Rule 51 New Mine Tailings Impoundment Structures

051. New Mine Tailings Impoundment Structures.

The following minimum design criteria shall be used for all mine tailings impoundment structures designed for installation in Idaho. These limitations are intended to serve as guidelines for a broad range of circumstances, and engineers should not consider them as a restriction to the use of other sound design criteria. Upon request, deviation from these established criteria will be considered by the Director in approving design plans and specifications prior to construction. (7-1-93)

01. Embankment Slopes.

a. For construction of borrowed fill embankments, in the absence of a stability analysis, the slopes shall be:

Upstream slope	2:1 or flatter
Downstream slope	2:1 or flatter

b. Construction by the upstream method shall not be used unless waived by the Director and provided the engineer presents ample evidence that the construction and operation of the tailings impoundment will be sufficiently robust to prevent liquefaction or other instability during earthquake loading.

c. Safety factors for the stability of the embankment and underlying foundation materials shall be at least one and five-tenths (1.5) for static loads and a minimum of one (1.0) for the static plus the appropriate earthquake (aka dynamic load), and shall include deformations that may result in loss of freeboard due to liquefaction.

d. To ensure sufficient permeability and stability of the embankment, designs submitted for approval will require that materials other than the tailings be sourced during construction. Unless waived by the Director, materials and designs for construction of the embankment shall not include the following :

i. Material that contain greater than seventy-five percent (75%) passing the #200 standard U.S. sieve, or fifty percent (50%) passing the #325 standard U.S. sieve;

ii. Materials that contain phosphate-bearing clays, silts or fine sand;

iii. Designs that allow the impoundment of supernatant or liquid water against the embankment;

iv. Materials that include other mechanical or chemical properties which make them

unsuitable for use as construction materials.

e. Embankments designed for the storage of hazardous levels of radioactive materials, in addition to any requirements of these regulations, shall not be exempt from criteria mandated by federal and state code, statute, or rule for impoundment of radioactive material. .

f. Embankment design shall consider the need for drains and operational procedures to promote consolidation and ensure that a low phreatic surface is maintained within the embankment cross-sectional area. When the quality of the mine tailings slurry is such that it will adversely affect the quality of the existing groundwater, the design should be coordinated with the Department and the Department of Environmental Quality to ensure that all applicable state of Idaho water quality permits are obtained.

g. Instrumentation of the embankment and/or foundation may be required as determined by the Director to ensure the structure is functioning safely and in accordance with the approved design. Piezometers installed for use in fine-grained or cohesive soils must be appropriately sized to minimize response time.

h. Tailings impoundment structures which are constructed using clay, silt, or fine sand shall not be constructed or raised during freezing weather to prevent formation of frost lenses in the embankment. Sufficient freeboard and horizontal distance for supernatant or liquid water from the embankment must be provided during the summer construction season and must always exist if the disposal operation is to continue during the winter.

02. Top Width Embankment.

b. The minimum top width for any tailings embankment is twelve (12) feet to allow safe access by wheeled vehicles or tracked equipment for maintenance or repair.

03. Cutoff Trenches or Walls.

a. Cutoff trenches, if determined necessary by the Director, shall be excavated through competent foundation material to bear on an approved stratum or zone. The trench shall be backfilled with suitable material free from organic matter and debris and compacted to the specified moisture and density. The cutoff trench shall extend up the sides of both abutments to the design maximum storage elevation. Cutoff trenches shall be wide enough to allow the free movement of excavation and compaction equipment. Side slopes shall be no steeper than 1:1 for shallow depths up to twelve (12) feet, and no steeper than one and one-half to one (1.5:1) for greater depths to provide for proper compaction. Flatter slopes may be required for safety and stability.

b. Concrete cutoff walls may be used in a similar manner as cutoff trenches, with the base firmly entrenched in the underlying foundation material. Where suitable bedrock is encountered, concrete cutoff walls shall be doweled into the rock with steel rebar a minimum depth of twelve (12) inches with a maximum spacing of eighteen (18) inches. Concrete walls shall have a minimum vertical projection above the rock surface of three (3) feet oriented perpendicular to the rock surface, and shall have a minimum thickness of twelve (12) inches. Reinforcement of the concrete may be required, as determined by the Director.

04. Borrowed Fill Embankment.

a. Materials used for construction of the embankment shall be sourced from approved borrow sites and placed in the embankment in continuous, approximately level layers, and compacted in strict accordance with the approved plans and specifications. Compacted fill shall be placed at a minimum ninety-five percent (95%) maximum dry density in accordance with ASTM D-698 Compaction of cohesionless soils shall insure a relative density of sixty percent (60%) or greater.

05. Riprap.

a. All mine tailings impoundment structures shall be protected from erosion that could negatively affect the integrity or stability of the embankment. As deemed necessary, the Director may require use of riprap or other protective measures as deemed necessary for existing site, seasonal, and operating conditions.

06. Freeboard. The elevation of the top of the embankment shall be constructed and maintained above the design flood surcharge level, including the vertical height of wind generated waves estimated for the greatest distance of open water measured perpendicular to the major axis of the dam. Camber shall be included in the design and incorporated in the construction of the top of the embankment, unless waived by the Director.

a. The minimum freeboard shall be two (2) feet plus wave height as calculated for the design spillway flow capacity during passage of the one percent (1%) flood, or greater to equal the surcharge elevation of the supernatant or liquid water surface during passage of the inflow design flood.

07. **Outlet Systems**.

a. Mine Tailings Impoundments must safely handle the design inflow for all areas draining into the reservoir. This may be done either by storing the entire design inflow or by having an outlet system or combination of systems adequate to safely divert runoff around the impoundment via a constructed channel or to pass the design inflow through an outlet conduit or a constructed emergency overflow spillway. If the tailings reservoir is situated on a stream channel, an outlet system or an approved alternative system capable of meeting downstream flow requirements must be provided.

b. The minimum design inflow for all impoundments shall be the flood with one percent (1%) probability of occurrence. The Director may require a greater design inflow be used in instances of larger mine tailings impoundment structures, or when the inflow is to be entirely stored in the reservoir during the flood period.

c. Outlet systems considered for approval may be composed of one or a combination of the following: decant line inclined to the vertical and safely supported against movement or collapse , overflow spillway, constructed diversion channel to bypass runoff around the impounded reservoir, evaporative pumps, or low-level conduits. The system(s) will be determined by individual site and reservoir conditions, and shall be approved by the Director on a case-by-case basis. Unless removal of the mine tailings impoundment structure and reservoir is part of the approved closure and reclamation plan,

the outlet system(s) shall be maintained in perpetuity, unless it is demonstrated that an outlet system is not needed.

d. Outlet systems will not be approved for construction if their use would release toxic, turbid, radioactive or otherwise hazardous discharge from the impoundment . In such instances, the impounded contents must either be contained by the perimeter embankment, or all runoff must be entirely diverted around the reservoir.

e. All spillways shall be designed to to prevent erosion of the channel and embankment with the use of concrete, masonry, riprap or other approved material, if not constructed in resistant rock.

f. Where site conditions allow, the spillway shall be constructed independent of the impoundment structure and perimeter embankment. The spillway shall discharge water far enough away from the mine tailings impoundment so as not to erode or otherwise endanger the structure.

g. All diversion of existing streams, rivers, or naturally occurring drainages shall conform to the minimum standards for stream channel alterations as written by this Department.

h. Decant conduits and underdrain pipes, if located through or under the embankment, shall be laid on a firm, stable foundation. The design life of the conduit shall be greater than the life of the mine tailings impoundment structure. The decant conduit shall have a minimum inside diameter of twelve (12) inches and one (1) of the following provisions shall be included in the design submitted for approval:

i. During the operation of the mine tailings impoundment, the Director may require the owner to have the conduit inspected by remote photographic or video equipment and a copy of the inspection provided to the Director if a problem is suspected; or

ii. Conduits and underdrain pipes shall be completely plugged with concrete and/or suitable approved material for that portion which extends through the embankment, if a nonrepairable problem occurs within the conduit.

j. More than two (2) decant pipes or low-level outlet conduits are not to be used in a single mine tailings impoundment unless special conditions warrant as determined by the Director.

08. Records. All monitoring data provided by instruments or measuring devices shall be collected, summarized, and evaluated at no greater frequency than annually. All summary records must be available for inspection by Department personnel on request.

09. Inspection and Completion Reports.

a. It is the responsibility of the engineer during each approved design stage of construction to submit test reports along with periodic inspection and progress reports to the Director.

b. Upon completion of each design stage approved for construction, the engineer shall submit a letter to the Director providing a short, narrative account covering all items of work. As-built plans shall be submitted to the Director if the completed stage of project was substantially changed from the plans originally approved.

10. Abandonment and Reclamation Plan.

a. A conceptual abandonment and reclamation plan shall be submitted to the Director by the owner which provides a stable, maintenance-free condition when the mine tailings impoundment is no longer being regularly maintained or the owner has ceased to use the site for disposal of mine tailings slurry.

b. The conceptual abandonment and reclamation plan shall provide for the removal of the tailings, or design and construction of a maintenance-free spillway, or design and implementation of diversion works where needed to accommodate runoff, or design and construction of a permanent cover to prevent erosion or release of stored tailings.

c. The conceptual abandonment and reclamation plan shall include provisions to prevent water storage behind, and erosion of, the mine tailings impoundment structure and the impounded contents. The conceptual engineering design report shall provide sufficient detail to establish the cost estimate for the value of monetary bond required to place the project is a stable, maintenance-free condition.

d. Detailed construction plans and specifications must be approved by the Director prior to implementation of any abandonment and site reclamation activities.

e. The Director shall release claim on the monetary bond upon acceptance of completed construction in accordance with the approved design plans and specifications for abandonment and reclamation.