

PROTECTION OF HEAVY DUTY MOBILE EQUIPMENT

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BACKGROUND

Heavy Duty Mobile Equipment (HDME) is usually operated under hazardous conditions and is frequently remote from water supplies and public fire protection. The equipment is costly, often custom designed, and difficult to replace. Damage to the equipment can result in serious interruption or reduction of operations for an extended period of time.

Equipment is frequently subject to hydraulic system fires. Hydraulic and fuel lines have leaked or failed with subsequent ignition of the fluid by hot exhaust manifolds, electrical components, or brake components. Electrical control panels for such equipment have short-circuited and ignited combustible deposits and wiring with subsequent involvement of exposed hydraulic and fuel systems, which then burn with intensity. More extensive damage to these smaller vehicles has occurred due to the inability or failure of the operator under fire conditions to take the appropriate steps, as often times the operator flees the equipment for their own personal safety. Thus, automatically actuated fire suppression systems should only be relied upon, vs. 'manually' activated systems which require operator involvement.



Bulldozer on fire



Typical High Pressure Hydraulic Lines

For the purposes of this guideline, 'Smaller Mobile Equipment' can be considered equipment such as front end loaders, backhoes, drills and normal sized hauling trucks. "Larger Mobile Equipment" can be considered power shovels, draglines, and building-sized hauling trucks used in the mining industries. The protection of Cranes and Draglines is a separate subject, and is not contemplated in these guidelines. Security and Theft precautions are also not discussed.

RECOMMENDED FIRE PROTECTION PRACTICES

1. Use 'FM Approved' or 'UL Listed' less hazardous fire resistant hydraulic fluids where practical.
2. If an approved hydraulic fluid cannot be used, provide an approved pre-engineered, fixed automatically actuated dry chemical extinguishing system (Class ABC or Class BC rated) for areas where ignition of hydraulic fluid is possible. The need for such fire suppression systems will greatly depend on equipment value, business interruption potential, and ease of replacement.

Provide a system for the engine compartment regardless of hydraulic fluid type, to protect against leaking fuel fires. Ensure that the extinguishing system also is capable of manual actuation from within the operator's compartment and at an outside location readily accessible from the ground. Interlock the engine, braking, and hydraulic systems with the actuation of the extinguishing system.

The fixed extinguishing system is to be automatically actuated by either thermal detection or optical flame detection. If optical flame detectors are used, provide a means that will activate a trouble signal and alarm in the vehicle operator cab when the lens is obscured, indicating the need for maintenance/cleaning. Note: Vehicles protected with manually actuated systems only are not satisfactory. Fire spread is often so rapid equipment operators have been unable to discharge the system prior to exiting the vehicle.

3. Provide at least one readily accessible 20-lb (9 kg) multipurpose dry chemical portable extinguisher on each vehicle.
4. Consider the use of 'sleeve guards' specifically designed to contain pinhole type leaks from hoses. Companies such as Gates "LifeGuard" and Suburbans "Diamondback" products may be suitable for such applications. Careful consideration should be made as to which products are suitable, as some products (such as spiral abrasion guards) are only meant to provide abrasion resistance to the hoses, not necessarily contain pinhole fluid leaks which is the common cause of equipment fires.



Typical Heavy Equipment Fire Suppression Systems

LARGE MOBILE EQUIPMENT

Large mobile equipment includes equipment such as power shovels and wheel excavators, and deserve additional protection features. The size of this equipment can be equivalent to the size of a multistory building.

Protect large mobile equipment as follows:

1. Protect compartments containing oil-filled transformers, circuit breakers, or hydraulic oil pumping facilities with automatic sprinklers in accordance with the appropriate standard.
2. A less desirable but acceptable alternative to providing automatic sprinklers as described above is to provide a recognized approved special protection system for areas housing combustibles. This may include gaseous systems for switchgear rooms, or dry chemical systems for hydraulic rooms. The installation of heat detection interlocked with a shutdown of the hydraulic pump system is also a possible solution, designed so that all hydraulics will shut down in the event of a fire (upon activation of the heat detection).
3. Enclose hydraulic fluid and fuel lines of new equipment within another piping system where they are located within the body of the equipment, such as where they pass through compartments containing ignition sources, such as electrical equipment.
4. Compartmentalize (i.e., cut off) hydraulic system equipment and other areas containing flammable liquid and drain these to a suitable location outside the vehicle. If these areas are insulated, use noncombustible insulation, such as glass fiber or mineral fiber.
5. Ensure electrical light fixtures within areas containing flammable liquid (e.g., hydraulic oil areas) are of the enclosed, gasket type and are guarded against mechanical damage.
6. Provide an audible alarm in the operator's cab upon fire detection and/or actuation of any fixed protection system.
7. Protect electrical equipment against surges due to lightning.
8. Provide portable extinguishers throughout the equipment, minimum of (2) 20 lb dry chemical type.
9. Provide approved or listed heat detection in all important areas or compartments not having fixed protection.

OPERATION AND MAINTENANCE

Ensure only properly trained personnel operate HDME. Prepare detailed written operating and emergency procedures and have personnel periodically retrained and/or evaluated in these procedures. Training in emergency procedures will minimize damage through proper response.

Check operator's Motor Vehicle Driving Record (MVR) on a minimum annual basis and upon allowing an operator to drive any high valued equipment. A driver's personal driving history is often reflective of that person's work driving habits (speeding, reckless driving, impaired driving, etc). Many times, operator error leads to collision, upset or overturn of this equipment.

Visually check hydraulic fluid and fuel lines daily. Check fittings for tightness weekly. Pressure test hydraulic lines annually. Replace flexible hydraulic lines periodically on a programmed basis, or whenever necessary as indicated by inspection or test.

Use nonflammable cleaners where possible. Handle flammable solvents and cleaners, if used, in approved safety cans.

A thorough inspection and maintenance program of fixed extinguishing systems is essential to ensure proper operation. As such, inspect the general condition of the extinguishing system at least weekly; inspect the dry chemical for free flow capability (i.e., no caking) at least monthly; and establish a quarterly maintenance program, including checking for free movement of the actuator mechanism. For specific details on recommended inspection and maintenance procedures, refer to the system manufacturer's inspection and maintenance manual.

Periodically clean equipment of all grease, oil, and other combustible material. Use noncombustible solvents whenever possible. The service interval will depend on the nature of the operation and the rate at which material accumulates.

Park equipment at least 25 ft (8 m) from combustible storage areas.

For facilities with large fleets of vehicles, provide facility fire trucks with fixed water supplies or dry chemical hand hose line systems.

Provide a manual engine shutoff switch that is accessible from the ground and in a location not exposed by the engine compartment.

Maintain high standards of housekeeping in and on the equipment. Store wiping rags in covered metal containers. Keep unnecessary combustibles (e.g., cardboard cartons) off equipment.

Establish a regular maintenance and inspection program for all equipment. Visually check electrical, mechanical, and hydraulic system components weekly. Replace flexible hydraulic oil lines periodically on a programmed basis, or whenever necessary as indicated by inspection. Check operating controls and all warning devices daily. At least semi-annually, inspect the equipment to ascertain its structural condition and the physical condition of all critical operating components. Make repairs as indicated by inspection. Prepare written, dated, and signed maintenance and inspection reports, and keep records available for review.

Additional requirements apply to draglines, and consultation with ARC Marine is encouraged.

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