

**19. Operating and Maintenance Data.** Operation and maintenance items include: conditions that may cause operation and maintenance problems, facility requirements for operation and maintenance personnel, periods when the facilities will be operated, monitoring and control requirements, communications requirements, requirements for preparation of Designers' Operating Criteria and availability of operation and maintenance personnel and equipment. Operation and maintenance data does not include data required for design of the facilities such as: flows, water surface elevations, electrical data, public facilities, fire protection and fencing, etc. The following design data items may be required for either feasibility (if data would materially affect cost or design) or specifications level designs:

**A. Operation Considerations:**

- (1) Plan of operation for facilities (canals, pipelines, powerplants, and pumping plants, etc.).
- (2) Comprehensive Regional operating scheme, including integration with any such scheme.
- (3) Responsible organization(s) for operating and maintaining facilities.
- (4) Description of initial operation and maintenance requirements and possible future operation and maintenance requirements for project facilities.
- (5) Portion of year structures should be designed to operate.
  - (a) Periods of shutdown (such as seasonal). Give conditions during shutdown, such as: unattended, winter maintenance, and needs for station power.
  - (b) Dates of irrigation season or when demand needs to be met.
- (6) Data on allowable outage times based on operation and maintenance requirements.
- (7) Filling and draining criteria (reservoirs, pipelines, canals) for operation and maintenance.
- (8) Special reliability requirements.
- (9) Self sustainability requirements – minimum or no maintenance requirements.
- (10) Personnel availability:
  - (a) Will facilities be operated by a part time or full-time resident caretaker?

- (b) Capabilities of existing O&M workforce.
  - (c) Intervals when operation and maintenance forces are expected to be on site (e.g., hours per day for plant staffing: 24 hours a day, 8 hours a day, once a day, once a week).
  - (d) Number of operations and support personnel which are anticipated to be available at the facilities.
- (11) Requirements for lighting for night operation or security purposes including requirements for temporary or permanent facilities (e.g. areas where visual monitoring may be required for water surface levels, leakage, or proper position or operation of equipment.).
  - (12) Recommendations on whether gate hoist equipment, controls, and measuring devices should be indoor or outdoor types.

**B. Access for Maintenance:**

- (1) Requirements for providing permanent access to the facilities for operation and maintenance. Include any limiting requirements imposed on private roads for public access/haul roads.
  - (a) Need for O&M roads on or along canal banks.
  - (b) Vehicle or boat access requirements for maintenance.
- (2) Requirements for providing permanent access to a tunnel or adit portal for operation and maintenance purposes and special requirements for transport of Government personnel in and out of tunnel.

**C. Monitoring and Control Requirements:**

- (1) Requirements for flow controls, flow measurement, water level measurement, and pressure measurement instrumentation. Include smallest and largest flows and pressures to be controlled and/or measured; degree of automation of controls.
- (2) Requirements for voice and data communications between the supervisory master station and the remote facilities.
- (3) For facilities located on open reservoirs and open channels (canals and rivers). Details of required downstream control sections, water measuring devices, gauging stations, or other operating equipment.
- (4) Use of automatic controls such as automatic pump restart after power failure; installation of alarms, warning devices, etc.

**D. Trash, Sediment, and Ice Considerations:**

- (1) Types and quantities of trash (including terrestrial and aquatic weeds, algae, etc.) anticipated at the plant intake;
- (2) Locations of trash-disposal areas. The suggested disposal sites should be able to meet requirements of either State or EPA for discharge of pollutants. Include items such as:
  - (a) Debris, biomass, aquatic weeds, sediment, and sludge.
  - (b) Spent chemicals from pretreatment and desalting cleaning and storage solutions.
- (3) Anticipated growth of algae in the channel and of other water-loving plants or weeds along banks.
- (4) Recommend methods of cleaning, trash handling and disposal and anticipated problems and delineation of disposal areas.
- (5) Potential for sediment deposition and disruption of operations. Discuss potential methods for sediment removal.
- (6) For facilities such as fish ladders and canals which are operated in subfreezing weather; minimum temperatures, lengths of time freezing may occur, average and maximum ice depths, conditions to be anticipated as to alternative freezing and thawing, and probability of facility drifting full of snow
- (7) Recommended or preferred provisions for sediment and ice control.
- (8) Possible utilization of residue such as reclaiming chemicals, etc.

**E. Type of Maintenance Equipment and Machinery Contemplated Including:**

- (1) Screens which are required to prevent disruption of operations by debris.
- (2) Equipment which is required to remove and dispose of debris.
- (3) Requirements for permanent equipment handling capabilities (e.g. overhead cranes, gantry cranes, monorail hoists, jib cranes, etc.) or use of a mobile truck for equipment handling.

**F. Operation and Maintenance Requirements for Space and Buildings; Include Size and Location Requirements:**

- (1) Recommendation on whether plant should be indoor or outdoor structure.

- (2) Availability of or need for permanent buildings for operating and maintenance personnel and functions (such as a remote control station) to be controlled from the buildings. Include locations of buildings.
- (3) Availability of repair shops (plant equipment, gate and control equipment) in vicinity
- (4) Recommendation as to inclusion of major or minor machine shop or service area in the plant.
- (5) Where a service area or machine shop is specified in a plant, furnish floor area requirements, and the name and size of machine tools, benches required, and need for welding booths.
- (6) Housed and open O&M storage requirements at the site; offsite storage provided; existing storage space and facilities.
- (7) Office and file space requirements

**G. Post Construction Monitoring and Evaluation Requirements (Often Required for Fishery and Wetlands Type Facilities):**

- (1) Facilities required for evaluation and monitoring.
- (2) Base line standards for evaluation and standards by which to measure progress.
- (3) Anticipated adaptive management requirements if any (e.g., for habitat areas if initial plantings or environment are inadequate and require follow-up remedial work).
- (4) Self sustainability requirements – minimum or no maintenance requirements.

**H. Powerplants:**

- (1) Nature of operations, i.e., whether baseload, peaking or seasonal.
- (2) Need for operation when isolated from power system, and including need for black-start (ability to start a unit without system power capability), particularly for small hydroplants.

**I. Tunnels:**

- (1) Recommended or preferred personnel or equipment access requirements including locations.
- (2) Special exhaust, heating, ventilating, or air-conditioning requirements.