



## REMR Technical Note HY-N-1.10

# Icing Reduced with Plastic on Miter Gate Recess Walls

### Purpose

The purpose of this technical note is to describe a method of reducing ice buildup on miter gate recess walls by means of plastic sheets mounted over the concrete surfaces.

### Requirements

A concrete drill and regular hand tools are required. The plastic sheets are 4 ft by 8 ft by 0.5 in. thick. One sheet weighs 80 lb. Attaching a sheet to the concrete wall can be accomplished by two to three men. Working from a boat or barge would be the most efficient way to mount the sheet.

### Applications and Limitations

Ice buildup on the concrete walls of miter gate recesses can prevent the gates from being recessed. The ice collar on the wall is usually chipped off manually. Ice can adhere tenaciously to rough concrete. To reduce this ice adhesion problem, ultra-high molecular weight (UHMW) polyethylene sheets can be attached to the concrete wall, as shown in Figure 1. Sheets of polyethylene have been placed on the miter gate recess walls at Starved Rock Lock and Dam (Figure 2). These sheets were attached to the concrete wall with Hilti studs that protruded out beyond the plastic sheets. Ice adheres to these studs and nuts and prevents easy ice removal. It is therefore important to use a flush-mounted fastener, such as a flathead screw, to attach the sheets. It is important to avoid damaging the surface of the polyethylene when removing ice with a chisel, etc. Steam or hot water should be used to remove ice from the plastic sheets when possible.

### Procedure

Holes should be drilled in the plastic sheet. The 13/32-in. mounting holes should be at 16-in. spacing and should be countersunk for 3/8 by 2-1/2-in. flathead Tapcon screws or the equivalent. After the sheet is placed in position with the 8-ft side horizontal, the mounting holes are used as a guide for drilling 3/8-in. holes in the concrete wall. The Tapcon screws are placed in the holes with flush mounting heads. The top of the sheet should be 6 in.

above the upper pool level. The sheets should be placed next to each other with no gap.

## **Advantages**

Even though ice grows on the plastic, the adhesive force between ice and UHMW plastic is much less than between ice and concrete. In laboratory tests, the force required to break ice off concrete was about 50 times the force required for breaking ice off polyethylene. Not only was the required force less for polyethylene, but the ice broke completely off the plastic at the interface. With the concrete, the ice broke away from the interface, leaving some ice still adhered to the concrete. Personnel at Starved Rock Lock and Dam have found that the ice can be removed much more easily from the polyethylene than from the concrete. When the plastic sheets become damaged over time, they can be replaced easily, restoring a smooth, low-adhesion surface.

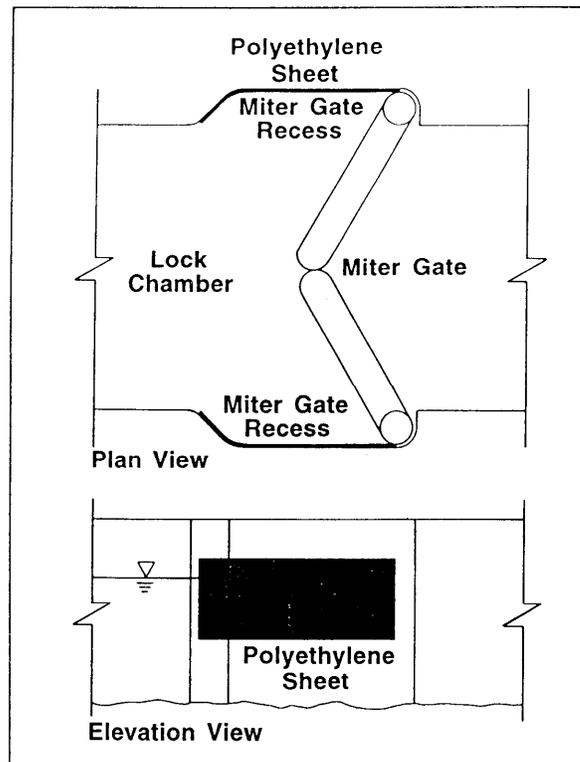


Figure 1. Schematic showing the location of the polyethylene sheet



Figure 2. Polyethylene sheets installed at Starved Rock Lock and Dam