Dam Safety- Fact Sheet

Montana Watercourse and Montana Department of Natural Resources and Conservation
Water Resources Division

Trashracks

Fact Sheet: 14

Keeping the principal spillway clear and function properly is an important part of maintaining the overall safety of the dam. Pipe and riser, drop inlet, and slant pipe spillways are susceptible to obstruction and damage by floating debris such as leaves, branches, and logs. One device used to ensure that these spillways operate correctly is a trashrack. Trashracks are designed to keep trash and other debris from entering the spillway and causing damage.

Common Problems

Trashracks usually become plugged because the openings are too small or the head loss at the inlet causes material and sediment to settle out and accumulate. Small openings will cause debris such as twigs and leaves to accumulate on the trashrack bars. This buildup will cause progressively larger debris to accumulate against the trashrack bars. Ultimately, this will result in the complete blockage of the spillway inlet. Pipe and riser spillways can also become blocked by a build up of debris in the spillway. This type of blockage occurs when no trashrack is in place, or if the openings are too large. In many spillway systems, the size of the outlet conduit is smaller than the size of the inlet. Therefore, it is incorrect to assume that debris which passes through the inlet will not obstruct the flow through the outlet. Large debris, such as logs and tree limbs, can become lodged in the transitions in the spillway. This reduces the capacity of the spillway and could cause damage. An obstructed outlet pipe can be a major problem because removal of large debris from inside the spillway can be very difficult. A partially blocked spillway reduces the capacity of the spillway and may also create a higher than normal pool level. The combination of these two factors can dramatically reduce the discharge/storage capacity of the dam. A reduction in the discharge/storage capacity of a dam increases the likelihood that the dam will be overtopped during a severe storm event. Overtopping for even a short period of time can cause damage to the embankment and possible failure of the dam. If the dam has an emergency spillway, a blocked principal spillway will cause more frequent flows in the emergency spillway. Since emergency spillways are usually grass lined channels designed for infrequent flows of short duration, serious damage is likely to result.

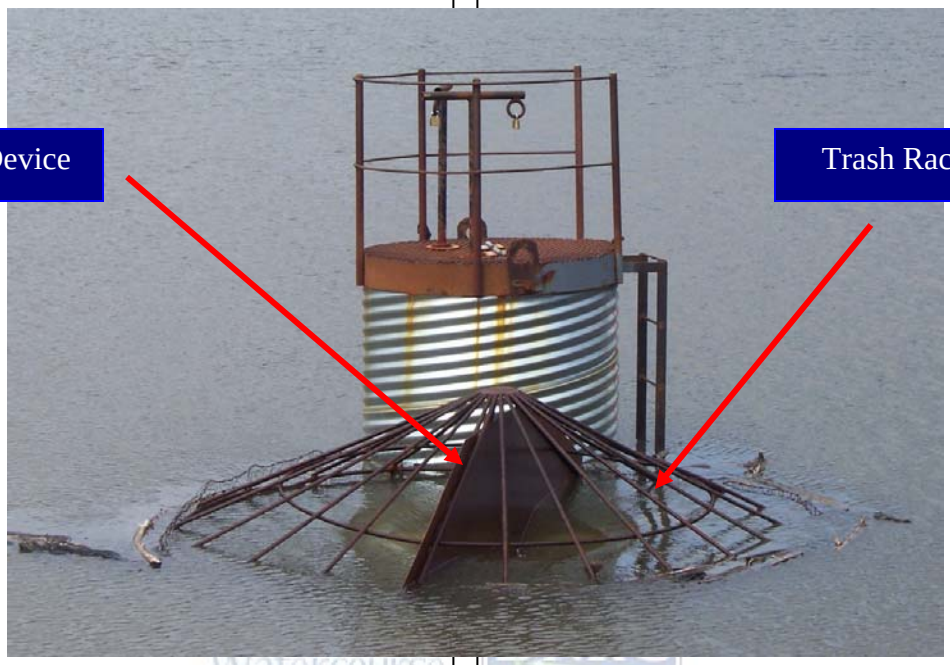
Trashrack Design

A well-designed trashrack will stop large debris that could plug the conduit but allow unrestricted passage of water and smaller debris. The larger the outlet conduit, the larger the trashrack opening should be. In the design of a trashrack the openings should be sized so that they measure one-half the nominal dimension of the outlet conduit. For example, if the outlet pipe is 18 inches in diameter, the trashrack openings should be the effective equivalent of 9 inches by 9 inches. This rule applies up to a maximum trashrack opening of two feet by two feet. For an outlet conduit with a nominal dimension of 12 inches or less, the trashrack openings should be at least 6 inches by 6 inches. This prevents large debris from passing through the inlet and blocking the outlet conduit while allowing smaller debris (leaves, sticks, etc.) to flush through the spillway system. Another important design criteria is that the trashrack

should be securely fastened to the inlet. The connection must be strong enough to withstand the hydrostatic and dynamic forces exerted on the trashrack during periods of high flow.

Anti-vortex devices

An anti-vortex device can easily be incorporated into most trashrack designs. A common anti-vortex device is a flat metal plate which is placed on edge and attached to the inlet of the spillway.



The capacity of the spillway will be increased by equipping the trashrack with an anti-vortex plate. The anti-vortex plate increases capacity by preventing the formation of a flow-inhibiting vortex during periods of high flow.

Fish Protection

Many owners are concerned about losing fish through trashracks that have large openings. If this is a concern, a metal plate surrounding the riser or drop inlet which extends above and below the normal pool level should be installed. On the bottom of the plate, a metal screen should be attached and connected to the riser pipe. The solid plate at the water level will prevent the fish and floating debris from passing over the crest of the riser. The underwater screen will keep the fish from moving under the metal plate and through the spillway. The underwater screen will not become blocked because most of the debris floats on the water surface. If this design is used, the area between the inside of the cylinder and the outside of the riser must be equal to or greater than the area inside the riser.

For more questions, comments, additional fact sheets, and area specific information you can contact DNRC or Montana Watercourse at the addresses below or on the web.

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