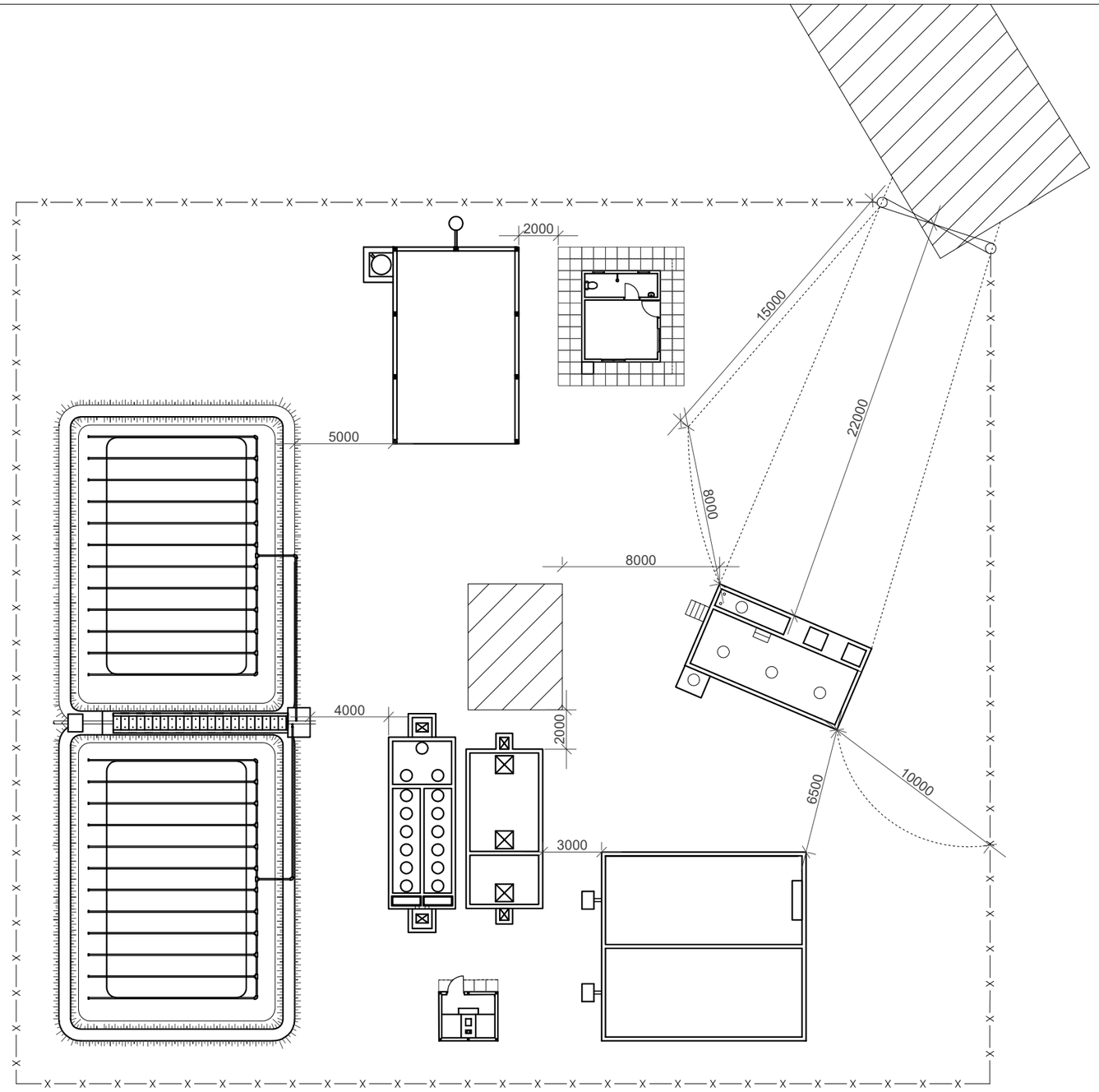
STRUCTURAL AND ENGINEERING DRAWINGS

DECENTRALISED TREATMENT FACILITY
(DTF)

Up-Scaling Basic Sanitation for the Urban Poor
(UBSUP)

WATER SERVICES TRUST FUND, KENYA

Dec 2016



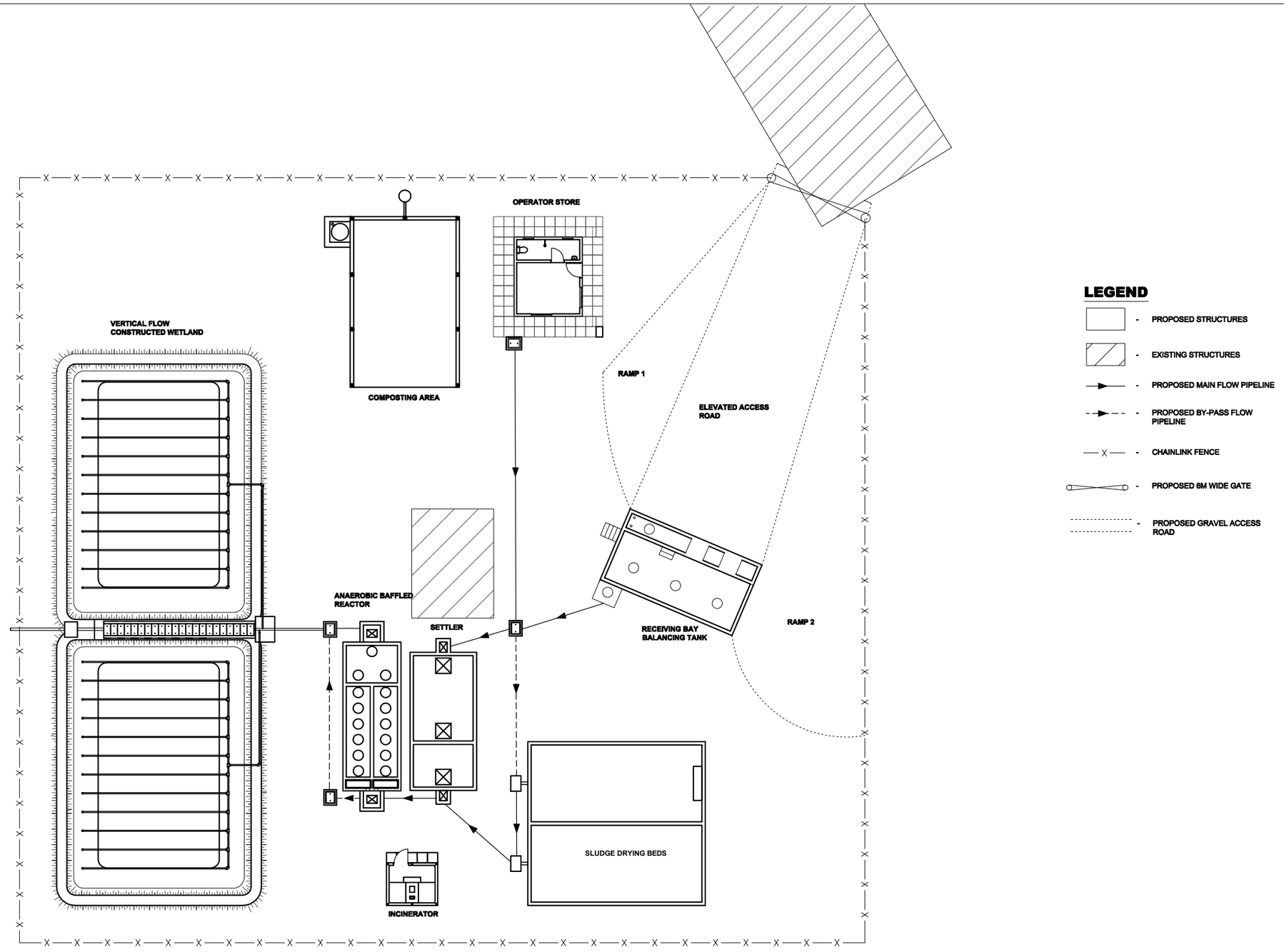
LEGEND

- PROPOSED STRUCTURES
- EXISTING STRUCTURES
- PROPOSED MAIN FLOW PIPELINE
- PROPOSED BY-PASS FLOW PIPELINE
- CHAINLINK FENCE
- PROPOSED 6M WIDE GATE
- PROPOSED GRAVEL ACCESS ROAD

LAYOUT PLAN SHOWING DIMENSIONS

KIBWEZI DTF LAYOUT

Project Title: **Up-scaling Basic Sanitation for Urban Poor (UBSUP)**	Project Area	Designed and drawn by: UBSUP technical team ***Checked by:*** *Programme Manager Urban Investments* Approved by: CEO WSTF	***Notes:*** *See Above*	***Index-No.:*** / ***Description:***	***Date:*** ***Scale: As shown*** ***page:***



LAYOUT PLAN OF THE PIPEWORK

KIBWEZI DTF LAYOUT

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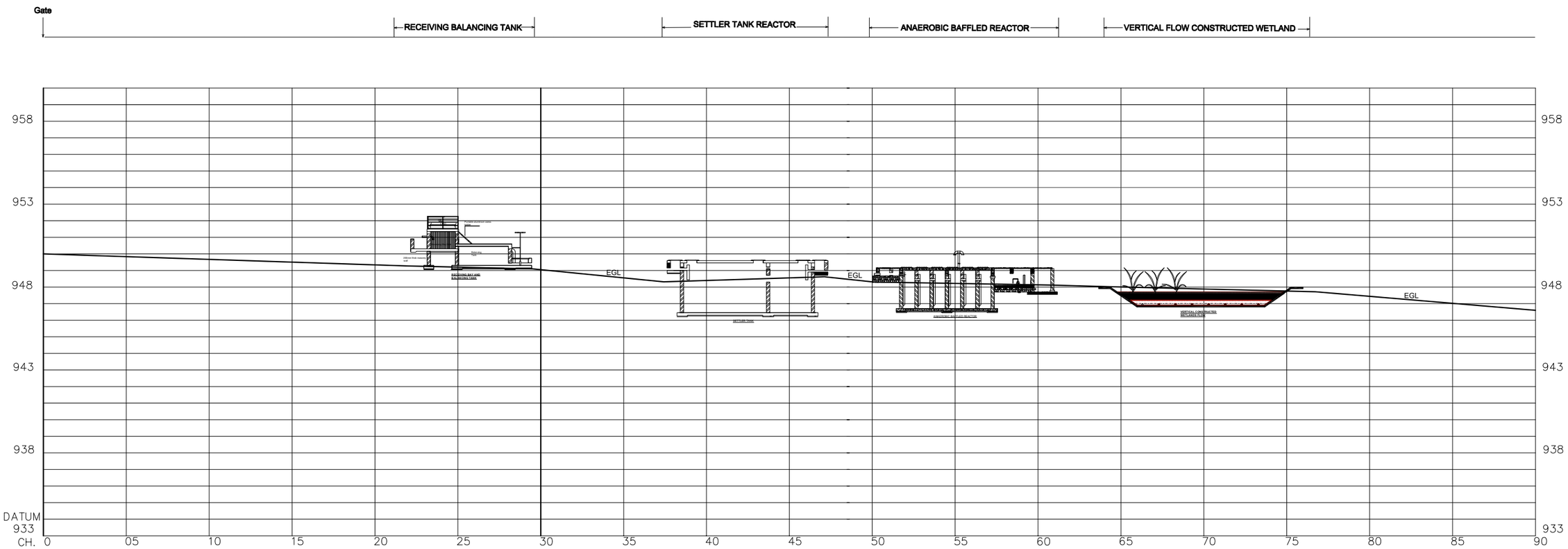
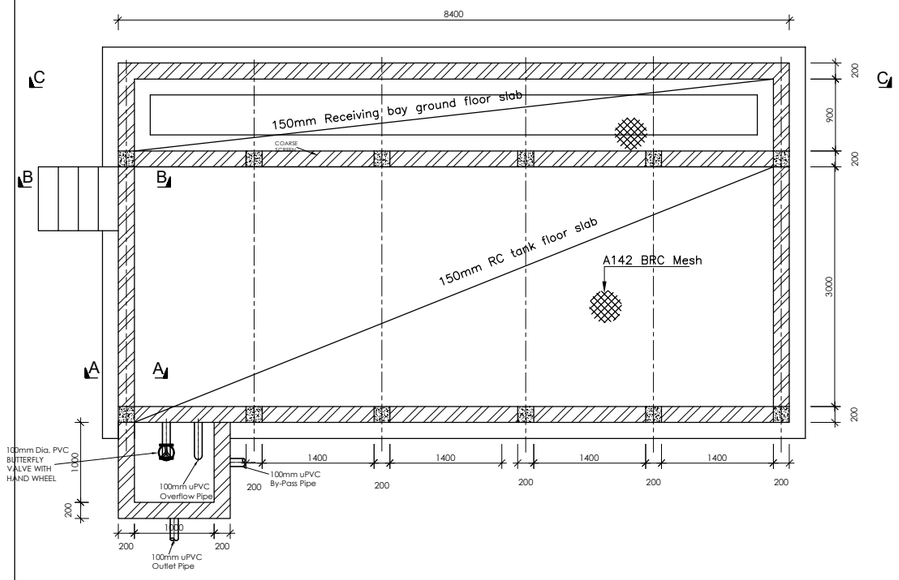
LEGEND

——— - EXISTING GROUND LEVEL (EGL)

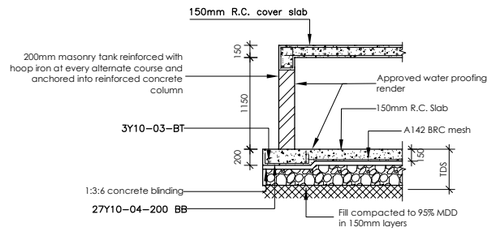


KIBWEZI DTF LONGITUDINAL PROFILE

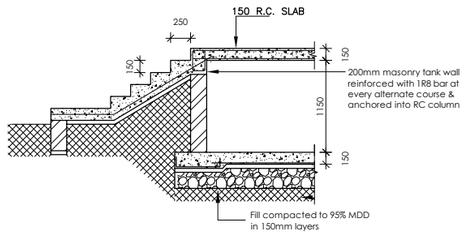
Project Title: **Up-scaling Basic Sanitation for Urban Poor (UBSUP)**	Project Area	Designed and drawn by: UBSUP technical team ***Checked by:*** *Programme Manager Urban Investments* Approved by: CEO WSTF	***Notes:*** *See Above*	***Index-No.:*** / ***Description:***	***Date:*** ***Scale: As shown*** ***page:***



FOUNDATION LAYOUT PLAN
SCALE 1:75



SECTION A - A
SCALE 1:50



SECTION B - B
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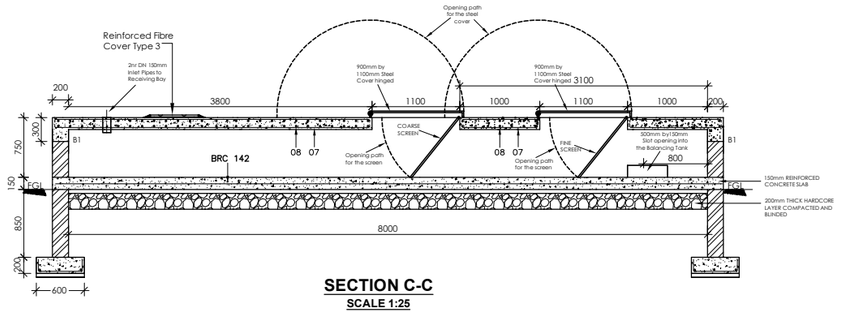
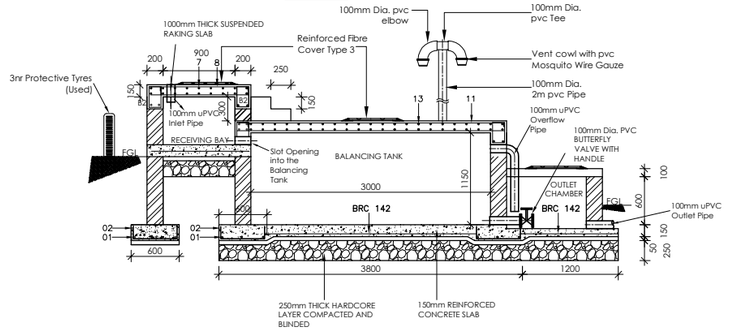
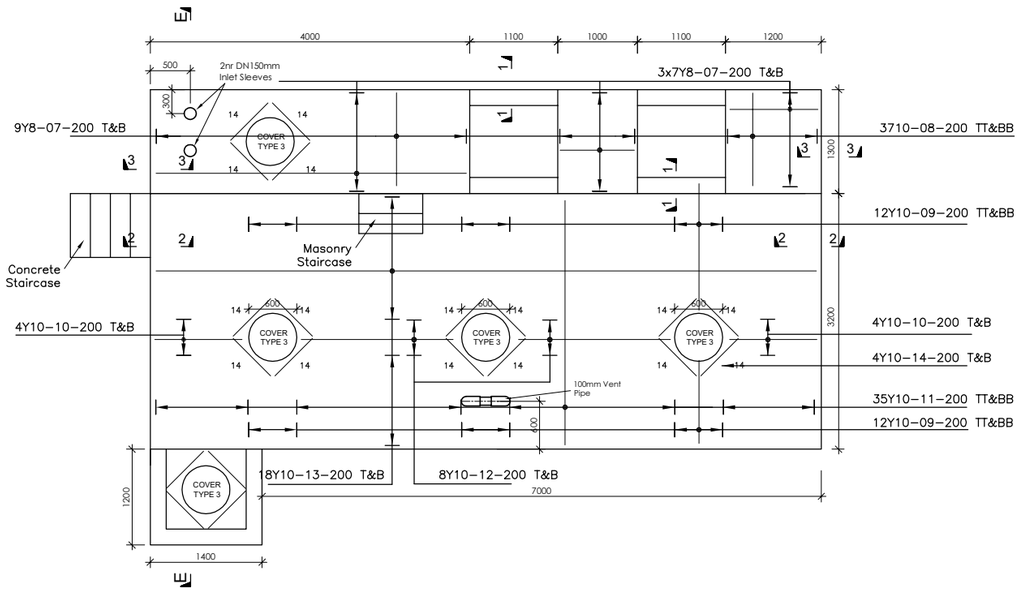


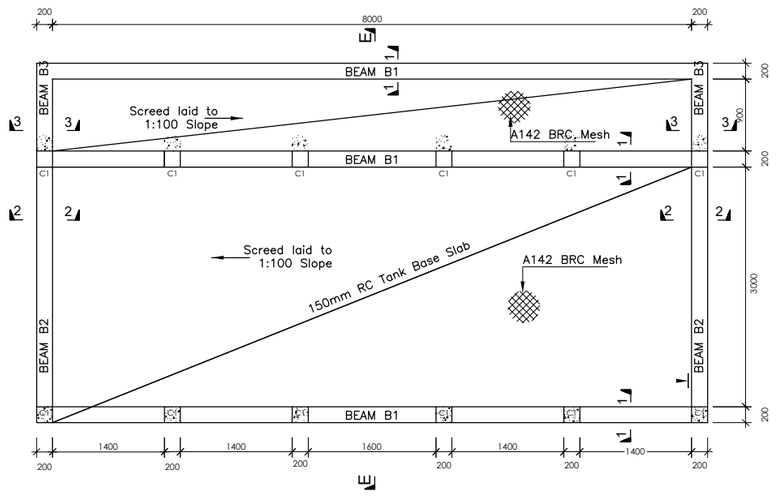
SECTION C-C
SCALE 1:25



SECTION E-E
SCALE 1:25



ROOF SLAB PLAN
STRUCTURAL DETAILS
SCALE 1:25



BASE SLAB PLAN
STRUCTURAL DETAILS
SCALE 1:25

NOTES

1 CONCRETE:
- (a) CEMENT TO BE ORDINARY PORTLAND CEMENT TO B.S. 12
- (b) CONCRETE AGGREGATE TO COMPLY WITH B.S. 882
- (c) WATER IN CONCRETE MIXES TO B.S. 3148
- (d) CONCRETE CLASSES TO BE AS FOLLOWS:–
  MASS CONCRETE FILL AND BLINDING MIX, CLASS 15/40
  REINFORCED CONCRETE, CLASS 25/20
- (e) MINIMUM COVER TO ALL REINFORCEMENT TO BE 40mm UNLESS AS SPECIFIED BELOW FOR BUILDINGS:
  MEMBERS OF BUILDINGS:
  - SLABS – 20 mm
  - BEAMS – 25 mm
  - COLUMNS – 40 mm
  - FOUNDATIONS & FOOTINGS – 50 mm
- (f) WALLS/COLUMNS SHOULD BE POURED, IF POSSIBLE, IN A FULL HEIGHT POUR AS SOON AS POSSIBLE AFTER THE BASE HAS BEEN CONCRETED (2 TO 3 DAYS)

2 REINFORCEMENT:
- (a) REINFORCEMENT TO BE HIGH YIELD SQUARE TWISTED BARS TO B.S. 4461
- (b) BENDING DIMENSIONS TO B.S. 4466
- (c) THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL SPACER BLOCKS, CHAIRS AND TYING WIRE
- (d) EXAMPLE: 16 T12 – 07 – 150 SIGNIFIES 16 No. HIGH TENSILE 12mm DIA. BARS IDENTIFICATION MARK 07 AT 150mm CENTRE TO CENTRE SPACING

3 JOINTS:
- (a) THE POSITION AND NUMBER OF INTERMEDIATE JOINTS TO BE AS DIRECTED BY THE ENGINEER OR AS SHOWN IN THE DRAWINGS.

  BEFORE PLACING FRESH CONCRETE THE OLD SURFACE SHALL BE ROUGHENED AND ALL LAITTANCE AND LOOSE MATERIAL REMOVED.

  THE SURFACE SHALL BE THOROUGHLY WETTED BUT EXCESS WATER SHOULD BE REMOVED SO THAT THE CONSTRUCTION JOINTS ARE IN A SATURATED BUT SURFACE DRY CONDITION
- (b) ALL WALL/COLUMN BASE CONNECTIONS SHOULD HAVE 100mm KICKER UNLESS OTHERWISE SPECIFIED
- (c) THE uPVC WATER STOP SHALL BE 200mm WIDE UNLESS OTHERWISE SPECIFIED
- (d) JOINT FILLER TO B.S. 5292 AND TO BE APPROVED BY THE ENGINEER

4 ABBREVIATIONS:

T – TOP	B – BOTTOM
N.F. – NEAR FACE	F.F. – FAR FACE
E.F. – EACH FACE	E.W. – EACH WAY

5 THIS DRAWING TO BE READ IN CONJUNCTION WITH DRAWING No. RBBT/01

RECEIVING BAY AND BALANCING TANK

Project Title:
Up-scaling Basic Sanitation for Urban Poor (UBSUP)

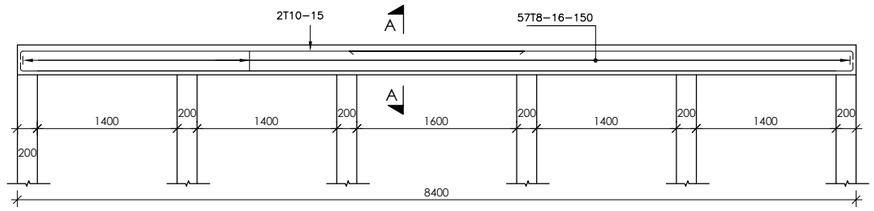
Project Area

Designed and drawn by: *UBSUP technical team*
Checked by: *Programme Manager Urban Investments*
Approved by: *CEO WSTF*

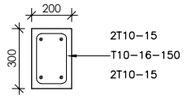
Notes:
See Above

Index-No.:	*Description:*

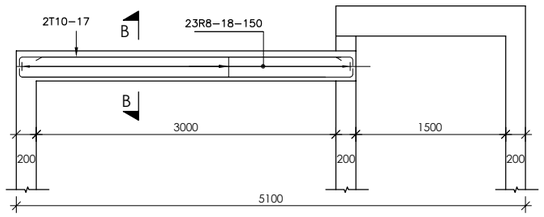
Date:
Scale: As shown
page:



BEAM B1
SCALE 1:100



BEAM B1 SECTION A-A
SCALE 1:50



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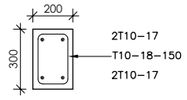
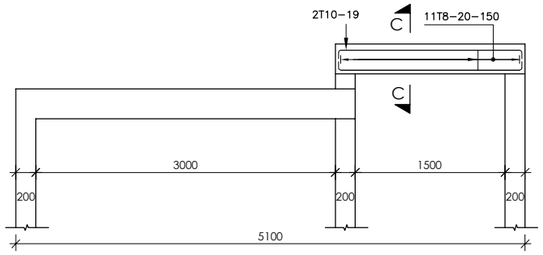
SCALE 1:100



BEAM B2 SECTION B-B
SCALE 1:50



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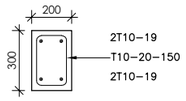
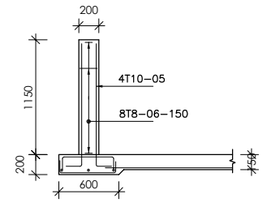


BEAM B3 SECTION C-C
SCALE 1:50



COLUMN C1
SCALE 1:50

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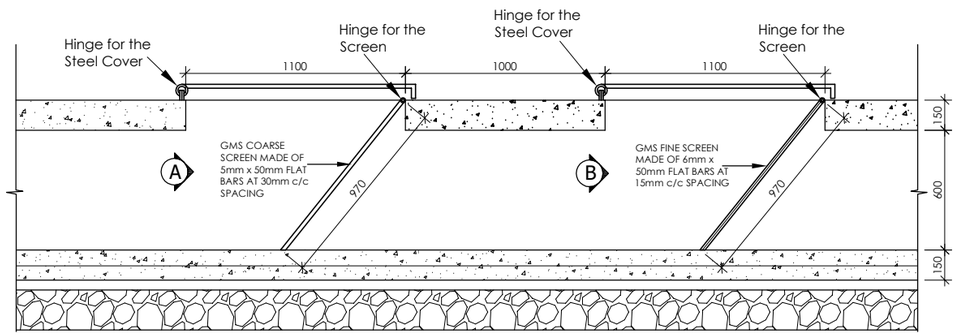
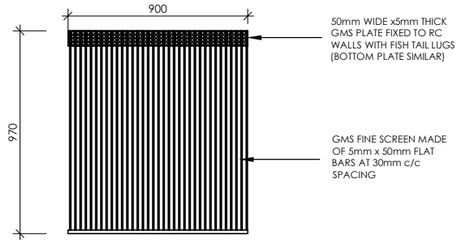
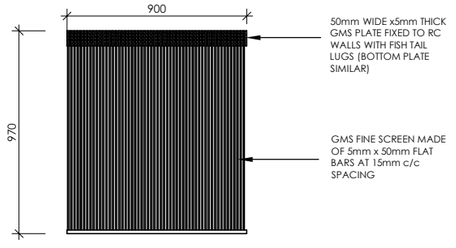
SCREEN DETAILS



SECTION 2-2
COARSE AND FINE SCREEN
SCALE 1:25



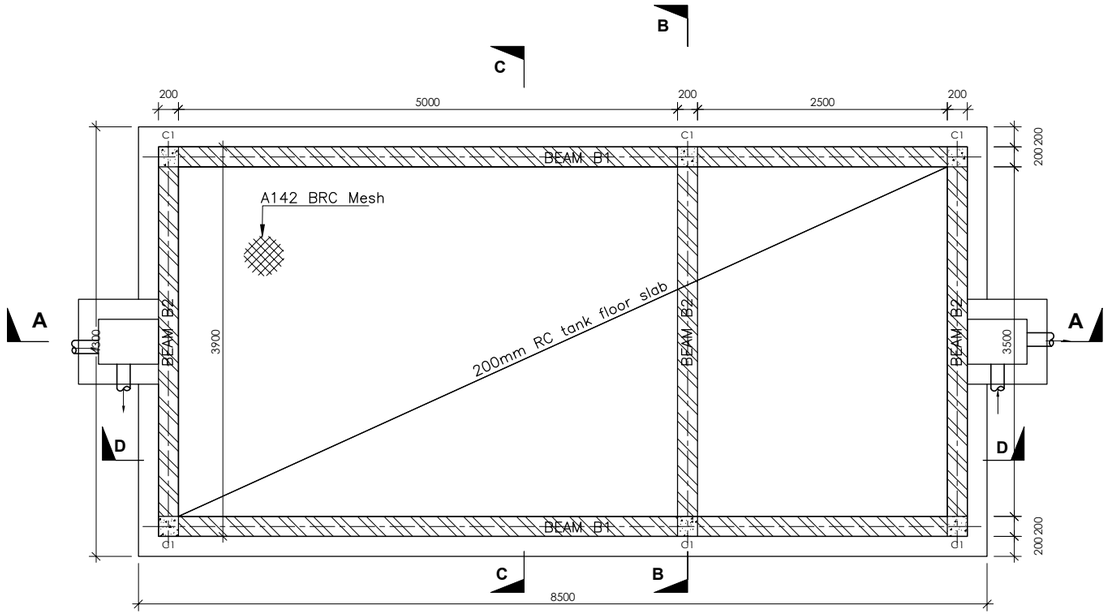
ELEVATION A
COARSE SCREEN DETAILS
SCALE 1:25



ELEVATION B
FINE SCREEN DETAILS
SCALE 1:25

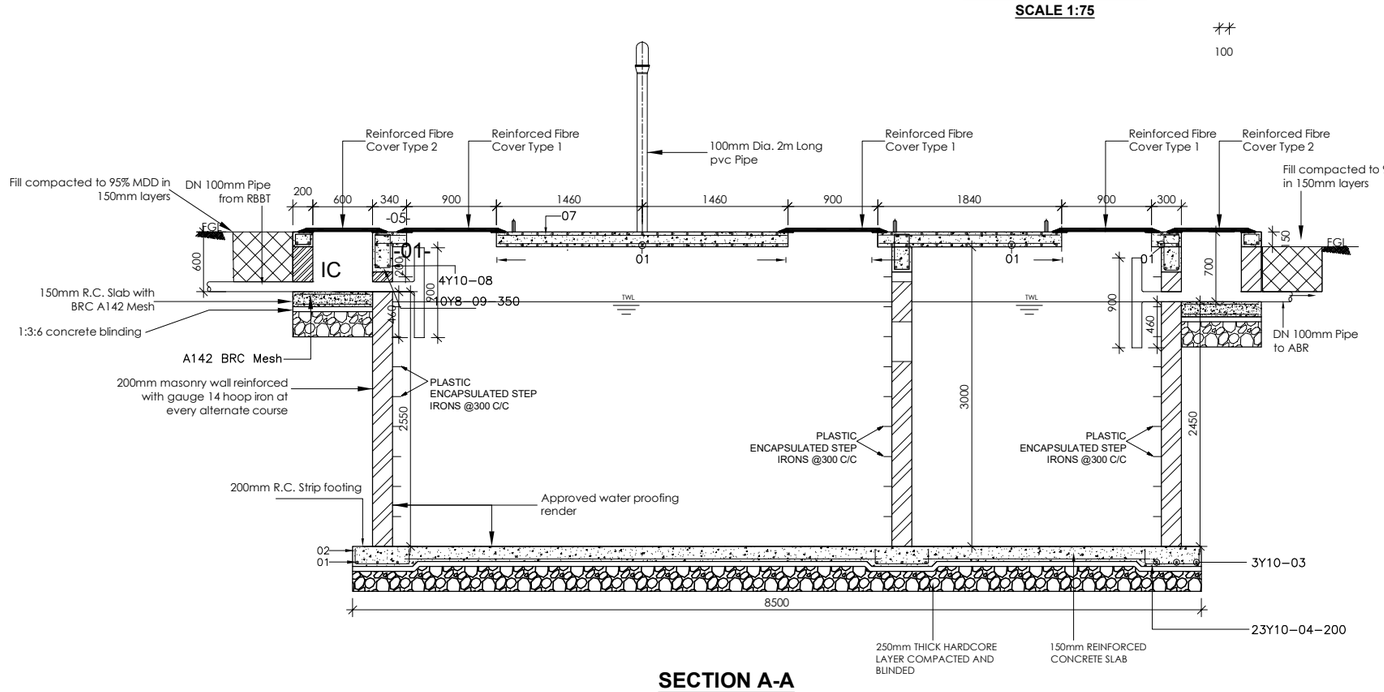
RECEIVING BAY AND BALANCING TANK

Project Title: Up-scaling Basic Sanitation for Urban Poor (UBSUP)	***Project Area***	***Designed and drawn by:*** *UBSUP technical team* ***Checked by:*** *Programme Manager Urban Investments* ***Approved by:*** *CEO WSTF*	***Notes:*** *See Above*	***Index-No.:*** / ***Description:***	***Date:*** ***Scale: As shown*** ***page:***



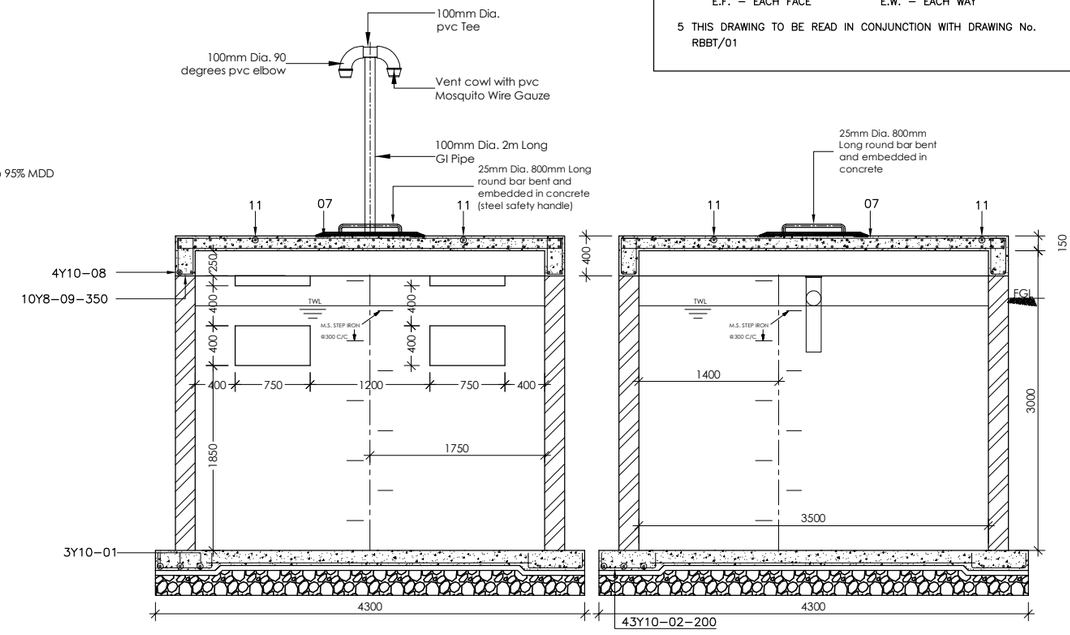
BASE SLAB PLAN

SCALE 1:75



SECTION A-A

SCALE 1:75



SECTION B-B

SCALE 1:50

SECTION C-C

SCALE 1:50

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SETTLER TANK

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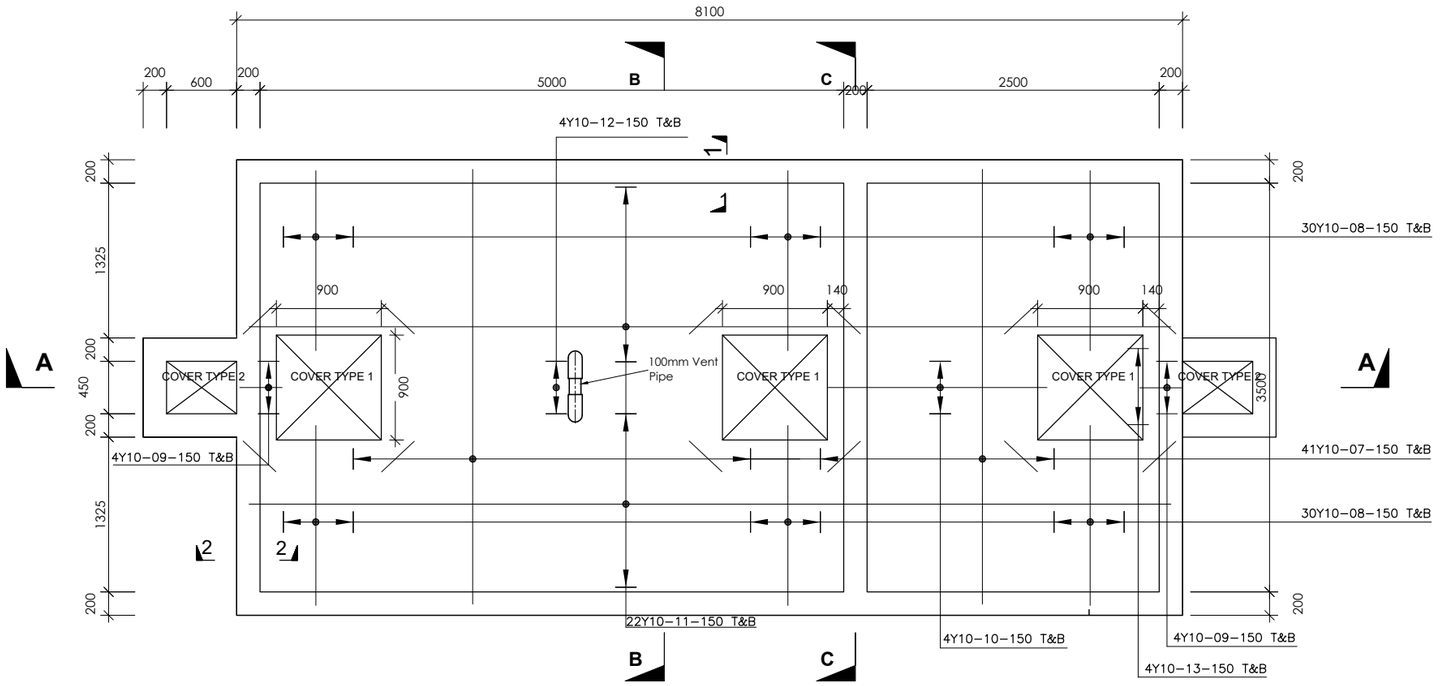

ROOF SLAB PLAN

SCALE 1:75

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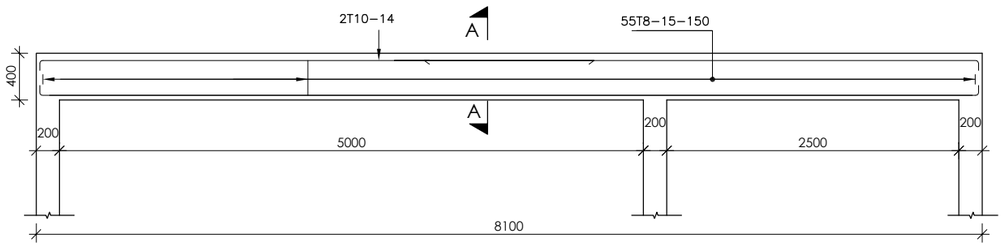
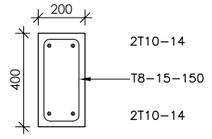


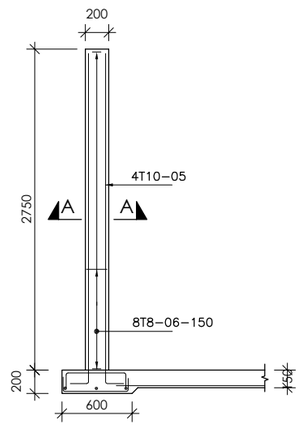
BEAM B1

SCALE 1:100



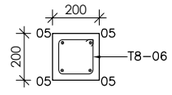
BEAM B1 SECTION A-A

SCALE 1:50



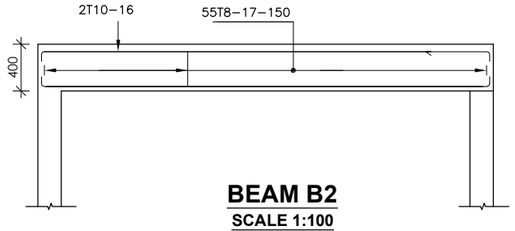
COLUMN C1

SCALE 1:50



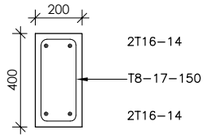
COLUMN C1 SECTION A-A

SCALE 1:50



BEAM B2

SCALE 1:100

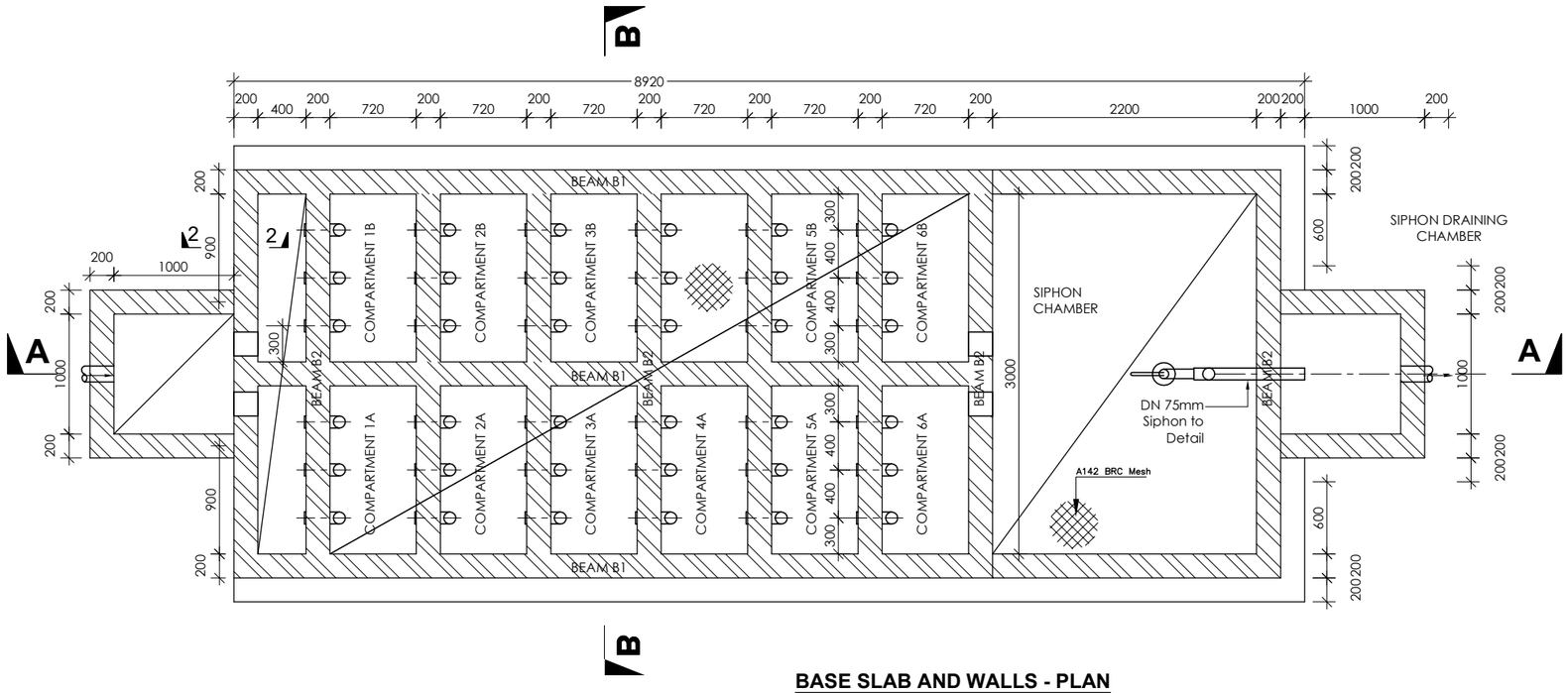


BEAM B2 SECTION A-A

SCALE 1:50

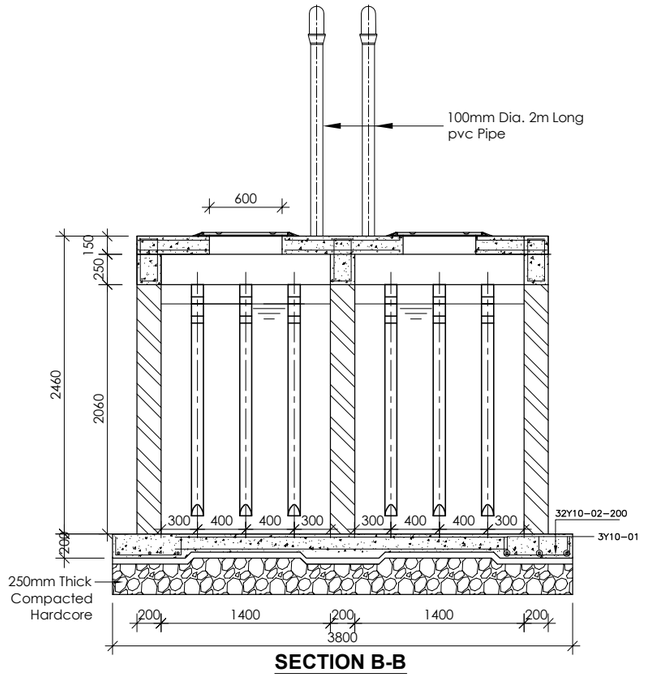
SETTLER TANK

Project Title: Up-scaling Basic Sanitation for Urban Poor (UBSUP)	***Project Area***	***Designed and drawn by:*** *UBSUP technical team* ***Checked by:*** *Programme Manager Urban Investments* ***Approved by:*** *CEO WSTF*	***Notes:*** *See Above*	***Index-No.:*** / ***Description:***	***Date:*** ***Scale: As shown*** ***page:***



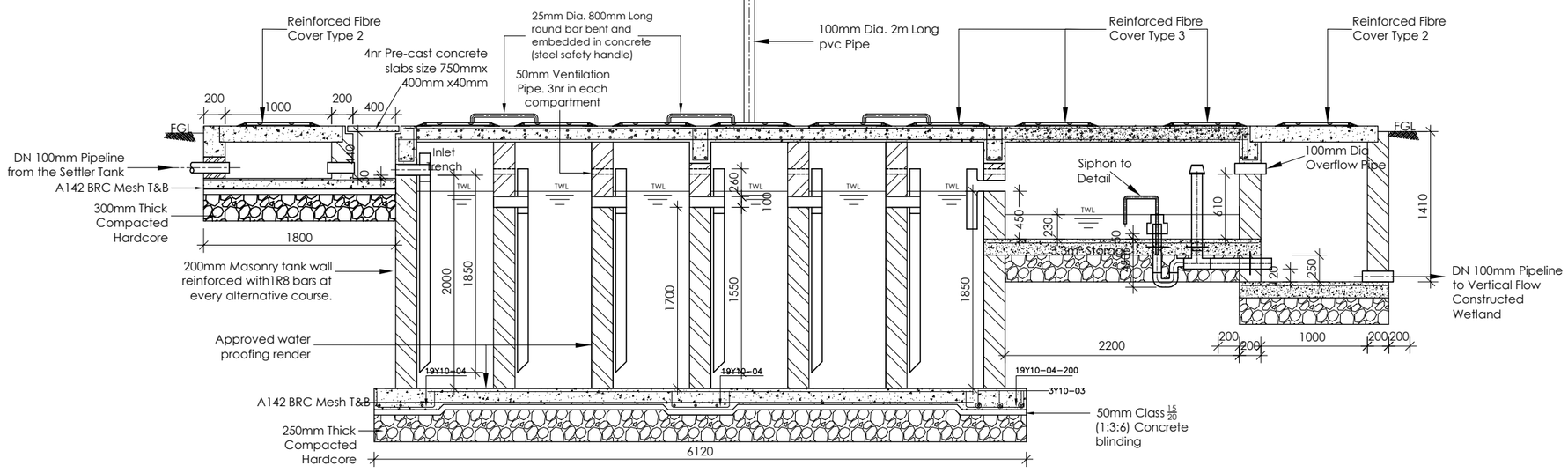
BASE SLAB AND WALLS - PLAN

SCALE 1:50



SECTION B-B

SCALE 1:50



SECTION A-A

SCALE 1:50

NOTES

1 CONCRETE:
- (a) CEMENT TO BE ORDINARY PORTLAND CEMENT TO B.S. 12
- (b) CONCRETE AGGREGATE TO COMPLY WITH B.S. 882
- (c) WATER IN CONCRETE MIXES TO B.S. 3148
- (d) CONCRETE CLASSES TO BE AS FOLLOWS:–
  MASS CONCRETE FILL AND BLINDING MIX, CLASS 15/40
  REINFORCED CONCRETE, CLASS 25/20
- (e) MINIMUM COVER TO ALL REINFORCEMENT TO BE 40mm UNLESS AS SPECIFIED BELOW FOR BUILDINGS:
  MEMBERS OF BUILDINGS:
  - SLABS – 20 mm
  - BEAMS – 25 mm
  - COLUMNS – 40 mm
  - FOUNDATIONS & FOOTINGS – 50 mm
- (f) WALLS/COLUMNS SHOULD BE POURED, IF POSSIBLE, IN A FULL HEIGHT POUR AS SOON AS POSSIBLE AFTER THE BASE HAS BEEN CONCRETED (2 TO 3 DAYS)

2 REINFORCEMENT:
- (a) REINFORCEMENT TO BE HIGH YIELD SQUARE TWISTED BARS TO B.S. 4461
- (b) BENDING DIMENSIONS TO B.S. 4466
- (c) THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL SPACER BLOCKS, CHAIRS AND TYING WIRE
- (d) EXAMPLE: 16 T12 – 07 – 150 SIGNIFIES 16 No. HIGH TENSILE 12mm DIA. BARS IDENTIFICATION MARK 07 AT 150mm CENTRE TO CENTRE SPACING

3 JOINTS:
- (a) THE POSITION AND NUMBER OF INTERMEDIATE JOINTS TO BE AS DIRECTED BY THE ENGINEER OR AS SHOWN IN THE DRAWINGS.
  BEFORE PLACING FRESH CONCRETE THE OLD SURFACE SHALL BE ROUGHENED AND ALL LAITTANCE AND LOOSE MATERIAL REMOVED.
  THE SURFACE SHALL BE THOROUGHLY WETTED BUT EXCESS WATER SHOULD BE REMOVED SO THAT THE CONSTRUCTION JOINTS ARE IN A SATURATED BUT SURFACE DRY CONDITION
- (b) ALL WALL/COLUMN BASE CONNECTIONS SHOULD HAVE 100mm KICKER UNLESS OTHERWISE SPECIFIED
- (c) THE uPVC WATER STOP SHALL BE 200mm WIDE UNLESS OTHERWISE SPECIFIED
- (d) JOINT FILLER TO B.S. 5292 AND TO BE APPROVED BY THE ENGINEER

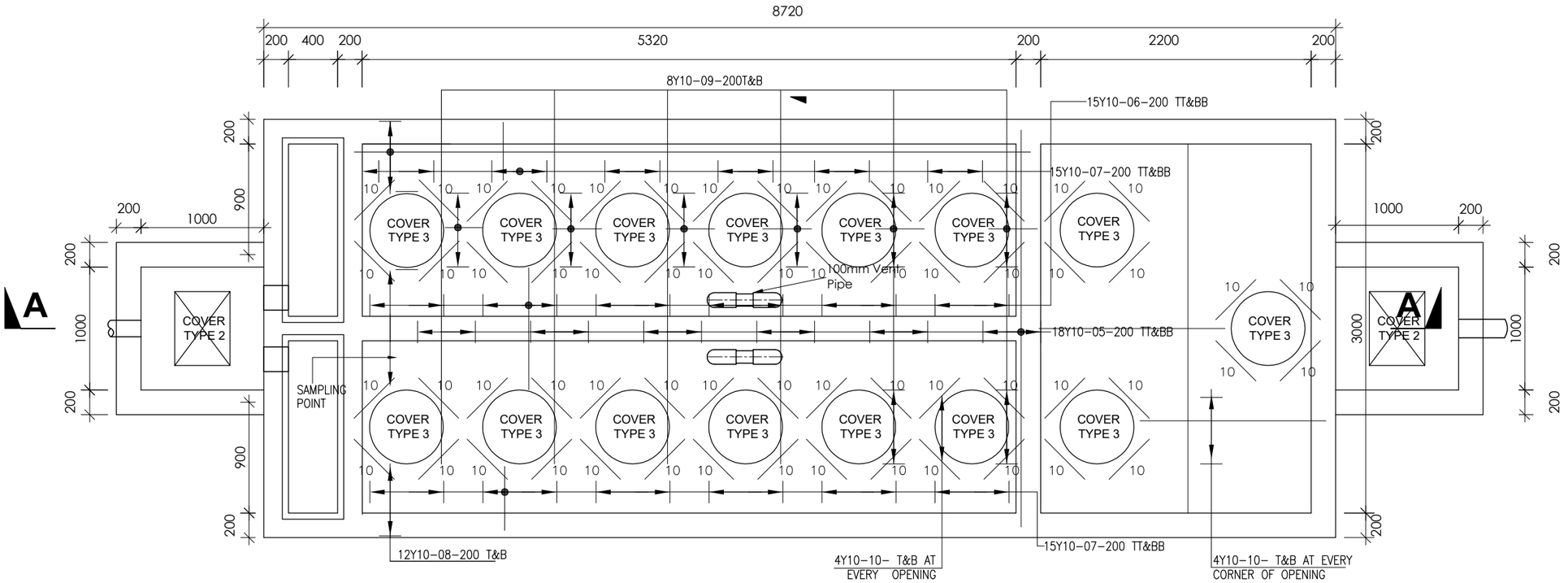
4 ABREVIATIONS:

T – TOP	B – BOTTOM
N.F. – NEAR FACE	F.F. – FAR FACE
E.F. – EACH FACE	E.W. – EACH WAY

5 THIS DRAWING TO BE READ IN CONJUNCTION WITH DRAWING No. RBBT/01

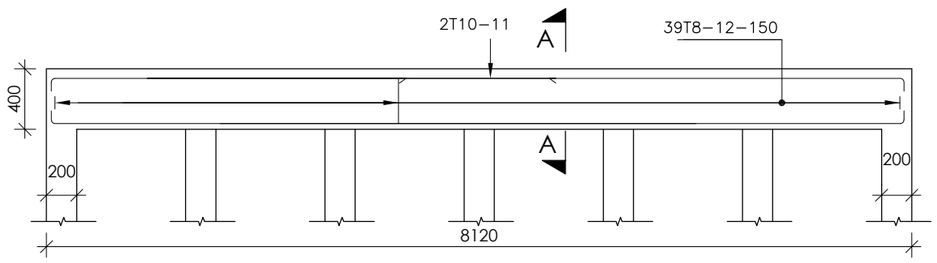
ANAEROBIC BAFFLED REACTOR

Project Title: **Up-scaling Basic Sanitation for Urban Poor (UBSUP)**	***Project Area***	***Designed and drawn by:*** *UBSUP technical team* ***Checked by:*** *Programme Manager Urban Investments* ***Approved by:*** *CEO WSTF*	***Notes:*** *See Above*	***Index-No.:*** / ***Description:***	***Date:*** ***Scale: As shown*** ***page:***



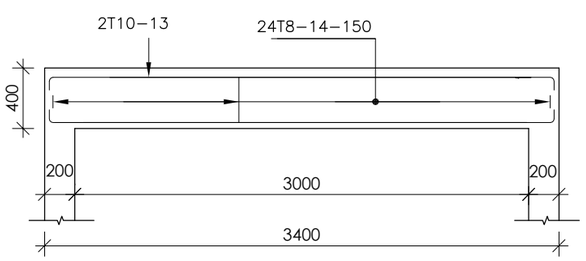
TOP SLAB PLAN

SCALE 1:50



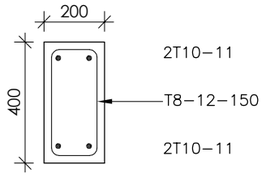
BEAM B1

SCALE 1:100



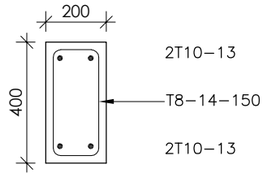
BEAM B2

SCALE 1:100



BEAM B1 SECTION A-A

SCALE 1:50



BEAM B2 SECTION A-A

SCALE 1:50

ANAEROBIC BAFFLED REACTOR

NOTES

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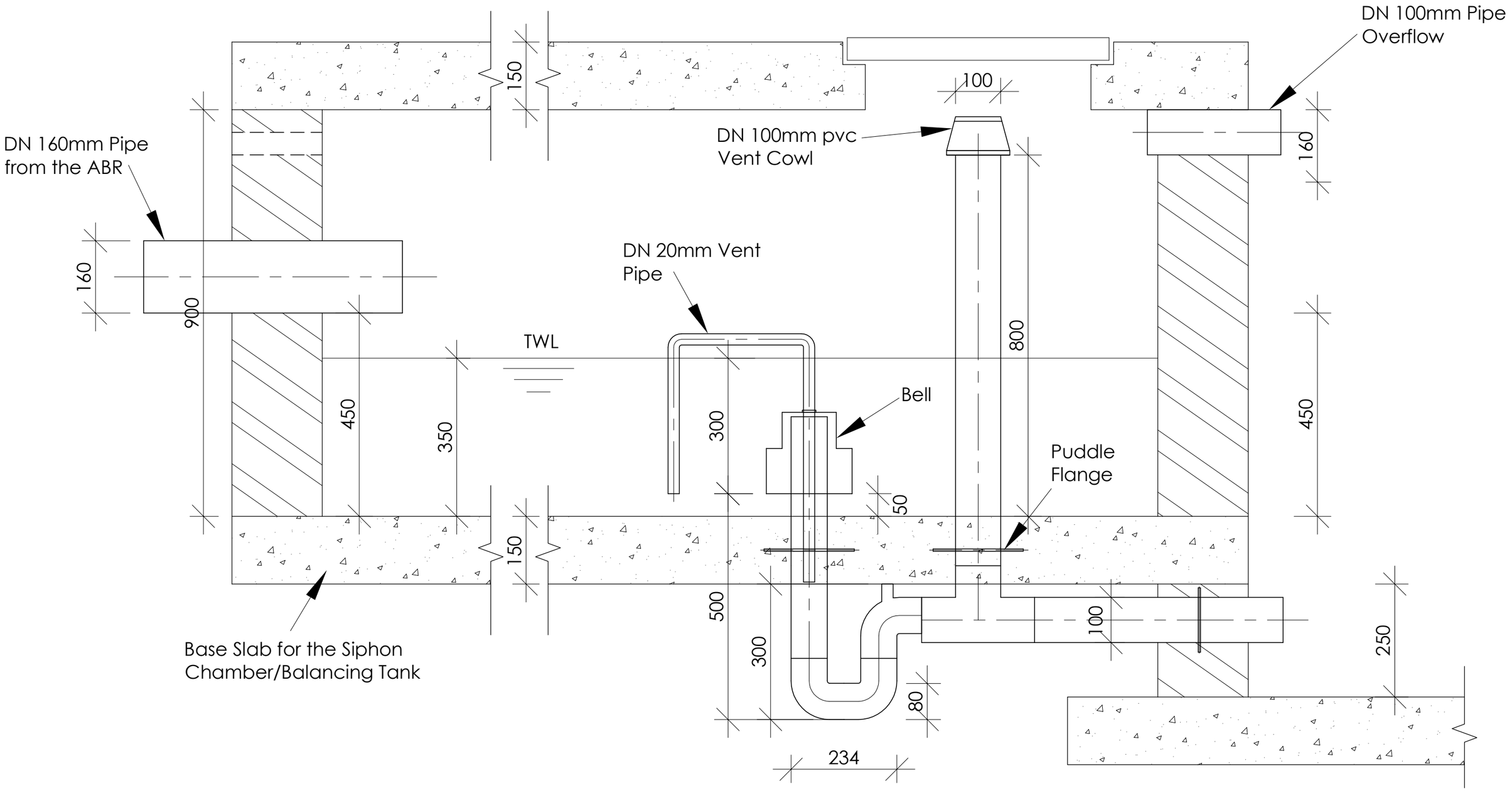
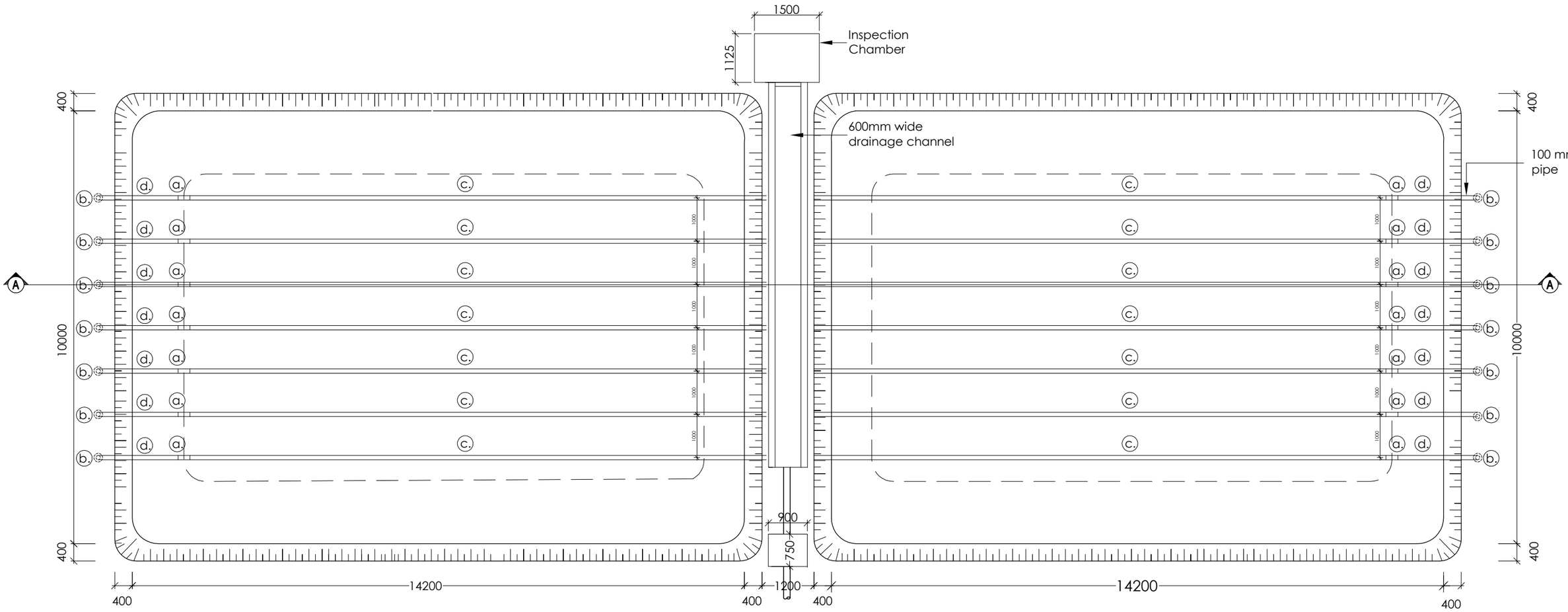
5 THIS DRAWING TO BE READ IN CONJUNCTION WITH DRAWING No. RBBT/01

Project Title: Up-scaling Basic Sanitation for Urban Poor (UBSUP)	***Project Area***	***Designed and drawn by:*** *UBSUP technical team* ***Checked by:*** *Programme Manager Urban Investments* ***Approved by:*** *CEO WSTF*	***Notes:*** *See Above*	***Index-No.:*** / ***Description:***	***Date:*** ***Scale: As shown*** ***page:***



ANAEROBIC BAFFLED REACTOR

Project Title: **Up-scaling Basic Sanitation for Urban Poor (UBSUP)**	***Project Area***	***Designed and drawn by:*** *UBSUP technical team* ***Checked by:*** *Programme Manager Urban Investments* ***Approved by:*** *CEO WSTF*	***Notes:*** *See Above*	***Index-No.:*** / ***Description:***	***Date:*** ***Scale: As shown*** ***page:***



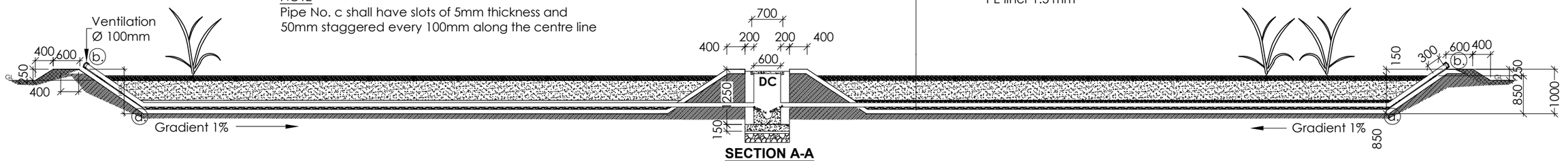
SCHEDULE OF PIPES AND FITTINGS

	Description	Length	Qty
a.	100mm Dia. uPVC 45° Bends	-	14
b.	100mm Dia. uPVC Vent Cowls	-	14
c.	100mm Dia. uPVC Pipe	13.5m	14
d.	100mm Dia. uPVC Pipe	1.7m	14

NOTE
Pipe No. c shall have slots of 5mm thickness and 50mm staggered every 100mm along the centre line

PLAN - UNDERDRAINAGE PIPEWORK
SCALE 1:100

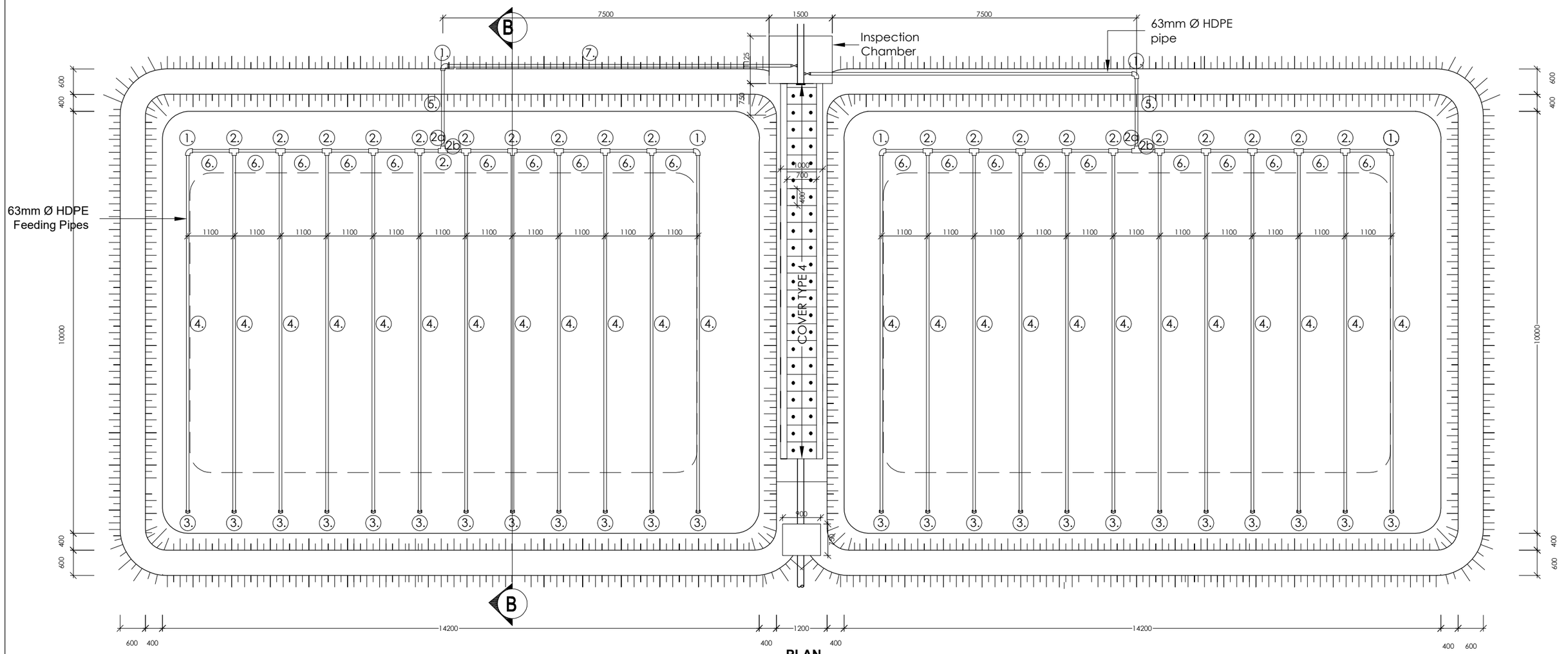
KEY
- 100mm Distribution Layer - Coarse Gravel; dia. 10 - 14mm
- 450mm Filter Layer - Sand; dia. 0.1 - 0.4mm
- 100mm Transition Layer - Coarse Gravel; dia. 10 - 14mm
- 100mm Drainage Layer - Course Gravel; dia. 20 - 32mm
- PE liner 1.5 mm



SECTION A-A
SCALE 1:100

VERTICAL FLOW CONSTRUCTED WETLAND

Project Title: **Up-scaling Basic Sanitation for Urban Poor (UBSUP)**	***Project Area***	***Designed and drawn by:*** *UBSUP technical team* ***Checked by:*** *Programme Manager Urban Investments* ***Approved by:*** *CEO WSTF*	***Notes:*** *See Above*	***Index-No.:*** / ***Description:***	***Date:*** ***Scale: As shown*** ***page:***

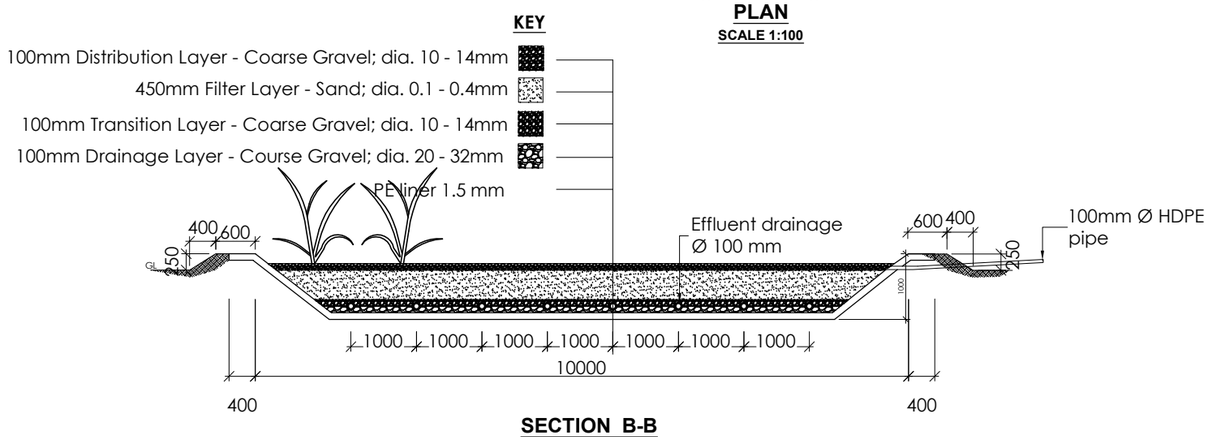


PLAN
SCALE 1:100

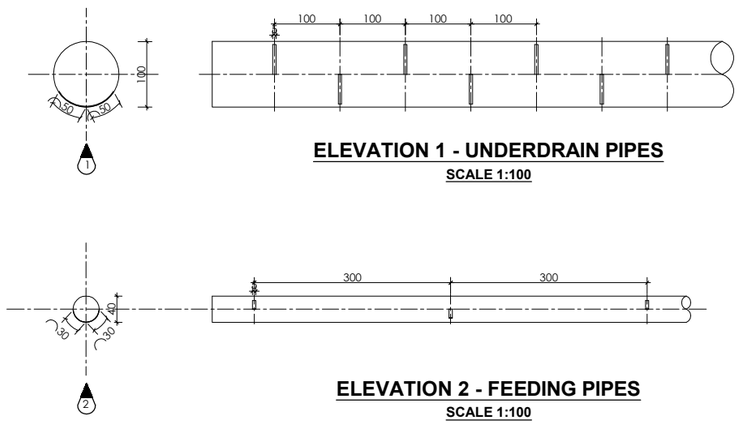
SCHEDULE OF PIPES AND FITTINGS

	Description	Length	Qty
1.	100mm Dia. HDPE 90° Bends	-	6
2.	63x40mm Dia. HDPE Tee	-	20
2a	100mm Dia. HDPE Equal Tee	-	2
2b	100x63mm Dia. HDPE Reducer	-	4
3.	40mm Dia. HDPE End Caps	-	24
4.	40mm Dia. HDPE Pipe	8.5m	24
5.	100mm Dia. HDPE Pipe	2.0m	2
6.	63mm Dia. HDPE Pipe	1.1m	22
7.	100mm Dia. HDPE Pipe	8.3m	2

NOTE
Pipe No. 4 shall have slots of 5mm thickness and 50mm staggered every 100mm along the centre line



SECTION B-B
SCALE 1:100



VERTICAL FLOW CONSTRUCTED WETLAND

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Date:
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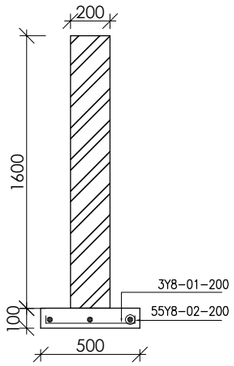
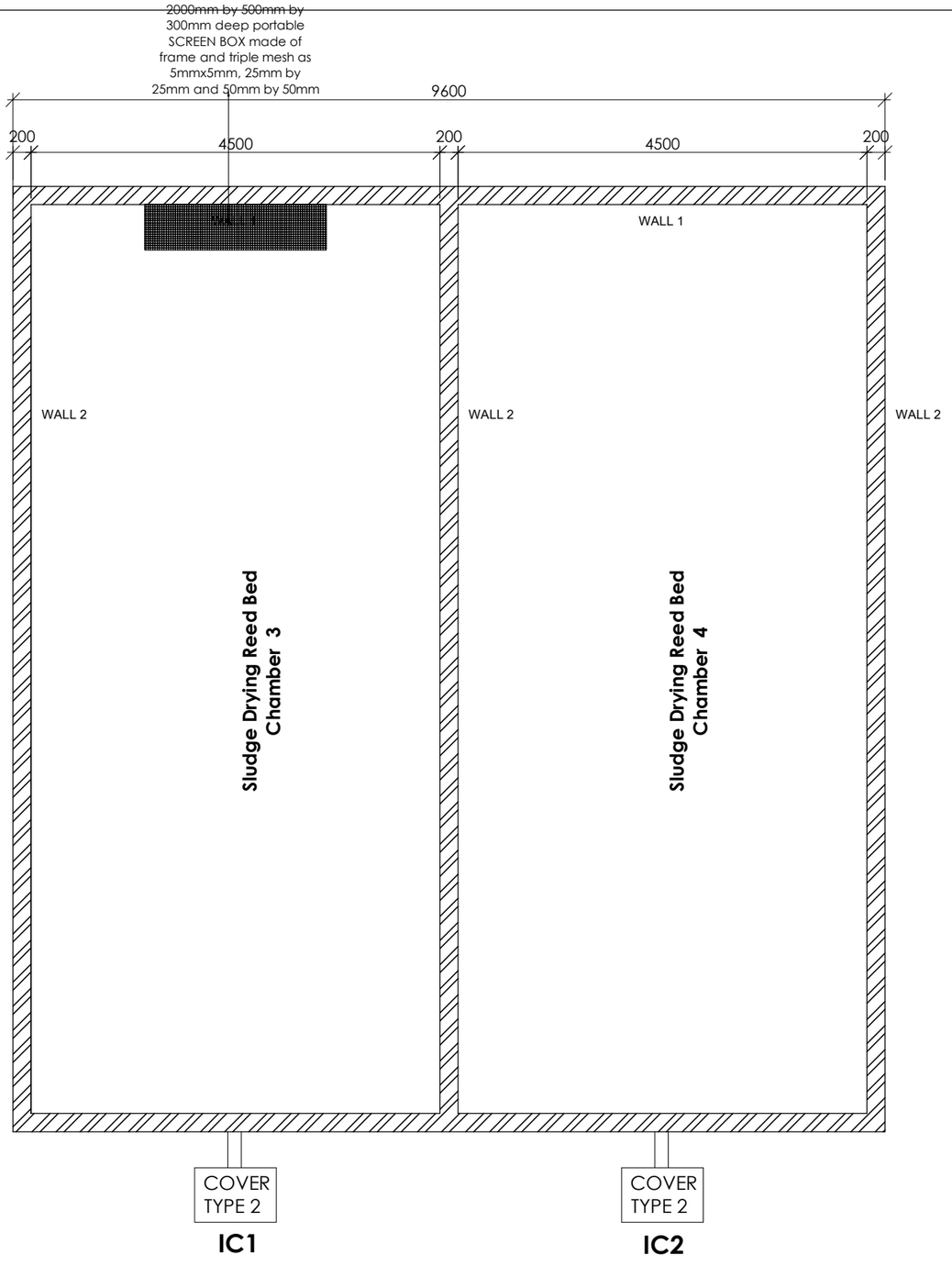


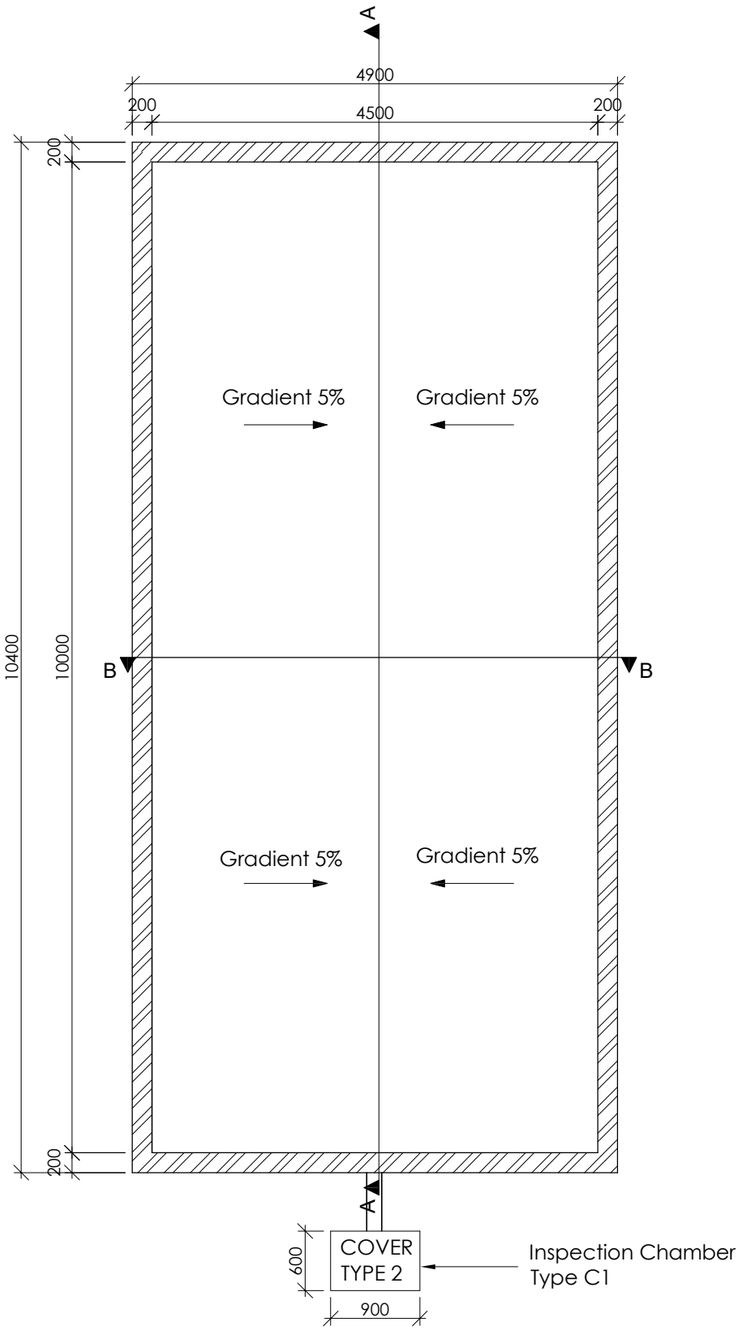
FOUNDATION - WALL 1

SCALE 1:50



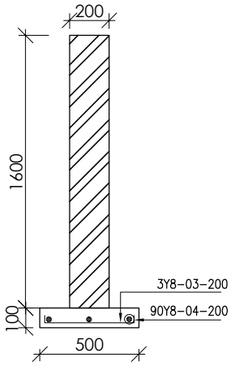
SDRB LAYOUT PLAN - 2NR UNITS

SCALE 1:50



SINGLE UNIT LAYOUT PLAN

SCALE 1:50

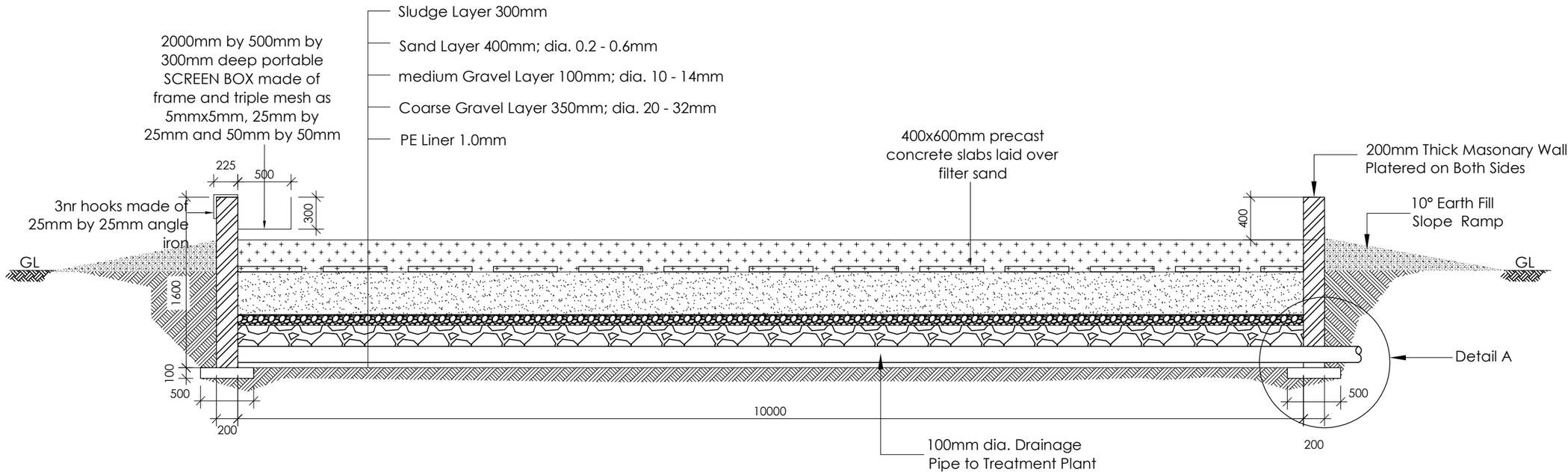


FOUNDATION - WALL 2

SCALE 1:25

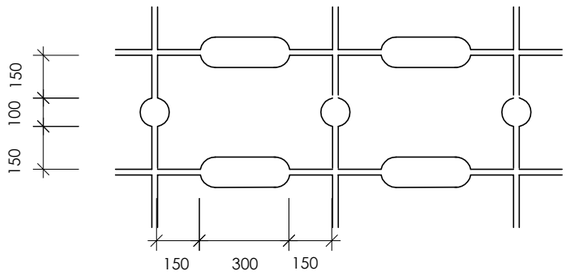
SLUDGE DRYING BED

Project Title: Up-scaling Basic Sanitation for Urban Poor (UBSUP)	***Project Area***	***Designed and drawn by:*** *UBSUP technical team* ***Checked by:*** *Programme Manager Urban Investments* ***Approved by:*** *CEO WSTF*	***Notes:*** *See Above*	***Index-No.:*** / ***Description:***	***Date:*** ***Scale: As shown*** ***page:***



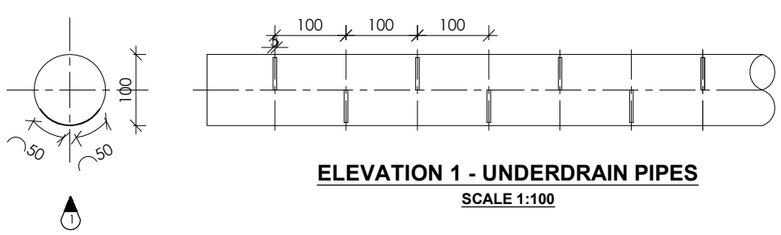
SECTION A - A

SCALE 1:50



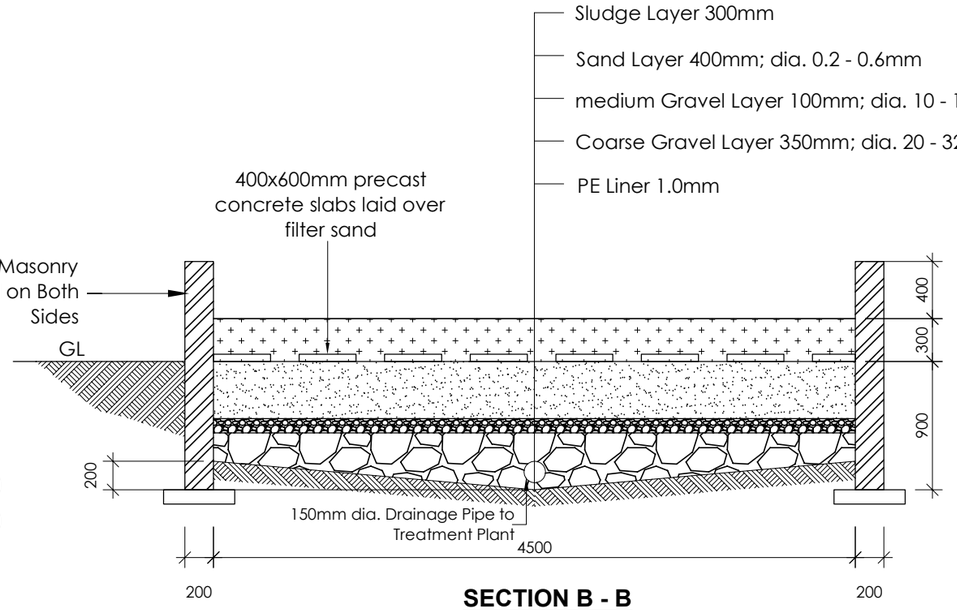
400mm x 600mm x 50mm THICK PRECAST CONCRETE SLABS LAID ON SURFACE OF MEDIA

N.T.S



ELEVATION 1 - UNDERDRAIN PIPES

SCALE 1:100

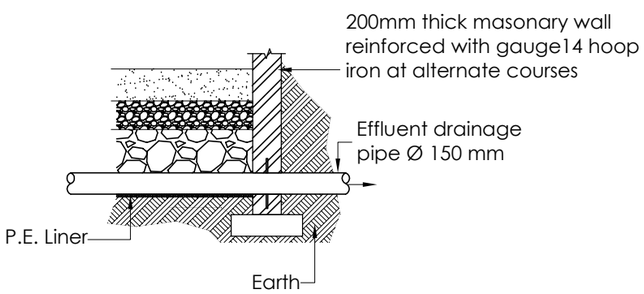


SECTION B - B

SCALE 1:50

KEY

- Fecal Sludge Layer
- Sand Layer; dia. 0.2 - 0.6mm
- Medium Gravel Layer; dia. 10 - 14mm
- Coarse Gravel Layer; dia. 20 - 32mm



COUPLING DETAIL A

SCALE 1:50

SLUDGE DRYING BED

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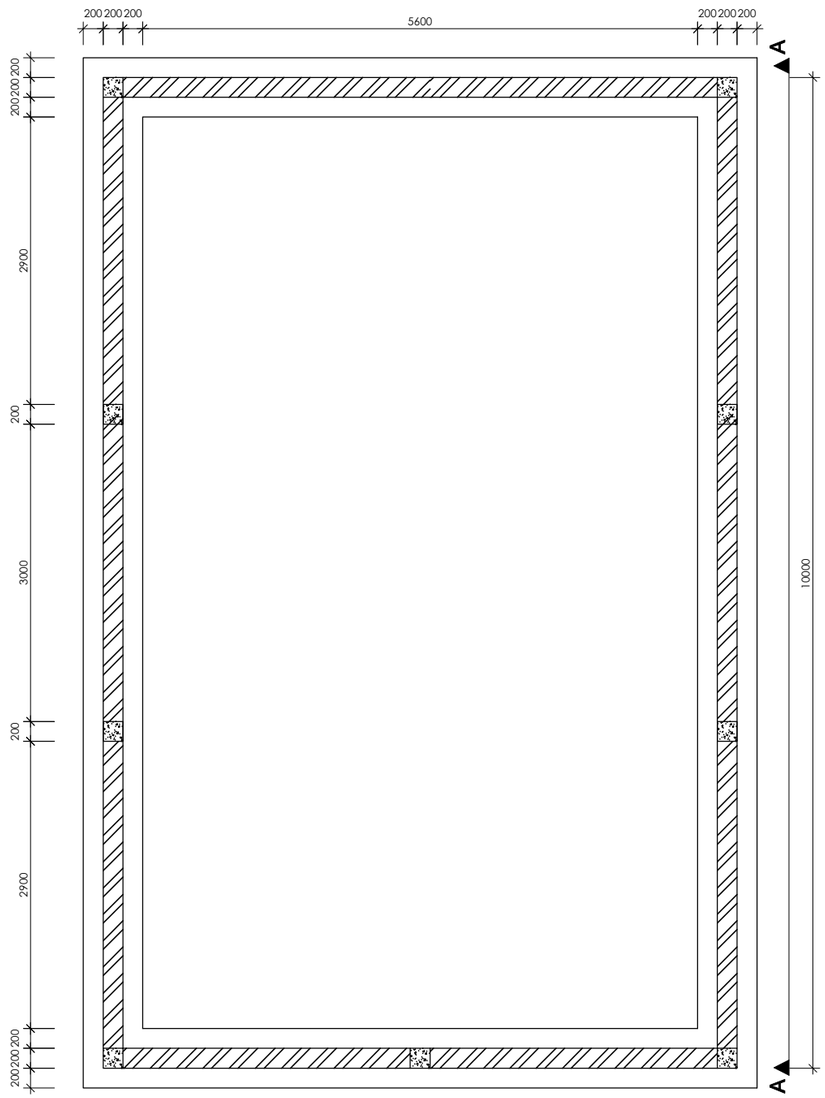
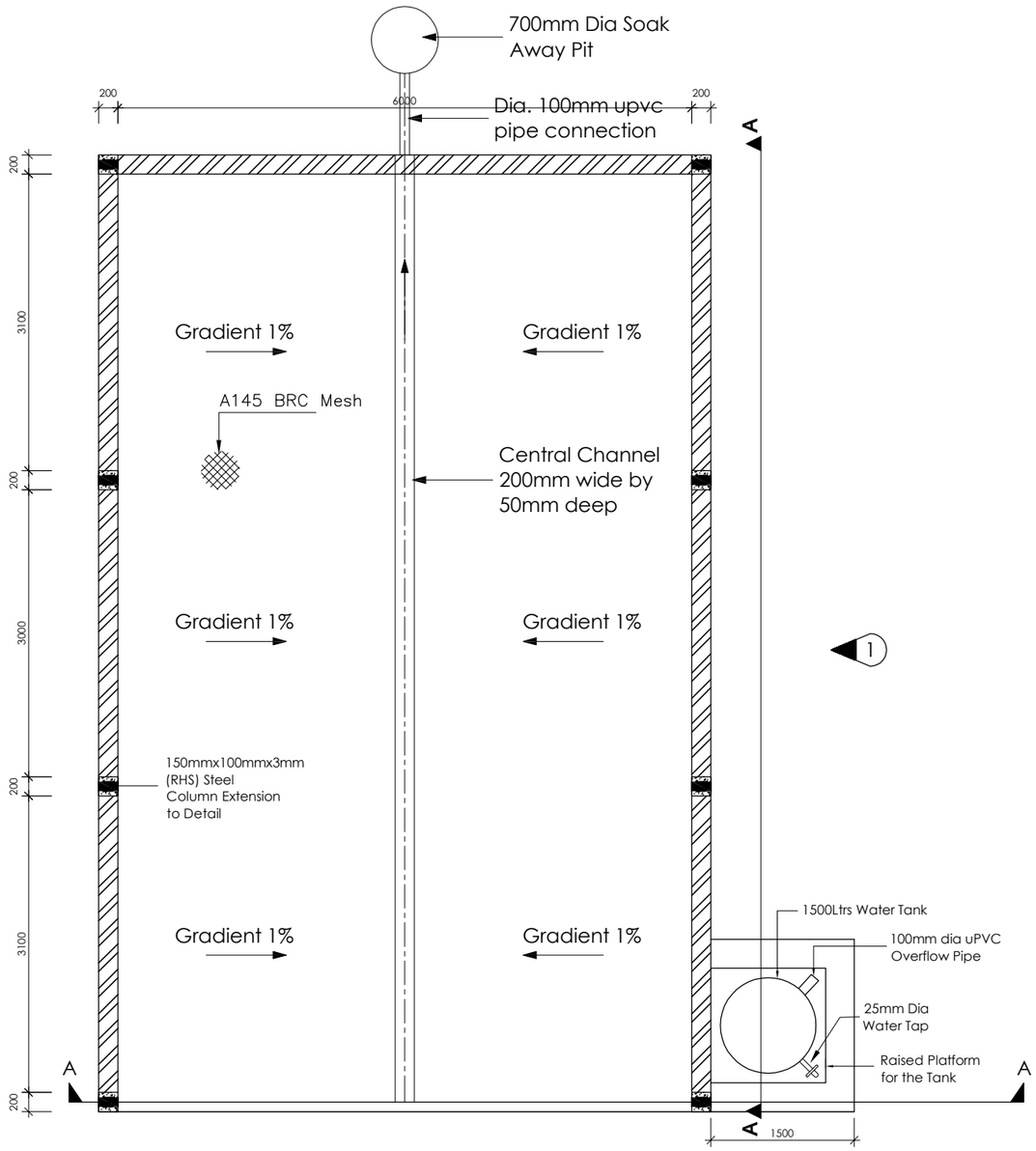


FOUNDATION PLAN

SCALE 1:100

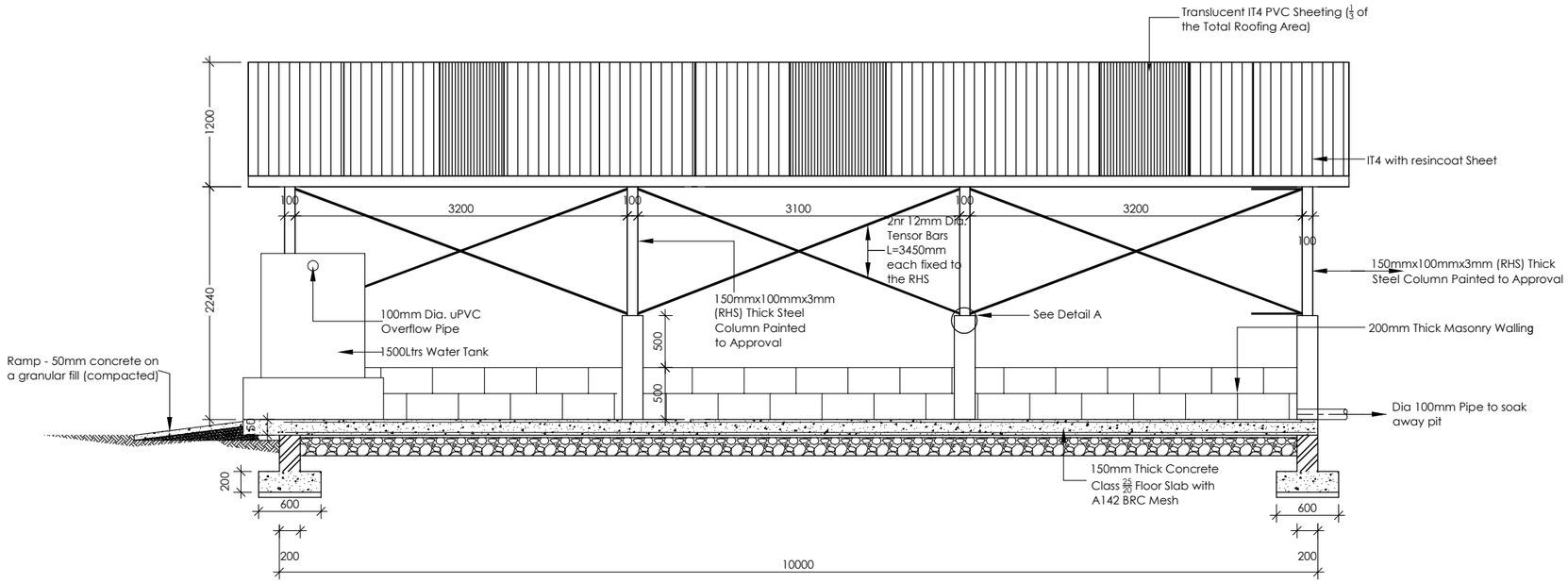


FLOOR SLAB PLAN

SCALE 1:100

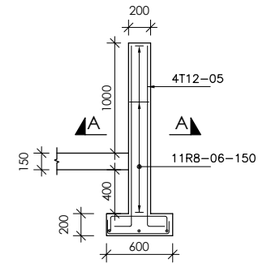
COMPOSTING AREA

Project Title: **Up-scaling Basic Sanitation for Urban Poor (UBSUP)**	***Project Area***	***Designed and drawn by:*** *UBSUP technical team* ***Checked by:*** *Programme Manager Urban Investments* ***Approved by:*** *CEO WSTF*	***Notes:*** *See Above*	***Index-No.:*** / ***Description:***	***Date:*** ***Scale: As shown*** ***page:***



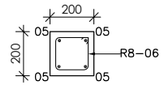
ELEVATION 01

SCALE 1:100



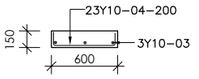
COLUMN C1

SCALE 1:50



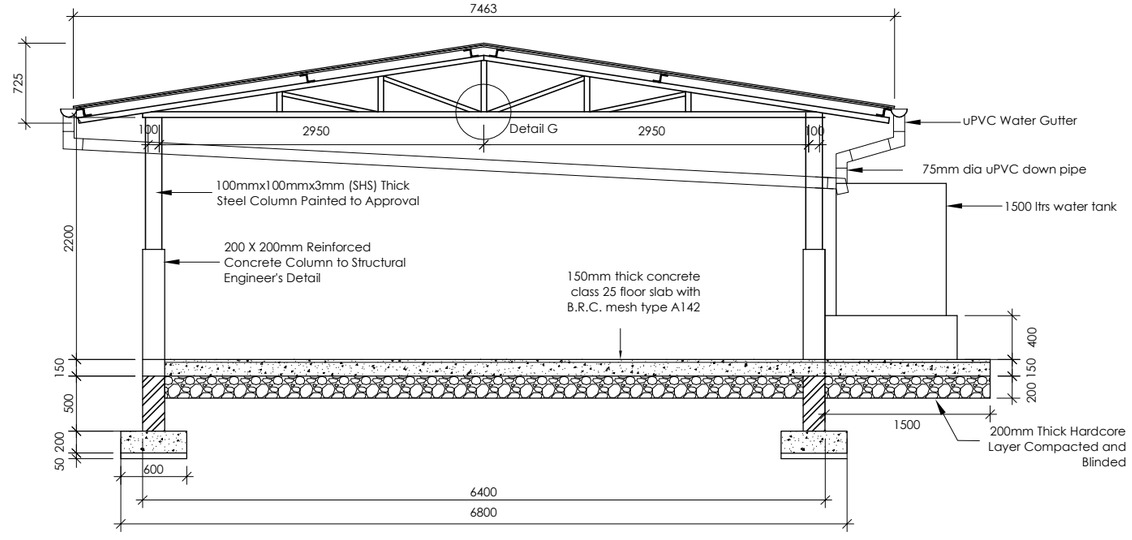
COLUMN C1 SECTION A-A

SCALE 1:50



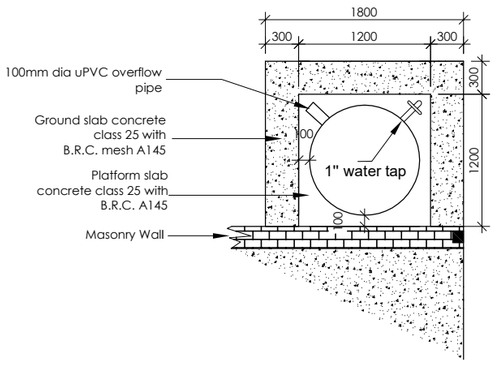
STRIP FOOTING

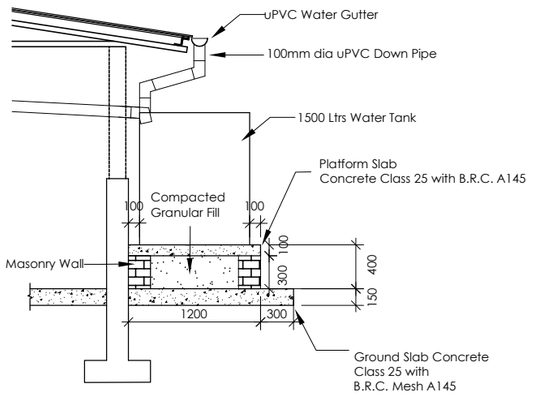
SCALE 1:50



SECTION A-A

SCALE 1:100





RAINWATER COLLECTING CISTERN DETAILS

SCALE 1:50

COMPOSTING AREA

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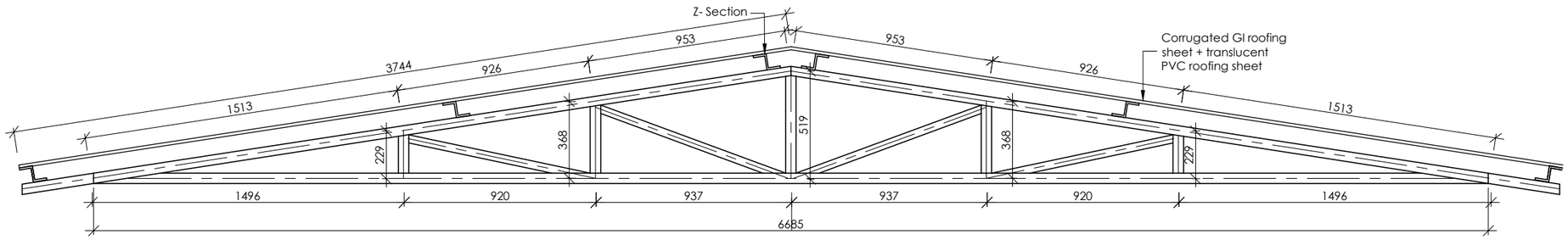
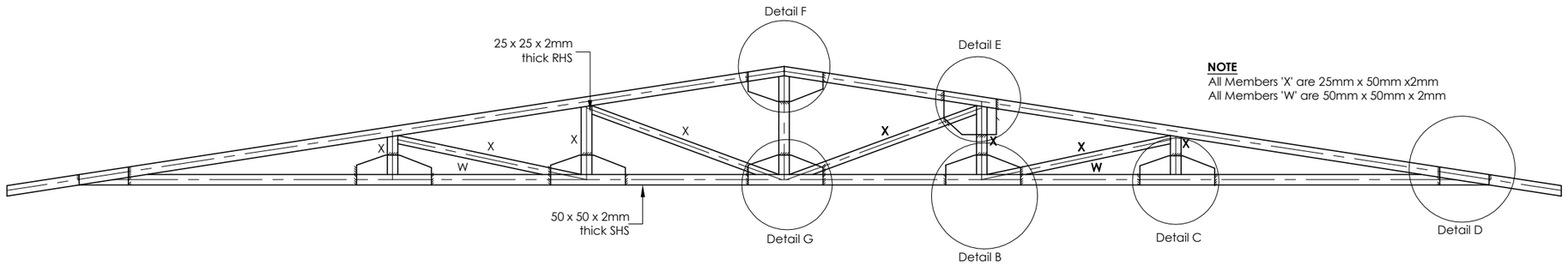
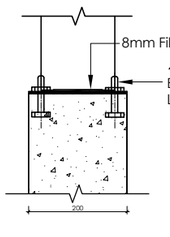


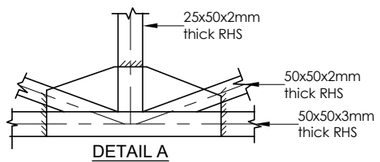
STEEL TRUSS DIMENSION - 4 NR REQUIRED
SCALE 1:50



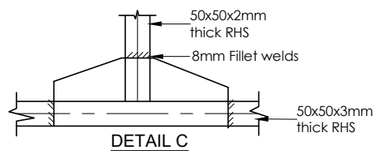
STEEL TRUSS DETAILS - 4 NR REQUIRED
SCALE 1:50



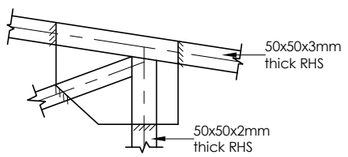
DETAIL A - STEEL COLUMN CONNECTION DETAILS
SCALE 1:20



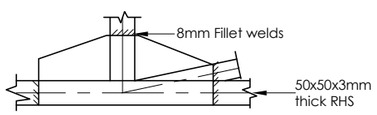
DETAIL A
SCALE 1:10



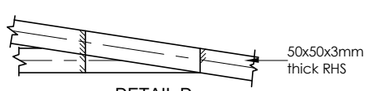
DETAIL C
SCALE 1:10



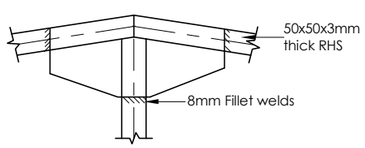
DETAIL E
SCALE 1:10



DETAIL B
SCALE 1:10



DETAIL D
SCALE 1:10

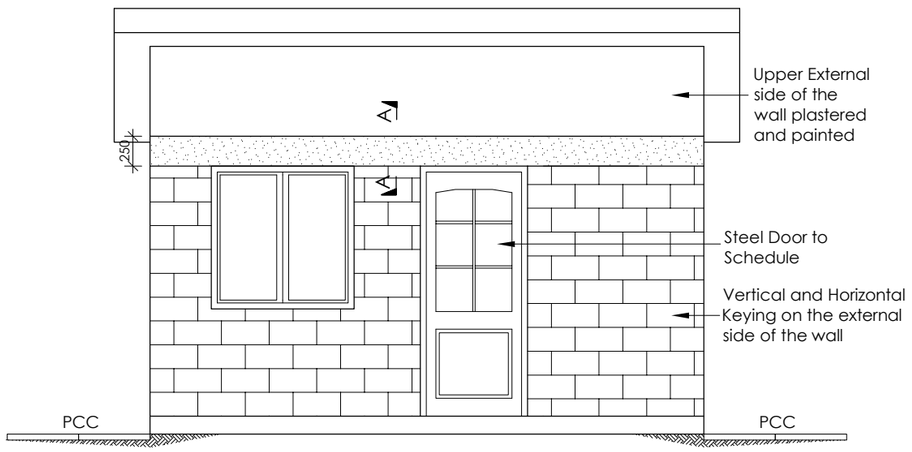


DETAIL F
SCALE 1:10

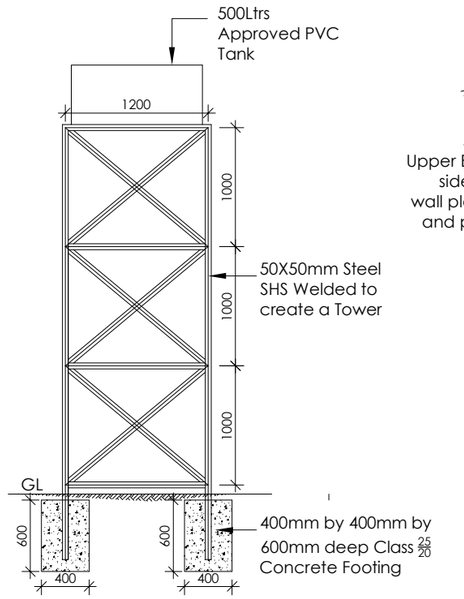
TENSOR FITTINGS
SCALE 1:10

COMPOSTING AREA

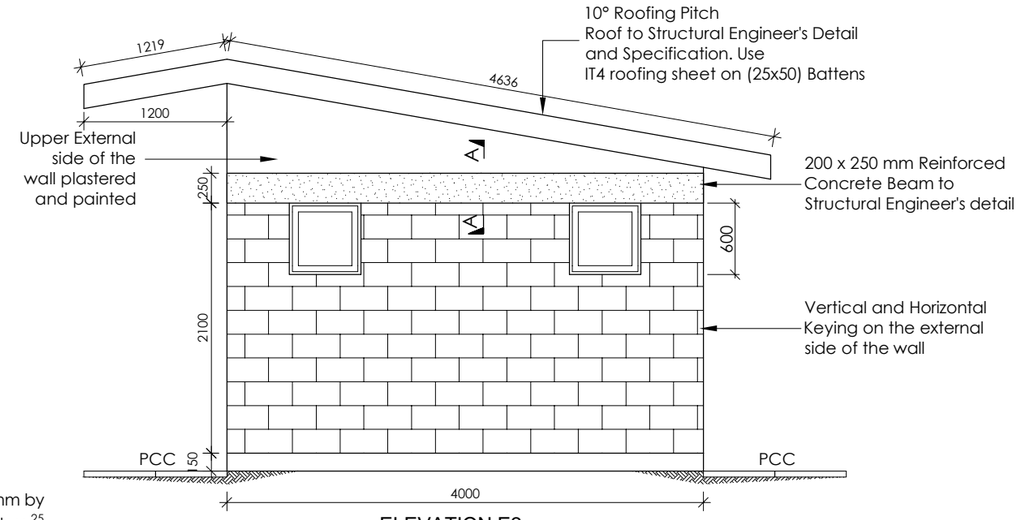
Project Title: **Up-scaling Basic Sanitation for Urban Poor (UBSUP)**	***Project Area***	***Designed and drawn by:*** *UBSUP technical team* ***Checked by:*** *Programme Manager Urban Investments* ***Approved by:*** *CEO WSTF*	***Notes:*** *See Above*	***Index-No.:*** / ***Description:***	***Date:*** ***Scale: As shown*** ***page:***



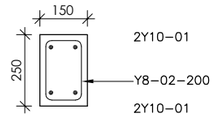
ELEVATION E1
SCALE 1:50



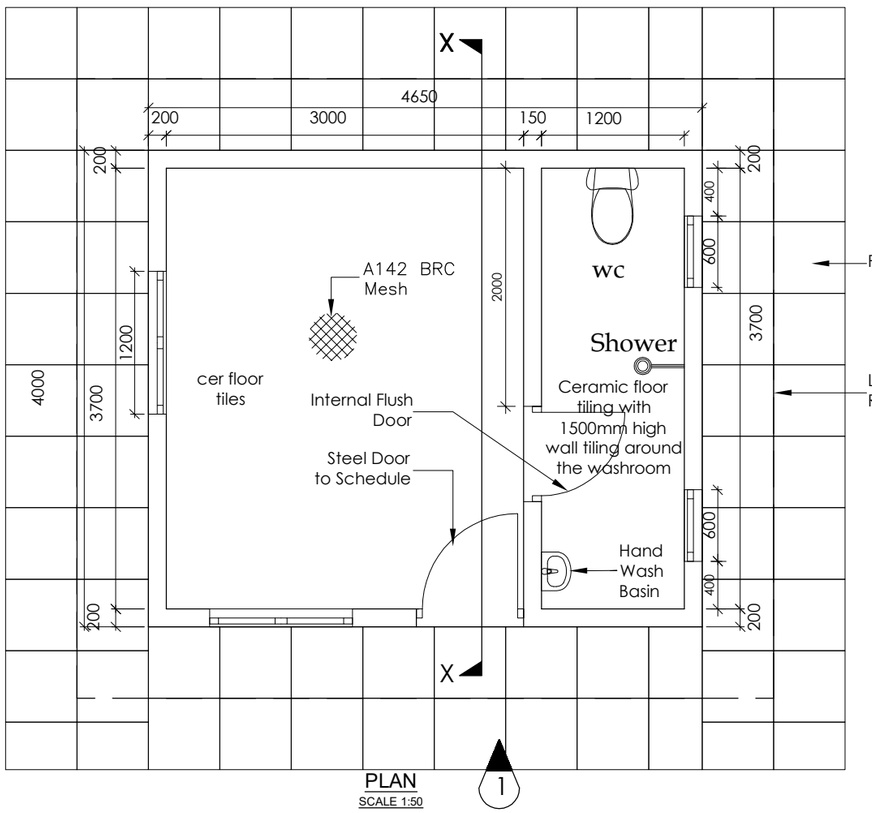
PVC TANK ELEVATED ON A STEEL TOWER
SCALE 1:50



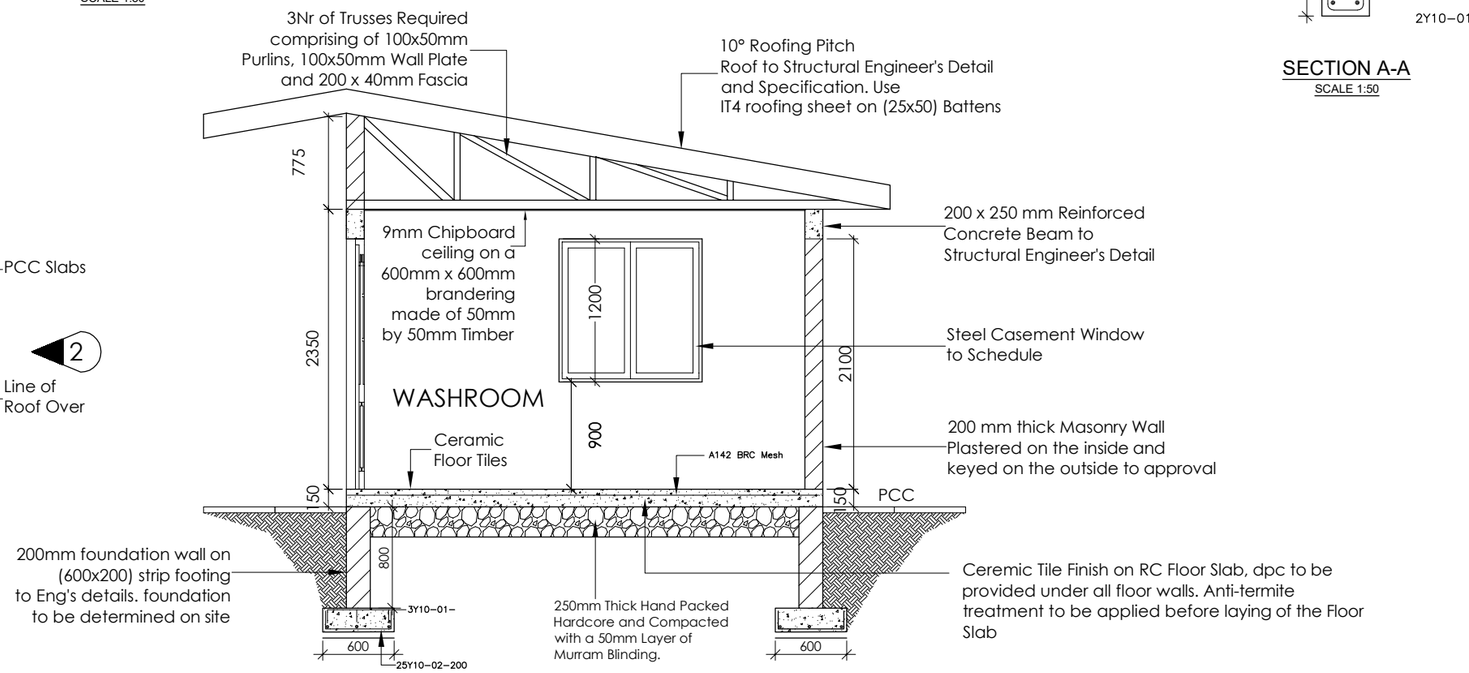
ELEVATION E2
SCALE 1:50



SECTION A-A
SCALE 1:50



PLAN
SCALE 1:50



SECTION X - X
SCALE 1:50

Doors and Windows Schedule		
Type	Width	Height
Door D1	900	2100
Window W1	1200	1200
Window W2	600	600

OPERATORS OFFICE

Project Title:
Up-scaling Basic Sanitation for Urban Poor (UBSUP)

Project Area

Designed and drawn by: UBSUP technical team
Checked by: *Programme Manager Urban Investments*
Approved by: CEO WSTF

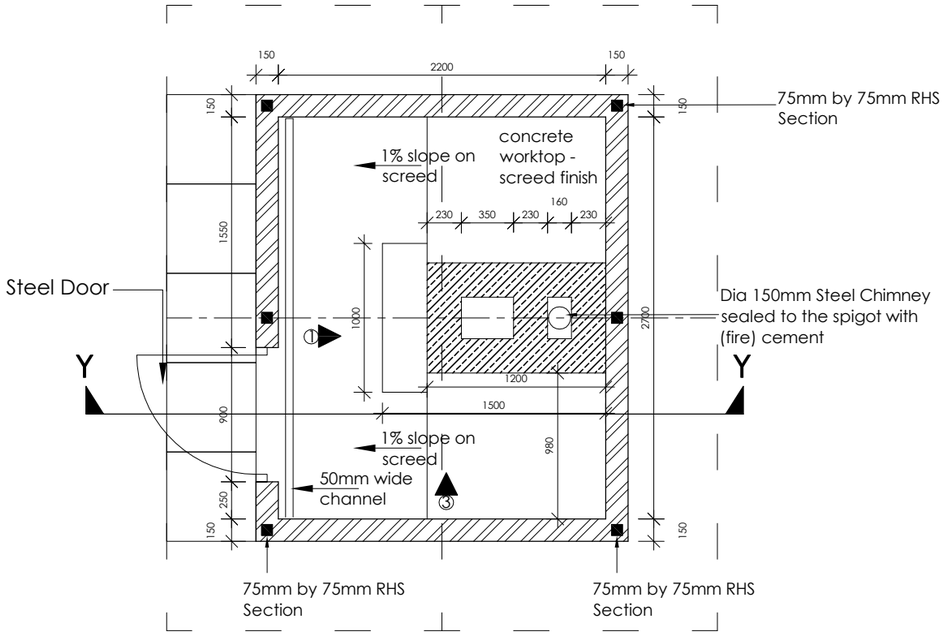
Notes:
See Above

Index-No.:	***Description:***

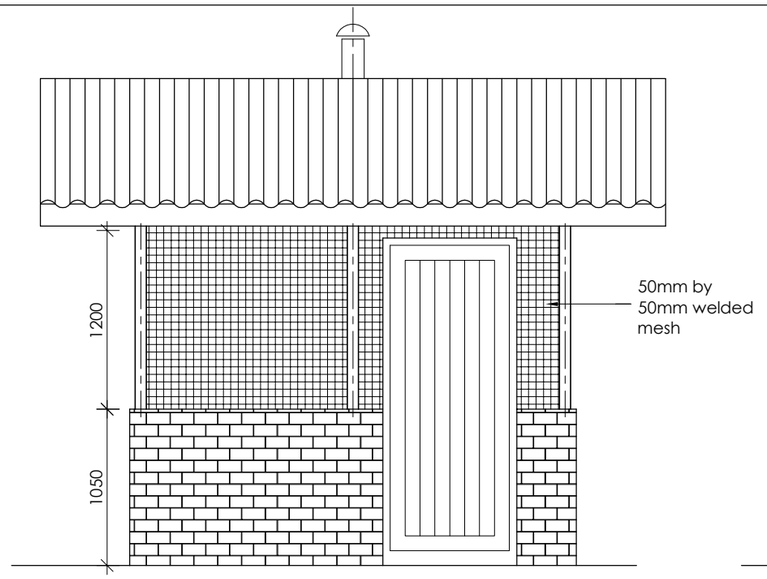
Date:

Scale: As shown

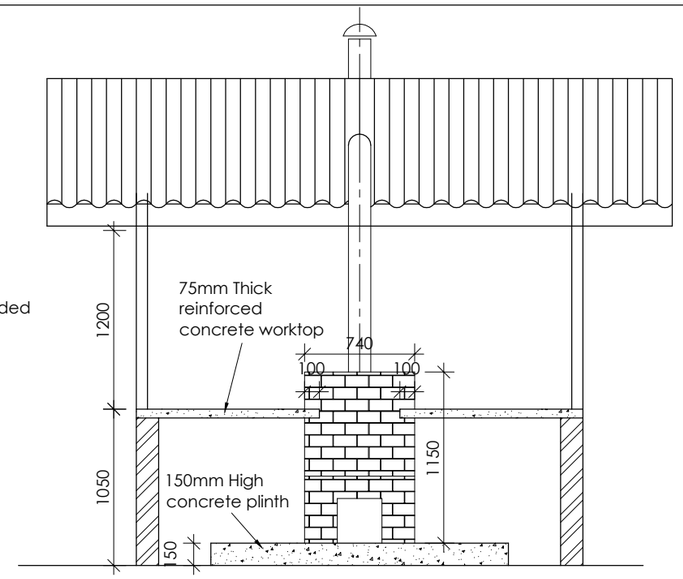
page:



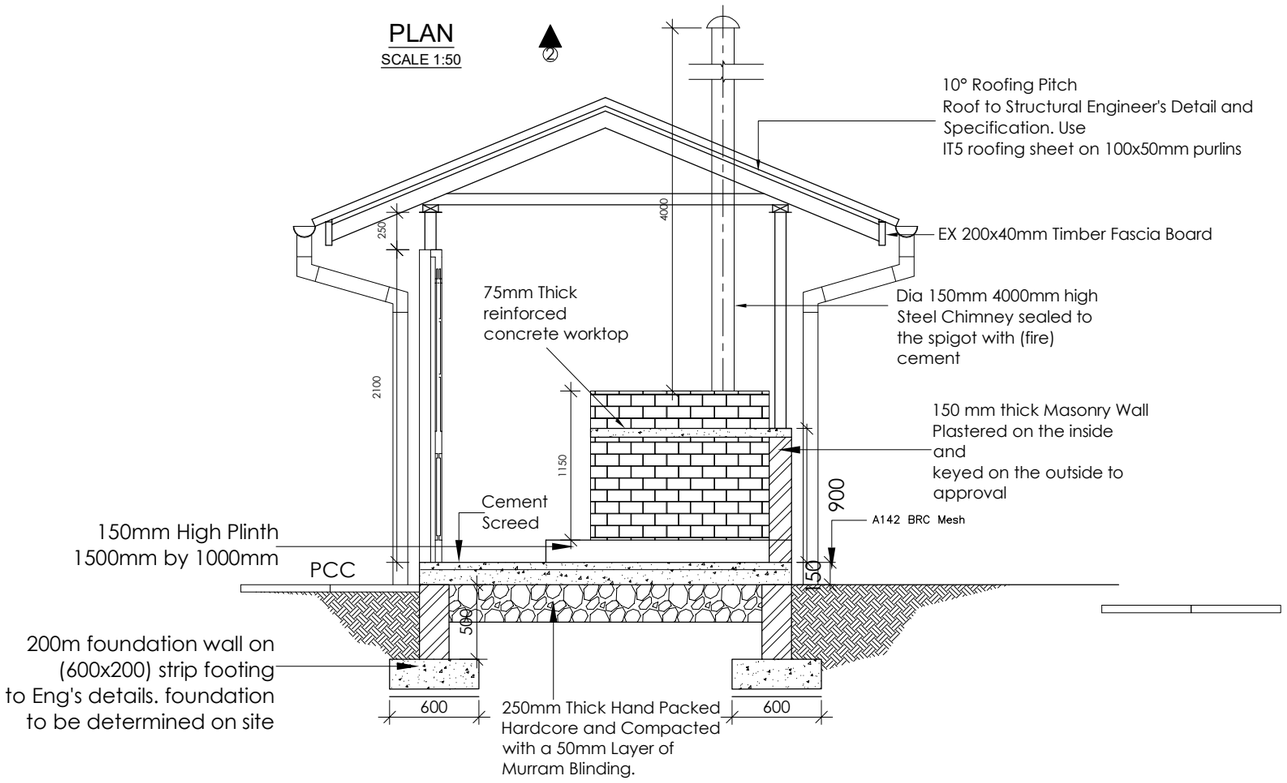
PLAN
SCALE 1:50



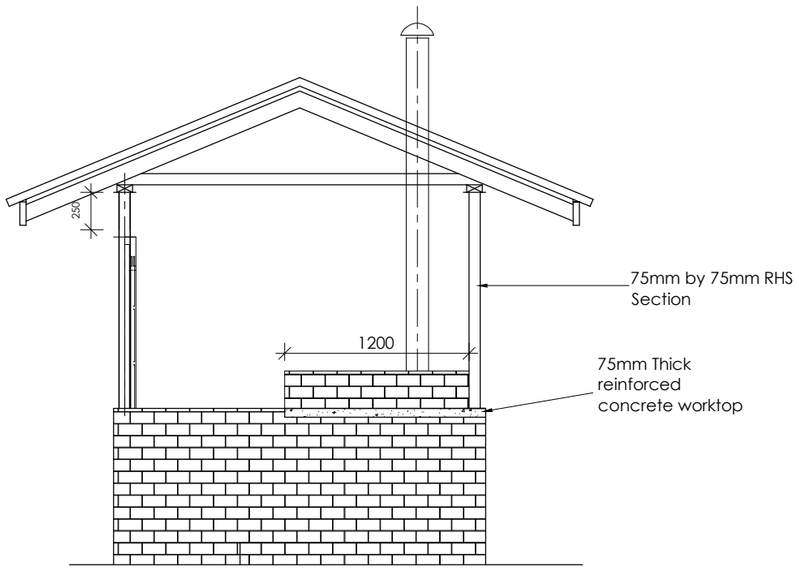
FRONT ELEVATION
SCALE 1:50



ELEVATION 1
SCALE 1:50



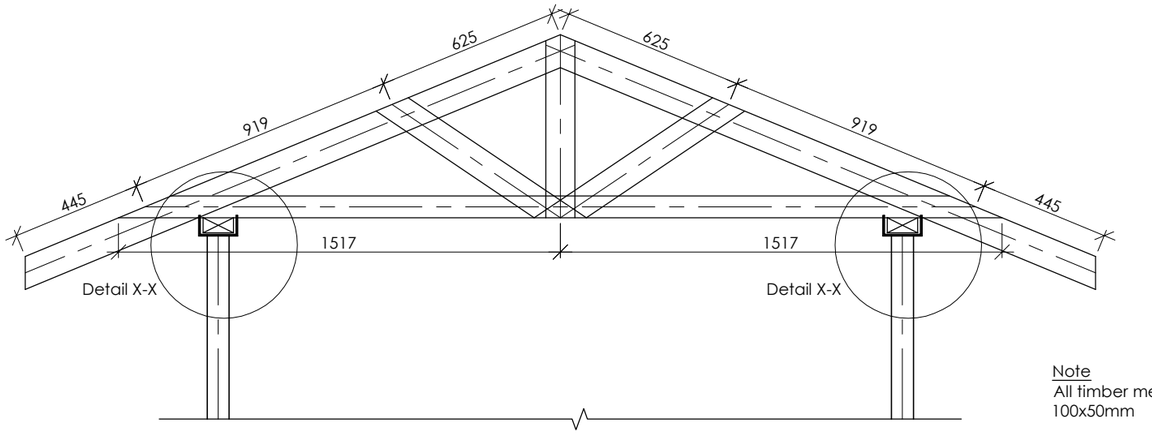
SECTION Y-Y
SCALE 1:50



ELEVATION 2
SCALE 1:50

INCINERATOR SHED

Project Title: **Up-scaling Basic Sanitation for Urban Poor (UBSUP)**	Project Area	Designed and drawn by UBSUP technical team ***Checked by:*** *Programme Manager Urban Investments* Approved by CEO WSTF	***Notes:*** *See Above*	***Index-No.:*** / ***Description:***	***Date:*** ***Scale: As shown*** ***page:***

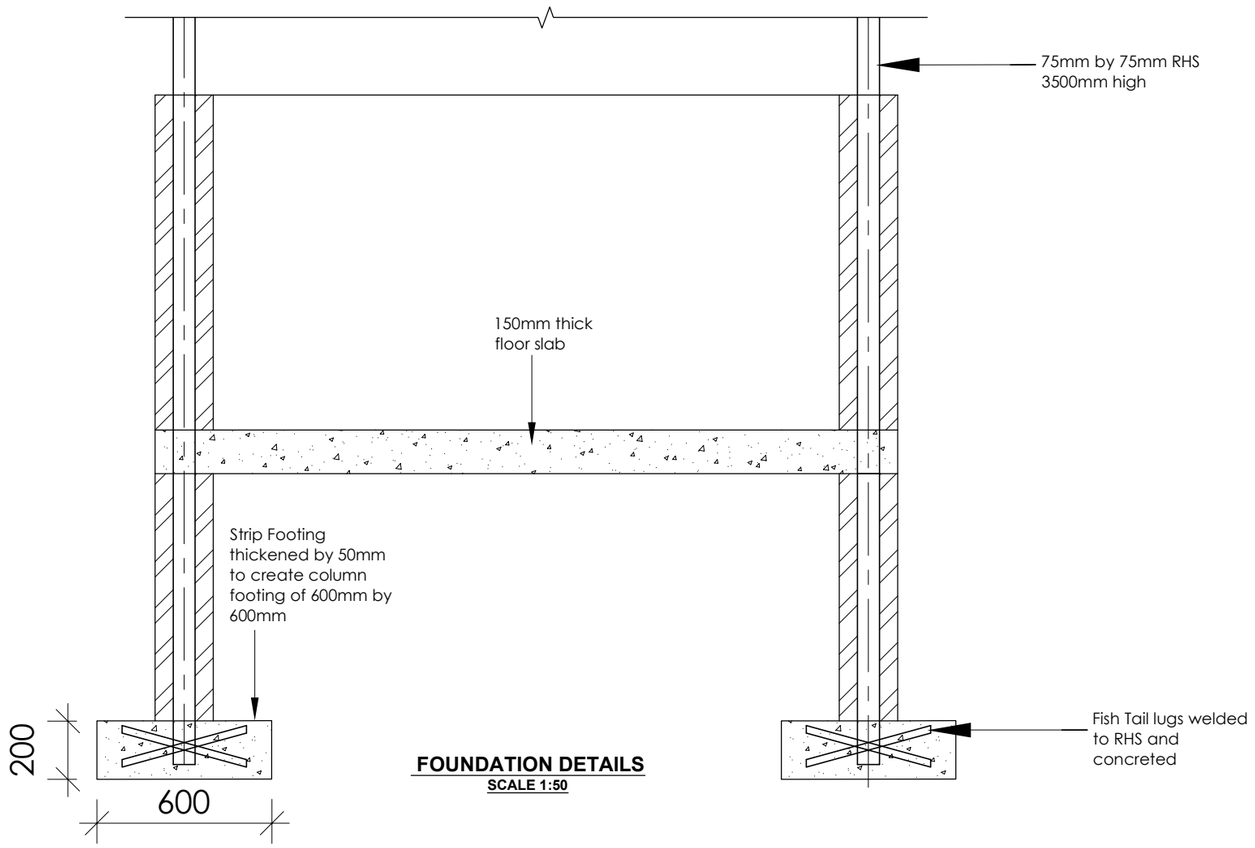


Note
All timber members are 100x50mm

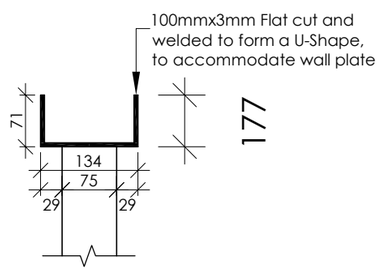
TRUSS DETAILS - 3 NR REQUIRED
SCALE 1:50

LIST OF MATERIALS FOR THE INCINERATOR UNIT

Item	Dimensions	Quantity
Fire Bricks	230mm by 115mm by 80mm	200 approx
Sand		200Kg
Fire Cement (High Alumina)	50Kg bag	2 bags
Steel Angle	30mm by 30mm by 3mm	12m
Steel Channel	100mm by 40mm by 5mm	4m
Flat sheet for loading door	600mm by 750mm by 3mm	1 sheet
Flat sheet for ash door	250mm by 250mm by 3mm	1 sheet
Flat sheet for chimney spigot support	250mm by 150mm by 3mm	1 sheet
Steel pipe	150mm Dia by 3mm thickness	4m long
Hinges for Ash Door		
Pipe for loading door hinge	1 inch	1nr
Rod for loading door hinge	3/4 inch	1nr
Masonry plugs	no 10	16nr
Steel cable	no 10	40m



FOUNDATION DETAILS
SCALE 1:50



DETAIL X-X
SCALE 1:10

INCINERATOR SHED

Project Title: Up-scaling Basic Sanitation for Urban Poor (UBSUP)	Project Area	Designed and drawn by UBSUP technical team ***Checked by:*** *Programme Manager Urban Investments* Approved by CEO WSTF	***Notes:*** *See Above*	***Index-No.:*** / ***Description:***	***Date:*** ***Scale: As shown*** ***page:***

De Montfort Mark 8a Incinerator

Introduction

This is the recommended incinerator for all but large hospitals.

The instructions which follow are meant to be used in all countries. The building instructions give the number and position of the bricks, but not the overall dimensions of the incinerator. This is because bricks differ slightly in size between one country and another, and it is simpler to adjust the overall size of the incinerator to the available bricks than to have to cut bricks to an exact dimension.

Similarly, only approximate dimensions of the steelwork are given. The correct procedure is to lay out the first two layers of bricks, and then measure the length and breadth of the steel which fits on top. The steel top can then be made to fit the finished brickwork.

The steel tunnel and ash door can also be dimensioned to fit the brickwork by taking measurements from the brickwork once the tunnel is formed in the first five layers of bricks.

Summary of characteristics

Use: designed espacially for most healthcare facilities, except large hospitals (more than 300 - 400 beds)

Capacity: 12 kg/h

Lifespan (average): 3-5 years

Approximate unit cost in USD (materials only): 250 - 1'000 depending on the availability of refractory bricks

Time necessary to build: 3-4 days

Remarks: Where the load to be burned consists almost entirely of **sharps boxes** filled with used hypodermics, special conditions apply:

1. The plastic in the syringes has a very high calorific value and additional fuel will not be required after the initial warm up period.

2. Boxes should be introduced **one at a time**. There will be a brief delay, then an increase in smoke level followed by a gradual decrease. The next box should be introduced when the smoke level is observed to be decreasing.

3. Tests have shown that this means that boxes of up to 100 syringes can be burned at a rate of about **one every 10 minutes**.

4. Introducing boxes at a higher rate than this will result in very high smoke rates and molten plastic at the base of the incinerator.

List of materials

item	dimensions	quantity
Fire bricks		200 (approx.)
Sand		200 kg
Fire cement (high alumina)		50 kg
Rolled steel angle (mild steel)	30x30x3mm thick	12 metres
Rolled steel channel (mild steel)	100x40x5mm thick	4 metres
Flat sheet (mild steel) for loading door	600 x 750 x 3mm	1 sheet
Flat sheet (mild steel) for ash door	250 x 250 x 3mm	1 sheet
Flat sheet (mild steel) for chimney spigot support	250 x 150 x 3mm	1 sheet
Mild steel pipe	150mm diameter x 3mm thick (approx)	4 metres
Hinges for ash door		
Pipe, for loading door hinge	1 inch	1
Rod, for loading door hinge	3/4 inch	1
Masonry plugs (rawlplugs), srews, etc	no 10	16
Welding rods (mild steel)		40
Steel cable (optional)	5 mm 7 strand	40 metres
Turnbuckles (optional)	M8 x 150 mm long	4 (not essential)
Wire Mesh (optional)	Any fine gauge	loose fill
Fuel tank, tap and pipe (optional)		1 set

Note

If required, the incinerator body can be clamped together with steel bars. It can also be surrounded by an outer case of common bricks to give extra strength and weather protection. In this case, the two thicknesses of brick should be “capped” with cement.

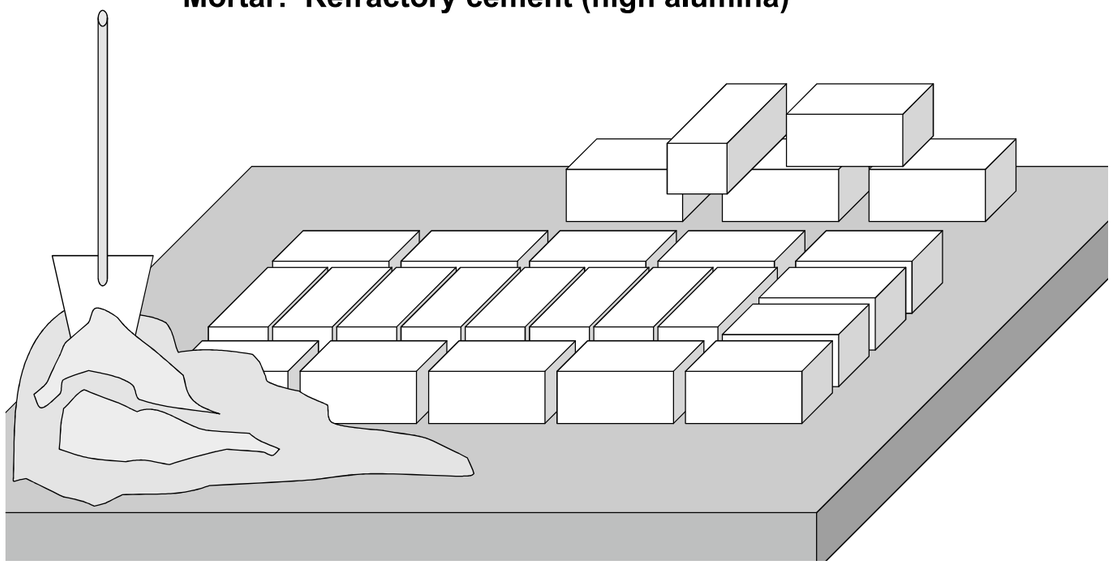
Materials should be obtained before starting the construction !

Complete layout

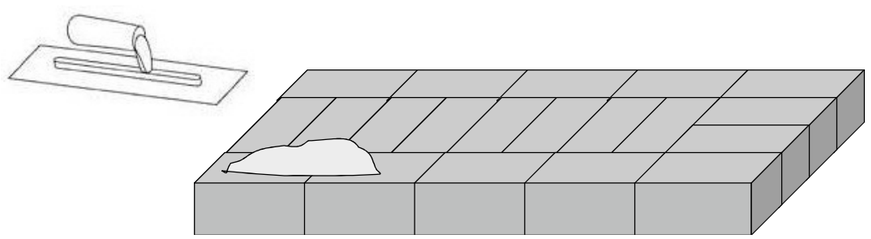
Figure 1: De Montfort incinerator Mark 8a

FOUNDATION

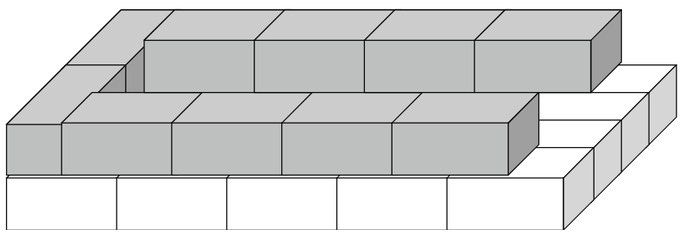
Concrete foundation: L x W x H = 2m x 2m x 0.15m
Refractory bricks: L x W x H = approx. 230 x 110 x 65 mm
Mortar: Refractory cement (high alumina)



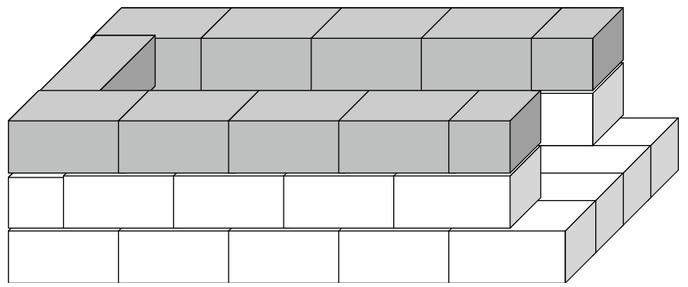
LAYER 1



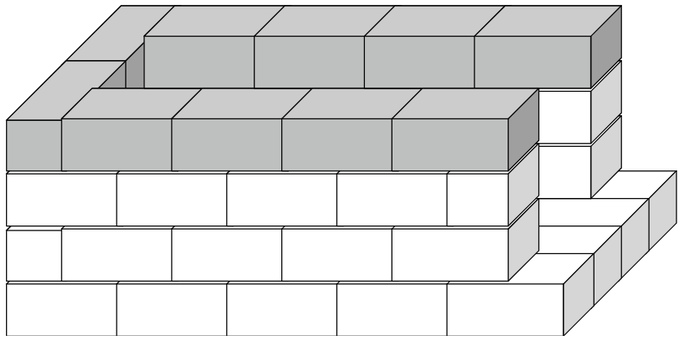
LAYER 2



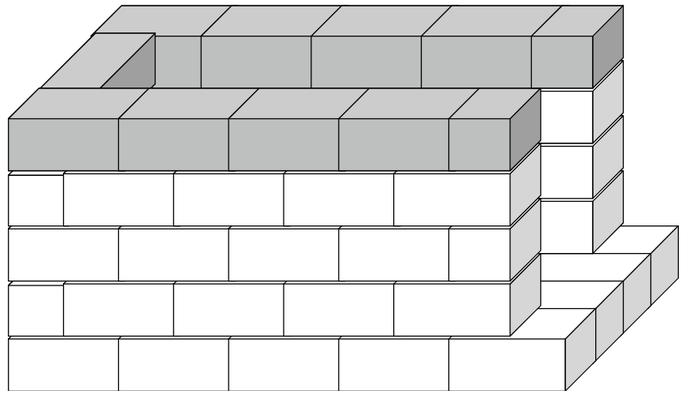
LAYER 3



LAYER 4

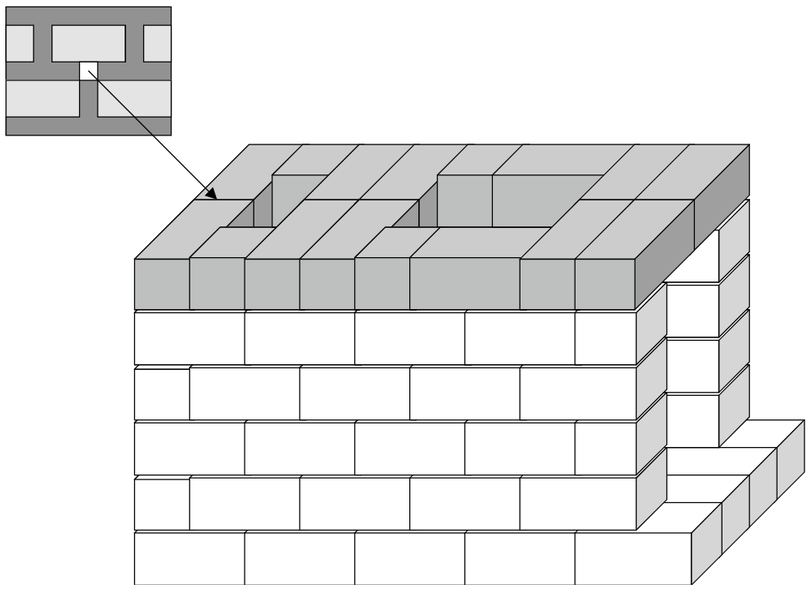


LAYER 5

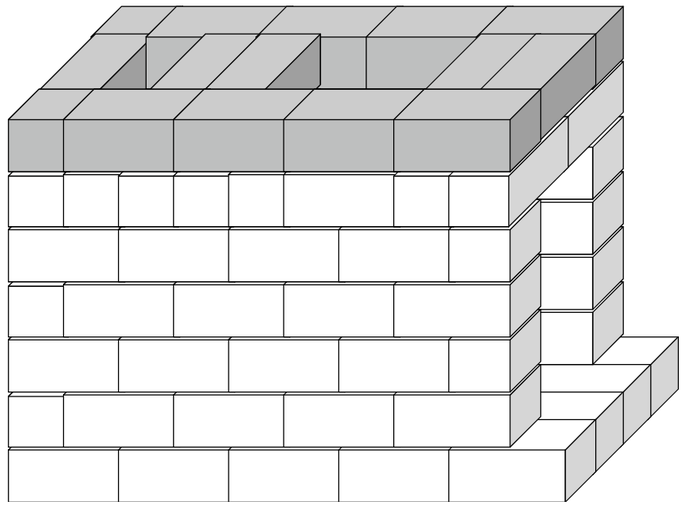


LAYER 6

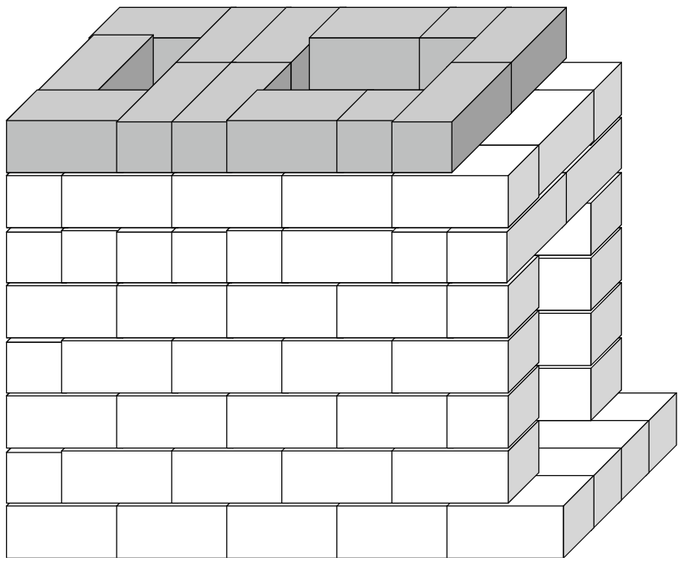
Make a viewing hole by creating a gap in the cement between layer 6 & 7. Insert a piece of wood that can be removed.



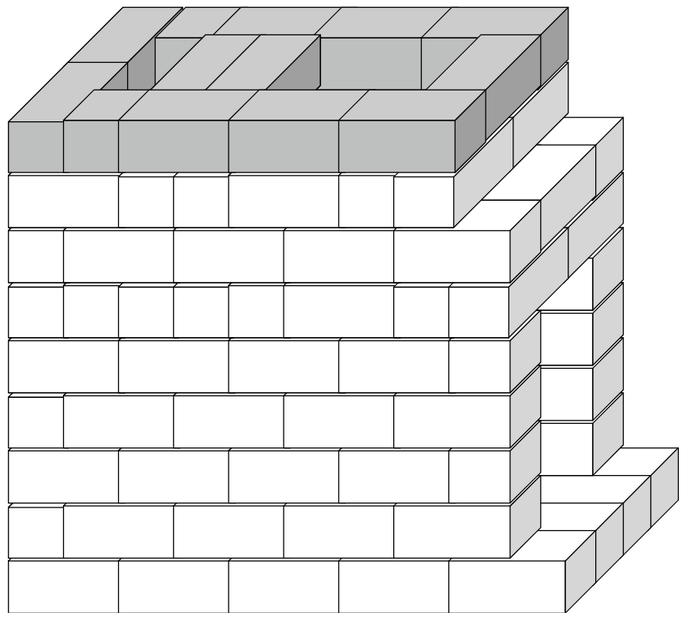
LAYER 7



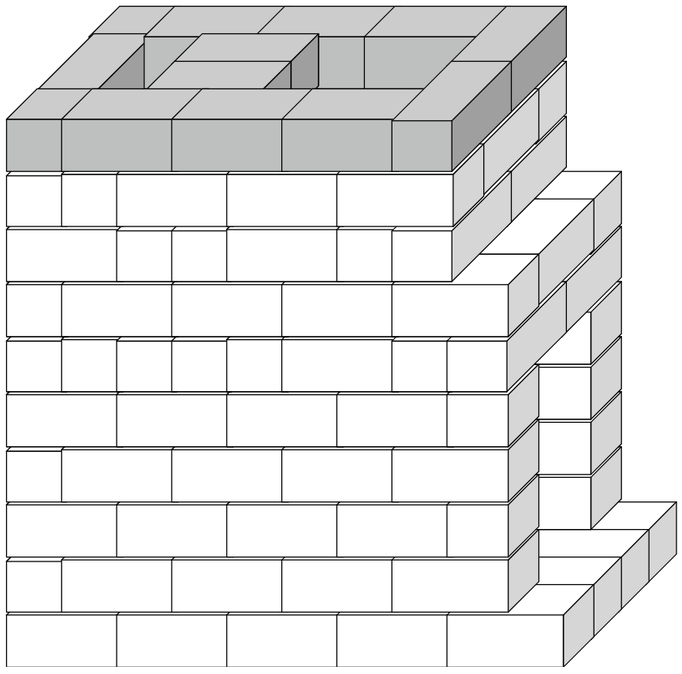
LAYER 8



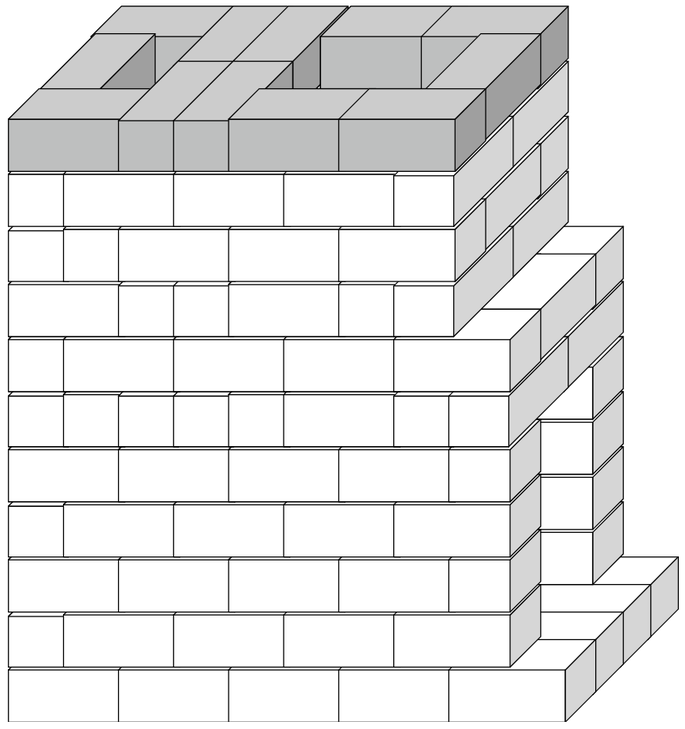
LAYER 9



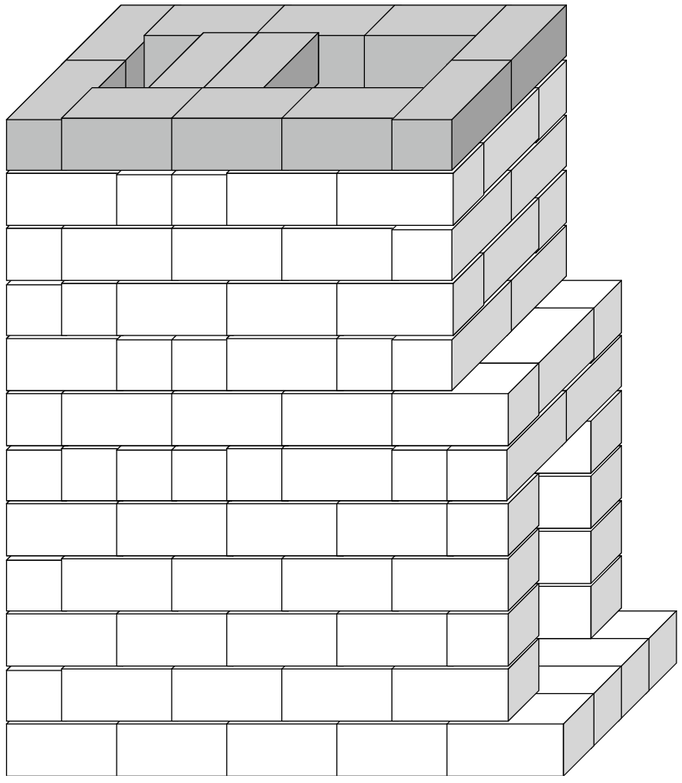
LAYER 10



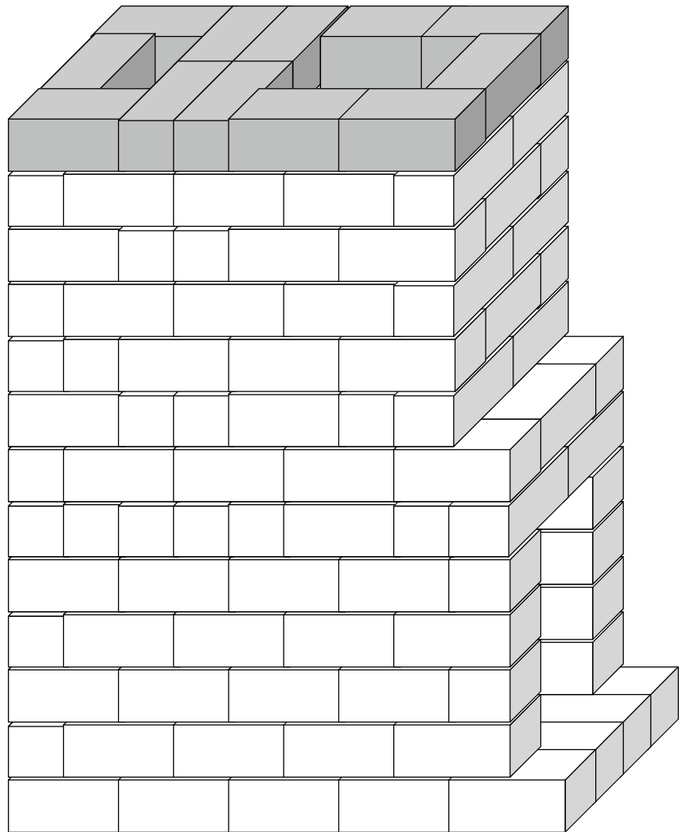
LAYER 11

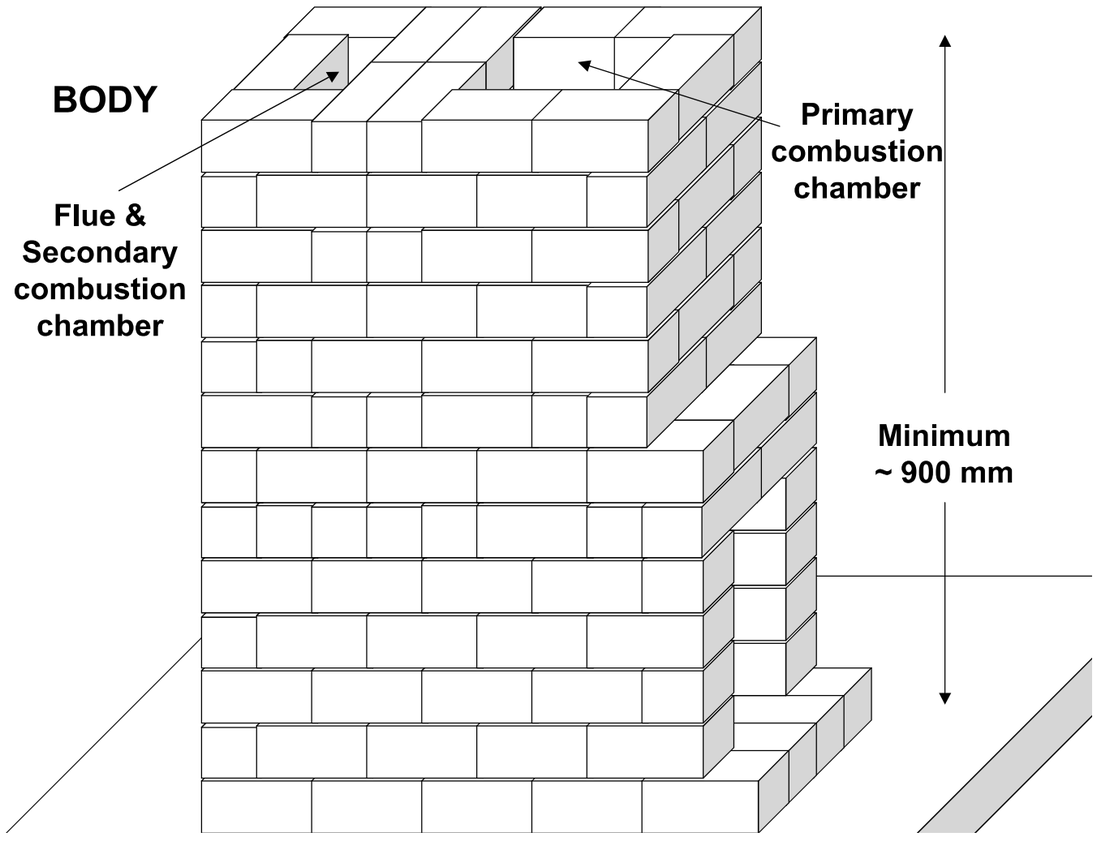


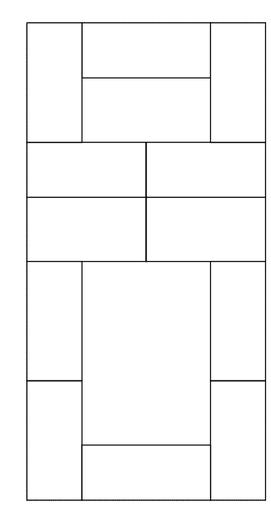
LAYER 12

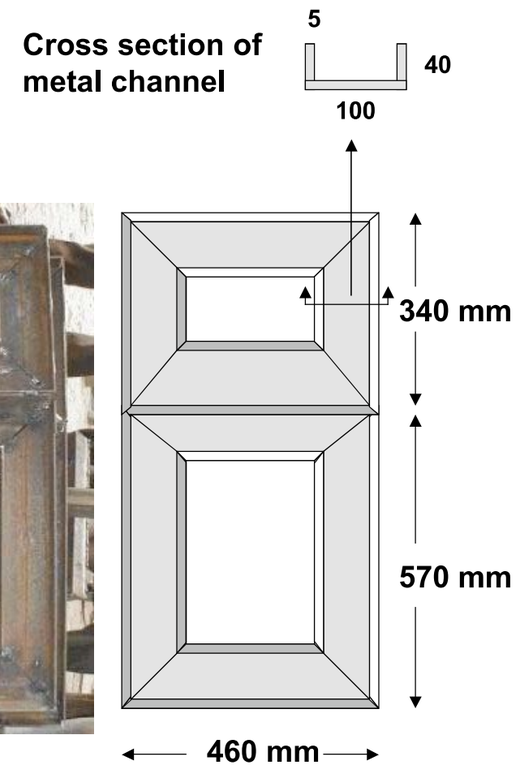


LAYER 13




BODY
Flue &
Secondary
combustion
chamber
Primary
combustion
chamber
Minimum
~ 900 mm

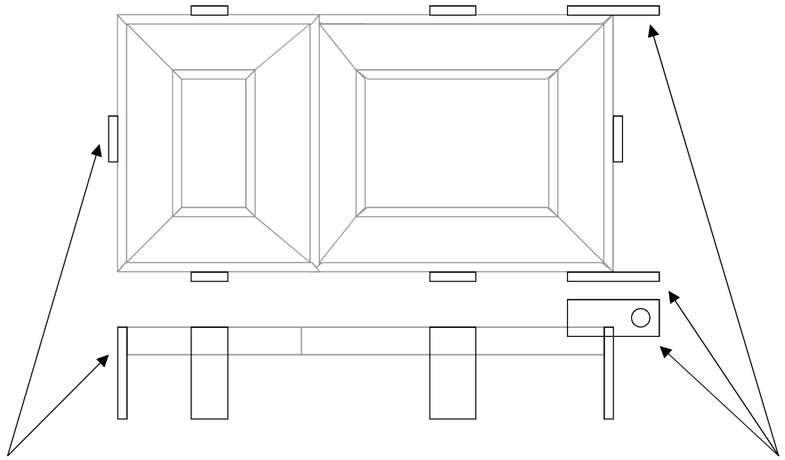

TOP
FRAME


Cross section of
metal channel
5
40
100
340 mm
570 mm
460 mm

TOP FRAME

Plan view

Side view

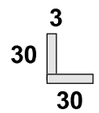


LOCATORS: Pieces of metal channel are welded to the top frame as locators

HINGES: 3mm metal plate is used for the loading door hinges

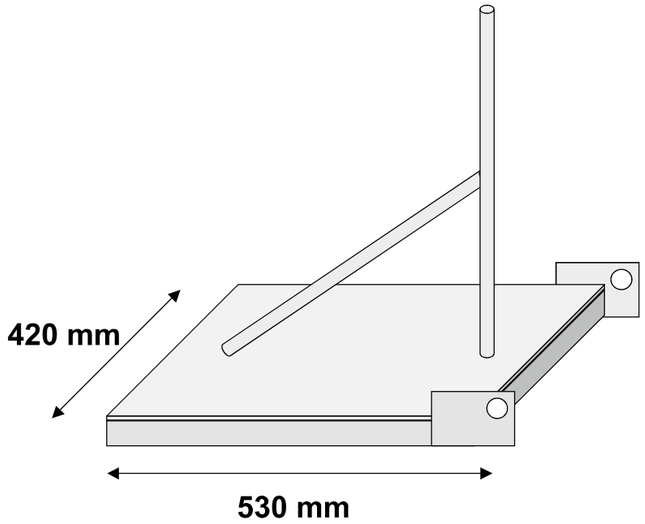
LOADING DOOR

Underside

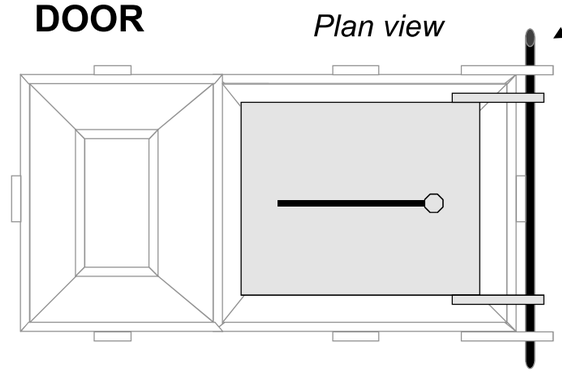


Metal Angle

The loading door is made from a frame of metal angle (30 x 30 x 3) with a plate of 3mm steel welded on top.

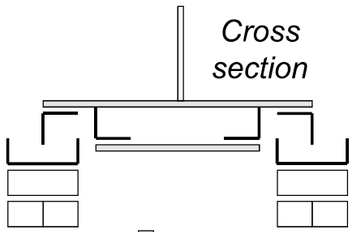


LOADING DOOR

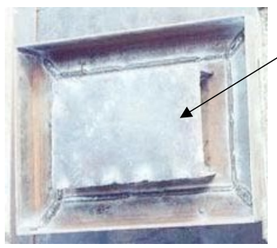


Plan view

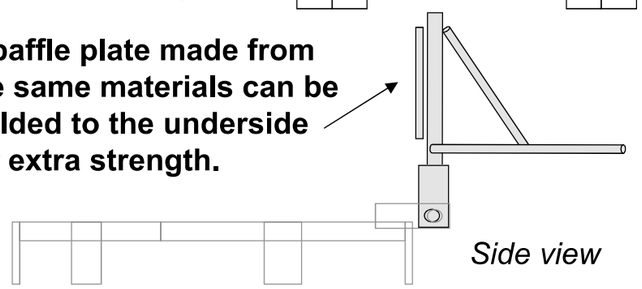
The loading door is hinged with metal bar threaded through the locating holes.



Cross section



A baffle plate made from the same materials can be welded to the underside for extra strength.

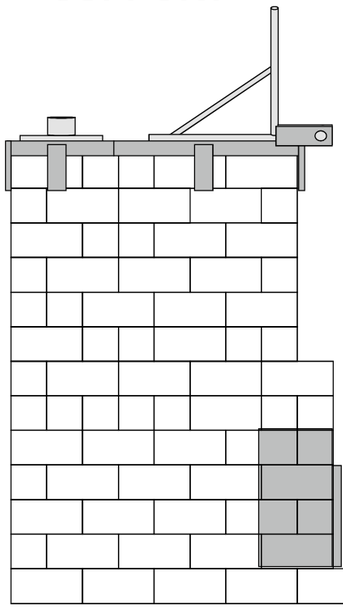


Side view

FITTING THE TOP FRAME TO THE INCINERATOR BODY

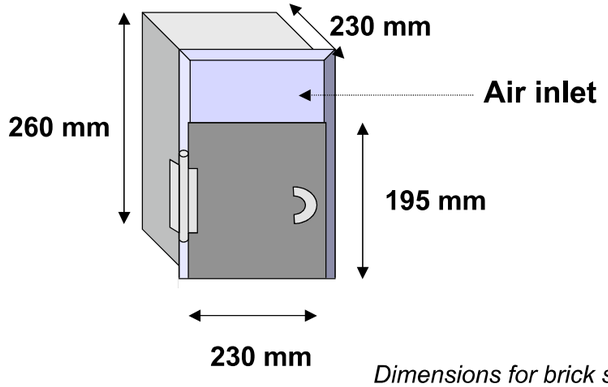
Seal with refractory cement

ASH DOOR & SUPPORT



The brick arch at the front is supported by a steel tunnel (3mm thickness). Steel angle (30x30x3) welded around the front edge of the tunnel forms the support for the ash door, which is hinged.

The ash door (3mm thickness) covers _ of the area of the arch. The remainder forms the air inlet.

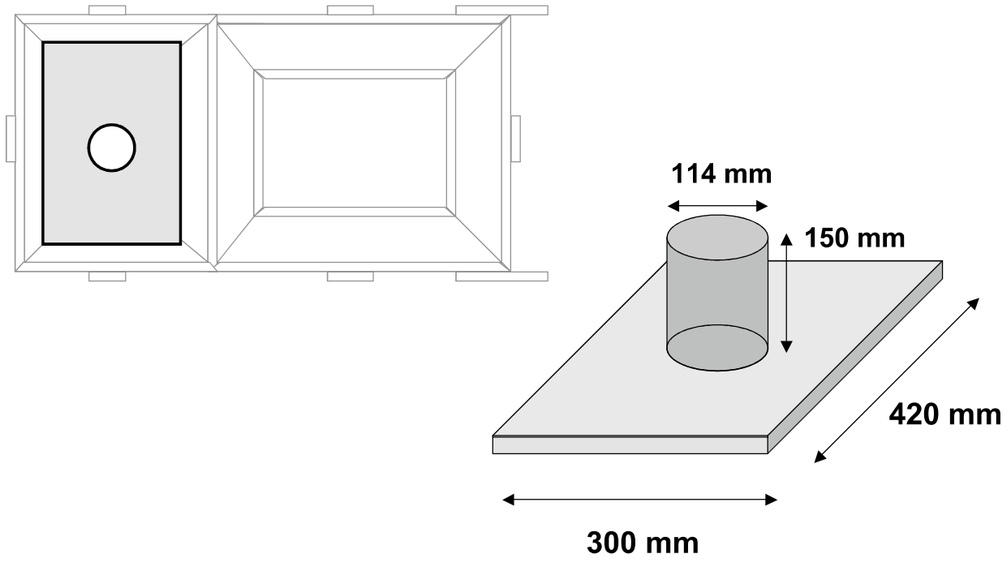


Dimensions for brick size (230 x 100 x 65), may need to be adjusted

BODY OF INCINERATOR WITH ASH DOOR AND TOP FRAME

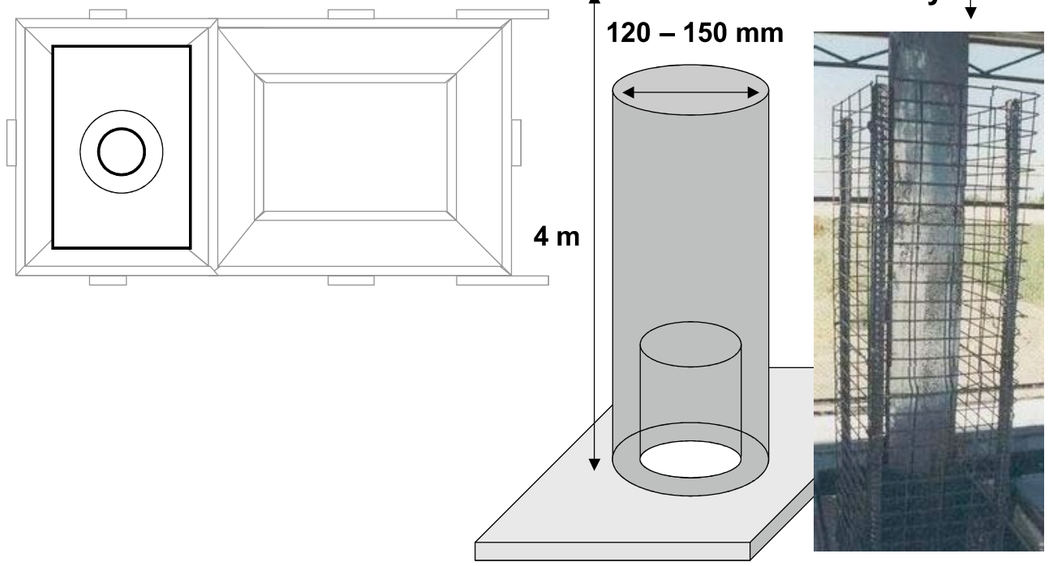
CHIMNEY SPIGOT

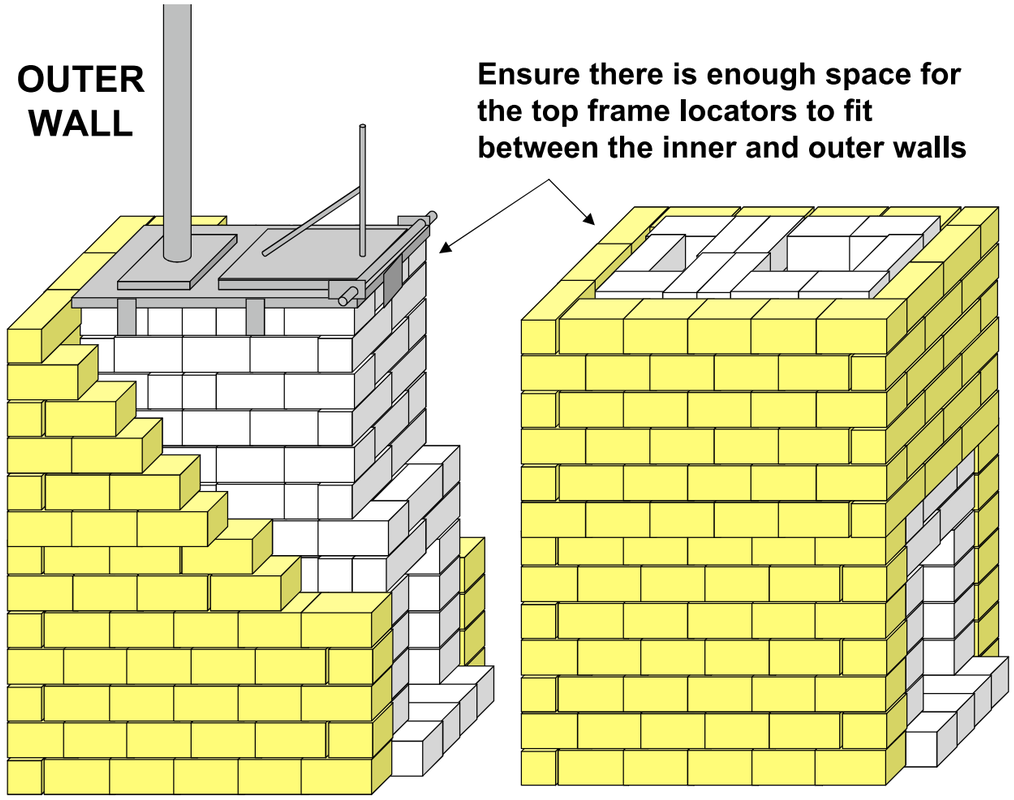
The chimney spigot is made from a frame of metal angle (30 x 30 x 3) with a plate of 5mm steel welded on top and a piece of steel pipe (3mm thickness)

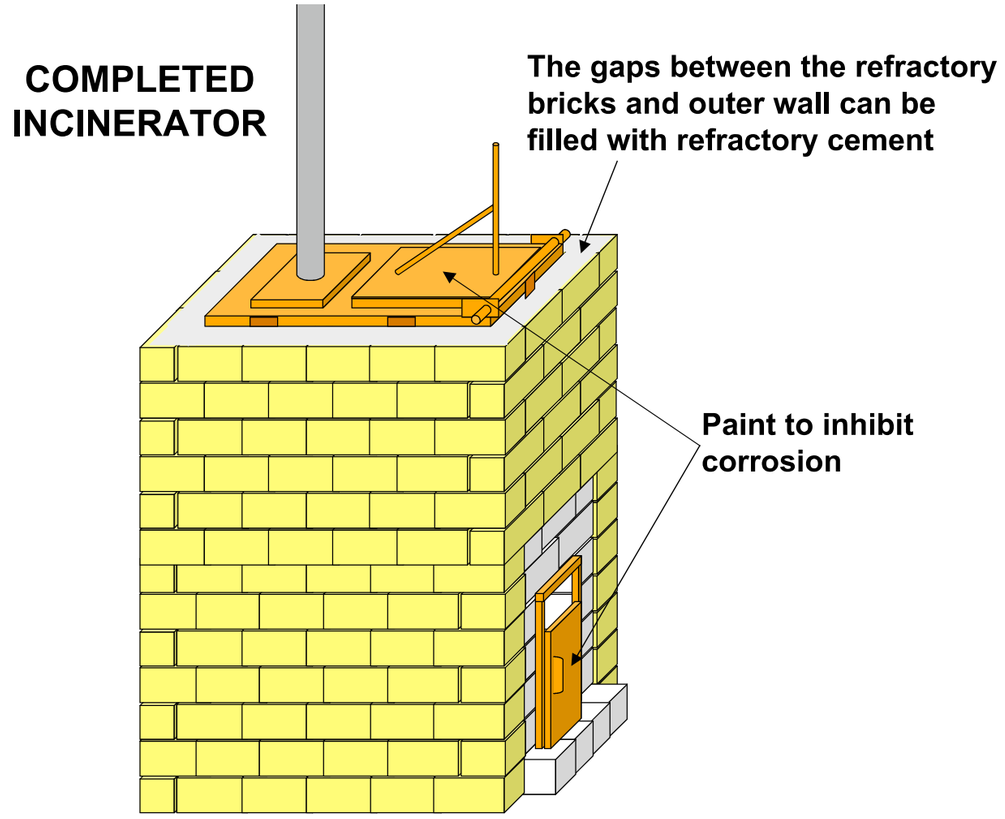


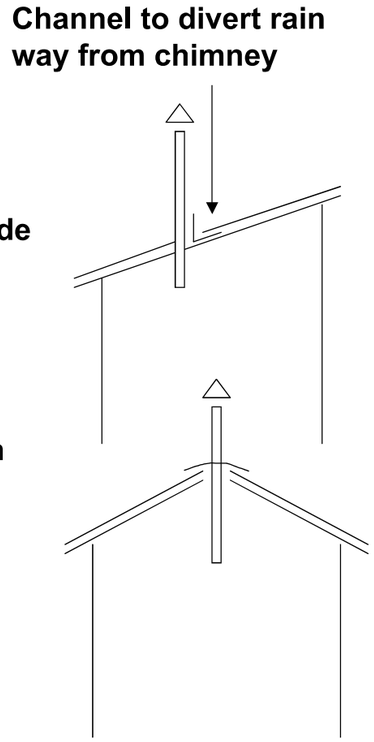
CHIMNEY

The chimney is made from a steel pipe (3mm thickness). It is sealed to the spigot with fire cement.




OUTER
WALL
Ensure there is enough space for
the top frame locators to fit
between the inner and outer walls


COMPLETED
INCINERATOR
The gaps between the refractory
bricks and outer wall can be
filled with refractory cement
Paint to inhibit
corrosion



Operation

The incinerator should be started by putting **waste paper, cardboard** or similar easily ignited material over the grate. Burning paper can then be dropped on top, and when a good flame is established, more combustible material added till the combustion chamber is half full. If available, about 100 cc of kerosene, diesel oil or used lubricating oil can be poured on top to speed the heating process. Only dry, non-infected waste should be added for the first 10 minutes or until a fierce flame is established.

The combustion chamber should be **kept at least half full**, and infectious and/or wet waste should be added above dry materials to ensure that it dries before reaching the combustion zone, Additional liquid fuel can be added if it is suspected that the combustion rate is decreasing. Any plastic waste available will also help to raise the temperature of combustion, but both this and the oil will give rise to black smoke if used to excess.

The incinerator will be most efficient if it is operated for fairly long periods once it is ignited. The grate and the flue passage to the base of the chimney must be kept clear by poking a steel rod through the air inlet hole from time to time. It may also be necessary to push down the load from time to time to prevent it “arching” above the grate. **The last load before closing down should be as dry and safe as possible**, so that no unburned material is left.

Maintenance

As with any type of equipment, there is a need to perform some regular maintenance to ensure both that the system will continue to work properly and to prolong the life span of the incinerator.

Before each operation.

- Check that ashes have been completely cleared from the grate and floor of incinerator.
- Check that loading door closes properly onto the sand seal in an air-tight manner. Loosen sand if necessary.

Annual inspection and rectifications

Component	Check	Rectify if necessary
Chimney	Vertical fixings	Reset or renew
	Corrosion	Repair any holes or weak points. Replace chimney or section thereof if necessary
Chimney support plate	Corrosion	Replace if necessary
Top sand seals	Cement seal to brickwork. Adequate sand level	Re-seal with refractory cement. Top up sand
Ash door	Corrosion, hinges, catch, blockage in door-frame	Repair and clean as necessary
Brickwork	Missing cement	Replace with refractory cement
	Evidence of thermal damage to bricks	Line inner surface of bricks with 10 mm refractory cement

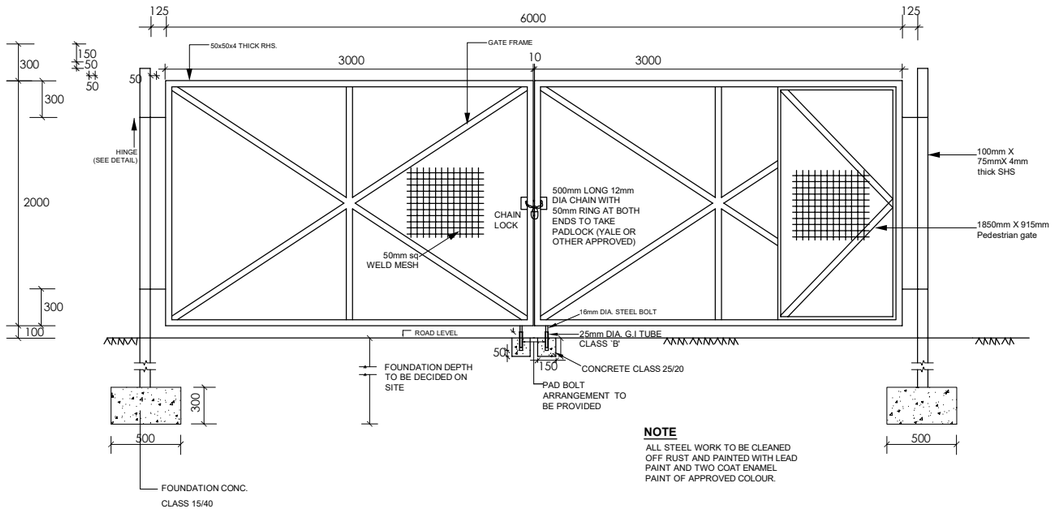
Disclaimer

Since the safe and successful use of the incinerator, which operates at very high temperatures, is entirely dependent on the building, operation and maintenance thereof, the University and the organizations supplying the drawings and instructions can bear no responsibility for any mishaps to personnel or inadequate technical performance of the incinerator.

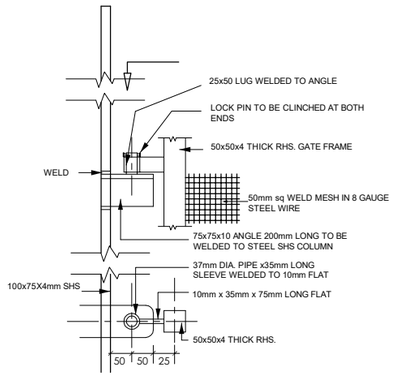
Information & questions

Any questions relating to these instructions should be referred to: Professor D.J. Picken (De Montfort University, Leicester, UK)

Contact formular available at:
http://www.mw-incinerator.info/en/601_contact_us.html



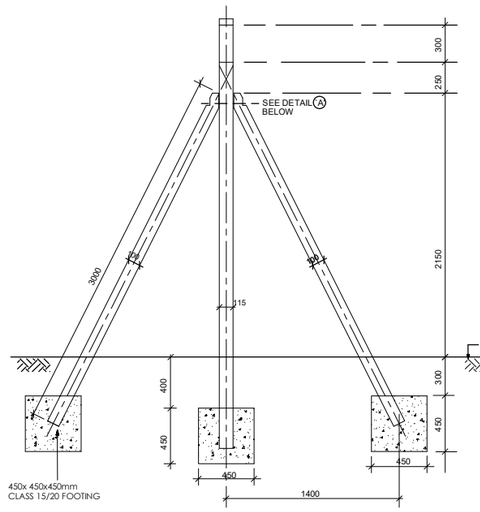
ELEVATION
SCALE 1:20



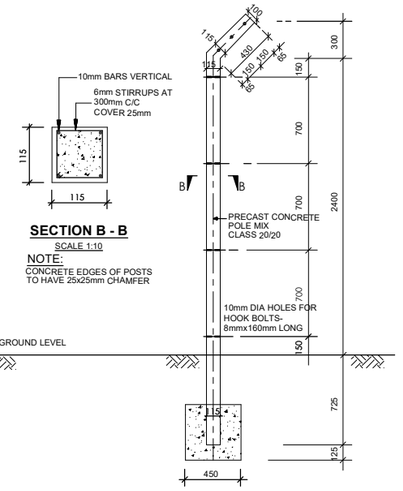
DETAILS OF HINGE
(VIEW AT Y - Y)
SCALE 1:5

NOTE
ALL STEEL WORK TO BE CLEANED
OFF RUST AND PAINTED WITH LEAD
PAINT AND TWO COAT ENAMEL
PAINT OF APPROVED COLOUR.

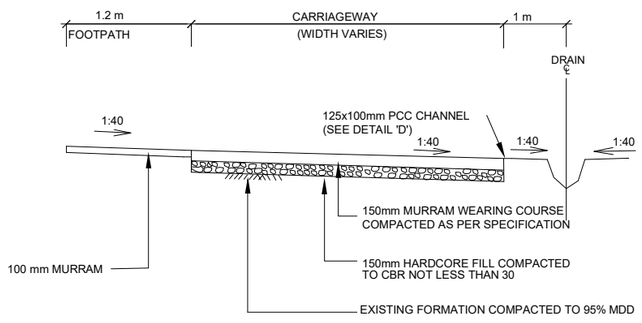
DETAILS OF 6M WIDE GATE



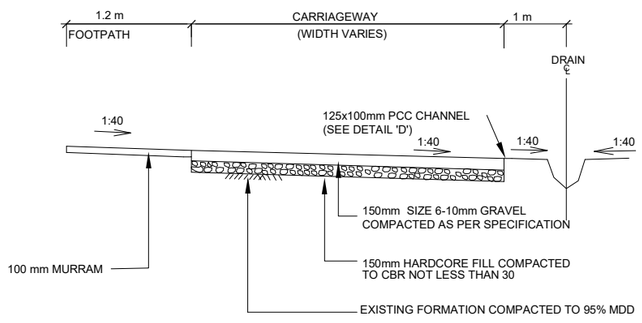
DETAILS OF STRAINING POST FOR
CHAIN LINK FENCE AT 33.3m Cts.
SCALE 1:50



DETAILS OF SINGLE P.C.C.
POST AT 3.30m Cts.
SCALE 1:50

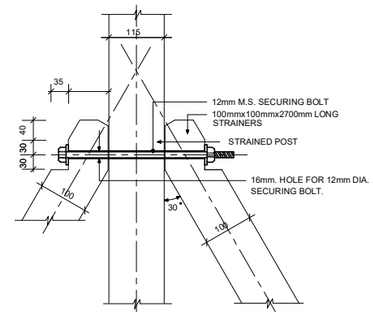


TYPICAL SECTION OF MURRAM ROAD
SCALE 1: 50

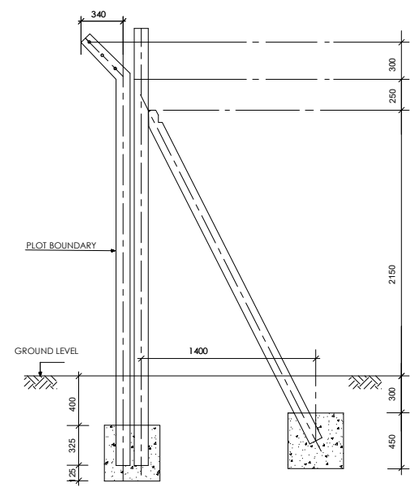


TYPICAL SECTION OF GRAVEL ROAD
SCALE 1: 50

FENCE, GATE AND ROAD



DETAIL (A)
SCALE 1:50

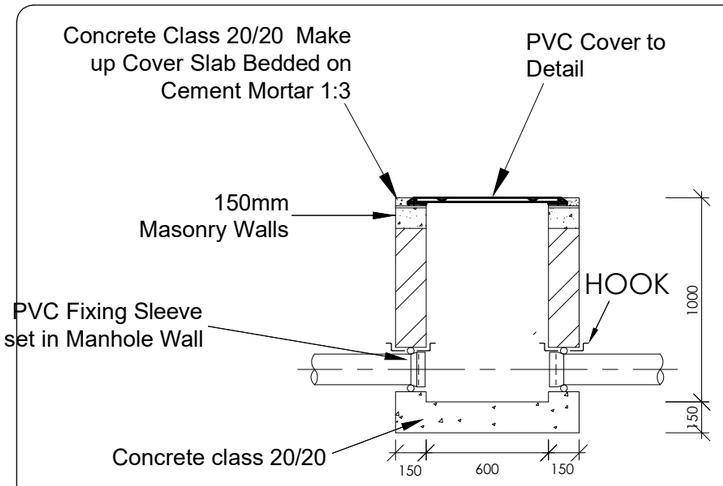


DETAILS OF CORNER POSTS
SCALE 1:50

NOTES
a. ALL CORNER POSTS AND EVERY 10th SINGLE POST TO HAVE 2No. STAYS
b. POSTS TO BE AT 3000mm CENTRES
c. TOP OF ALL POSTS TO BE KEPT IN UNIFORM LIN
d. EXTENT OF FENCING IS SHOWN ON THE LAYOUT PLAN
e. CHAINLINK TO BE GAUGE 12 GALVANIZED STEEL WIRE
f. EXTENT OF FENCING IS SHOWN ON THE LAYOUT PLAN

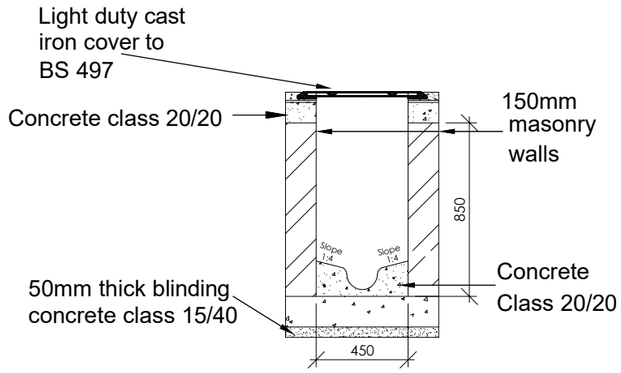
CHAIN LINK FENCE

Project Title: **Up-scaling Basic Sanitation for Urban Poor (UBSUP)**	Project Area	Designed and drawn by: UBSUP technical team ***Checked by:*** *Programme Manager Urban Investments* Approved byCEO WSTF	***Notes:*** *See Above*	***Index-No.:*** / ***Description:*** / ***Date:*** / ***Scale: As shown*** / ***page:***



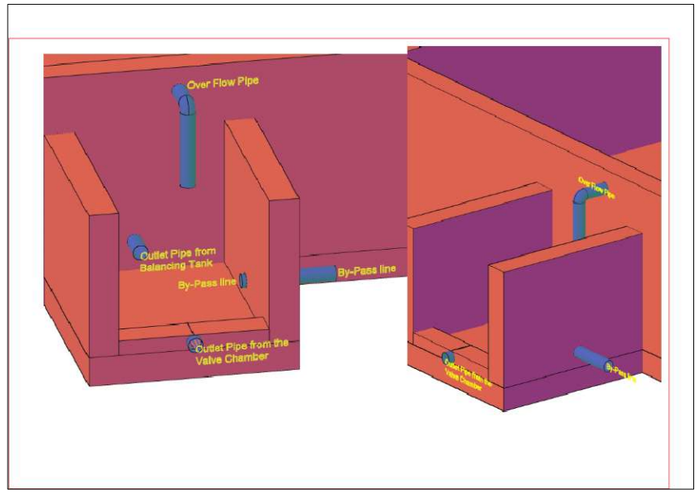
SECTION B-B

SCALE 1:40

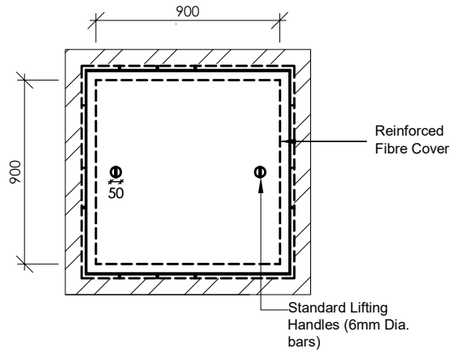


SECTION A-A

SCALE 1:40

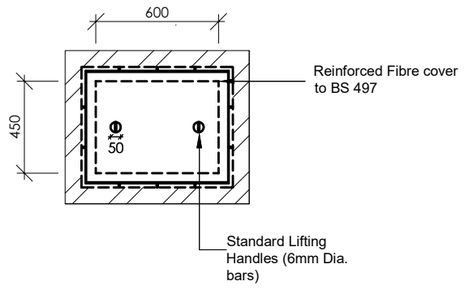


TYPICAL SECTION OF THE PIPEWORK AT THE BALANCING TANK VALVE CHAMBER



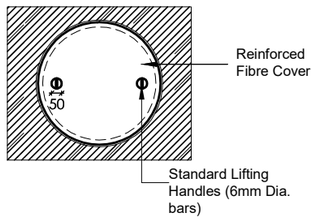
TYPE 1 - PLAN
900mmx900mm Reinforced Fibre Cover

SCALE 1:40



TYPE 2 - PLAN
600mmx450mm PVC Cover

SCALE 1:40

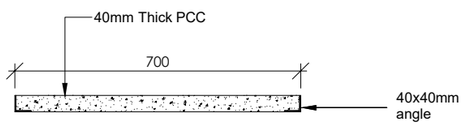


TYPE 3 - PLAN
600mm Dia. Reinforced Fibre Cover

SCALE 1:40

NOTES:

1. WALLS OF INSPECTION CHAMBER TO BE OF MASONRY
2. ALL CONCRETE TO BE CLASS 20/20



TYPE 4 - SECTION
700mmx400mm PCC Cover

SCALE 1:40

CHAMBERS AND MANHOLES

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