

6.6 Extended Detention Basin



Figure 6-24: Extended Detention Basin. Photograph courtesy of Bill Southard (DES Architects and Engineers)

Best uses

- Detain low flows
- Can be expanded to detain peak flows
- Sedimentation of suspended solids
- Sites larger than 5 acres

Advantages

- Easy to operate
- Inexpensive to construct
- Treatment of particulates
- Low maintenance

Limitations

- Storage area available
- Moderate pollutant removal

Extended detention ponds (a.k.a. dry ponds, dry extended detention basins, detention ponds, extended detention ponds) are basins whose outlets have been designed to detain the stormwater runoff from a water quality design storm for some minimum time (e.g., 48 hours) to allow particles and associated pollutants to settle. Unlike wet ponds, these facilities do not have a permanent pool. They can also be used to provide flood control by including additional flood detention storage above the treatment storage area.

Beginning December 1, 2011, projects will no longer be allowed to meet stormwater treatment requirements with stand-alone extended detention basins that are designed to treat stormwater through the settling of pollutants and gradual release of detained stormwater through an orifice. However, this type of extended detention basin could be used as part of a treatment train, in which the basin stores a large volume of water, which is gradually released to a bioretention area that meets the new MRP requirements for biotreatment soils and surface loading area.

Design and Sizing Guidelines

TREATMENT DIMENSIONS AND SIZING

- Extended detention basins shall be sized to capture the required water quality volume over a 48-hour period. At least 10 percent additional storage shall be provided to account for storage lost to deposited sediment.
- Extended detention basin shall have no greater than 3:1 side slopes.
- The optimal basin depth is between 2 and 5 feet.
- A safety bench shall be added to the perimeter of the basin wall for maintenance when basin is full.

C.3 STORMWATER TECHNICAL GUIDANCE

- Extended detention basin shall empty within five days of the end of a 6-hour, 100-year storm event to avoid vector generation.
- A 12-foot wide maintenance ramp leading to the bottom of the basin and a 12-foot wide perimeter access road shall be provided. If not paved, the ramp shall have a maximum slope of 5 percent. If paved, the ramp may slope 12 percent.
- The extended detention basin shall have a length to width ratio of at least 1.5:1.
- A fixed vertical sediment depth marker shall be installed in the sedimentation forebay. The depth marker shall have a marking showing the depth where sediment removal is required. The marking shall be at a depth where the remaining storage equals the design water quality volume.
- The detention basin is a volume-based treatment measure and requires detention time to be effective. The basin shall not empty more than 50% of its treatment volume in less than 24 hours to ensure treatment of runoff.

INLETS TO TREATMENT MEASURE

- The inlet pipe shall have at least 1 foot of clearance to the basin bottom.
- Piping into the extended detention basin shall have erosion protection. As a minimum, a forebay with a 6-inch thick layer of Caltrans Section 72, Class 2 rock slope protection shall be placed at and below the inlet to the extent necessary for erosion protection.
- Check with municipality regarding trash screen requirements. Trash screen installation may be required upstream of the pipe conveying water into the pond, in order to capture litter and trash in a central location where it can be kept out of the pond until it is removed.

OUTLETS AND ORIFICES

- The outlet shall be sized with a drawdown time of 48 hours for the design water quality volume. The outlet shall have two orifices at the same elevation sized using the following equation:

$$a = (7 \times 10^{-5}) * A * (H - H_o)^5 / CT$$

Where:

- a = area of each orifice in square feet
- A = surface area of basin at mid-treatment storage elevation (square feet)
- H = elevation of basin when filled by water treatment volume (feet)
- H_o = final elevation of basin when empty (bottom of lowest orifice) (feet)
- C = orifice coefficient (0.6 typical for drilled orifice)
- T = drawdown time of full basin (hours)

(Caltrans Method, Appendix B, Stormwater Quality Handbook, September 2002)

- The orifices shall each be a minimum diameter of 1 inch. Extended detention basins are not practical for small drainage areas because the minimum orifice diameter cannot be met.
- Each orifice shall be protected from clogging using a screen with a minimum surface area of 50 times the surface area of the openings to a height of at least 6 times the diameter. The screen shall protect the orifice openings from runoff on all exposed sides.
- For each outlet, documentation shall be provided regarding adequacy of outlet protection, and a larger stone size may be necessary depending on the slope and the diameter of the outfall.

VEGETATION

- Plant species should be adapted to periods of inundation. See planting guidance in Appendix A.
- Use integrated pest management (IPM) principles in the landscape design to help avoid or minimize any use of synthetic pesticides and quick-release fertilizer. Check with the local jurisdiction for any local policies regarding the use of pesticides and fertilizers.
- Irrigation shall be provided as needed to maintain plant life.
- If vegetation is not established by October 1st, sod shall be placed over loose soils. Above the area of inundation, a 1-year biodegradable loose weave geofabric may be used in place of sod.

SOIL CONSIDERATIONS

- If the groundwater level is within 10 feet of the ground surface, a liner shall be provided.
- Beginning December 1, 2011, if the extended detention basin is designed to meet biotreatment requirements, soils in the area of inundation within the facility shall meet biotreatment soil specifications approved by the Regional Water Board (see Appendix K), The minimum percolation rate for the biotreatment soil is 5 inches per hour. Long-term desired maximum infiltration rate is 10 inches per hour, although initial infiltration rate may exceed this to allow for tendency of infiltration rate to reduce over time.
- Beginning December 1, 2011, if extended detention basin is designed per biotreatment requirements, the surface area shall be no smaller than what is required to accommodate a 5" per hour stormwater runoff surface loading rate. A combination flow and volume design basis, described in Section 5.1, may be used.
- Beginning December 1, 2011, if the extended detention basin is NOT designed to meet biotreatment requirements, it cannot function as a stand-alone treatment measure and may only be used as part of a treatment train, followed by a biotreatment measure.

MAINTENANCE CONSIDERATIONS FOR ALL TREATMENT MEASURES

- A Maintenance Agreement shall be provided.
- Maintenance Agreement shall state the parties' responsibility for maintenance and upkeep.
- Prepare a maintenance plan and submit with Maintenance Agreement. Maintenance plan templates are in Appendix G.

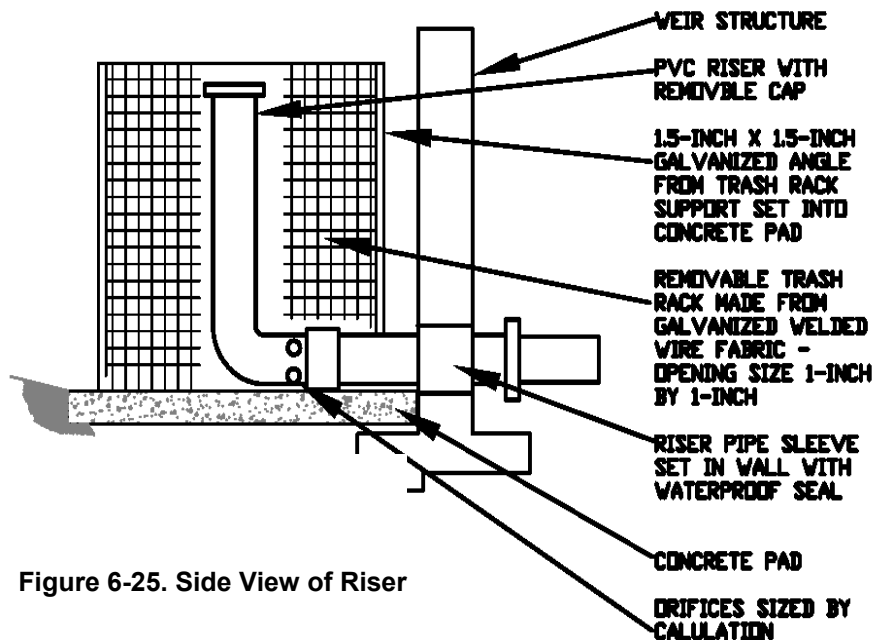


Figure 6-25. Side View of Riser

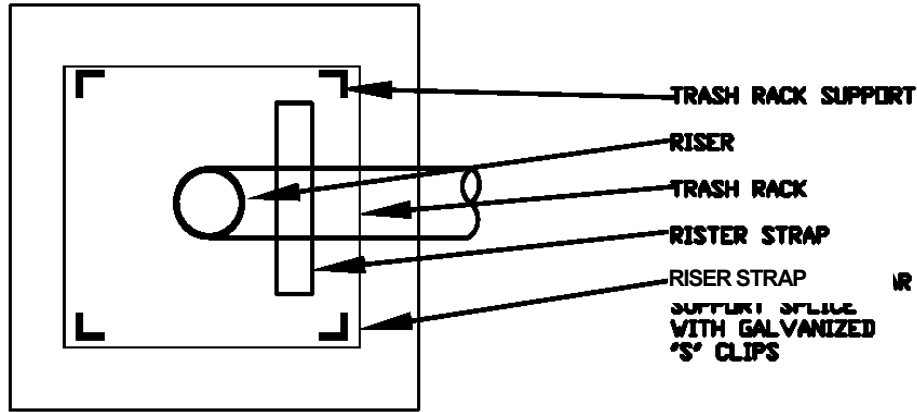
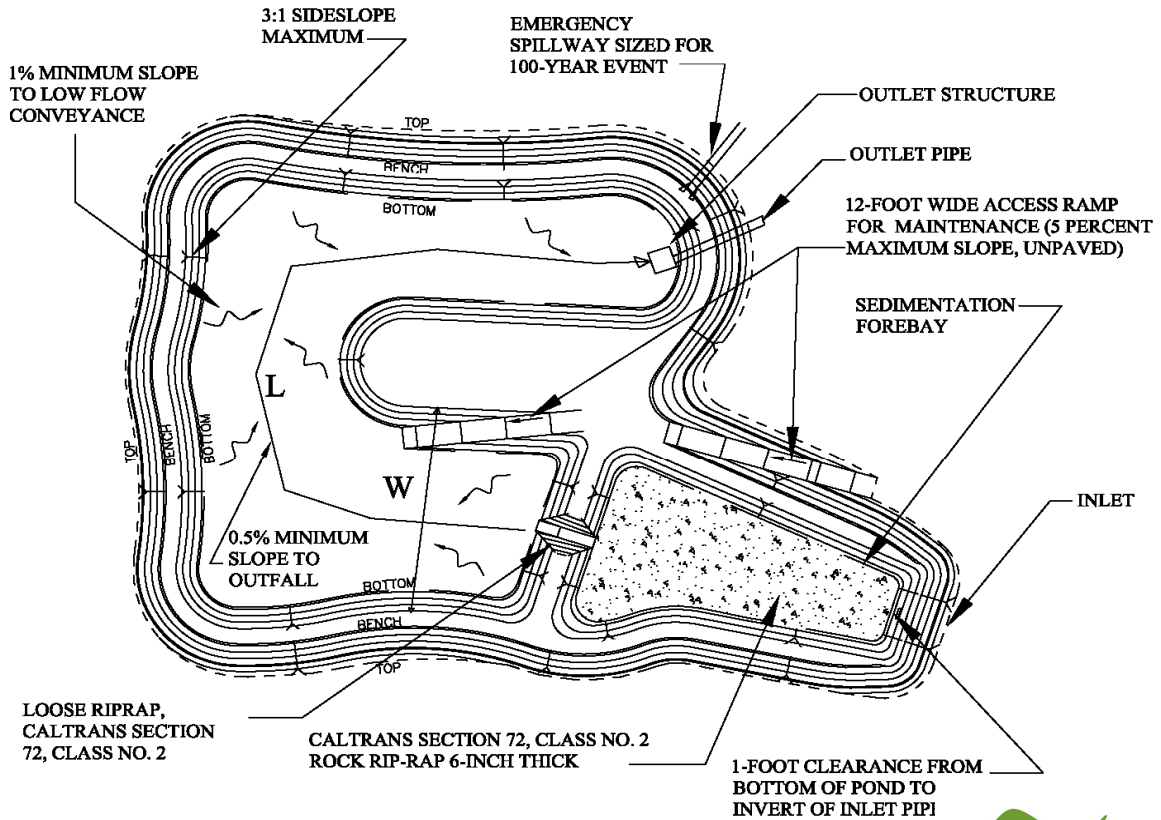


Figure 6-26. Top View of Riser (Square Design)



NOTES:
 LENGTH (L) SHALL BE AT LEAST 1.5 TIMES
 THE WIDTH (W)

Figure 6-27. Plan View, Typical Extended Detention Basin

