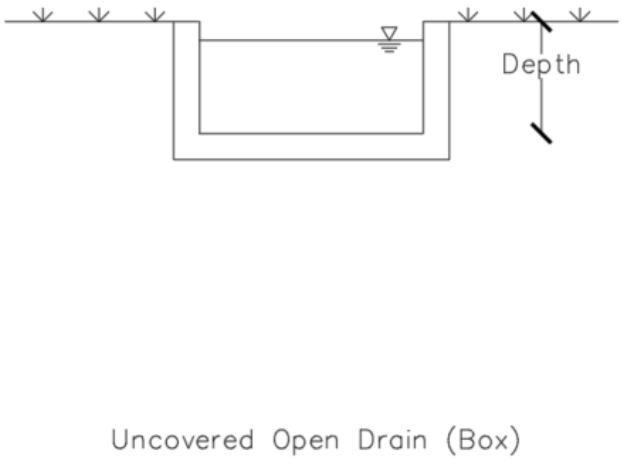
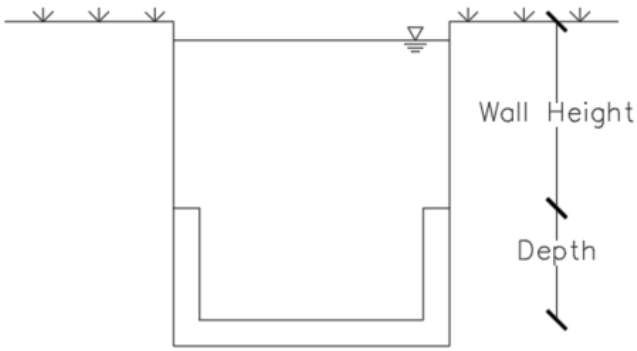
Include Wall Height Option

Drain · https://mes100.com/docs/include-wall-height-option/

Wall height refers to the extra depth from the top of the precast drain to the ground surface. In other words, it is an additional non-precast portion of wall height of the drain caused by a lowered invert level (IL).



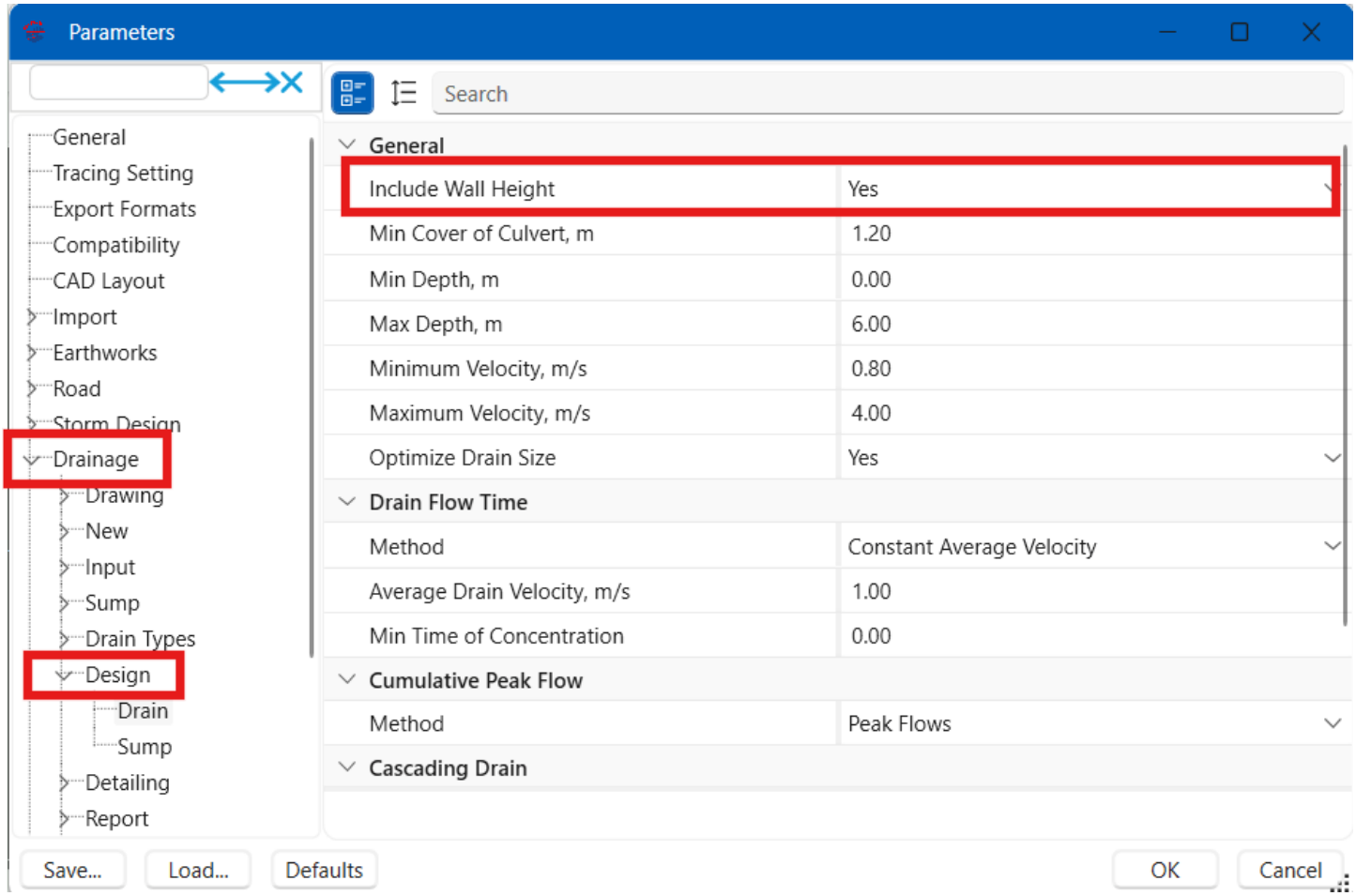
Uncovered Open Drain (Box)



Uncovered Open Drain (Box)

This option applies only to precast and open drain, and it has no effect on cast in situ drain (e.g.: Half-round, block drain, etc) and closed conduit (e.g.: pipe culvert, box culvert, etc). For cast in situ drain, you may refer here.

Users can choose to include wall height in the analysis and design calculation by toggling the option in Project Settings.



Options > Project Settings > Drainage > Design > Drain > Include Wall Height

Comparison:

Sample file: Exclude Wall Height

Sample file: Include Wall Height

Take example on Drain 1 calculation in the project files.

	Exclude Wall Height	**Include Wall Height**
Manning coefficient, n	0.013	0.013
Slope, S (1/x)	1/200	1/200

Depth, H (mm)	300mm	= 300 + 459 (extra wall height) = 759mm
Width, W (mm)	600mm	600mm
Freeboard, fb (mm)	50mm	50mm
Cross Sectional Area, A (m2) A = W x [H - fb]	= 0.6 x [0.3 - 0.05] = 0.15m2	= 0.6 x [0.459 + 0.3 - 0.05] = 0.425m2
Wetted Perimeter, P (m) P = W + 2 [H - fb]	= 0.6 x 2 [0.3 - 0.05] = 1.10m	= 0.6 x 2 [0.459 + 0.3 - 0.05] = 2.018m
Hydraulic Radius, R (m) R = A/P	= 0.15 / 1.1 = 0.136m	= 0.425 / 2.018 = 0.211m
Velocity, V (m/s) V = 1 / n . R^2/3 . S^1/2	= 1 / 0.013 x 0.136^2/3 x 1/200^1/2 = 1.44m/s	= 1 / 0.013 x 0.211^2/3 x 1/200^1/2 = 1.93m/s
Drain Flow Capacity (m3/s) Q = AV	= 0.15 x 1.44 = 0.216m3/s	= 0.425 x 1.93 = 0.819m3/s



Wall height (From drain invert level to Ground Level) = 0.759m

From the comparison, when wall height is included in the design calculation, the cross sectional area (A), wetted perimeter (P) and hydraulic radius (R) will increase. Therefore, the velocity and flow capacity will eventually increase. In addition, including wall height can increase the storage volume, since it can account for temporary detention and delays the timing of overflow.

When wall height is excluded, the effective depth is only the precast depth. When wall height is included, the extra height will be taken as part of the conveyance section, increasing both flow and storage parameters in the hydraulic model.

Significance of Including Wall Height Option in Design

Say a precast drain dimension of 300mm depth placed at a depth of 500mm below ground level. This 500mm additional depth can act like an extra freeboard before stormwater overtops/ floods the surrounding area.

Including wall height in drainage design can ensure:

1. As a protection against overflow during storm events exceeding the design capacity
2. Prevent flooding and erosion due to the extra freeboard
3. Provide additional storage capacity for temporary stormwater detention while functioning as conveyance system at the same time

When should we include the wall height, or not?

It is ultimately the call for the civil engineers. You have to decide whether the extra depth that you encase your drain into the soil possess enough capacity to hold the water discharge. If the extra depths are purely just mud and/or soil, then those extra capacities incurred are not usable because you can't hope that they can transport the water.

On the other hand, if the extra depths are concrete cast in situ, then they can be considered as a part of the drain, as they can be counted on to transport the stormwater.

Related



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I'm the Benevolent Dictator for Life for MiTS Software cum Editor of this website. Read more here.

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