

# Hydraulic engineering

Structural measures, technical interventions and construction in the area of groundwater, surface water and the coast are all referred to as **hydraulic engineering**. The basic principles of hydraulic engineering are taught in hydromechanics and hydrology.

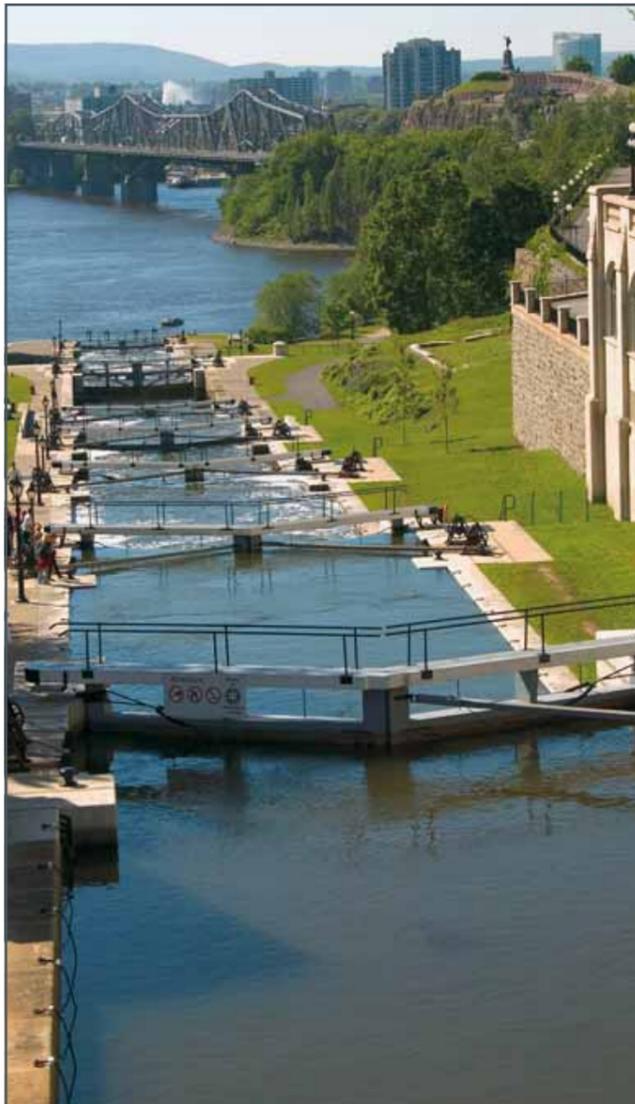
Hydromechanics is divided into hydrostatics, flow in pipes, flow in open channels and flow in groundwater. This catalogue covers hydrostatics and pipe flow in the section on the **fundamentals of fluid mechanics**.

Hydrology is concerned with the natural distribution of water over and under the ground. Some processes from hydrology are demonstrated in the subsections of **sediment transport** and **seepage flow**.

The forces and phenomena in running waters are covered in the **open-channel flow** subsection. What happens if – in addition to water – sediment and/or solids are also transported in the running water, as is usually the case in nature? Questions on this topic are tackled in the subsection on **sediment transport**.

The **seepage flow** subsection deals with issues of how water is transported in soil.

## Open-channel flow



Open-channel flow involves, amongst other things, the management of watercourses for the purpose of navigability, damming of lakes for power generation and/or storage of drinking water and flood protection measures.

Experimental flumes are used in teaching and research to demonstrate and study the main phenomena of open-channel flow at the laboratory scale. The GUNT experimental flumes demonstrate flow conditions in open channels with a rectangular cross-section. There are a variety of models that are used in the experimental flumes that cover topics such as control structures, change in cross-section, discharge measurement and waves.

## Sediment transport

This subsection investigates the transport of sediments in flowing watercourses. When talking about sediment transport, we distinguish between suspended matter and bed-load transport.

Rivers primarily involve bed-load transport. When sediment is removed, this is called erosion or scouring. Siltation occurs when sediment is deposited. Sediment transport can be influenced by hydraulic engineering measures.

Suspended load transport is a topic in the field of wastewater treatment plants and upstream of barrages and dams. In wastewater treatment plants, the sedimentation of suspended matter is desired, whereas in the case of dams it causes problems.

The GUNT units for bed-load transport study, for example, changes in the bed surface of a river and the formation of bed forms. It is possible to observe the formation and migration of dunes. Furthermore, erosion and siltation at bridge piers are also considered.



## Seepage flow



Seepage flows and groundwater flows are water movements in a permeable subsoil (sand, gravel, etc.) This includes the seepage and retention of precipitation. In hydraulic engineering it is the seepage through earth dams or the seepage under barrages in particular that are of importance.

The GUNT units demonstrate and study the relationship between precipitation, seepage and groundwater flow. The influence of wells on the groundwater level and the storage capacity of soils during these processes is considered.