Hastings Deering



General Equipment Safety Bulletin

Technical Support Department

Reference Number	Bulletin 01 - 2017
Affected Product	All mobile construction and mining equipment
Risks Identified	Deficiencies in maintenance strategies and quality, and aftermarket modifications can cause machine incidents
Release Date	August 2 2017

Potential issues

Many machine incidents are reported to Hastings Deering each year. A large number of these incidents fall into two categories:

<u>Maintenance quality</u> - Issues include failing to adhere to manufacturer's repair instructions, tightening torques, isolation procedures, ancillary items overlooked when maintenance strategies are formulated, and deviation from the manufacturer's original machine consist when carrying out maintenance.

<u>Aftermarket systems and attachments</u> – When aftermarket systems are added without stringent and informed risk assessments, machine safety and reliability can be affected.

Discussion

Deterioration of ancillary parts

Earthmoving and construction equipment is subject to heat, corrosion, vibration, material fatigue, and mechanical and abrasive wear. While the effect of these factors on major components and structures is well recognized, the effect on ancillary parts and systems is often overlooked. There have been several instances recorded where original factory fitted hoses, clamps, tubes and wiring harnesses have deteriorated or failed on machines that have had one or more major component replacements.

Maintenance quality

Many different systems – cooling, fuel, electrical, implement, steering and braking hydraulics, exhaust, air inlet, compressed air, and power train lines "co-exist" in confined areas and in close proximity to major components and structures. The inspection and maintenance of these ancillary systems should be included in maintenance schedules, in the same way that major component overhaul and replacement is scheduled. It is important that the same care and attention to detail is dedicated to the inspection, repair and replacement of these ancillary parts and systems as that applied to tasks that are more complex.

Installation of aftermarket parts and systems

The installer needs to ensure that aftermarket replacement parts, and additional parts and systems are compatible with, and do not interfere with the OEM's hose routing, clamps, wiring, electronics and the intended function of machine systems. Aftermarket parts and additional systems require the same attention to detail, routing and clamping as the original OEM systems.

Sime Darby Industrial Company



CAT

General Equipment Safety Bulletin

Technical Support Department

Photographs on pages 3 to 8 of this bulletin show examples of various incidents and potential incidents reported to Hastings Deering.

Recommended Actions

- Personnel accessing, operating or maintaining equipment should have ready access to, and be conversant with the contents of the Operation and Maintenance Manual (OMM). Important safety and maintenance information is contained in each of the Safety, Operation and Maintenance sections of the OMM.
- Perform daily walk around inspection prior to operating machine refer safety, operation and maintenance sections of OMM.
- A more detailed inspection of wiring harnesses, water, hydraulic and air hoses, and steel tubes should be conducted at scheduled intervals. Remove all guards and covers concealing these items. Remove any accumulation of oil, dirt or grease that may conceal defects. Inspect all items carefully* Loosen/remove all clamps and inspect for wear areas between clamp and secured item. Replace clamps that have 'relaxed' and allow relative movement of the secured hose, pipe or harness. A suggested interval for these scheduled detailed inspections is at scheduled 'mid-life' repair or at Planned Component Replacement (PCR), however site experience and operating environment should be considered to determine a suitable interval.
- Determine suitable intervals, based on site experience, for scheduled replacement
 of wiring harnesses and flexible engine oil, hydraulic, fuel, coolant and air lines.
 Replacement parts should be secured/routed as per the original OEM routing.
 Check and rectify any potential abrasion points. NB: Replace heater hoses at the
 same interval as coolant hoses.
- Read and understand OEM procedures and safety warnings before commencing a repair. Observe OEM warnings and procedures closely. There can be serious and costly consequences when instructions are not followed or completed incorrectly. If an OEM procedure is found to be deficient, report to the OEM via your dealer representative or via SISWeb Feedback.
- Torque all bolts and fasteners to the torque specified by OEM.
 NB. Incorrect thread lubricants will change tensile loadings on bolts. Bolts and nuts on Caterpillar equipment should be assembled 'dry' unless otherwise specified in service procedures and specifications. Consult your dealer representative if in doubt.
- Ensure after-market replacement parts are compatible with OEM clamps and clearances and meet OEM durability and safety requirements.
- After market systems such as fire suppression, additional wiring, access systems should not have harnesses and hoses clamped, 'zip tied' or otherwise secured to OEM systems. Route separately with suitable retaining clamps and clearances. Using zip ties to secure harnesses or hoses together when there is relative movement between them (including hose pulsation) has caused short circuits, hose failures and fires.

Hastings Deering



General Equipment Safety Bulletin

Technical Support Department

- Hastings Deering strongly advises against the use of 'fire sleeve' and 'pressure sleeve' on fuel lines on Caterpillar engines in all applications. The use of sleeving combined with vibration, fuel line pulsation, sustained high temperatures, dirt ingress, confined routing areas, moisture and corrosion has caused low hour failures of fuel lines. Maintain the OEM clamps, grommets and clearances.
- Pay particular attention to plastic coated 'P-clamps'. If the plastic becomes worn exposing the metal of the clamp, rapid wear can occur to hoses, battery cables and harnesses. Often this wear cannot be seen without removing 'P-clamp'.
- The use of unapproved reclamation procedures or unsuitable parts in critical systems (e.g. braking, steering and suspension) can cause serious incidents. Consult the OEM for advice if in doubt.
- Use the correct fluids in steering and braking systems. The use of unsuitable or incorrect viscosity fluids can cause incidents.
- Report all incidents involving Caterpillar equipment to Hastings Deering. These reports will be forwarded to Caterpillar, and often result in product improvements.

*Caterpillar Special Instruction M0069606 provides guidance on hydraulic hose inspection (available in WebSIS). Also refer to the safety section of most OMM's.



Off Highway Truck steering tube perforated by corrosion – concealed by guard.

Abrasive wear on OHT steering tube – concealed by guard.



D11T pilot hydraulic hose – holed by abrasive wear with clamp.



Aftermarket smaller diameter hose installed in OEM clamp grommet. Must be a firm fit to prevent hose pulsation and movement.

A Sime Industrial Company



Technical Support Department



Loose and poorly secured brake tube clamps lead to perforated OHT brake line.



Incorrectly routed oil lines lead to abrasive wear and hose failure.



Brake tube perforated due to abrasive wear caused by loose clamp.



Incorrectly routed fuel line after engine replacement.



Image shows where installer has removed OEM rubber grommets to accommodate after-market 'fire sleeve'.

Another image showing how installer has removed OEM rubber grommets to accommodate after-market 'fire sleeve'.





Technical Support Department



Use of fire sleeve in confined spaces can eliminate hose clearance and has caused fuel line failures.



Fire sleeve provides minimal protection against abrasive wear.



Hose unworn under OEM grommet

Abrasive wear from hose being trapped under heathardened fire sleeve.



Abrasive wear from 'zip ties' and abrasive material. Arrow indicates wear from zip tie securing fire sleeve.



In some environments, sleeving can retain moisture and dirt, causing accelerated corrosion.



Technical Support Department

Must compress on cable to prevent movement.

Examples of preferred grommet style clamp for battery cables.



8S-0948 clip & 2V-1771 Grommet (12mm ID)

4S-1962 Clip & 7V-6571 Grommet (16mm ID)

Chaffed battery cable from worn plastic coated 'P'-clamp.



Incorrectly 'zip tied' wiring. "Stray" hose clamp.



Securing cables/hoses that travel in different directions together with zip ties can lead to abrasive wear.



Poorly secured or temporarily repaired 'add-on' wiring.



Swivel mount 'saddles' can be used for light duty applications.

Hastings Deering



General Equipment Safety Bulletin

Technical Support Department



Electrical fire damage due to battery cables short circuiting near starter motor on large track type dozer. Damage occurred after engine was replaced.



Ensure battery cables are adequately protected, securely clamped to prevent movement and with sufficient separation to prevent rubbing/contact.



Swivel saddles - Small: part number 206-2423 Large: part number 200-6345



Failed steering cylinder rod due to un-approved weld repairs to thread.



Technical Support Department



Rear axle 'A frame to rear axle connection on large offhighway truck. Regular inspections may have identified loose/damaged top bolts prior to failure.



Steering wheel came off due to stripped thread five (5) weeks after repair – possible causes - excess torque applied or lubricant applied to thread.

If you have any queries regarding the contents of this bulletin, please contact your Hastings Deering Mining or Product Support Representative.

This bulletin is to inform you of the recommendations of the supplier in respect of issues dealt with in the bulletin and should not be used as specific advice in respect of any particular events. Advice from a qualified repairer should be sought in respect of any particular events and Hastings Deering (Australia) Limited accepts no responsibility for any loss or damage occasioned by a party using this general bulletin.

