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Indian Standard

RECOMMENDATIONS FOR LIGHTING, VENTILATION AND OTHER FACILITIES INSIDE DAMS

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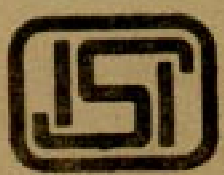

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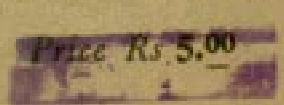

August 1980

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RECOMMENDATIONS FOR LIGHTING, VENTILATION AND OTHER FACILITIES INSIDE DAMS

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RECOMMENDATIONS FOR LIGHTING, VENTILATION AND OTHER FACILITIES INSIDE DAMS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 25 October 1979, after the draft finalized by the Dam Sections (Non-overflow) Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 This standard lays the guidelines for provision of various facilities such as lighting, ventilation, water supply, etc, inside dams so as to achieve maximum productivity coupled with high standard of safety and welfare.

0.3 Proper lighting inside dams is essential for creating good visual environment and for permitting a high degree of efficiency in seeing whatever equipment/machinery is of special importance. Lighting is considered good when it is suitable both in quality and quantity.

0.4 To cater for the requirement of fresh air inside the dam galleries which are not normally connected to outside atmosphere, provision of good ventilation system to ensure the required number of air changes is essential.

0.5 The other facilities recommended in this standard for provision inside dams include water supply, compressed air supply, drainage system, fire-fighting system, telephone system, elevators, entrance doors and first-aid.

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1. SCOPE

1.1 This standard covers the requirements of lighting, ventilation and other facilities such as water supply, compressed air supply, drainage, fire fighting, telephone system, elevators and first aid inside dams and the methods of achieving the same.

2. LIGHTING

2.1 General — Good and proper lighting is a necessity inside all dams and has certain primary requirements. Lighting installation should

provide satisfactory illumination so as to allow personnel to carry out their task without any strain on the eye. There should be spatial distribution of light. This includes the combination of diffused and directional light, the distribution of luminances, the amount of homogeneity and the amount of glare. It is necessary not only to provide a sufficient quantity of light but also ensure proper quality of light depending upon the type, location and brightness of light source. The light source should provide minimum of glare; its brightness should be kept to a low value and shall be located in such a way that it does not come within the direct line of vision. In further combating glare, good screening of light source shall be ensured. The mounting height can also help in preventing glare. The light source shall be placed higher up in order to remove the disturbing brightness as far as possible from the centre of visual field.

2.1.1 An important aspect of lighting is to select proper colour for the walls, ceiling, floor and equipment in the area so as to reduce the brightness contrasts between adjacent surfaces. In the selection of room colours, the reflection factors of the colours shall be given due consideration. Glossy paints and highly polished surfaces, especially those of metal are often a source of eye irritation and should be avoided.

2.1.2 Another important aspect of lighting is that it determines the atmosphere in a location to a larger extent that is cool, warm, pleasant, gay or sobre. Efficient lighting not only makes the space visible but its quality accentuates its character and thus becomes an integral part of the dam.

2.1.3 In the event of sudden failure of supply, it is necessary to have provision for emergency lighting, at essential points like stairways, adits cross galleries and near instruments, etc.

2.2 Illumination Levels — The general illumination levels required for various locations inside the dam are given below. Special circumstances may require higher intensities than those normally encountered inside dams. The intensities given below are the average illumination values maintained on the work plane:

Sl No.	*Description of Area*	*Recommended Illumination Level in Lux*
i)	Corridors	70
ii)	Stairways	100
iii)	Inspection and drainage galleries and tunnels	70
iv)	Equipment galleries	150
v)	Substations	150
vi)	Toilets	80
vii)	Offices/laboratories	300

2.2.1 The recommended level of illumination of emergency lighting required for various locations inside dams is of the order of 10-20 lux.

2.3 Lighting Fixtures — The illumination level is only one phase of the task of seeing. The source of the illumination flux is just as important as its density. The lighting fixtures to be provided at various locations inside the dam should be so chosen as to provide sufficient illumination on the working plane and to blend suitably with the environments. The choice of the luminairs should also be based on the total economics of the installation over a period of time including the annual costs of energy and maintenance. This means that in most cases lamps with higher luminairs efficiency and luminair meeting equal quality standards as regards glare, etc, but with higher output ratio, are more advantageous in the long run. In deciding upon the choice of the luminair, the following points are recommended to be kept in view:

a) Discharge lamps are more efficient than incandescent lamps.

b) Lamps with reflectors are more efficient than those without reflectors.

c) The higher the wattage, the more efficient is the lamp.

d) Luminairs which are easily maintained provide better utilization of light output.

2.3.1 The type of lighting fixtures generally recommended for different galleries in a dam are given at **2.3.1.1** to **2.3.1.4.**

2.3.1.1 The requirement of illumination in inspection galleries is more of a functional nature. These galleries generally have a very low ceiling height, consequently recesses are formed in the ceiling to accommodate the lighting fixtures. The spacing recommended is between 5 to 6·5 metres depending upon the height of the galleries. In case sufficient head room is not available, bulkhead fitting may be provided on the side walls.

2.3.1.2 In case of inspection and drainage galleries where the above types of recesses cannot be formed, incandescent bulkhead lighting fixtures are recommended. These are generally installed on the fillet of the galleries so that walls or ceilings do not remain dark.

2.3.1.3 In galleries which are frequently in use, such as visitors galleries, fluorescent light fixtures in recesses are recommended. The lighting fixtures can be with either perspex cover or with polystyrene louvres.

2.3.1.4 For equipment galleries, industrial type fluorescent lighting fixtures or bulkhead lighting fixtures are recommended. The fluorescent

lighting fixtures are installed on the ceiling. The bulkhead lighting fixtures can also be installed on the walls.

2.4 Wiring — All wiring shall be in conduits. The joints shall be made in junction boxes provided for the purpose through porcelain connectors. Screws in the porcelain connectors shall be kept tight and smeared with plastic compound to prevent entry of moisture. Temporary connections, straps or wires shall be made good as far as possible. Untidy porcelain connectors with loose screwed connections are a potential source of trouble and should be avoided.

2.5 Additional plug points may be provided in the galleries for special lighting requirements.

3. VENTILATION

3.1 General — Galleries inside dams are not adequately connected to outside atmosphere. It is, therefore, necessary to provide positive means of ventilation in the galleries. Ventilation is required for supplying fresh air, diluting inside air vitiated by body odours, relief of dampness, removing contaminants in air, if any, and providing thermal environments for maintaining heat balance of the body for comfort of working personnel in the galleries.

3.2 Recommended Values for Air Changes — Requirement of fresh air supply to the galleries may be very small as the number of occupants is usually very low. A minimum of two air changes per hour may be provided (a change per hour means that quantity of air equivalent to the total volume of galleries is supplied to and exhausted from the galleries each hour). However, for lavatories, a minimum of six air changes per hour should be provided.

3.3 Mechanical Ventilation — As the volume of air to be supplied to and exhausted from galleries is large, means of mechanical ventilation may be provided. Mechanical ventilation can be effected either by exhaust of air or by positive ventilation or combination of the two. In case exhaust method cannot be applied to the galleries, because of their layout the air should be supplied into the galleries by centrifugal or axial fans through ducting.

3.3.1 Selection of the fans shall be made after calculating the head required (in cm of water) to overcome the resistance in the duct system and by the characteristics of the fans. Air intake openings shall be provided with storm proof louvers and screens.

3.3.2 Where temperature and humidity control is required inside the galleries, air-conditioning/dehumidification may be resorted to.

4. WATER SUPPLY

4.1 General — Adequate water supply should be provided inside the dam for drinking purposes and for various service utilities such as cooling, flushing, fire-fighting, grouting, flushing of choked pipes, etc (*see* IS : 1172-1971*). The water supply facility can be divided into two categories given in **4.2** and **4.3**.

4.2 Service (Raw) Water Supply — It is provided to meet the requirements of various equipment and for maintenance and cleanliness purposes inside the dam. For the supply, pipelines of at least 50 mm diameter should be provided. Location of pipelines should be such that there is no obstruction to normal working. Service water pipelines should have tappings with valve and suitable hose connections, normally spaced at 15 metres. In case filteration/treatment arrangements are provided inside the dam, only one main line for raw and fresh water is recommended.

4.3 Drinking (Fresh/Treated) Water Supply — To cater for requirements of drinking water for personnel working inside the dam, a supply-line of at least 40 mm diameter should be provided. This pipeline shall be of galvanized iron or PVC. It should run in the galleries along with the service water and compressed air pipelines. Drinking water connections are provided on this line at suitable locations.

4.4 Sanitary Arrangements — Toilet facilities including wash basins and urinals, where required, should be provided at suitable locations to serve the personnel working inside the dam. Sewerage and waste water from all these facilities should be collected through a well laid out system of sanitary drains and carried to a septic tank provided for the purpose. Digestive sludge should be disposed of by sludge pumps. Alternatively, chemical toilets with proper disposal of waste may be provided.

5. COMPRESSED AIR SUPPLY

5.1 Compressed air supply is required in dam galleries for maintenance work such as grouting, flushing of chocked pipes, etc. To meet these requirements, pipes at least 50 mm diameter should be provided. The layout of the pipelines should be such that they do not cause any obstruction to the normal working inside the dam. Moisture traps should be provided at suitable locations for draining the condensed water.

5.2 Compressed air piping is usually left finished at the entrance of the gallery which is at ground level and has connection with approach road. In case of necessity, a portable compressor is brought there and hooked

*Code of basic requirements for water supply, drainage and sanitation (*second revision*).

to the piping. Alternatively, compressed air piping may be connected to an independent compressed air system, capable of delivering a minimum pressure of 5·5 kg/cm^2 at the terminal point.

5.3 Compressed air pipings should have tappings with valve and suitable hose connections in the galleries, normally spaced 15 metres. The tappings on the compressed air and the raw water supply lines may be located side by side to facilitate certain operations.

6. DRAINAGE SYSTEM

6.1 For details of drainage system reference may be made to Indian Standard Code of practice for drainage system for gravity dams (*under preparation*).

7. FIRE FIGHTING SYSTEM

7.1 In order to meet any eventuality of fire breaking out inside the dam, provision of fire fighting equipment should be made in the galleries. For this purpose fire hose cabinets containing fire hose, nozzles and couplings should be provided at suitable places inside the dam. These may be connected to the hose connection point provided in the service water piping in case of need. Particular attention should be paid for this facility in equipment galleries where the chances of fire are relatively more. In addition, portable fire extinguishers of requisite capacity shall also be provided at suitable places in the galleries.

8. TELEPHONE SYSTEM

8.1 To provide local communication between various parts of the dam and outlying structures and for quick and reliable communication between various personnel working at key points in and around the dam to save considerable time and energy in operation, maintenance and repair of equipment installed inside the dam, a suitable telephone system shall be provided.

9. ELEVATORS

9.1 Elevators of suitable capacities in dams having galleries at various elevations should be provided to cater for personnel and equipment in the dam. For dams below 30 m height elevators may not be provided.

10. ENTRANCE DOORS

10.1 Suitable entrance doors where necessary should be provided at the entrance to the gallery and various other key points for security reasons.

11. FIRST-AID

11.1 First-aid facility should be available inside the dam.

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Members	*Representing*
SUPERINTENDING ENGINEER (MD)	Irrigation Department, Government of Maharashtra, Bombay
SHRI G. N. TANDON	Irrigation Department, Government of Uttar Pradesh, Lucknow
SHRI P. R. TONGAONKAR	In personal capacity (*Shirish Co-operative Housing Society, Veer Savarkar Marg, Bombay 400016*)
SHRI C. R. VENKATESHA DR C. RAJ KUMAR (*Alternate*)	Cement Research Institute of India, New Delhi

INDIAN STANDARDS

ON

DAMS

IS:

4410 Glossary of terms relating to river valley projects:
(Part VIII)-1968 Dams and dam section
(Part IX)-1968 Spillways and siphons

4997-1968 Criteria for design of hydraulic jump type stilling basins with horizontal and sloping apron

5186-1969 Criteria for design of chute and side channel spillways

6512-1972 Criteria for design of solid gravity dams

6934-1973 Recommendations for hydraulic design of high ogee overflow spillways

6955-1973 Code of practice for subsurface exploration of earth and rockfill dams

7365-1974 Criteria for hydraulic design of bucket type energy dissipators

7894-1975 Code of practice for stability analysis of earth dams

8237-1976 Code of practice for protection of slope for reservoir embankments

8414-1977 Guidelines ford esign of underseepage control measures for earth and rockfill dams

8605-1977 Code of practice for construction of masonry in dams

8826-1978 Guidelines for design of large earth and rockfill dams