CRREL Ice Engineering Research Area

Providing a venue for the physical modeling of waterway and terrestrial processes in a controlled environment

The Research Area in the Ice Engineering Facility is a 12,800 square foot refrigerated room capable of supporting large, realistic physical based modelling studies. The research area contains a water reservoir with water flow capabilities and is environmentally controlled, an ideal combination for investigating waterway processes such as ice dam formation. Due to its large size and the ability to control the environment, the research area also serves as an effective test and evaluation facility for large scale equipment, vehicles, and structures.

A scaled physical model of New York's Grasse River was used to develop and demonstrate a low-cost solution to control ice flow and protect an in-channel hazardous-waste remediation site

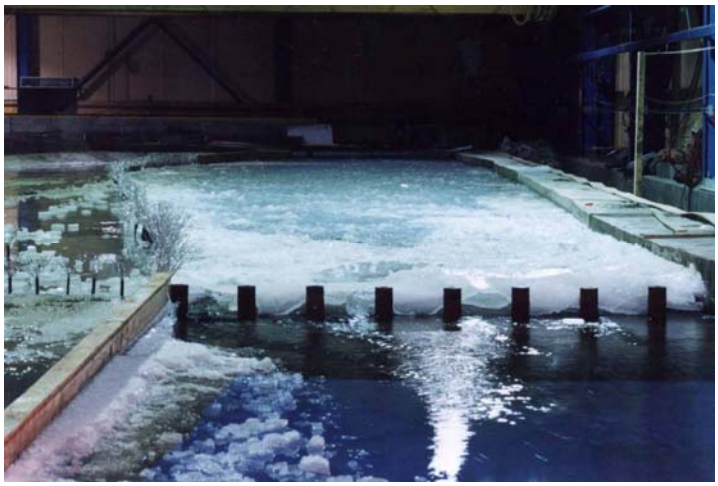
Previous research activities supported in the Research Area include:

- Basic research in cold regions river hydraulics
- Calibration of numerical hydraulic modeling
- Physical modeling of riverine systems to optimize ice control structures
- Physical models of Locks and Dams
- Performance of equipment at cold temperatures
- Accumulation and shedding of ice and snow on structures
- Capabilities of large equipment in cold region environments (including snow)
- Vehicle mobility in snow

Supported Research

Lamoille River

Hardwick, Vermont had a long history of ice jams and ice jam floods forming on the Lamoille River—nine in the period from 1964 to 1993, three of them severe. One of the techniques used to minimize ice-jam-related floods in metropolitan areas is to capture the ice upstream of the town in a flood plain. A model study of the Lamoille resulted in the construction of a customized ice control structure. There have been NO ice jam floods since the granite block ice control structure, modeled and tested at the Ice Engineering Facility Research Area, was constructed in 1994.



A scaled physical model of Cazenovia Creek was used to develop and demonstrate a low-cost solution to ice jam formation

Cazenovia Creek

Cazenovia Creek, near Buffalo, New York, experiences breakup ice jams along the lower basin nearly every year during mid-winter or spring thaw. Ice-jam flooding occurs in the City of Buffalo and the Town of West Seneca about every 2-3 years, causing an estimated $1 million in damage for each occurrence.

ERRDC-CRREL developed a physical model of Cazenovia Creek to optimize the configuration of an ice control structure and to quantify design loads for the structure. The simulations resulted in the development of a low-cost means of controlling the creek ice jams**.**

Features

CRREL's Engineering Resources Branch prepares the (indoor) Research Area for a mobility study involving snow

- The Research Area is 160 feet long (East-West) by 80 feet wide (North-South)
- An X-Y crane system consists of a bridge crane running east-west, (X axis) with a personnel platform and 2 ½ ton crane that can be independently positioned along the bridge crane (Y Axis)
- A recirculated ammonia refrigeration system can refrigerate the room to –15ºF (–26ºC)
- Water can be maintained at the freezing point independent of the ambient room temperature, or heated using an inline shell and tube heat exchanger
- Glycol taps are available for localized refrigeration or heating
- Air bubblers agitate the water to keep sediment in suspension and ensure that the water is isothermal
- Snow guns are available, one of which has an articulating base

Instrumentation

- Thermistors for temperature measurement
- Pressure sensors for monitoring water levels
- Sontek acoustic Doppler velocimeter capable of measuring mean water flow and turbulence in three directions
- Pressure, flow, temperature, force, moment, event triggering, and near-real-time, automated, process documentation, including video and summary data to WEB

CRREL evaluates the all-weather performance of a prototype building exterior

The size, environmental control and flexible nature of the research area makes it an ideal facility for supporting large scale modeling efforts. In addition to the above, the facility can be used to support efforts related to ice floe forecasting, weather impacts on signal propagation across ice and snow covered terrain and for evaluating potential effects of climate change equipment and structures.

ERDC Points of Contact

Questions about the Ice Engineering Research Area?

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