

## OP 4.37 - Safety of Dams

These policies were prepared for use by World Bank staff and are not necessarily a complete treatment of the subject.

OP 4.37  
October, 2001

Note: OP and [BP 4.37](#) replace the versions dated September 1996. Other Bank policies that may apply to projects that involve dams include the following: [OP/BP 4.01, Environmental Assessment](#); [OP/BP 4.04, Natural Habitats](#); [OP/BP 4.10, Indigenous Peoples](#); [OP/BP 4.11, Physical Cultural Resources](#); [OP/BP 4.12, Involuntary Resettlement](#); and [OP/BP 7.50, Projects on International Waterways](#). Questions on dam safety should be addressed to the Director, [Rural Development Department](#) (RDV).

1. For the life of any dam, the owner<sup>1</sup> is responsible for ensuring that appropriate measures are taken and sufficient resources provided for the safety of the dam, irrespective of its funding sources or construction status. Because there are serious consequences if a dam does not function properly or fails, the Bank<sup>2</sup> is concerned about the safety of new dams it finances and existing dams on which a Bank-financed project is directly dependent.

### New Dams

2. When the Bank finances a project that includes the construction of a new dam,<sup>3</sup> it requires that the dam be designed and its construction supervised by experienced and competent professionals. It also requires that the borrower<sup>4</sup> adopt and implement certain dam safety measures for the design, bid tendering, construction, operation, and maintenance of the dam and associated works.

3. The Bank distinguishes between small and large dams.

(a) Small dams are normally less than 15 meters in height. This category includes, for example, farm ponds, local silt retention dams, and low embankment tanks.

(b) Large dams are 15 meters or more in height. Dams that are between 10 and 15 meters in height are treated as large dams if they present special design complexities--for example, an unusually large flood-handling requirement, location in a zone of high seismicity, foundations that are complex and difficult to prepare, or retention of toxic materials.<sup>5</sup> Dams under 10 meters in height are treated as large dams if they are expected to become large dams during the operation of the facility.

4. For small dams, generic dam safety measures designed by qualified engineers are usually adequate. For large dams, the Bank requires

a) reviews by an independent panel of experts (the Panel) of the investigation, design, and construction of the dam and the start of operations;

b) preparation and implementation of detailed plans: a plan for construction supervision and quality assurance, an instrumentation plan, an operation and maintenance plan, and an emergency preparedness plan;<sup>6</sup>

(c) prequalification of bidders during procurement and bid tendering,<sup>7</sup> and

d) periodic safety inspections of the dam after completion.

5. The Panel consists of three or more experts, appointed by the borrower and acceptable to the Bank, with expertise in the various technical fields relevant to the safety aspects of the particular

dam.<sup>8</sup> The primary purpose of the Panel is to review and advise the borrower on matters relative to dam safety and other critical aspects of the dam, its appurtenant structures, the catchment area, the area surrounding the reservoir, and downstream areas. However, the borrower normally extends the Panel's composition and terms of reference beyond dam safety to cover such areas as project formulation; technical design; construction procedures; and, for water storage dams, associated works such as power facilities, river diversion during construction, ship lifts, and fish ladders.

6. The borrower contracts the services of the Panel and provides administrative support for the Panel's activities. Beginning as early in project preparation as possible, the borrower arranges for periodic Panel meetings and reviews, which continue through the investigation, design, construction, and initial filling and start-up phases of the dam.<sup>9</sup> The borrower informs the Bank in advance of the Panel meetings, and the Bank normally sends an observer to these meetings. After each meeting, the Panel provides the borrower a written report of its conclusions and recommendations, signed by each participating member; the borrower provides a copy of that report to the Bank. Following the filling of the reservoir and start-up of the dam, the Bank reviews the Panel's findings and recommendations. If no significant difficulties are encountered in the filling and start-up of the dam, the borrower may disband the Panel.

### **Existing Dams and Dams under Construction**

7. The Bank may finance the following types of projects that do not include a new dam but will rely on the performance of an existing dam or a dam under construction (DUC): power stations or water supply systems that draw directly from a reservoir controlled by an existing dam or a DUC; diversion dams or hydraulic structures downstream from an existing dam or a DUC, where failure of the upstream dam could cause extensive damage to or failure of the new Bank-funded structure; and irrigation or water supply projects that will depend on the storage and operation of an existing dam or a DUC for their supply of water and could not function if the dam failed. Projects in this category also include operations that require increases in the capacity of an existing dam, or changes in the characteristics of the impounded materials, where failure of the existing dam could cause extensive damage to or failure of the Bank-funded facilities.

8. If such a project, as described in para. 7, involves an existing dam or DUC in the borrower's territory, the Bank requires that the borrower arrange for one or more independent dam specialists to (a) inspect and evaluate the safety status of the existing dam or DUC, its appurtenances, and its performance history; (b) review and evaluate the owner's operation and maintenance procedures; and (c) provide a written report of findings and recommendations for any remedial work or safety-related measures necessary to upgrade the existing dam or DUC to an acceptable standard of safety.

9. The Bank may accept previous assessments of dam safety or recommendations of improvements needed in the existing dam or DUC if the borrower provides evidence that (a) an effective dam safety program is already in operation, and (b) full-level inspections and dam safety assessments of the existing dam or DUC, which are satisfactory to the Bank, have already been conducted and documented.

10. Necessary additional dam safety measures or remedial work may be financed under the proposed project. When substantial remedial work is needed, the Bank requires that (a) the work be designed and supervised by competent professionals, and (b) the same reports and plans as for a new Bank-financed dam (see para. 4(b)) be prepared and implemented. For high-hazard cases involving

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significant and complex remedial work, the Bank also requires that a panel of independent experts be employed on the same basis as for a new Bank-financed dam (see paras. 4(a) and 5).

11. When the owner of the existing dam or DUC is an entity other than the borrower, the borrower enters into agreements or arrangements providing for the measures set out in paras. 8-10 to be undertaken by the owner.

### **Policy Dialogue**

12. Where appropriate, as part of policy dialogue with the country, Bank staff discuss any measures necessary to strengthen the institutional, legislative, and regulatory frame-works for dam safety programs in the country.

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1. The owner may be a national or local government, a parastatal, a private company or a consortium of entities. If an entity other than the one with legal title to the dam site, dam, and/or reservoir holds a license to operate the dam, and has responsibility for its safety, the term "owner" includes such other entity.
  2. "Bank" includes IBRD and IDA, and "loans" include IDA credits and IDA grants.
  3. For example, a water storage dam for a hydropower, water supply, irrigation, flood control, or multipurpose project; a tailings or a slimes dam for a mine project; or an ash impoundment dam for a thermal power plant.
  4. When the owner is not the borrower, the borrower ensures that the obligations of the borrower under this OP are properly assumed by the owner under arrangements acceptable to the Bank.
  5. The definition of "large dams" is based on the criteria used to compile the list of large dams in the World Register of Dams, published by the International Commission on Large Dams.
  6. [BP 4.37, Annex A](#), sets out the content of these plans and the timetable for preparing and finalizing them. In the dam safety practice of several countries, the operation and maintenance plan includes both the instrumentation plan and the emergency preparedness plan as specific sections. This practice is acceptable to the Bank, provided the relevant sections are prepared and finalized according to the timetable set out in [BP 4.37, Annex A](#).
  7. See [Guidelines: Procurement under IBRD Loans and IDA](#) (Washington, D.C., World Bank).
  8. The number, professional breadth, technical expertise, and experience of Panel members are appropriate to the size, complexity, and hazard potential of the dam under consideration. For high-hazard dams, in particular, the Panel members should be internationally known experts in their field.
  9. If the Bank's involvement begins at a later stage than project preparation, the Panel is constituted as soon as possible and reviews any aspects of the project that have already been carried out.