Rainwater Harvesting Tank Size by a Monthly Balance

Yearly rainwater harvested from a roof and the tank needed to meet a constant monthly demand, by a monthly sequent-peak mass balance.

Method: Monthly mass balance with the sequent-peak algorithm (Thomas and Fiering; Subramanya, Engineering Hydrology, ch. 9)

Input parameters

Unit system: SI

Parameter	Value	Unit
Catchment (roof) area	500.00	m^2
Runoff coefficient	85.000	%
Demand per month	30.000	m^3
Rainfall, January	5.0000	mm
Rainfall, February	5.0000	mm
Rainfall, March	5.0000	mm
Rainfall, April	10.000	mm
Rainfall, May	30.000	mm
Rainfall, June	150.00	mm
Rainfall, July	250.00	mm
Rainfall, August	220.00	mm
Rainfall, September	150.00	mm
Rainfall, October	60.000	mm
Rainfall, November	15.000	mm
Rainfall, December	5.0000	mm

Calculated results

Parameter	Value	Unit
Water harvested per year	384.62	m^3
Demand per year	360.00	m^3
Storage needed for full supply	182.62	m^3
Supply-to-demand ratio	106.84	%

Notes for this case

- Monthly balance; first-flush losses and evaporation are not modelled. Use rainfall of a dry year, not the average, for a reliable supply.

Formula and method

$$V_t = \sum_i P_i A C, \quad S = \max_t \sum (D - V)^+ \ \text{(sequent peak)}$$

Variables

A	Catchment (roof) area	m^2
C	Runoff coefficient	-
D	Demand per month	m^3
P_1	Rainfall, January	m

P_2	Rainfall, February	m
P_3	Rainfall, March	m
P_4	Rainfall, April	m
P_5	Rainfall, May	m
P_6	Rainfall, June	m
P_7	Rainfall, July	m
P_8	Rainfall, August	m
P_9	Rainfall, September	m
P_{10}	Rainfall, October	m
P_{11}	Rainfall, November	m
P_{12}	Rainfall, December	m
V_y	Water harvested per year	m^3
D_y	Demand per year	m^3
S	Storage needed for full supply	m^3
V_y/D_y	Supply-to-demand ratio	-

Method and standards

Monthly mass balance.

Assumptions and limits

- Constant demand; repeating year.

References

• Monthly mass balance with the sequent-peak algorithm (Thomas and Fiering; Subramanya, Engineering Hydrology, ch. 9)

Report details

Report reference	FCC-97NC-CYWP (the same inputs always give the same reference)
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Release checks	2 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/civil/hydraulics/rainwater-harvesting-tank

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.