

# GOING UP?

TRADE LINK: INSPECTOR (ELECTRICAL)

## TEACHER BACKGROUND

**Duration:** one (1) 45 minute class.  
**Group Size:** small groups of 2-3 students.  
**Setting:** indoors (classroom).



## RATIONALE

Students, when studying fluids and hydraulics, learn that fluids have special properties such as viscosity, density, buoyancy and compressibility which are useful in industry and in our daily lives. Most people think of liquids when they hear the word “fluids”, but gases are also fluids. These concepts, combined with a basic understanding of Pascal’s law have led to numerous inventions such as hydraulic and pneumatic which are used every day by heavy duty equipment operators and mechanics. Systems that use fluids to transfer forces are called hydraulic systems.

## METHOD

This activity should be done over a sink. Students create a hydraulic press using two identical syringes connected by plastic tubing. The experiment can be repeated using one large and one small syringe. In both scenarios, the moving part of the syringe represents a movable piston. Students can use their sense of touch to compare the amount of force required in both cases to move an identical object resting on the larger sized syringe.

## MATERIALS

- Two identical syringes (approximate 60ml size).
- One syringe (10ml).
- Beaker or glass of water.
- Plastic tubing approximately 100cm in length (airline tubing for aquarium filters works well).
- Clamps and retort stands to hold syringes (optional).
- Heavy object or weights (kg).

## GETTING STARTED

The study of fluids and their various properties such as buoyancy, density, viscosity and compressibility has led to inventions which have helped us to do work or make our lives easier. These systems are called hydraulic systems. In this activity, you will design a hydraulic press.

## THE ACTIVITY

1. Connect two identical large syringes (plungers removed) with plastic tubing (100cm in length).
2. Add water to one until both syringes are full.
3. Keeping the two syringes level, place a plunger into one syringe, pushing it all the way in.
4. Place the second plunger into the open syringe, pushing gently until both plungers are halfway down. You now have a closed system with no air in it.

5. The syringes should be level and held carefully or supported on retort stands with clamps. Place a small weighted object on top of one of the syringe plungers and push against the other plunger to make it rise. You will need to compare the force used to raise the object in this activity with the force needed in the activity identified in the next step.
6. Repeat this experiment using one syringe from the previous activity and a second smaller syringe. Compare the force needed to move the same weighted objects (placed on the larger plunger) as in the first activity.

## BRANCHING OUT (EXTENSIONS AND VARIATIONS)

1. Repeat experiment using a 10ml and a 100ml syringe (if available). Were the results what you expected?
2. Design an experiment to show if the type of liquids used affects the results.
3. Test to see if the experiment will work using “air” as your liquid.
4. Design posters on elevator safety or handicap lifts to promote safety among younger students at your school.
5. Find out how often lift devices in your school are inspected and by whom?

## SKILLS FOR SUCCESS

1. How much water will be used to fill both syringes? (Numeracy)
2. Which activity required the least amount of force? (Problem Solving)

## INFORMATION BITE

To be an electrical and/or elevator inspector requires a journeyman ticket as an electrician and/or elevator constructor. Elevator constructors train to install, modify, service and repair electrical and hydraulic elevators, hoists, moving walkways, and escalators. Electricians learn about electrical systems, controls and switches, heating and cooling systems, electronics and lighting. To be successful in either trade, you will need mechanical aptitude, the ability to do detailed and precise work, the ability to read blueprints, and a willingness to continually upgrade your knowledge and skill levels regarding new innovations in the industry. In terms of Numeracy, these trades also involve the use of measurement and calculation math, estimation, and data analysis. Inspectors generally have extensive experience in the trades area and work for government and/or regulator agencies.