

Ferrocement Cast-in-place Water Tank (90 Cu. M.)

Designed by:

ACECOMS

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

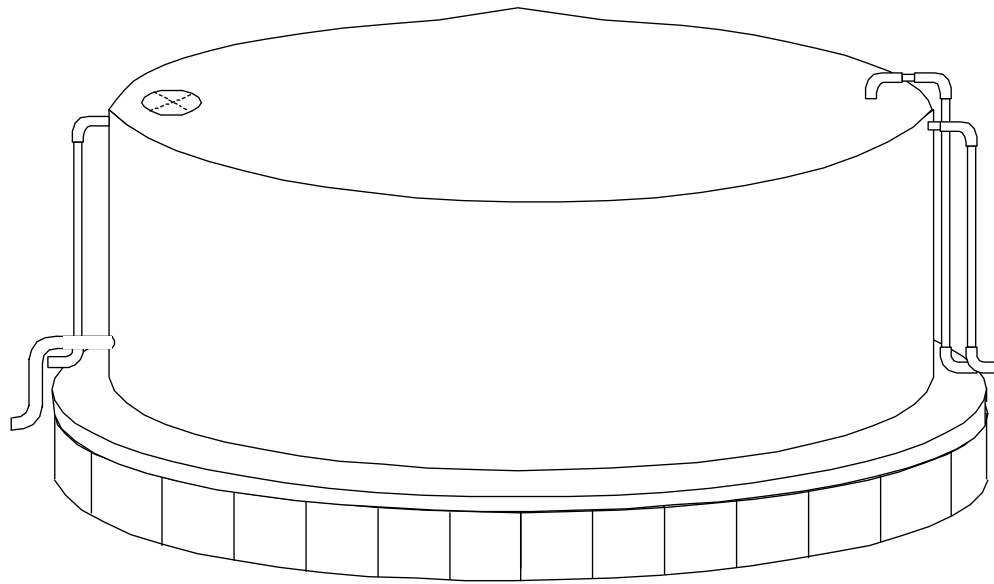


Designed for:

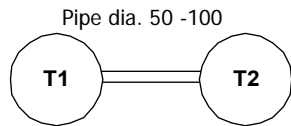


United Nations High Commissioner for Refugees (UNHCR)

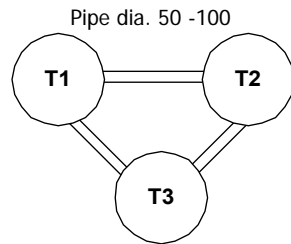
Content	
Drawing Number	Title
CD90-01	Key Features
CD90-02	Plan, Elevation and Section
CD90-03	Foundation Details
CD90-04	Base Slab Details
CD90-05	Wall and Central Column Details
CD90-06	Roof Details
CD90-07	Reinforcing Steel Skeleton
CD90-08	Construction Tools and Steps
CD90-09	Material Specification and BOM



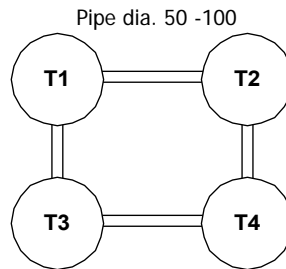
Single Tank



Plan - 2 Tanks

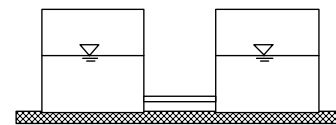


Plan - 3 Tanks

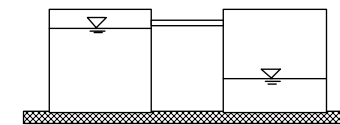


Plan - 4 Tanks

Examples for Connecting Multiple Tanks



For Same Water Head



For Different Water Head
(Overflow Type Connection)

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

Key Features

Capacity	90 Cu. m
Diameter	7300
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	<ul style="list-style-type: none"> • Inside Plastering Only • Outside Ordinary Paint • No Special Paint/Additives



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Drawing Title:

Key Features

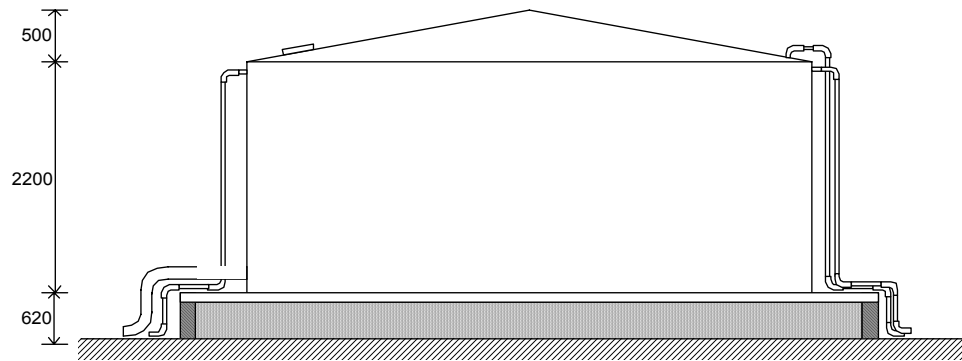
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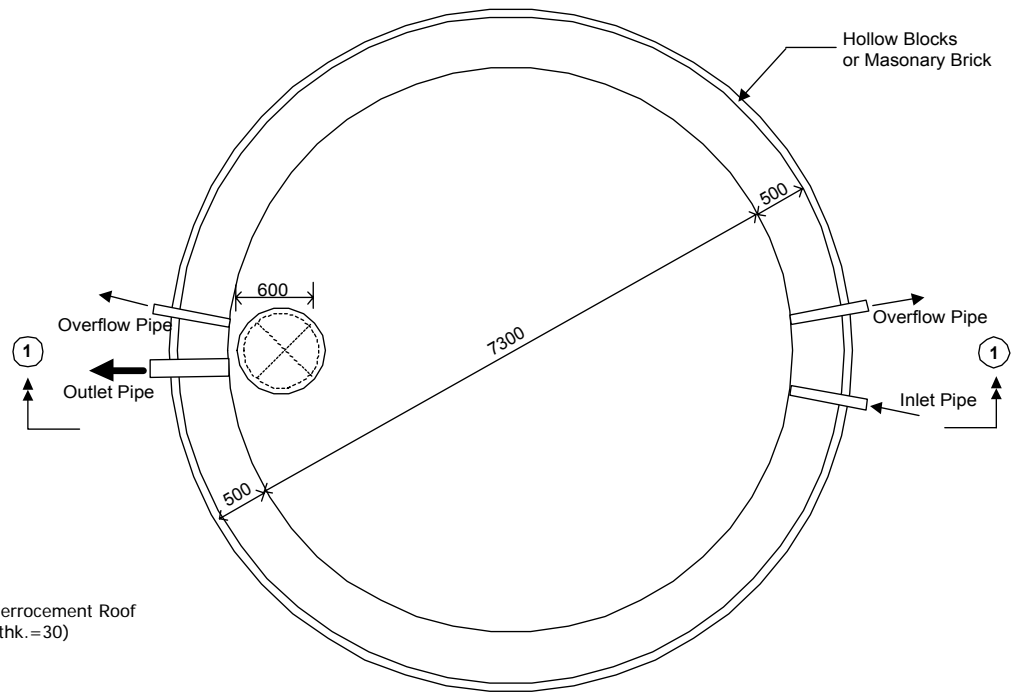
Drawing No:

CD90-01

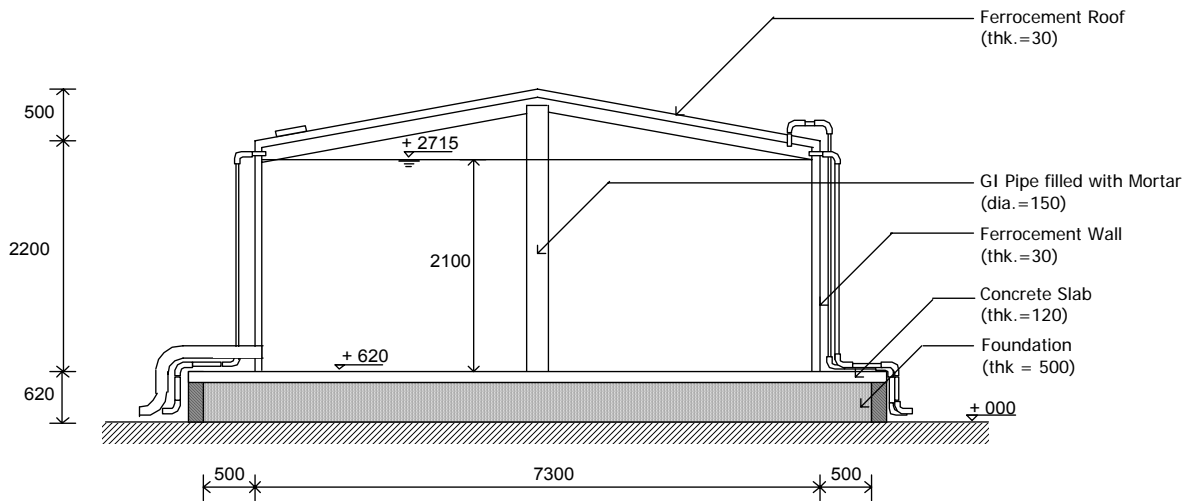
Date: March 2002



Elevation



Roof Plan



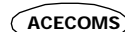
Section 1-1

Note: - RB = Round Bar
 - GI = Galvanized Iron
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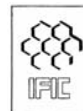


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Drawing Title:

Plan, Elevation and Section

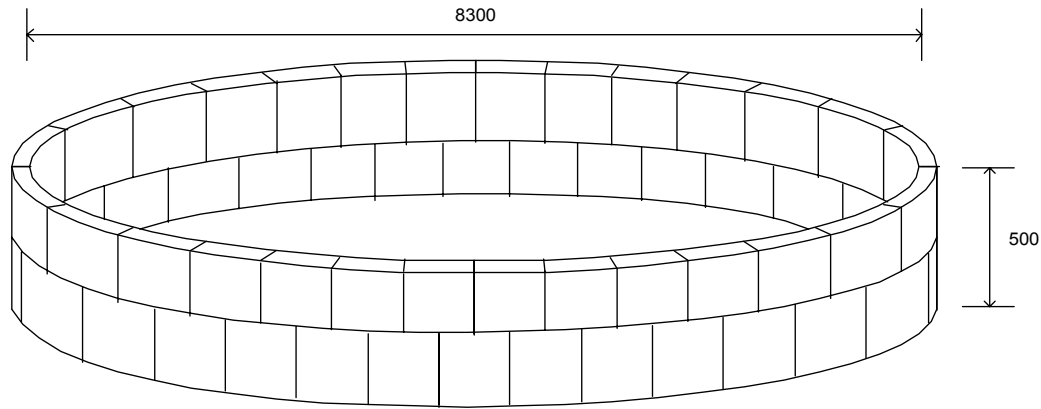
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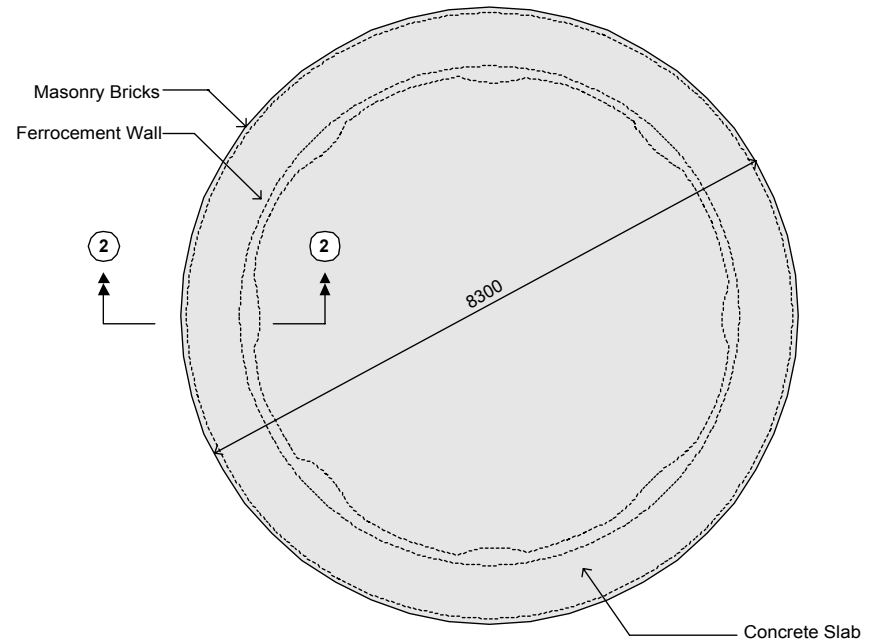
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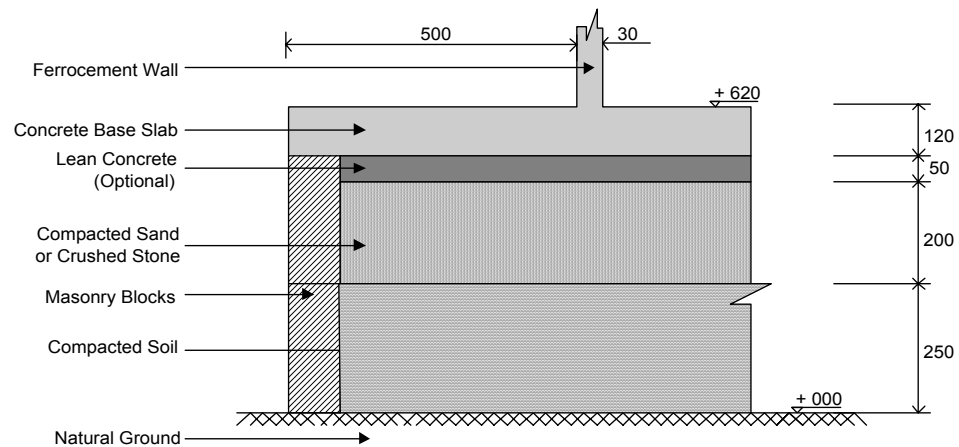
Date: March 2002



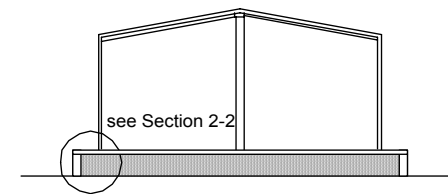
Masonry Brick Layout



Foundation Plan
(Level + 620)



Section 2-2: Foundation Detail



see Section 2-2

Note: - RB = Round Bar
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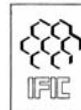


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Drawing Title:

Foundation Details

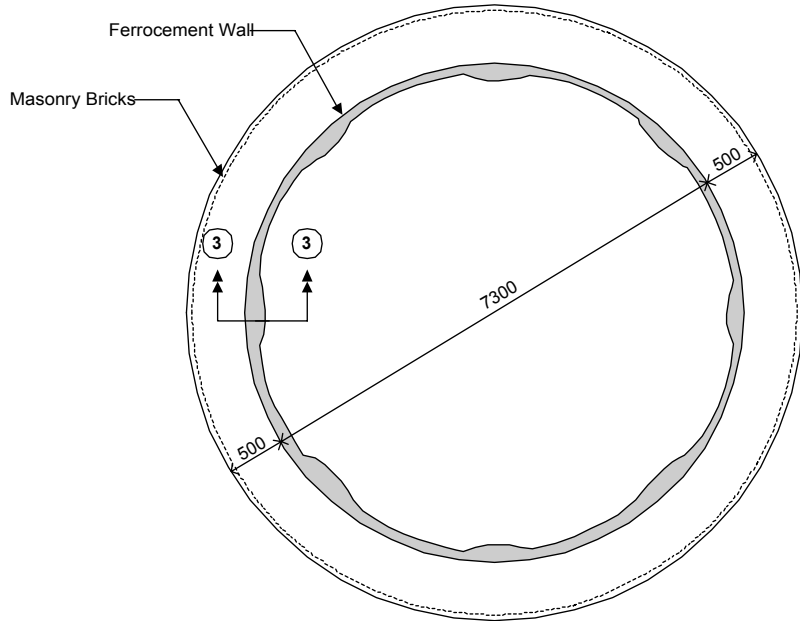
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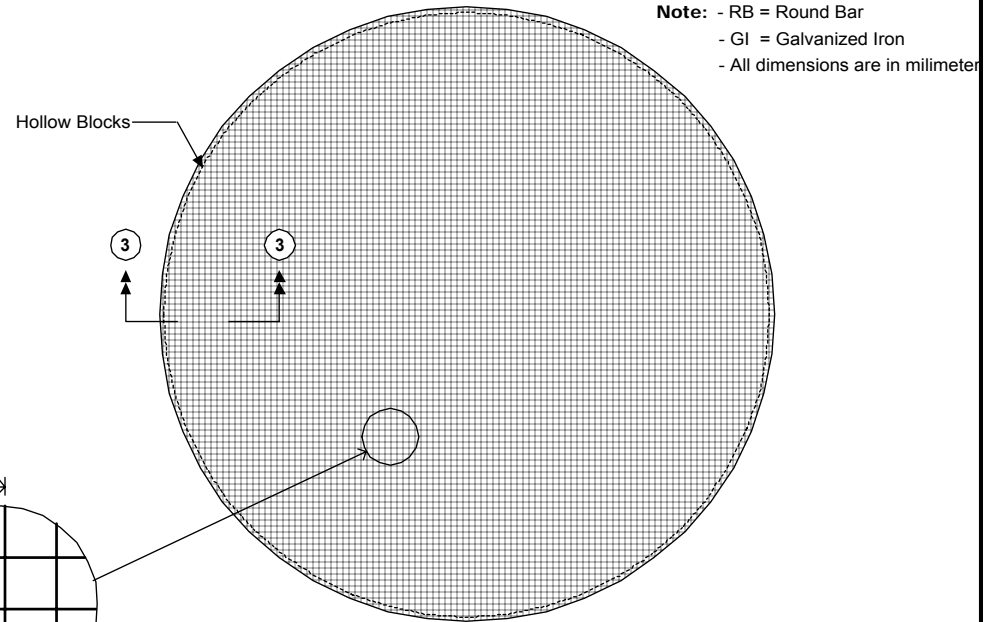
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CD90-03

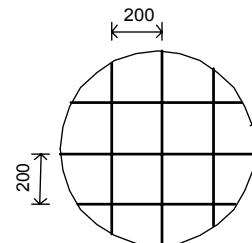
Date: March 2002



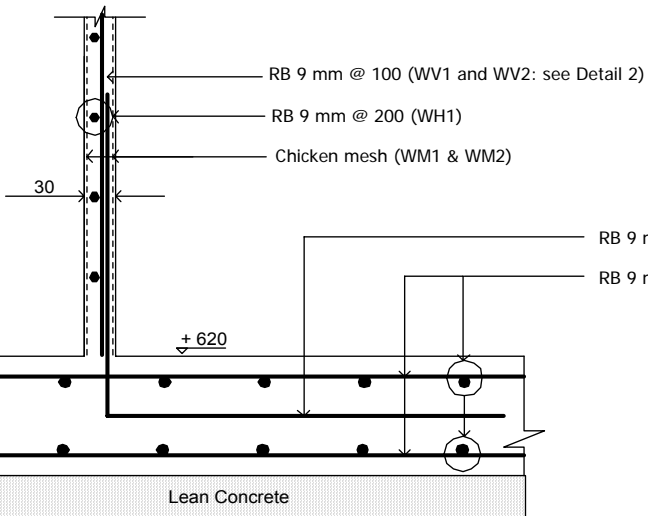
Water Tank Plan



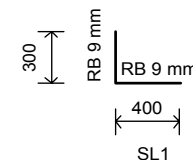
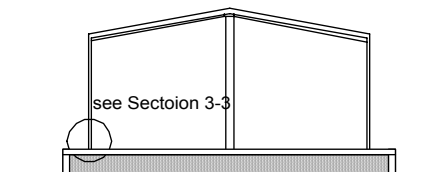
Base Slab Reinforcement Detail



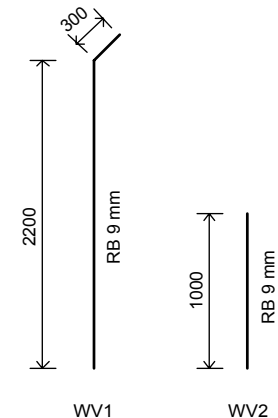
RB 9 mm @ 200 #
(ST1 & SB1: 2 Layers)



Section 3-3: Slab Detail



Detail 1



Detail 2



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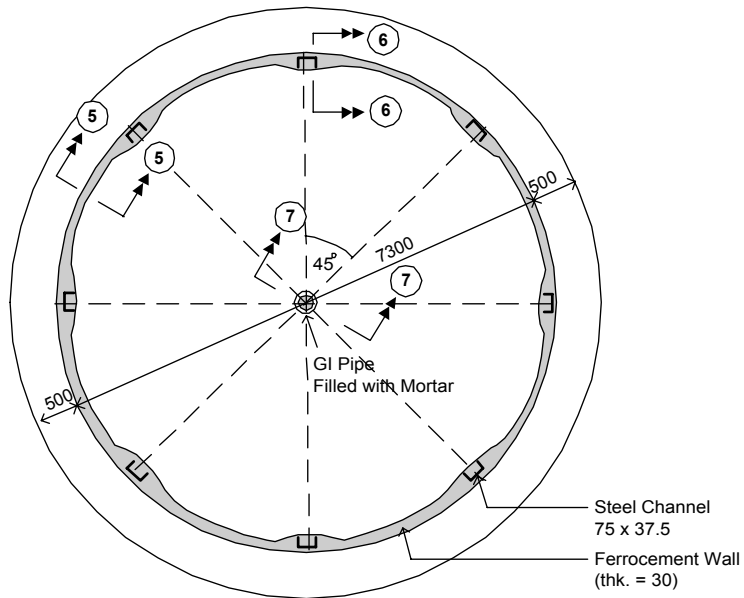
Drawing Title:
Base Slab Details

Drawing No:
CD90-04

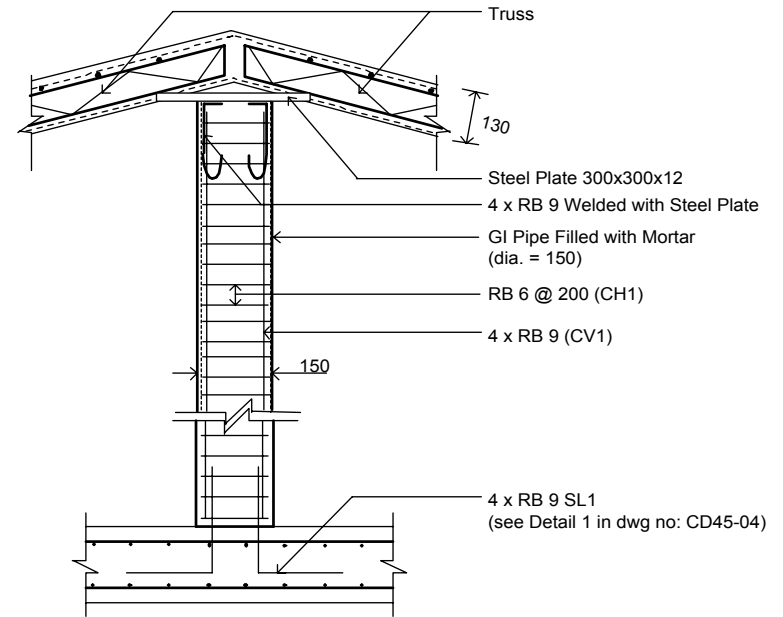
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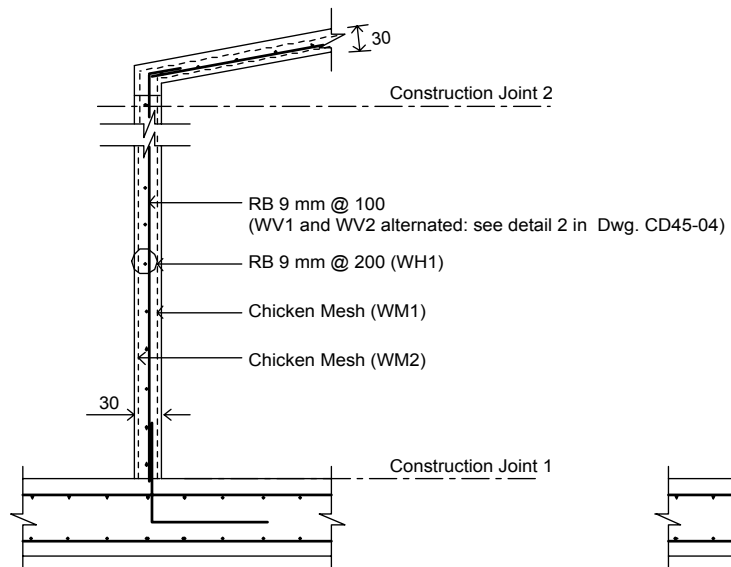
Date: March 2002



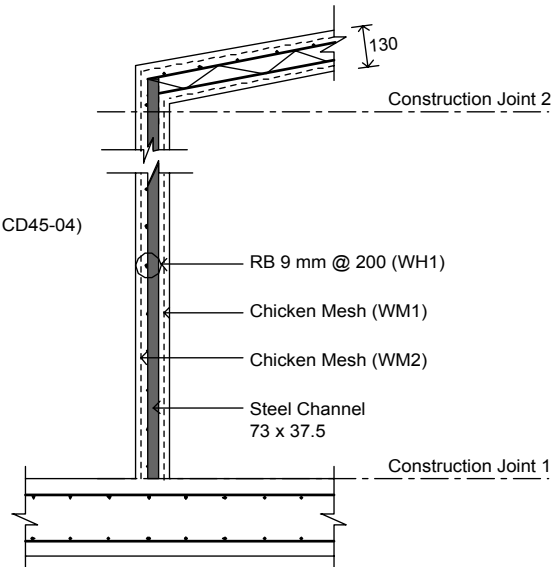
Section 4-4: Water Tank Wall Section



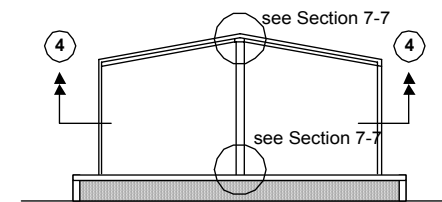
Section 7-7: Central Column Detail



Section 5-5



Section 6-6



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UNHCR

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Drawing Title:

Wall and Central Column Details

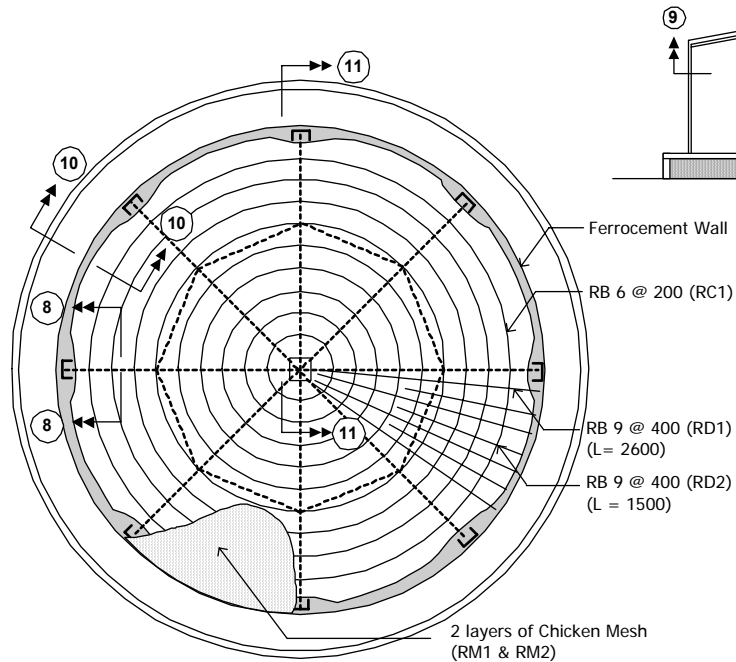
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
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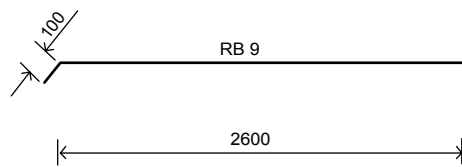
CD90-05

Date: March 2002

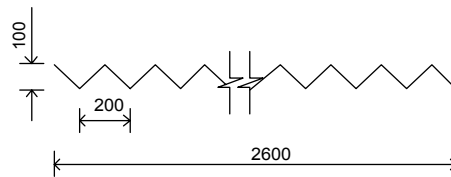


Section 9-9: Roof Framing Plan

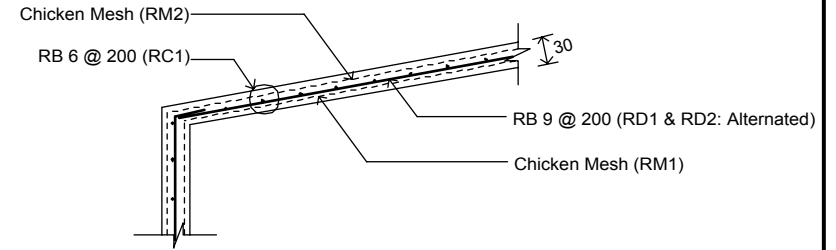
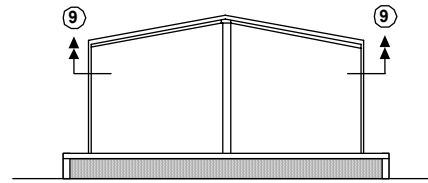
-  Steel Channel 75 x 37.5
-  Truss (see Section 11-11)



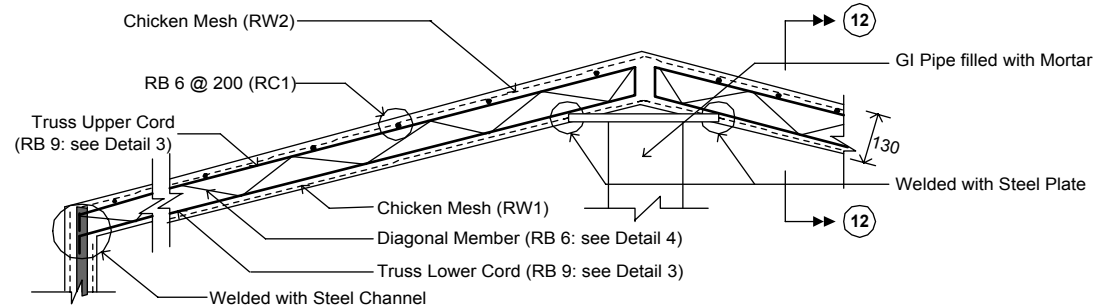
Detail 3: Truss Upper and Lower Cord Detail



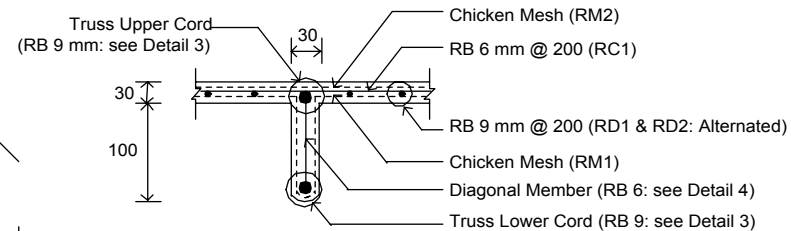
Detail 4: Diagonal Member Detail Welded to Upper and Lower Chord



Section 10-10: Roof Slab Detail



Section 11-11: Truss Detail



Section 8-8: Truss Section

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Drawing Title:

Roof Details

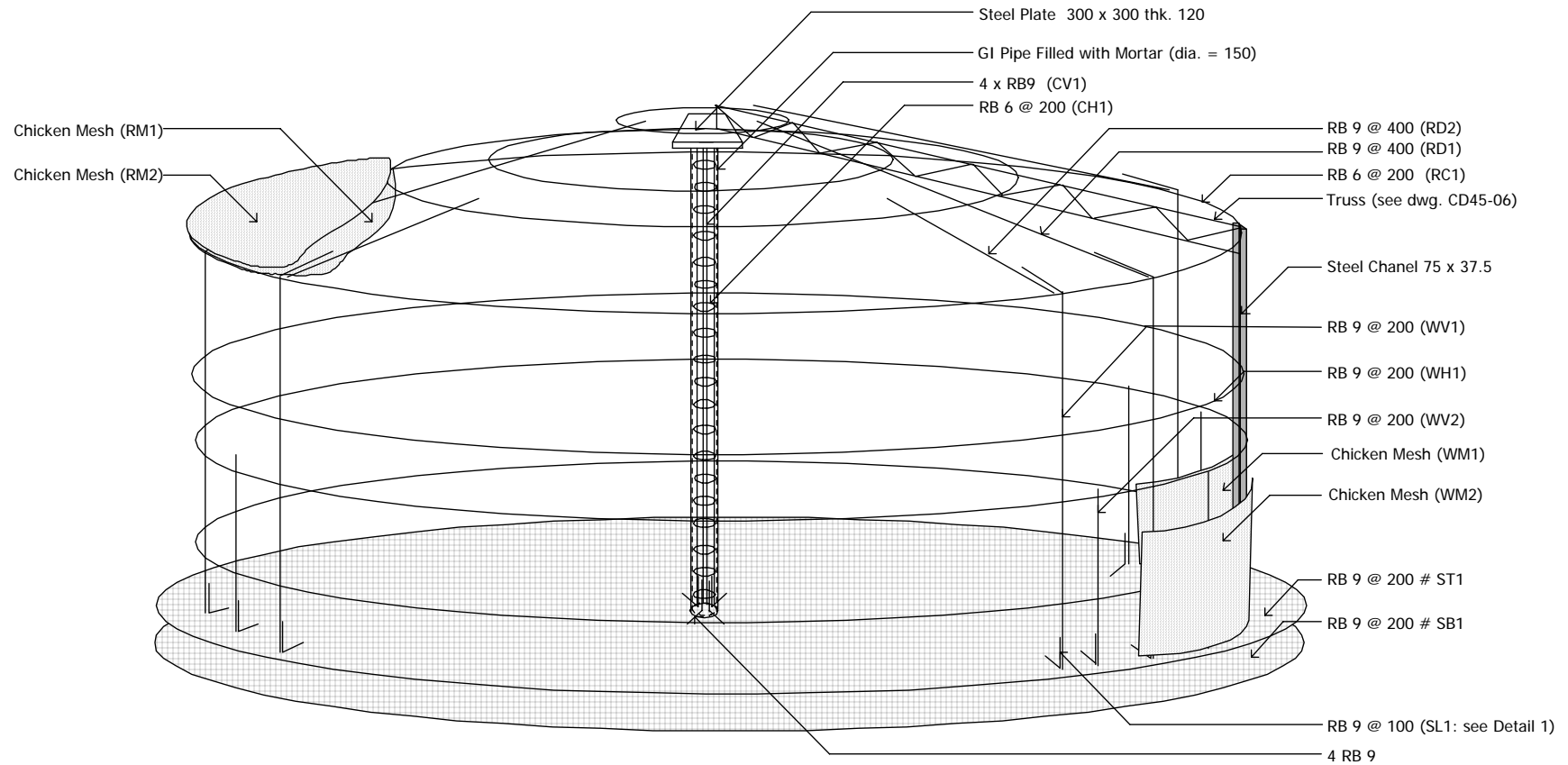
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Client: UNHCR

Drawing No:

CD90-06

Date: March 2002



Note: Only Selected Typical Elements Shown

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Drawing Title:

Reinforcing Steel Skeleton

Scale: Not to Scale

Client: UNHCR

Drawing No:

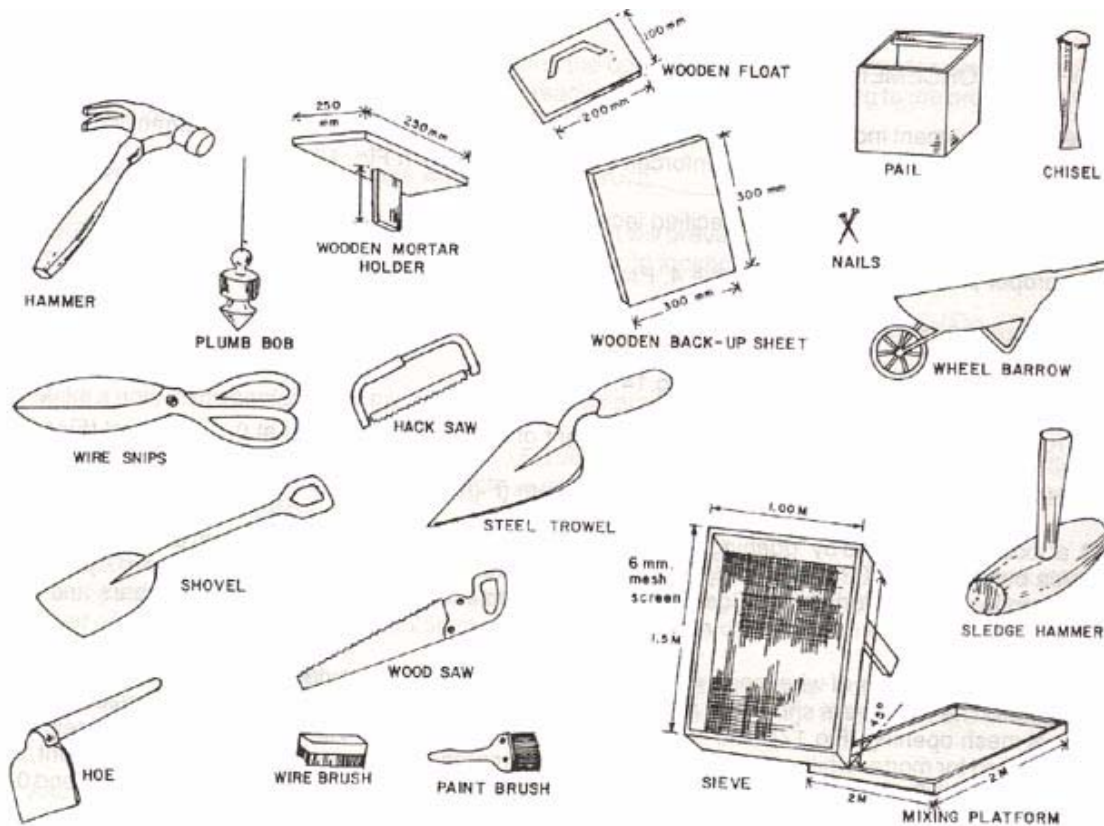
CD90-07

Date: March 2002

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"]



Ferrocement Construction Tools



Ferrocement Cast-in-place Water Tank
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Drawing Title:

Construction Tools and Steps

Scale: Not to Scale

Client: UNHCR

Drawing No:

CD90-08

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 $F_y = 2400-2600$ ksc (34-36 ksi) and $F_U = 4,000-4,500$ 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 (90 cu. m.)

Items	Quantity	Unit
Coarse Sand	25	m ²
Hollow Blocks	195	pieces
Cement	5078	kg
Sand	7	m ²
Stone	7	m ²
Water	2.62	m ²
RB 6 mm	279	m
RB 9 mm	2375	m
Steel Channel (7.50 cm x 3.75 cm)	18	m
Chicken Mesh	191	m ²
GI Pipe	2.7	m
Steel Plate	0.09	m ²

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)



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Drawing Title:

Material Specification and BOM

Scale: Not to Scale

Client: UNHCR

Drawing No:

CD90-09

Date: March 2002