



REMR TECHNICAL NOTE EM-MS-1.1

SELECTION OF DAM GATE SEAL MATERIALS

PURPOSE: To summarize the results of an in-depth study of the Corps of Engineers' experience with gate seals for 40 dams on the Monongahela, Ohio, Mississippi, Columbia, and Illinois Rivers. Availability and analysis of this information are considered significant because the information can be useful in selecting the most viable and cost-effective materials and design options for dam gate seals.

BACKGROUND: Engineer Manual 1110-2-2702, "Design of Spillway Tainter Gates," states that the side seals on tainter gates should be rubber, the side-seal rubbing plates (i.e., the pier seals) should be of a corrosion-resisting steel to ensure permanently smooth surfaces, and the rubber seals should be attached to the gates so as to allow for field adjustment. The same manual also provides guidelines for the bottom seals on these structures. If a small amount of leakage under a closed gate can be tolerated, contact between the finished bottom edge of the skinplate and a corrosion-resistant surface on the sill is considered adequate; however, if a tighter seal is required, it may be advisable to use a rubber seal attached to the skinplate.

Examination of the gate seals for the dams included in the study revealed that these guidelines have, in general, been followed with the result that there has been reasonably good performance. The only exception is at Emsworth Dam on the Ohio River where treated, laminated wood is used for seals on the tainter gates. Reportedly, personnel at Emsworth Dam do not like rubber seals on the gates because of their tendency to "bind" and subsequently overload the gate motors. This opinion, however, is not completely shared by any of the personnel at the other dams contacted. For example, nylon-reinforced seals have been used on roller gates for as long as 46 years without the need for replacement; i.e., at Dam No. 4 on the Mississippi River. Only about 100 ft of rubber or neoprene J-seals have been replaced on the 15 tainter gates at Dam No. 24 on the Mississippi River during the past 25 years.

An unavoidable problem associated with the use of rubber or neoprene seals on the gates is mechanical damage associated with river debris and ice which collects between the rubber and the seal plates in the piers and spillways. This can be an especially serious problem when rubber or neoprene seals are located on the bottom of tainter gates.

SELECTION OF MATERIALS: Based upon an analysis of the information collected during this investigation, the most viable materials and design options for the side and bottom seals on tainter dam gates are listed below.

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a. Dam Gate Side Seals

1. Natural rubber or neoprene J-seals for the gates, preferably with fluorocarbon inserts in the seals for the rubbing or contact areas.
2. Type 304 stainless steel plates for the contacting seal surfaces in the piers.
3. Type 304 stainless steel bolts and washers with Nitronic 60 nuts for attachment of the J-seals; i.e., in order to minimize galling or wear and to facilitate removal and loosening of the bolts for field adjustment of the seals.

b. Dam Gate Bottom Seals

1. Type 304 stainless steel plates attached to the skinplates on the gates.
2. Type 304 stainless steel plates for the spillway and sills for those gates where water leakage can be tolerated.
3. Cast-in-place (in a steel channel) lead or babbitt for the spillway and sill seals for those gates where water leakage under a closed gate cannot be tolerated.