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**DAM SAFETY**  
**POLICY MEMORANDUM #7**

**TO:** Dam Owners, Operators, and Engineers

**FROM:** Sediment, Stormwater, and Dam Safety Program  
Water and Science Administration

**DATE:** May 23, 2019

**SUBJECT:** Impoundment Filling Plans

*Policy Statement*

It is the policy of the Maryland Department of the Environment (the Department) that an impoundment filling plan is required for the first filling of a new dam and after significant reconstruction efforts that have required a lowered or drained pool, where the dam is acting as a new structure. The requirement for an impoundment filling plan will be included as a condition of a Waterway Construction Permit issued by the Department's Dam Safety Division when it is deemed necessary. This policy memorandum provides a background on the reasons why controlled filling of an impoundment is necessary and considerations for the owner and design engineer to use when developing the filling plan. Filling plans must be approved by the Dam Safety Division prior to the initiation of water storage. This policy has been adapted from the "Reservoir Filling Plan" chapter in US Army Corps of Engineers ER 1110-2-1156.

*Background*

The initial filling of an impoundment is typically the first test that a dam will face, and the first opportunity to determine if it will perform as designed. Accordingly, a managed filling plan is critical to assess that the dam and its appurtenant works are functioning as intended. Multiple dams in Maryland have failed or suffered significant damage upon first filling, with the likely cause being design or construction flaws. According to the Bureau of Reclamation, approximately two-thirds of all dam failures and one-half of all dam incidents occur on first filling or in the first five (5) years of reservoir operation.

The first filling of an impoundment may take place over a few weeks for a small impoundment, but the process may take several months or even years for increasingly large impoundments. It must also be recognized that existing impoundments which have not yet experienced their maximum designed pool level associated with the inflow design storm are actually undergoing a type of initial filling each time they achieve a new pool of record.

Because the first filling of an impoundment is a critical phase in the life for the dam, it is vital for dam operators and engineers to have as much control over the first filling as possible, allowing as much time as needed for appropriate surveillance, including the observation and analysis of instrumentation data. The first filling should be scheduled to occur after construction of the dam and all necessary appurtenances (i.e., spillways and outlet works) have been completed as well as the installation of appropriate instrumentation. Specifications regarding the rate of reservoir rise should be developed to allow the dam to adjust to the forces it will experience as the water level behind it increases. These plans should be documented in a design memorandum that may also include requirements on necessary bypass flows to maintain baseflow downstream, contingency plans for greater than anticipated inflows, visual inspection schedules, instrumentation monitoring schedules and action levels, and designation of responsibility and record keeping duties.

It may be necessary to halt filling or in some cases lower the reservoir before the desired operating water level is achieved to investigate signs of seepage, cracking and erosion. Repairs to any project features that did not function as designed can be re-evaluated and modified to ensure the dam operates according to its original design.

### ***Impoundment Filling Plan***

A detailed impoundment filling plan must be established on a dam-by-dam basis for all impoundments which are new or have been significantly modified. In general, the objective is to provide a planned program that allows adequate time for monitoring and evaluating the performance of the dam and its foundation as the reservoir is being filled (or as it achieves periodic record pool levels). This plan should use all pertinent hydrologic, hydraulic, structural, and geotechnical criteria that was developed during the design and construction of the project. If the plan is being developed for an existing dam, it should consider past operational experiences. It should also consider all significant potential failure modes for monitoring and evaluation. Just because a dam is old in terms of years does not mean that it is old in terms of experience. Many factors must be considered when new or record water levels are expected. These considerations should include:

- Purposes of the new, modified or existing impoundment;
- Risks associated with the filling, including potential failure modes;
- Hazard potential both upstream and downstream;
- Type of dam;
- The geology in the vicinity of the dam;
- Inflow characteristics (controlled or uncontrolled);
- Hydrology of the river/basin as it relates to the time necessary to fill the reservoir;
- Releases required to meet minimum requirements;
- Potential need for flood releases;
- Amount/type of instrumentation installed; and
- Provisions for monitoring/evaluating the instrumentation.

After consideration of the aforementioned items, the impoundment filling plan should be organized to include, at a minimum, the following:

- Project background and pertinent data (including past floods or pools or record, if available).
- Preparations required within the impoundment ahead of first filling (e.g., clearing of downed trees).
- The preferred filling rate, reasoning behind the recommended rate, and means to control the rate of rise (if possible).
- An inspection/surveillance plan designed to detect the most likely occurring problems. This should be tied to the identified significant potential failure modes associated with the dam. A visual inspection checklist should be developed to facilitate the effectiveness of the surveillance efforts and the reporting of results. Specific distress indicators for various failure modes should be identified in the checklist.
- A plan for reading the instruments and evaluating the data throughout the entire filling process. This should also include expected readings (i.e., what is normal for pools already experienced and what is expected for pools higher than yet experienced) and tied to specific responses in the event of readings outside the prescribed range.
- Instructions for observers on conditions that require immediate attention of personnel authorized to make emergency decisions. The plan should clearly define reporting requirements and specific actions to be taken for all observed problems. An appropriate level of response should be clearly identified and matched with the severity of the observation.
- Discussions regarding emergency actions. Note: the Emergency Action Plan for the dam, if required, should be complete and distributed to all record-holders prior to first filling. For a new dam, it is preferred that the EAP is exercised prior to first filling.

A performance report must be prepared upon completion of the first filling. The report should include records of visual inspections, instrumentation measurements and assessments, and a record of the reservoir filling rate.

### ***Additional Information***

Questions about this policy or other items relating to ponds and dams can be directed to the Chief of the Dam Safety Division at 410-537-3538.