Technique	This practice will increase equipment reliability and decrease maintenance by preventing unnecessary repairs to equipment, personnel time loss, and schedule impact due to liquid intrusion. Facilities that contain electrical and electronic equipment (e.g., motor control centers, power supplies, programmable logic controllers, etc.) should be designed with adequate protection from overhead oil or water sources. Oil sources can come from an overhead crane gearbox that may leak and water intrusion from an overhead pipe or valve.
	Electrical Equipment Protection From Liquid Intrusion ***Protection of equipment from oil or water sources will enhance reliability by preventing additional equipment failure***
Benefit	Water leaks or ruptures can also spill onto sensitive flight hardware or other equipment. This technique will prevent additional repairs if overhead oil or water leaks occur from facility systems. Most importantly, this technique will decrease the electrical hazard potential to maintenance personnel by restricting the entry of water that can cause short circuits. During hoisting operations, oil can drip onto sensitive flight hardware or other equipment. If a drip pan is used, the pan can catch the oil and it can be inspected to monitor the gearbox for oil loss. Significant oil loss can cause damage to the gearbox assembly.
Key Words	Electrical Equipment, Protection, Water, Oil, Hoist
Application Experience	• Facilities
Technical Rationale	This technique is included in the Space Shuttle Ground Support Equipment General Design Requirements. Utilization of this technique can help prevent failures to other equipment and unnecessary downtime.
Contact Center	**Kennedy Space Center (KSC)**

Electrical Equipment Protection from Liquid Intrusion

Technique OPS-17

To protect against water intrusion, design facilities with drip pans above electronic equipment as shown in Figure 1. Water sources can come from fluid condensation, firex water, or ruptured fluid lines.

Use of this technique could have prevented the loss of air conditioning at the KSC Vehicle Assembly Building, Orbiter Processing Facility, and the Launch Control Center when a water line, located above a main power substation, ruptured and shorted the main buses. This mishap interrupted Shuttle processing and cost considerable resources.

Hoists contain gearbox assemblies that are filled with oil for lubrication and gear cooling. Gaskets that seal the gearbox housing parts or shaft seals can deteriorate over time and cause oil to leak out. Startup and vibration can cause bolts that connect the gearbox assembly together to become loose and cause oil to leak out.

To capture the oil, pans can be constructed from sheet metal. Metal straps are placed on each end of the pan and loop around the front and rear of the gearbox shown in Figure 2. The oil pan should be deep enough to hold all the oil in the gearbox. However, because of space constraints a shallower pan may be used. The pan area should cover the bottom area of the gearbox.

For example, Bridge Buckets, located in each of the Orbiter Processing Facilities, are used by personnel to travel along the length of the Orbiter Cargo Bay for inspections. There are gearbox assemblies at various locations such as the hoisting system and the bridge drive assembly. The bucket hoisting system contains a gearbox assembly on each end of the hoist drum. Each gearbox contains a shallow pan with two straps, one on each end, that loop around the front and rear of the gearbox. This prevents any oil that may drip into the Orbiter Cargo Bay.

The 250 Ton Bridge Crane, located in the Vehicle Assembly Building, contains an oil drip pan inside the hook load assembly. This prevents oil that could drip onto Solid Rocket Booster Segments or the Orbiter.

References

SW-E-0002, Space Shuttle Ground Support Equipment General Design Requirements, section 3.4.3.1.ff

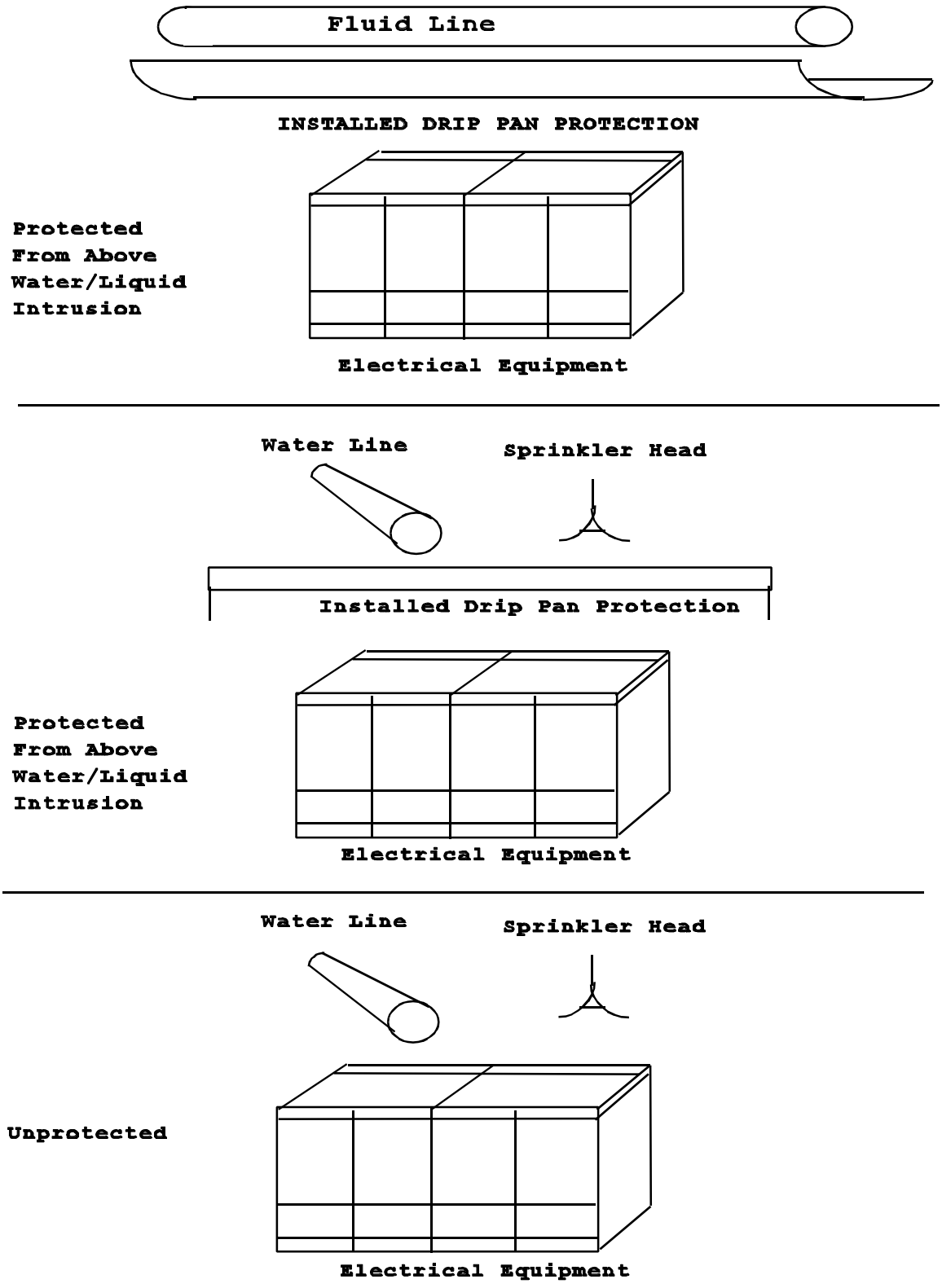

Figure 1. PROTECTED AND UNPROTECTED EQUIPMENT INSTALLATIONS

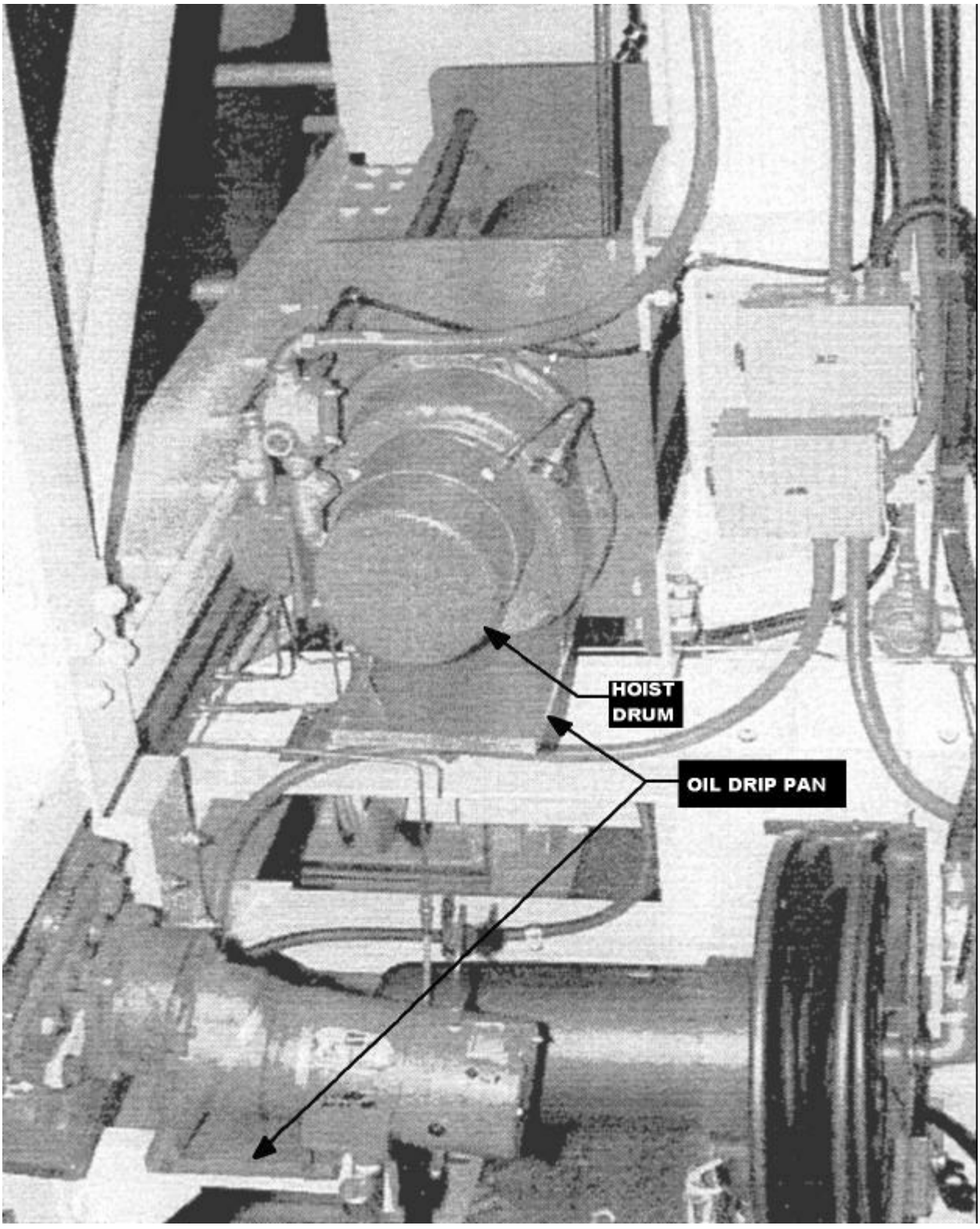

Figure 2. Placement of Oil Drip Pans