THOMPSON ENVIRONMENTAL
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ESTIMATING THE POTENTIAL FOR HARVESTING WATER

Goal: Learn how to estimate the amount of water that can be collected at a particular site.


WOODARD
CF4 X604

ARCSA
American Rainwater Catchment Systems Association


How Many Drops Are There in 1 Litre of Water?
23,900 Drops
ARCSA
American Rainwater Catchment Systems Association

How Many Seconds are in 1 Day?

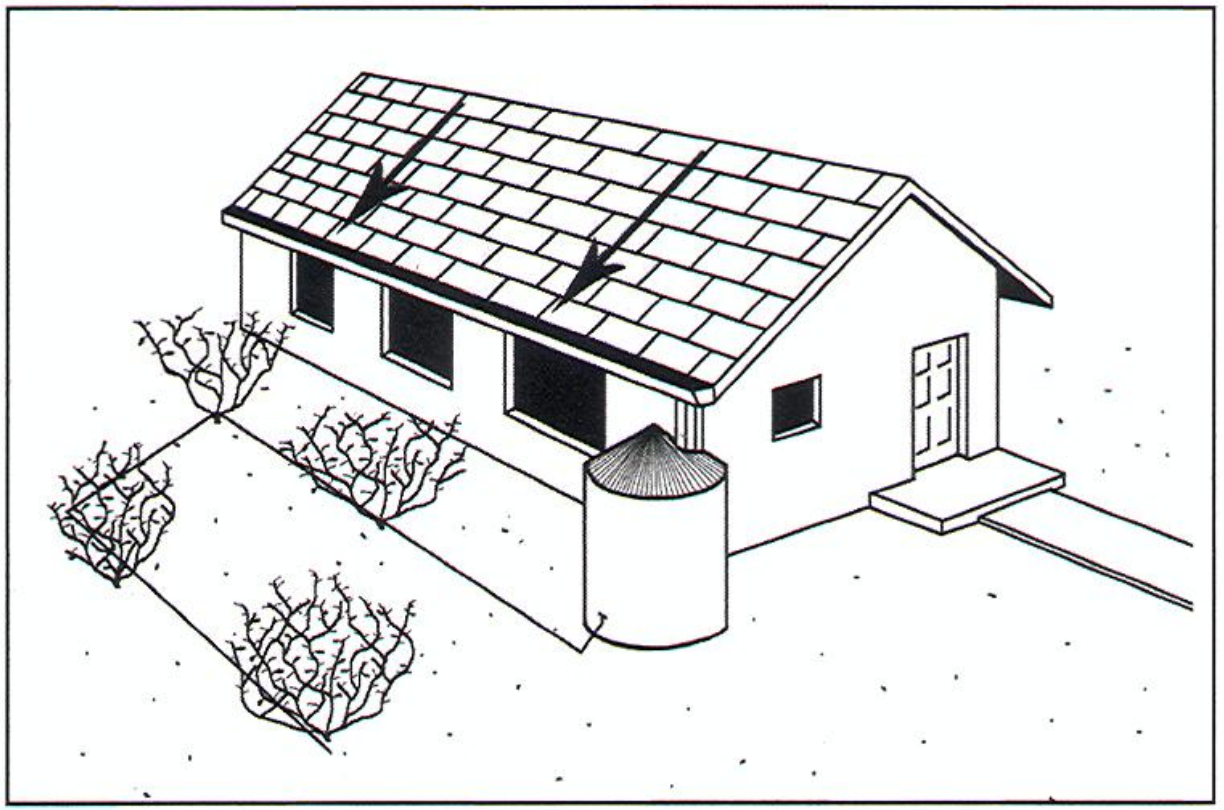
How Many Seconds are in 1 Day?

86,400

Supply

- 25 Liters/square meter of roof/25 mm rainfall
- 1 Liter per square meter of roof per 1 mm rainfall
- 100 sq. meter X 1 L. X 25 mm rain = 2,500 L. water
- 816 mm rainfall per year= 81,600 L/yr

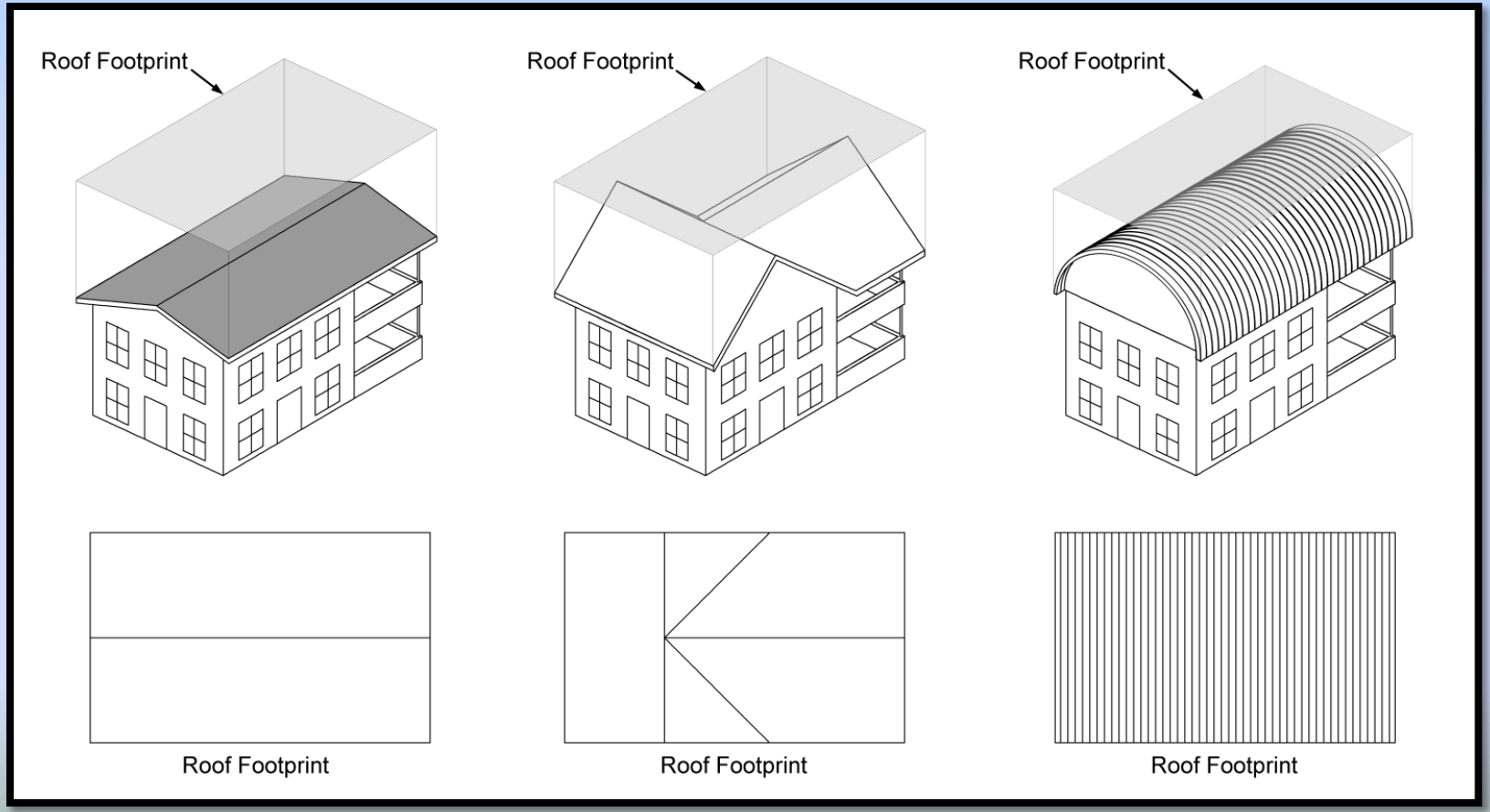
Complex Rainwater Harvesting



Complex water harvesting system with roof catchment, gutter, downspout, storage and drip distribution system.

Supply

Footprint of the building



Roof area to be considered Optional Method

- In considering the roof area, it must be remembered that rain does not necessary fail vertically and that maximum conditions exist only when rain falls perpendicular to a surface.
- Since the roof area would increase as its pitch increases, then it would not be advisable to use the plan area of a pitched roof in the calculation of a drainage system.

To determine the design area for a pitched roof:

cm./meter PITCH	To determine the design area multiply the plan area by the factor in this column.
Level to 10 cm	1.00
11 to 15 cm	1.05
16 to 20	1.10
19 to 30	1.20
31 or greater	1.30

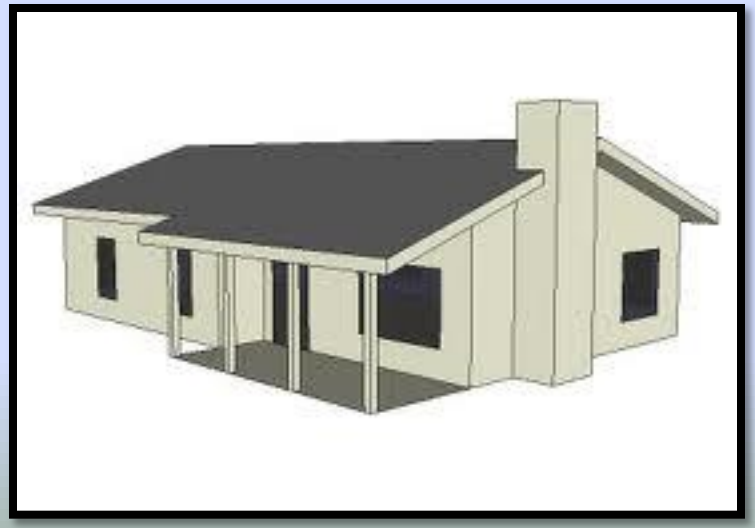
Roof Slope

Steep roof

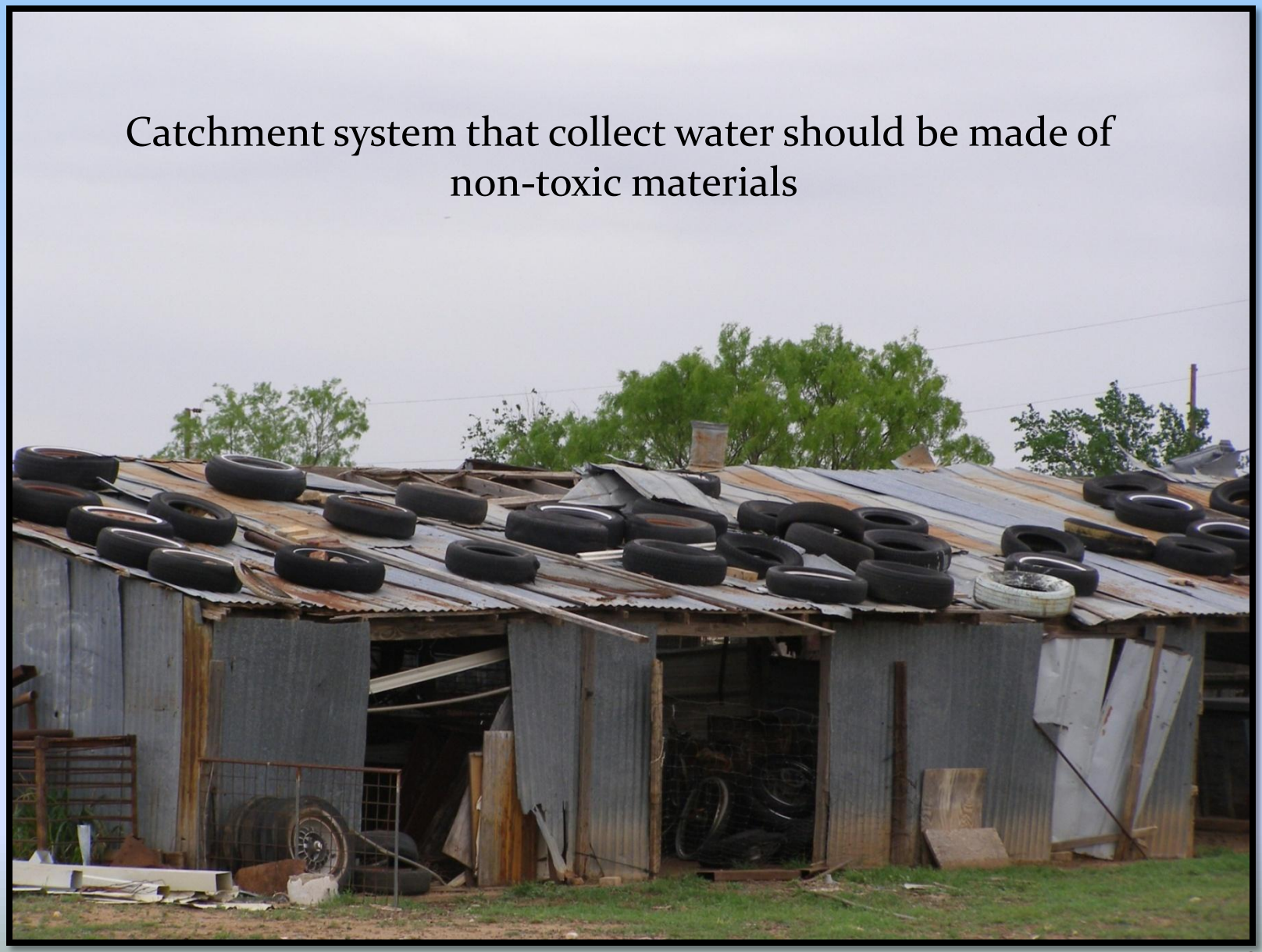
- Water comes off faster
- Cleans contaminants faster
- Gutter must stop and transport it faster

Flat roof

- Water moves slower
- Contaminants very slow to run off



Catchment system that collect water should be made of non-toxic materials



Runoff Coefficients

Character of Surface	High	Low
Metal, gravel, asphalt shingles	95%	75%
Paving-concrete, asphalt	95%	70%
Paving-brick	85%	70%
Gravel	75%	25%
Soil	70%	10%
Lawns	25%	05%

Coefficent Rounded Down

- 95% Efficiency = 0.95 Liters
- 90% Efficiency = 0.90 Liters
- 85% Efficiency = 0.85 Liters

- 200 sq m roof and 25 mm x = 5,000 Liters
- 95% Efficiency – loose 250 Liters
- 90% Efficiency – loose 500 Liters
- 85% Efficiency – Loose 750 Liters

Safety Factor 100% down 90%

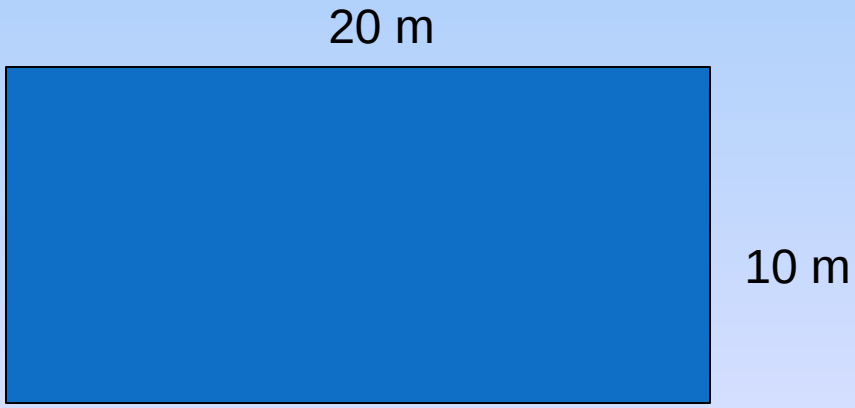
- Fudge Factor
- Others add it in based on location
  - Heat
  - Spills, leaks
  - Rain intensity
  - Wind speed and direction
  - Roof slope

Size Of The Roof Dictates How Much Water You Can Capture

- 10 m x 20 m = 200 sq’
- Multiplied by a pitch of 20 cm per meter (1.2 pitch)
- Multiplied by Runoff Coefficient Asphalt Shingles 90% (0.9)
- Multiply by a fudge factor (spillage, evaporation, etc.) 90%

Problem 1: Sizing Roof Area

What is the runoff potential for a fire station in Sudbury, Ontario which has a metal roof when there is a 25 mm rain event? What is the annual potential?



- **Square meter of building?_____**
- **Average annual amount in Sudbury, Ontario?_____**
- **Runoff Coefficient?_____**
- **Design Area Pitched Roof? _____**
- **Amount of runoff from 25 mm rain?_____**
- **Total annual runoff potential?_____**
- **Factors that might affect rainfall coefficient and safety factor?_____**

Answer to Problem 1:

- Square Meter of fire station? 10 x 20 = **200 sq m**
- Average annual amount in Kitchener, Ontario? **816 mm**
- Runoff Coefficient? **90% efficient**
- Design Area of Pitched Roof? **1.2**
- Fudge Factor? **90% efficient**
- Amount of runoff from 25 mm rain? 25 x 0.9 x 1.2 x 0.9 x 200 = **4,860 Liters/25 mm rain**
- Total annual runoff potential? 4,860 L x 37.1 occurrences = **180,306 Liters**

Problem 2: Catchment Potential–Chapter 7 Page 44

- **What is the monthly catchment potential (May – July) for the fire station in Sudbury, Ontario in problem 1, which has an asphalt roof, building oriented North and South and 2 large trees are on the north west side of the building with no limbs overhanging the building?**

Month	Mo Av Rainfall	Ft2 of Building	Runoff Coefficient	Safety Factor	Amount to Multiply	Monthly Potential
May	54.8					
June	66.1					
July	68.2					

Answer to Problem 2: Catchment Potential

- **What is the monthly catchment potential (May – July) for the residence in Sudbury, Ontario in problem 1, which has a metal roof, house oriented North and South and 2 large trees are on the north west side of the house with no limbs overhanging the house?**
- **90% in May June and July because rain intensity is the highest in the summer and trees may block some rain from getting on the roof. (also in cold climates, the winter months will have frozen precipitation that might be lost).**

Month	Mo Av Rainfall	Ft2 of Building	Runoff Coefficient	Safety Factor	Amount to Multiply	Monthly Potential
May	67	300	90%	90%	67 x 300 x 0.9 x 0.9 =	16,281 L.
June	81	300	90%	90%	81 x 300 x 0.9 x 0.9 =	19,683 L.
July	76	300	90%	90%	76 x 300 x 0.9 x 0.9 =	18,468 L.

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