

# Safety of Tailings Management Facilities (TMF) Recommendations

## Scope:

The recommendations shall apply to minerals tailings and waste-rock management facilities (tailings management facilities) if they are governed by the provisions of the following directives and international agreements:

- SEVESO II Directive,
- UNECE-Convention on the Transboundary Effects of Industrial Accidents, and
- UNECE -Convention on the protection and use of transboundary watercourses and international lakes.

## Definition:

Minerals tailings and waste-rock management facilities (TMF) within the meaning of the present recommendations are facilities for the management of the residues generated at mining operations in tailings ponds.

Tailings Management Facilities include facilities for tailings and waste rock management including

- heaps of topsoil and overburden as far as these are used in tailings management and
- the parts of processing plants relevant for tailings management.

## Recommendations:

Tailings management facilities shall be inspected for the application of the **Best Available Techniques (BAT)** (according to the BREF-document MTWR of EIPPCB of July 2004) and this BAT shall be applied.

### 1. Management and risk assessment

- a) Tailings management facilities shall be operated on the grounds of a tailings and waste rock management plan.
- b) The management plan shall be based on the life-cycle management approach and include all life-cycle phases (design, construction, operation, closure, after-care).
- c) Construction phase of a tailings embankment shall take into account the design-construct process. (During construction time many conditions may change, so it is essential to maintain a flexible approach and amend the design as required.)
- d) Tailings management facilities may only be permitted if closure and after-care are compulsorily regulated.
- e) Owners and operators have specific responsibilities for their dams and the need to formulate safety management procedures. Technical and managerial approaches should be utilised to improve safety and reduce risk.
- f) The potential hazard risk of the facility shall be classified (high-hazard dam).
- g) As a result of different geological and hydro geological conditions each industrial tailings management facility shall be planned, constructed, operated and closed "Case by case" or "Site by site".

## **2. Prevention and control of hazardous substances (additional safety requirements)**

- a) Tailings management facilities shall have additional impoundments to receive the inflow from emergency outlets during the operational phase.
- b) Hazardous substances and process water shall be reused, as far as technically possible, i.e. recycling - closed-cycle use.
- c) Should it not be possible to avoid the use of hazardous substances (recycling), such substances shall be neutralised, if possible, before they are discharged into the tailings management facilities.
- d) Tailings management facilities whose tailings/ waste rock have acid rock drainage potential must have a management plan to prevent, reduce and treat acid waters generation.

## **3. Dam safety**

Dams shall be designed, constructed, raised, operated and decommissioned in such a way that sufficient safety is guaranteed in each life-cycle phase. In this context the following aspects are of particular importance:

- a) In the design, management and construction of tailings dams shall be engaged competent persons only.
- b) When planning tailings management facilities, the backfilling of tailings directly into or as closely as possible to the underground mine should have as much priority as the construction of the tailings management facility in an open pit.
- c) For tailing ponds shall be selected a place, where the consequences of failure can be reduced considerably. (Tailings can usually be transported over considerable distances relatively cheaply, so that it is a great freedom to select a site which is relatively free of constrains.)
- d) There must be sufficient emergency outlets whose sizing shall be carried out in accordance with the risk class of the dam.
- e) For the measurements in the operational phase and the closure and after-care phases a safety factor of 1.3 shall be taken account of (in particular for the stability of dams and heaps).
- f) The ground on which the dam is built and the material to be used for the pioneer dam shall be processed or selected in such a way that sufficient stability is guaranteed in each life-cycle phase. The site has to be thoroughly investigated to see if the foundation conditions are satisfactory. Information about the geotechnical properties of the foundation are an essential prerequisite for the design of the dam.
- g) The risk of a too high pore pressure inside the dam shall be regularly and compulsorily monitored and evaluated by an independent expert (structural engineer specialised in dam and heap stability) before each raise . Seepage waters shall be avoided, reduced and/or monitored.
- h) The dam raising method shall be chosen with regard to the local conditions (seismicity, tailings composition). Dams built by the upstream method are particularly susceptible to damage by earthquake shaking. (There is a general suggestion that this method of construction should not be used in areas where there is risk of earthquake.)

- i) Properly designed internal drains of suitably graded material within the downstream shoulder has to be introduced during construction, or as a toe berm, in order to avoid erosion or failure of the downstream slope as impounding levels increase.
- j) Special attention should be paid to tailing pond located in severe climate. Freezing of the downstream slope can prevent evaporation from the slope and so increase pore pressures within the body of the dam. Prolonged freezing can also cause ice lenses to form, drawing pore water towards the surface of the slope. During thaw the released water can initiate slope instability.
- k) Dam stability shall be regularly monitored with regard to maximum capacity/freeboard, pore pressure, groundwater level, functioning of the drainage system, surface water diversion, dam movements and slope stability.
- l) In the event of emergency, sufficient diversion options and additional impoundments (substitute basins) shall be available for the tailings and additional impoundments (tailings ponds) for emergency outlets.

#### **4. Inspected by authorities and independent experts in regular intervals**

- a) Monitoring by authorities shall above all embrace:
  - checking on the monitoring performed by the operator on his own responsibility,
  - verifying the extent to which monitoring by independent experts is arranged by the operator and whether orders must be issued on the basis of the monitoring findings, and
  - spot checks by the authority or checks by authorised third parties in installations.
- b) Monitoring by authorities may also be ensured by independent certified experts who, for example, check that especially important parts of the installation are in proper condition before commissioning and thereafter at regular intervals.
- c) Monitoring activities by authorities and experts should be co-ordinated in time and with regard to the monitoring tasks.

#### **5. Contingency planning and hazard control measures**

- d) A contingency planning must be available for each tailings management facility.
- e) The staff must be regularly instructed in safety aspects.
- f) Elaboration of incident scenarios for the design, construction, operation and closure of each tailings management facility.
- g) Accidents shall be reported to the competent authorities, the causes shall be identified and taken account of in the management plans and contingency planning