. Wait until the Diagnostic Information Display (DID) panel indicates "SYSTEM READY".

8. Turn the key to "START" position. It will take 10-15 seconds before the starter engages to allow for the pre-lube cycle. Continue holding the key until the engine fires up (Maximum of 30 seconds).

9. When the haul truck starts, the engine tachometer will show 700-800 RPM at idle.

NOTE: ***If the haul truck does not start, contact Mine Care to schedule a hot start for the Komatsu haul truck and notify supervisor.***

NOTE: ***If the pre-lube does not engage, contact Mine Care***.

10. Actuate the mode switch to the READY position. Verify the Diagnostic Information Display (DID) displays "System Ready". Equipment is now ready for operation.

Shutdown Procedures:

1. Position truck on a level surface, away from hazards. If possible choose a designated tie-line.

NOTE: ***If truck has been operating with a load and climbing a ramp, the engine should be idled 3-5 minutes to allow for engine cool-down prior to shut down.***

2. Place Directional Selector Switch in NUETRAL or PARK. For the SE4 models place the selector to park.

3. Apply parking brake. **DO NOT** apply the wheel lock brake. Verify the brake indicator light in the overhead panel is illuminated.

4. Apply the mode switch to the "REST" position. Verify the Diagnostic Information Display (DID) displays Rest Mode.

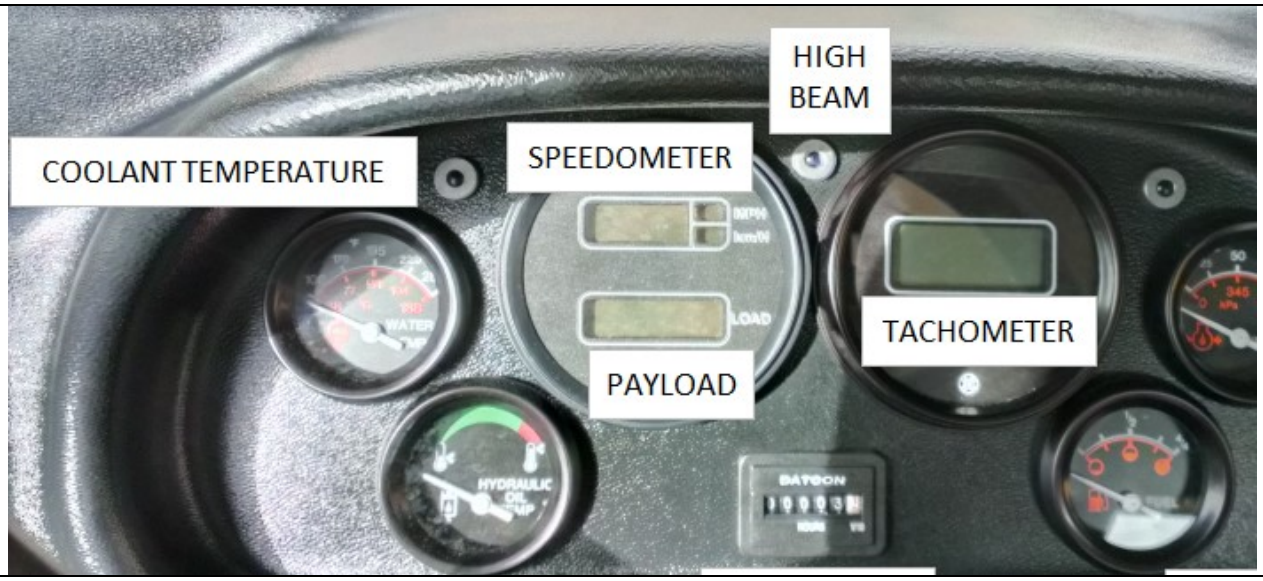
5. Turn the key to the "STOP" position.

6. Turn off all lights.

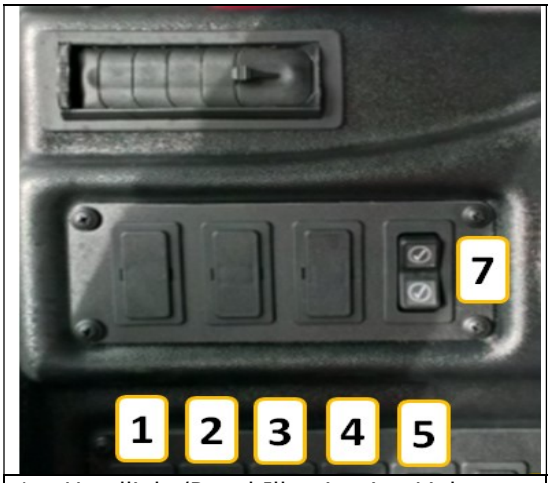
7. Place wheel chock on the downhill side of the driver's side front tire.

CONTROLS

OVER HEAD CONSOLE



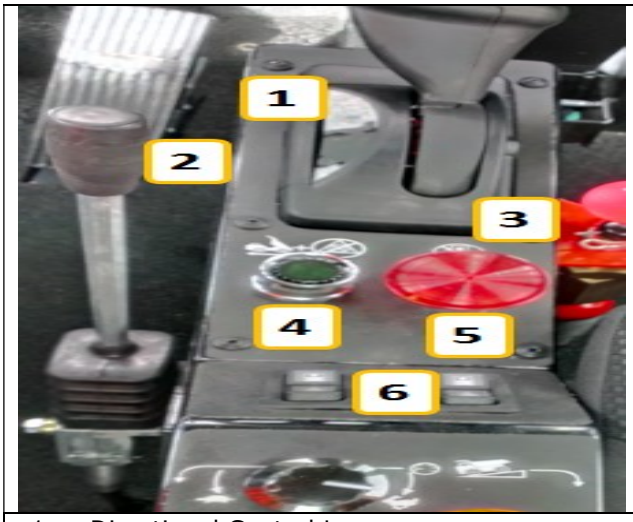
DASH DISPAY



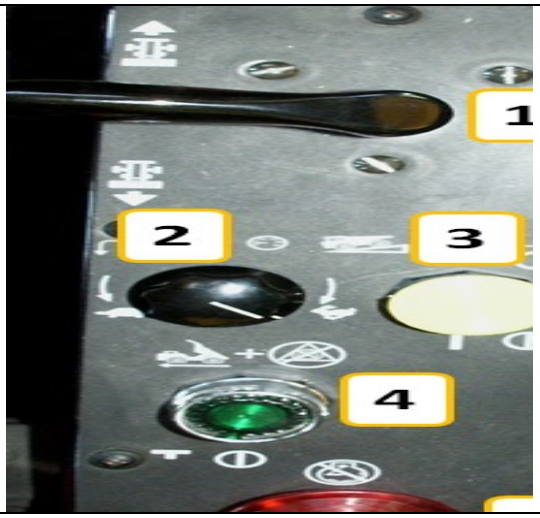
1. Headlight/Panel Illumination Lights
2. Ladder Light
3. Backup Light
4. Fog Light
5. Payload Meter
6. Panel Light Dimmer
7. Indicator Light Lamp Check

8. Wheel Brake Lock
9. Hazard Light
10. AC DRIVE/REST mode selector

Heater/AC Controls



1. Directional Control Lever
2. Hoist Control Lever
3. Manual Fire Suppression Plunger
4. Override/Fault Reset
5. Engine Shutdown
6. Power Window Control
7. Auto Retarder Speed Control Dial
8. Auto Retarder Control On/Off



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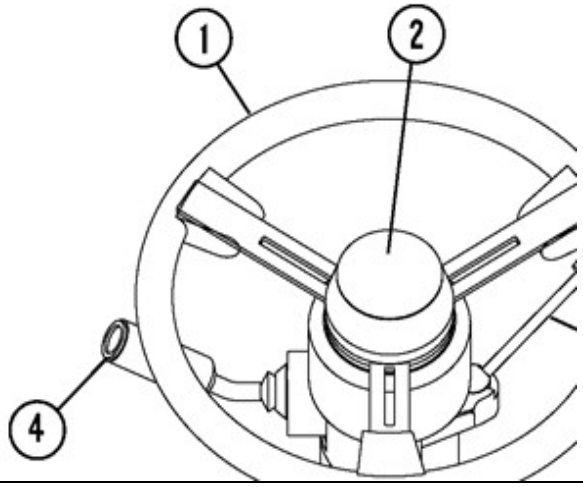
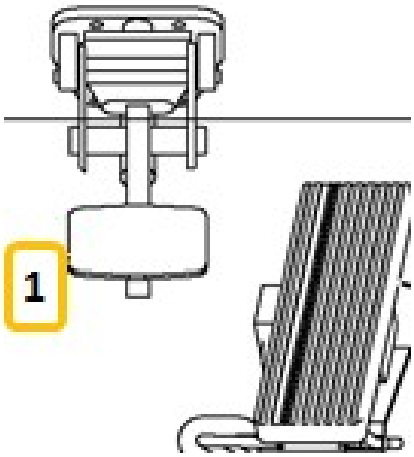
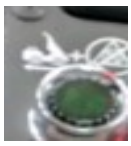


1. Steering Wheel
2. Horn Button
3. Tilt/Telescope Lever
4. Multi-Function Turn Signal Switch (High/Low Beam) (Windshield Wiper Operation) (Windshield Wiper Fluid)
5. Retarder Lever



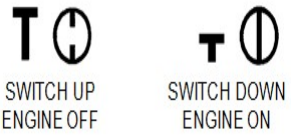
1. Brake/Retarder Pedal
2. Throttle/Accelerator

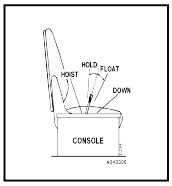


Override/Fault Reset Switch: This push-button switch is spring-loaded to the OFF position. When pushed in and held, this switch may be used for several functions.

- The switch permits the operator to override the body-up limit switch and move the truck forward when the directional control lever is in FORWARD, the dump body is raised, and the brakes are released. Use of the override switch for this purpose is intended for emergency situations only!
- The push-button deactivates the retard pedal function when the truck speed is below 3 mph.
- The switch is also used to reset an electric system fault that is indicated by a red warning light. Refer to Overhead Status/Warning Indicators later in this section.
- The switch can also be used to allow the haul truck to spread a load by allowing the truck to propel in forward and raise the dump bed simultaneously.

Engine Shutdown Switch: Engine shutdown switch is used for engine shutdown. Pull the switch up to stop the engine. Push the switch back down to enable engine





Raising the Dump Body:

1. Pull the lever to the rear to actuate the hoist circuit. Releasing the lever anywhere during "hoist up" will place the body in HOLD at that position.

2. Raise engine rpm to increase hoist speed.

3. Reduce the engine speed as the last stage of the hoist cylinders begin to extend, then let the engine go to low idle as the last stage reaches half-extension.

4. Release the hoist lever as the last stage reaches full extension.

5. After the material being dumped clears the body, lower the body to the frame.

Lowering the Dump Body:

1. Move the hoist lever forward to the DOWN position and release. Releasing the lever places hoist control valve in the FLOAT position, allowing the body to return to the frame.

Diagnostic Information Display (D.I.D.): The diagnostic information display records all actions and faults. It displays which mode the truck is currently in. It also displays the results of all brake tests.

BRAKE OPERATION

DYNAMIC RETARDING: Dynamic retarding is a braking torque (not a brake) produced through electrical generation by the wheel motors when the truck motion (momentum) is the propelling force.

For normal truck operation, dynamic retarding should be used to slow and control truck speed.

Dynamic retarding is available in FORWARD/ REVERSE at all truck speeds above 0 kph/mph. However, as the truck speed slows below 3 mph, the available retarding force may not be effective. Use the service brakes to bring the truck to a complete stop.

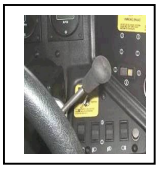
Dynamic retarding will not hold a stationary truck on an incline. Use the parking brake or wheel brake lock for this purpose.

When in NEUTRAL, dynamic retarding is available only when truck speed is above 3 mph.

When dynamic retarding is in operation, engine rpm will automatically go to an advance retard speed setting. This rpm will vary depending on temperature of several electrical system components.

Dynamic retarding will be applied automatically if the speed of the truck reaches the maximum speed setting programmed in the control system software.

When dynamic retarding is activated, an indicator light in the overhead display will illuminate. The grade/speed retard chart should always be used to determine safe downhill speeds. Refer to the Grade/ Speed Chart.



Retarder Lever: Retarder lever mounted on the right side of the steering column can be used to modulate retarding effort. The lever will command the full range of retarding and will remain at a fixed position when released.

When the lever is rotated to full "up" (counterclockwise) position, it is in the OFF or NO retard position. An adjustable detent holds the lever in the OFF position. Refer to Section J in the service manual for adjustment procedures.

When the lever is rotated to full "down" (clockwise) position, it is in the full ON or FULL retard position.

For long downhill hauls, the lever may be positioned to provide desired retarding effort, and it will remain where it is positioned.

NOTE: ***The retarder lever must be rotated back to the OFF position before the truck will resume any propel motion.***

NOTE: ***The lever and foot-operated retarder/service brake pedal can be used simultaneously or independently. The Propulsion System Controller***

(PSC) will determine which device is requesting the most retarding effort and apply that amount.

Brake/Retarder Pedal: Brake/retarder pedal is a single, foot-operated pedal that commands retarding effort through a rotary potentiometer. The second portion of pedal travel modulates service brake pressure directly through a hydraulic valve. Thus, the operator must first apply, and maintain, full dynamic retarding in order to apply the service brakes. Releasing the pedal returns brake and retarder to the OFF position.

When the pedal is partially depressed, the dynamic retarding is actuated. As the pedal is further depressed, to where dynamic retarding is fully applied; the service brakes (while maintaining full retarding) are actuated through a hydraulic valve which modulates pressure to the service brakes. Completely depressing the pedal causes full application of both dynamic retarding and the service brakes. Indicator light (B3) in the overhead panel will illuminate, and an increase in pedal resistance will be felt when the service brakes are applied.

NOTE: ***For normal truck operation, dynamic retarding (lever or foot-operated pedal) should be used to slow and control the speed of the truck. Service brakes should be applied only when dynamic retarding requires additional braking force to slow the truck speed quickly or when bringing the truck to a complete stop***.

Unintentional Truck Movement Feature (U.T.M.): The unintentional truck movement feature is a safety program for the SE series trucks that will activate the wheel brake lock if the haul truck's logic computer assumes the operator has forgotten to apply the park brake when s/he should have.

Conditions required before UTM sets:

Truck direction selector is in R, N, F and the equipment's traveling speed is below 3mph.

No dynamic brake active

No acceleration

No service brake applied

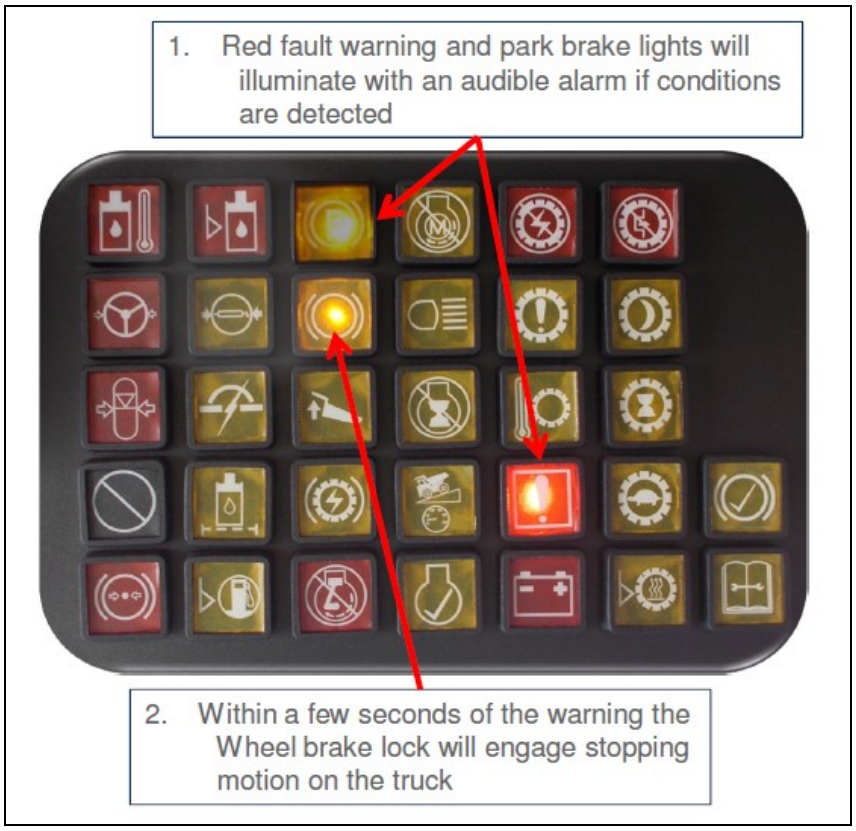
No park brake set

To Clear the Unintentional Movement Feature once activated:

1. Place the truck direction selector in the PARK position.

2. Wait for the UTM warning to clear:

Unintentional Truck Movement Warning



3. Place the direction selector back to the desired position and resume operation.

Throttle/Accelerator Pedal: Throttle/accelerator pedal is a foot- operated pedal which allows the operator to control engine rpm depending on pedal depression.

It is used by the operator to request torque from the wheel motors when in forward or reverse motion. In this mode, the propulsion system controller commands the correct engine speed for the power required. In NEUTRAL, this pedal controls engine RPM directly.

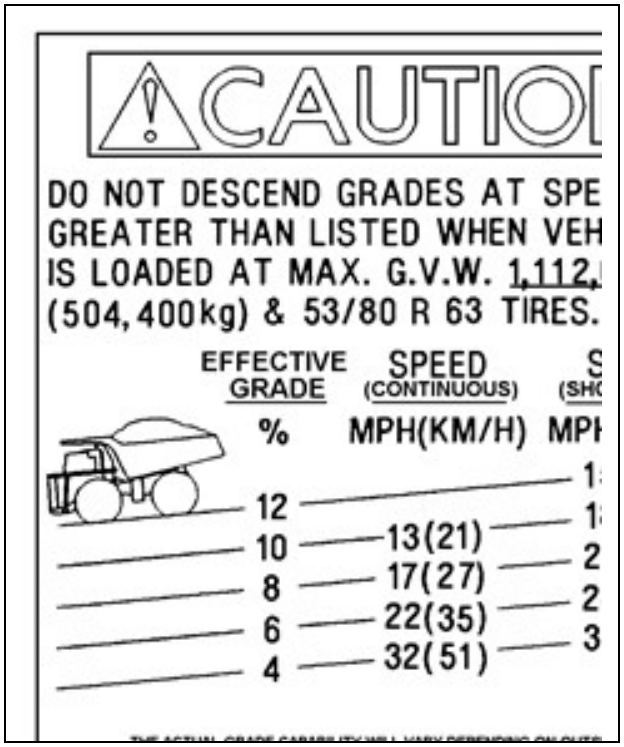
Retarder Speed Control (RSC) Dial: To activate the automatic Dynamic Retarder Control pull up on the mushroom button and push the mushroom down to de-activate it

The retarding effort is controlled by adjusting the retarder control dial. Rotate the dial to proportionally apply dynamic braking.

NOTE: ***Depressing the throttle pedal will override the RCS braking. When the pedal is released RCS braking will resume.***

Grade/Speed Chart: provides the recommended MAXIMUM retarding limits at various truck speeds and grades with a fully loaded truck. The operator should refer to this chart before descending any grade with a loaded truck. Proper use of dynamic retarding will maintain a safe speed.

Two speed lists are provided, one for *continuous* retarding, and the second for *short term* retarding. Both lists are matched to the truck at maximum Gross Vehicle Weight (GVW). The two ratings are guidelines for proper usage of the retard function on downhill grades.



PROCEDURES:

Stopping on a grade for blasting or road condition: Come to a complete stop. Use the service brake to hold the truck and engage the park brake.

NOTE: ***The wheel brake lock is only to be used at the shovel and at the dump.***

Breakdown on a ramp: Stop and set ONLY the park brake.

WARNING: ***If the rear wheel brake lock is set first it will eventually bleed off. Setting the rear wheel brake lock and then the park brake may allow the truck to unexpectedly roll away on a ramp.***

WARNING: ***Call Mine Care and your supervisor and let s/he know you are broke down on a ramp and need a safety berm placed on the downhill side of the haul truck to secure it from motion. DO NOT exit the truck until a safety berm is in place.***

Starting on a grade loaded:

1. Fully depress the foot-operated retarder/service brake pedal.

WARNING: ***NEVER use the retarder lever to hold the truck on a grade.***

2. Release the park brake.

3. Move the directional selector into a drive position (forward/reverse) and depress the accelerator pedal to increase the engine RPM.

4. As the engine RPM approaches maximum, and operator senses propulsion effort working against the brakes, slowly release the brakes and let the truck movement start.

5. Completely release the foot-operated retarder/service brake pedal.

Fire Safety: (Once the haul truck's fire suppression system discharges, the engine **WILL shut down.)**

CAUTION: ***Stay calm, get the haul truck stopped. Place the directional selector in the PARK position. On the older models place the directional control in the Neutral position and apply the park brake.***

1. If the fire suppression system has failed to detect a fire the operator must manually discharge the fire suppression system by activating the Fire System Switch.

2. If the Activation Switch malfunctions and does not discharge, activate the fire suppression system manually by locating plunger, pulling the pin and pushing the plunger down.

4. Push SOS on the Mine Star

computer and call "May Day, May Day, May Day" on the company two-way radio (Mine Operations Chanel or Emergency Channel) be sure to clearly state your emergency, giving your truck number and location.

5. Exit the haul truck immediately. Use the handheld fire extinguisher if necessary to put out small fires in your evacuation route ONLY. (Aim retardant at the base of the flames and use a sweeping motion to extinguish the fire)

6. Get off the haul truck and move into the clear in a safe manner. Be aware of your surroundings and be on the guard for any potential hazards.

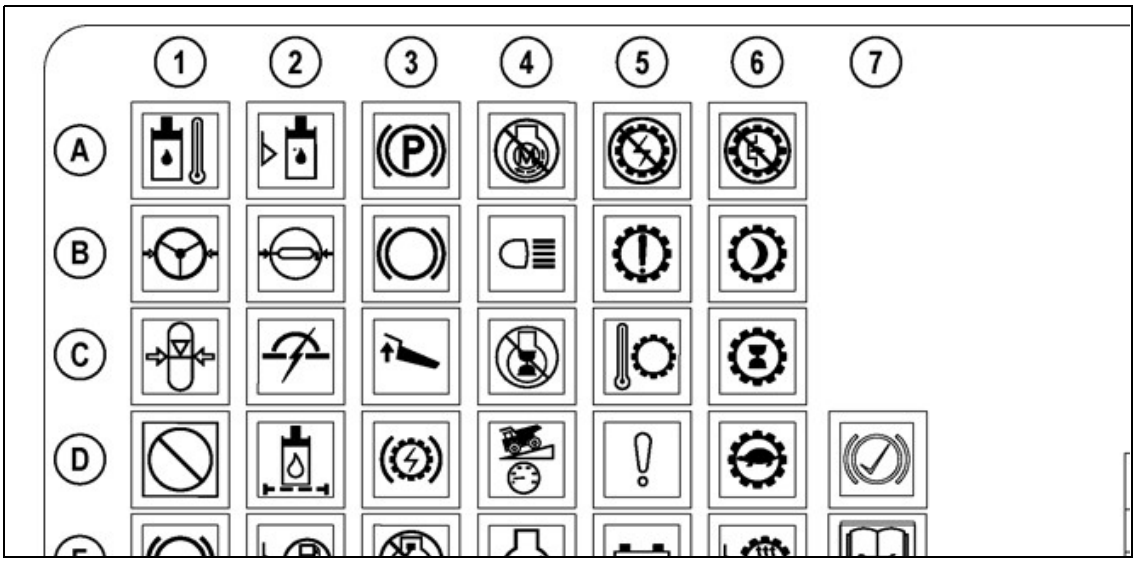
NOTE: ***Use the Boarding Stairs or Emergency Ladders and all Platform Steps. Do Not jump off of the equipment. Serious injuries can result from jumping from the deck of a haulage truck.***

6. Keep all personnel away from the scene of the incident until the Emergency Response Team arrives.

Engine Shut Down: If the truck's engine shuts down while operating, the truck's steering will operate on the secondary emergency steering system for a limited time.

WARNING: If the operator exceeds the emergency steering capacity the haul truck will have NO STEERING! And the steering wheel will lock in the position it is in. Ensure the truck is stopped quickly and safely.

OVERHEAD STATUS/WARING INDICATORS



A1 High Brake Oil Temperature	A2 Low Hydraulic Oil Level	A3 Park Brake Applied	A4 Starter Failure	A5 No Propel/No Retard	A6 No Propel
B1 Low Steering Pressure	B2 Lubrication Pressure Low	B3 Service Brake Applied	B4 Manual Backup Lights	B5 Propulsion System Warning	B6 Propulsion @ Rest
C1 Accumulator Pressure Low	C2 Circuit Breaker Tripped	C3 Body up	C4 Timed Engine Shutdown	C5 Propulsion System Temp	C6 Propulsion System Not Ready
D1 Not Used	D2 Hydraulic Oil Filter	D3 Dynamic Retarding	D4 Retard Speed Control	D5 System/Component Failure	D6 Reduced Propulsion System
E1 Low Brake Pressure	E2 Low Fuel	E3 Stop Engine	E4 Check Engine	E5 Battery Charge System Failure	E6 Retard @ Continuous Level
D7 Brake Check	E7 Maintenance Monitor	8 Brake Test Switch			

AMBER INDICATOR LIGHTS ALERT THE OPERATOR THAT A TRUCK FUNCTION REQUIRES SOME PRECAUTION!

DO NOT OPERATE THE TRUCK WITH A RED WARNING LIGHT ILLUMINATED!

NOTE: ***Overhead Status/Warning Indicator Panel supersedes gauge readings. If a gauge is reading in the green range and a red overhead indicator light does not go out, stop the engine and notify maintenance personnel.***

WARNING: ***If oil pressure decreases, the brake auto-apply feature will activate and the service brakes will apply automatically to stop the truck. Do not attempt further operation until the malfunction is located and corrected.***

WARNING: ***If the low accumulator precharge warning light flashes, notify maintenance personnel. Do not attempt further operation until the accumulators have been properly charged with nitrogen.***

WARNING: ***If the Stop Engine warning light illuminates, stop the truck as quickly as possible in a safe area. Move the directional control lever to PARK or NUETRAL position and apply the Park Brake. Turn off the engine immediately.***

Steering warnings:

NOTE: ***DO NOT steer truck immediately after starting. Allow the truck sufficient time to warm up the before steering the truck. Damage to the steering system may occur if steering occurs before the oil has been warmed up.***

LOW STEERING PRESSURE WARNING – B1: This is usually caused by over-steering. Stop steering the truck and allow the pressure to build back up. The warning alarm will stop when the pressure builds. If alarms continue contact Mine Care.

LOW ACCUMULATOR PRESSURE WARNING – C1: The operator has exceeded the primary and secondary steering systems or the accumulators are not charged properly. The operator must stop truck immediately or risk completely losing the steering!

OPERATOR WARNINGS/CAUTIONS/NOTES:

WARNING: ***DO NOT use the wheel brake lock switch to stop the truck unless foot-operated treadle valve is inoperative. Use of this switch applies rear service brakes INSTANTLY.***

WARNING: ***DO NOT use wheel brake lock for parking. With engine stopped, hydraulic pressure will bleed down, allowing brakes to release.***

CAUTION: ***The truck must be completely stopped before the directional control lever is move into PARK. A fault will be logged if the truck is still moving.***

CAUTION: ***DO NOT activate the rest mode switch while the truck is moving! The truck may unintentionally enter the REST mode after stopping.***

WARNING: ***DO NOT allow anyone to climb on or off equipment while the truck is energized.***

WARNING: ***De-Energize the haul truck whenever the engine is to be shut down.***

NOTE: ***Notify your supervisor if your truck is not equipped with a wheel chock. DO NOT start a pre-operation inspection until a wheel chock is brought to you. If you lose your wheel chock during the shift, continue working and remain in the cab until a new chock is brought to you.***

WARNING: ***DO NOT open any electrical cabinets.***

CAUTION: ***The grid box can become extremely hot. Keep debris clear of deck, cabinets and grid box as it can catch on fire.***

NOTE: ***The haul truck engine will not shut off if the park brake is not applied.***

WARNING: ***NEVER use the park brake at the shovel or at a dump. This brake is motion sensitive and a sudden shock caused by loading or dumping could cause the haul truck's motion sensor to release the park brake.***

WARNING: ***Always apply the park brake when stopping on a grade. It has a higher amount of braking pressure than the wheel lock brake and it will not bleed off.***

CAUTION: ***In an emergency scenario, the wheel lock brake can be applied while the haul truck is in motion. (Equipment damage may result from the sudden application of brake force.***

WARNING: ***DO NOT pump the service brake.***

CAUTION: ***Dynamic Retarding will NOT hold a truck stationary.***

CAUTION: ***Dynamic Retarding will be applied automatically if the speed of the truck obtains the maximum set truck speed. (Approximately 40MPH)***

WARNING: ***The kinetic energy of the truck can exceed the dynamic braking capacity, this normally occurs when a loaded truck is traveling too fast down a grade. In the event that the dynamic retarding becomes ineffective STOP THE TRUCK IMMEDIATELY WITH THE SERVICE BRAKE! Contact Mine Care and your supervisor***.

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Effective Date: 09-05-2014	Document Number: MNSOP160-0011	Rev: 12

WARNING: ***If you are experiencing abnormal steering or wandering you may have some mechanical failure. STOP THE TRUCK IMMEDIATELY! And contact Mine Care.***

REVISION/REVIEW HISTORY:

MOC#	Description of Change	Prepared By	Date
9460	Separated Komatsu Haul Truck SOP from General Haul Truck SOP and updated the information.	Crystal Darger	2/10/2009
9633	Starting and stopping a haul truck	Leo Combs	
10983.1	Grammatical errors and corrected contradictory statements.	Mike Washburn	12/5/2009
12273	Defined standard for stopping/starting on a grade loaded, for blast or other road condition.	Joseph Summers	5/25/2010
13443 13500	Komatsu haul truck fire suppression systems upgraded. SOP updated to reflect changes.	Joseph Summers	10/01/2010
14962	Komatsu Brake Test & Switches added to new series trucks.	Dustin Stauffer	2/26/2011
24470	Revision and Unintentional Truck Movement (UTM)	Alex Gonzales	10-10-2013
NO MOC	Adding review schedule, no MOC needed. "P" taken out of SOP#	Shawn Bateman & Lisa Jansson	2/4/2014
25915	Idle management policy added to the Environmental section.	Mike Combs	4/11/2014
26547	Addition of the required field Park Brake Test.	Mel Ingersoll	7/24/2014
26970	Convert the park brake tests to the 10% grade test.	Dallan Webb	9/5/2014
26908	Updated the items in the Pre-Op Inspection section to align with MNSWI160-0011.1. Next review by 8-2019.	Tonia Pfeifer	10/1/2014
95688	Removed LOTO and Pre-op inspections and created SWI's for both procedures.	Chuck Norton	1/18/2023