

SOAKAGE PIT SIZING DESIGN GUIDELINES:

DESIGN CRITERIA:

- THE TOTAL VOLUME OF RUNOFF FROM THE CATCHMENT AREA TO THE SOAKAGE PIT SHOULD BE CALCULATED USING A 1 IN 5 YEAR 12 HOUR DURATION ARI DESIGN STORM.
- RUNOFF VOLUME TO BE DETERMINED BY APPLYING COMBINED EQUIVALENT CATCHMENT AREA WITH DESIGN RAINFALL DEPTH (SEE TABLE BELOW).
- THE ENGINEER SHALL DETERMINE APPROPRIATE PROPORTIONS CONTRIBUTING IMPERVIOUS AND PERVIOUS AREAS.
- THE SOAKAGE PIT IS REQUIRED TO EMPTY FROM FULL LESS THAN 50% VOLUME WITHIN 24 HOURS OF THE STORM EVENT.
- NO SURFACE WATER IS TO RESULT FROM A 1 IN 5 YEAR 12 HOUR ARI STORM EVENT (IE. CONTAINED WITHIN SOAKAGE PIT).
- MAXIMUM ROADWAY FLOODING IS 150mm DEPTH AND IS TO BE CONTAINED WITHIN THE ROAD KERB AND CHANNEL FOR A 1 IN 10 YEAR 24 HOUR ARI STORM EVENT.
- NO ENCROACHMENT WITHIN 300mm OF ANY HABITABLE OR NON HABITABLE FLOOR LEVEL RESULTING FROM THE INUNDATION BY A 1 IN 100 YEAR 24 HOUR ARI STORM EVENT.

EQUATIONS: $I = (\text{Equiv. } A_i + \text{Equiv. } A_p)R$, $O = a_{50}fD$, $S = I - O$, $t_{50} = \frac{0.5S}{a_{50}f}$

WHERE:

- I = INFLOW DRAINED TO SOAKAGE PIT FROM STORM EVENT (m³),
- A_i = IMPERVIOUS AREA (m²),
- A_p = PERVIOUS AREA (m²),
- R = DESIGN RAINFALL DEPTH OBTAINED FROM THE TABLE BELOW (m),
- O = OUTFLOW FROM INFILTRATION INTO THE SOIL DURING STORM EVENT (m³),
- a₅₀ = 50% OF TOTAL AVAILABLE INTERNAL WALL AREA (m²),
- L & W = LENGTH AND WIDTH OF OVERALL SOAKAGE PIT (m),
- h = OVERALL HEIGHT OF SOAKAGE PIT (m),
- f = SOIL INFILTRATION RATE (m/s),
- D = STORM DURATION (sec),
- S = STORAGE VOLUME OF SOAKAGE PIT AND TURKEYS NEST (IF REQUIRED). (m³),
- t₅₀ = TIME FOR SOAKAGE PIT TO DRAIN TO 50% VOLUME (sec).

DESIGN RAINFALL DEPTH:

ARI	12 HOUR DESIGN RAINFALL DEPTH (mm)	24 HOUR DESIGN RAINFALL DEPTH (mm)
1 IN 5	53.14	66.98
1 IN 10	60.54	76.52
1 IN 100	96.58	123.6

EXAMPLE CALCULATION:

DESIGN DATA:

- ASSUME THAT THE TOTAL CATCHMENT IS 0.34 Ha (3,400 m²), THAT THE IMPERVIOUS AREA IS 0.09 Ha (900 m²) AND THE PERVIOUS AREA IS 0.25 Ha (2,500 m²).
- ASSUME THAT 90% OF IMPERVIOUS AND 30% PERVIOUS AREA CONTRIBUTE AS RUNOFF.
- ASSUME OVERALL HEIGHT OF SOAKAGE PIT (h) TO BE 0.903 m.
- USING A 1 IN 5 YEAR 12 HOUR ARI DESIGN STORM, THE RAINFALL DEPTH (R) IS 53.14 mm.
- FROM A SOIL TEST THE INFILTRATION RATE (f) WAS DETERMINED TO BE 1.15 x 10⁻⁴ m/s.

INFLOW VOLUME TO SOAKAGE PIT CALCULATION:

$$I = (\text{Equiv. } A_i + \text{Equiv. } A_p)R$$

$$I = (900 \times 0.9 + 2,500 \times 0.3) \times 0.05314 = \underline{82.90 \text{ m}^3}$$

SOAKAGE PIT SIZING:

OUTFLOW FROM SOAKAGE PIT:

$$O = a_{50}fD \text{ \& } a_{50} = 2 \times [(L \times 0.5h) + (W \times 0.5h)] = 1.806L \text{ (ASSUMING } L = W)$$

$$O = 1.806L \times 0.000115 \times (12 \times 60 \times 60) = \underline{8.972L}$$

STORAGE VOLUME OF SOAKAGE PIT:

$$S = L \times W \times 0.903 = \underline{0.903L^2} \text{ (ASSUMING } L = W) \text{ \& } S = I - O$$

$$\text{THEREFORE } 0.903L^2 + 8.972L - 82.90 = 0,$$

$$\text{SOLVING, } L = \underline{5.825 \text{ m}} \text{ \& } S = \underline{30.637 \text{ m}^3}$$

THEREFORE ADOPT:

$$L = \underline{6.0 \text{ m}} \text{ \& } W = \underline{5.7 \text{ m}},$$

$$\text{ACTUAL } S = 0.903 \times 6.0 \times 5.7 = \underline{30.88 \text{ m}^3}$$

CHECK TIME FOR EMPTYING:

$$\text{ACTUAL } a_{50} = 2 \times [(6.0 \times 0.5 \times 0.903) + (5.7 \times 0.5 \times 0.903)] = \underline{10.565 \text{ m}^2}$$

$$t_{50} = \frac{0.5S}{a_{50}f}$$

$$t_{50} = \frac{0.5 \times 30.88}{10.565 \times 0.000115} = 12709 \text{ sec}$$

(JUST UNDER 3 HOURS & 32 MINUTES)

LESS THAN 24 HOURS, THEREFORE OK

NOTES:

- 1 USE ONLY FOR CONSTRUCTION OF PUBLIC SOAK PITS WITHIN THE ROAD RESERVE.



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MANAGER - INFRASTRUCTURE PROJECTS

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