

Cost Analysis Comparison: Dry vs Wet Floodproofing Technologies

DRY FLOOD PROOFING SCENARIOS

Scenario 1D

- 5000 sq. ft. full height enclosed space with a concrete slab with concrete walls used to resist water.
- Two – 12 ft. wide vehicle entry doors
- Two – 3 ft. wide personnel doors

This becomes a dry flood proofing solution when the walls resist the water and flood barriers are used across the door openings, also to resist water. In addition, walls must be coated or protected to prevent water leakage through the wall, and a water collection system is required to collect water that infiltrates through or under the exterior wall.

	No. of units	Unit Cost	Total Cost
Scenario 1D			
4" concrete slab	5000 sq. ft.	\$3.56	\$17,800
6" concrete wall with reinforcing steel	1500 sq. ft.	\$12.95	19,423
Footing – 4' wide x 1' thick x 300' long	44 cubic yd.	\$236	10,488
12' wide x 5' high flood barrier – bolt-in-place	120 sq. ft.	\$100	12,000
3' wide x 5' high flood barrier – bolt-in-place	30 sq. ft.	\$100	3,000
Waterproofing	1500 sq. ft.	\$0.86	1,290
Helical anchors – 60,000 # uplift capacity	21	\$1200	25,200
Sump pump w/ electric, piping and interior drain	1	\$1100	1,100
Total – Scenario 1D			\$90,301

Scenario 2D

- 5000 sq. ft. crawlspace.
- Floor system attached at the top of the wall is assumed to be wood.
- Two crawlspace hatches in the walls of crawlspace.
- Opening sizes are assumed to be 4 sq. ft. each.

In order to ensure that flood water does not enter the interior of the crawlspace, walls must be coated or protected to prevent water leakage and a water collection system must collect water that infiltrates through or under the wall. This scenario also requires a concrete slab on the floor of the crawlspace in order to keep water from infiltrating under the footing and up through the soil.

Scenario 2D			
4" concrete slab	5000 sq. ft.	\$3.56	\$17,800
4" concrete wall with reinforcing steel	1500 sq. ft.	\$12.24	18,365
Footing – 2' wide x 1' thick x 300' long	33 cubic yd.	\$236	7,866
2' wide x 2' high flood barrier – bolt-in-place (2)	8 sq. ft.	\$100	800
Waterproofing	1500 sq. ft.	\$0.86	1,290
Helical anchors – 60,000 # uplift capacity	24	\$1200	28,800
Sump pump w/ electric, piping and interior drain	1	\$1100	1,100
Total – Scenario 2D			\$76,021

WET FLOOD PROOFING SCENARIOS

Scenario 1W

- 5000 sq. ft. full height enclosed space (same as 1D above)
- Two – 12 ft. wide vehicle doors
- Two – 3 ft. wide personnel doors

Exterior walls unreinforced concrete masonry units coated with a protective covering to allow for easy clean up after a flood. Thirteen (13) ICC-ES certified engineered flood vents in the walls allow floodwater to enter and exit the floor space. No need for water collection system.

Scenario 1W			
4" concrete slab	5000 sq. ft.	\$3.56	\$17,800
6" CMU unreinforced walls	1500 sq. ft.	\$7.60	11,400
Footing – 2' wide x 1' thick x 300' long	22 cubic yd	\$236	5,244
Flood vents from pre-approved manufacturer	13	\$393.84	5,120
Urethane for CMU walls	3000 sq. ft.	\$0.86	2,580
Total – Scenario 1W			\$42,144

Scenario 2W

5000 sq. ft. crawlspace (same as 2D above) Instead of the crawlspace hatches with flood barriers in the dry flood proofing scenario. In this case, thirteen (13) ICC-ES certified flood vents in the crawlspace walls allow flood water to enter and exit.

Floor of the crawlspace is covered with 6 mil polyethylene to reduce moisture migration into the wood floor above. Need for the concrete floor and water collection system is eliminated.

Scenario 2W			
6" CMU unreinforced walls	5000 sq. ft.	\$7.60	11,400
Footing – 2' wide x 1' thick x 300' long	22 cubic yd	\$236	5,244
Flood vents from pre-approved manufacturer	13	\$393.84	5,120
6 mil poly vapor barrier	5000 sq. ft.	\$0.16	800
Urethane for CMU walls	3000 sq. ft.	\$0.86	2,580
Total – Scenario 2W			\$25,144

DESIGN NOTES FOR DRY FLOOD PROOFING

Note that in order to provide dry floodproofing protection, a number of features were necessary, including:

- Reinforced concrete designed to resist the hydrostatic pressure of the water on the outside of the walls so the interior remains completely dry.
- Coated walls to prevent moisture migration
- Water leakage collection system to remove water seeping through cracks in walls and under interior slab
- Exterior walls reinforced with ½" diameter reinforcing steel spaced 12" on center in both the horizontal and vertical directions.
- Scenario 1D, wall treated as a cantilever wall where the reinforcement between the wall and the footing resists the tendency to overturn that occurs when the wall is resisting the lateral load from water.
- Footing is reinforced concrete, 4 ft. wide to resist overturning when the wall is supporting the full design flood depth.
- Scenario 2D, 4" concrete wall supported at the top with assumed wood floor system, acting like simple beam spanning between the footing and the floor support. Reduces the bending moment in the wall and thickness of concrete.
- Resistance to building buoyancy (significant for 5 ft. of water depth) is resisted with helical anchors of 60,000 lb. of uplift resistance capacity per anchor. Helical anchors selected, because other option is over 300 cubic yards of concrete required to provide this resistance (nearly 1.75 ft. thick over the 5000 sq. ft. area).
- Allowance has been made for water proofing membrane, sump pump, water collection perimeter drain system, and power for the pump and piping.
- Flood barriers: Set of barriers manually installed by lifting shields into place and bolting the shields to permanently attached brackets. Other option would be automatically deployed barrier but installed cost and necessary concrete pit were prohibitive at estimated \$40,000.