

# FLOODPROOFING NON-RESIDENTIAL STRUCTURES

For 'SEEPAGE' description see page 191, (attached)





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### 3. CRITERIA 3 - SCOUR AND DEBRIS ACCUMULATION

The following provisions apply to facilities that may be subjected to flow velocities in excess of 5 fps, and/or floating debris content.

**a) Elevation on Posts, Piles, Piers or Walls.** Structures elevated on posts, piles, piers or walls or other similar supports should have clear spacing of support members, measured perpendicular to the general direction of flood flow of not less than eight (8) feet apart at the closest point. The supports should, as far as practicable, be compact and free from unnecessary appendages which would tend to trap or restrict free passage of debris during a flood. Solid walls, or walled-in columns are permissible if oriented with the longest dimension of the member parallel to the flow. Bracing, where used to provide lateral stability should be of a type that causes the least obstruction to the flow and the least potential for trapping floating debris. The potential of surface scour around the supports should be recognized and protective measures provided.

**b) Watertight Structures and Floodwalls.** Watertight structures and floodwalls should be sited and/or designed to resist undermining of foundation elements as a result of scour and increased structural loads associated with extensive debris accumulation.

**c) Levees and Elevation on Fill.** Levees and elevated fill areas should be designed to resist the effects of scour. For slopes exposed to flood velocities of less than 5 fps, grass or comparable vegetation may be used to provide adequate protection from scour. For areas subject to higher velocities, stone, concrete or some other durable material shall be used to prevent excessive scour.

**d) Commentary.** Protection against scour may include paving or riprapping of foundations, levees or earthfill areas. Consideration should also be given to landscaping features or the construction of flood flow diverters or barriers near the upstream side of the structure to reduce flood velocities and the associated impacts of scour and debris accumulation.

### 4. CRITERIA 4 - PERMEABILITY AND STORM DRAINAGE

**a) Watertight Structures.** Buildings and associated structures that are protected from the Design Flood by permanent closures, flood shields and related techniques must remain substantially impermeable to water. This requirement applies to the total structure including walls and floors that are below grade elevation. Slight seepage may be allowed in cases where resulting damages would be negligible, and where seepage can be easily collected at a sump and pumped out of the structure. Acceptable seepage rates should not exceed an amount which would result in accumulation of more than four (4) inches of water depth during a 24-hour period, if there were no devices provided for its removal. However, sump pumps would be required to control such seepage.

**b) Floodwalls and Levees.** Floodwalls and levees should be designed and constructed to minimize seepage through or under the structure during a Design Flood event. Provisions should also be made to collect all seepage and storm water that collects behind the levee or floodwall and pump this water from the dry to the wet side of the structure.

**c) Commentary.** To meet the requirements stated in item b, watertight construction must incorporate the following minimum design considerations:

- All expansion and construction joints shall be constructed with appropriate waterstops and joint sealing material. To prevent excess seepage at these tension zones, the maximum deflection of any structural floor slab or exterior wall shall not exceed 1/500 of its shorter span.
- Structure design may include the use of impervious barriers or cutoffs around the building perimeter to decrease the potential for the development of full hydrostatic uplift pressures and related seepage. These cutoffs must be connected to the impervious membrane of the building walls to operate effectively.