37.03.05 – SAFETY OF DAMS RULES

000. LEGAL AUTHORITY (RULE 0).
These rules are adopted pursuant to Chapter 17, Section 42-1714, Idaho Code

001. TITLE AND SCOPE (RULE 1).

01. Title. These rules are titled IDAPA 37.03.05, "Safety of Dams Rules." ( )

02. Scope. ( )

a. The requirements that follow are intended as a guide to establish acceptable standards for design and construction, and to provide guidelines for evaluating the safety of new or existing water storage dams and mine tailings impoundment structures. The rules apply to all new construction including existing structures considered for enlargement, alteration, modification or repair as specifically provided in the rules. The Director will evaluate any deviation from the standards hereinafter stated as they pertain to the safety of any given dam. The standards listed herein are not intended to restrict the application of other sound engineering design principles that will provide for the public safety.

b. Under no circumstances shall these rules be construed to deprive or limit the Director of the Department of Water Resources of any exercise of powers, duties and jurisdiction conferred by law, nor to limit or restrict the amount or character of data, or information which may be required by the Director from any owner of a water storage dam or a mine tailings impoundment structure for the proper administration of the law. State sovereignty as expressed in Policy 1A of the adopted State Water Plan for independent review and approval of engineering design, construction, operation, and maintenance will not be waived due to any overlapping jurisdiction from federal agencies.

002. ADMINISTRATIVE APPEALS (RULE 2).

01. Any owner who is aggrieved by a determination or order of the Director may request a hearing pursuant to the provisions of Section 42-1701A(3), Idaho Code, and the Department's adopted Rules of Procedure. ( )

003. -- 009. (RESERVED)

010. DEFINITIONS (RULE 10).
Unless the context otherwise requires, the following definitions govern these rules. ( )

01. Active Storage. The water volume in the reservoir stored for irrigation, water supply, power generation, flood control, or other purposes but does not include flood surcharge. Active storage is the total reservoir capacity in acre-feet, less the inactive and dead storage.

02. Alterations, Repairs or Either of Them. Only such alterations or repairs as may directly affect the safety of the dam or reservoir, as determined by the Director. Alterations, repairs does not include routine maintenance items.

03. Appurtenant Structures. Ancillary features (e.g. outlets, tunnels, gates, valves, spillways, auxiliary barriers) used for operation of a dam, which are owned by the dam owner or for which the owner has responsible control.

XX. Artificial barrier or embankment. Any structure constructed to impede or obstruct the flow of water.

07. Borrowed Fill Embankment. Any embankment constructed of borrowed earth materials

and which is designed for construction by conventional earth moving equipment.

04. **Board**. The Idaho Water Resource Board.

05. **Certificate of Approval**. A certificate issued by the Director for all dams or mine tailings impoundment structures listing restrictions imposed by the Director, and without which no new dams shall be allowed to impound water or mine tailings impoundment structures shall be allowed to impound mine tailings slurry.

XX. **Conduit.** A pipe or other constructed conveyance within a water storage dam or mine tailings impoundment structure designed to release water or liquid in the reservoir.

XX. **Core.** A zone of relatively low permeability material within an embankment dam.

XX. **Cutoff Trench**. An excavation later to be filled with impervious material during construction of a water storage dam or mine tailings impoundment structure so as to limit seepage beneath structure and through the foundation.

06. **Dam**. Any artificial barrier together with appurtenant works, which is or will be ten (10) feet or more in height and has or will have an impounding capacity at maximum storage elevation of fifty (50) acre-feet or more. Height of a dam is defined as the vertical distance from the natural bed of the stream or watercourse at the downstream toe of the barrier, as determined by the Director, or from the lowest elevation of the outside limit of the barrier, if it is not across a stream channel or watercourse, to the maximum water storage elevation. The following are not included as regulated dams or are not considered dams for the purposes of sections 42-1710 through 42-1721, Idaho Code:

a. Barriers in a canal used to raise or lower water therein or divert water therefrom.

b. Fills or structures determined by the Director to be designed primarily for highway or railroad traffic.

c. Fills, retaining dikes or structures less than twenty (20) feet in height, which are under jurisdiction of the Department of Environmental Quality or the Department of Agriculture, determined by the Director of the Department of Water Resources to be designed primarily for retention or treatment of municipal, livestock, or domestic wastes, or sediment and wastes from produce washing or food processing plants.

d. Levees, that store water regardless of storage capacity.

11. **Days Used in Establishing Deadlines**. Calendar days including Sundays and holidays.

12. **Dead Storage**. The water volume in the bottom of the reservoir stored below the lowest outlet and generally unavailable for withdrawal.

13. **Department**. The Idaho Department of Water Resources.

14. **Design Evaluation**. The engineering analysis required to evaluate the performance of a dam relative to earthquakes, floods or other site-specific conditions that are anticipated to affect the safety of a dam or operation of appurtenant facilities.

15. **Director**. The Director of the Idaho Department of Water Resources.

XX. Emergency Action Plan. A written plan with instructions to be taken to reduce the potential for property damage and loss of life in an area affected by a dam failure or uncontrolled release of water.

17. Enlargement. Any change in or addition to an existing dam, reservoir, or mine tailings impoundment structure which raises or may raise the water storage elevation of the water impounded by the dam or mine tailings slurry impounded by the mine tailings impoundment structure.

18. Factor of Safety. A ratio of available shear strength to shear stress, required for stability.

XX. Flashboards. Structural members of timber, concrete, steel or other erosion resistant material placed across a channel or entrance to a spillway to temporarily raise the surface level of the reservoir.

XX. Flood. An increase in water surface elevation due to naturally occurring runoff or other rise in water levels that result in the inundation of areas not normally covered by water. As defined herein floods may be expressed in terms of average probability of exceedance per year, corresponding to values which may be described as flow rate, volume, or elevation.

19. Flood Surcharge. A variable volume of water temporarily detained in a reservoir, in the space (or part thereof) that is filled by excess runoff or flood water, above the approved design maximum storage elevation. Flood surcharge is passed through the reservoir and discharged by the spillway(s) until the reservoir level has been drawn down to the maximum storage elevation.

XX. Hazard. The potential consequences to downstream life and property resulting from a dam failure and uncontrolled release of water, exclusive of the size or the physical condition of the dam or mine tailings impoundment structure. Hazard Classification shall be assigned to new and existing dams or mine tailings impoundment structures based on the severity of failure consequences to life and property.

XX. Hydraulics. The conveyance of liquid through pipes and channels.

XX. Hydrology. The study of precipitation, snowmelt, and runoff in relation to land surfaces.

20. Inflow Design Flood (IDF). The flood specified for designing the dam and appurtenant facilities.

08. Intermediate Dams. Artificial barriers more than twenty (20) feet, but less than forty (40) feet in height, or are capable of storing one hundred (100) acre-feet or more, but less than four thousand (4,000) acre-feet of water.

09. Large Dams. Artificial barriers forty (40) feet or more in height or are capable of storing four thousand (4,000) acre-feet or more of water.

XX. Levee. A retaining structure alongside a natural lake which has a length that is two hundred (200) times or more greater than its greatest height measured from the lowest elevation of the toe to the maximum crest elevation of the retai8ning structure.

XX. Lift Construction. Mine tailings impoundment structure enlargement by raising the elevation of the structure on a continuous or recurring basis. Such practice will be considered under

construction until the structure reaches its final crest elevation.

21. **Maximum Credible Earthquake**. The largest earthquake that reasonably appears capable of occurring under the conditions of the presently known geology and seismic history.

XX **Maximum Water Storage Elevation.** The maximum design elevation of water surface which can be impounded by the dam or reservoir.

04. **Mine Tailings Impoundment Structure**. Any artificial embankment which is or will be more than thirty (30) feet in height measured from the lowest elevation of the toe to the maximum crest elevation constructed for the purpose of storing mine tailings slurry.

05. **Mine Tailings Slurry**. All slurry wastes from a mineral processing or mining operation.

06. **Mine Tailings Storage Capacity**. The total storage volume of the impoundment when filled with tailings to the maximum approved design storage elevation.

22. **Operation Plan**. A specific plan that promotes the safe operation of the water storage dam or mine tailings impoundment structure for its intended purpose, and which provides specific limits and procedures for controlling inflow, storage, and/or release of water or slurry.

23. **Owner**. Includes any of the following who own, control, operate, maintain, manage, or propose to construct a dam, reservoir or mine tailings impoundment structure:

a. The state of Idaho and its departments, agencies, institutions and political subdivisions;

b. The United States of America and any of its departments, bureaus, agencies and institutions; provided that the United States of America shall not be required to pay any of the fees required by Section 42-1713, Idaho Code, and shall submit plans, drawings and specifications as required by Section 42-1712, Idaho Code, for information purposes only;

c. Every municipal or quasi-municipal corporation.

d. Every public utility;

e. Every person, firm, association, organization, partnership, business trust, corporation or company;

f. The duly authorized agents, lessees, or trustees of any of the foregoing;

g. Receivers or trustees appointed by any court for any of the foregoing;

14. **Professional Engineer**. A person who has been duly licensed as a professional engineer by the Idaho Board of Licensure of Professional Engineers and Professional Land Surveyors under chapter 12, title 54, Idaho Code.

27. **Release Capability**. The ability of a dam to pass excess water through the spillway(s) and outlet works and otherwise discharge.

24. **Reservoir**. Any basin which contains or will contain the water impounded by a dam.

07. **Small Dams**. Artificial barriers twenty (20) feet or less in height that are capable of storing less than one hundred (100) acre-feet of water.

XX. **Spillway.** A constructed channel over or through a water storage dam or mine tailings impoundment structure which is designed to accommodate the inflow design flood and thus prevent overtopping by the reservoir.

25. **Storage Capacity**. The total storage in acre-feet at the maximum storage elevation.

XX. **Surety.** Monetary bond or other approved financial instrument secured by the owner of a mine tailings impoundment structure payable to the Director of Department of Water Resources.

011. -- 014. (RESERVED)

015. AUTHORITY OF REPRESENTATIVE (RULE 15).

01. When plans, drawings and specifications are filed by another person on behalf of an owner, written evidence of authority to represent the owner shall be filed with the plans, drawings and specifications.

016. -- 019. (RESERVED)

020. DAM SIZE CLASSIFICATION AND RISK CATEGORY (RULE 20).

01. **Size Classification**. The following table defines the height and storage capacity limits used by the Department to classify water storage dams and mine tailings impoundment structures:

Size Classification	Height		Storage Capacity
Small Water Storage Dams and Reservoirs	Ten (10) feet or more but less than twenty (20) feet	and	50 acre-feet or more but less than one hundred (100) acre feet.
Mine Tailings Impoundment Structures	30 feet or more		Any Storage Volume (No Min. or Max. Value)
Intermediate Water Storage Dams and Reservoirs	Twenty (20) feet or more but less than forty (40) feet	and	One hundred (100) acre feet or more but less than four thousand (4000) acre feet
Large Water Storage Dams and Reservoirs	40 feet or more	or	4000 acre-feet or more

02. **Determination of Size and Risk Category**. The Director shall determine the size and risk category of a new or existing dam.

021. -- 024. (RESERVED)

025. DAM SIZE CLASSIFICATION AND RISK CATEGORY (RULE 25).

01. **Hazard Classification**. The following table describes categories of hazard used by the Department to classify water storage dams and mine tailings impoundment structures relative to the potential failure consequences estimated for downstream locations. The listed hazard categories are meant to serve as guidelines for implementing design, construction, and operation criteria used by the regulator and the design engineer; however, subject to final interpretation by the Director for benefit of public safety.

Hazard Category	Downstream Development	Estimated Loss of Life	Economic Losses
Low	Undeveloped property, no permanent or permanently occupied structures for human habitation.	No loss of life	Low probability for economic loss or damage to or disruption of a lifeline or other infrastructure.
Significant	No concentrated urban development, 1 or more permanent structures for human habitation within the flood zone that are potentially inundated with flood water at a depth of two (2) feet or less.	Loss of life is unlikely to occur	Significant damage to agricultural, commercial, or industrial facilities; damage to or the disruption of transportation, utilities or other public facilities or values including environmental loss.
High	Urban development, or any structure for permanent or temporary human habitation which are potentially inundated with flood water at a depth greater than or equal to two (2) feet	High probability for loss of life	Major damage to agricultural, commercial or industrial facilities; damage to or the disruption of transportation, utilities or other public facilities or values including prolonged environmental loss.

02. Determination of Hazzard Classification. The Director shall determine the hazard category of a new or existing water storage dam or mine tailings impoundment structure.

026. -- 029. (RESERVED)

030. FORMS (RULE 30).
Forms required by these rules are available from the Department to interested parties upon request. Construction of a water storage dam or a mine tailings impoundment structure requires the filing of Form 1710-/1712 "Application for Construction or Enlargement of a New or Existing Dam".

031. -- 034. (RESERVED)

035. DESIGN REPORTS, DRAWINGS, AND SPECIFICATIONS (RULE 35).
The following provisions shall apply when submitting plans, drawings and specifications for review and approval, prior to commencing construction.

01. Submission of Duplicate Plans, Drawings and Specifications. Any owner who shall desire to construct, enlarge, alter or repair any dam or mine tailings impoundment, shall submit duplicate plans, drawings and specifications prepared by an engineer for the proposed work to the Director with required fees prior to commencing construction. An owner who desires to construct a continuously raised tailings impoundment structure shall submit duplicate copies of plans, drawings, and specifications prepared by an engineer, showing the stages of lift height, by periods of time, and ultimate design height prior to commencing construction of each design stage or phase of construction.

02. Applying for and Obtaining Written Approval. Construction of a new water storage dam or mine tailings impoundment, or the enlargement, alteration or repair of such shall not commence until the owner has applied for and obtained written approval of the plans, drawings and specifications.

04. Preparation and Submission of Plans. Plans and drawings shall be of a sufficient scale

with an adequate number of views showing proper dimensions, so that the plans and drawings may be readily interpreted and so that the structure and appurtenances can be built in conformance with the approved design. Plans and drawings shall be submitted in both printed and digital format, with the printed version consisting of paper size 11" x 17" or equivalent dimension. After reviewing the plans, the Director will notify the owner of any required changes.

05. Information Included with Plans. Plans for new water storage dams and mine tailings impoundment structures or the enlargement, alteration or repair of such shall include as much of the following information as determined by the Director to adequately describe the enlargement, alteration or repair and the effect on the existing structure or its appurtenances:

a. A topographic map of the project site showing the location of the proposed construction by section, township and range, and location of all borings, test pits, borrow pits and other locations of samples obtained for field or laboratory testing;

b. A profile along the axis showing the locations, elevations, and depths of borings or test pits, including the visual illustration logs of bore holes, test pits or borrow pits;

c. A cross-section of the structure at maximum section showing elevation and width of crest, slopes of upstream and downstream faces, thickness of riprap, zoning of earth embankment, location of cutoff and bonding trenches, elevations and dimensional heights, size and type of conduits, valves, operating mechanism and dimensions of all other essential elements deemed to be necessary for properly constructing the approved design .;

d. Detailed drawings showing plans, cross and longitudinal sections of appurtenant features such as but not limited to the spillway, training walls, outlet conduits, valves, gates, trashrack, and control works;

e. A curve or table showing the capacity of the reservoir or tailings impoundment in acre-feet vs gauge height referenced to a common project datum and the computations used in making such determinations.

f. A curve or table showing the outlet discharge capacity in cubic feet per second vs gauge height of reservoir storage level, and the computations used in making such determinations;

g. A curve showing the spillway discharge capacity in cubic feet per second vs gauge height of the reservoir or flood surcharge level above the spillway crest and the computations used in making such determinations;

h. Detailed drawings of spillway structure(s), cross-sections of the channel entrance and exit points to and from the spillway and a spillway profile;

i. Plans for flow measuring devices capable of providing an accurate determination of the flow of the stream above and below the reservoir, and a permanent reservoir or staff gauge near the outlet of the reservoir plainly marked in feet and tenths of a foot referenced to an approved datum;

j. Plans or drawings of instruments recommended by the owner or engineer to monitor the performance of the water storage dam or mine tailings impoundment structure to assure safe operation, or as may be required by the Director as deemed necessary to monitor any structure for benefit of public safety regardless of size.

06. Specifications. Specifications shall be prepared by the design engineer that include

instructions for construction of the approved design in accordance with accepted engineering and industry standards of care, including provision adequate observation, inspection, and control of the work by a registered professional engineer during the period of construction.

07. Changes to the Approved Design. The approved design shall not be materially changed without prior written consent of the Director. Significant design changes, while construction is underway, shall be submitted for the Director's review and approval. In emergency situations, the owner shall make the required alterations or repairs necessary to relieve the emergency, and subsequently notify the Director of all alterations or repairs implemented.

08. Inspections. The owner shall provide for and allow inspections by the Department to assure the dam and appurtenant structures are constructed in conformance with the approved plans and specifications, or as may be revised by the design engineer and approved by the Director if there are unforeseen conditions discovered during site preparation or construction which potentially jeopardize the future integrity and safety of the project works. The Department may request of the owner that certain stages of construction shall not proceed without inspection and approval by the Director. Owners are encouraged to give prior notice to the Department, so that inspection(s) can be scheduled to prevent construction delays.

09. Inspection, Examination and Testing of Materials. All materials and workmanship shall be subject to review, inspection, examination or testing by the Director at any and all times.

10. Rejection of Defective Material. The Director may order the owner or engineer to reject defective material.. Rejected workmanship shall be corrected and rejected material shall be replaced with proper material.

11. Suspension of Work. The Director may order the engineer to suspend any work that is or is likely to be subject to damage by inclement weather conditions.

12. Responsibility of Engineer. These provisions shall not relieve the engineer of their responsibility to assure that construction is accomplished in accordance with the approved plans and specifications as mandated by I.C. 54.1202(15), or to unilaterally suspend work as deemed necessary.

14. Design Report. Owners proposing to construct, enlarge, alter or repair a water storage dam or mine tailings impoundment structure shall submit an engineering or design evaluation report to accompany the plans and specifications. The engineering report shall include as much of the following information as necessary to present the technical basis for the design and to describe the analyses used to evaluate performance of the structure and appurtenances.

a. All technical reference(s); equations, calculations, and assumptions used in the design;

b. Hydrologic data used in determining runoff from the drainage areas, reservoir flood routing, pertinent to the project location, and hydraulic evaluations of the outlet(s) and the spillway(s) as may be required for approval of the design plans and specifications.

c. Investigation of site and subsurface conditions, to include the engineering properties of the foundation area and of each type of material to be encountered or used in the construction of the project works.

d. A stability analysis, including an evaluation of overturning, sliding, slope, and foundation stability and a seepage analysis;

i. An evaluation of seismic design loads may be included in the stability analysis for all water storage dams or mine tailings impoundment structures as deemed necessary by the Director for benefit of public safety. The evaluation required for large water storage dams or high hazard structures shall use the maximum ground acceleration generated by the maximum credible earthquake which could affect the dam site.

ii. Seismic analyses may be waived by the Director for new or existing water storage dams or mine tailings impoundment structures if the consequence of failure is demonstrated to be sufficiently low or the critical features of design are demonstrated to be sufficiently conservative to allow minor deformation(s) without releasing the contents of the impounding structure.

e. Geologic description of reservoir area, including evaluation of landslide potential;

j. Engineering properties and the weathering characteristics of the contents proposed for storage in the impoundment, if applicable;

k. Other information which would aid in evaluating the safety of the design.

15. Additional Information/Waiver. The Director may require the filing of such additional information which in his opinion is necessary for benefit of public safety or waive any requirement herein cited if available data demonstrates that it is unnecessary.

16. Alternate Plans. The Director may accept plans and specifications or portions thereof prepared for other agencies which are determined to meet the requirements of Rule 40.

a. An operation plan;

b. An emergency action plan to help protect downstream of life and property;

c. An abandonment plan that assures the Director to his satisfaction that, upon completion of the mining operation, the site will be in a safe maintenance-free condition.

036. -- 039. (RESERVED)

040. BONDING (RULE 40).

An active surety bond or other means of acceptable monetary surety shall be secured by the owner of a mine tailings impoundment structure payable to the Director of the Department of Water Resources and shall be on file with the Director throughout the active life of the tailings disposal site. The purpose of this bond is to provide financial means by which the tailings impoundment can be placed in a safe maintenance-free condition in the event said facility is improperly abandoned or otherwise closed by the owner without conforming to a reclamation plan approved by the Director.

01. Filing of Bond. The bond shall be filed prior to any issuance by the Director of a Certificate of Approval for use of the mine tailings impoundment structure to impound mine tailings slurry and shall be valid for the approved period authorized on the Certificate of Approval.

02. Provisions of Bond. Bond provisions shall provide that the surety may be held liable for a period of up to five (5) years following notice of default on the bond.

03. Amount of Bond. The value of bond will be set by the Director and is subject to revision each time it is renewed. The owner must obtain approval for both the duration and the amount of surety prior to each renewal of the bond.

04. Cost Estimate Submitted by Engineer. To provide a basis for setting the bond amount, the owner's engineer shall submit a cost estimate acceptable to the Director, together with conceptual details deemed necessary for proper abandonment of the facility at each proposed stage of its construction. Conceptual designs, while necessary to establish a monetary basis for the value of the bond, do not constitute approval by the Director to commence closure activities of the mine tailings impoundment or the tailings disposal site.

05. Current Costs for Abandonment. The value of bond will be based on current cost estimates for proper abandonment of the facility based on the present construction condition or the next approved design stage of construction, whichever represents the larger bond amount.

06. Determination of Bond Amount. If the final closure of the mine tailings facility is determined to be the most costly condition, the owner may elect to use this as a basis for bonding throughout the life of the project. The Director may, however, revise the required bond amount to reflect updated costs for materials, equipment, fuel and labor necessary to place the mine tailings facility in a safe, maintenance free condition.

07. Filing Initial Bond. The initial bond shall be filed prior to completion of the first stage or level of construction, and before the required Certificate of Approval is issued to allow storage of mine tailings slurry or waste in the impoundment. No Certificate of Approval shall be either issued or renewed prior to filing by the owner of a bond in an amount approved by the Director.

041. -- 044. (RESERVED)

045. EMERGENCY ACTION AND OPERATION PLANS (RULE 45).

An Emergency Action Plan (EAP) is required for water storage dams and mine tailings impoundment structures as described in the following rules. The EAP shall provide procedures for emergency procedures and notification during unexpected or non-routine events either naturally occurring, mechanical, or a result of intentional vandalism/ terrorism. The EAP may be a component of an Operation Plan that includes guidelines and procedures for inspection, operation, maintenance, and monitoring of instruments required to record performance of the structure during normal operating cycles, critical filling or flood periods, or as may be necessary for evaluating the effects of an earthquake

with an epicenter near the project site.

01. New, Reconstructed or Enlarged Water Storage Dams and Mine Tailings Impoundment Structures. Prior to the initial filling of the reservoir or placing mine waste slurry or paste into a mine tailings impoundment the owner shall file with the Director an Emergency Action Plan for review and approval.

02. Existing Dams. The Director may waive the requirements for individual Low Hazard Water Storage Dams or Mine Tailings Impoundment Structures upon a determination that the flood inundation zone resulting from the potential failure or uncontrolled release of contents impounded by the structure will not damage downstream life or property.

046. -- 049. (RESERVED)

050. NEW WATER STORAGE DAMS AND RESERVOIRS (RULE 50).
The following criteria shall be used by the Director as a basis to evaluate the design of earthen water storage dams in Idaho. These guidelines are intended for a broad range of circumstances, and engineers should not consider them as a restriction to the use of other sound engineering design principles. Exclusion from these established criteria will be considered by the Director on a case-by-case basis during design review of plans and specifications submitted for approval prior to commencing construction. Structures which are or will be constructed of other materials, for example concrete, shall comply with these criteria as found appropriate by the Director and with other engineering design methods, and construction standards of care approved by the Director.

01. Embankment Stability. Slope stability analyses shall determine the appropriate upstream and downstream slopes. Unless a discrete slope stability analysis determines otherwise, the embankment slopes of earthen dams shall resemble the following:

Upstream slope	3:1 or flatter
Downstream slope	2:1 or flatter

a. Water storage dams shall be designed, constructed and maintained to assure stability under static loads and prevent instability due to seepage or uplift forces, rapid drawdown conditions and applied seismic loads.

b. The design analysis shall consider the need for installing filters, filter fabric and/or toe drains to stabilize the fill and protect against piping of the embankment fill material. Transmission of seepage through the embankment, abutments and foundation shall be controlled to prevent internal removal of material and instability where seepage emerges.

c. The minimum factor of safety for a steady state loading condition shall be 1.5. The minimum factor of safety for rapid drawdown loading shall be 1.2. The minimum factor of safety for seismic loading shall be 1.0.

d. Seismic Stability

i. The stability of an embankment subjected to earthquake ground motions can be analyzed by dynamic response or pseudo-static analysis. Pseudo-static analyses are acceptable for embankment dams and foundations composed of non-liquifiable soils that preclude the generation of excess pore water pressures due to shaking. Otherwise the stability analysis shall employ a dynamic response method.

ii. Slope deformation analyses are required for structures that are constructed of cohesionless soils and/or on foundations that may be subject to liquefaction

iii. The design analyses for large water storage dams shall include a geologic and seismic report. The seismic report shall identify the location of faults, evaluate landslide potential, and include a history of seismicity.

iv. The design engineer shall include in the stability analysis peak ground accelerations obtained from

published U.S.G.S. Seismic Hazard Maps using as a minimum a 2 percent probability of exceedance in 50 years, or as determined by the Director.

e. Where in the opinion of the Director, embankment design or conditions warrant, instrumentation of the embankment and/or foundation will be required.

02. Top Width.

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

03. Cutoff Trenches or Walls. Cutoff trenches shall be excavated through competent foundation material to bear on an approved stratum or zone.

a. The cutoff 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.

b. Cutoff trenches shall be wide enough to allow the free movement of excavation and compaction equipment. To provide for proper compaction side slopes shall be no steeper than one to one (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. Flatter slopes may be required for safety and stability.

c. 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 with steel rebar into rock 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. Impervious Core Material. Soils used to construct the inner sectional core of a water storage dam shall consist of relatively impervious cohesive materials approved by the engineer, and compacted in strict accordance with the approved plans and specifications. . A minimum ninety-five percent (95%) maximum dry density compacted in accordance with ASTM D-698 is required. The use of other relatively impermeable non-cohesive material is subject to approval by the Director on a case-by-case basis.

05. Drains. Toe, blanket, or chimney drains consisting of approved free draining material shall be installed where necessary to maintain the phreatic line at or near the design level(s) within the embankment.

a. Filter design for toe, blanket or chimney drains shall be included in the design plans and specifications submitted by the engineer for review and approval by the Director.

d. Blanket drains and chimney drains shall have a minimum thickness of twelve (12) inches or thicker, as determined by the Director and the dimensional size of the equipment used to place the material. The maximum particle size is one (1) inch, but may be increased with increasing thickness of the filter however, never to exceed three (3) inches. Each zone of filter comprising the drain must not be less than twelve (12) inches thick per each zone. The lay-down width of granular filters shall not be less than the width of the installation equipment unless the plans and specifications include construction procedures adequate to ensure the integrity of a narrower width.

e. Perforated and slotted drain pipes must be four (4) inches diameter or greater, and shall be surrounded on all sides by a thickness of drain material equal to or greater than the outside pipe diameter. The maximum particle size of the drain material shall reside between one-half (1/2) inch to three-fourths (3/4) inch Underdrains and collection pipes must be constructed of noncorrosive material, taking care to ensure slots and perforations are appropriately sized to avoid long-term migration of the drain material into the pipe.

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 reservoir during passage of the inflow design flood.

07. Riprap. All dams which are subject to erosion on either the upstream and downstream slope(s) shall be protected using riprap or other approved material. Pipes, cables, brush, tree growth, dead growth, logs, or floating debris are not acceptable substitutes for approved riprap. The design engineer, with approval of the Director, shall determine the extent of slope protection as deemed necessary for existing site, seasonal, and operating conditions.

a. Where rock riprap or other approved material is used for erosion protection on the upstream slope, it shall be placed on an approved thickness of well-graded and free-draining granular bedding material. Riprap or other approved erosion protection material shall extend up the slope, from three (3) feet below the normal minimum operating level of the reservoir to the top of the dam.

08. Outlet Conduits. All reservoirs shall be provided with an outlet conduit of sufficient capacity to prevent interference with natural streamflow through the reservoir to the injury of downstream appropriators, unless waived by the Director. In addition to any natural flow releases, the outlet conduit should be of sufficient capacity to pass at the same time, the maximum water requirement of the owner. A larger outlet conduit may be required to provide adequate release capability as determined by the Director.

a. Outlet conduits shall be laid on a firm and stable foundation material to avoid the likelihood of differential settlement or excessive consolidation that could cause separation or misalignment of the pipe. Outlet conduits shall be encased on all sides by concrete of approved compressive strength a minimum thickness of twelve (12) inches. During construction outlet conduits shall be properly aligned on an established grade and adequately supported to prevent movement or damage caused by compaction equipment.

b. Unless otherwise required, the outlet conduit shall have a minimum inside diameter of twelve (12) inches. The conduits shall consist of approved material and composition as approved by the Director. Exceptions may be made only where conditions warrant, but in no case shall the reasonable life expectancy of the pipe be less than the design life of the dam.

c. The use of multiple conduits that penetrate the embankment beneath the maximum reservoir level is allowed only upon the written approval of the Director.

09. Gates.

a. All conduits shall be gated on the upstream end to avoid pressurizing the conduit internal to the embankment. Unless otherwise approved by the Director, all conduits shall be fitted with either a vertical or an inclined gate.

b. All conduits shall be vented directly behind the gate unless otherwise determined by the Director.

c. All gate stem pedestals shall be made of concrete.

d. At least one (1) of the sides of the inlet structure shall be open to allow water to flow into the outlet conduit and shall be covered with a trash rack.

e. Trash racks should be designed with bars primarily in one (1) direction so they can be cleaned. If fish screens are used, they shall be placed over the trash rack and shall be removable for cleaning, or of the self-cleaning type, as approved by the Director.

10. Outlet Controls. Outlet controls shall be installed at a stable location, on the crest or on an elevated

platform, or within an enclosure when required, which is readily accessible, but secured to prevent unauthorized operation. Reservoirs storing water during the winter and subject to severe ice conditions shall have inclined gate stems or other controlling mechanical or hydraulic features enclosed in a protective sleeve which is buried beneath the upstream slope to suitable depth.

11. Emergency Spillway Flow Capacity Based on the size of the dam and on the downstream hazard classification assigned by the Director, the release capability of a dam shall equal or exceed the inflow design flood. The minimum flow capacity of the emergency spillway(s) shall be sized using the one-percent (1%) rate of flow (cfs) calculated for the contributing watershed upstream from the dam (aka Q100), plus two (2) feet of freeboard

Hazard Classification	Size Classification	Inflow Design Flood
Low	All Sizes	Q100
Significant	Small	Q100
	Intermediate	Q100 to Q500
	Large	Q500
High	Small	Q100
	Intermediate	Q100 to Q500
	Large	Q500 to PMF

a. All spillways shall be stabilized for the discharge of flow by the use of concrete, masonry, riprap or sod, or as approved by the Director if not constructed in resistant rock.

b. Where site conditions allow, the spillway shall be constructed independent of embankment dams. The spillway(s) shall guide the discharge of water away from the dam embankment so as not to erode or otherwise endanger the structure.

c. The minimum base width of an open-channel spillway shall be ten (10) feet, or greater to allow access by mechanical equipment. Siphon pipes or pumps are not acceptable substitutes for an open-channel spillway.

d. The effective flow capacity of spillways shall be undiminished by bridges, fences, pipelines or other obstructions.

e. Unless a part of an approved design and included as an integral part of an operation plan, stop logs or flashboards shall not be installed in spillways.

12. Reservoir Site. Prior to filling the reservoir, the site shall be cleared of all woody material, growth or debris that is large enough to lodge in the spillway, or outlet works, except as otherwise approved by the Director.

13. Inspection and Completion Reports. As construction proceeds, it is the responsibility of the engineer to submit test reports (e.g. soil material analyses, density tests, concrete strength tests) along with periodic inspection and progress reports to the Director.

a. Upon completion of construction the owner or his engineer shall provide the Director a written narrative account of all items of construction. Record drawings (aka asbuilts) and revised specifications shall be

submitted to the Director to accurately reflect the as-constructed, completed project

b. The engineer, acting on behalf of and representing the owner, shall certify that construction or re-construction or enlargement or replacement or repair of the dam and appurtenances was completed in accordance with the record drawings and specifications.

051. NEW MINE TAILINGS AND IMPOUNDMENT STRUCTURES (RULE 51).
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.

052. -- 054. (RESERVED)

055. EXISTING DAMS AND EXISTING MINE TAILINGS IMPOUNDMENT STRUCTURES (RULE 55).

All water storage dams and mine tailings impoundment structures regulated by the department shall be operated and maintained to retain the existing structural dimensions, to resist deformations or movement, and to maintain the hydraulic capacity of the outlet works, spillway, and other discharge features as designed and constructed, or as otherwise required by these rules.

01. Analyses Required. The analyses required by Rule 35 shall apply to all existing water storage dams and mine tailings impoundments when, for good cause, the Director specifically requires the analyses. Impounding structures constructed of other than earth material shall comply with these criteria, as determined by the Director, or with other engineering criteria approved by the Director.

a. Every water storage dam and mine tailings impoundment, unless exempted by the Director, shall have an overflow spillway with a capacity that will pass an inflow design flood of one percent (1%) probability of occurrence (aka Q100) or more, with the reservoir or the impoundment full to the spillway crest while maintaining the freeboard required by Rule Subsection 050.06.

b. The Director may lessen or waive the spillway requirement for water storage dam(s) or mine tailings impoundment structure(s) that demonstrate out-of-stream (off-channel) storage, upon a showing acceptable to the Director.

c. The release capability or discharge capacity can include the combined rates of flow for multiple appurtenances; for example, spillway(s), outlet(s), diversion facilities, or other constructed conveyance features. Approved operating procedures which can be shown to utilize upstream storage, diversion, and reservoir flood routing to reduce flood runoff events may also be considered. The remainder of the required release capacity, if any, may be met by the following:

i. Reconstruction, enlargement or addition of spillway(s), outlet(s), diversion facilities or other

constructed conveyance features.

ii. A showing acceptable to the Director that potential failure of the water storage dam or mine tailings impoundment during a flood of the specified magnitude described in Rule Subsection 050.11 would be incrementally small in comparison to the flood being considered, and that the release of reservoir would not substantially increase downstream damages to life and property which are anticipated to result from any natural flood equal to or exceeding that magnitude.

iv. A showing acceptable to the Director that limiting physical factors unique to the project site exist that prevent construction of a spillway or other release capability mechanisms during a flood of the specified magnitude described in Rule Subsection 050.11, and provided the owner implements storage operational procedures and/or provides for emergency warning to protect life and property that are approved by the Director.

d. Seismic loads shall be evaluated and applied to water storage dams and mine tailings impoundment structures. The evaluation shall use the maximum ground motion/acceleration generated by the maximum credible earthquake. The Director may accept maximum ground motion/acceleration corresponding to a specified return interval using a probabilistic evaluation of earthquake history using in accordance with

e. The Director may accept existing studies relative to requirements of Rule Subsections 055.01.a. and 055.01.e., if the Director determines the information provided fulfills the requirements of Rule Subsections 055.01.a. and 055.01.e.

f. The Director may allow the owner of an existing dam a compliance period to complete structural modifications or implement other improvements deemed necessary to provide the hydraulic capability determined to be required

g. The Director may allow the owner of an existing water storage dam or mine tailings impoundment a compliance period to complete structural modifications or implement other improvements deemed necessary to resolve seismic stability or safety concerns. .

h. Within thirty (30) days after completing the analyses required in Rule Subsection 055.01.a. or 055.01.g., the owner of an existing dam that is deficient in either case (Rule Subsection 055.01.a. or 055.01.g.) shall file with the Director a schedule outlining the dates work or construction items will be completed.

02. Other Requirements.

a. Routine maintenance items include the following:

i. Eradication of rodents and filling animal burrows.

ii. Removal of vegetation and debris from the dam.

iii. Restoring original dimensions of the dam by the addition of fill material.

iv. Addition of bedding or riprap material which will not increase the height or storage capacity.

v. Repair or replacement of gates, gate stems, seals, valves, lift mechanisms or vent pipes with similar equipment.

vi. Repair or replacement of wingwalls, headwalls or aprons including spalling concrete.

b. The following are not routine maintenance items:

i. Reconstruction of embankment slopes.

ii. Replacement, reconstruction or extension of outlets.

iii. Foundation stabilization.

iv. Filter or drain construction or replacement.

v. Spillway size alteration or modification.

vi. Installation of instrumentation or piezometers.

vii. Release capability modification.

c. Items not specifically described in Rule Subsections 055.02.a. and 055.02.b. will be determined by the Director to be included in one rule or the other upon receipt of a written request from the owner or his representative seeking such a determination.

d. Where riprap is required to prevent erosion and to maintain a stable embankment, pipes, cables, brush, tree growth, logs, or floating debris are not acceptable substitutes for rock riprap and granular bedding material. Dams or portions thereof which are stable without riprap, are not required to have riprap.

e. Upon completion of reconstruction of a dam or feature of a dam included in Rule Subsection 055.02.b., the owner or his engineer shall provide the Director a short written narrative account of all items of work. Record drawings and revised specifications shall be submitted to the Director if the completed project has been substantially changed from the plans and construction specifications originally approved.

f. Upon request, the owner of every dam shall provide his name and address to the Director and shall advise the Director of future changes in ownership. If the owner does not reside in Idaho, the owner shall provide the name and address of the person residing in Idaho who is responsible for the operation, maintenance and repair of the dam.

056. -- 059. (RESERVED)

060. THE PROVISIONS OF CHAPTER 17, TITLE 42, IDAHO CODE (RULE 60).
The provisions of Sections 42-1709 through 42-1721, Idaho Code, are a part of these rules.

061. -- 064. (RESERVED)

065. DAMS STORING TAILINGS AND WATER (RULE 50).

01. Construction of Mine Tailings Impoundment Structures Storing Fifty Acre-Feet or More. Construction of dams intended to store or likely to store fifty (50) acre-feet or more of water in excess of the water contained in the tailings material shall meet the requirements specified in Rules 40, 45, 50 and 55 of these rules. The Director may waive any or all of these requirements if, in the opinion of the Director, sound engineering design provided by the owner indicates such requirements are not applicable.

02. Abandonment Plan. An abandonment plan which provides a stable, maintenance-free condition at any time tailings are not being actively placed for an extended period of time, as determined by the Director, shall be submitted to the Director by the owner of a dam storing tailings and water. This rule may be waived by the Director if determined not to be applicable.

066. -- 999. (RESERVED)