

The International Fluid Power Society (IFPS) believes that implementation of safe procedures is paramount in all fluid power systems, the electrical and electronic controls that guide them, and all associated technologies. The IFPS recommends that, in every circumstance, factory, piece of mobile equipment, or application of any fluid power product or its controls, every employee and employer is responsible to know, understand, and practice the safety policies and procedures already in place. Consult manufacturer's safety specifications for each machine. Take the responsibility to improve the safety standards whenever an opportunity presents itself. No one knows the equipment better than the people who work with it daily – they are the most important ones to improve that equipment's safety!

This general safety guide covers many aspects for safe applications in hydraulic, pneumatic, and electrical systems. Safety must be of primary consideration at all times. It is important for everyone to be aware of ALL these safety guidelines, even if they primarily impact another aspect of the application. Please read and follow all of them.

Warning: Do not operate any machinery unless you have read and understood the instructions in the operator's guide. Improper machinery operation is dangerous and could cause injury or death.

GENERAL SAFETY GUIDELINES FOR ALL FLUID POWER TECHNOLOGIES

Training and certification are highly recommended for all individuals working with pressurized fluids.

When working on any machine, **use lock-out procedures.**

Follow the manufacturer's guidelines during startup! Learn how to operate the emergency stop before starting.

Comply with all rules and requirements established by the particular manufacturer and site where the work is being performed. Use lifting devices for heavy or awkward objects.

Use personal protective devices: Face shields or safety goggles, ear plugs or covers, safety shoes and clothing that is suitable for the environment. Wear gloves when handling hot materials to protect hands against hot surfaces.

Before starting any machinery, all protective guards should be in position and be secure. **Do not disable or override any safety devices.**

Each worker has an obligation to work safely and to correct unsafe acts, practices and/or conditions for the protection of that worker and others. It is extremely important to understand how each task is to be performed in a safe manner. If instructions are not clear, get clarification before beginning the work.

Understand the dynamic forces that act on equipment as it is operated. Consider how the machine operates and pay particular attention to the potential for interference, pinch points and trapped pressure. Relieve pressure before disconnecting hydraulic and pneumatic lines. Tighten all connectors before pressurizing the system. Avoid contact with escaping fluids. Treat all leaks as though they are pressurized and hot enough to burn human skin. Never use any part of the body to check for leaks!

Monitor gauges at startup and during operation. If they are not reading normal values, or have become damaged, take immediate action for corrections.

Be aware that other government and industry regulations also need to be followed.

SPECIFIC HYDRAULIC SAFETY GUIDELINES

Fluid Injections - Fine streams of escaping pressurized fluid can penetrate the skin and thus enter the human body. If a fluid injection accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result. Do not delay treatment or treat injections as a simple cut!

Fluid spillage - Clean up leakage immediately to avoid slippage or fire potential. Do not return any spillage to the reservoir (it causes contamination). Put mopped spillage and associated materials into proper disposal containers.

Whipping Hoses - If a pressurized hose/tube assembly blows apart, the fittings can be thrown off at high speed, and the loose hose can flail or whip with great force. Where this risk exists, consider the use of guards and hose restraints to protect against injury. Do not temporarily drape a return line hose into the reservoir.

Burns from Conveyed Fluids - Fluid power media may reach temperatures that can burn human skin. If there is a risk of burns from escaping fluid, consider the use of guards and shields, particularly in areas where operators are located.

Fire and Explosion from Conveyed Fluids - Most fluid power media, including fire resistant hydraulic fluids, will burn under certain conditions. As fluid escapes from a pressurized system, a mist of fine spray may be formed. The fluid may then flash or explode upon contact with an ignition source. Use area guards, hose shields, and route fluid conductors to minimize the risk of combustion.

Fire and Explosion from Static Electric Discharge - Fluid passing through fluid conductors can generate static electricity, resulting in a static electric discharge. This may create sparks that can ignite system fluids or gases in the surrounding atmosphere. When the potential of this hazard exists, select fluid conductors specifically designed to carry the static electricity charge to ground, thereby reducing the risk of injury or damage.

Electric Shock and High Amperage Discharge - Electrocution could occur if hydraulic tubing conducts electricity to a person. In the case of high amperage, tubing could short the electricity to ground, which in turn could create very high fluid temperatures. Electrical wiring and hydraulic lines should be isolated by being separated and securely fastened to avoid contact between the two types.

Mechanisms Controlled by Fluid Power - Mechanisms controlled by fluid in tubing and hoses may become hazardous when a tube or hose fails. Objects supported by the pressurized fluid may inadvertently fall. Vehicles or machines may experience loss of power and/or control. Be aware of these events and learn what actions to take in case they happen.

SPECIFIC PNEUMATIC SAFETY GUIDELINES

Compressed air can be dangerous unless precautions are taken. Display proper safety guidelines in a prominent place.

It is essential that a check valve and shutoff valve are fitted in the delivery line when the compressor is to be coupled in parallel with another compressor or connected to an existing air supply system. In such cases, a safety valve must be provided upstream of the valves, unless one is already fitted on the compressor.

Do not use frayed, damaged or deteriorated hoses. Always store hoses properly and away from heat sources or direct sunlight. A hose failure can cause serious injury.

Use only the correct type and size of hose or tubing, fittings and connections. Ensure that tolerances on plastic tubing match the requirements of the fittings. Secure all flexible lines with clamps.

Use eye protection. If using compressed air for cleaning equipment, do so with extreme caution. Take care not to blow dirt at people or into machinery.

When initially pressurizing a hose or air line, ensure that the open end is held securely. A free end will whip and can cause injury. Open the supply valve carefully and ensure that any ejected particles will be restrained. A blocked hose can become a compressed air gun.

Never apply compressed air to the skin or direct it at a person. It can cause serious injury.

When using compressed air for cleaning purposes, ensure that pressure at the nozzle does not exceed 30 psi. Do not use compressed air to clean dust or debris off the body or from clothing.

Do not use air directly from a compressor for breathing purposes.

If an isolating or check valve is fitted in the compressor discharge, it is essential to ensure that an adequate safety valve is in place between this isolating valve and the compressor and that the isolating valve is open.

Isolating valves should be of the self-venting type and designed to be locked in the off position so that air pressure cannot be applied inadvertently while the machine is being serviced. All Lock-Out/ Tag-Out procedures are to be carefully followed.

Vent all components into a non-hazardous area that is connected to the atmosphere. A concentration of oil mist in the air from system lubricators can be hazardous. Use properly sized oil removal filters at exhaust ports where necessary.

Check tubing, hoses and couplings daily before use. Use only conductors designed to handle compressed air. Provide all hose couplings with a positive locking device. Secure Chicago-type fittings together with wire or clips.

Never crimp, couple, or uncouple pressurized hose. Use shutoff valves and remove residual pressure before working on hoses.

Make sure all hoses exceeding 1/2 inch ID have a safety fuse device at the source of supply or branch line to reduce the pressure in case of hose failure.

Periodically examine the level of oil in lubricators, and the fluid level in filters. Maintain proper levels at all times. Be sure that lubricators are filled with the proper type of lubricant.

GENERAL ELECTRICAL SAFETY GUIDELINES

When connecting electrical controls to a hydraulic or pneumatic system, it is necessary to properly ground the equipment to ensure that dangerous voltage potentials will not be present on the chassis of the equipment.

Use a multimeter to ensure the correct voltage source is connected to the equipment and visually verify that the pump(s) are turning in the correct direction.

Be sure to use only the correct gauge of wire for the circuit being used and ensure that the connectors/terminals are rated for the same temperature as the wires being connected.

All electrical control circuits should have a circuit diagram mounted in its electrical enclosure. Disconnect power and use proper lock-out procedures before working on any machine or equipment.

Prior to performing any work on the circuit use the proper electrical measurement equipment to verify that power has been removed from the circuit. Remember that some circuits have capacitors that can store a charge just like an accumulator stores liquid under pressure. Discharge all capacitors using an appropriately sized resistor.

Replace blown fuses with the same current AND voltage ratings as the originally installed fuse. Never install a higher amperage fuse. DO NOT operate equipment that has exposed wires. These can cause electric shock or ignite a fire.

To prevent electrical shocks, avoid standing on wet surfaces while operating or working on electrical equipment.

Avoid using multiple extension cords to operate equipment and do not stack adaptors to run multiple pieces of equipment from a single outlet.

The ends of flexible cables should always have the outer sheath of the cable firmly clamped to prevent the wires from pulling out of the terminals.

Replace damaged sections of cable completely.

Use proper connectors or cable couplers to join lengths of cable. Do not use connector blocks covered with insulating tape.

To avoid unexpected machine movement during power up, never hardwire a “circuit enable input” to the power source. Use a proper switch to start movement only when the operator is ready.

When taking electrical measurements with a multimeter, ensure that the correct function (i.e.: volt- age, current, or resistance) is selected. Start at the highest range and work down to a usable reading.

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