

424 Aviation Road NE
Calgary, Alberta, T2E 8H6, Canada
Phone: + 1 (403) 243-3285, Fax: + 1 (403) 243-6199
E-mail: resources@cawst.org, Website: www.cawst.org

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This presentation is used with Lesson Plan 18:
Sizing Latrine Pits in the Latrine Design and
Construction Trainer Manual.

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Sizing Latrine Pits



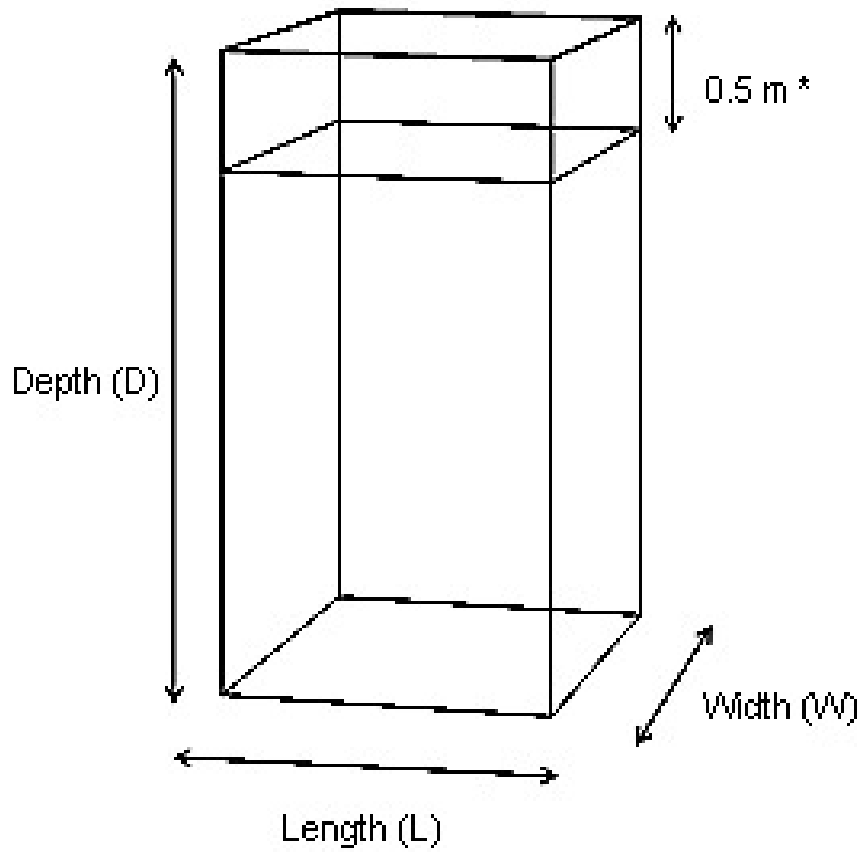
Learning Outcomes

1. Discuss the importance of sizing a latrine pit.
2. Identify the key information needed to size a latrine pit.
3. Determine the size of a latrine pit.

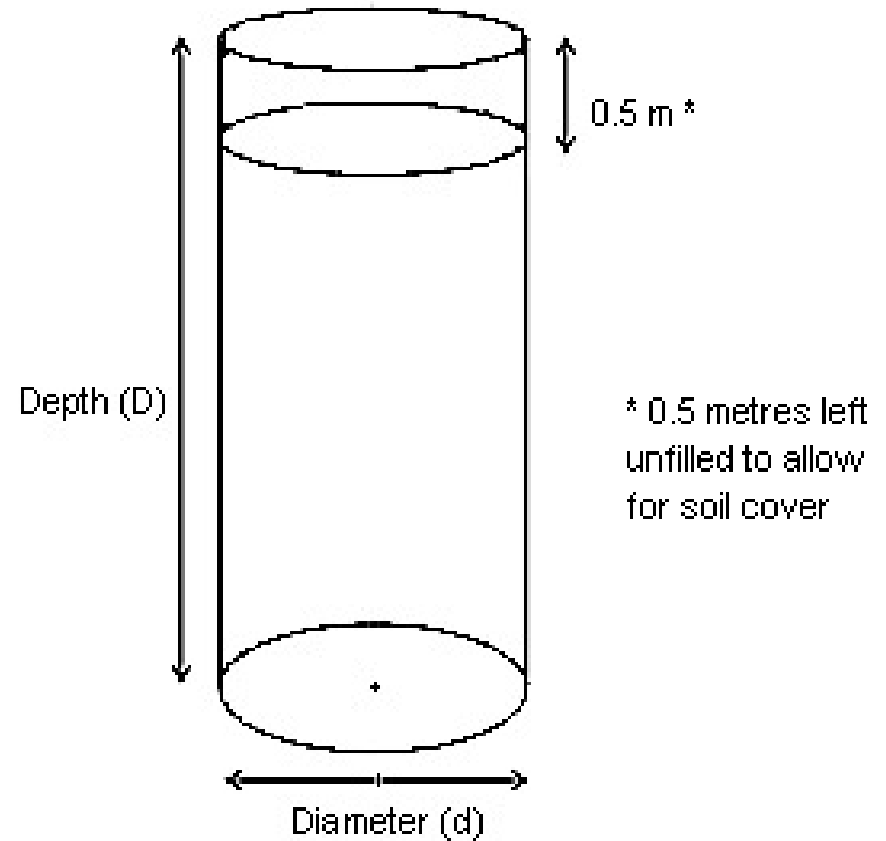


Pit Dimensions

Rectangular Pit



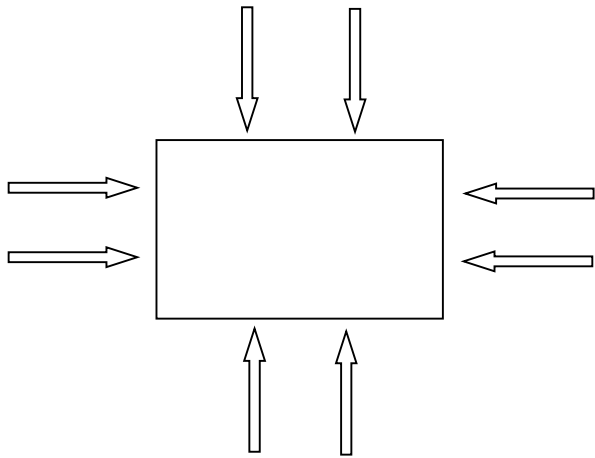
Circular Pit



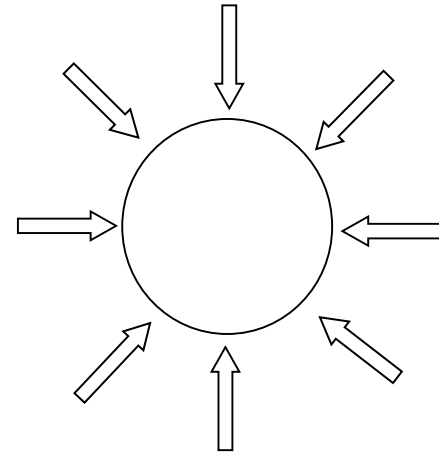
* 0.5 metres left unfilled to allow for soil cover

(Credit: Lifewater International, 2009)

Strength of Pit Shapes



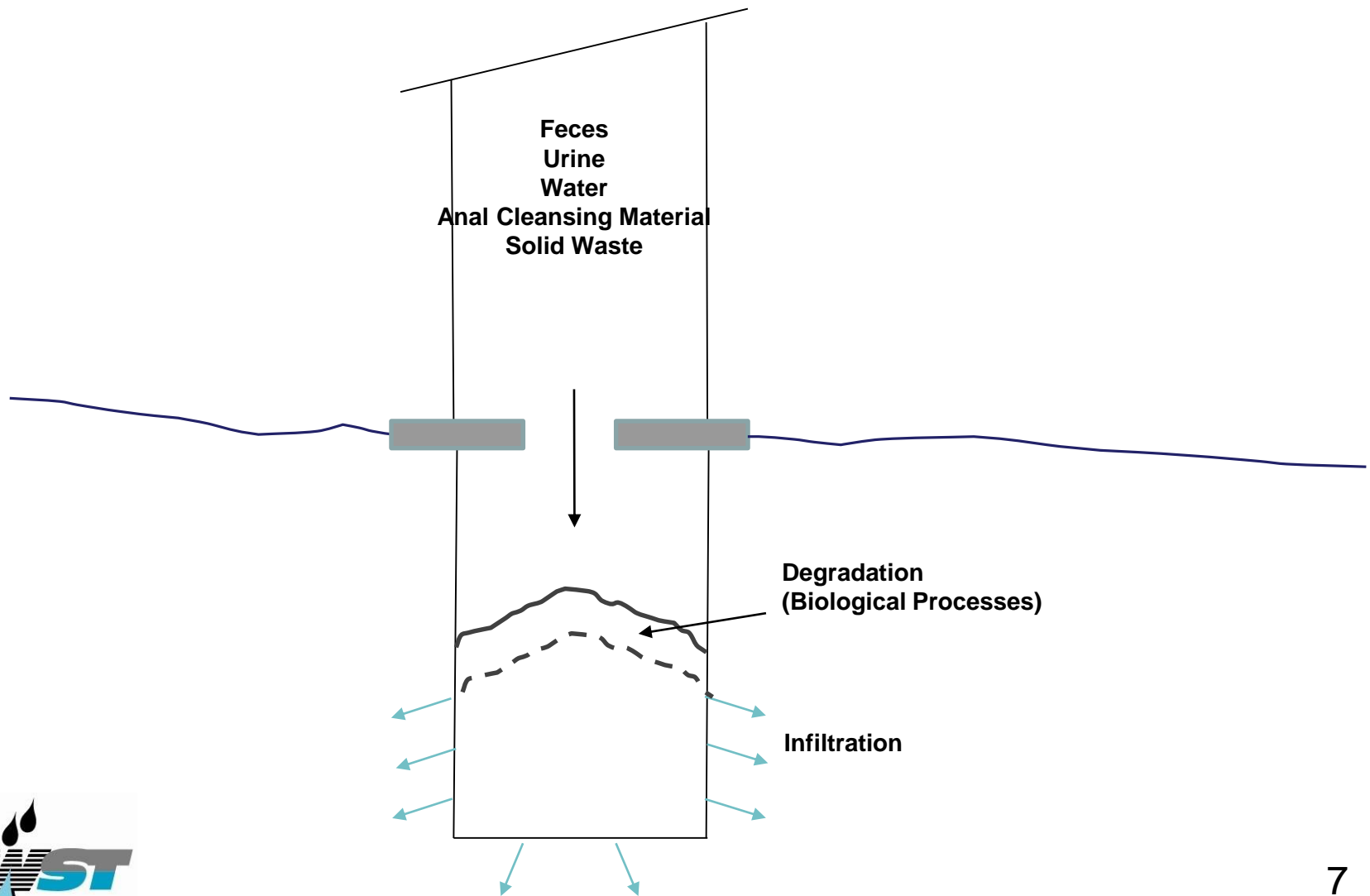
Pressure from surrounding ground



Pressure from surrounding ground

(Credit: Lifewater International, 2009)

Sludge Accumulation



Sludge Accumulation Rates

Pit Conditions	Sludge Accumulation Rate	
	Degradable anal cleansing materials (e.g., paper, leaves) and water	Non-degradable anal cleansing materials (e.g., stones, plastic)
Water in pit (e.g., pour flush latrine)	A	B
Dry in pit (e.g., no or small amount of water in pit)	B	C



Suggested Sludge Accumulation Rates

Pit Conditions	Sludge Accumulation Rate	
	Degradable anal cleansing materials (e.g., paper, leaves) and water	Non-degradable anal cleansing materials (e.g., stones, plastic)
Water in pit (e.g., pour flush latrine)	40	60
Dry in pit (e.g., no or small amount of water in pit)	60	90



Pit Design for 4 Users

Pit Dimensions	Pit Depth (D) (metres)											
	2 Year Lifetime ¹			5 Year Lifetime			10 Year Lifetime			15 Year Lifetime		
Square/Rectangular Pit Length (L) x Width (W) (metres)	R=40	R=60	R=90	R=40	R=60	R=90	R=40	R=60	R=90	R=40	R=60	R=90
1.0 x 1.0 (square)	1.0	1.2	1.6	1.3	1.7	2.3	2.1	2.9	4.1	2.9	4.1	5.9
1.0 x 1.2	0.9	1.1	1.4	1.2	1.5	2.0	1.8	2.5	3.5	2.5	3.5	5.0
1.0 x 1.5	0.8	1.0	1.2	1.0	1.3	1.7	1.6	2.1	2.9	2.1	2.9	4.1
1.2 x 1.2 (square)	0.8	1.0	1.3	1.1	1.3	1.8	1.6	2.2	3.0	2.2	3.0	4.3
1.2 x 1.5	0.8	0.9	1.1	0.9	1.2	1.5	1.4	1.8	2.5	1.8	2.5	3.5
1.5 x 1.5 (square)	0.7	0.8	1.0	0.9	1.0	1.3	1.2	1.6	2.1	1.6	2.1	2.9
Circular Pit Diameter (d) (metres)	R=40	R=60	R=90	R=40	R=60	R=90	R=40	R=60	R=90	R=40	R=60	R=90
1.0	1.1	1.4	1.9	1.5	2.0	2.8	2.5	3.6	5.1	3.6	5.1	7.4
1.1	1.0	1.3	1.6	1.3	1.8	2.4	2.2	3.0	4.3	3.0	4.3	6.2
1.2	0.9	1.1	1.5	1.2	1.6	2.1	1.9	2.6	3.7	2.6	3.7	5.3
1.3	0.9	1.0	1.3	1.1	1.4	1.9	1.7	2.3	3.2	2.3	3.2	4.6
1.4	0.8	1.0	1.2	1.0	1.3	1.7	1.5	2.1	2.8	2.1	2.8	4.0
1.5	0.8	0.9	1.1	1.0	1.2	1.5	1.4	1.9	2.5	1.9	2.5	3.6



Pit Design for 6 Users

Pit Dimensions	Pit Depth (D) (metres)											
	2 Year Lifetime ¹			5 Year Lifetime			10 Year Lifetime			15 Year Lifetime		
Square/Rectangular Pit Length (L) x Width (W) (metres)	R=40	R=60	R=90	R=40	R=60	R=90	R=40	R=60	R=90	R=40	R=60	R=90
1.0 x 1.0 (square)	1.2	1.6	2.1	1.7	2.3	3.2	2.9	4.1	5.9	4.1	5.9	8.6
1.0 x 1.2	1.1	1.4	1.9	1.5	2.0	2.8	2.5	3.5	5.0	3.5	5.0	7.3
1.0 x 1.5	1.0	1.2	1.6	1.3	1.7	2.3	2.1	2.9	4.1	2.9	4.1	5.9
1.2 x 1.2 (square)	1.0	1.3	1.6	1.3	1.8	2.4	2.2	3.0	4.3	3.0	4.3	6.1
1.2 x 1.5	0.9	1.1	1.4	1.2	1.5	2.0	1.8	2.5	3.5	2.5	3.5	5.0
1.5 x 1.5 (square)	0.8	1.0	1.2	1.0	1.3	1.7	1.6	2.1	2.9	2.1	2.9	4.1
Circular Pit Diameter (d) (metres)	R=40	R=60	R=90	R=40	R=60	R=90	R=40	R=60	R=90	R=40	R=60	R=90
1.0	1.4	1.9	2.6	2.0	2.8	3.9	3.6	5.1	7.4	5.1	7.4	10.8
1.1	1.3	1.6	2.2	1.8	2.4	3.3	3.0	4.3	6.2	4.3	6.2	9.0
1.2	1.1	1.5	1.9	1.6	2.1	2.9	2.6	3.7	5.3	3.7	5.3	7.7
1.3	1.0	1.3	1.7	1.4	1.9	2.5	2.3	3.2	4.6	3.2	4.6	6.6
1.4	1.0	1.2	1.6	1.3	1.7	2.3	2.1	2.8	4.0	2.8	4.0	5.8
1.5	0.9	1.1	1.4	1.2	1.5	2.0	1.9	2.5	3.6	2.5	3.6	5.1



Pit Design for 8 Users

Pit Dimensions	Pit Depth (D) (metres)											
	2 Year Lifetime ¹			5 Year Lifetime			10 Year Lifetime			15 Year Lifetime		
Square/Rectangular Pit Length (L) x Width (W) (metres)	R=40	R=60	R=90	R=40	R=60	R=90	R=40	R=60	R=90	R=40	R=60	R=90
1.0 x 1.0 (square)	1.5	1.9	2.7	2.1	2.9	4.1	3.7	5.3	7.7	5.3	7.7	11.3
1.0 x 1.2	1.3	1.7	2.3	1.8	2.5	3.5	3.2	4.5	6.5	4.5	6.5	9.5
1.0 x 1.5	1.1	1.5	1.9	1.6	2.1	2.9	2.6	3.7	5.3	3.7	5.3	7.7
1.2 x 1.2 (square)	1.2	1.5	2.0	1.6	2.2	3.0	2.7	3.8	5.5	3.8	5.5	8.0
1.2 x 1.5	1.0	1.3	1.7	1.4	1.8	2.5	2.3	3.2	4.5	3.2	4.5	6.5
1.5 x 1.5 (square)	0.9	1.1	1.5	1.2	1.6	2.1	1.9	2.6	3.7	2.6	3.7	5.3
Circular Pit Diameter (d) (metres)	R=40	R=60	R=90	R=40	R=60	R=90	R=40	R=60	R=90	R=40	R=60	R=90
1.0	1.7	2.3	3.3	2.5	3.6	5.1	4.6	6.6	9.7	6.6	9.7	14.3
1.1	1.5	2.0	2.8	2.2	3.0	4.3	3.9	5.6	8.1	5.6	8.1	11.9
1.2	1.3	1.8	2.4	1.9	2.6	3.7	3.3	4.7	6.9	4.7	6.9	10.1
1.3	1.2	1.6	2.1	1.7	2.3	3.2	2.9	4.1	5.9	4.1	5.9	8.6
1.4	1.1	1.4	1.9	1.5	2.1	2.8	2.6	3.6	5.2	3.6	5.2	7.5
1.5	1.0	1.3	1.7	1.4	1.9	2.5	2.3	3.2	4.6	3.2	4.6	6.6



Calculate the Volume

$$V = \frac{N \times R \times Y}{1000} + 0.5 \times A$$

V = volume

N = number of people using the pit

R = Sludge Accumulation Rate

Y = number of years the pit will last

A = area of pit (looking from above)



Calculate the Pit Lifetime

$$\text{Lifetime} = \frac{(\text{Volume} - 0.5 \times \text{Area}) \times 1000}{\text{Number of users} \times \text{Sludge accumulation rate}}$$

$$Y = \frac{(V - 0.5 \times A) \times 1000}{N \times R}$$

V = volume

N = number of people using the pit

R = Sludge Accumulation Rate

Y = number of years the pit will last

A = area of pit (looking from above)



Review

- What information do you need to determine the size of a pit?

