Ferrocement Cast-in-place Water Tank (75 Cu. M.)

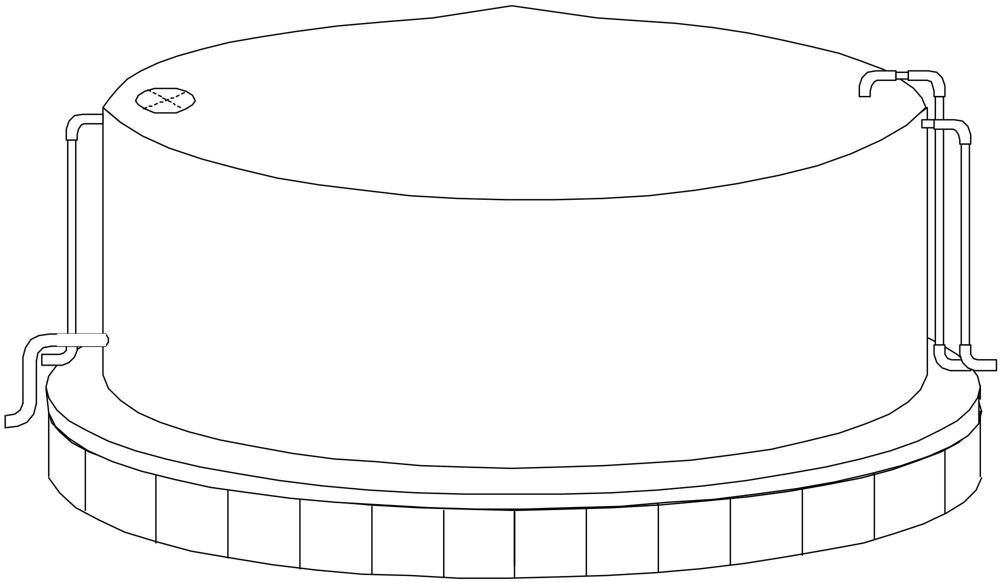
Designed by:

ACECOMS, IFIC
School of Civil Engineering
Asian Institute of Technology (AIT)

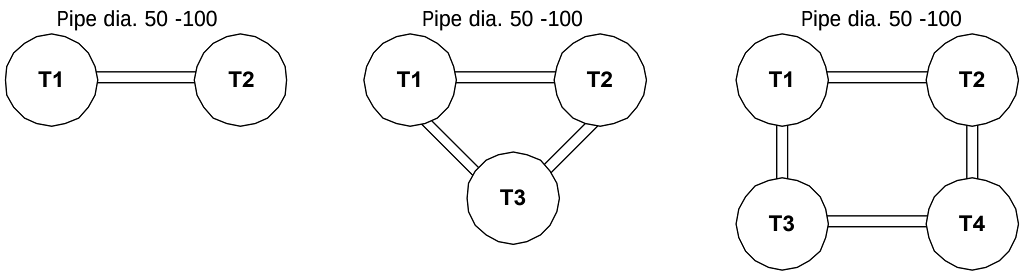
Designed for:

United Nations High Commissioner for Refugees (UNHCR)

Content

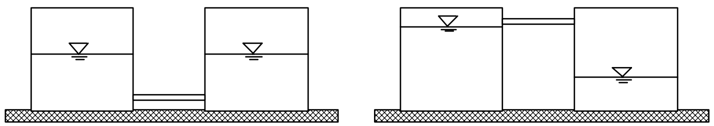


Single Tank



Plan - 2 Tanks　　Plan - 3 Tanks　　Plan - 4 Tanks

Examples for Connecting Multiple Tanks



For Same Water Head

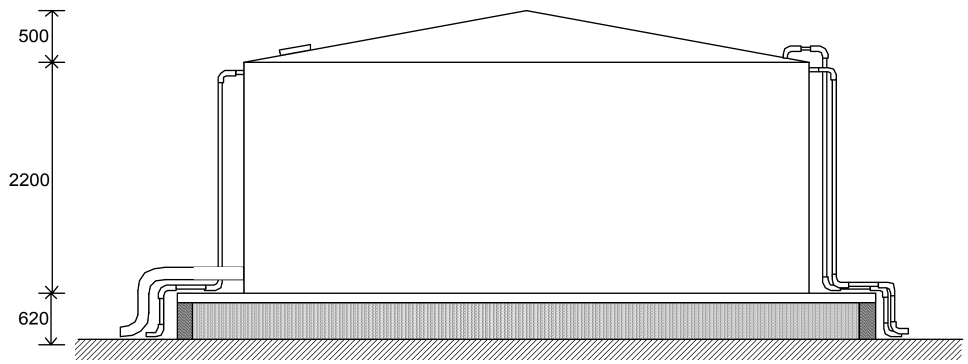
For Different Water Head
(Overflow Type Connection)

Key Features

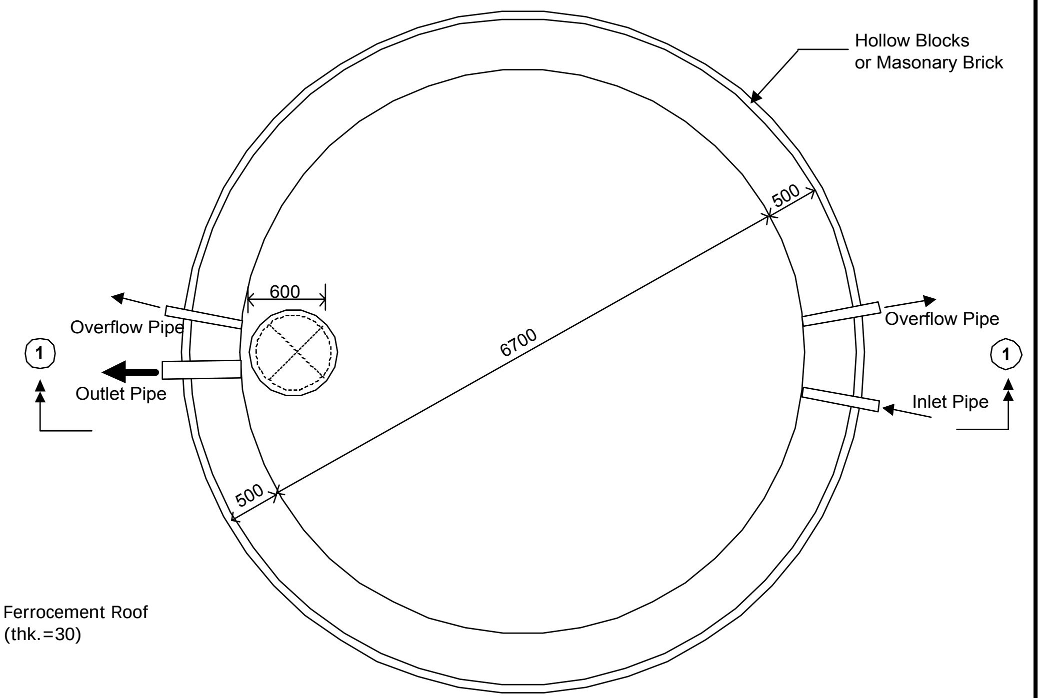
Capacity	75 Cu. m
Diameter	6700
Height	2700 (2200+500)
Foundation	Compacted Sand/ Soil (thk. = 500) Retained by Hollow Blocks/ Masonry Bricks
Base Slab	Reinforced Concrete (thk. = 120)
Wall	Ferrocement (thk. = 30) Stiffened by Embedded Steel Channels
Roof	Ferrocement (thk. = 30) Stiffened by Embedded Trusses
Central Column	GI Pipe (Diameter = 150) Filled with Mortar
Access Opening	Diameter = 600 (in Roof)
Pipe Work	Intel, Outlet and Over Flow Pipes
Finishing	• Inside Plastering Only • Outside Ordinary Paint • No Special Paint/Additives

Note: - RB = Round Bar
- GI = Galvanized Iron
- All dimensions are in milimeter
- Foundation height depends upon water head required

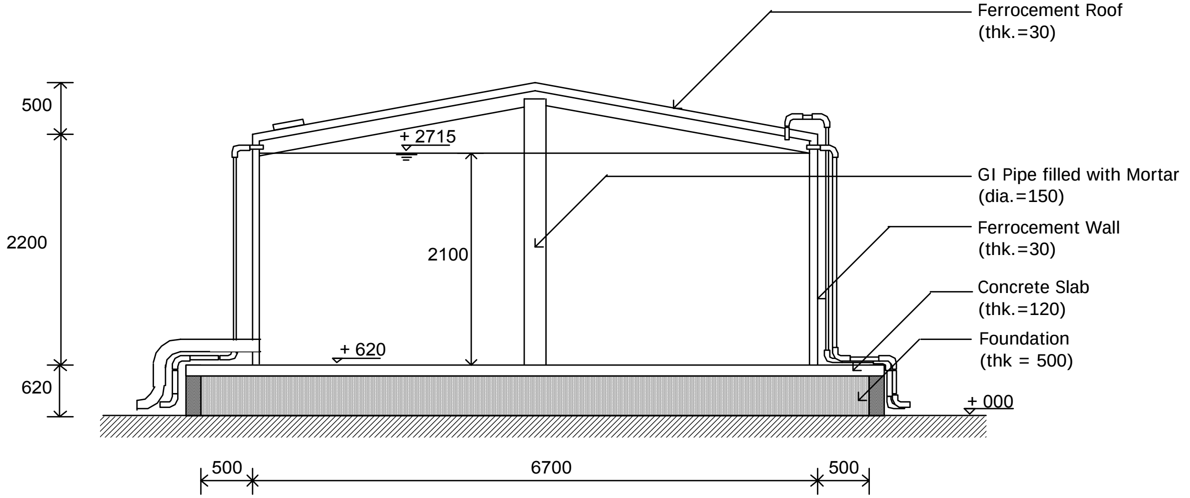
UNHCR — Ferrocement Cast-in-place Water Tank (75 Cu.m.)	Designed by ACECOMS — School of Civil Engineering (AIT)	Drawing Title: **Key Features**	Drawing No: **CD75-01**
		Scale: Not to Scale / Client: UNHCR	Date: March 2002



Elevation



Roof Plan



Section 1-1

Note:
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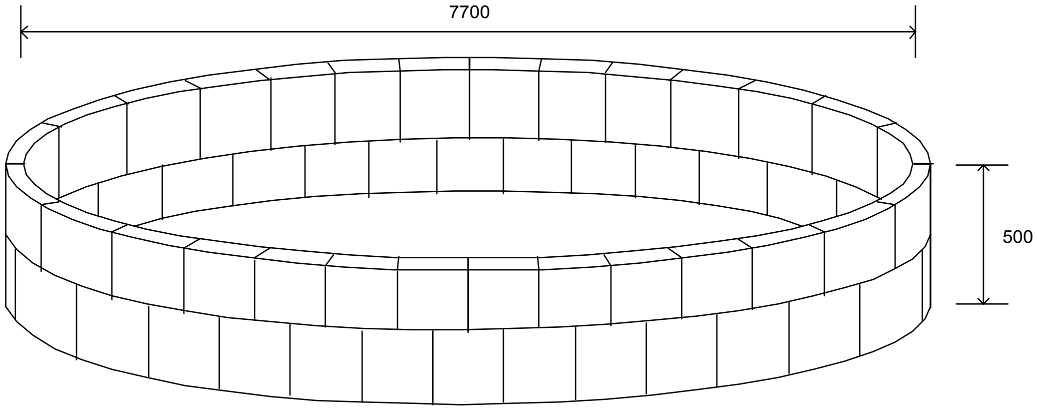
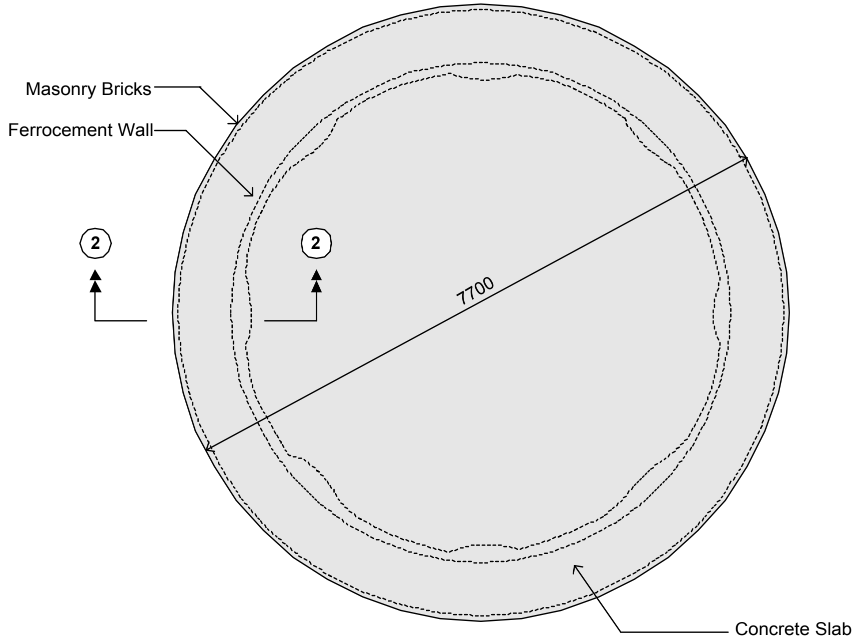
- Foundation height depends upon water head required

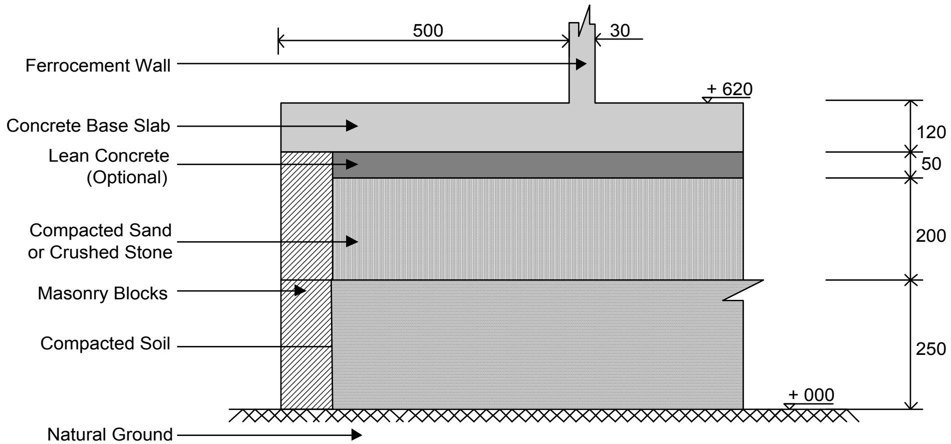
UNHCR — Ferrocement Cast-in-place Water Tank (75 Cu.m.)	Designed by ACECOMS — School of Civil Engineering (AIT)	Drawing Title: **Plan, Elevation and Section**	Drawing No: **CD75-02**
		Scale: Not to Scale — Client: UNHCR	Date: March 2002



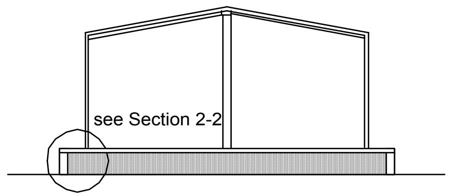
Masonry Brick Layout



Foundation Plan
(Level + 620)



Section 2-2: Foundation Detail



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UNHCR

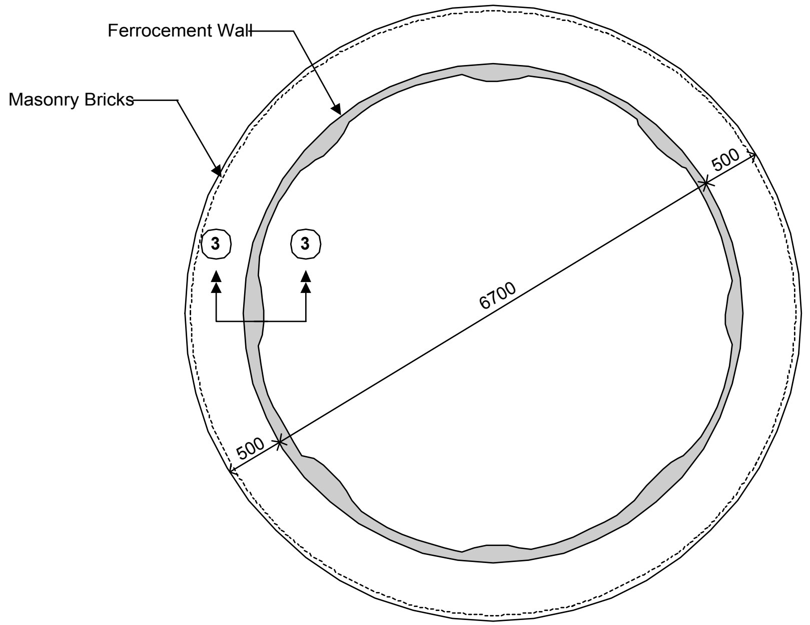
Ferrocement Cast-in-place Water Tank
(75 Cu.m.)

Designed by
ACECOMS
School of Civil Engineering (AIT)

Drawing Title:
Foundation Details

Drawing No:
CD75-03

Scale: Not to Scale | Client: UNHCR | Date: March 2002



Water Tank Plan

Note: - RB = Round Bar
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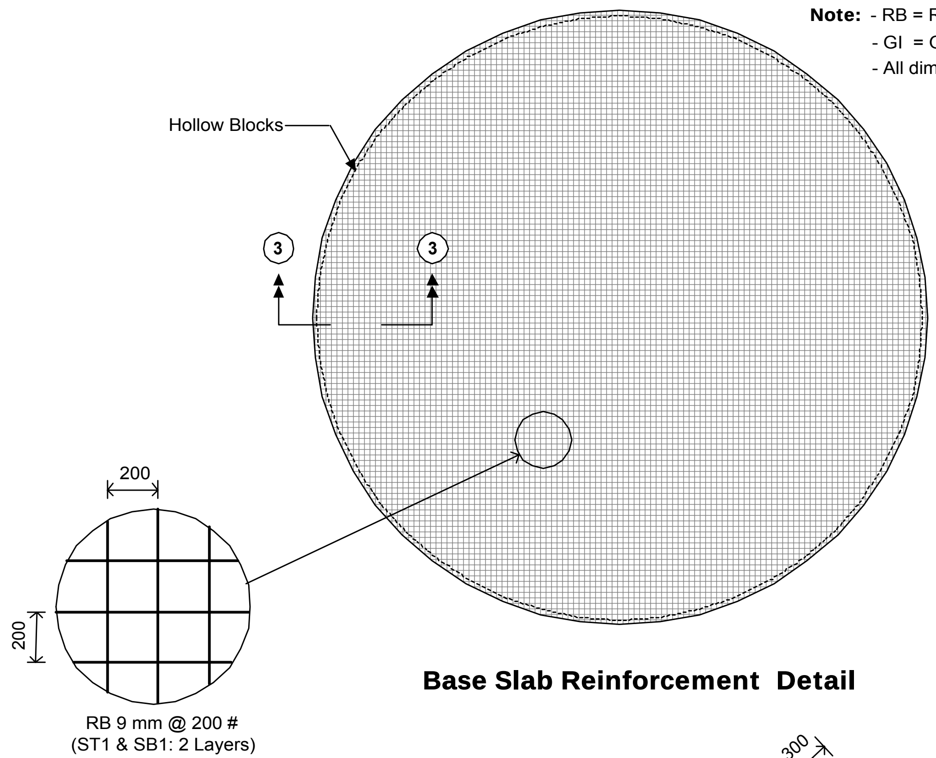
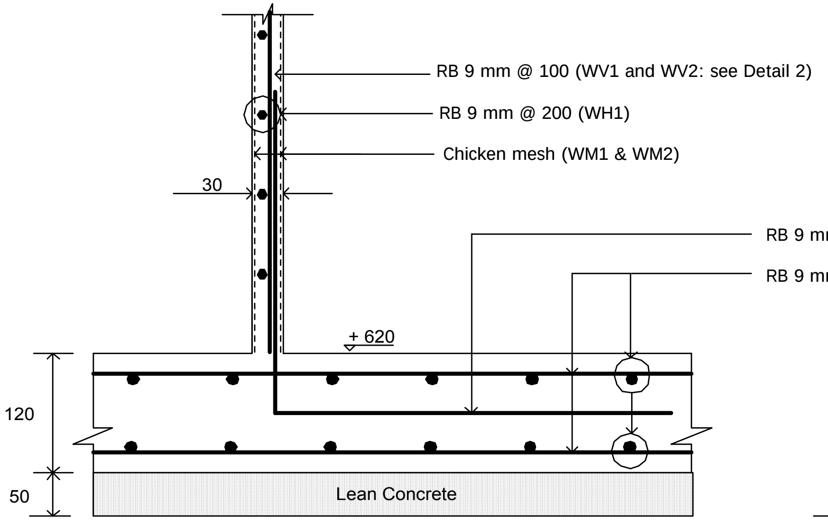
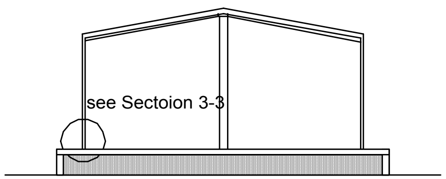
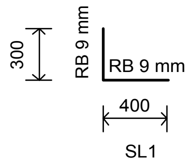


Base Slab Reinforcement Detail

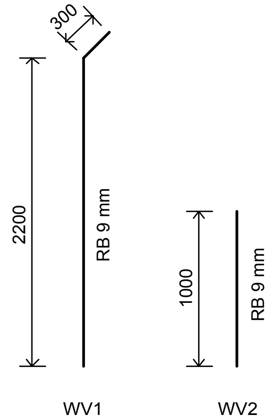


Section 3-3: Slab Detail



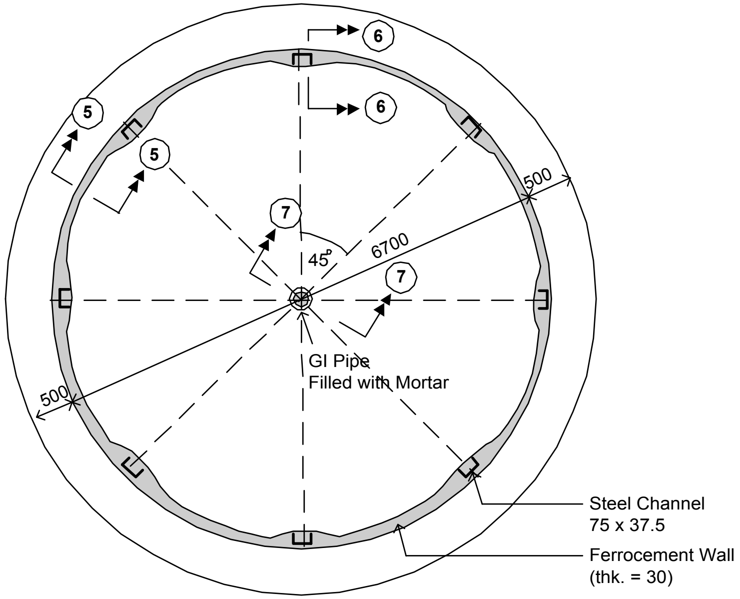


Detail 1

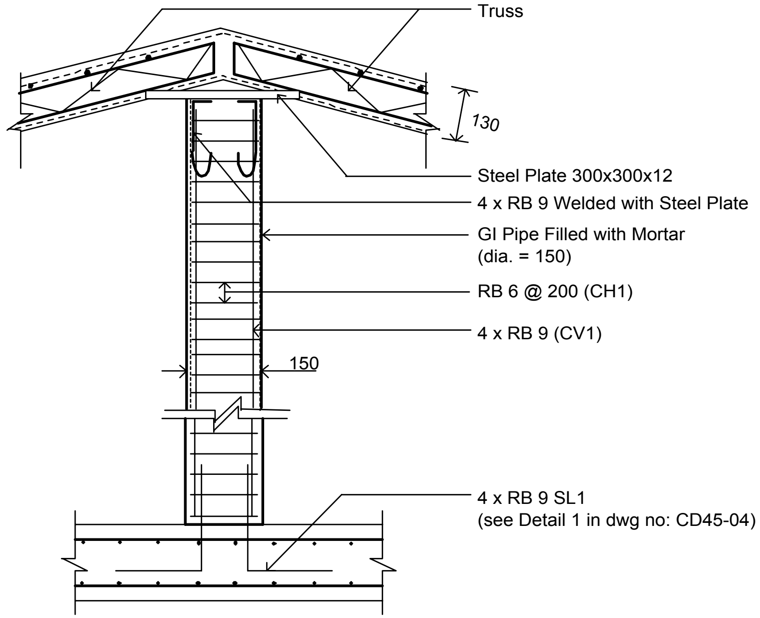


Detail 2

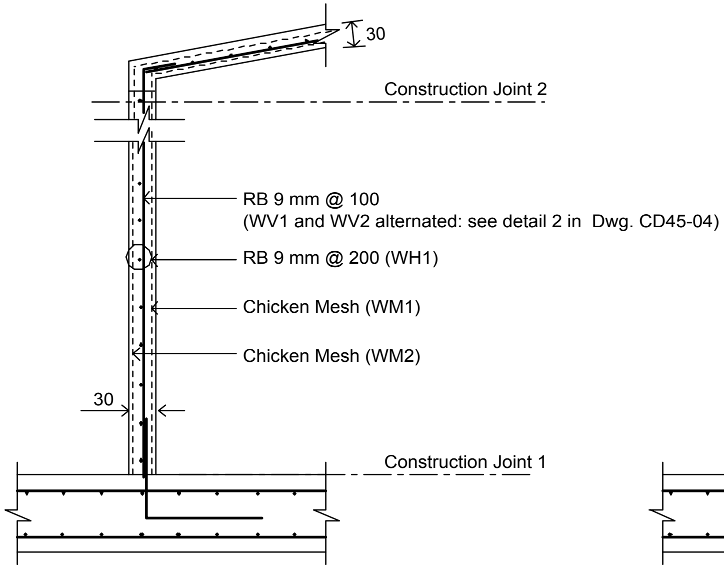
UNHCR — Ferrocement Cast-in-place Water Tank (75 Cu.m.)	Designed by ACECOMS — School of Civil Engineering (AIT)	Drawing Title: **Base Slab Details**	Drawing No: **CD75-04**
		Scale: Not to Scale — Client: UNHCR	Date: March 2002



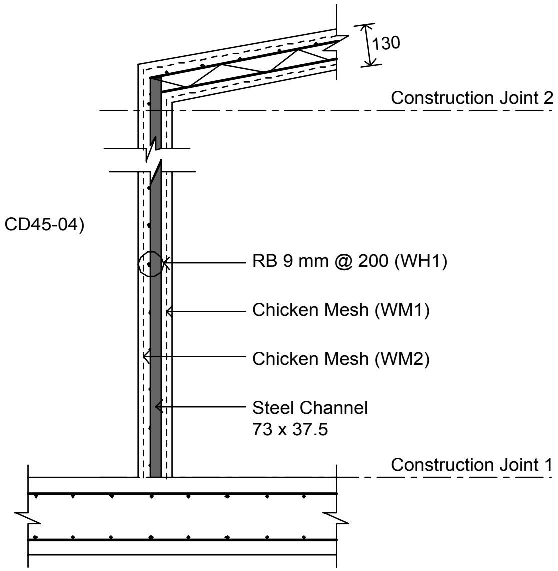
Section 4-4: Water Tank Wall Section



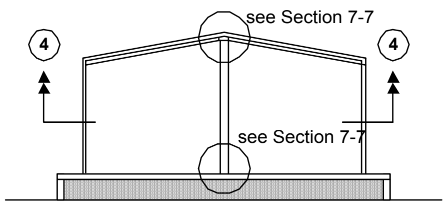
Section 7-7: Central Column Detail



Section 5-5



Section 6-6



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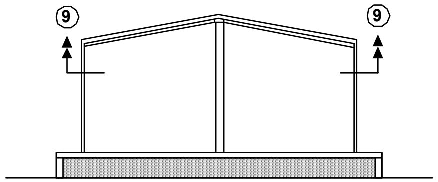
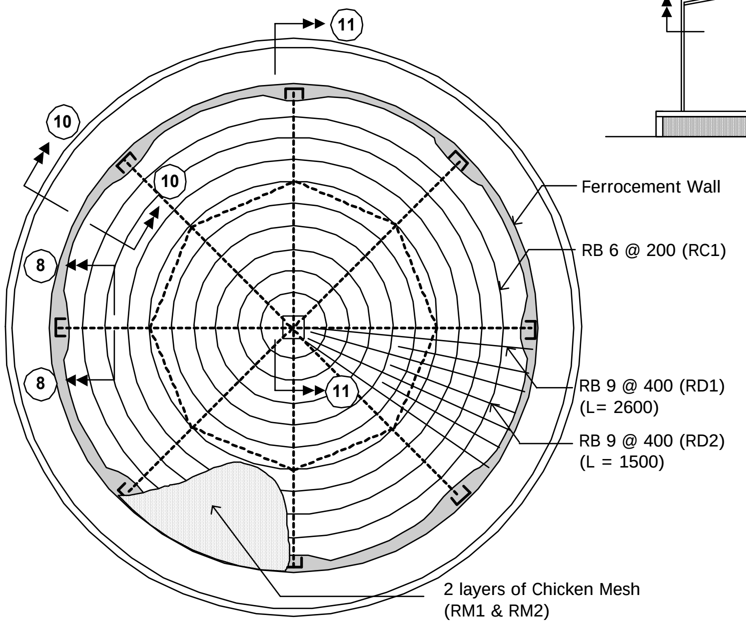
UNHCR — Ferrocement Cast-in-place Water Tank (75 Cu.m)	Designed by ACECOMS IFIC — School of Civil Engineering (AIT)	Drawing Title: **Wall and Central Column Details**	Drawing No: **CD75-05**
		Scale: Not to Scale / Client: UNHCR	Date: March 2002

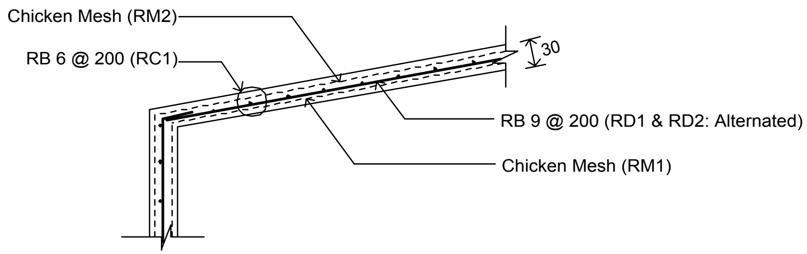




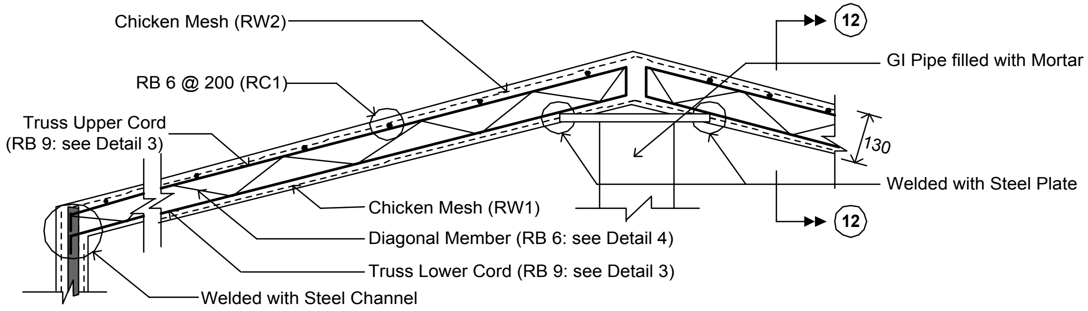
Section 9-9: Roof Framing Plan

Steel Channel 75 x 37.5

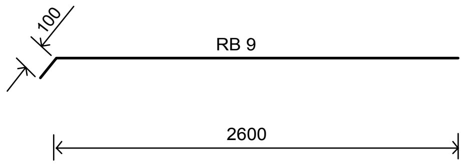
Truss (see Section 11-11)



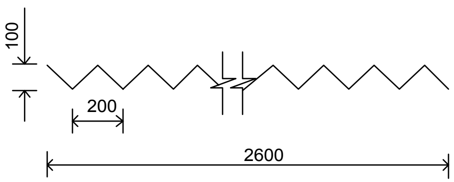
Section 10-10: Roof Slab Detail



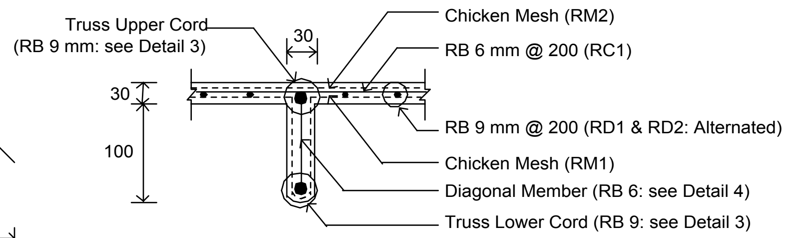
Section 11-11: Truss Detail



Detail 3: Truss Upper and Lower Cord Detail



Detail 4: Diagonal Member Detail Welded to Upper and Lower Chord



Section 8-8: Truss Section

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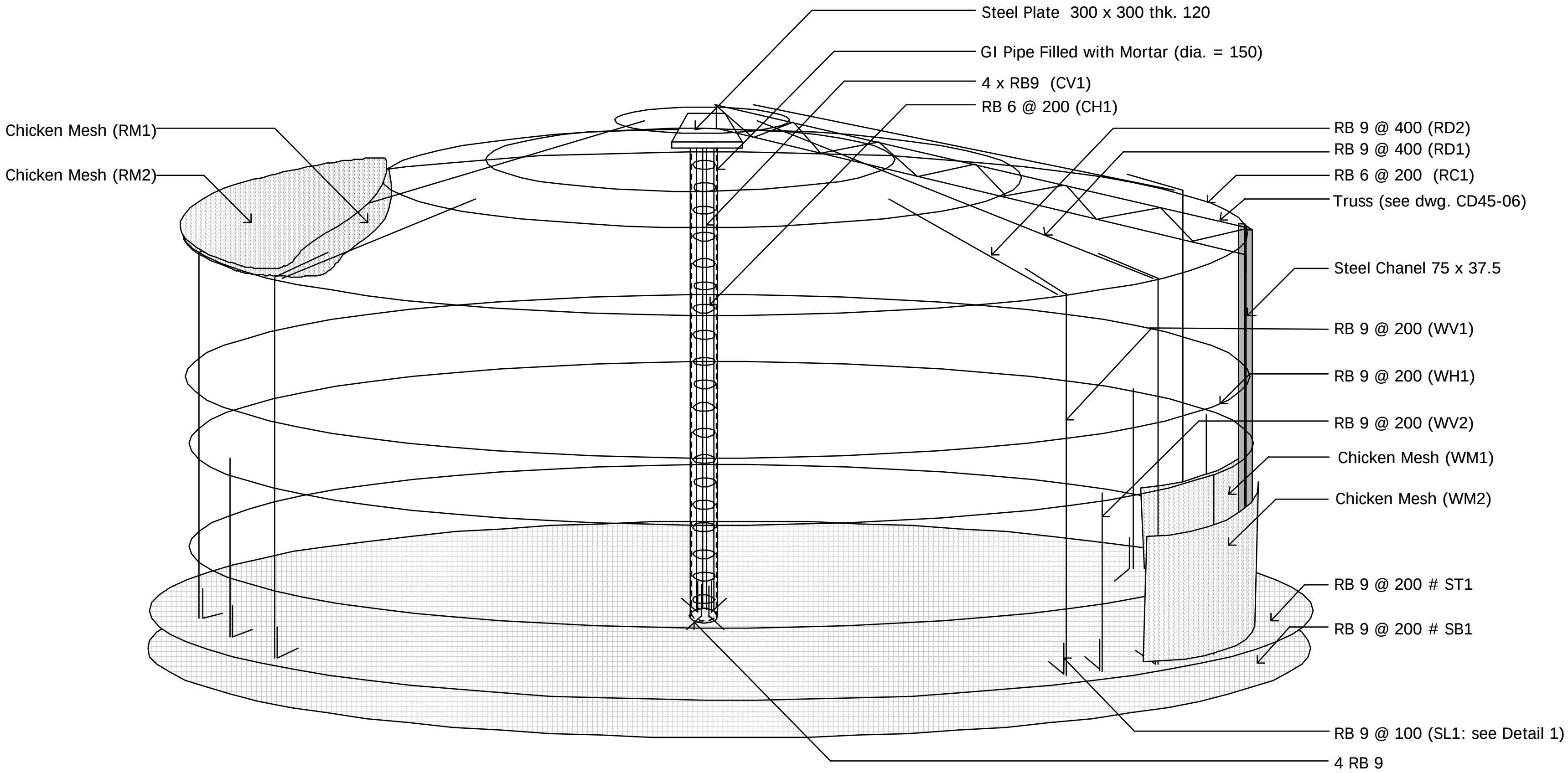
UNHCR	Ferrocement Cast-in-place Water Tank (75 Cu.m.)	Designed by ACECOMS IFIC School of Civil Engineering (AIT)	Drawing Title: **Roof Details**	Drawing No: **CD75-06**
			Scale: Not to Scale / Client: UNHCR	Date: March 2002



Note: Only Selected Typical Elements Shown

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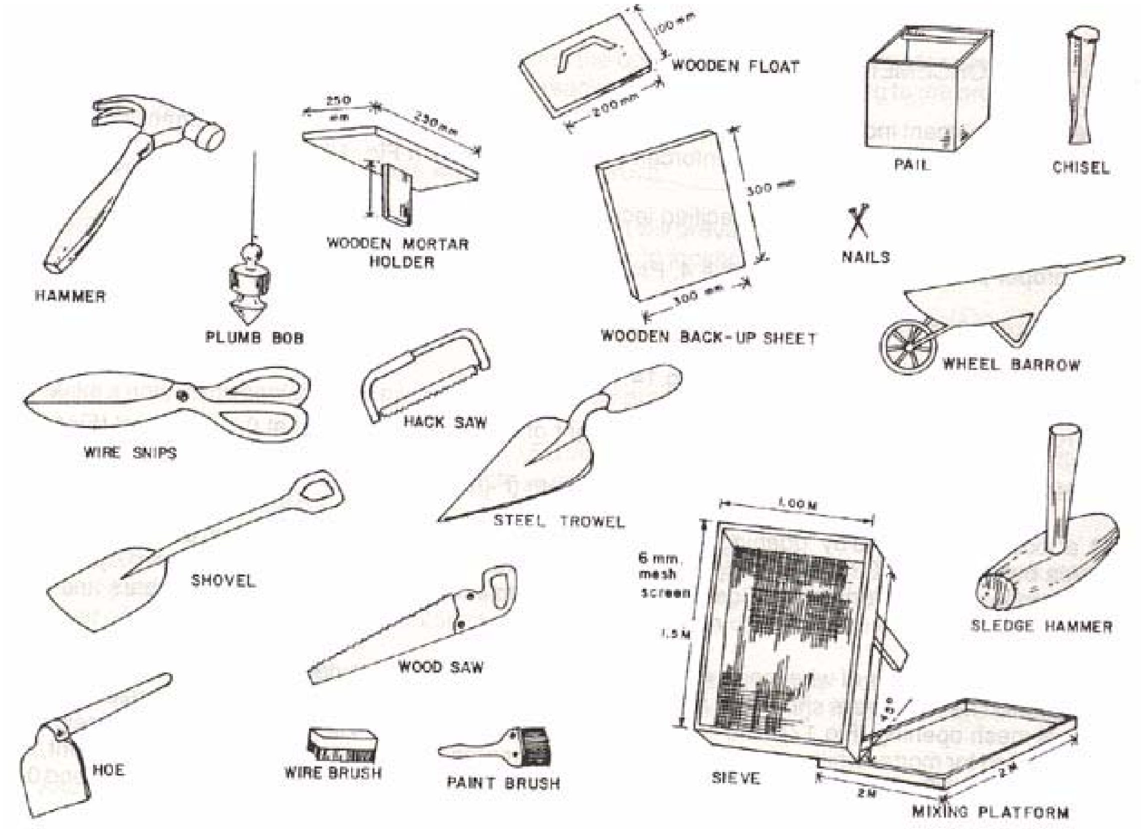
UNHCR — Ferrocement Cast-in-place Water Tank (75 Cu.m.)	Designed by ACECOMS, IFIC — School of Civil Engineering (AIT)	Drawing Title: **Reinforcing Steel Skeleton**	Drawing No: **CD75-07**
		Scale: Not to Scale / Client: UNHCR	Date: March 2002



Ferrocement Construction Tools

Construction Main Steps

Step 1: Selection of Site

Step 2: Site Clearance

Step 3: Preparation of Foundation

Step 4: Preparation of Lean Concrete Base

Step 5: Preparation of Base Slab Reinforcement

Step 6: Laying Base Slab Reinforcement

Step 7: Erecting L-bars Along the Wall-Base Junction

Step 8: Placing Vertical Dowel/ Plate/Bars for Central Column

Step 9: Casting the Base Slab

Step 10: Erection of Vertical Reinforcement and Stiffeners for Wall

Step 11: Keeping Openings for Construction and Pipe Works

Step 12: Fixing Wire (Chicken) Mesh (WM1 and WM2)

Step 13: Preparation and Fixing the Central Column

Step 14: Plastering the Wall

Step 15: Preparation of Roof Shallow Truss

Step 16: Fixing Roof Trusses (Roof Stiffeners)

Step 17: Placing Roof Reinforcements

Step 18: Fixing the Roof Mesh

Step 19: Providing Openings in the Roof

Step 20: Plastering Roof Trusses

Step 21: Temporary Formwork for Plastering of Roof Surface

Step 22: Plastering Roof Surface

Step 23: Plastering Temporary Openings

Step 24: Finishing the Surface

[For Construction Procedure Details Refer to "How to Manual"]

UNHCR — Ferrocement Cast-in-place Water Tank (75 Cu.m.)	Designed by ACECOMS IFIC School of Civil Engineering (AIT)	Drawing Title: **Construction Tools and Steps**	Drawing No: **CD75-08**
		Scale: Not to Scale / Client: UNHCR	Date: March 2002

Material Specification

Cement: Use ordinary Portland cement Type I or II for tropical countries and Type II for cold climates

Sand:
1. Use well graded sand. Sand that is too fine or too coarse is not suitable
2. Separate sand from stone using 6.4 mm (1/4 inch) mesh screen.
3. No organic or chemical impurities. If quality is in doubt, wash with clean water.
4. Desirable sand grading is as follow:

Sieve	Percent passing
3/8 in (9.5mm)	100
No. 4 (4.75mm)	95 to 100
No. 8 (2.36 mm)	80 to 100
No. 14 (1.18mm)	50 to 85
No. 30 (600um)	25 to 60
No. 100 (150um)	2 to 10

Water:
1. Water fit for drinking is suitable.
2. Salty water should never be used.

Wire Mesh:
1. Must be easy to handle and flexible enough to be bent around corners.
2. Galvanized wire mesh is preferred as it is less likely to rust or corrode.
3. Use 0.5 mm to 1.00 mm diameter with 10 mm to 25 mm mesh opening.
4. Free from grease, oil, rust and anything that might reduce bond.

Skeletal Steel :
1. Free from grease, oil detergents, organic matter, cracks of blow holes.
2. Bars are acceptable if no cracks appear after the following field test:
"Bend bar into U shape and then straighten it out. Bend it again in U shape in the opposite direction and straighten it out."
3. Grade SR24: Yield strength = 2400-2600 ksc

Steel Channel:
1. Free from grease, oil detergents, organic matter, cracks of blow holes
2. Size 7.50 cm x 3.75 cm (height x width)
3. Grade Fy = 2400-2600 ksc (34-36 ksi) and FU = 4,000-4,500 ksc (57-64 ksi)

Tie Wire: Use annealed (soft) galvanized wires of 24 or 26 gauge. Cut pieces of wire from meshes could also be used for tying.

Material Quantity Summary (75 cu. m.)

Items	Quantity	Unit
Coarse Sand	21	m2
Hollow Blocks	180	pieces
Cement	4553	kg
Sand	6	m2
Stone	7	m2
Water	2.4	m2
RB 6 mm	242	m
RB 9 mm	1976	m
Steel Channel (7.50 cm x 3.75 cm)	18	m
Chicken Mesh	168	m2
GI Pipe	2.7	m
Steel Plate	0.09	m2

Mix Proportions

Lean Concrete = 1:4:8 (Cement: Sand: Aggregate by weight)

Slab Concrete = 1:2:4 (Cement: Sand: Aggregate by weight)

Ferrocement Mortar = 1:2:0.4 (Cement: Sand: Water by weight)

UNHCR — Ferrocement Cast-in-place Water Tank (75 Cu.m.)	Designed by ACECOMS IFIC School of Civil Engineering (AIT)	Drawing Title: **Material Specification and BOM**	Drawing No: **CD75-09**
		Scale: Not to Scale / Client: UNHCR	Date: March 2002