

Hydraulic Safety

Hydraulic power can have many hazards, including burns, fires, and injection injuries. Knowing the proper precautions when using hydraulic equipment is important to lab safety.



Hazards of Hydraulics

Hydraulic systems can harm people in a variety of ways. Hot fluid from the system can cause burns, and if fluid touches an ignition source, it may result in fires. They are also sources of mechanical hazards, as the systems can produce strong forces, including torque and crushing. If hoses detach during operation, they can whip around, causing injury. Spilled hydraulic fluid can cause slips and falls. Also, most hydraulic fluid is toxic, and can be harmful to the skin, eyes, and the environment.

One of the most severe hazards associated with hydraulic system is injection injury. This occurs when a person is struck by a high-pressure stream of hydraulic fluid, injecting it into their body. This happens most often on people's hands and fingers when checking for leaks in a system. These injuries often seem small at the beginning, but within hours can become severe enough to require amputation of the fingers or hand. It takes only 100 psi to pierce skin, and these injuries are very severe.

Control of Hazardous Energy and Lock Out/Tag Out

Work with hydraulic systems may also result in the uncontrolled release of hazardous energy, including:

- Thermal energy, from system parts and heated hydraulic fluid
- Hydraulic pressure, from liquids under pressure and accumulators storing energy
- Mechanical energy, from moving pistons or machinery or equipment/weight held off the ground that may fall

If you will be doing service or maintenance work such as setup, repairs, or assembly on your system, think about the need to control any harmful energy. Certain types of work may need to be done using Lock Out/Tag Out, a system of ensuring that all hazardous energy is controlled in a system before starting work on it. This involves writing a procedure on how to control the energy and providing training on the procedure to those working with the equipment. Equipment using accumulators often falls under Lock Out/Tag Out, as they store energy by definition.

If you have any questions about controlling energy in your systems or Lock Out/Tag Out, contact your department safety officer for more information.

Hydraulic Safety (cont.)

Personal Safety

- When working with hydraulics, make sure you are wearing appropriate clothing. You should have long pants and sleeves, and slip-resistant shoes. Aim to cover as much of your skin as possible to help protect against burns.
- Proper personal protective equipment (PPE) should always be worn when working with hydraulics. Safety glasses with side shields and closed-toe shoes are required. A face shield should be worn whenever you are connecting or disconnecting hoses or pipes.
- Remove jewelry, watches, and rings before starting work. Avoid wearing scarves, ties, or anything else that could get caught in machinery. Long hair should be tied back, and tucked into your collar if needed.
- Don't work alone on hydraulic equipment. If you must work alone, make sure that somebody knows what you are doing, and when you expect to be done so they can check up on you if needed.
- *Know where the emergency stops for your equipment are, and know how to use them.*



Equipment Safety

- Construct a safety checklist for your equipment
- Items on the list should include inspecting the hoses for bends, kinks, or twists, checking if the emergency stop is working properly and that all connections are secure, monitoring fluid levels, and other safety items.
- Be aware of when your system might be leaking. Signs include low pressure, loss of fluid with no immediate explanation, poor performance, and loss of speed. If you think your system might be leaking, inspect it carefully.
- Never check for leaks using your hands. If you must check for the leak without depressurizing the system, wear eye protection and gloves. Use a piece of cardboard to check for leaks by running it through the areas you believe there may be a leak. Any pressurized streams of hydraulic fluid would strike the cardboard instead of your hand, preventing serious injury. The best option is to depressurize the system and carefully inspect for leaks.
- Understand the pressure ratings of your system—check pressure rating on all hoses and tubes. Check application pressure, system pressure, and component pressure before connecting a system to a pressure source. Ensure the pressure of your system does not exceed the pressure ratings of your hoses. These ratings and pressures are listed on labels or published on the manufacturer website.
- Make sure hoses are restrained properly—if one of them detaches, it can become a dangerous whip, striking people and spraying fluid.
- Regularly inspect all hoses for leakage, cracks, kinks, or breaks.



Figure 1: Using cardboard to check for hydraulic leaks

Hydraulic Safety (cont.)

- Ensure sprayed oil cannot cause a fire or explosion by removing ignition sources such as oxidizers, and ensuring nearby electrical junctions are covered.
- When connecting pieces, use the correct connectors and adapters. Don't mix connector types.
- If you are using quick couplings, make sure the parts are compatible. Don't try to connect two parts that are "close enough" to compatible. Listen for a "snap" when connecting them, then try to gently pull them apart.
- Test systems at low pressure first, then slowly increase to operating pressure.
- Identify where parts may fly in case the system fails, and ensure people stay clear of those areas. You may need to leave the room during operation.
- Completely depressurize the system before working on it. Include accumulators, pneumatic reservoirs, and any other parts that may contain energy or power.
- Be aware of the hazards of hydraulic accumulators. Accumulators store energy that can be hazardous even when machines are turned off. Do not work on any equipment that could be powered by an accumulator releasing stored energy without first controlling the release of any stored energy. Lock Out/Tag Out is required for working on equipment that has the potential for the unexpected release of stored energy. If you have any concerns about Lock Out/Tag Out or working with accumulators, ask your supervisor or your department safety officer.

Chemical Safety

- Fluid can get very hot during operation – be careful to avoid burns. Before changing lines, connections, filters, or fittings, or starting work on any part of the system, wait for it to cool.
- All hydraulic fluid should be stored apart from incompatible materials and in a closed container. The container should be labeled according to UMN standards. For labeling guidelines, read [Chemical Labeling Principles for Laboratories](#).
- Spilled and dirty oil should be treated as regulated waste, and disposed of properly. Spilled oil is hydrophobic and is difficult to clean up with regular soap and water. Floor Dry and kitty litter are good sorbents to use to help clean up. Oil absorbent wipes are also very useful.
- Any oil-contaminated wipes must be disposed of in a tightly closed container. Metal containers are ideal, as this helps reduce the risk of fire.

For more information, contact your department safety officer, the department's research safety partner, or call the DEHS main office at (612) 626-6002.