

REPUBLIC OF LEBANON

MINISTRY OF ENERGY AND WATER

COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

PROJECT No

CONTRACT No

**CONSTRUCTION OF WATER WORKS IN OUADI ED
DELEM – QABB ELIAS AND MRAIJAT**

VOLUME 6

DRAWINGS

**DECEMBER
2023**

**BUREAU TECHNIQUE POUR
LE DEVELOPPEMENT
(B.T.D.) P.O.Box : 70-492
Antélias
Tel : 04/712157-712158
Fax: 04/712159
Email: btd@btd-lb.com**

**MINISTRY OF ENERGY
AND WATER**

**COUNCIL FOR
DEVELOPMENT AND
RECONSTRUCTION**

TITLE 1	TITLE 2	FILE	DRAWING Nb.	SHEET Nb.
MREIJAT BOREHOLE AND PUMPING STATION	TOPOGRAPHICAL SURVEY SITE LAYOUT	509W-PS01-C01-05	509W-PS01-C01	1/5
MREIJAT BOREHOLE AND PUMPING STATION	SITE PLAN-SECTION AA RETAINNING WALL SECTION	509W-PS01-C01-05	509W-PS01-C02	2/5
MREIJAT BOREHOLE AND PUMPING STATION	PLANS-SECTIONS-ELEVATIONS-REINFORCEMENT	509W-PS01-C01-05	509W-PS01-C03	3/5
MREIJAT BOREHOLE AND PUMPING STATION	PLANS-SECTIONS	509W-PS01-C01-05	509W-PS01-C04	4/5
MREIJAT BOREHOLE AND PUMPING STATION	HEAD WORK STRUCTURAL DETAILS	509W-PS01-C01-05	509W-PS01-C05	5/5
FENCE AND TYPICAL GATE 4M AND 1.2M	ELEVATIONS SECTIONS AND DETAILS	509W-PS01-SF01-02	509W-PS01-SF01	1/2
FENCE AND TYPICAL GATE 4M AND 1.2M	ELEVATIONS SECTIONS AND DETAILS	509W-PS01-SF01-02	509W-PS01-SF02	2/2
QABB ELIAS RESERVOIRS (CAPACITY 2'400 M ³)	TOPOGRAPHICAL SURVEY SITE LAYOUT	509W-RS02-C01-07	509W-RS02-C01	1/7
QABB ELIAS RESERVOIRS (CAPACITY 2'400 M ³)	SITE PLAN SECTION A-A	509W-RS02-C01-07	509W-RS02-C02	2/7
QABB ELIAS RESERVOIRS (CAPACITY 2'400 M ³)	ELEVATIONS AND SECTIONS FORMWORK	509W-RS02-C01-07	509W-RS02-C03	3/7
QABB ELIAS RESERVOIRS (CAPACITY 2'400 M ³)	DETAILS FORMWORK	509W-RS02-C01-07	509W-RS02-C04	4/7
QABB ELIAS RESERVOIRS (CAPACITY 2'400 M ³)	DETAILS FORMWORK	509W-RS02-C01-07	509W-RS02-C05	5/7
QABB ELIAS RESERVOIRS (CAPACITY 2'400 M ³)	VERTICAL HALF-SECTION AND PLANS REINFORCEMENT	509W-RS02-C01-07	509W-RS02-C06	6/7
QABB ELIAS RESERVOIRS (CAPACITY 2'400 M ³)	SECTIONS AND DETAILS REINFORCEMENT	509W-RS02-C01-07	509W-RS02-C07	7/7
QABB ELIAS VALVE CHAMBER INSIDE DIAMETER 300 CM INSIDE HEIGHT VARIABLE BETWEEN 300 & 600 CM DEPENDING ON THE GROUND LEVEL	FORMWORK REINFORCEMENT	509W-RS02-C08-09	509W-RS02-C08	1/2
QABB ELIAS VALVE CHAMBER INSIDE DIAMETER 300 CM INSIDE HEIGHT VARIABLE BETWEEN 300 & 600 CM DEPENDING ON THE GROUND LEVEL	FORMWORK REINFORCEMENT	509W-RS02-C08-09	509W-RS02-C09	2/2
QABB ELIAS RESERVOIRS (CAPACITY 2'400 M ³)	FENCE ELEVATIONS-SECTIONS AND DETAILS RETAINING WALL DETAILS	509W-RS02-SF01-02	509W-RS02-SF01	1/2
QABB ELIAS RESERVOIRS (CAPACITY 2'400 M ³)	FENCE ELEVATIONS-SECTIONS AND DETAILS	509W-RS02-SF01-02	509W-RS02-SF02	2/2
QABB ELIAS RESERVOIRS VALVE CHAMBER	HYDRAULIC ACCESSORIES	509W-RS02-VC01	509W-RS02-VC01	1/1
MAKSE RESERVOIR (CAPACITY 500 M ³)	TOPOGRAPHICAL SURVEY SITE LAYOUT	509W-RS03-C01-09	509W-RS03-C01	1/9
MAKSE RESERVOIR (CAPACITY 500 M ³)	SITE PLAN SECTION A-A	509W-RS03-C01-09	509W-RS03-C02	2/9
MAKSE RESERVOIR (CAPACITY 500 M ³)	ELEVATION AND SECTIONS FORMWORK	509W-RS03-C01-09	509W-RS03-C03	3/9
MAKSE RESERVOIR (CAPACITY 500 M ³)	DETAILS FORMWORK	509W-RS03-C01-09	509W-RS03-C04	4/9
MAKSE RESERVOIR (CAPACITY 500 M ³)	DETAILS FORMWORK	509W-RS03-C01-09	509W-RS03-C05	5/9

TITLE 1	TITLE 2	FILE	DRAWING Nb.	SHEET Nb.
MAKSE RESERVOIR (CAPACITY 500 M ³)	VERTICAL HALF-SECTION AND PLANS REINFORCEMENT	509W-RS03-C01-09	509W-RS03-C06	6/9
MAKSE RESERVOIR (CAPACITY 500 M ³)	SECTIONS AND DETAILS REINFORCEMENT	509W-RS03-C01-09	509W-RS03-C07	7/9
VALVE CHAMBER INSIDE DIAMETER 400 CM INSIDE HEIGHT VARIABLE BETWEEN 300& 600 CM DEPENDING ON THE GROUND LEVEL	FORMWORK REINFORCEMENT	509W-RS03-C01-09	509W-RS03-C08	8/9
VALVE CHAMBER INSIDE DIAMETER 400 CM INSIDE HEIGHT VARIABLE BETWEEN 300& 600 CM DEPENDING ON THE GROUND LEVEL	FORMWORK REINFORCEMENT	509W-RS03-C01-09	509W-RS03-C09	9/9
FENCE AND TYPICAL GATE 4M AND 1.2M	ELEVATIONS SECTIONS AND DETAILS	509W-RS03-SF01-02	509W-RS03-SF01	1/2
FENCE AND TYPICAL GATE 4M AND 1.2M	ELEVATIONS SECTIONS AND DETAILS	509W-RS03-SF01-02	509W-RS03-SF02	2/2
MAKSE RESERVOIR VALVE CHAMBER	HYDRAULIC ACCESSORIES	509W-RS03-VC01	509W-RS03-VC01	1/1
REHABILITATION WORKS OF QABB ELIAS WATER TANK	GENERAL VIEW	509W-RS04	509W-RS04-P01	00
REHABILITATION WORKS OF QABB ELIAS WATER TANK	METALLIC FRAME AND FLOWMETER CHAMBER	509W-RS04	509W-RS04-P02	01
REHABILITATION WORKS OF QABB ELIAS WATER TANK	WATER TANK FORMWORK AND REINFORCEMENT	509W-RS04	509W-RS04-P03	03
REHABILITATION WORKS OF QABB ELIAS WATER TANK	BEAMS REINFORCEMENT	509W-RS04	509W-RS04-P04	04
EL MRAIJAT PUMPING STATION	WELL HEAD SCHEMATIC	509W-PS01-M01	509W-PS01-M01	1/7
EL MRAIJAT PUMPING STATION	CHLORINATION SCHEMATIC	509W-PS01-M02	509W-PS01-M02	2/7
EL MRAIJAT PUMPING STATION	MECHANIC DRAWING FOR WELL HEAD	509W-PS01-M03	509W-PS01-M03	3/7
EL MRAIJAT PUMPING STATION	ELECTRICAL SCHEMATIC	509W-PS01-E01	509W-PS01-E01	4/7
EL MRAIJAT PUMPING STATION	DOMESTIC ELECTRICAL INSTALLATION SCHEMATIC	509W-PS01-E02	509W-PS01-E02	5/7
EL MRAIJAT PUMPING STATION	ELECTRICAL SCHEMATIC	509W-PS01-E03	509W-PS01-E03	6/7
EL MRAIJAT PUMPING STATION	CONTROL SCHEMATIC	509W-PS01-01	509W-PS01-01	7/7
QABB ELIAS PUMPING STATION	HYDRAULIC SCHEMATICS	509W-PS02-M01	509W-PS02-M01	1/4
QABB ELIAS PUMPING STATION	CHLORINATION SCHEMATIC	509W-PS02-M02	509W-PS02-M02	2/4
QABB ELIAS PUMPING STATION	ELECTRICAL SCHEMATIC	509W-PS02-E01	509W-PS02-E01	3/4
QABB ELIAS PUMPING STATION	CONTROL SCHEMATIC	509W-PS02-E02	509W-PS02-E02	4/4
GRAVITY LINE FROM OUADI EL DELEM SPRING TO QABB ELIAS EXISTING RESERVOIRS	PLAN+PROFILES	509W-TR-01P01-03	509W-TR-01P01	1/3

TITLE 1	TITLE 2	FILE	DRAWING Nb.	SHEET Nb.
GRAVITY LINE FROM OUADI EL DELEM SPRING TO QABB ELIAS EXISTING RESERVOIRS	PLAN+PROFILES	509W-TR-01P01-03	509W-TR-01P02	2/3
GRAVITY LINE FROM OUADI EL DELEM SPRING TO QABB ELIAS EXISTING RESERVOIRS	PLAN+PROFILES	509W-TR-01P01-03	509W-TR-01P03	3/3
GRAVITY LINE FROM OUADI EL DELEM SPRING TO MRAIJAT MIDDLE RESERVOIR PART 1	PLAN+PROFILES	509W-TR-02P01-02	509W-TR-02P01	1/2
GRAVITY LINE FROM OUADI EL DELEM SPRING TO MRAIJAT MIDDLE RESERVOIR PART 1	PLAN+PROFILES	509W-TR-02P01-02	509W-TR-02P02	2/2
GRAVITY LINE FROM OUADI EL DELEM SPRING TO MRAIJAT MIDDLE RESERVOIR PART 2	PLAN+PROFILES	509W-TR-02P03-03	509W-TR-02P03	3/3
RAS EL AIN GRAVITY LINE	PLAN+PROFILES	509W-TR-03P	509W-TR-03P01	1/1
LIFT LINE FROM QABB ELIAS FRENCH RESERVOIR TO PROPOSED QABB ELIAS RESERVOIRS	PLAN+PROFILES	509W-TR-04P	509W-TR-04P01	1/1
LIFT LINE FROM PROPOSED MRAIJAT WELL TO EXISTING DOUMANI RESERVOIR	PLAN+PROFILES	509W-TR-05P	509W-TR-05P01	1/1
TRANSMISSION AND DISTRIBUTION SYSTEMS	WASHOUT AND AIR VALVE CHAMBER DETAILS	509W-STD001-16	509W-STD001	1/16
TRANSMISSION AND DISTRIBUTION SYSTEMS	WASHOUT AND AIR VALVE CHAMBER DETAILS	509W-STD001-16	509W-STD002	2/16
TRANSMISSION AND DISTRIBUTION SYSTEMS	TYPICAL TRENCH DETAILS AND TELEMETRY CABLE DRAW PIT	509W-STD001-16	509W-STD003	3/16
TRANSMISSION AND DISTRIBUTION SYSTEMS	TYPICAL TRENCH DETAILS AND TELEMETRY CABLE DRAW PIT	509W-STD001-16	509W-STD004	4/16
TRANSMISSION AND DISTRIBUTION SYSTEMS	TYPICAL CONNECTIONS OF NEW PIPES TO EXISTING PIPES	509W-STD001-16	509W-STD005	5/16
TRANSMISSION AND DISTRIBUTION SYSTEMS	TYPICAL CONNECTIONS OF NEW PIPES TO EXISTING PIPES	509W-STD001-16	509W-STD006	6/16
TRANSMISSION AND DISTRIBUTION SYSTEMS	PIPELINE THRUST BLOCKS	509W-STD001-16	509W-STD007	7/16
TRANSMISSION AND DISTRIBUTION SYSTEMS	PIPELINE THRUST BLOCKS	509W-STD001-16	509W-STD008	8/16
TRANSMISSION AND DISTRIBUTION SYSTEMS	PIPELINE THRUST BLOCKS	509W-STD001-16	509W-STD009	9/16
TRANSMISSION AND DISTRIBUTION SYSTEMS	PIPELINE ANCHOR BLOCKS	509W-STD001-16	509W-STD010	10/16
TRANSMISSION AND DISTRIBUTION SYSTEMS	TYPICAL VALVE CHAMBER DETAILS	509W-STD001-16	509W-STD011	11/16
TRANSMISSION AND DISTRIBUTION SYSTEMS	TYPICAL VALVE CHAMBER DETAILS	509W-STD001-16	509W-STD012	12/16
TRANSMISSION AND DISTRIBUTION SYSTEMS	PRESSURE REGULATING AND PRESSURE SUSTAINING VALVE DETAILS OF INSTALLATION AND PROTECTION CHAMBER	509W-STD001-16	509W-STD013	13/16

TITLE 1	TITLE 2	FILE	DRAWING Nb.	SHEET Nb.
TRANSMISSION AND DISTRIBUTION SYSTEMS	PRESSURE SUSTAINING AND PRESSURE REGULATING VALVES DETAILS OF INSTALLATION AND PROTECTION CHAMBER	509W-STD001-16	509W-STD014	14/16
TRANSMISSION AND DISTRIBUTION SYSTEMS	PRESSURE REGULATING VALVES,PRESSURE SUSTAINING VALVES AND WATERMETERS DETAILS OF INSTALLATION AND PROTECTION CHAMBER	509W-STD001-16	509W-STD015	15/16
TRANSMISSION AND DISTRIBUTION SYSTEMS	WATERMETERS DETAILS OF INSTALLATION AND PROTECTION CHAMBER	509W-STD001-16	509W-STD016	16/16

	Date	Dsgn	Drwn	Chk'd	Appr'd

REPUBLIC OF LEBANON

COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

BD

BUREAU TECHNIQUE POUR LE DEVELOPEMENT

JALL ED DIB – HAJAL Bldg
P.O.BOX:70492 – ANTELIAS

TEL:(04) 712157 / 712158
FAX: (04) 712159

CONSTRUCTION OF WATER WORKS IN
OUADI ED DELEM-QABB ELIAS AND MRAIJAT

LIST OF DRAWINGS - 1 OF 1

FILE NAME	DESIGNED BY	DRAWN BY	CHECKED BY
509W-01LS	J. ZALZAL	J. ZALZAL	Z.SABA

DATE	SCALE	SHEET No.	DRAWING No.
JULY 2019	-	1/1	509W-01LS01

TOPOGRAPHICAL SURVEY
SITE LAYOUT
SCALE 1:200
MREIJAT CADASTRAL AREA



- NOTES:**
- GROUND LEVEL OF PUMPING STATION BUILDING = +1218.00M
 - DO NOT SCALE FROM THIS DRAWING
 - ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED
 - ALL LEVELS ARE IN M UNLESS OTHERWISE SPECIFIED

TOPOGRAPHICAL LEGEND

	CULVERT/BRIDGE		RETAINING WALL
	SPRING		RAILWAY
	WELL		CHANNEL
	DECIDUOUS/PINE TREE		TERRACE
	ROCKS		FENCE
	BUSHES		STREAM/RIVER
	MANHOLE SEWER		PYLON
	MANHOLE WATER		ELECTRIC POLE/TELEGRAPH POLE
	MANHOLE TELEPHONE		OVERGROUND WATER PIPE
	MANHOLE NOT IDENTIFIED		UNDERGROUND WATER PIPE
	LIGHTING POLE		SPOT HEIGHT
	BUILDING		TRAVERSING STATION
	FOUNDATION/BUILDING UNDER CONSTRUCTION		TRIANGULATION POINT
	ROAD		BENCH MARK
	TRACK		ML
	REFERENCE LINE		LOT No
	SLOPE		BOUNDARY
			CIRCUMSCRIPTION BOUNDARY
			PRIVATIZATION LIMIT

REPUBLIC OF LEBANON
COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

BD BUREAU TECHNIQUE POUR LE DEVELOPEMENT

JALL ED DIB - HAJAL Bldg TEL:(04) 712157/712158
P.O.BOX:70492 - ANTELIAS FAX:(04) 712159

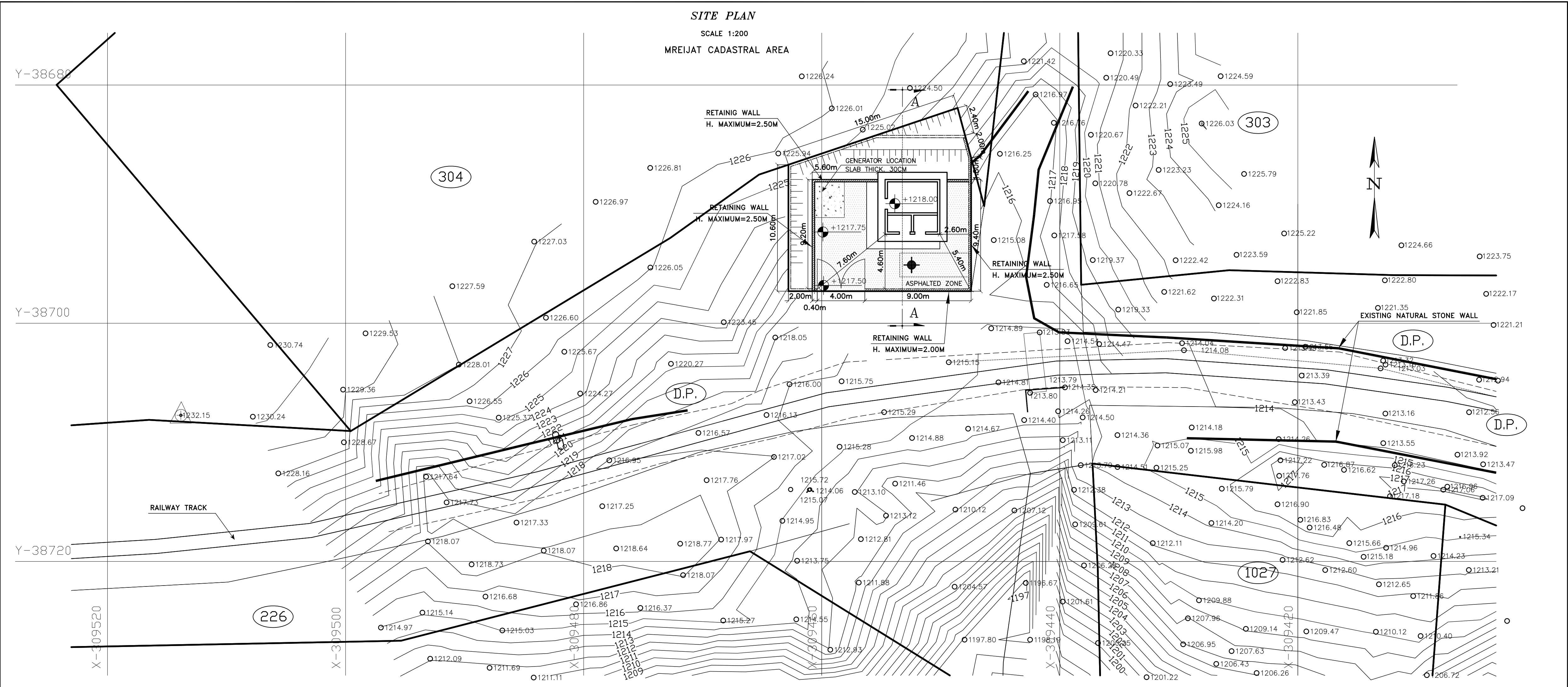
CONSTRUCTION OF WATER WORKS IN
QUADI ED DELEM-QABB ELIAS AND MRAIJAT

MREIJAT BOREHOLE
AND PUMPING STATION

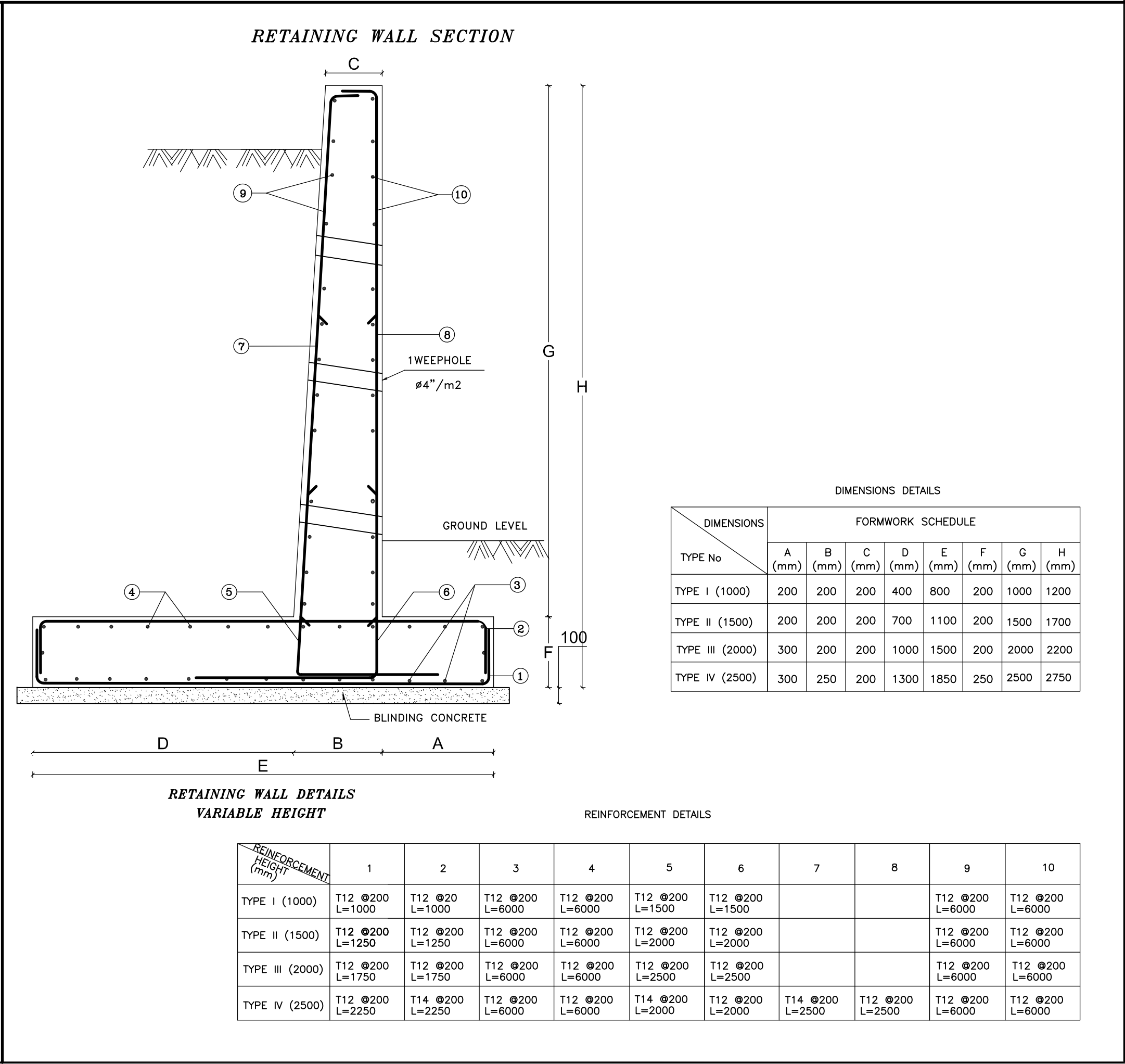
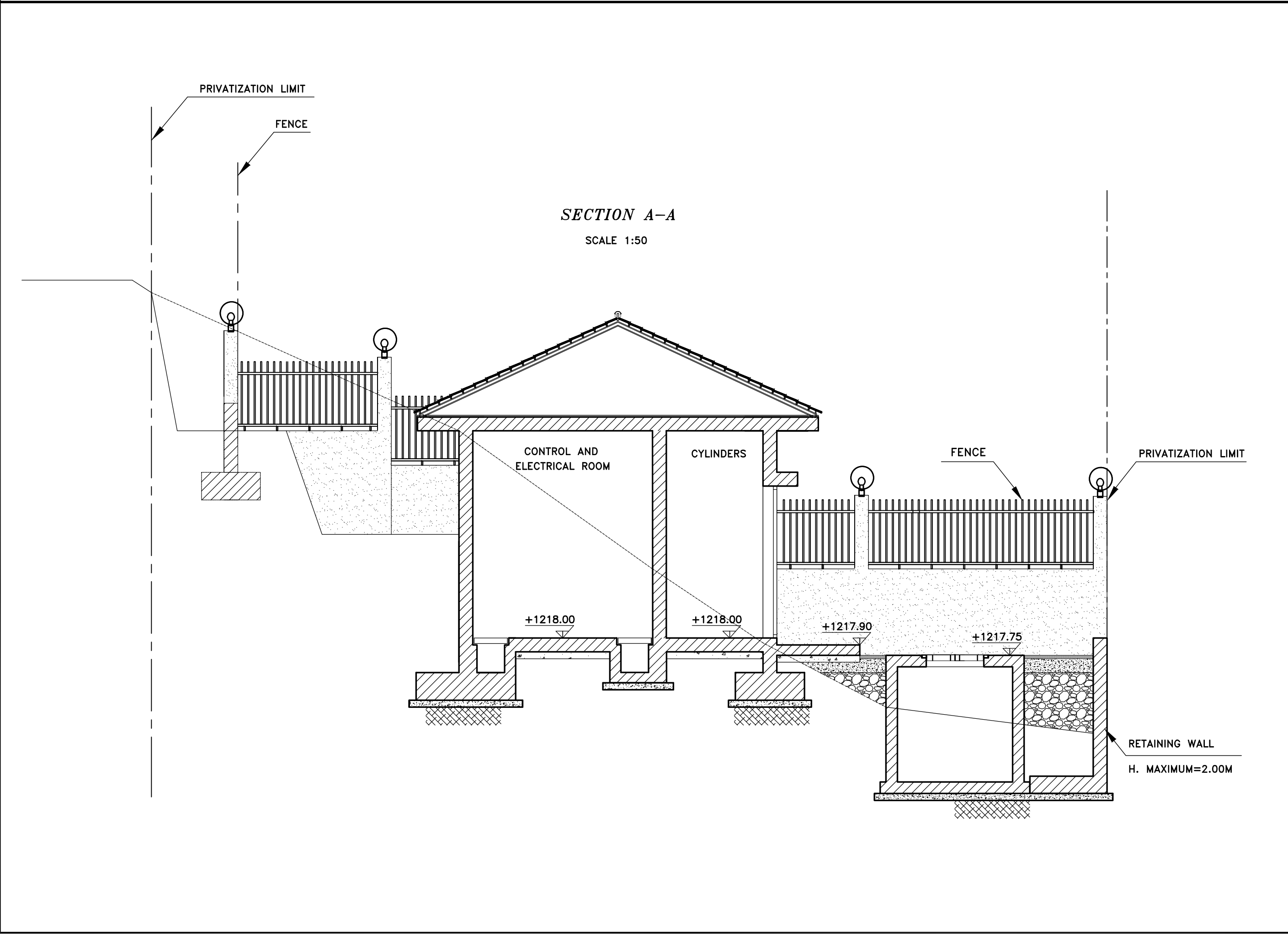
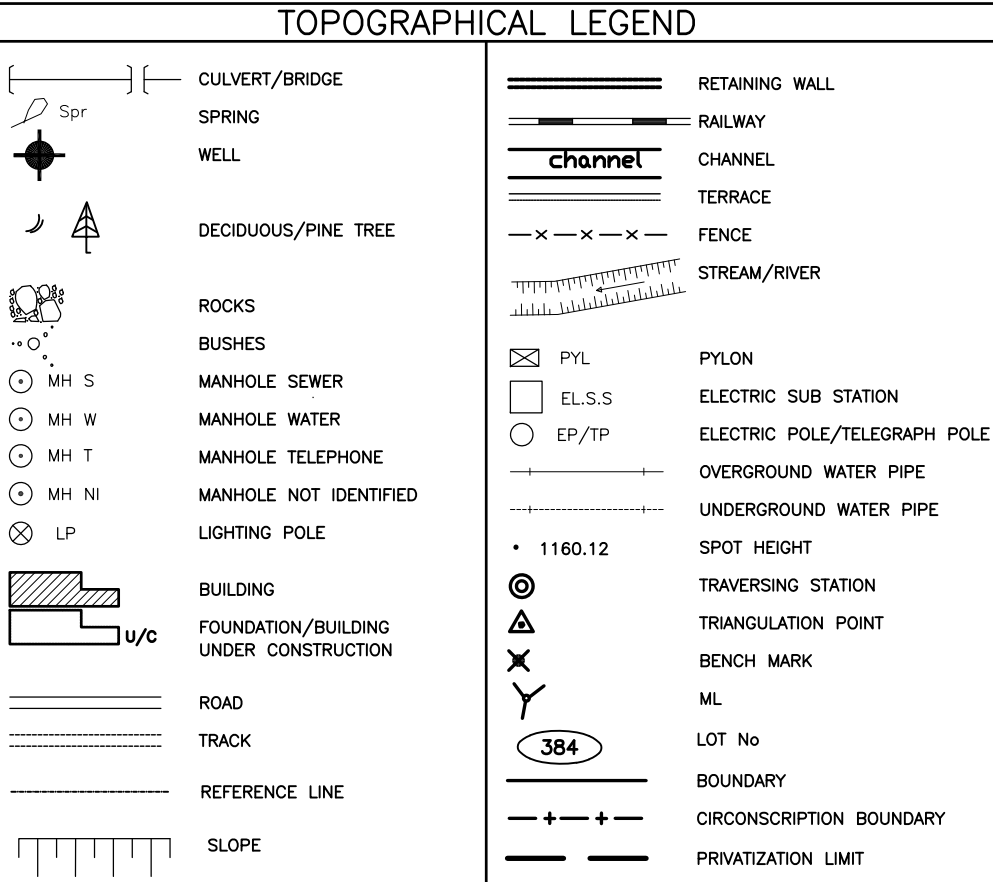
TOPOGRAPHICAL SURVEY
SITE LAYOUT

FILE NAME	DESIGNED BY	DRAWN BY	CHECKED BY
509W-PS01-C01-05	W. SEIFEDDINE	W. SEIFEDDINE	W. SEIFEDDINE

DATE	SCALE	SHEET No.	DRAWING No.
JULY 2019	1/200	1/5	509W-PS01-C01



- NOTES:**
- GROUND LEVEL OF PUMPING STATION BUILDING = +1218.00M
 - DO NOT SCALE FROM THIS DRAWING
 - ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED
 - ALL LEVELS ARE IN M UNLESS OTHERWISE SPECIFIED



Rev.	Date	Dsgn	Drwn	Chk'd	Appr'd

REPUBLIC OF LEBANON
COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

BUREAU TECHNIQUE POUR LE DEVELOPEMENT
JALL ED DIB - HAJAL Bldg TEL:(04) 712157/712158
P.O.BOX:70492 - ANTELIA FAX:(04) 712159

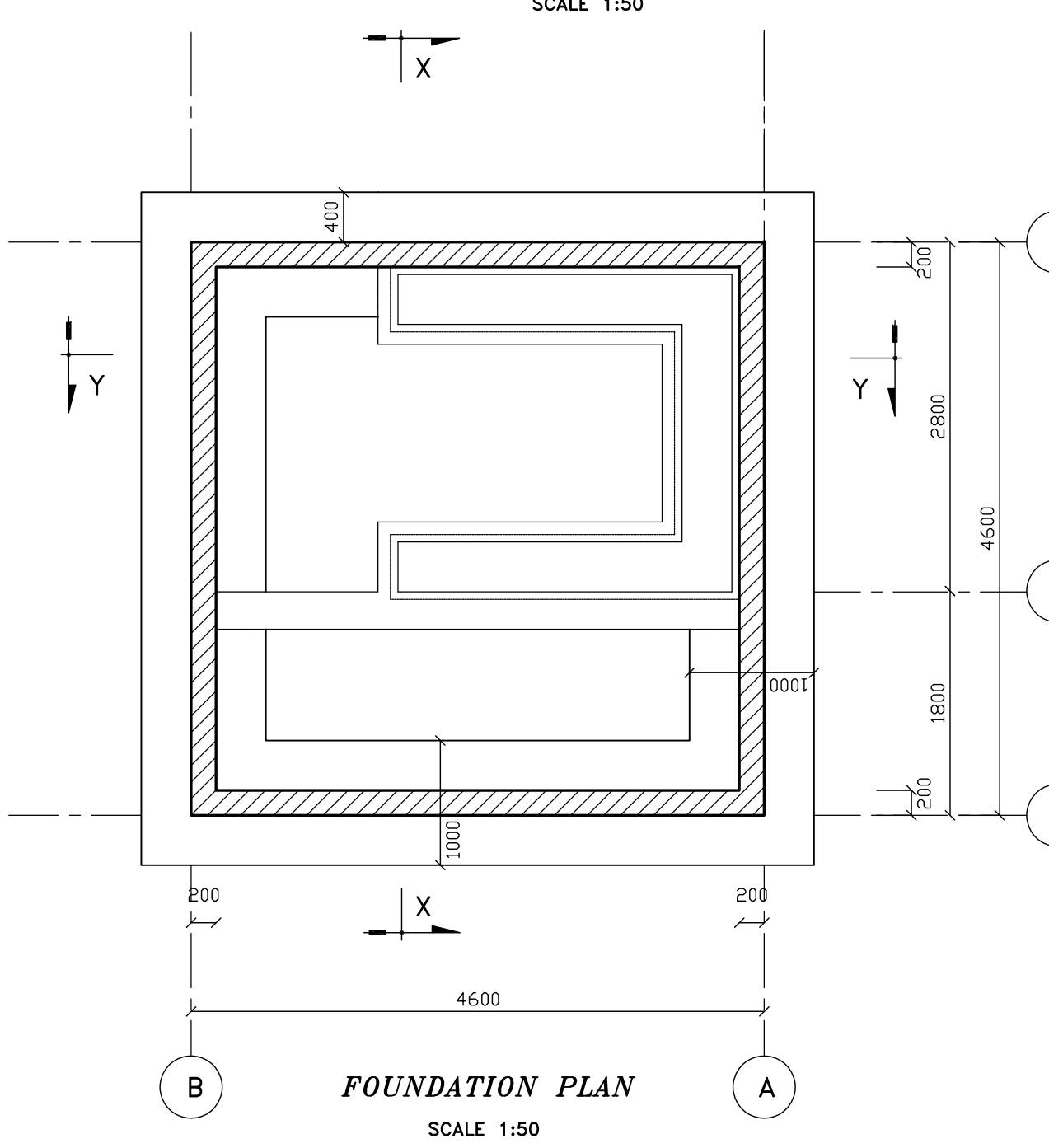
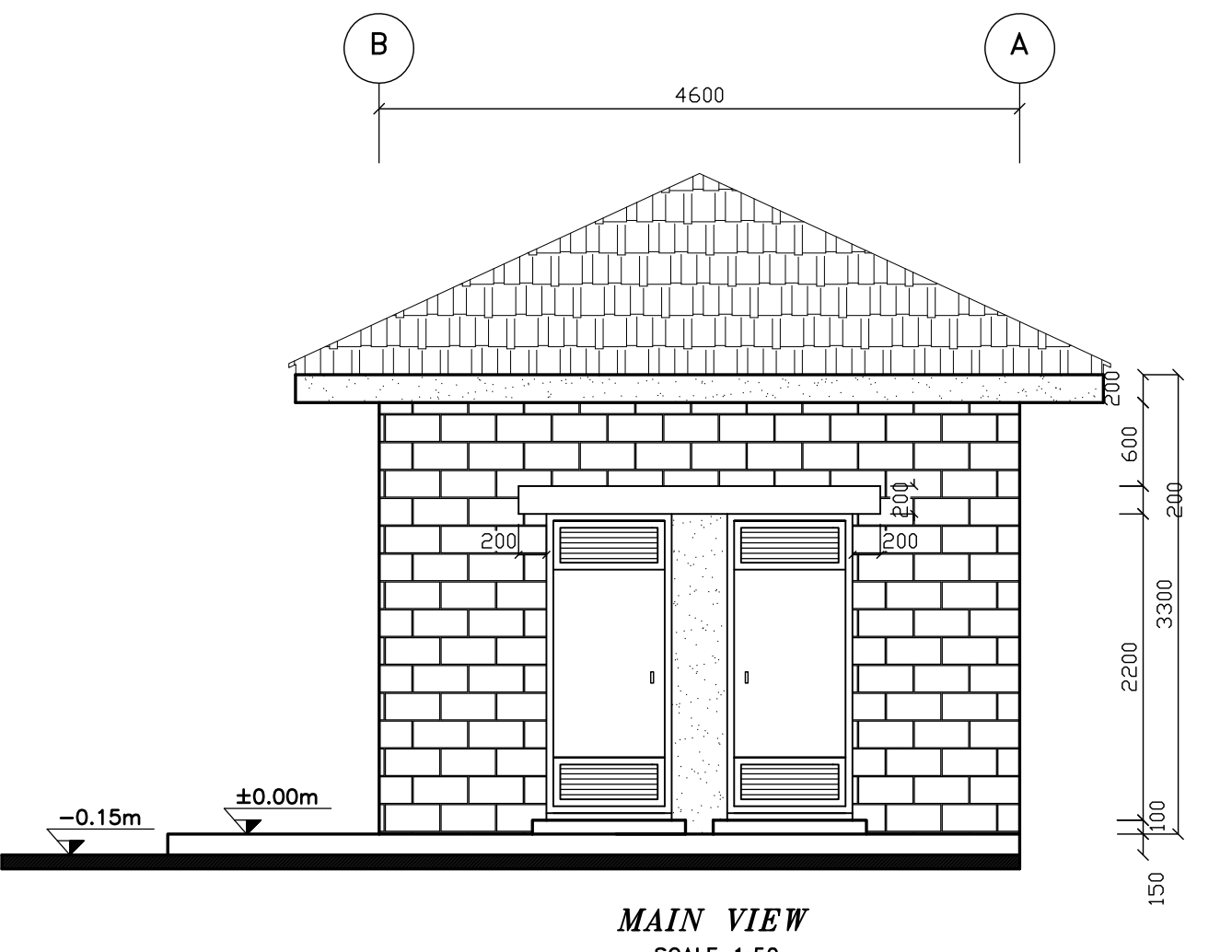
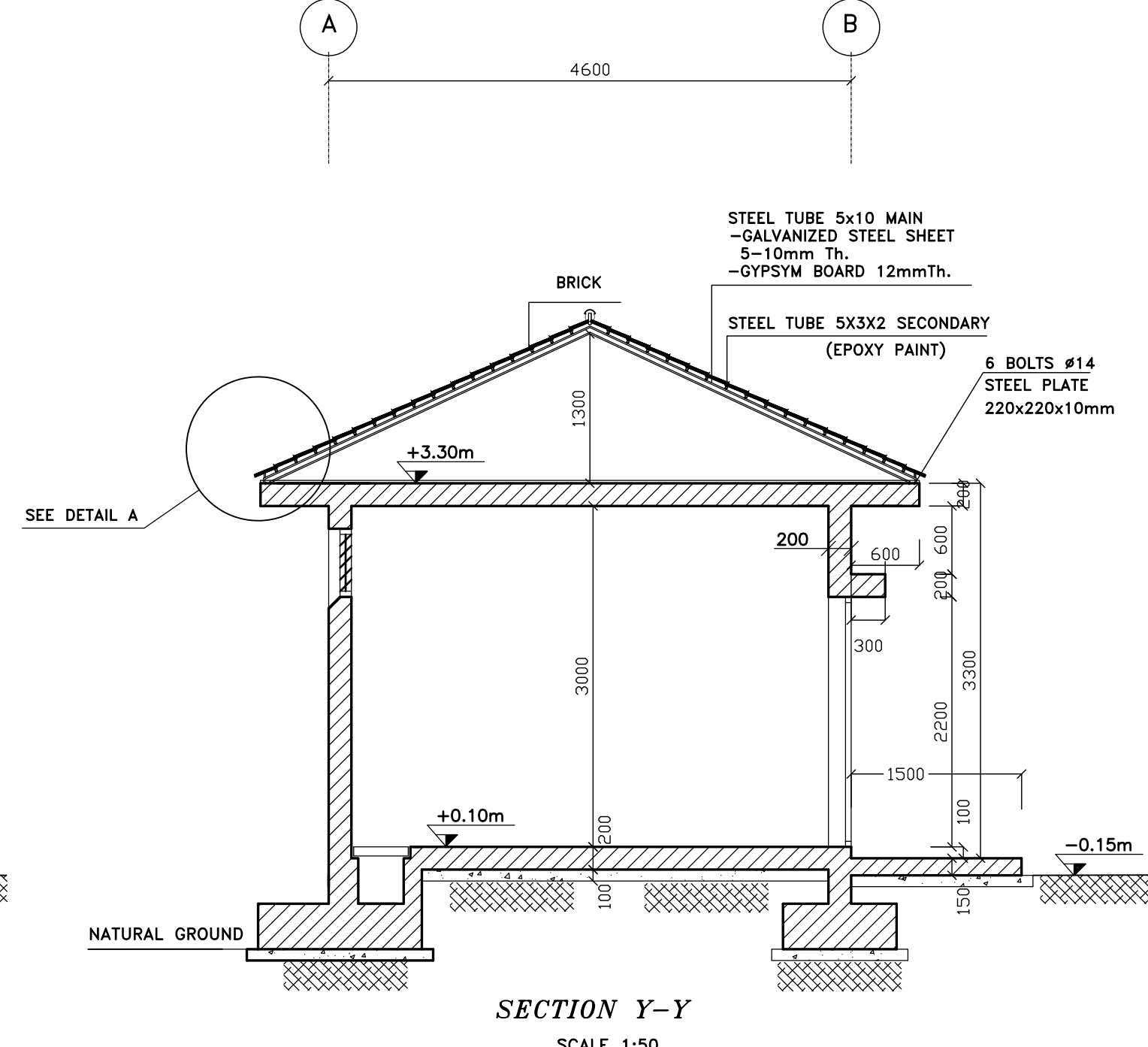
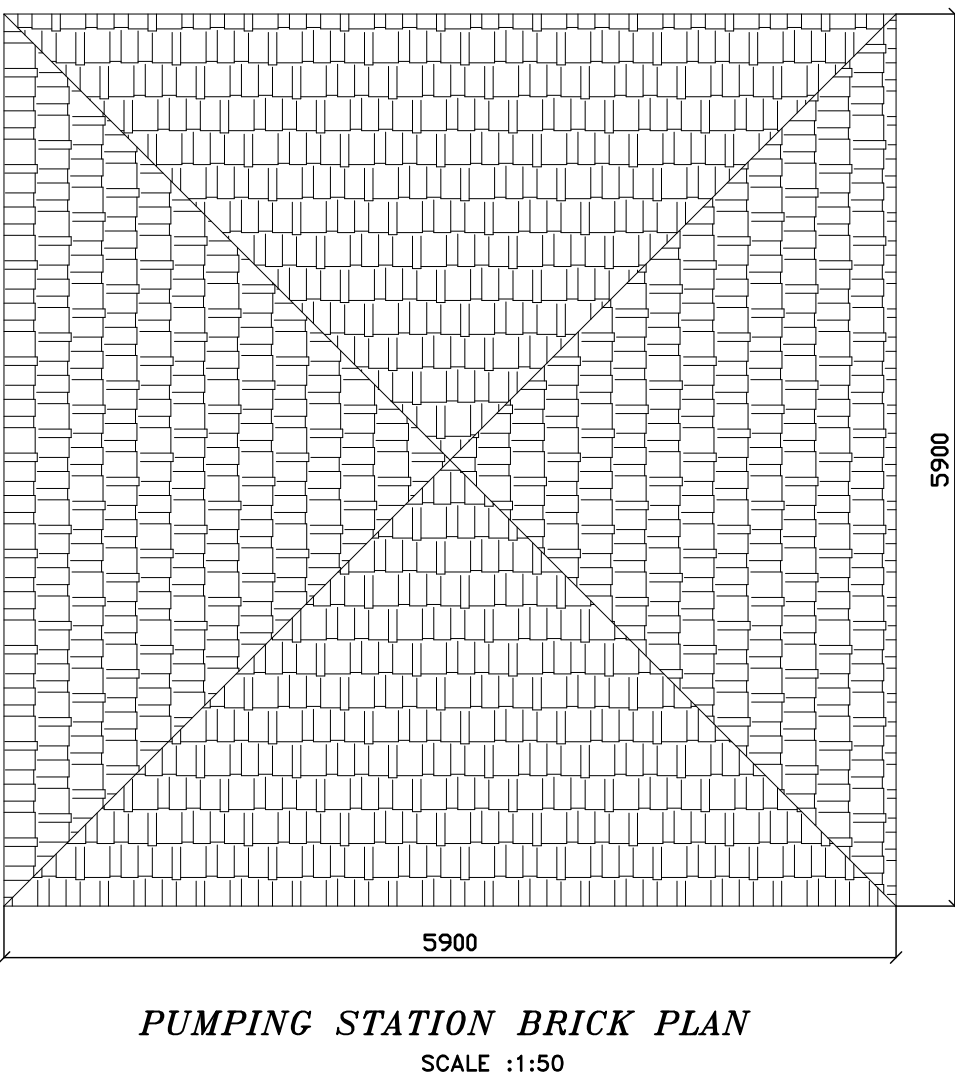
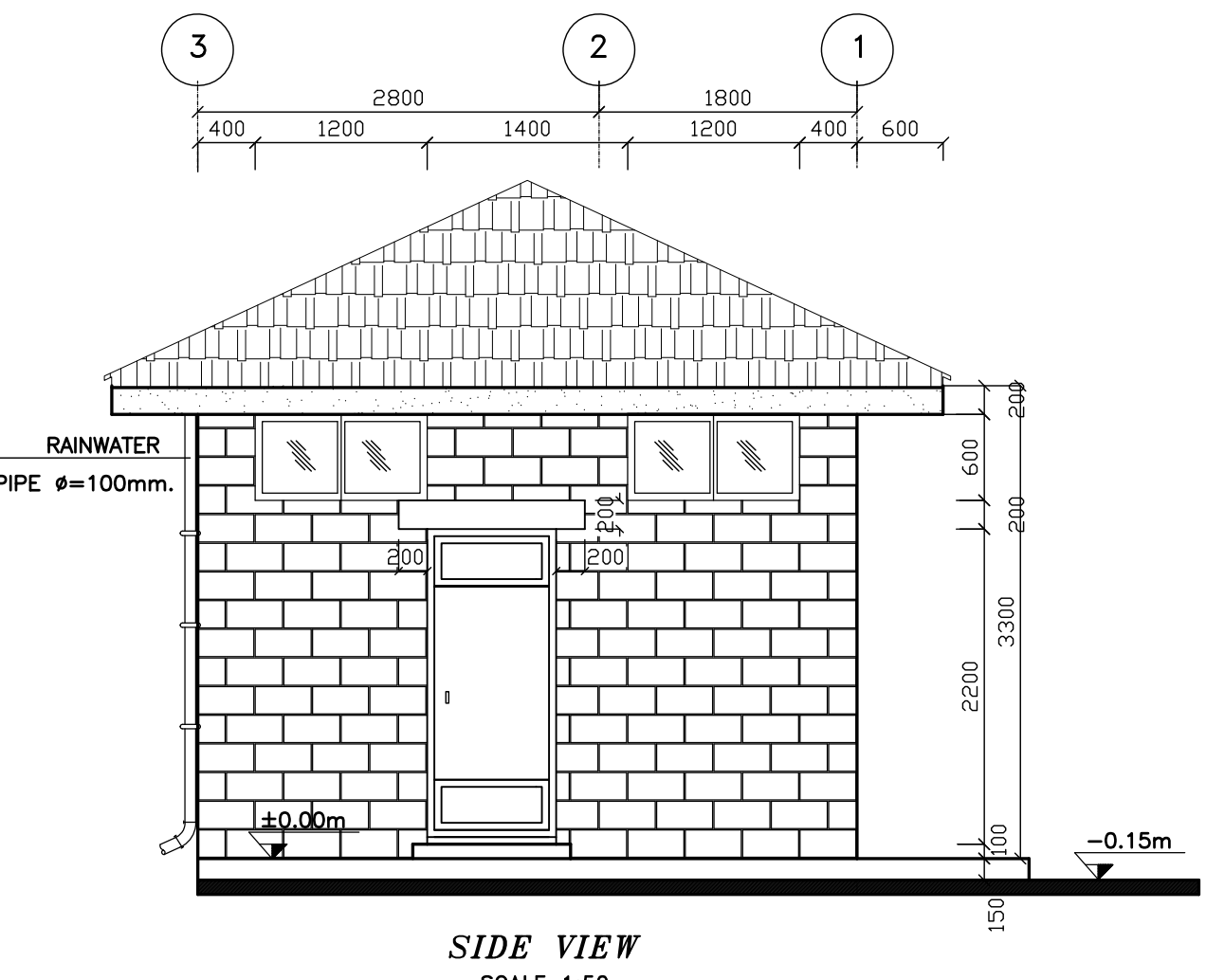
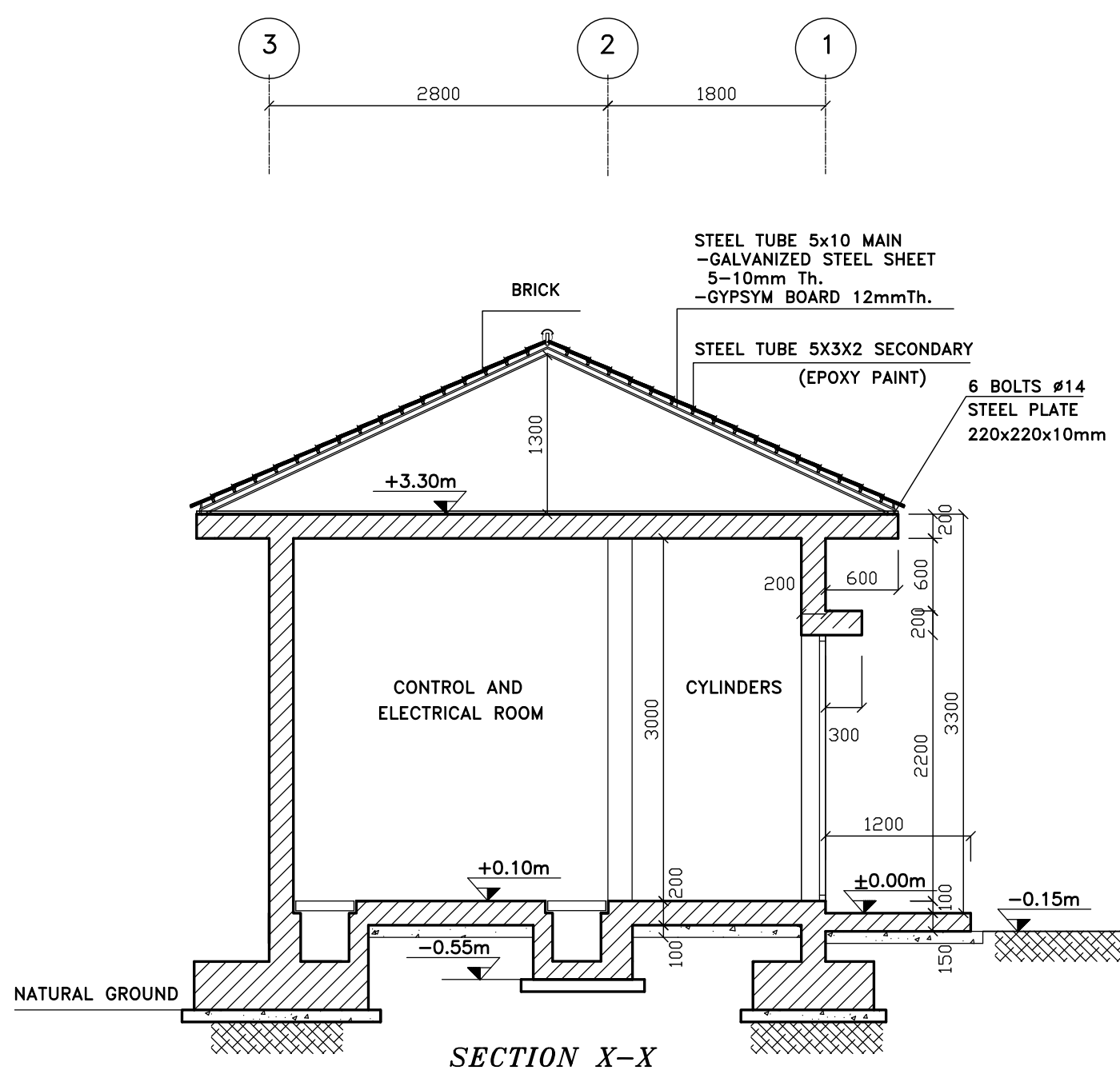
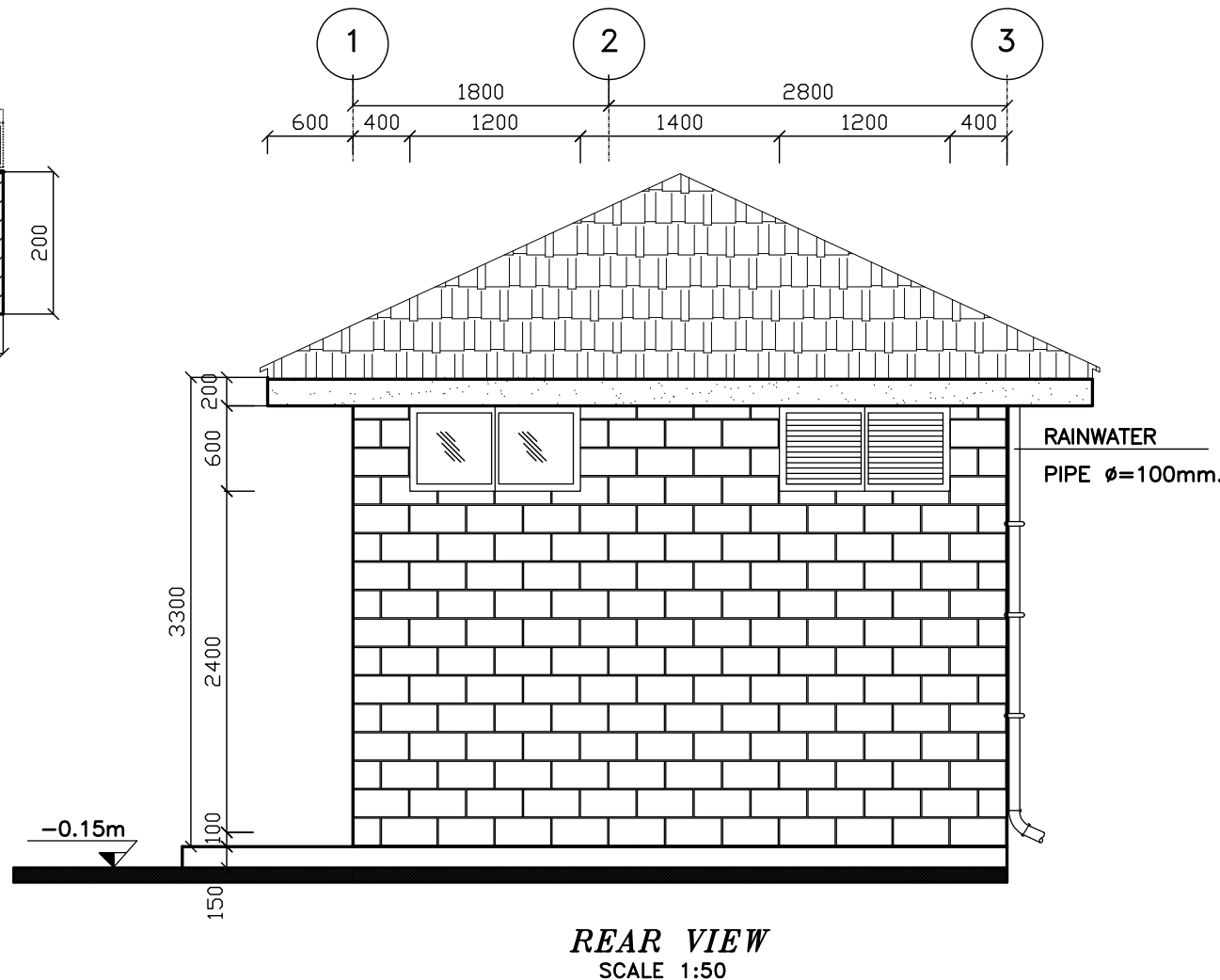
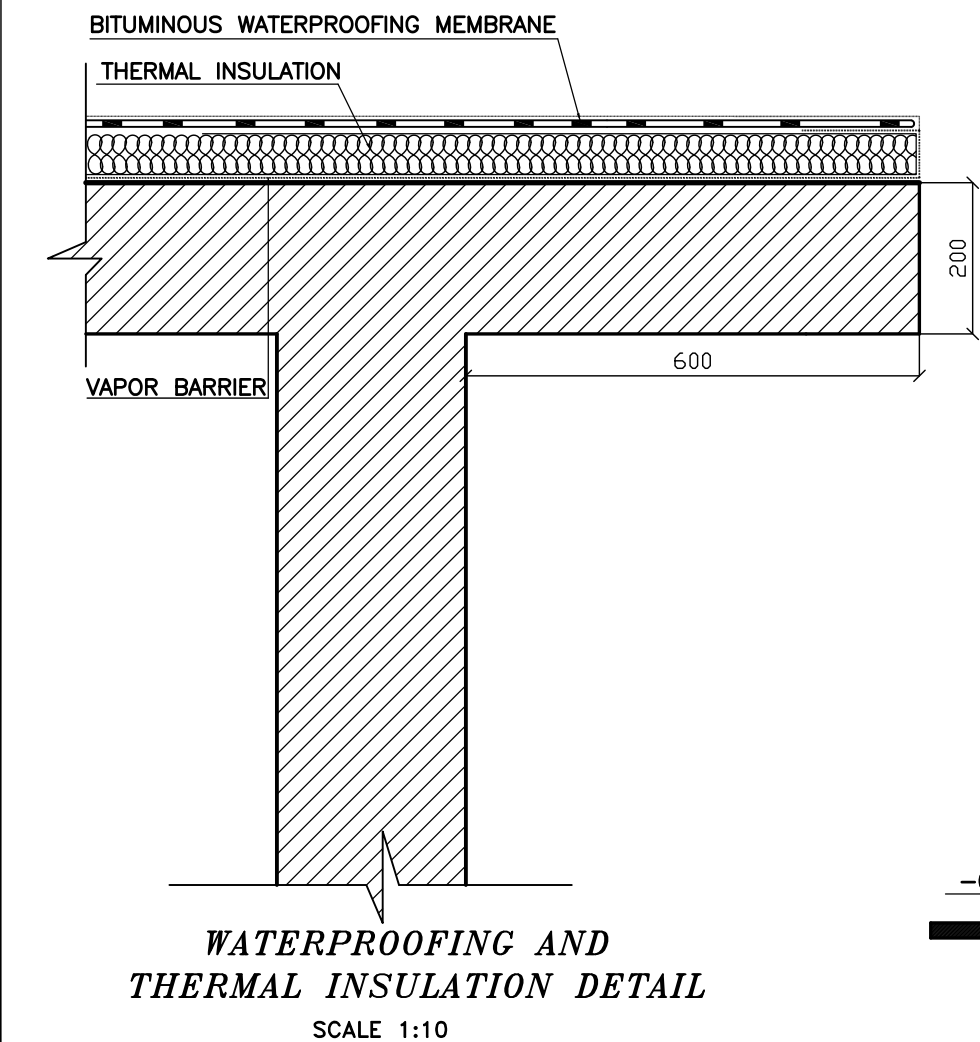
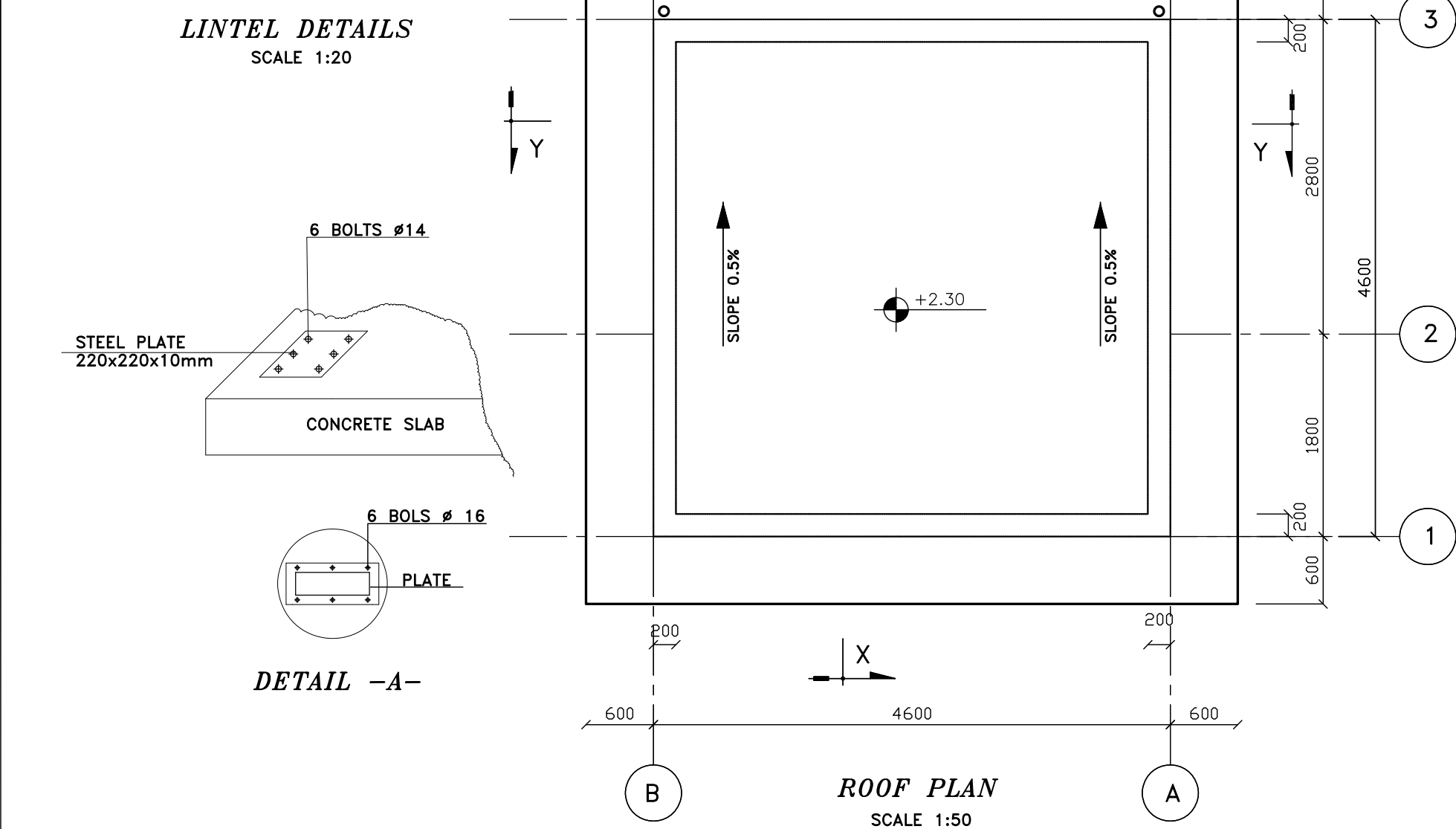
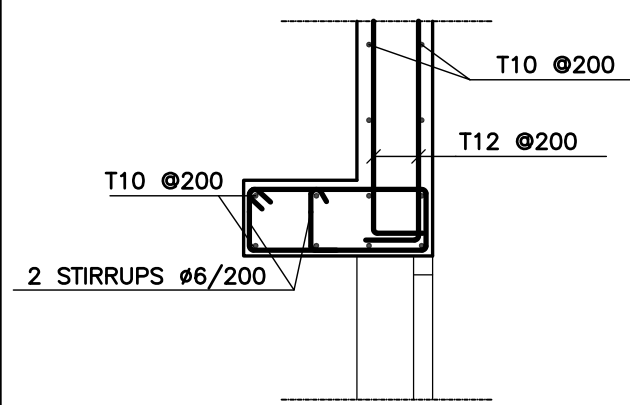
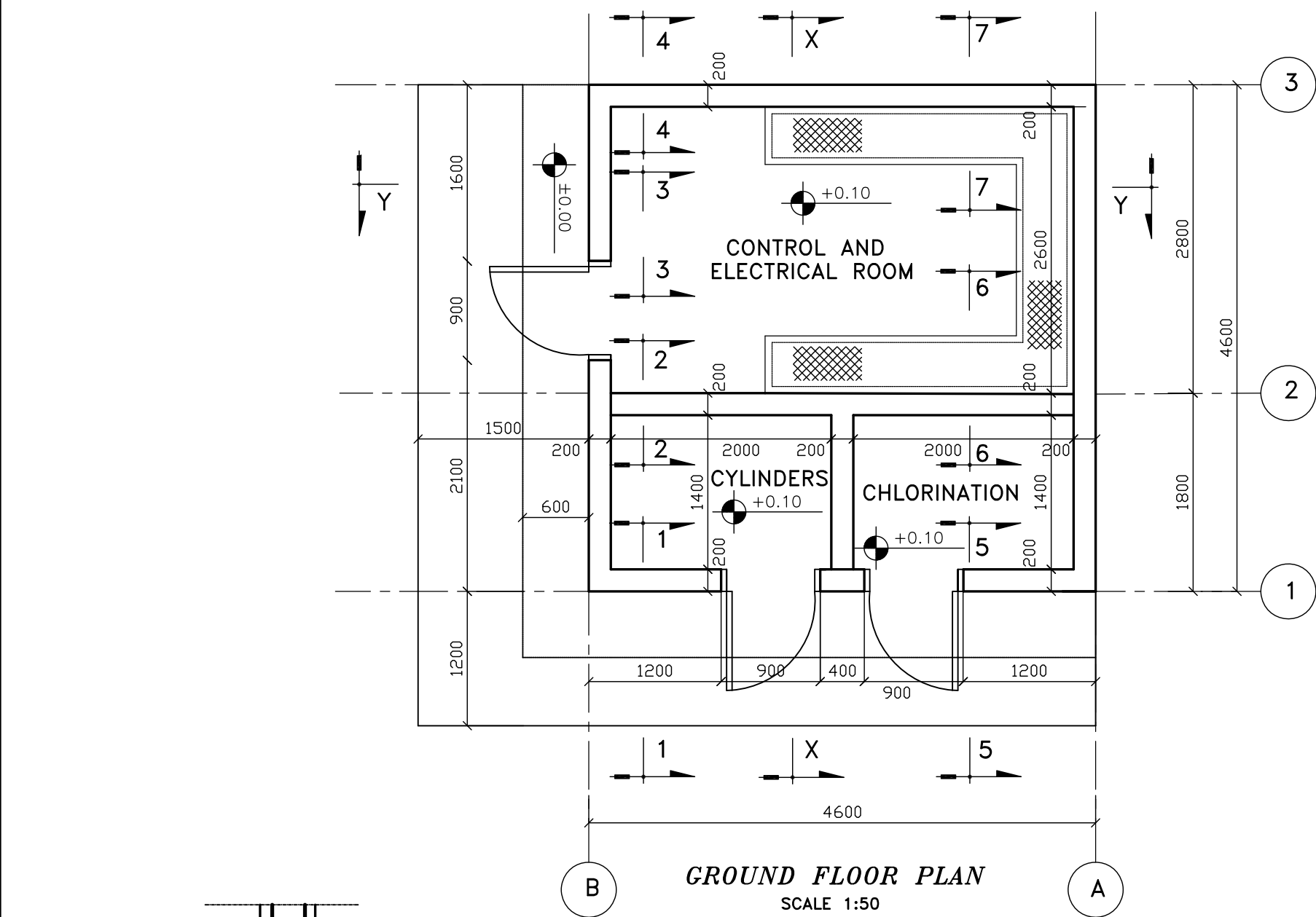
CONSTRUCTION OF WATER WORKS IN
QUADI ED DELEM-QABB ELIAS AND MRAIJAT

MREIJAT BOREHOLE
AND PUMPING STATION

SITE PLAN
SECTION A-A
RETAINING WALL SECTION

FILE NAME	DESIGNED BY	DRAWN BY	CHECKED BY
509W-PS01-C01-05	W. SEIFEDDINE	W. SEIFEDDINE	W. SEIFEDDINE

DATE	SCALE	SHEET No.	DRAWING No.
JULY 2019	1/200-1/50	2/5	509W-PS01-C02



NOTES:

REINFORCED CONCRETE:
CONCRETE GRADE C30 FOR ALL STRUCTURES

MIX ELEMENTS:
ORDINARY PORTLAND CEMENT, 350kg/m³.

STRESSES:
CONCRETE COMPRESSIVE STRENGTH AT 28 DAYS:
- ON A CUBE, a= 150mm : 30N/mm²
- ON A CYLINDER #150mm, h=300mm : 25N/mm²
CONCRETE TENSILE STRENGTH AT 28 DAYS: 2.1N/mm²
MAXIMUM POURING HEIGHT :1500mm.

CONCRETE COVER:
CLEARANCE BETWEEN THE EXTERNAL GENERATRIX OF BARS AND THE FACINGS SHALL BE 30mm FOR STRUCTURES FLOOR SLAB, WALLS AND COVER.

LEAN CONCRETE/ CYCLOPEAN CONCRETE:
MIX MADE WITH ORDINARY PORTLAND CEMENT, 250kg/m³.

REINFORCEMENT:
DEFORMED HIGH STRENGTH STEEL BARS : SYMBOL : T YIELD STRESS : Fy= 420N/mm²
MILD STEEL BARS : SYMBOL : # YIELD STRESS : Fy= 250N/mm²

OVERLAPPING:
LAPS SHALL NOT BE LESS THAN FIFTY TIMES THE BAR DIAMETER
WHERE SPLICE BARS ARE USED, THEIR LENGTH SHALL NOT BE LESS THAN 2d₅₀
(d= NOMINAL DIAMETER OF BAR)
LAPS SHALL BE STAGGERED FROM ONE HOOP TO THE OTHER AND/OR ONE BAR TO THE OTHER IN ORDER TO REDUCE THE NUMBER OF LAPS IN A SECTION. PINS #8 SHALL BE USED ON EACH LAP.

BENDING:
#> 12mm MECHANICALLY COMPULSIONLY
#≤ 12mm MANUALLY EVENTUALLY
STRATENING OF BENDED BARS IS NOT ALLOWED.

DRAWINGS CONSIDERATION:
--- TOP BARS
--- BOTTOM BARS

CONSTRUCTION JOINTS:
REDUCED TO THE STRICT MINIMUM IN ALL ELEMENTS PROVIDED THAT NECESSARY PRECAUTIONS ARE TAKEN: SETTING RETARDERS, BONDING MATERIALS.

SETTING RETARDERS (CONSTRUCTION JOINTS), PLASTISIZERS, ...
THE USE OF CHLORINE BASED ADMIXTURES IS NOT ALLOWED.

ALL EXECUTED INTERIOR CONCRETE SHALL BE FAIR FACE CONCRETE.
THE ROSS HOLES MADE BY THE TIE-RODS SHALL BE FILLED WITH A NON SHRINK GROUT BY MEANS OF SPECIAL INJECTION METHODS.
ALL MATERIALS AND EXECUTION PROCESSES SHOULD BE SUBMITTED FOR APPROVAL. THE USE OF #6mm BARS AS TIE-RODS IS NOT ALLOWED.

METALWORKS:
DOORS ARE MADE OF 3mm MINIMUM SHEET PLATE AND SHALL BE EPOXY PAINTED (PRIMER AND A MINIMUM OF TWO COATS). OPENINGS AND VENTILATIONS SHALL BE TAKEN INTO CONSIDERATION ACCORDING TO THE EQUIPMENT TO BE INSTALLED.

FINISHING SCHEDULE			
ROOM	FLOOR	WALLS	CEILING
CHLORINATION	INDUSTRIAL RESIN	INTERNAL USE COATING, WASHABLE	INTERNAL USE COATING, WASHABLE
CYLINDERS	INDUSTRIAL RESIN	INTERNAL USE COATING, WASHABLE	INTERNAL USE COATING, WASHABLE
CONTROL + ELECTRICAL ROOM	INDUSTRIAL RESIN	INTERNAL USE COATING, WASHABLE	INTERNAL USE COATING, WASHABLE
EXTERNAL FACE OF EXTERIOR WALLS	NATURAL STONE		

EXTERIOR DOORS	WINDOWS	PROTECTION BARS FOR EXTERIOR WINDOWS
STEEL PANELS 3mm THICK (ACCORDING TO DRAWINGS)	ALUMINUM (ACCORDING TO DRAWINGS)	STEEL SQUARE BARS 10x10 (ACCORDING TO DRAWINGS)

N.B.
* SCALING FROM THIS DRAWING IS NOT ALLOWED.
ALL LEVELS ARE IN M UNLESS OTHERWISE SPECIFIED.
ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.

- THIS DESIGN HAS BEEN FOUNDED ON AN HYPOTHESIS STATING THAT THE SOIL IN THE PROJECT AREA IS CONSTITUTED COMPLETELY OF A HARD AND CONTINUOUS LIMESTONE FORMATION. IF DURING EXECUTION A CONTRADICTORY REALITY APPEARS, THE DESIGN SHALL BE REVISED TO COMPLY WITH THE EVENTUAL NEW DATA REVEALED.
- THE TRENCH LOCATION COULD BE MODIFIED ACCORDING TO THE EQUIPMENT TO BE INSTALLED.
- THE LEVEL ±0.00 IS EQUIVALENT TO +1217.90m.

Rev.	Date	Dsgn	Drwn	Chk'd	Appr'd

REPUBLIC OF LEBANON

COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

BD BUREAU TECHNIQUE POUR LE DEVELOPEMENT

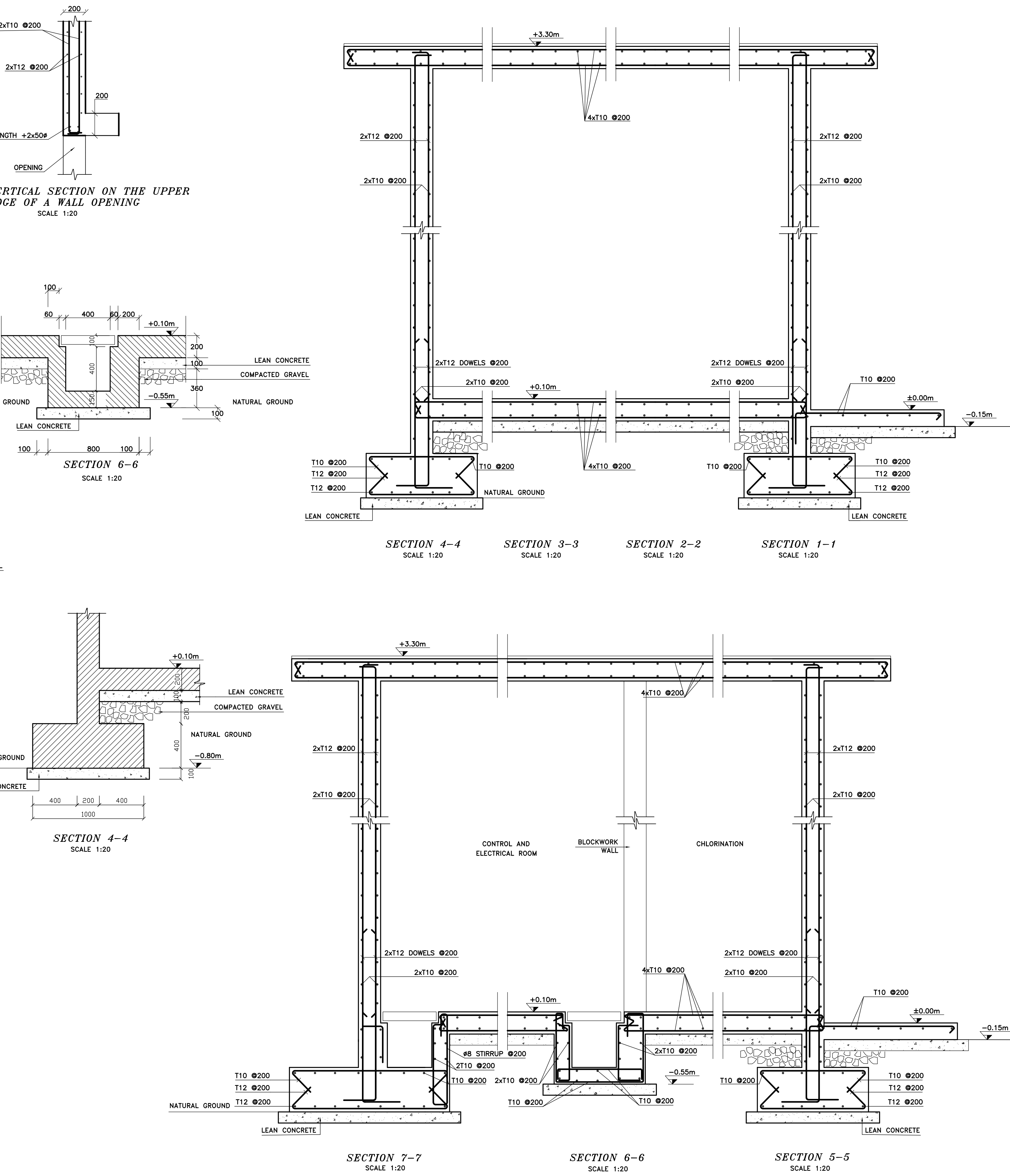
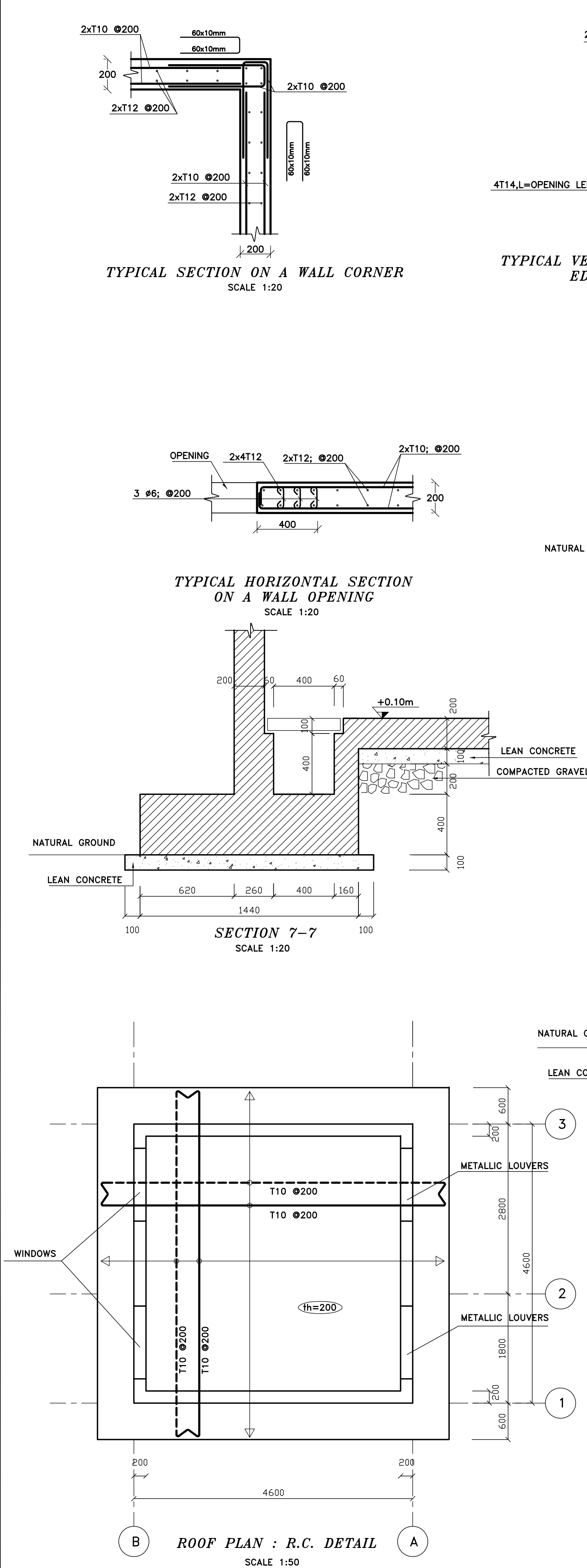
JALL ED DIB - HAJAL Bldg TEL:(04) 712157/712158
P.O.BOX:70492 - ANTELIAS FAX:(04) 712159

CONSTRUCTION OF WATER WORKS IN QUADI ED DELEM-QABB ELIAS AND MRAIJAT

MREIJAT BOREHOLE AND PUMPING STATION	PLANS-SECTIONS-ELEVATIONS REINFORCEMENT
---	--

FILE NAME	DESIGNED BY	DRAWN BY	CHECKED BY
509W-PS01-C01-05	W. SEIFEDDINE	W. SEIFEDDINE	W. SEIFEDDINE

DATE	SCALE	SHEET No.	DRAWING No.
JULY 2019	1:50 - 1:20 - 1:10	3/5	509W-PS01-C03



NOTES:

REINFORCED CONCRETE:
CONCRETE GRADE C30 FOR ALL STRUCTURES

MIX ELEMENTS:
ORDINARY PORTLAND CEMENT, 350kg/m³.

STRESSES:
CONCRETE COMPRESSIVE STRENGTH AT 28 DAYS:
- ON A CUBE: $\phi=150\text{mm}$: 30N/mm²
- ON A CYLINDER $\phi150\text{mm}$, h=300mm : 25N/mm²
CONCRETE TENSILE STRENGTH AT 28 DAYS: 2.1N/mm²
MAXIMUM POURING HEIGHT :1500mm.

CONCRETE COVER:
CLEARANCE BETWEEN THE EXTERNAL GENERATRIX OF BARS AND THE FACINGS SHALL BE 30mm FOR STRUCTURES FLOOR SLAB, WALLS AND COVER.

LEAN CONCRETE/ CYCLOPEAN CONCRETE:
MIX MADE WITH ORDINARY PORTLAND CEMENT, 250kg/m³.

REINFORCEMENT:
DEFORMED HIGH STRENGTH STEEL BARS : SYMBOL : T YIELD STRESS : F_y= 420N/mm²
MILD STEEL BARS : SYMBOL : ϕ YIELD STRESS : F_y= 250N/mm²

OVERLAPPING:
LAPS SHALL NOT BE LESS THAN FIFTY TIMES THE BAR DIAMETER
WHERE SPLICE BARS ARE USED, THEIR LENGTH SHALL NOT BE LESS THAN 2x ϕ (ϕ = NOMINAL DIAMETER OF BAR)
LAPS SHALL BE STAGGERED FROM ONE HOOP TO THE OTHER AND/OR ONE BAR TO THE OTHER IN ORDER TO REDUCE THE NUMBER OF LAPS IN A SECTION. PINS $\phi8$ SHALL BE USED ON EACH LAP.

BENDING:
 $\phi>12\text{mm}$ MECHANICALLY COMPULSIONALLY
 $\phi\leq12\text{mm}$ MANUALLY EVENTUALLY
STRAIGHTENING OF BENDED BARS IS NOT ALLOWED.

DRAWINGS CONSIDERATION:
TOP BARS
BOTTOM BARS

CONSTRUCTION JOINTS:
REDUCED TO THE STRICT MINIMUM IN ALL ELEMENTS PROVIDED THAT NECESSARY PRECAUTIONS ARE TAKEN: SETTING RETARDERS, BONDING MATERIALS.
SETTING RETARDERS (CONSTRUCTION JOINTS), PLASTISIZERS, ...
THE USE OF CHLORINE BASED ADMIXTURES IS NOT ALLOWED.

ALL EXECUTED INTERIOR CONCRETE SHALL BE FAIR FACE CONCRETE.
THE RODS HOLES MADE BY THE TIE-RODS SHALL BE FILLED WITH A NON SHRINK GROUT BY MEANS OF SPECIAL INJECTION METHODS.
ALL MATERIALS AND EXECUTION PROCESSES SHOULD BE SUBMITTED FOR APPROVAL.
THE USE OF $\phi6\text{mm}$ BARS AS TIE-RODS IS NOT ALLOWED.

METALWORKS:
DOORS ARE MADE OF 3mm MINIMUM SHEET PLATE AND SHALL BE EPOXY PAINTED (PRIMER AND A MINIMUM OF TWO COATS). OPENINGS AND VENTILATIONS SHALL BE TAKEN INTO CONSIDERATION ACCORDING TO THE EQUIPMENT TO BE INSTALLED.

FINISHING SCHEDULE			
ROOM	FLOOR	WALLS	CEILING
CHLORINATION	INDUSTRIAL RESIN	INTERNAL USE COATING, WASHABLE	INTERNAL USE COATING, WASHABLE
CYLINDERS	INDUSTRIAL RESIN	INTERNAL USE COATING, WASHABLE	INTERNAL USE COATING, WASHABLE
CONTROL + ELECTRICAL ROOM	INDUSTRIAL RESIN	INTERNAL USE COATING, WASHABLE	INTERNAL USE COATING, WASHABLE
EXTERNAL FACE OF EXTERIOR WALLS	NATURAL STONE		

EXTERIOR DOORS	WINDOWS	PROTECTION BARS FOR EXTERIOR WINDOWS
STEEL PANELS 3mm THICK (ACCORDING TO DRAWINGS)	ALUMINUM (ACCORDING TO DRAWINGS)	STEEL SQUARE BARS 10x10 (ACCORDING TO DRAWINGS)

N.B:
• SCALING FROM THIS DRAWING IS NOT ALLOWED.
ALL LEVELS ARE IN M UNLESS OTHERWISE SPECIFIED.
ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.

• THIS DESIGN HAS BEEN FOUNDED ON AN HYPOTHESIS STATING THAT THE SOIL IN THE PROJECT AREA IS CONSTITUTED COMPLETELY OF A HARD AND CONTINUOUS LIMESTONE FORMATION. IF DURING EXECUTION A CONTRADICTORY REALITY APPEARS, THE DESIGN SHALL BE REVISED TO COMPLY WITH THE EVENTUAL NEW DATA REVEALED.

• THE TRENCH LOCATION COULD BE MODIFIED ACCORDING TO THE EQUIPMENT TO BE INSTALLED.

• THE LEVEL ±0.00 IS EQUIVALENT TO +1217.90m.

Rev.	Date	Dsgn	Drwn	Chk'd	Appr'd

REPUBLIC OF LEBANON
COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

BD BUREAU TECHNIQUE POUR LE DEVELOPPEMENT

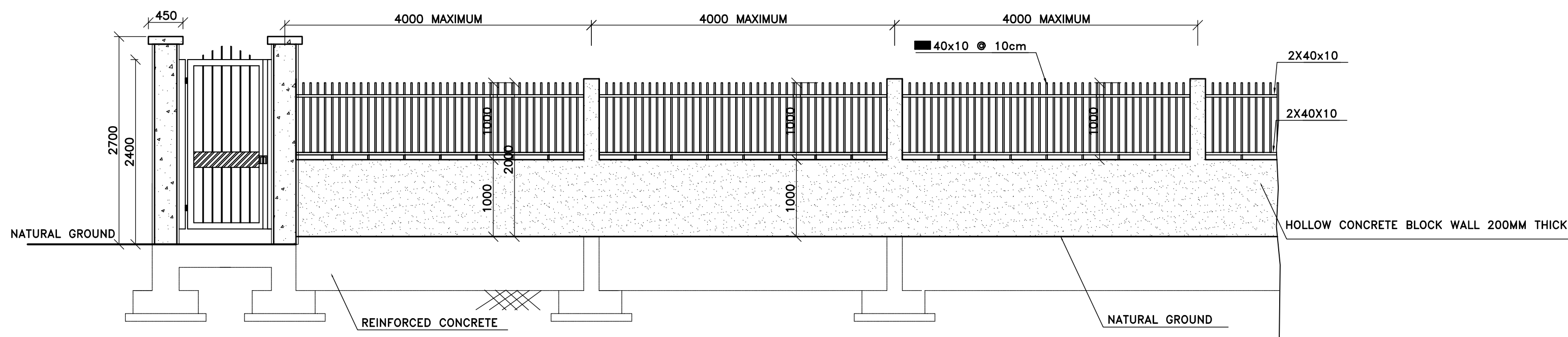
JALL ED DIB - HAJAL Bldg TEL:(04) 712157/712158
P.O.BOX:70492 - ANTELIAS FAX:(04) 712159

CONSTRUCTION OF WATER WORKS IN
QUADI ED DELEM-QABB ELIAS AND MRAIJAT

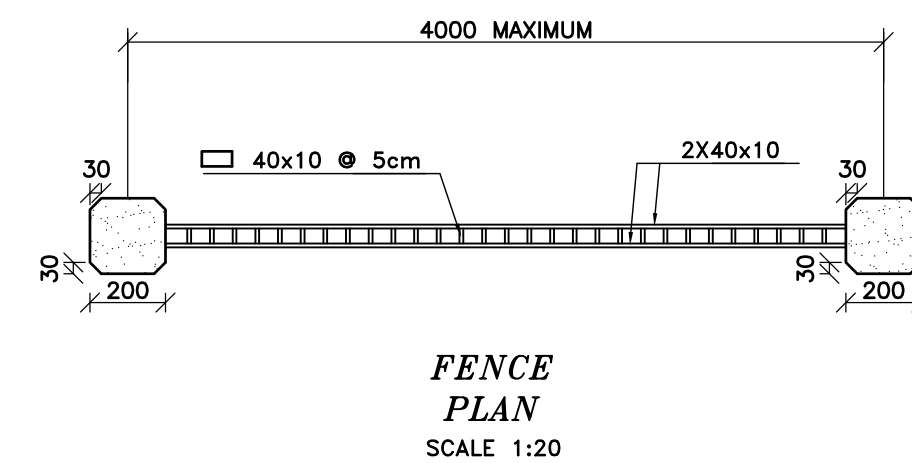
MREIJAT BOREHOLE AND PUMPING STATION	PLAN - SECTIONS
---	-----------------

FILE NAME			
509W-PS01-C01-05	W. SEIFEDDINE	W. SEIFEDDINE	W. SEIFEDDINE

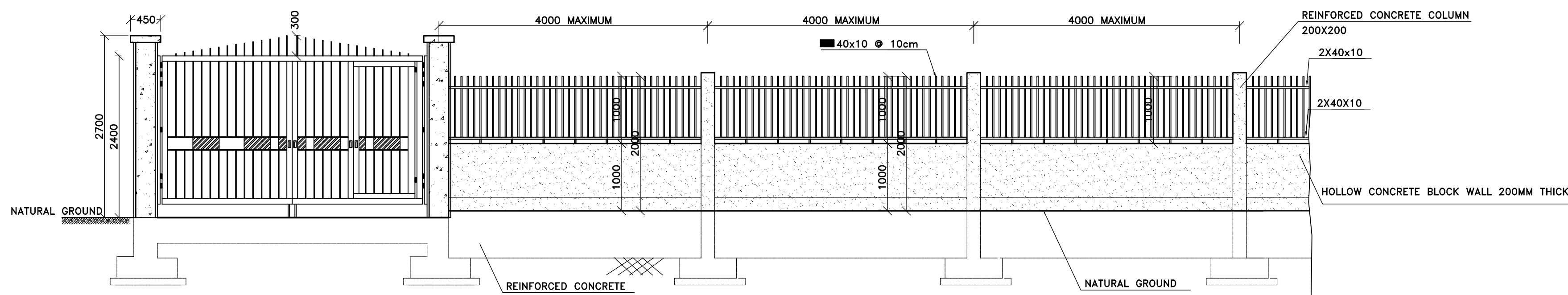
JULY 2019	1:20-1:50	4/5	DRAWING No. 509W-PS01-C04
-----------	-----------	-----	------------------------------



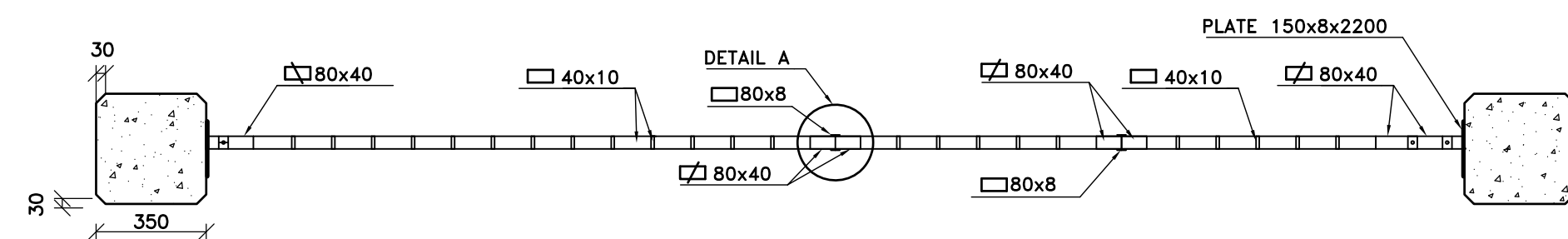
GATE 1.2 m (ELEVATION)
SCALE 1:50



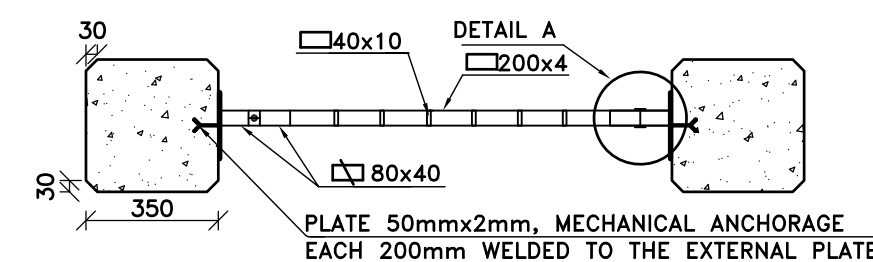
FENCE
PLAN
SCALE 1:20



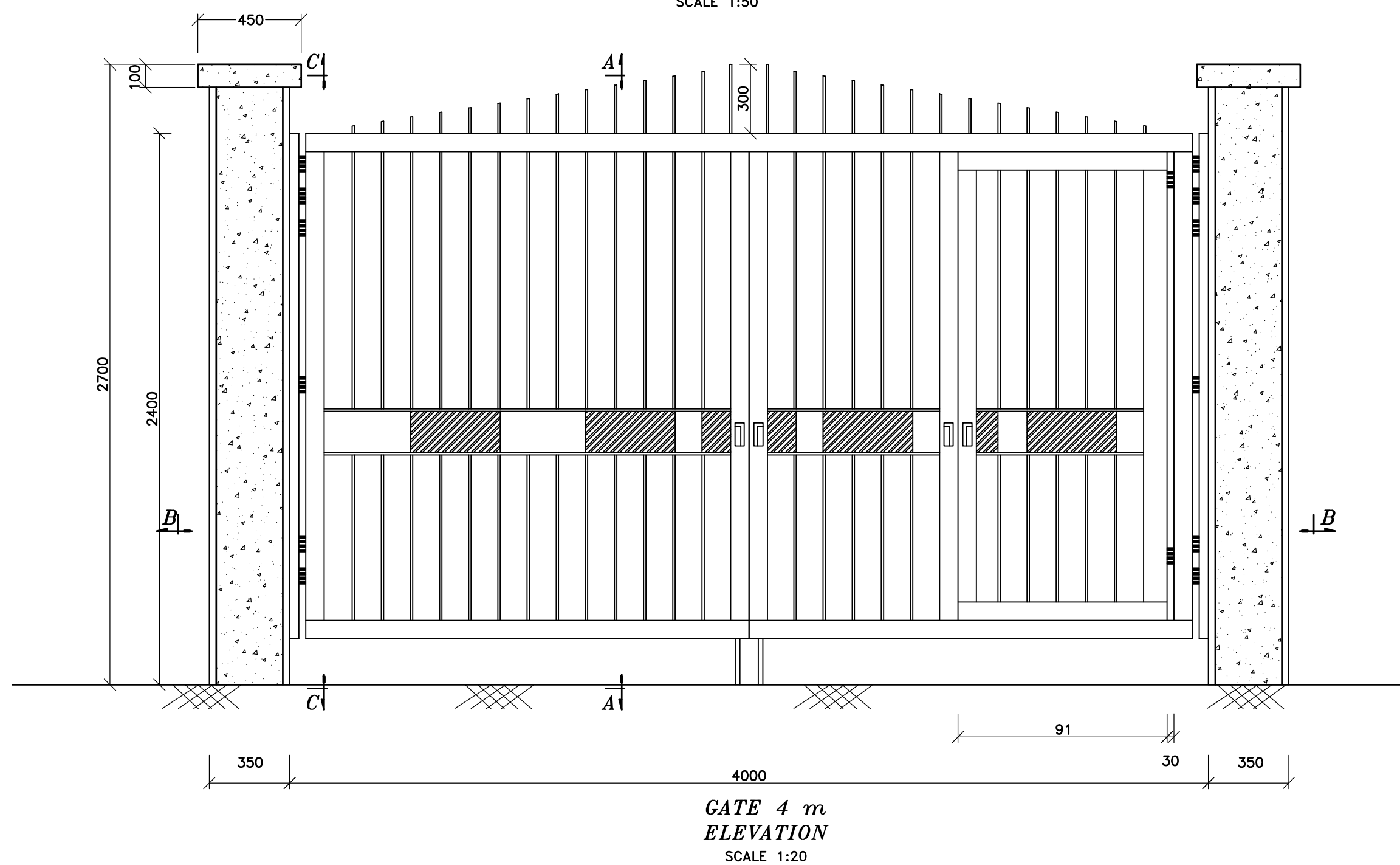
GATE 4 m (ELEVATION)
SCALE 1:50



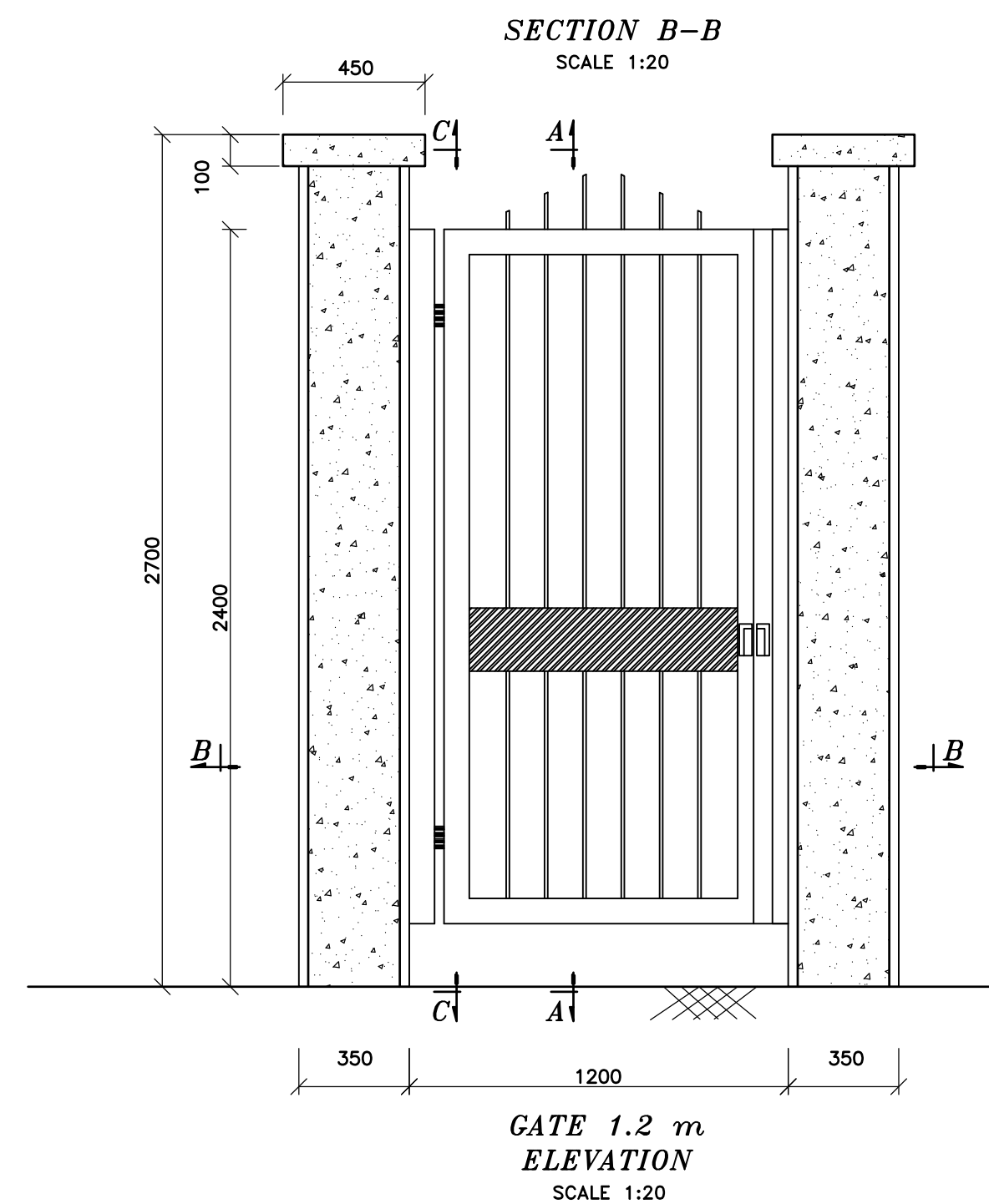
SECTION B-B
SCALE 1:50



SECTION B-B
SCALE 1:20



GATE 4 m
ELEVATION
SCALE 1:20



GATE 1.2 m
ELEVATION
SCALE 1:20

REPUBLIC OF LEBANON COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

BUREAU TECHNIQUE POUR LE DEVELOPPEMENT
JALL ED DIB - HAJAL Bldg TEL:(04) 712157/712158
P.O.BOX:70492 - ANTELJAS FAX:(04) 712159

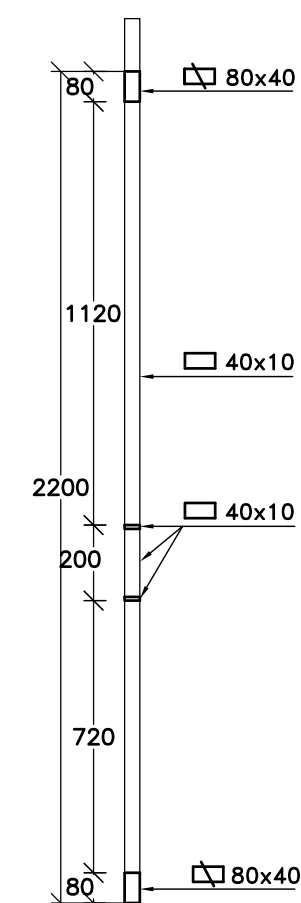
CONSTRUCTION OF WATER WORKS IN
OUADI ED DELEM-QABB ELIAS AND MRAIJAT

FENCE AND
TYPICAL GATE 4m AND 1.2m

ELEVATIONS
SECTIONS AND DETAILS

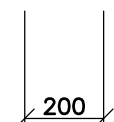
FILE NAME	DESIGNED BY	DRAWN BY	CHECKED BY
509W-PS01-SF01-02	BTD	BTD	BTD

DATE	SCALE	SHEET No.	DRAWING No.
JULY 2019	1:50 - 1:20	1/2	509W-PS01-SF01

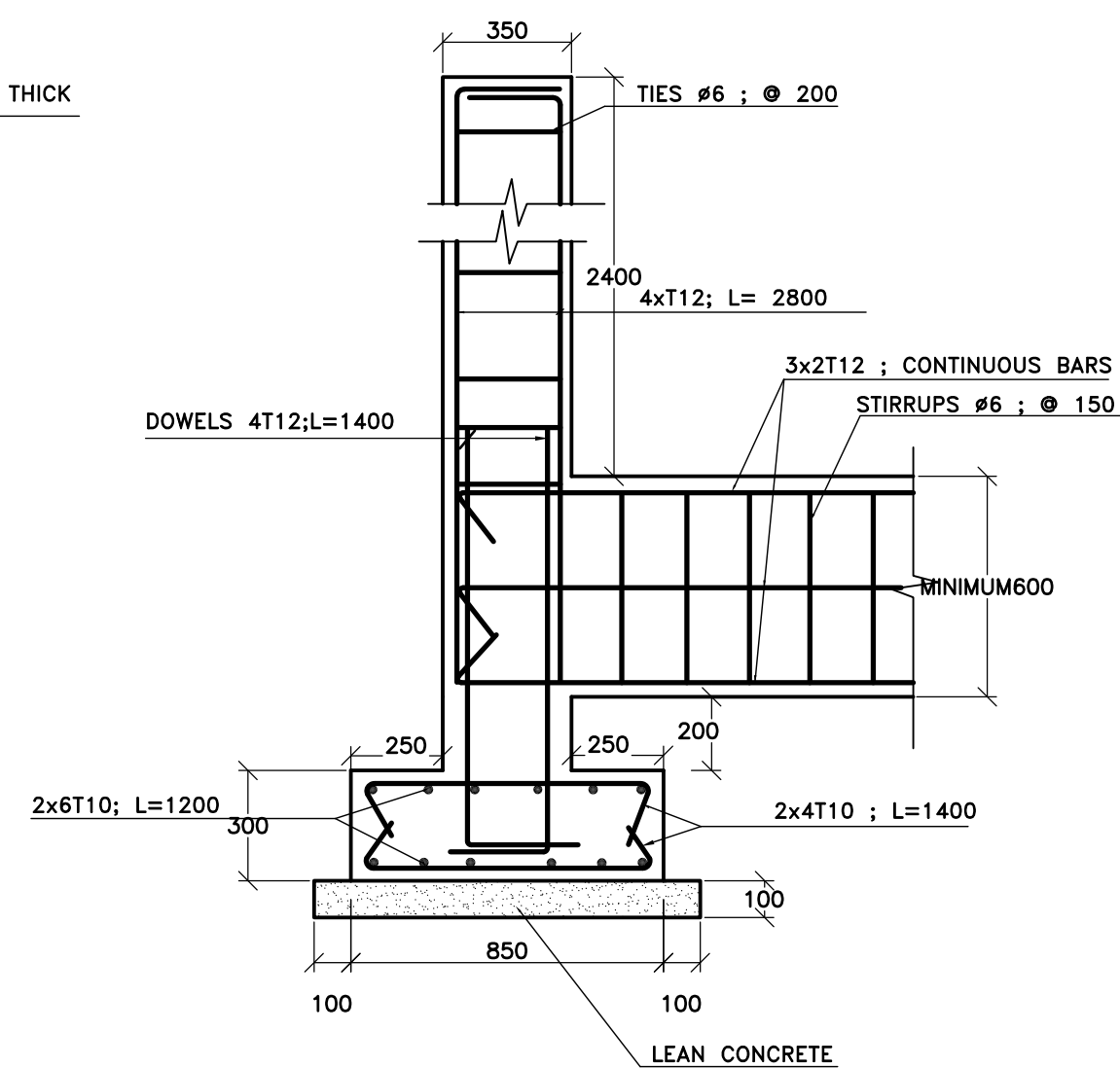


SECTION C-C
SCALE 1:20

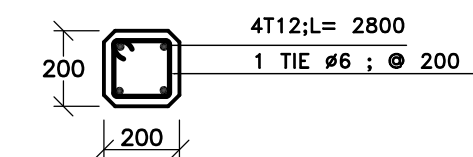
SECTION A-A
SCALE 1:20



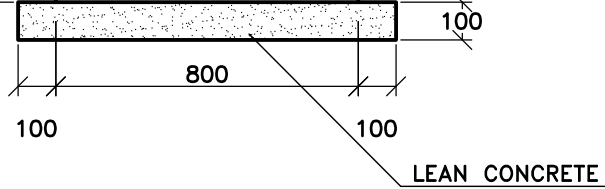
TYPICAL FENCE COLUMN
SCALE 1:20



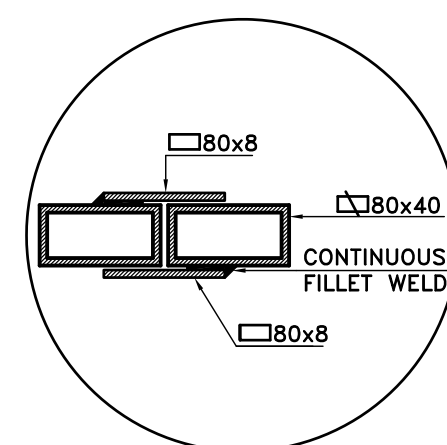
REINFORCEMENT OF TYPICAL ACCESS GATE COLUMN AND FOOTING
SCALE 1:20



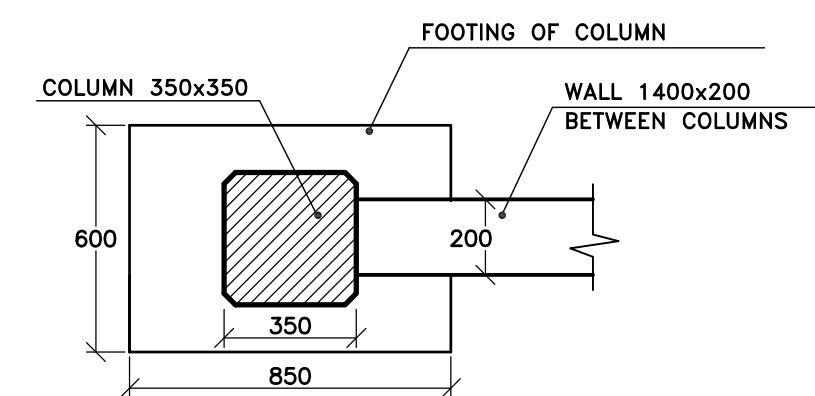
HORIZONTAL SECTION
OF COLUMN
SCALE 1:20



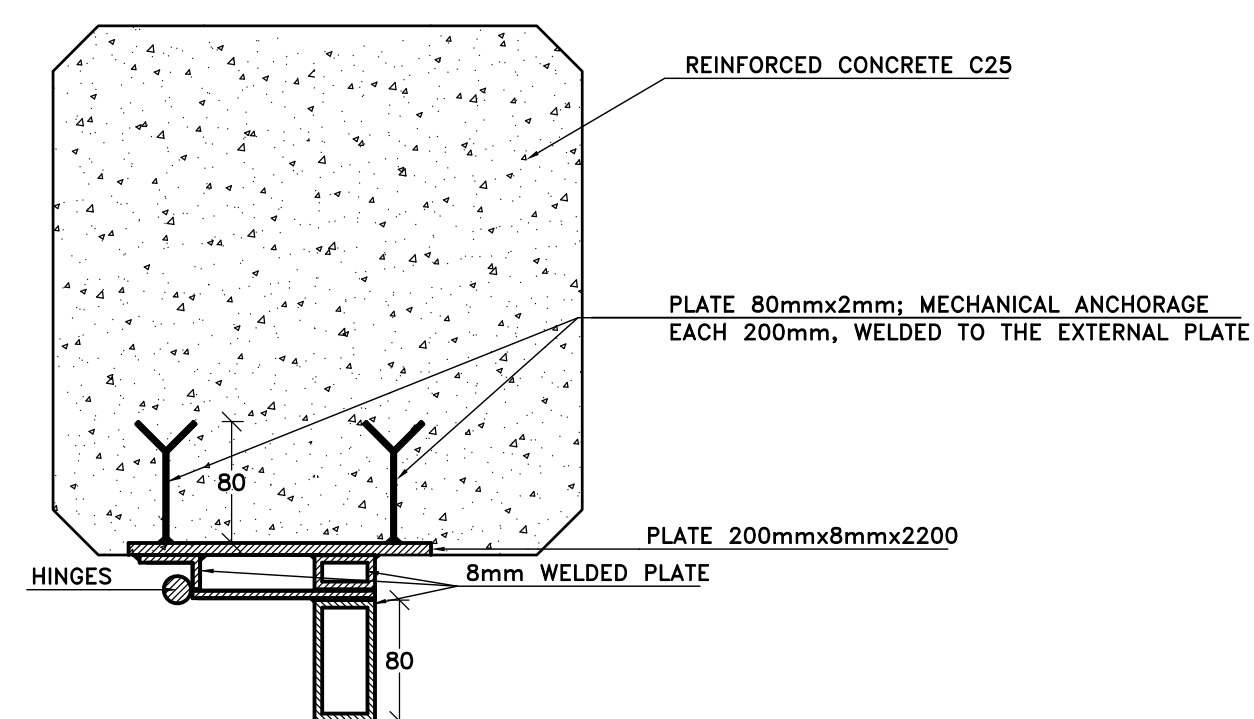
REINFORCEMENT OF TYPICAL COLUMN AND FOOTING
SCALE 1:20



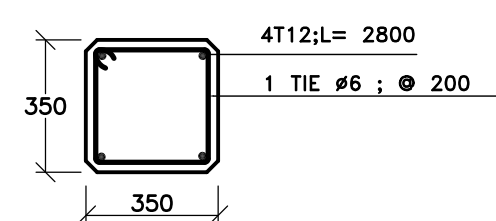
DETAIL A
SCALE 1:5



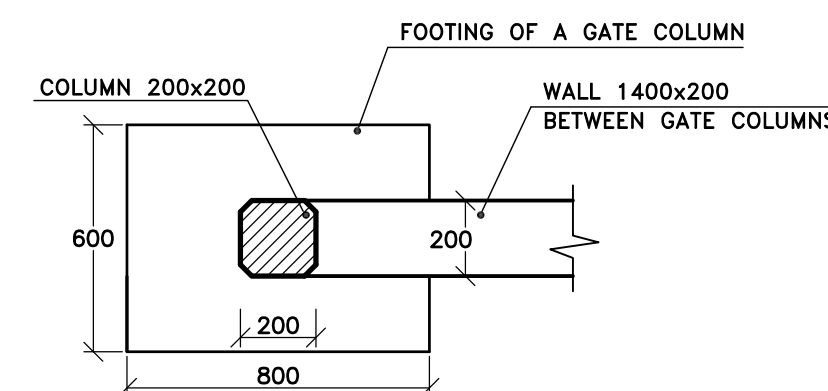
FOOTING
SCALE 1:20



SECTION D-D
SCALE 1:5



*HORIZONTAL SECTION
OF GATE COLUMN*
SCALE 1:20



FOOTING
SCALE 1:20

REPUBLIC OF LEBANON

COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

BUREAU TECHNIQUE POUR LE DEVELOPPEMENT

JALL ED DIB – HAJAL Bldg TEL:(04) 712157/712158
P.O.BOX:70492 – ANTELIAS FAX:(04) 712159

CONSTRUCTION OF WATER WORKS IN OUADI DELEM-QABB ELIAS AND MRAIJAT

FENCE AND TYPICAL GATE 4m AND 1.2m		ELEVATIONS SECTIONS AND DETAILS	
FILE NAME	DESIGNED BY	DRAWN BY	CHECKED BY
509W-PS01-SF01-02	BTD	BTD	BTD

DATE	SCALE	SHEET No.	DRAWING No.
JULY 2019	1:5 - 1:20	2/2	509W-PS01-SF02

TOPOGRAPHICAL SURVEY
SITE LAYOUT
SCALE 1:200
QUADI ED DELEM CADASTRAL AREA



- NOTES:
- GROUND LEVEL OF RESERVOIR = +983.50m
 - GROUND LEVEL OF EXISTING VALVE CHAMBER = +983.35m
 - GROUND LEVEL OF PROPOSED VALVE CHAMBER = +983.40m
 - DO NOT SCALE FROM THIS DRAWING
 - ALL LEVELS ARE IN M UNLESS OTHERWISE SPECIFIED

TOPOGRAPHICAL LEGEND

	CULVERT/BRIDGE		RETAINING WALL
	SPRING		RAILWAY
	WELL		CHANNEL
	DECIDUOUS/PINE TREE		TERRACE
	ROCKS		FENCE
	BUSHES		STREAM/RIVER
	MANHOLE SEWER		PYLON
	MANHOLE WATER		ELECTRIC SUB STATION
	MANHOLE TELEPHONE		ELECTRIC POLE/TELEGRAPH POLE
	MANHOLE NOT IDENTIFIED		OVERGROUND WATER PIPE
	LIGHTING POLE		UNDERGROUND WATER PIPE
	BUILDING		SPOT HEIGHT
	FOUNDATION/BUILDING UNDER CONSTRUCTION		TRAVERSING STATION
	ROAD		TRIANGULATION POINT
	TRACK		BENCH MARK
	REFERENCE LINE		ML
	SLOPE		LOT No
			LOT LIMIT
			CIRCUMSCRIPTION BOUNDARY
			EXPROPRIATION LIMIT

REPUBLIC OF LEBANON

COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION



BUREAU TECHNIQUE POUR LE DEVELOPPEMENT

JALL ED DIB - HAJAL Bldg
P.O.BOX:70492 - ANTELIAS

PHONE:(04) 712157/712158 (03) 291016
FAX: (04) 712159

CONSTRUCTION OF WATER WORKS IN
QUADI ED DELEM-QABB ELIAS AND MRAIJAT

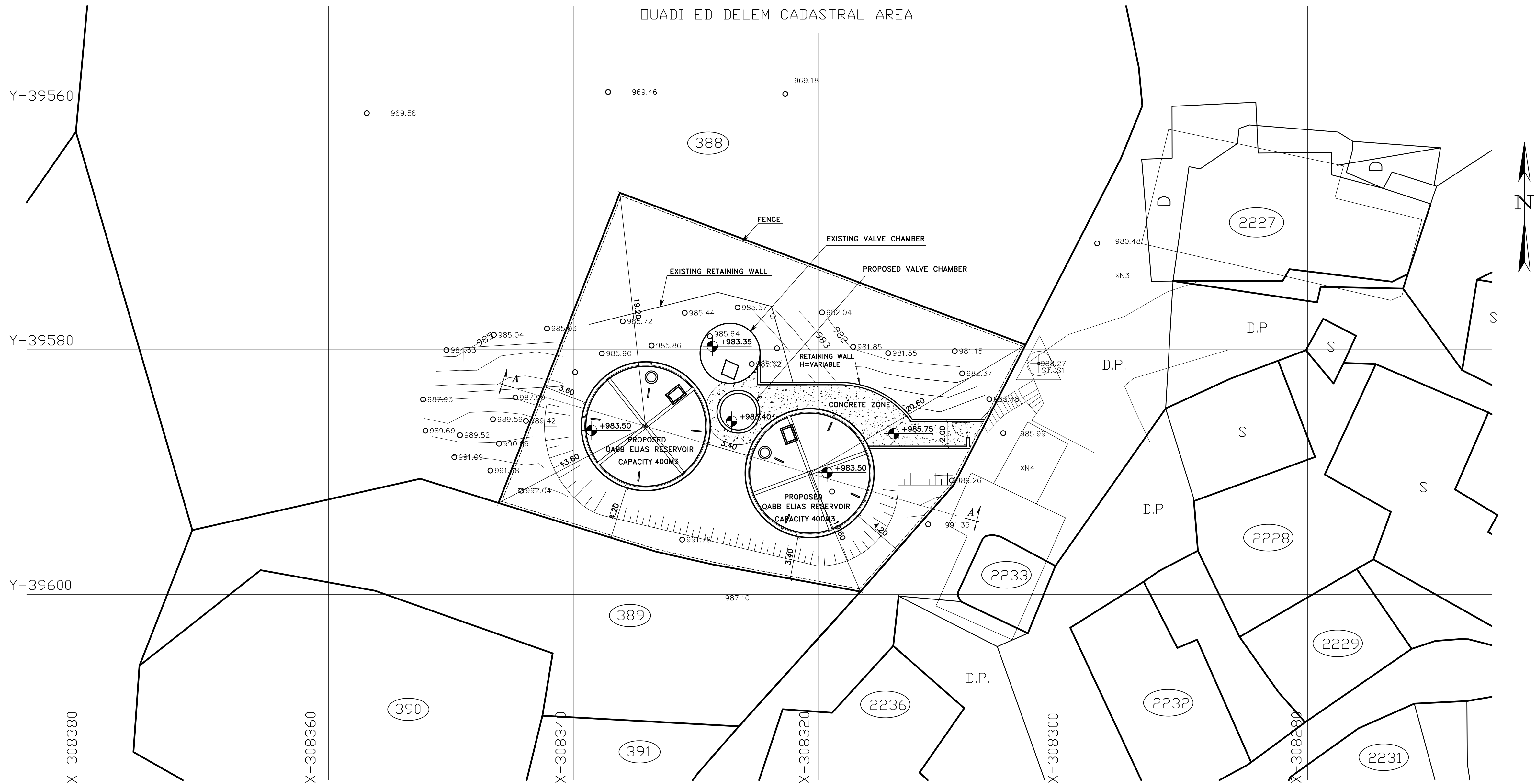
QABB ELIAS RESERVOIRS
(CAPACITY 2X400 m³)

TOPOGRAPHICAL SURVEY
SITE LAYOUT

FILE NAME	DESIGNED BY	DRAWN BY	CHECKED BY
509W-RS02-C01-07	W. SEIFEDDINE	W. SEIFEDDINE	W. SEIFEDDINE

DATE	SCALE	SHEET No.	DRAWING No.
JULY 2019	1:200	1/9	509W-RS02-C01

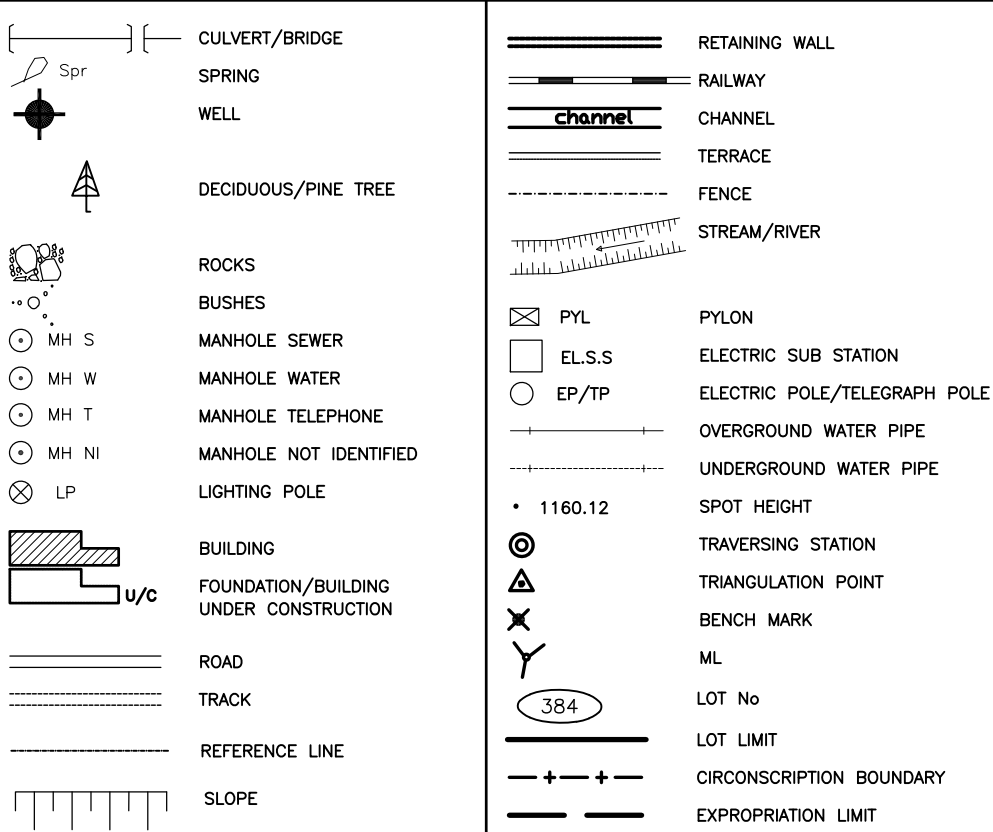
SITE PLAN
SCALE 1:200
QUADI ED DELEM CADASTRAL AREA



NOTES:

- GROUND LEVEL OF RESERVOIR = +983.50m
- GROUND LEVEL OF EXISTING VALVE CHAMBER = +983.35m
- GROUND LEVEL OF PROPOSED VALVE CHAMBER = +983.40m
- DO NOT SCALE FROM THIS DRAWING
- ALL LEVELS ARE IN M UNLESS OTHERWISE SPECIFIED

TOPOGRAPHICAL LEGEND



Rev.	Date	Dsgn	Drwn	Chk'd	Appr'd
------	------	------	------	-------	--------

REPUBLIC OF LEBANON
COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION



BUREAU TECHNIQUE POUR LE DEVELOPEMENT

JALL ED DIB - HAJAL Bldg
P.O.BOX:70492 - ANTELIAS

PHONE:(04) 712157/712158 (03) 291016
FAX: (04) 712159

CONSTRUCTION OF WATER WORKS IN
QUADI ED DELEM-QABB ELIAS AND MRAIJAT

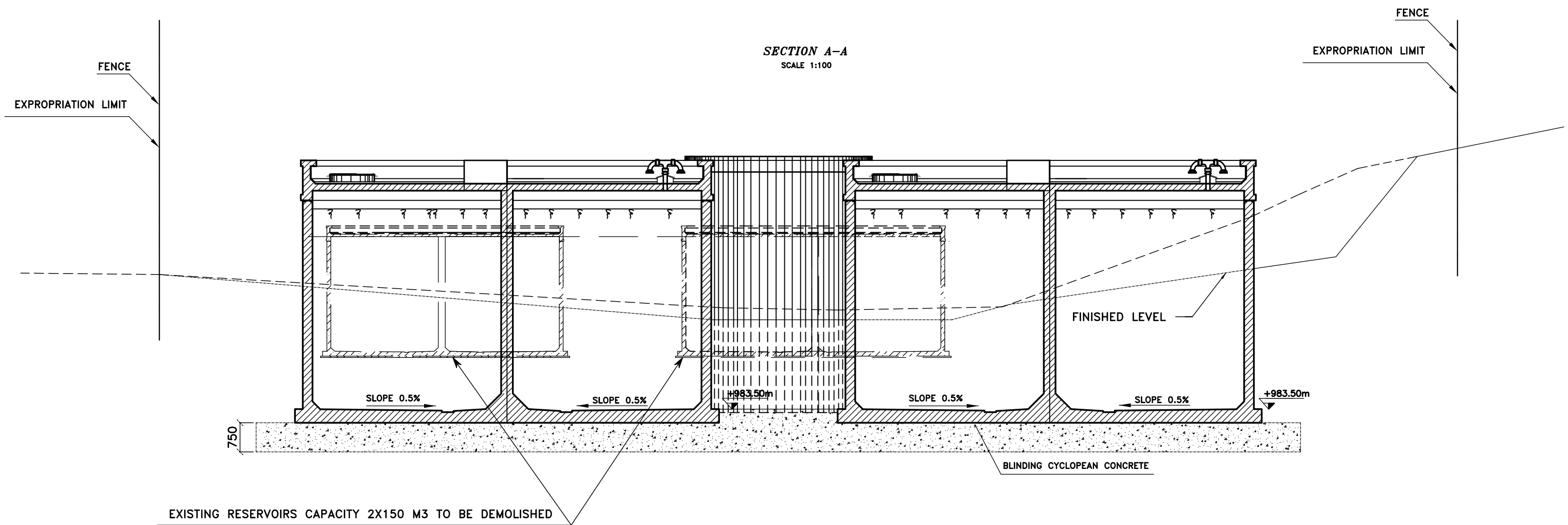
QABB ELIAS RESERVOIRS
(CAPACITY 2X400 m³)

SITE PLAN
SECTION A-A

FILE NAME	DESIGNED BY	DRAWN BY	CHECKED BY
509W-RS02-C01-07	W. SEIFEDDINE	W. SEIFEDDINE	W. SEIFEDDINE

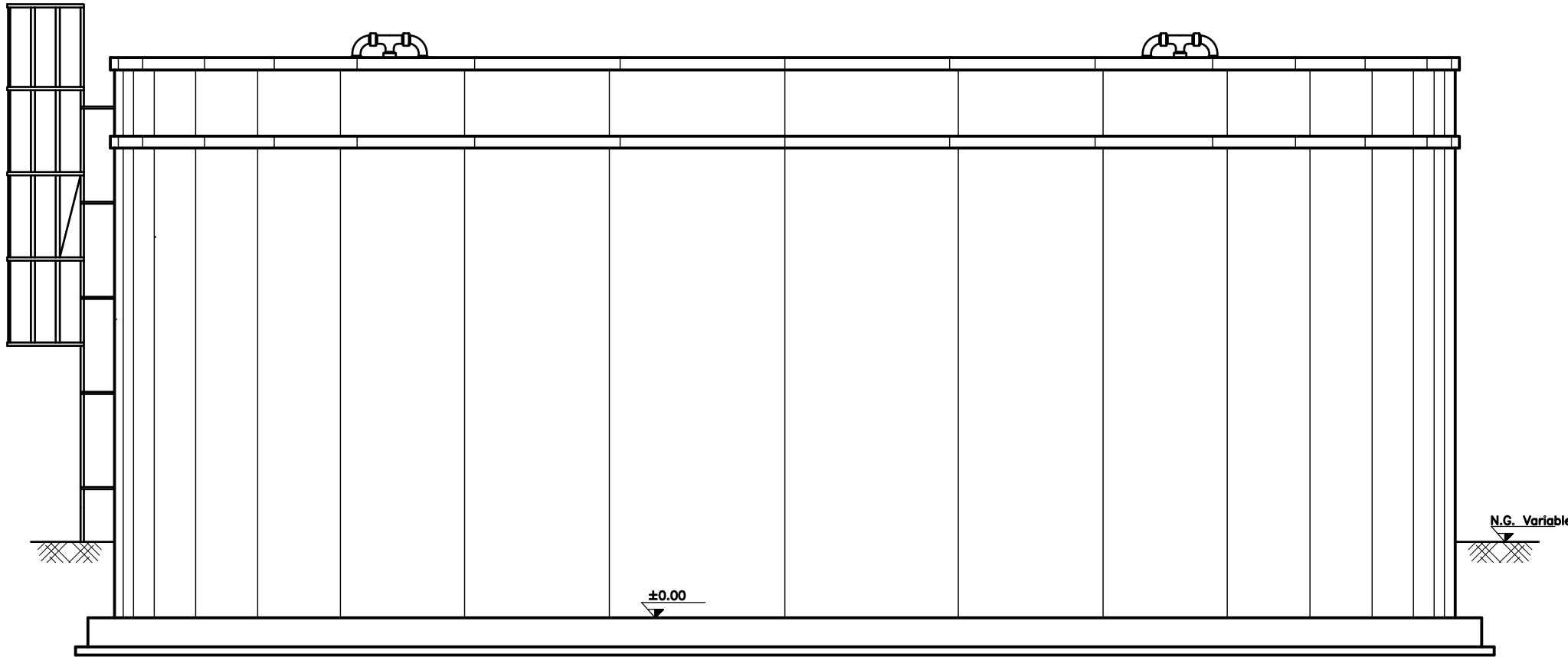
DATE	SCALE	SHEET No.	DRAWING No.
JULY 2019	1/200-1/100	2/7	509W-RS02-C02

SECTION A-A
SCALE 1:100

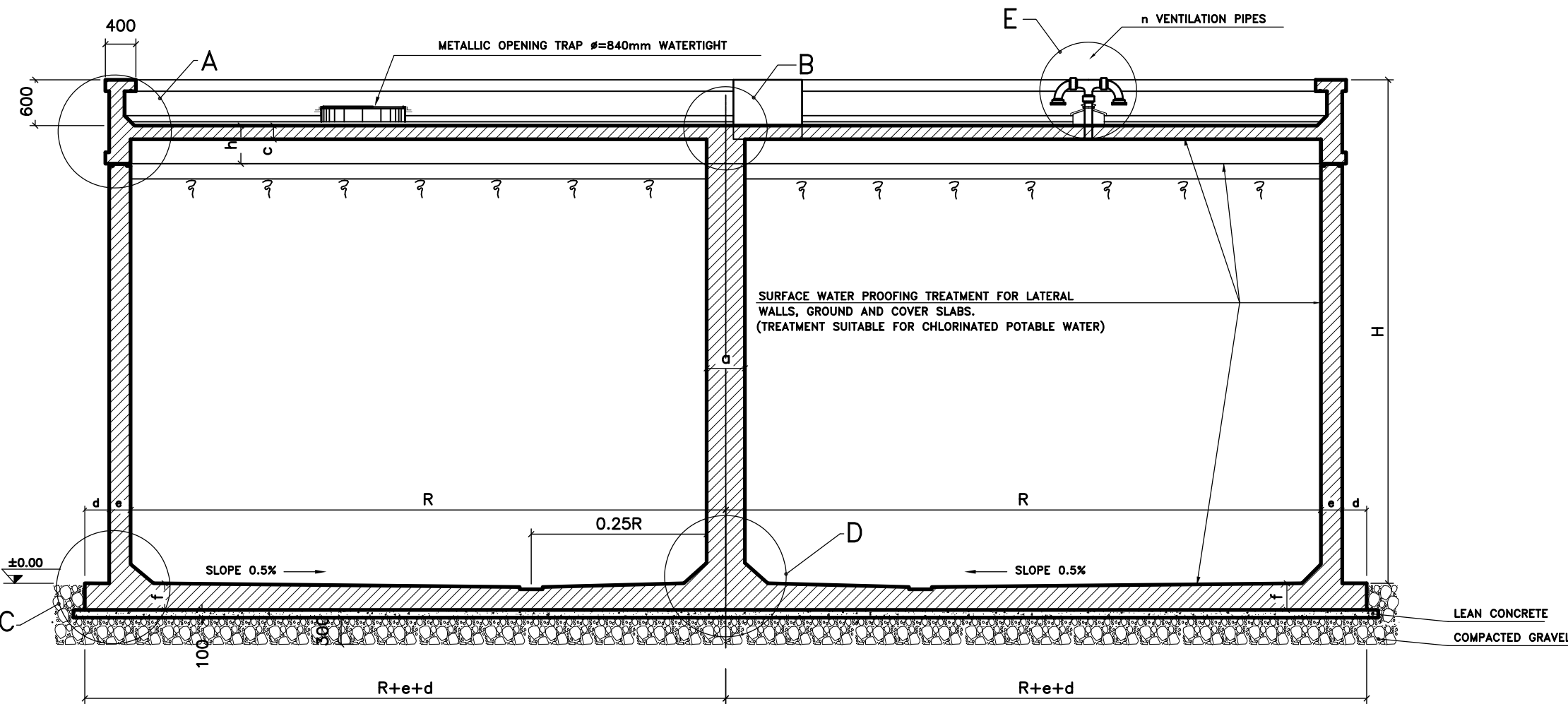


CAPACITY	400M3
R (mm)	5000
0.25R (mm)	1250
t (mm)	250
R+t (mm)	5250
c (mm)	200
f (mm)	300
d (mm)	200
R+t+d (mm)	5450
a (mm)	300
b (mm)	300
h (mm)	350
n (VENTILATION PIPES)	3
n' (DRAIN PIPES)	3
H (mm)	6450
g (mm)	800
j (mm)	1200

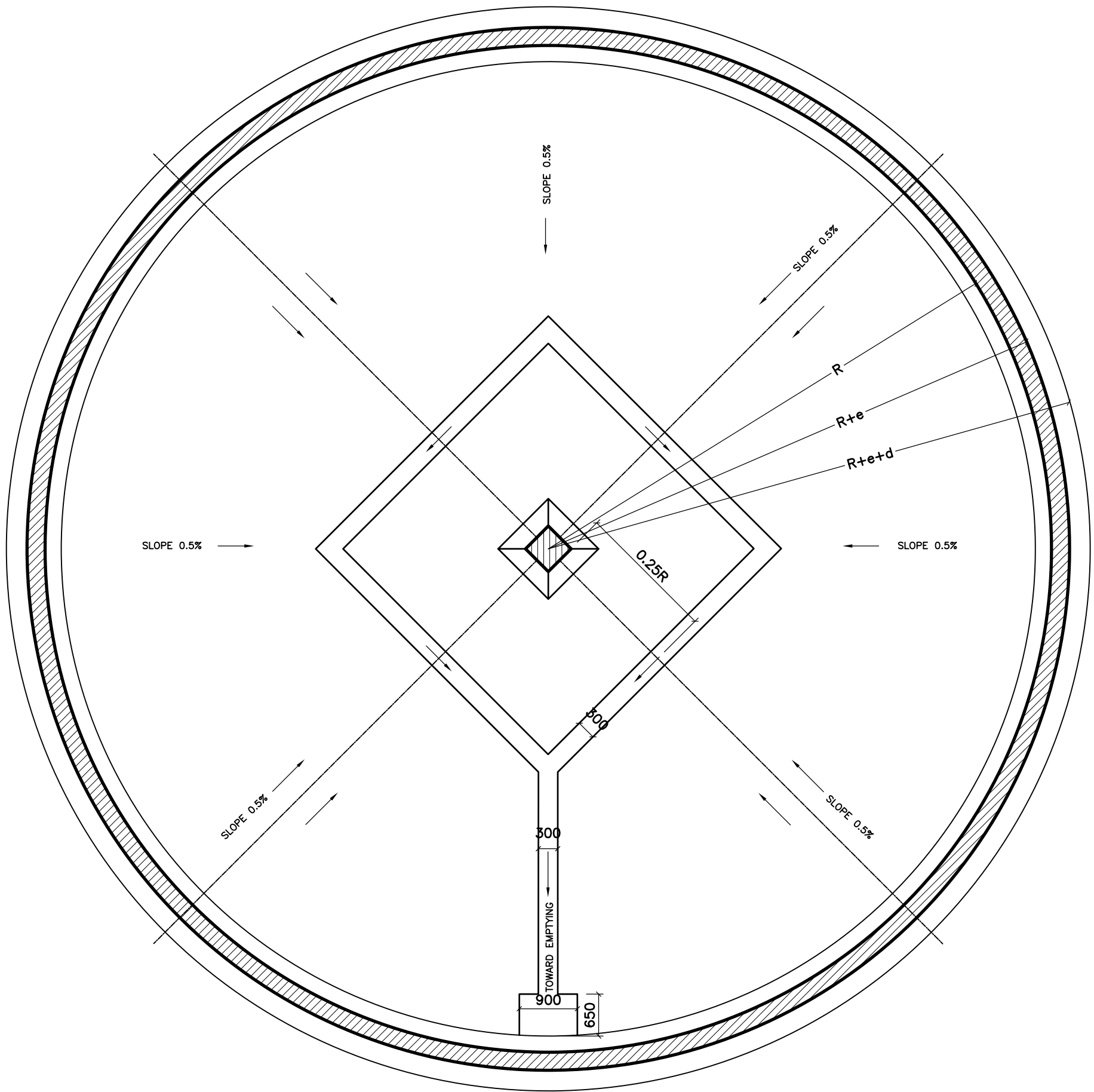
ELEVATION



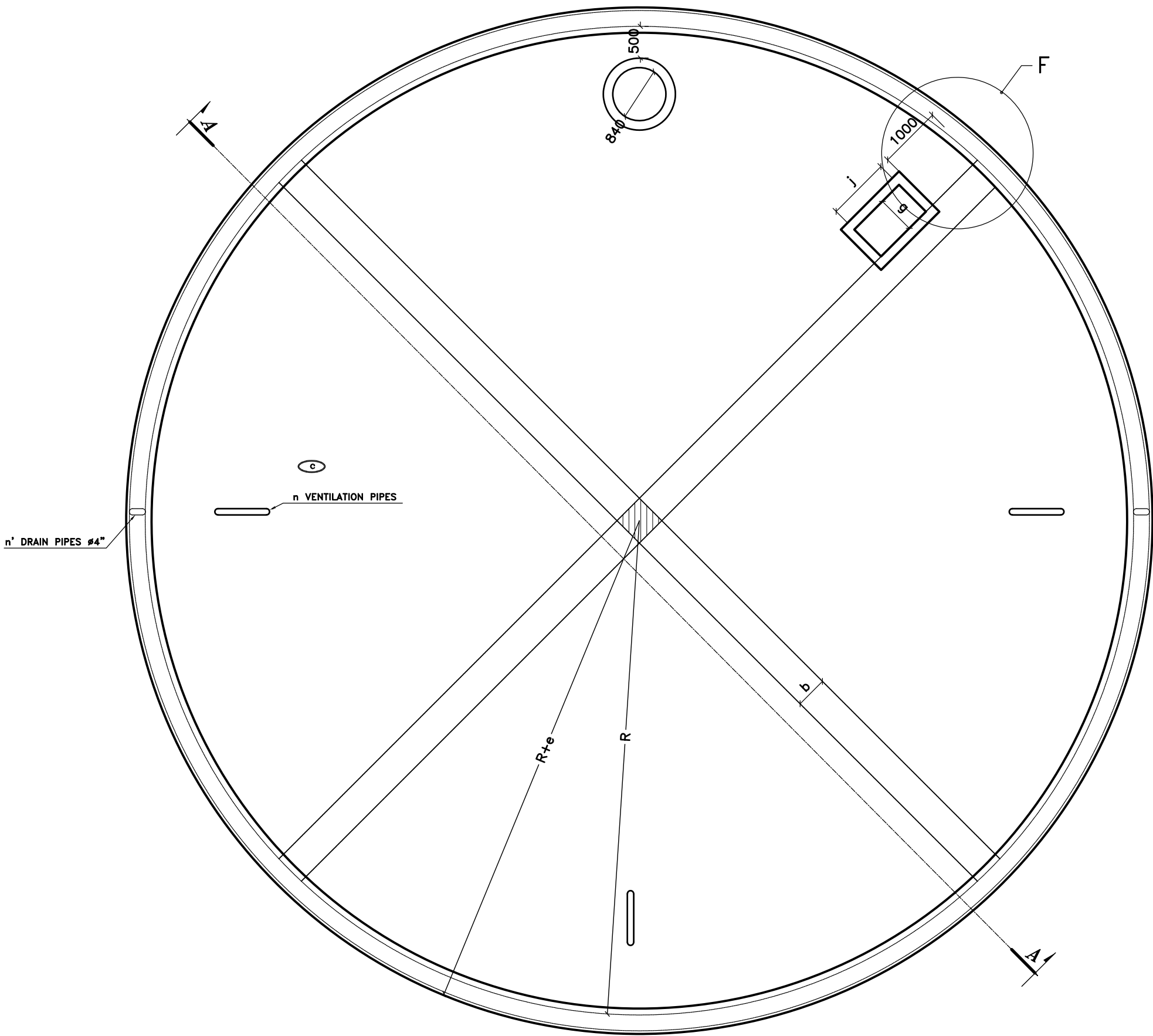
VERTICAL SECTION A-A



MAT FORMWORK



COVER SLAB FORMWORK



NOTES:

- REINFORCED CONCRETE:
NORMAL PORTLAND CEMENT, GRADE C45.
DOSING 400 Kg/m³ FOR LATERAL WALLS AND THE COVER SLAB; 350 kg/m³ ELSEWHERE.
- LEAN CONCRETE:
NORMAL PORTLAND CEMENT, GRADE C45.
DOSING 250 kg/m³.
- REINFORCEMENT:
DEFORMED HIGH STRENGTH STEEL BARS: SYMBOL T YIELD STRESS: F_y=400 MPa.
MILD STEEL BARS: SYMBOL # YIELD STRESS: F_y=215 MPa.
- STRESSES:
SEVERE CONTROL:
CONCRETE COMPRESSIVE STRENGTH AT 28 DAYS: f_c = 25 MPa.
CONCRETE TENSILE STRENGTH AT 28 DAYS: f_t = 2.1 MPa.
- CONSTRUCTION JOINTS:
PROHIBITED IN RESERVOIR WALLS.
REDUCED TO THE STRICT MINIMUM ELSEWHERE PROVIDED THAT NECESSARY PRECAUTIONS ARE TAKEN, SUCH AS: SETTING RETARDERS, BONDING MATERIALS, WATER-STOP JOINTS.
MAXIMUM POURING HEIGHT: 1.50 m.
- ADMIXTURES:
SETTING RETARDERS (CONSTRUCTION JOINTS).
WATERPROOFING ADMIXTURE (TO IMPROVE WATER PROOFNESS OF WALLS, FLOOR SLAB AND COVER SLAB).
THE USE OF CHLORINE BASED ADMIXTURES IS NOT ALLOWED.
EVERY ADMIXTURE SHALL BE APPROVED BY THE ADMINISTRATION.
WATER-STOP JOINTS MUST BE USED IN EACH CONSTRUCTION JOINT CONTINUOUSLY (CONFORMING TO THE PRODUCT'S TECHNICAL SHEET).
- CONCRETE COVER:
CLEARANCE BETWEEN THE EXTERNAL GENERATRIX OF BARS AND THE FACINGS SHALL BE 4 cm FOR THE RESERVOIR FLOOR SLAB AND WALLS, 3 cm ELSEWHERE.
- OVERLAPPING:
LAPS SHALL NOT BE LESS THAN FIFTY TIMES THE BAR DIAMETER.
WHERE SPICE BARS ARE USED, THEIR LENGTH SHALL NOT BE LESS THAN 2x50φ.
(φ= NOMINAL DIAMETER OF BAR).
LAPS SHALL BE STAGGERED FROM ONE HOOP TO THE OTHER AND/OR ONE BAR TO THE OTHER IN ORDER TO REDUCE THE NUMBER OF LAPS IN THE SAME SECTION.
STIRRUPS #8 SHALL BE USED ON EACH LAP.
- BENDING:
> 12mm MECHANICAL.
< 12mm MANUEL (POSSIBLY).
STRAIGHTENING OF BENDED BARS IS NOT ALLOWED.
- FORMWORK:
ALL EXECUTED CONCRETE SHALL BE FAIR FACE CONCRETE (METALLIC OR PLYWOOD FORMWORK).
- WATERPROOFING:
SURFACE WATERPROOFING TREATMENT OF RESERVOIR WALLS, COVER AND FLOOR SLAB.
COVER WATERPROOFING CONSISTING OF A VAPOUR BARRIER, A THERMAL INSULATION, A WATERPROOFING MEMBRANE AND ITS PROTECTION.
- WATERPROOFING DETAILS:
(1) D.V:
- SBS/OR/APP t_{sbs} ≥ 2.5mm
- ADHERENCE OR SEMI-ADHERENCE APPLICATION
(variable min. t=50mm)
(2) INSULATION:
- EXPANDED POLYSTYRENE λ=0.037kcal/h.m².°C
- WITH λ₁ = λ₂ = λ₃
- SEMI-ADHERENCE OR TOTAL ADHERENCE APPLICATION ON VAPOUR BARRIER.
(3) WATERPROOFING:
- SBS/OR/APP t_{sbs} ≥ 4mm
- WITH MINERAL PROTECTION.
- SEMI-ADHERENCE OR TOTAL ADHERENCE APPLICATION.
(4) PROTECTION:
- IN FACTORY MINERAL AUTOPROTECTION.
(5) h' ≥ 150mm (NILL SLOPE)
- REMARKS:
* FLOOR SLAB INVERT LEVEL ±0.00: SEE LAYOUT DAWRINGS.
* DOUBLE THREADED WATERPROOF CONNECTION SLEEVES SHALL BE USED FOR RESERVOIR FORMWORKS TIE-RODS.
* HOLES MADE BY THE TIE-RODS SHALL BE FILLED WITH A NON SHRINK GROUT BY MEANS OF SPECIAL INJECTION METHODS.
* ALL THE DIMENSIONS ARE IN mm.
* SCALING FROM THESE DRAWINGS IS NOT ALLOWED.
* PROVIDE PERFORATED DRAIN PIPES, #4" IN THE GRAVEL PROTECTION LAYER.

Rev.	Date	Dsgn	Drwn	Chk'd	Appr'd

REPUBLIC OF LEBANON
COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

ED BUREAU TECHNIQUE POUR LE DEVELOPEMENT

JALL ED DIB - HAJAL Bldg PHONE:(04) 712157/712158 (03) 291016
P.O.BOX:70492 - ANTELIAS FAX: (04) 712159

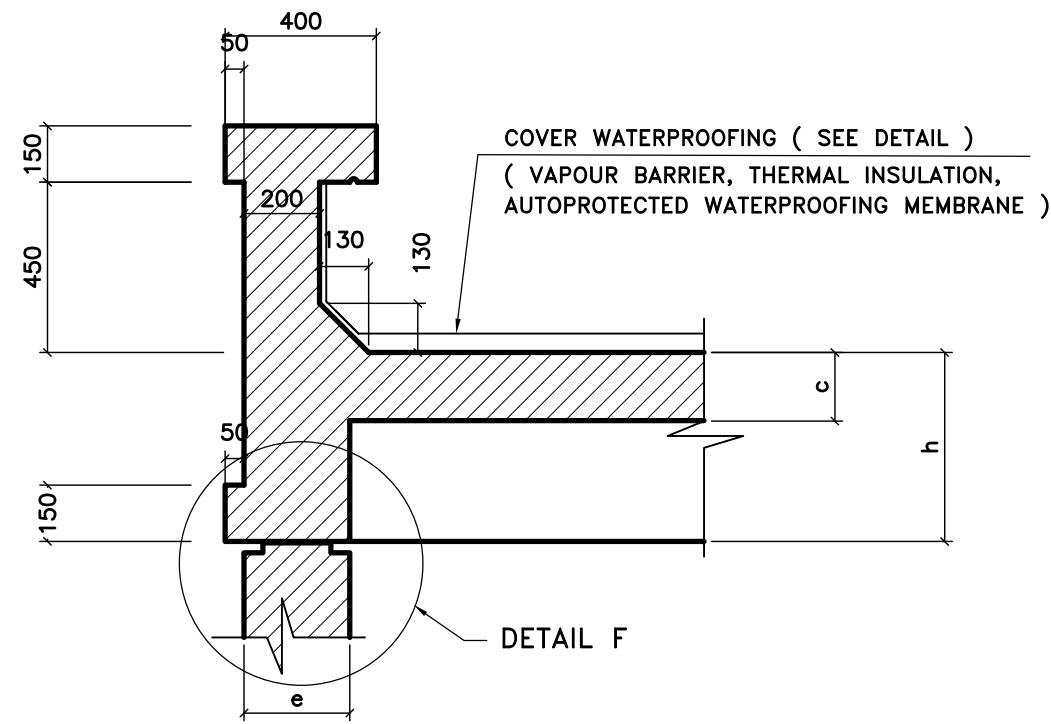
CONSTRUCTION OF WATER WORKS IN
QUADED DELEM-QABB ELIAS AND MRAIJAT

QABB ELIAS RESERVOIRS (CAPACITY 2X400 m ³)	ELEVATION AND SECTIONS FORMWORK
---	------------------------------------

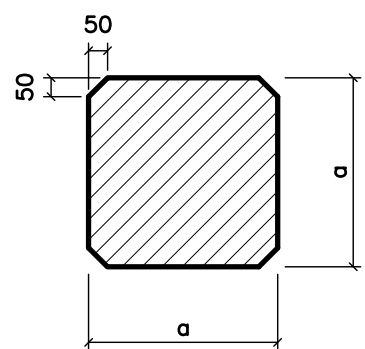
FILE NAME	DESIGNED BY	DRAWN BY	CHECKED BY
509W-RS02-C01-07	W. SEIFEDDINE	W. SEIFEDDINE	W. SEIFEDDINE

DATE	SCALE	SHEET No.	DRAWING No.
JULY 2019	N.T.S.	3/7	509W-RS02-C03

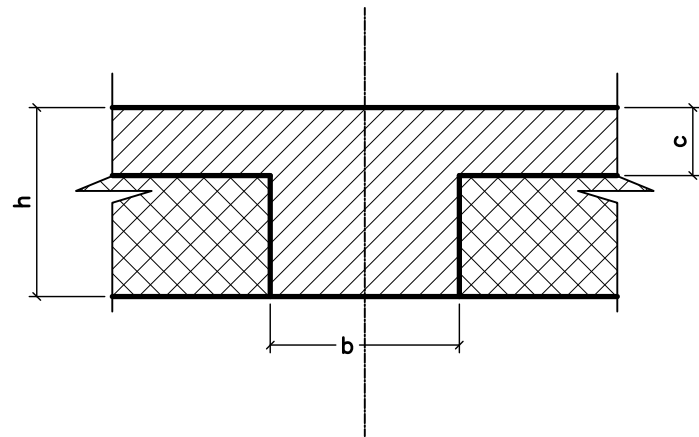
DETAIL A
PARAPET – SLAB SECTION



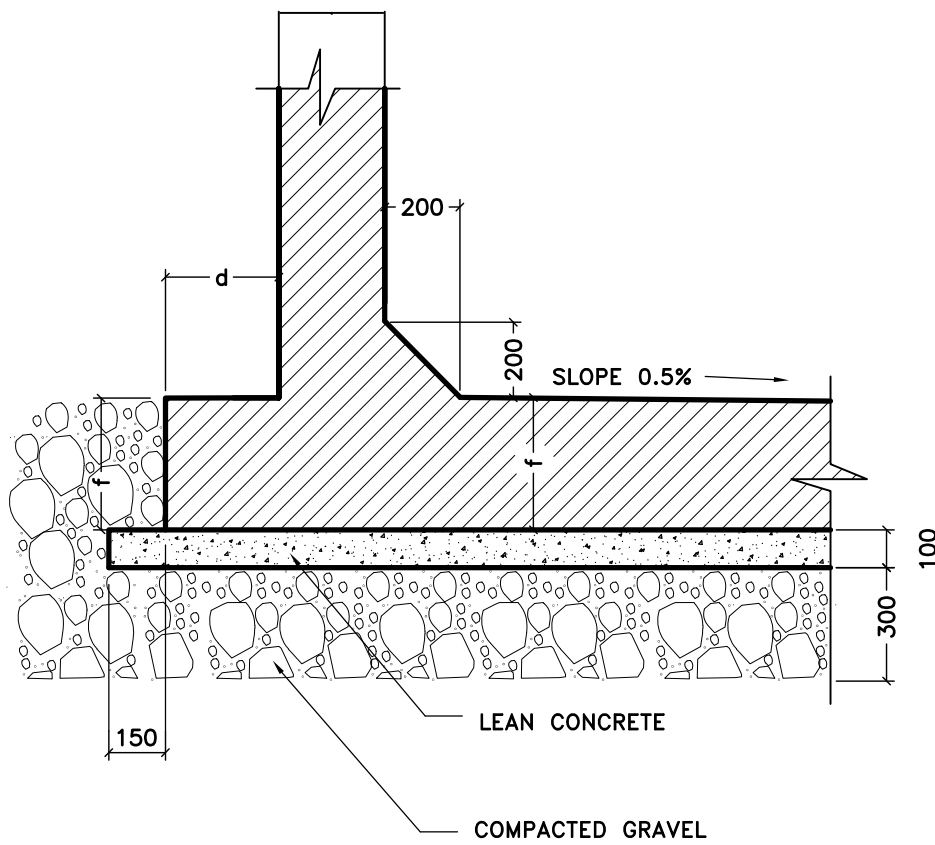
COLUMN DETAIL



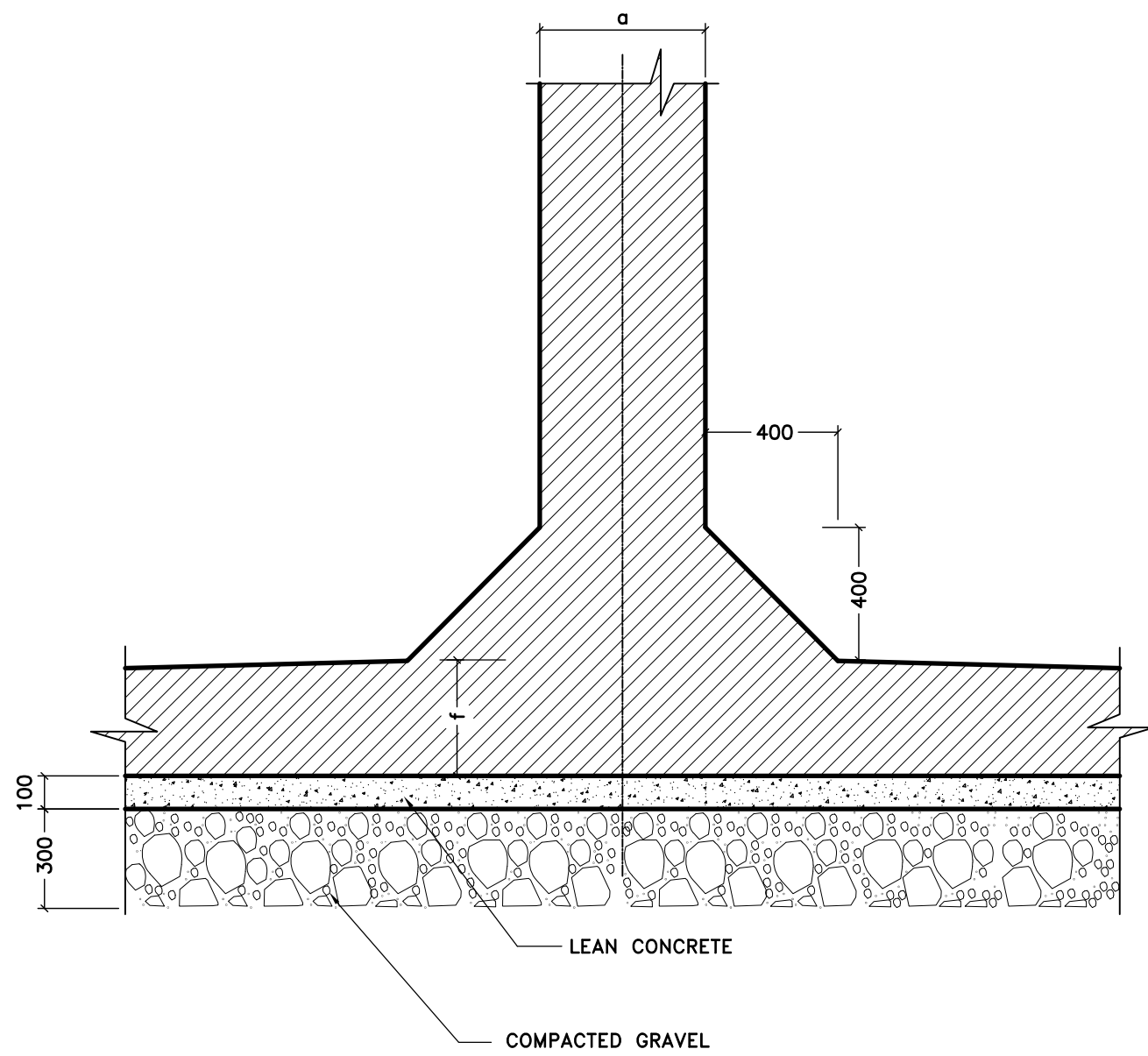
DETAIL B
BEAM–SLAB SECTION



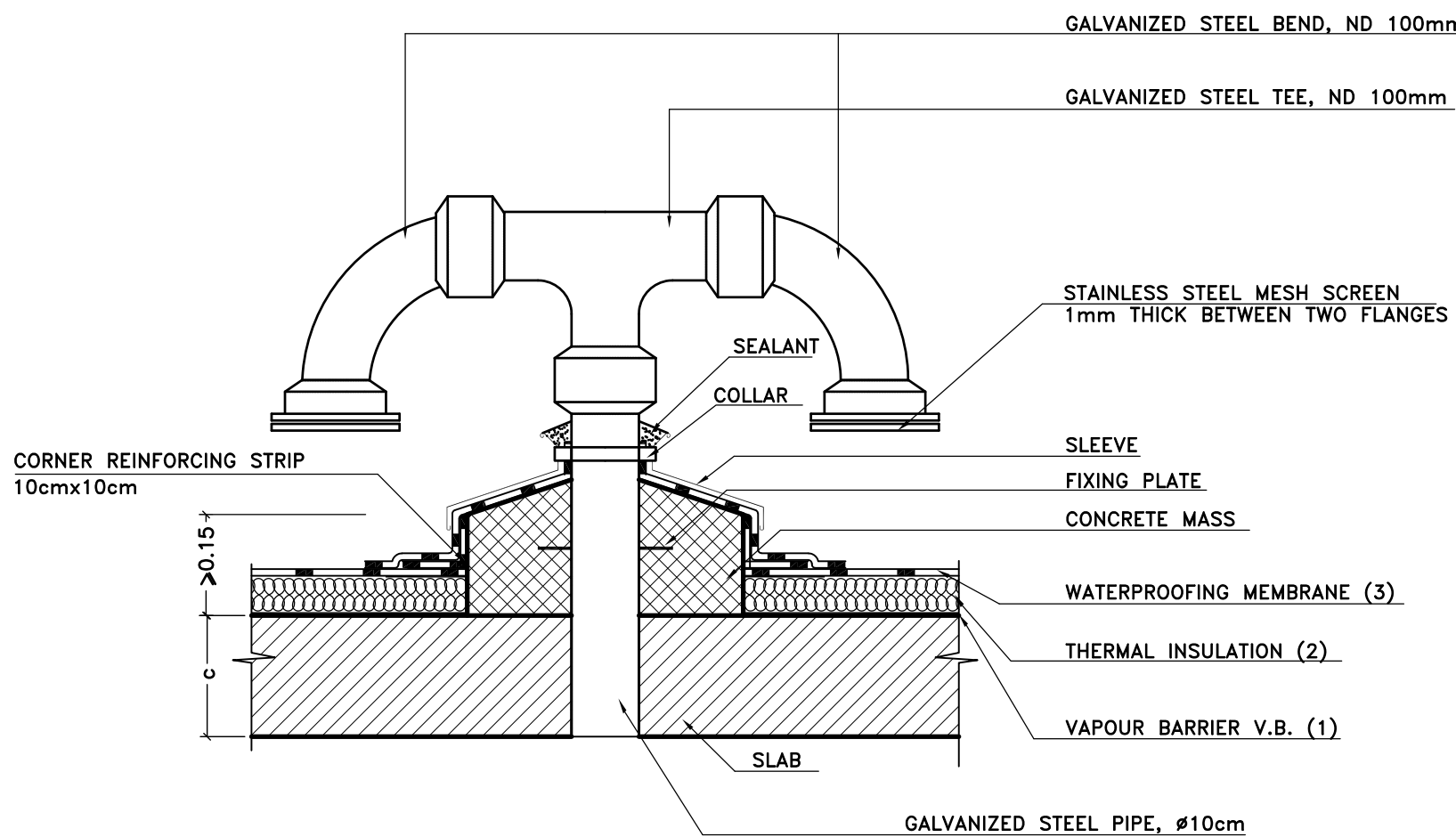
DETAIL C
MAT–WALL SECTION



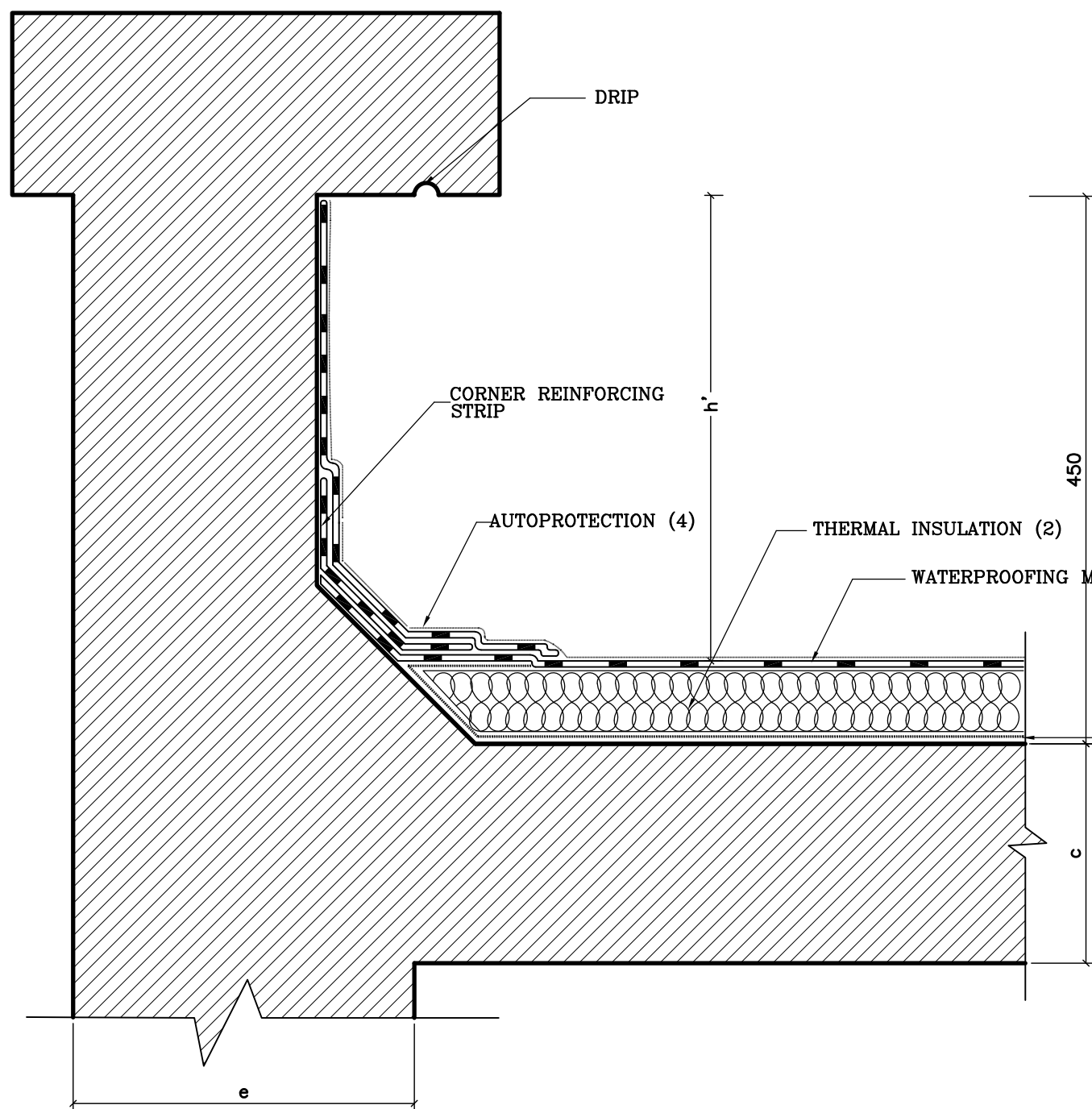
DETAIL D
COLUMN–MAT SECTION



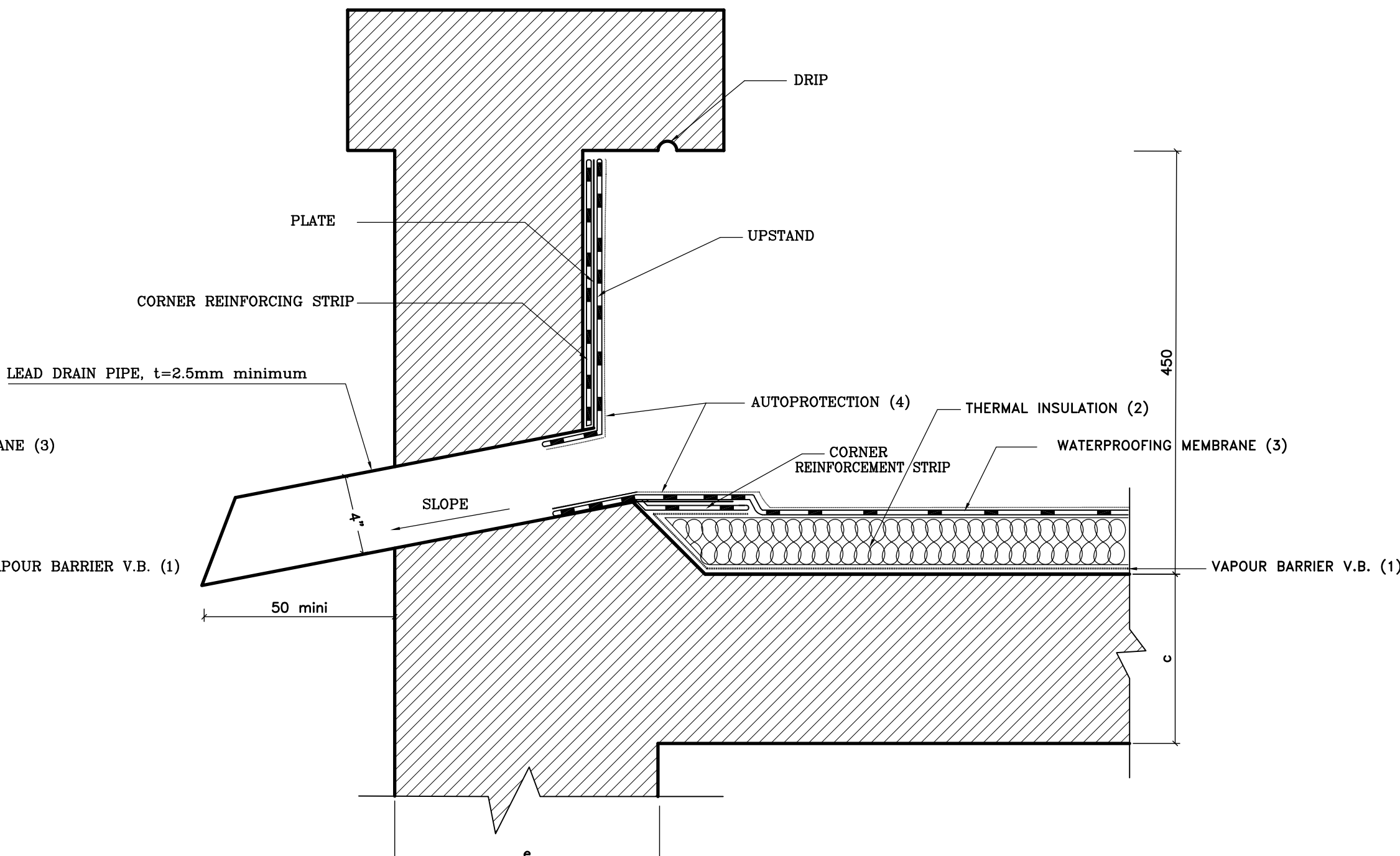
DETAIL E – VENTILATION PIPE
Scale 1:10



WATERPROOFING DETAIL



RAINWATER DRAINAGE DETAIL



CAPACITY	400M3
R (mm)	5000
0.25R (mm)	1250
e (mm)	250
R+e (mm)	5250
c (mm)	200
f (mm)	300
d (mm)	200
R+t+d (mm)	5450
a (mm)	400
b (mm)	400
h (mm)	500
n (VENTILATION PIPES)	3
n' (DRAIN WATER)	3
H (mm)	6600
g (mm)	800
j (mm)	1200

NOTES FOR RESERVOIRS:

REINFORCED CONCRETE:
CONCRETE GRADE C30 FOR ALL STRUCTURES.

MIX ELEMENTS:
ORDINARY PORTLAND CEMENT(400 Kg/m³ FOR LATERAL WALLS, FLOOR SLAB, AND THE COVER SLAB; 350 kg/m³ ELSEWHERE) SHOULD COMPLY WITH BS12.
AGGREGATES (SAND AND GRAVELS) FROM NATURAL QUARRIES, SHOULD COMPLY WITH BS882.
WATER SHOULD COMPLY WITH THE REQUIREMENTS OF BS5328.

LEAN CONCRETE / CYCLOPEAN CONCRETE:
MIX MADE WITH ORDINARY PORTLAND CEMENT, CONCRETE GRADE C20
DOSING 250 kg/m³.

REINFORCEMENT:
DEFORMED HIGH STRENGTH STEEL BARS: SYMBOL T YIELD STRESS: F_y=420 MPa.
MILD STEEL BARS: SYMBOL Ø YIELD STRESS: F_y=250 MPa.

STRESSES:
SEVERE CONTROL
CONCRETE COMPRESSIVE STRENGTH AT 28 DAYS:
– ON A CUBE, a=150mm : 30 N/mm²
– ON A CYLINDER, ø=150mm, h=30mm : 25 N/mm²
CONCRETE TENSILE STRENGTH AT 28 DAYS : 2.1 N/mm².

CONSTRUCTION JOINTS:
PROHIBITED IN RESERVOIR WALLS.
REDUCED TO THE STRICT MINIMUM ELSEWHERE PROVIDED THAT NECESSARY PRECAUTIONS ARE TAKEN, SUCH AS: SETTING RETARDERS, BONDING MATERIALS, WATER–STOP JOINTS.
MAXIMUM POURING HEIGHT: 1.50 m.

ADMIXTURES:
SETTING RETARDERS (CONSTRUCTION JOINTS).
WATERPROOFING ADMIXTURE (TO IMPROVE WATER PROOFNESS OF WALLS, FLOOR SLAB AND COVER SLAB).
THE USE OF CHLORINE BASED ADMIXTURES IS NOT ALLOWED.
EVERY ADMIXTURE SHALL BE APPROVED BY THE ADMINISTRATION.

CONCRETE COVER:
CLEARANCE BETWEEN THE EXTERNAL GENERATRIX OF BARS AND THE FACINGS SHALL BE 4 cm FOR THE RESERVOIR FLOOR SLAB AND WALLS, 3 cm ELSEWHERE.

OVERLAPPING:
LAPS SHALL NOT BE LESS THAN FIFTY TIMES THE BAR DIAMETER.
WHERE SPLICE BARS ARE USED, THEIR LENGTH SHALL NOT BE LESS THAN 2x50ø.
(ø= NOMINAL DIAMETER OF BAR).
LAPS SHALL BE STAGGERED FROM ONE HOOP TO THE OTHER AND/OR ONE BAR TO THE OTHER IN ORDER TO REDUCE THE NUMBER OF LAPS IN THE SAME SECTION.
STIRRUPS ø8 SHALL BE USED ON EACH LAP.

BENDING:
ø > 12mm MECHANICAL.
ø ≤ 12mm MANUEL (POSSIBLY).
STRAIGHTENING OF BENDED BARS IS NOT ALLOWED.

DRAWINGS CONSIDERATION:
TOP BARS
BOTTOM BARS

FORMWORK:
ALL EXECUTED CONCRETE SHALL BE FAIR FACE CONCRETE (METALLIC OR PLYWOOD FORMWORK).

WATERPROOFING:
SURFACE WATERPROOFING TREATMENT OF RESERVOIR WALLS, COVER AND FLOOR SLAB.
COVER WATERPROOFING CONSISTING OF A VAPOUR BARRIER, A THERMAL INSULATION, A WATERPROOFING MEMBRANE AND ITS PROTECTION.

WATERPROOFING DETAILS:
(1) V.B. – SBS/OR/APP t≥2.5mm
– ADHERENCE OR SEMI-ADHERENCE APPLICATION
(2) INSULATION – t=variable min. t=50mm
– EXPANDED POLYSTYRENE λ=0.037kcal/h.m.2.°C
– WITH $\frac{1}{\lambda_1} = \frac{1}{\lambda_2}$
– SEMI-ADHERENCE OR TOTAL ADHERENCE
APPLICATION ON VAPOUR BARRIER.
(3) WATERPROOFING – SBS/OR/APP t_{total}≥4mm
WITH MINERAL PROTECTION.
– SEMI-ADHERENCE OR TOTAL ADHERENCE APPLICATION.
IN FACTORY MINERAL AUTOPROTECTION.
(4) PROTECTION – h'≥ 150mm (NULL SLOPE)
(5) h'≥ 150mm (NULL SLOPE)

REMARKS:
• FLOOR SLAB INVERT LEVEL ±0.00: SEE LAYOUT DRAWINGS.
• DOUBLE THREADED WATERPROOF CONNECTION SLEEVES SHALL BE USED FOR RESERVOIR FORMWORKS TIE-RODS.
• HOLES MADE BY THE TIE-RODS SHALL BE FILLED WITH A NON SHRINK GROUT BY MEANS OF SPECIAL INJECTION METHODS.
• ALL THE DIMENSIONS ARE IN mm.
• SCALING FROM THESE DRAWINGS IS NOT ALLOWED.
• PROVIDE PERFORATED DRAIN PIPES, ø4" IN THE GRAVEL PROTECTION LAYER.

Rev.	Date	Dsgn	Drwn	Chk'd	Appr'd
------	------	------	------	-------	--------

REPUBLIC OF LEBANON
COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

ED BUREAU TECHNIQUE POUR LE DEVELOPEMENT
JALL ED DIB – HAJAL Bldg PHONE:(04) 712157/712158 (03) 291016
P.O.BOX:70492 – ANTELAS FAX: (04) 712159

CONSTRUCTION OF WATER WORKS IN
OUADI DELEM-QABB ELIAS AND MRAIJAT

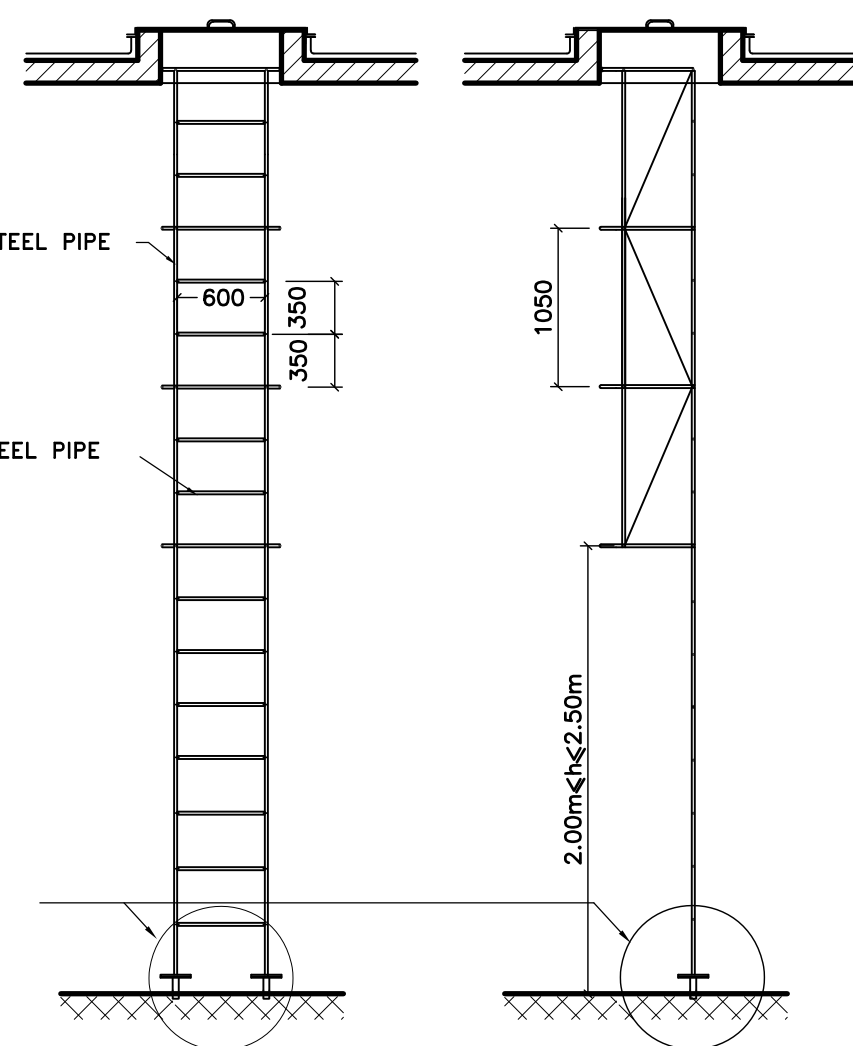
QABB ELIAS RESERVOIRS
(CAPACITY 2X400 m³)

DETAILS
FORMWORK

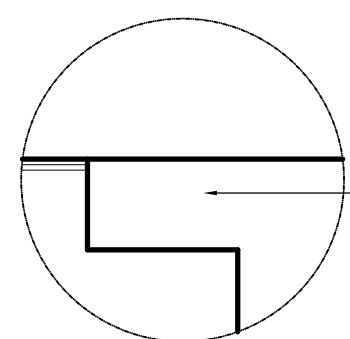
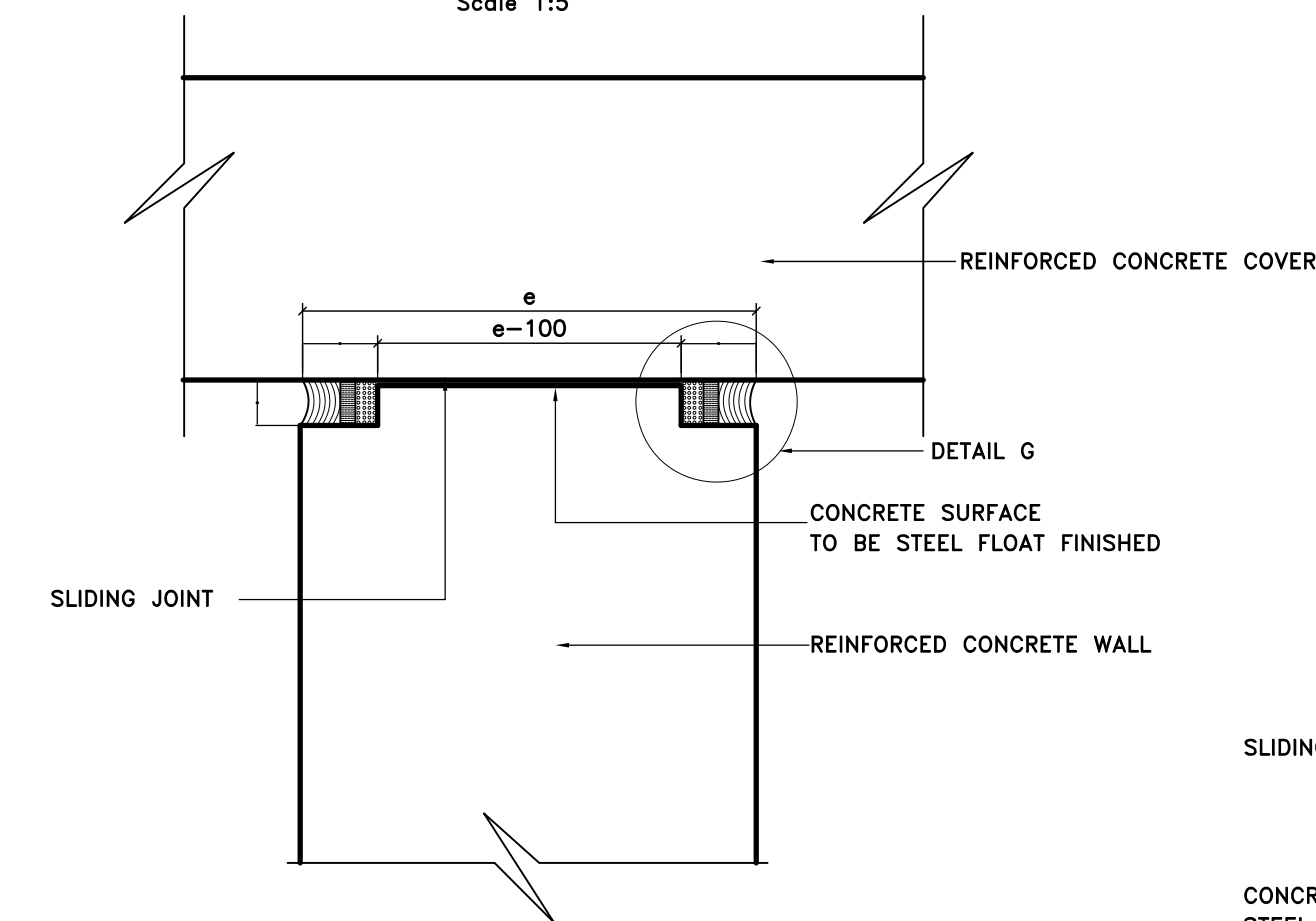
FILE NAME	DESIGNED BY	DRAWN BY	CHECKED BY
509W-RS02-C01-07	W. SEIFEDDINE	W. SEIFEDDINE	W. SEIFEDDINE

DATE	SCALE	SHEET No.	DRAWING No.
JULY 2019	1:50-1:20-1:10 1:5	4/7	509W-RS02-C04

FRONT VIEW
Scale 1:50

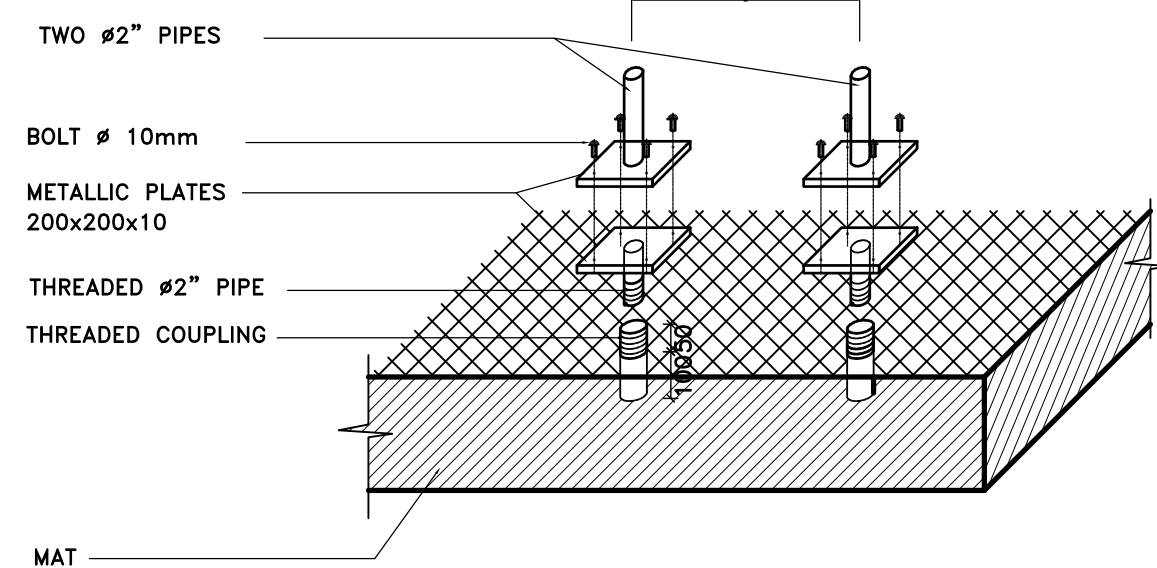


JOINT DETAIL
Scale 1:5



50x30 PERIPHERAL OPENING FILLED WITH RIGID
POLYSTYRENE PLACED PRIOR TO COVER CONCRETING

FIXING OF INTERNAL METALLIC LADDER DETAIL
Scale 1:20

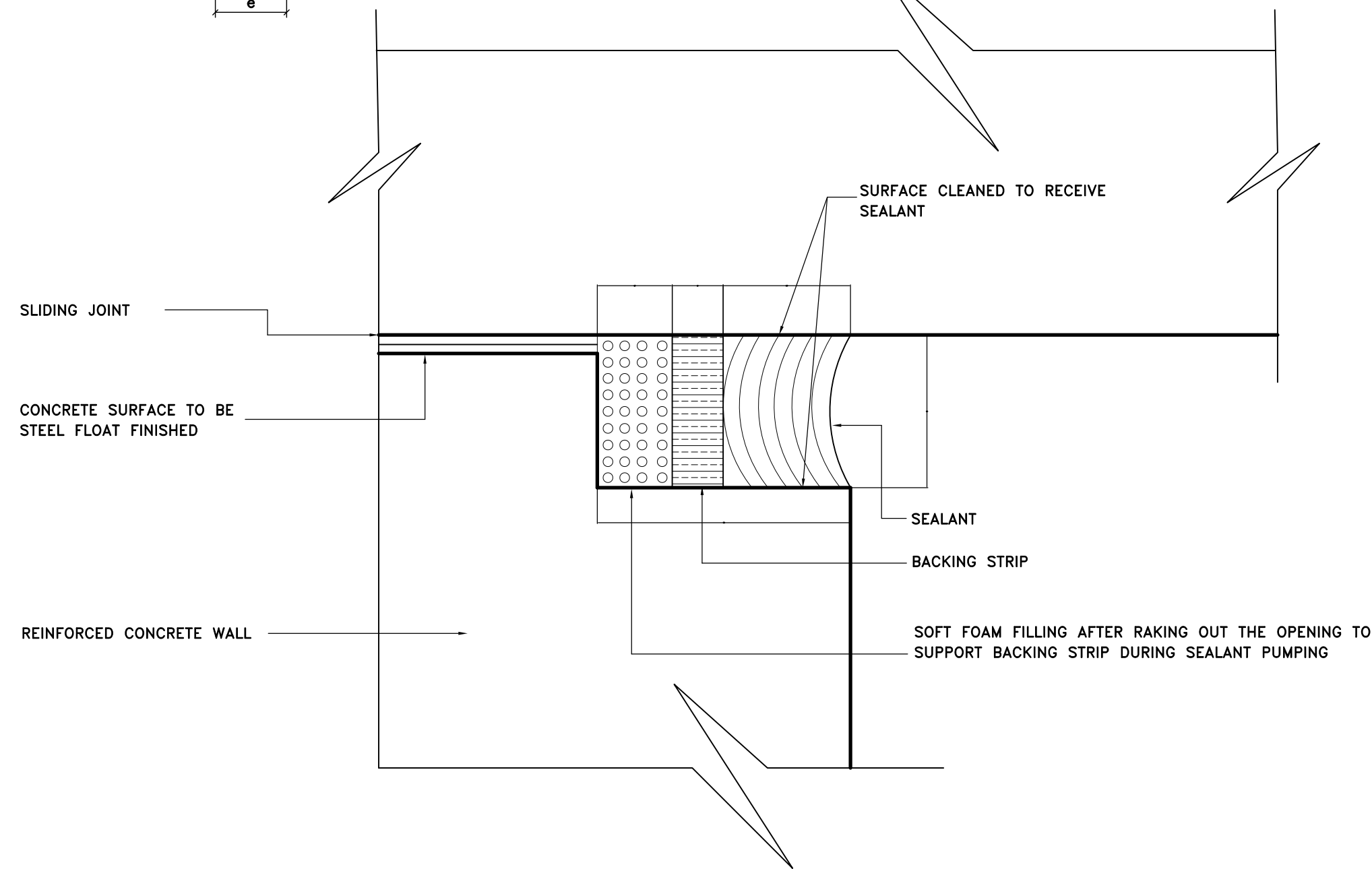


Technical drawing of a roof detail showing a cross-section of a parapet wall and roof assembly. The drawing includes dimensions and labels for various components:

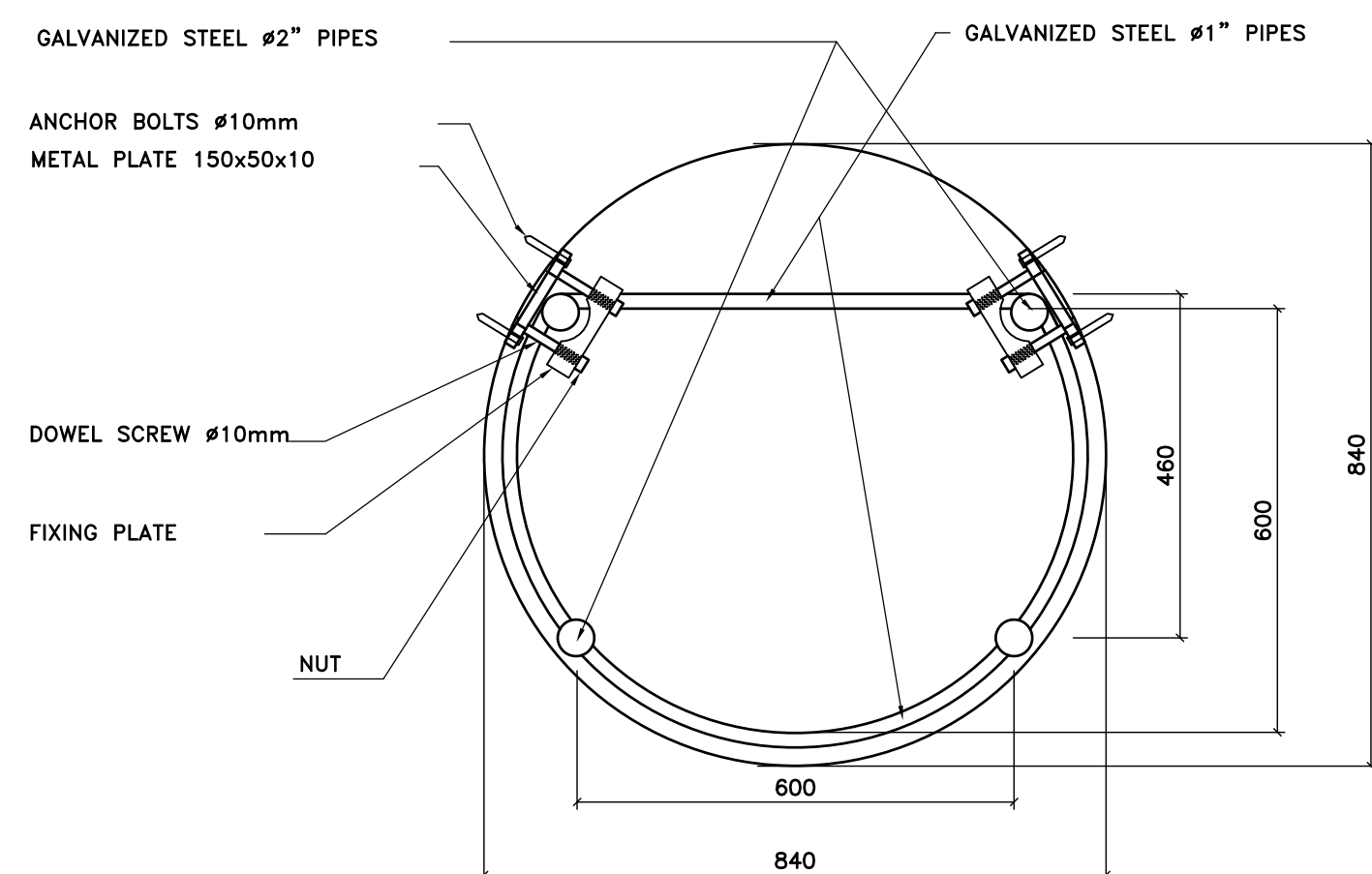
- Dimensions:**
 - Top width: 400
 - Parapet wall thickness: 10
 - Roof slope: 150%
 - Parapet wall height: 270
 - Horizontal distance from parapet face to centerline: 500
 - Horizontal distance from centerline to edge: 150
 - Total horizontal distance: 840
 - Horizontal distance from edge to centerline: 150
 - Bottom width: e
- Labels:**
 - COVER WATERPROOFING (pointing to the sloped roof surface)
 - METALLIC SHEET-IRON THICKNESS= 3mm (pointing to the flat roof surface)
 - COVER WATER PROOFING (pointing to the vertical parapet wall surface)

DETAIL G
Scale 1:1

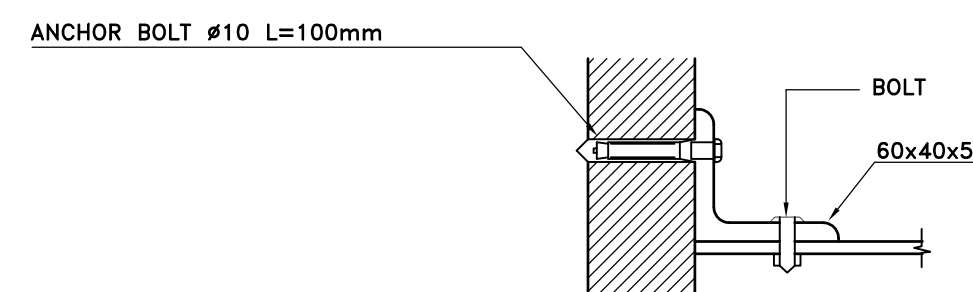
DETAIL G
Scale 1:1



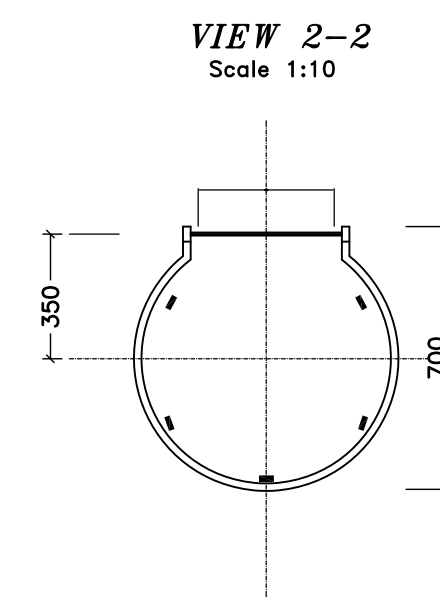
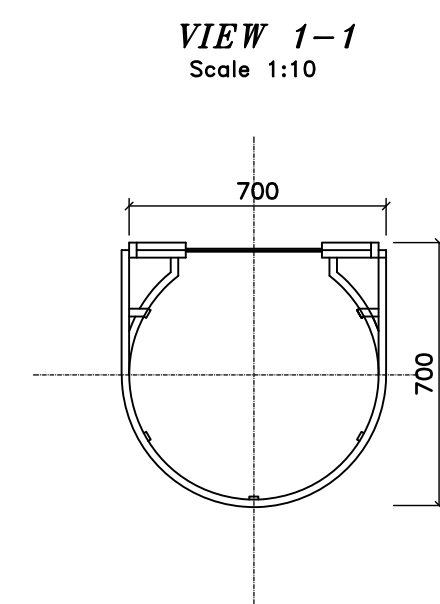
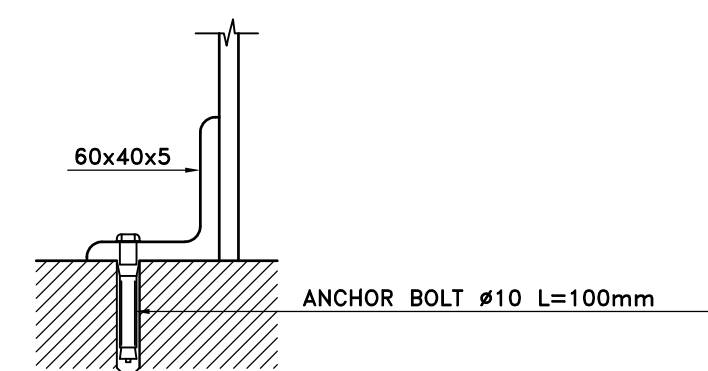
DETAIL OF INTERNAL LADDER AND UPPER FIXING
PLAN VIEW

[illegible]

*DETAIL 4: FIXING OF
EXTERNAL LADDER TO RESERVOIR WALLS*



DETAIL 3: FIXING OF EXTERNAL LADDER TO CONCRETE



REMARKS:

- * FLOOR SLAB INVERT LEVEL ± 0.00 : SEE LAYOUT DAWINGS.
- * DOUBLE THREADED WATERPROOF CONNECTION SLEEVES SHALL BE USED FOR RESERVOIR FORMWORKS TIE-RODS.
- * HOLES MADE BY THE TIE-RODS SHALL BE FILLED WITH A NON SHRINK GROUT BY MEANS OF SPECIAL APPLICATION METHODS.
- * ALL THE DIMENSIONS ARE IN mm.
- * SCALING FROM THESE DRAWINGS IS NOT ALLOWED.
- * PROVIDE PERFORATED DRAIN PIPES, $\phi 4"$ IN THE GRAVEL PROTECTION LAYER.

<i>Rev.</i>	<i>Date</i>	<i>Dsgn</i>	<i>Drwn</i>	<i>Chk'd</i>	<i>Appr'd</i>
-------------	-------------	-------------	-------------	--------------	---------------

REPUBLIC OF LEBANON

COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION



BUREAU TECHNIQUE POUR LE DEVELOPPEMENT

JALL ED DIB - HAJAL Bldg
P.O.BOX:70492 - ANTELIA

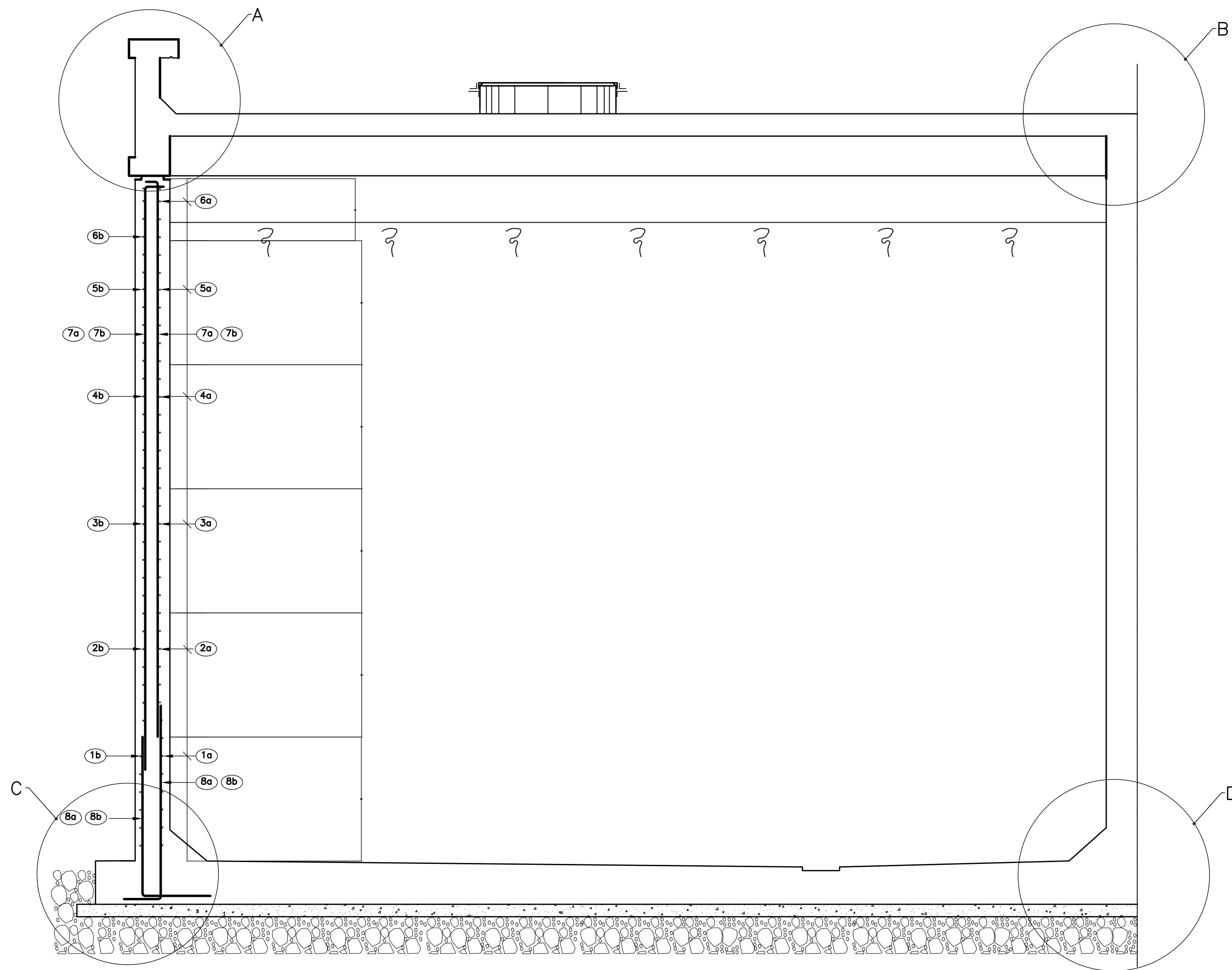
CONSTRUCTION OF WATER WORKS IN OUADI ED DELEM-QABB ELIAS AND MRAIJAT

QABB ELIAS RESERVOIRS (CAPACITY 2X400 m³)	DETAILS FORMWORK
--	---------------------

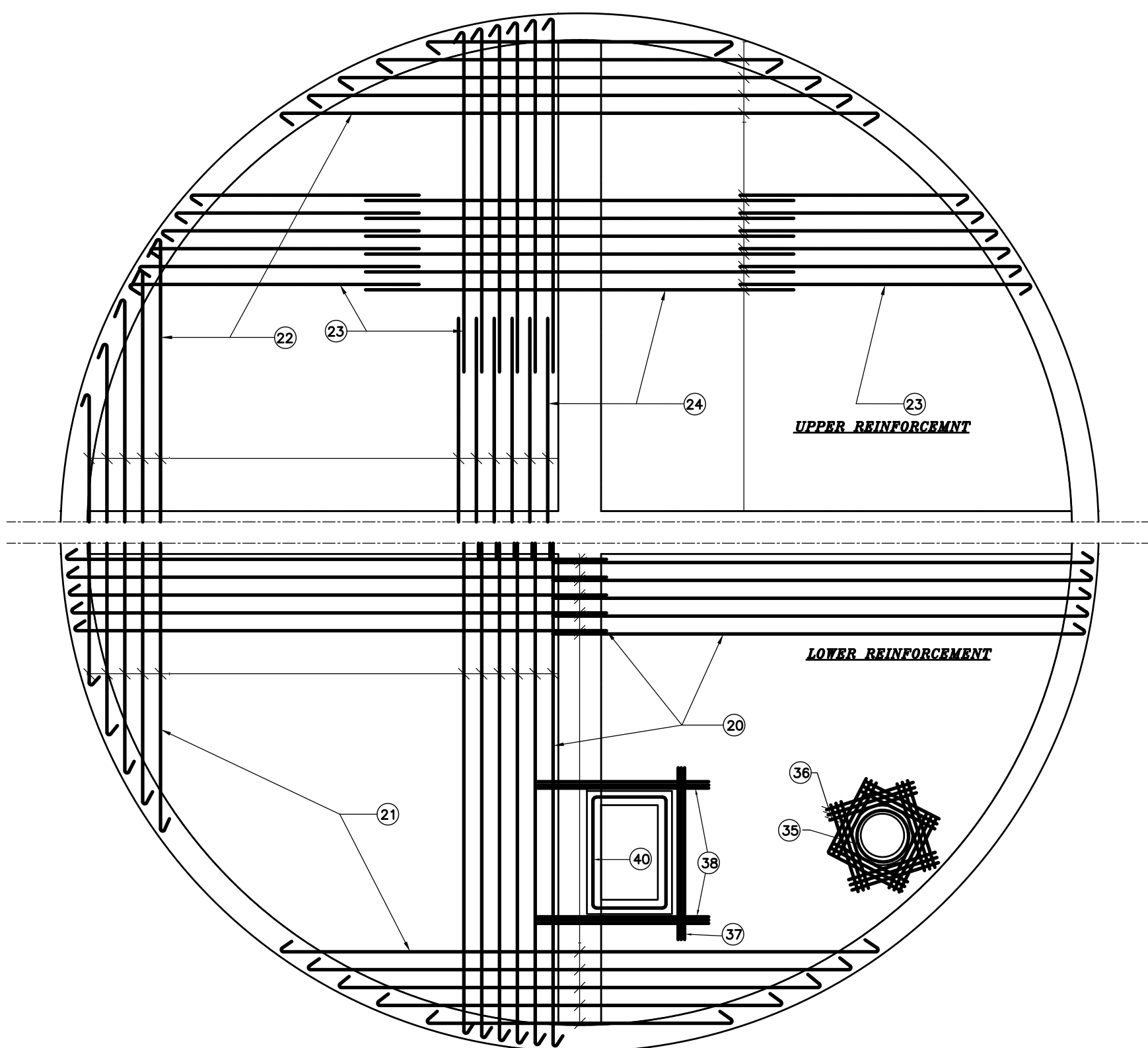
<i>FILE NAME</i>	<i>DESIGNED BY</i>	<i>DRAWN BY</i>	<i>CHECKED BY</i>
509W-RS02-C01-07	W. SEIFEDDINE	W. SEIFEDDINE	W. SEIFEDDINE

<i>DATE</i>	<i>SCALE</i>	<i>SHEET No.</i>	<i>DRAWING No.</i>
JULY 2019	1:50-1:20-1:10 1:5-1:1	5/7	509W-RS02-C05

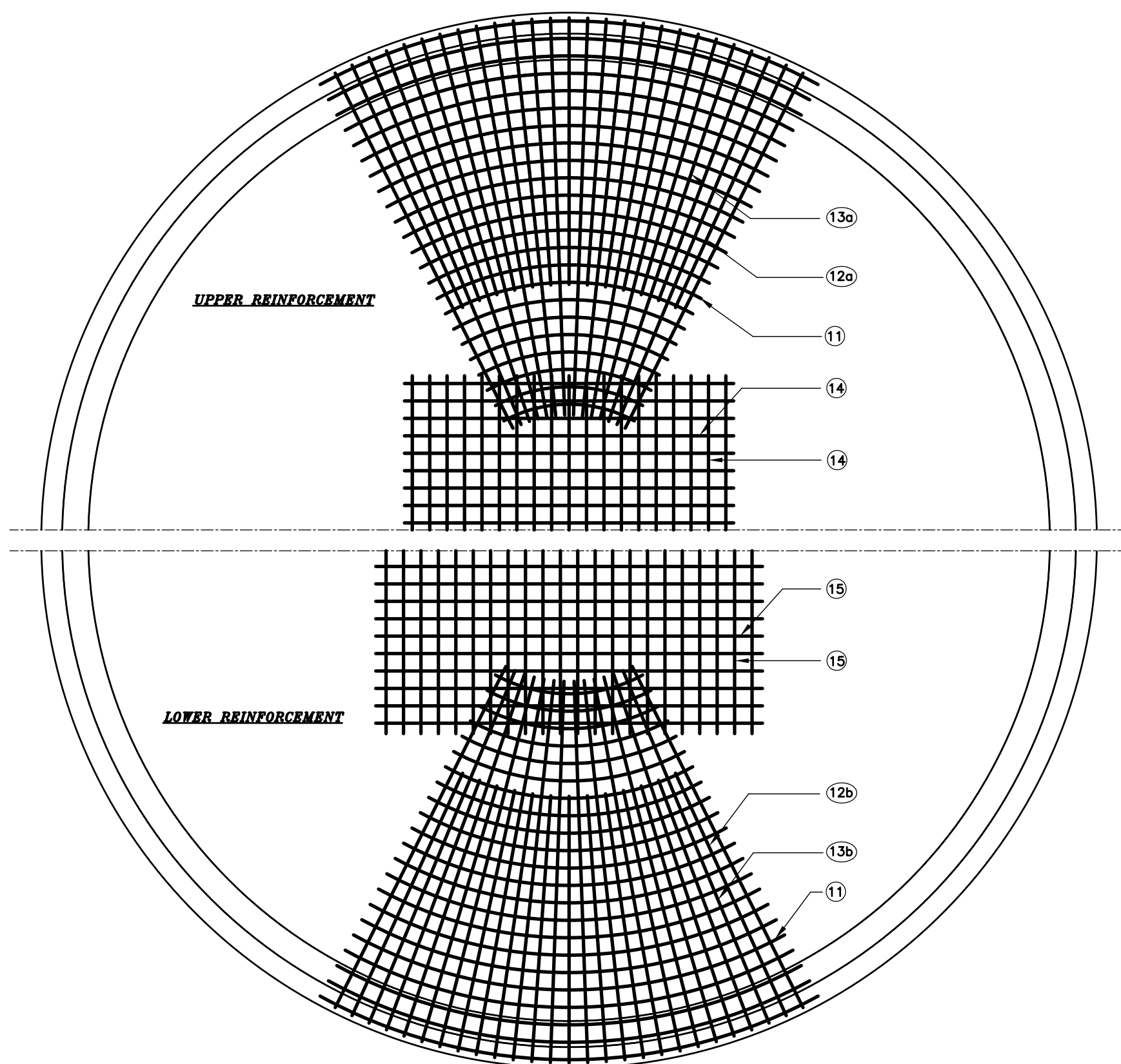
VERTICAL HALF-SECTION REINFORCEMENT



COVER SLAB REINFORCEMENT



MAT REINFORCEMENT



CAPACITY 400

Des.	Nbr of layer per ml	Diameter T or Ø	Length (m)	Nbre of bars/layer	Type	Total Nber of bars
1a	6	T14	8.70	4		24
1b	6	T14	8.90	4		24
2a	5	T14	8.70	4		20
2b	5	T14	8.90	4		20
3a	7	T12	8.70	4		28
3b	7	T12	8.90	4		28
4a	6	T12	8.70	4		24
4b	6	T12	8.90	4		24
5a	6	T12	8.70	4		24
5b	6	T12	8.90	4		24
6a	6	T12	8.70	4		12
6b	6	T12	8.90	4		12
7a	3	T12	4.00			198
7b	3	T12	4.50			198
8a	3	T14	2.80			198
8b	3	T14	2.30			198
9a	6	T14	2.00			198
9b	2 (Per section)	T12	8.15	4		8
10a	6	T12	0.50			198
10b	6	T14	1.00			198
11	7	T16	2.70 to 8.20	4		240
12a	3	T16	2.90			99
12b	3	T16	3.00			99
13a	3	HA16	4.20			99
13b	3	HA16	4.40			99
14	7	HA16	3.15			44
15	8	HA16	3.70			64
16	8 (Per section)	HA12	6.00			8
17a	6	Ø8	1.50			35
17b	6	Ø8	1.35			35
18a	8 (Per section)	T12	2.40			8
18b	1 (Per section)	T12	2.75			1
19	8 (Per section)	T12	1.50			8
20	6	T14	3.35 to 5.45	2		212
21	6	T14	2.70 to 6.20	1		24
22	6	T12	2.70 to 6.20	1		24
23	6	T12	1.80 to 3.80	2		212
24	6	T12	4.00	1		106
25a	4 (Per section)	T20	6.00	2		16
25b	4 (Per section)	T20	4.00	2		16
26	4 (Per section)	T16	3.50	2		16
27a	4 (Per section)	T25	6.25	1		8
27b	4 (Per section)	2T25+ 2T20	3.75	1		8
28	-	-	-	-	-	-
29a	Ø8	1.70	n1=1Ø6.12 n2=11Ø6.20	0.52		128
29b	Ø8	1.50	n1=1Ø6.12 n2=11Ø6.20	0.53		128
29c	-	-	-	-	-	-
30	-	-	-	-	-	-
31a	15 (Per section)	T12	8.50 to 8.80	4		60
31b	8 (Per section)	T12	8.50 to 8.80	4		32
31c	5	Ø8	0.80	-		165
32	5	Ø8	1.00			165
33a	5	Ø8	3.00			165
33b	5	Ø8	0.90			165
34	4 (Per section)	T10	3.25 to 4.00	1		4
35	5	Ø8	1.10			15
36		T12	1.50			48
37		T14	3.00			3
38		T12	2.60			6
39		T10	2.60			3
40		T10	2.40			6
41	8 (Per section)	T10	1.30 to 1.70			24
42	5	Ø8	1.50			23

NOTES FOR RESERVOIRS:

REINFORCED CONCRETE:

CONCRETE GRADE C30 FOR ALL STRUCTURES.

MIX ELEMENTS:

ORDINARY PORTLAND CEMENT(400 kg/m³ FOR LATERAL WALLS, FLOOR SLAB, AND THE COVER SLAB, 350 kg/m³ ELSEWHERE) SHOULD COMPLY WITH BS12.
AGGREGATES (SAND AND GRAVELS) FROM NATURAL QUARRIES, SHOULD COMPLY WITH BS882.
WATER SHOULD COMPLY WITH THE REQUIREMENTS OF BS5328.

LEAN CONCRETE / CYCLOPEAN CONCRETE:

MIX MADE WITH ORDINARY PORTLAND CEMENT, CONCRETE GRADE C20
DOSING 250 kg/m³.

REINFORCEMENT:

DEFORMED HIGH STRENGTH STEEL BARS: SYMBOL T YIELD STRESS: F_y=420 MPa.
MILD STEEL BARS: SYMBOL Ø YIELD STRESS: F_y=250 MPa.

STRESSES:

SEVERE CONTROL

CONCRETE COMPRESSIVE STRENGTH AT 28 DAYS:

- ON A CUBE, a=150mm : 30 N/mm²- ON A CYLINDER, Ø=150mm, h=30mm : 25 N/mm²CONCRETE TENSILE STRENGTH AT 28 DAYS : 2.1 N/mm².

CONSTRUCTION JOINTS:

PROHIBITED IN RESERVOIR WALLS.

REDUCED TO THE STRICT MINIMUM ELSEWHERE PROVIDED THAT NECESSARY PRECAUTIONS ARE TAKEN, SUCH AS: SETTING RETARDERS, BONDING MATERIALS, WATER-STOP JOINTS.
MAXIMUM POURING HEIGHT: 1.50 m.

ADMIXTURES:

SETTING RETARDERS (CONSTRUCTION JOINTS).

WATERPROOFING ADMIXTURE (TO IMPROVE WATER PROOFNESS OF WALLS, FLOOR SLAB AND COVER SLAB).

THE USE OF CHLORINE BASED ADMIXTURES IS NOT ALLOWED.

EVERY ADMIXTURE SHALL BE APPROVED BY THE ADMINISTRATION.

CONCRETE COVER:

CLEARANCE BETWEEN THE EXTERNAL GENERATIVITY OF BARS AND THE FACINGS SHALL BE 4 cm FOR THE RESERVOIR FLOOR SLAB AND WALLS, 3 cm ELSEWHERE.

OVERLAPPING:

LAPS SHALL NOT BE LESS THAN FIFTY TIMES THE BAR DIAMETER.

WHERE SPLICE BARS ARE USED, THEIR LENGTH SHALL NOT BE LESS THAN 2x5Øp.

(Øp= NOMINAL DIAMETER OF BAR).

LAPS SHALL BE STAGGERED FROM ONE HOOP TO THE OTHER AND/OR ONE BAR TO THE OTHER IN ORDER TO REDUCE THE NUMBER OF LAPS IN THE SAME SECTION.

STIRRUPS Ø8 SHALL BE USED ON EACH LAP.

BENDING:

Ø > 12mm MECHANICAL.

Ø ≤ 12mm MANUEL (POSSIBLY).

STRAIGHTENING OF BENDED BARS IS NOT ALLOWED.

DRAWINGS CONSIDERATION:

TOP BARS

BOTTOM BARS

FORMWORK:

ALL EXECUTED CONCRETE SHALL BE FAIR FACE CONCRETE (METALLIC OR PLYWOOD FORMWORK).

WATERPROOFING:

SURFACE WATERPROOFING TREATMENT OF RESERVOIR WALLS, COVER AND FLOOR SLAB.

COVER WATERPROOFING CONSISTING OF A VAPOUR BARRIER, A THERMAL INSULATION, A WATERPROOFING MEMBRANE AND ITS PROTECTION.

WATERPROOFING DETAILS:

(1) V.B.

- SBS/OR/APP 1x2.5mm

- ADHERENCE OR SEMI-ADHERENCE APPLICATION

(2) INSULATION

- t=variable min. t=50mm

- EXPANDED POLYSTYRENE λ=0.037kcal/h.m.2.°C

- WITH $\frac{1}{\lambda} = \frac{1}{\lambda_1} + \frac{1}{\lambda_2}$

- SEMI-ADHERENCE OR TOTAL ADHERENCE

APPLICATION ON VAPOUR BARRIER.

(3) WATERPROOFING

- SBS/OR/APP 1x2mm

WITH MINERAL PROTECTION.

- SEMI-ADHERENCE OR TOTAL ADHERENCE APPLICATION.

IN FACTORY MINERAL AUTOPROTECTION.

(5) n> 150mm (NULL SLOPE)

REMARKS:

* FLOOR SLAB INVERT LEVEL ±0.00; SEE LAYOUT DAWINGS.

* DOUBLE THREADED WATERPROOF CONNECTION SLEEVES SHALL BE USED FOR RESERVOIR FORMWORKS TIE-RODS.

* HOLES MADE BY THE TIE-RODS SHALL BE FILLED WITH A NON SHRINK GROUT BY MEANS OF SPECIAL INJECTION METHODS.

* ALL THE DIMENSIONS ARE IN mm.

* SCALING FROM THESE DRAWINGS IS NOT ALLOWED.

* PROVIDE PERFORATED DRAIN PIPES, Ø4" IN THE GRAVEL PROTECTION LAYER.

REPUBLIC OF LEBANON
COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

ED BUREAU TECHNIQUE POUR LE DEVELOPPMENT

JALL ED DIB - HAJAL Bldg

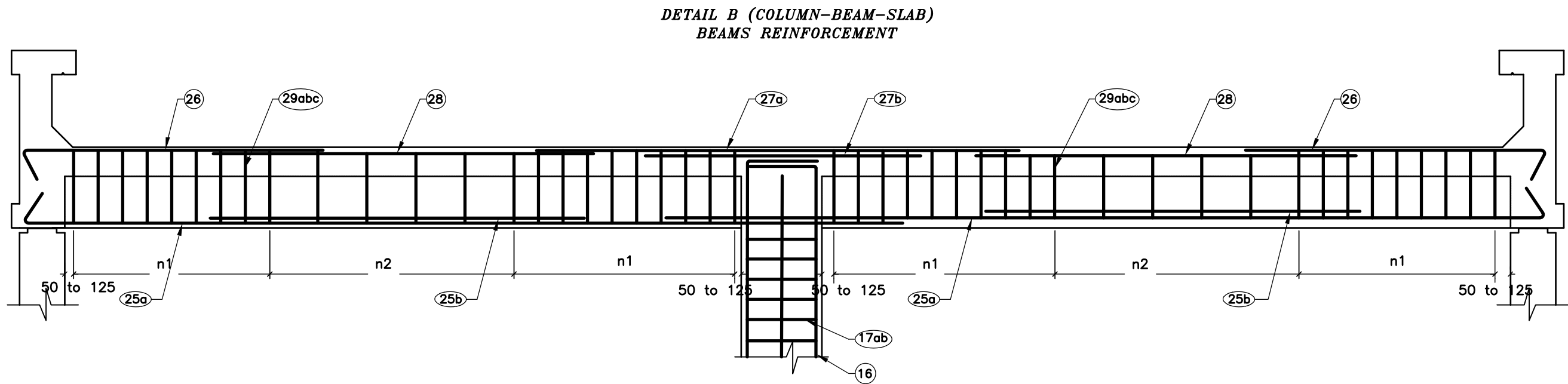
P.O.BOX:70492 - ANTELAS

PHONE:(04) 712157/712158 (03) 291016

FAX: (04) 712159

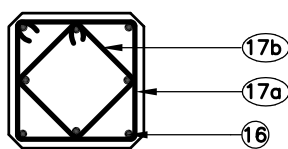
CONSTRUCTION OF WATER WORKS IN
QUADI ED DELEM-QABB ELIAS AND MRAIJATQABB ELIAS RESERVOIRS
(CAPACITY 2X400 m³)VERTICAL HALF-SECTION AND PLANS
REINFORCEMENT

FILE NAME	DESIGNED BY	DRAWN BY	CHECKED BY
509W-RS02-C01-07	W. SEIFEDDINE	W. SEIFEDDINE	W. SEIFEDDINE
DATE	SCALE	SHEET No.	DRAWING No.
JULY 2019	N.T.S.	6/7	509W-RS02-C06

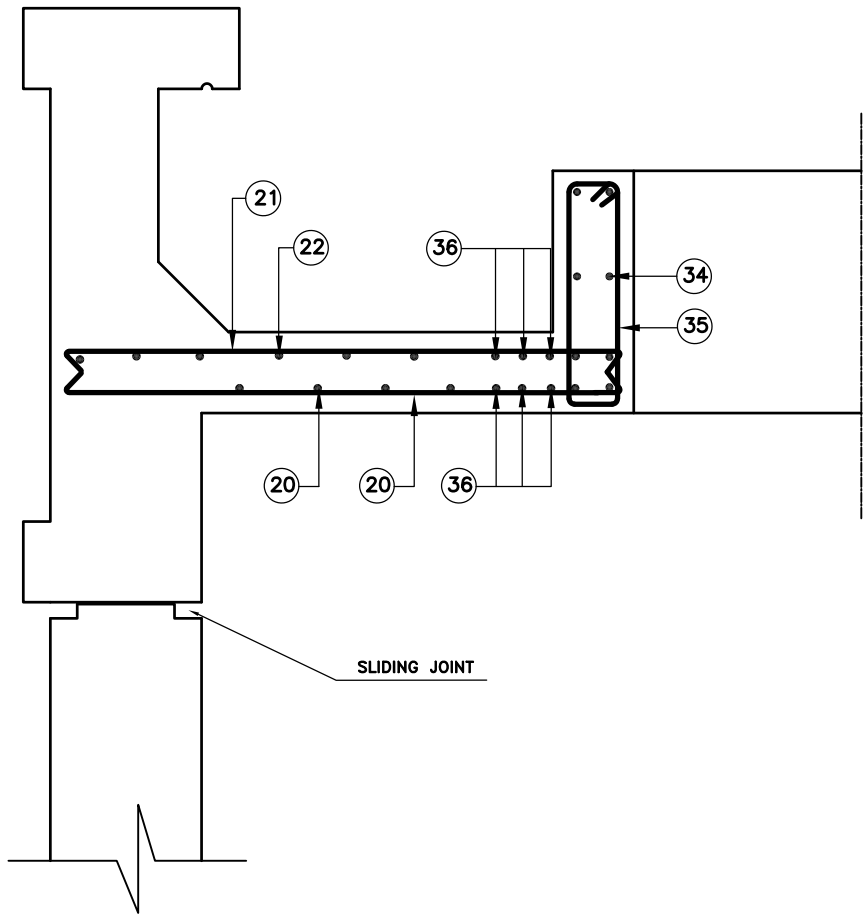


COLUMN REINFORCEMENT

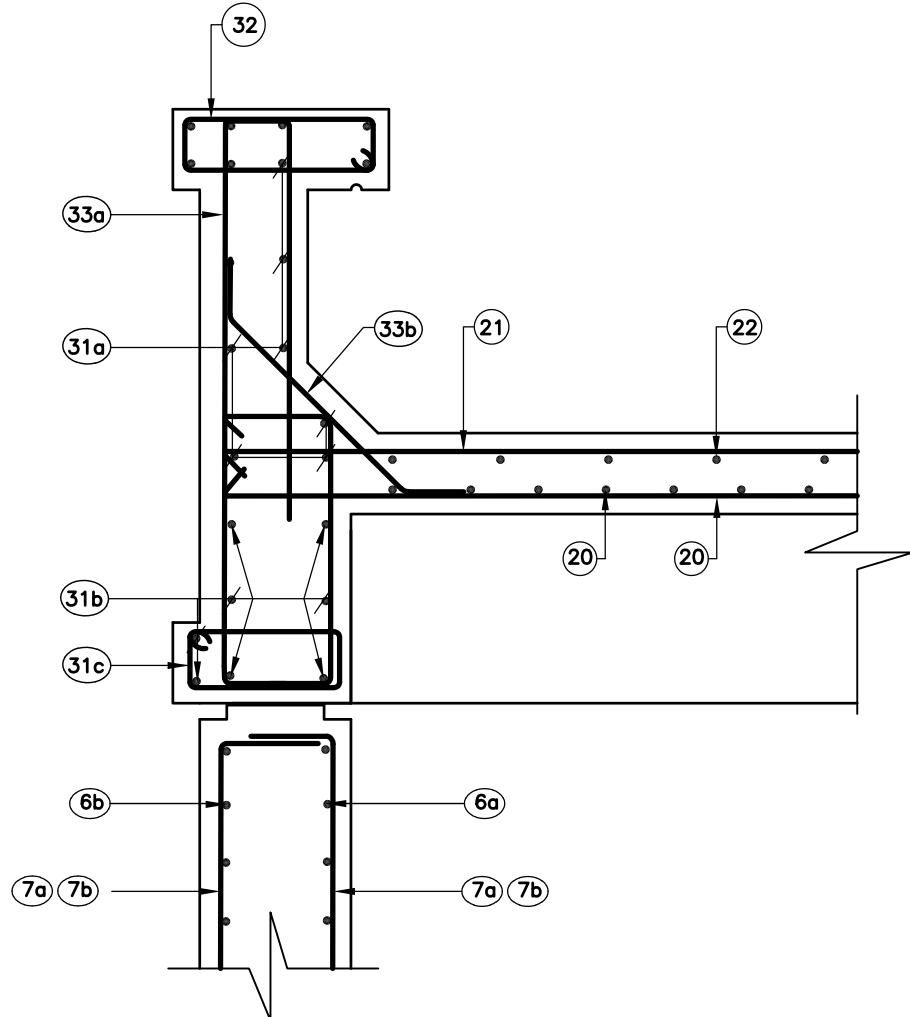
SECTION AT MID SPAN



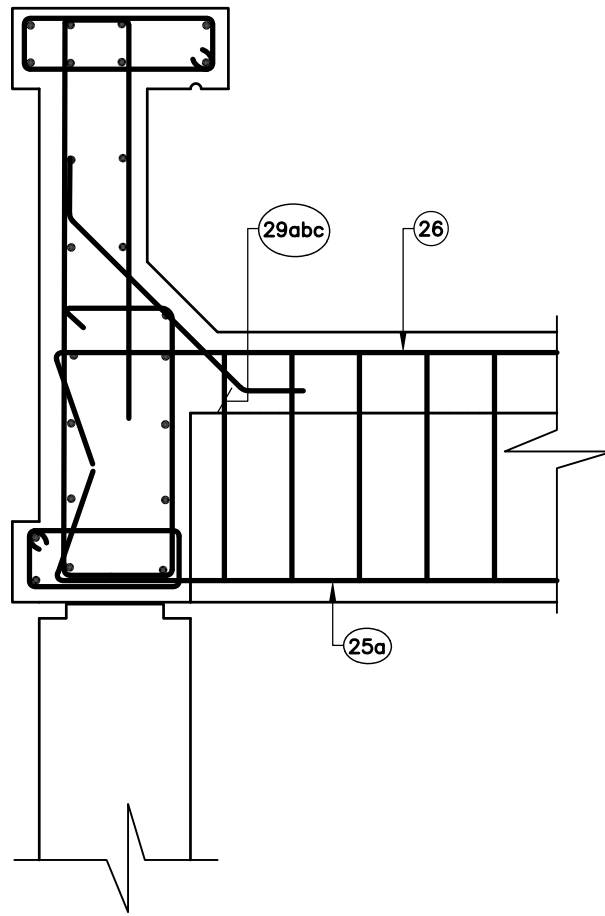
SLAB-TRAP DOOR REINFORCEMENT



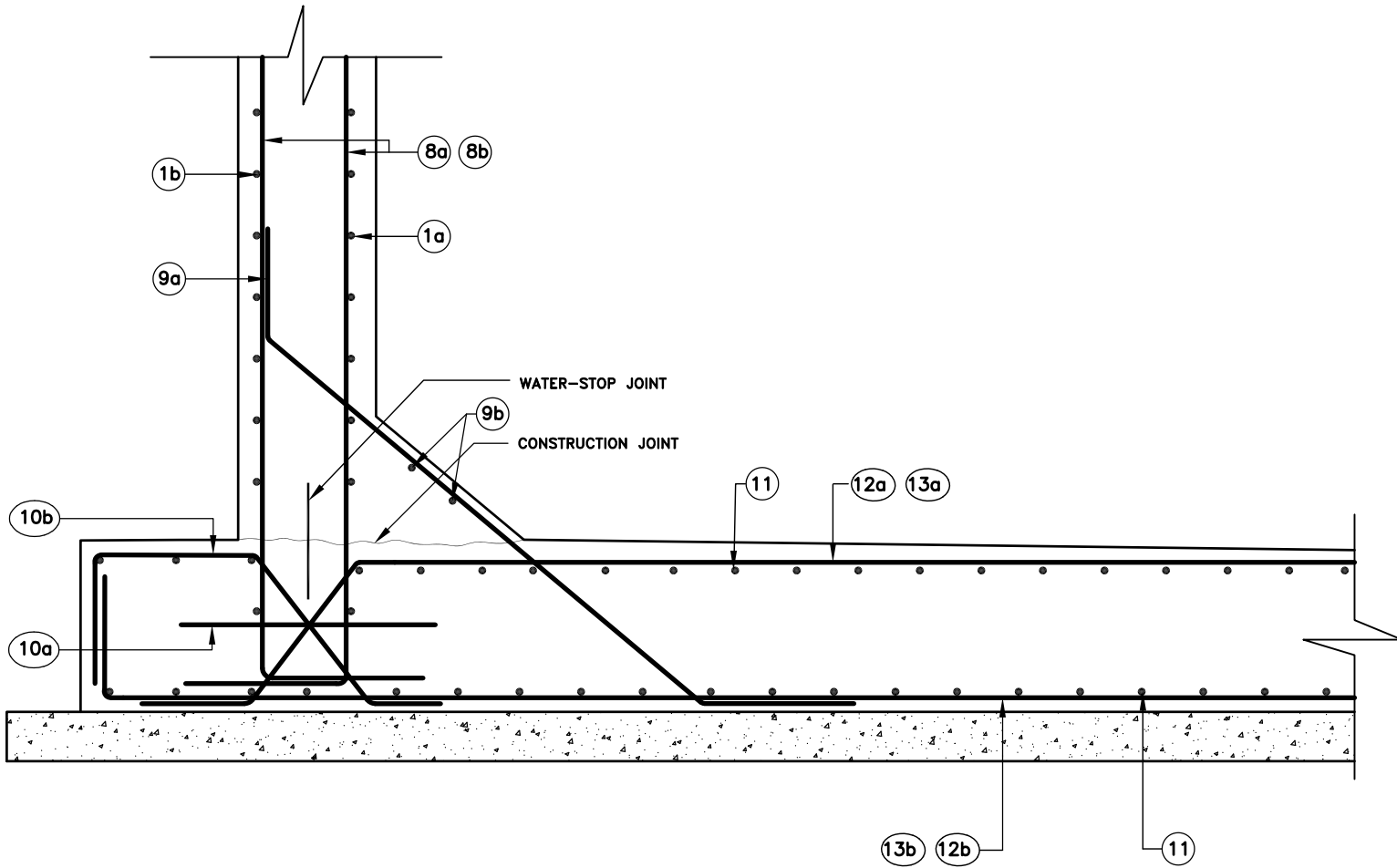
DETAIL A
SLAB-PARAPET REINFORCEMENT



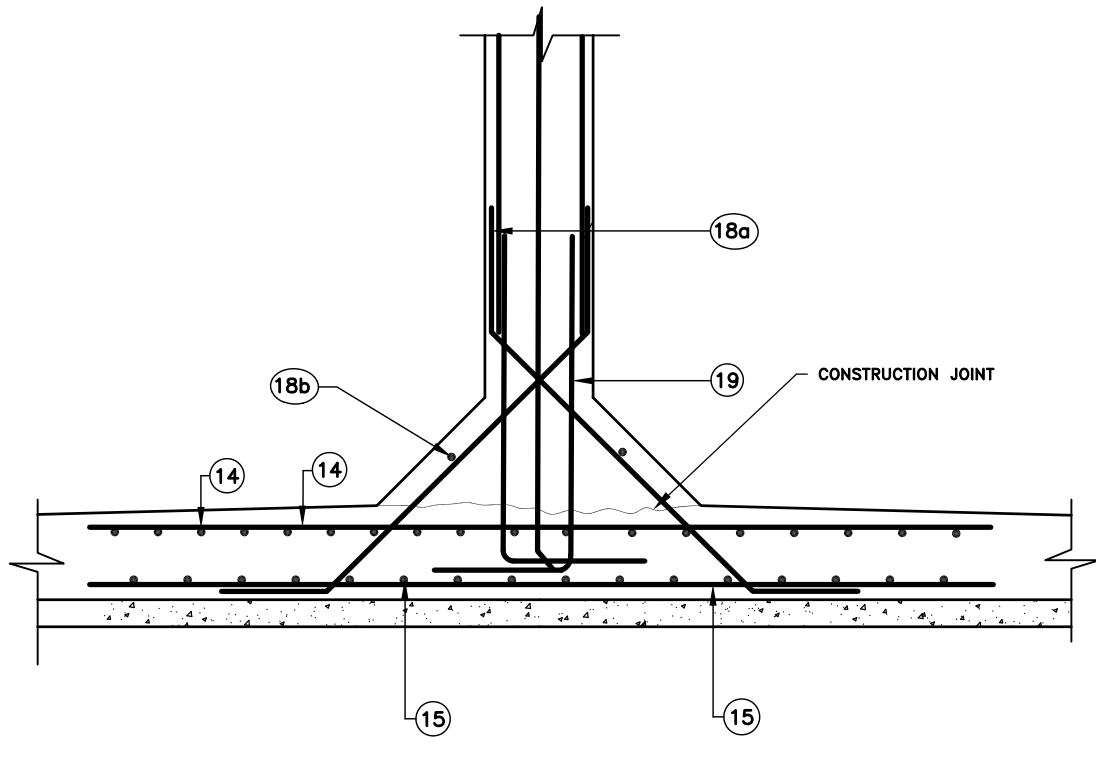
BEAM-PARAPET REINFORCEMENT



DETAIL C
MAT-WALL REINFORCEMENT



DETAIL D
COLUMN-MAT REINFORCEMENT



CAPACITY 400									
Des.	Nbr of layer per ml	Diameter T or Ø	Length (m)	Nbre of bars/layer	Type	total Nbr of bars			
1a	6	T14	8.70	4	8.70	24			
1b	6	T14	8.90	4	8.90	24			
2a	5	T14	8.70	4	8.70	20			
2b	5	T14	8.90	4	8.90	20			
3a	7	T12	8.70	4	8.70	28			
3b	7	T12	8.90	4	8.90	28			
4a	6	T12	8.70	4	8.70	24			
4b	6	T12	8.90	4	8.90	24			
5a	6	T12	8.70	4	8.70	24			
5b	6	T12	8.90	4	8.90	24			
6a	6	T12	8.70	4	8.70	12			
6b	6	T12	8.90	4	8.90	12			
7a	3	T12	4.00		0.20	198			
7b	3	T12	4.50		0.20	198			
8a	3	T14	2.80		0.40	198			
8b	3	T14	2.30		0.40	198			
9a	6	T14	2.00		0.50	198			
9b	2 (Per section)	T12	8.15	4	8.15	8			
10a	6	T12	0.50		0.50	198			
10b	6	T14	1.00		0.20	198			
11	7	T16	2.70 to 8.20	4	2.70 to 8.20	240			
12a	3	T16	2.90		0.10	99			
12b	3	T16	3.00		0.20	99			
13a	3	HA16	4.20		0.15	99			
13b	3	HA16	4.40		0.20	99			
14	7	HA16	3.15		3.15	44			
15	8	HA16	3.70		3.70	64			
16	8 (Per section)	HA12	6.00		0.50	8			
17a	6	#8	1.50		0.30	35			
17b	6	#8	1.35		0.30	35			
18a	8 (Per section)	T12	2.40		0.50	8			
18b	1 (Per section)	T12	2.75		0.65	1			
19	8 (Per section)	T12	1.50		1.10	8			
20	6	T14	3.35 to 5.45	2	3.35 to 5.45	212			
21	6	T14	2.70 to 8.20	1	2.70 to 8.20	24			
22	6	T12	2.70 to 8.20	1	2.70 to 8.20	24			
23	6	T12	1.80 to 3.80	2	1.80 to 3.80	212			
24	6	T12	4.00	1	4.00	106			
25a	4 (Per section)	T20	6.00	2	6.00	16			
25b	4 (Per section)	T20	4.00	2	4.00	16			
26	4 (Per section)	T16	3.50	2	3.50	16			
27a	4 (Per section)	T25	6.25	1	6.25	8			
27b	4 (Per section)	2725+ 2720	3.75	1	3.75	8			
28	-	-	-	-	-	-			
29a	#8	1.70	n1=10x0.12 n2=11x0.20	0.30	0.40	128			
29b	#8	1.50	n1=10x0.12 n2=11x0.20	0.23	0.40	128			
29c	-	-	-	-	-	-			
30	-	-	-	-	-	-			
31a	15 (Per section)	T12	8.50 to 8.80	4	8.50 to 8.80	60			
31b	8 (Per section)	T12	8.50 to 8.80	4	8.50 to 8.80	32			
31c	5	#8	0.80	-	0.90	165			
32	5	#8	1.00		0.84	165			
33a	5	#8	3.00		0.50	165			
33b	5	#8	0.90		0.50	165			
34	4 (Per section)	T10	3.25 to 4.00	1	3.25 to 4.00	4			
35	5	#8	1.10		0.50	15			
36		T12	1.50		1.50	48			
37		T14	3.00		3.00	3			
38		T12	2.60		2.60	6			
39		T10	2.60		2.60	3			
40		T10	2.40		2.40	6			
41	8 (Per section)	T10	1.30 to 1.70		1.30 to 1.70	24			
42	5	#8	1.50		0.50	23			

NOTES FOR RESERVOIRS:

REINFORCED CONCRETE:
CONCRETE GRADE C30 FOR ALL STRUCTURES.

MIX ELEMENTS:
ORDINARY PORTLAND CEMENT(400 Kg/m³ FOR LATERAL WALLS, FLOOR SLAB, AND THE COVER SLAB; 350 kg/m³ ELSEWHERE) SHOULD COMPLY WITH BS12.
AGGREGATES (SAND AND GRAVELS) FROM NATURAL QUARRIES, SHOULD COMPLY WITH BS882.
WATER SHOULD COMPLY WITH THE REQUIREMENTS OF BS5328.

LEAN CONCRETE / CYCLOPEAN CONCRETE:
MIX MADE WITH ORDINARY PORTLAND CEMENT, CONCRETE GRADE C20
DOSING 250 kg/m³.

REINFORCEMENT:
DEFORMED HIGH STRENGTH STEEL BARS: SYMBOL T YIELD STRESS: Fy=420 MPa.
MILD STEEL BARS: SYMBOL # YIELD STRESS: Fy=250 MPa.

STRESSES:
SEVERE CONTROL
CONCRETE COMPRESSIVE STRENGTH AT 28 DAYS:
- ON A CUBE, ø=150mm : 30 N/mm²
- ON A CYLINDER, ø=150mm, h=30mm : 25 N/mm²
CONCRETE TENSILE STRENGTH AT 28 DAYS : 2.1 N/mm².

CONSTRUCTION JOINTS:
PROHIBITED IN RESERVOIR WALLS.
REDUCED TO THE STRICT MINIMUM ELSEWHERE PROVIDED THAT NECESSARY PRECAUTIONS ARE TAKEN, SUCH AS: SETTING RETARDERS, BONDING MATERIALS, WATER-STOP JOINTS.
MAXIMUM POURING HEIGHT: 1.50 m.

ADMIXTURES:
SETTING RETARDERS (CONSTRUCTION JOINTS).
WATERPROOFING ADMIXTURE (TO IMPROVE WATER PROOFNESS OF WALLS, FLOOR SLAB AND COVER SLAB).
THE USE OF CHLORINE BASED ADMIXTURES IS NOT ALLOWED.
EVERY ADMIXTURE SHALL BE APPROVED BY THE ADMINISTRATION.

CONCRETE COVER:
CLEARANCE BETWEEN THE EXTERNAL GENERATRIX OF BARS AND THE FACINGS SHALL BE 4 cm FOR THE RESERVOIR FLOOR SLAB AND WALLS, 3 cm ELSEWHERE.

OVERLAPPING:
LAPS SHALL NOT BE LESS THAN FIFTY TIMES THE BAR DIAMETER.
WHERE SPLICE BARS ARE USED, THEIR LENGTH SHALL NOT BE LESS THAN 2x50ø.
(ø= NOMINAL DIAMETER OF BAR).
LAPS SHALL BE STAGGERED FROM ONE HOOP TO THE OTHER AND/OR ONE BAR TO THE OTHER IN ORDER TO REDUCE THE NUMBER OF LAPS IN THE SAME SECTION.
STIRRUPS #8 SHALL BE USED ON EACH LAP.

BENDING:
ø > 12mm MECHANICAL.
ø ≤ 12mm MANUEL (POSSIBLY).
STRAIGHTENING OF BENDED BARS IS NOT ALLOWED.

DRAWINGS CONSIDERATION:
--- TOP BARS
--- BOTTOM BARS

FORMWORK:
ALL EXECUTED CONCRETE SHALL BE FAIR FACE CONCRETE (METALLIC OR PLYWOOD FORMWORK).

WATERPROOFING:
SURFACE WATERPROOFING TREATMENT OF RESERVOIR WALLS, COVER AND FLOOR SLAB.
COVER WATERPROOFING CONSISTING OF A VAPOUR BARRIER, A THERMAL INSULATION, A WATERPROOFING MEMBRANE AND ITS PROTECTION.

WATERPROOFING DETAILS:
(1) S.B. - SBS/OR/APP (≥2.5mm
(2) INSULATION - ADHERENCE OR SEMI-ADHERENCE APPLICATION
- t=variable min. t=50mm
- EXPANDED POLYSTYRENE λ=0.037kcal/h.m².°C
- WITH t = L1 + L2
λ λ1 λ2
(3) WATERPROOFING - SEMI-ADHERENCE OR TOTAL ADHERENCE
APPLICATION ON VAPOUR BARRIER.
- SBS/OR/APP ttotal ≥4mm
WITH MINERAL PROTECTION.
(4) PROTECTION - SEMI-ADHERENCE OR TOTAL ADHERENCE APPLICATION.
- IN FACTORY MINERAL AUTOPROTECTION.
(5) H"> 150mm (NIL SLOPE)

REMARKS:
* FLOOR SLAB INVERT LEVEL ±0.00: SEE LAYOUT DRAWINGS.
* DOUBLE THREADED WATERPROOF CONNECTION SLEEVES SHALL BE USED FOR RESERVOIR FORMWORKS TIE-RODS.
* HOLES MADE BY THE TIE-RODS SHALL BE FILLED WITH A NON SHRINK GROUT BY MEANS OF SPECIAL INJECTION METHODS.
* ALL THE DIMENSIONS ARE IN mm.
* SCALING FROM THESE DRAWINGS IS NOT ALLOWED.
* PROVIDE PERFORATED DRAIN PIPES, ø4" IN THE GRAVEL PROTECTION LAYER.

Rev.	Date	Dsgn	Drwn	Chk'd	Appr'd

REPUBLIC OF LEBANON

COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

BUREAU TECHNIQUE POUR LE DEVELOPEMENT
JALL ED DIB - HAJAL Bldg PHONE:(04) 712157/712158 (03) 291016
P.O.BOX:70492 - ANTELIAS FAX: (04) 712159

CONSTRUCTION OF WATER WORKS IN

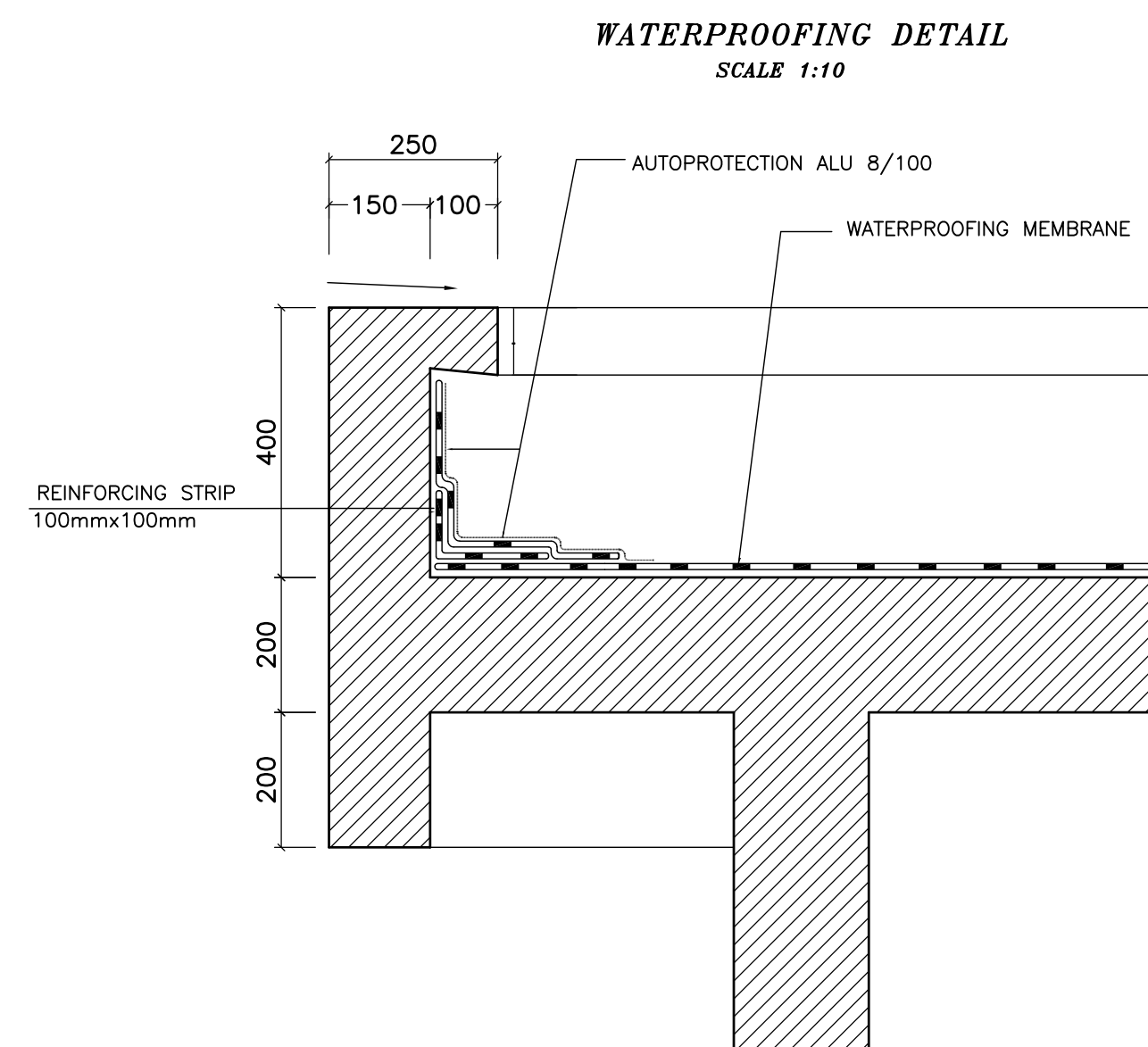
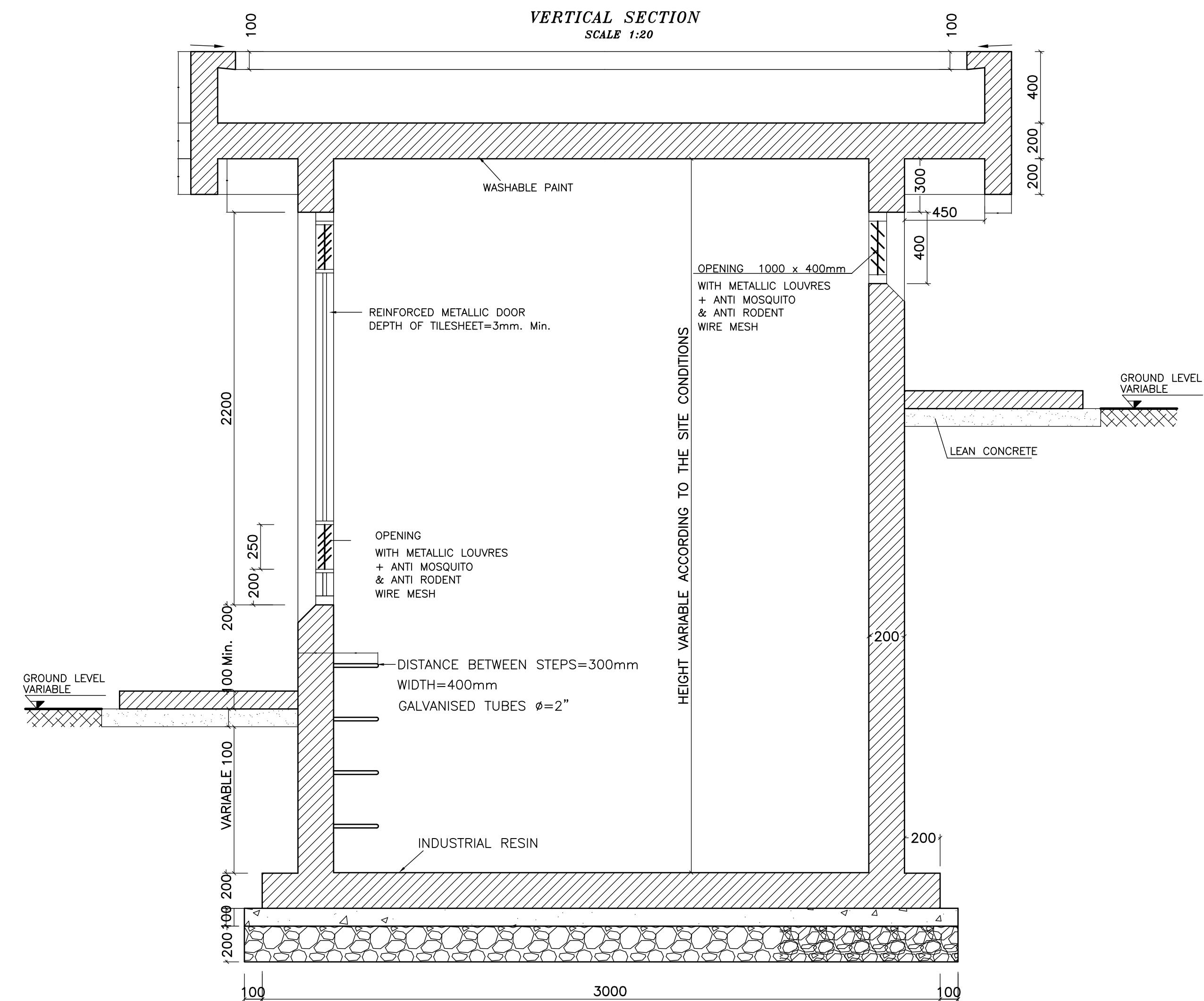
QUADI ED DELEM-QABB ELIAS AND MRAIJAT

QABB ELIAS RESERVOIRS
(CAPACITY 2X400 m³)

SECTIONS AND DETAILS
REINFORCEMENT

FILE NAME	DESIGNED BY	DRAWN BY	CHECKED BY
509W-RS02-C01-07	W. SEIFEDDINE	W. SEIFEDDINE	W. SEIFEDDINE

DATE	SCALE	SHEET No.	DRAWING No.
JULY 2019	N.T.S.	7/7	509W-RS02-C07



		BOTTOM STEEL REINFORCEMENT TOP STEEL REINFORCEMENT				
Rev.	Date	Dsgn	Drwn	Chk'd	Appr'd	

ED BUREAU TECHNIQUE POUR LE DEVELOPPEMENT

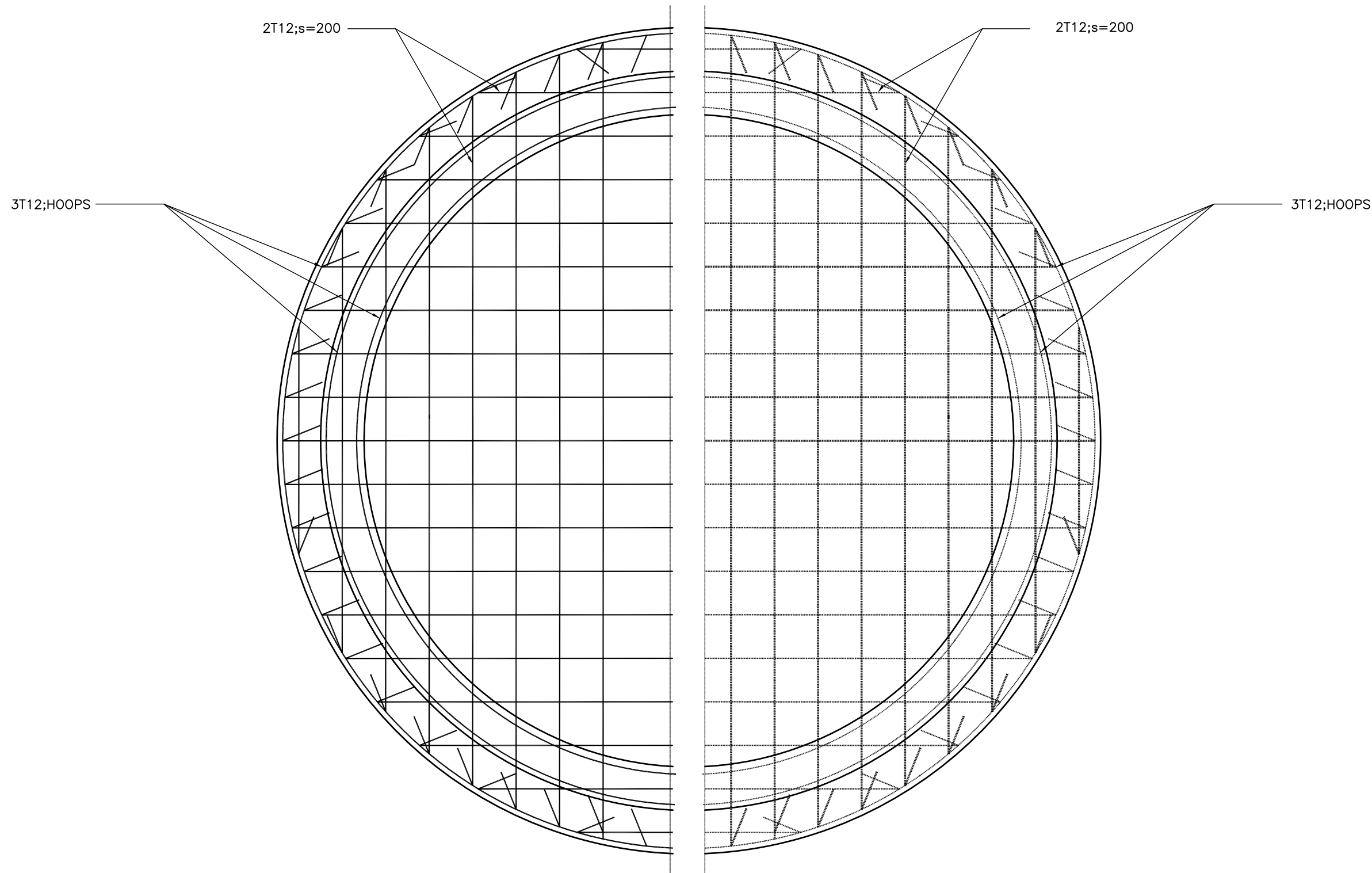
JALL ED DIB - HAJAL Bldg TEL:(04) 712157/712158
P.O.BOX:70492 - ANTELIA5 FAX:(04) 712159

QABB ELIAS VALVE CHAMBER INSIDE DIAMETER 300 cm INSIDE HEIGHT VARIABLE BETWEEN 300 & 600cm DEPENDING ON THE GROUND LEVEL	FORMWORK REINFORCEMENT
--	---------------------------

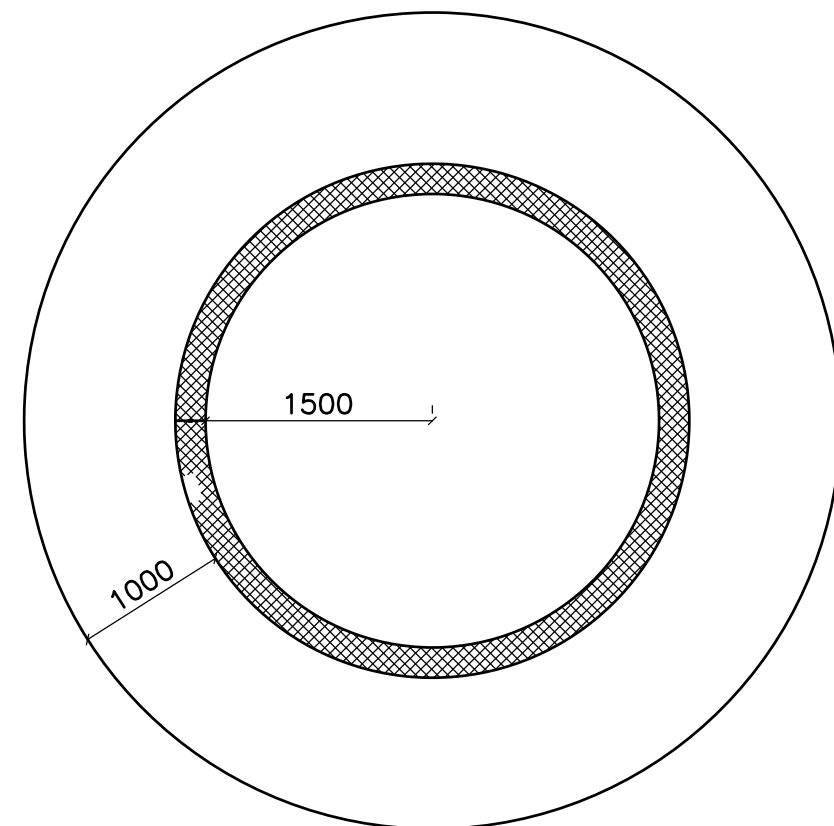
<i>DRAWING No.</i>	<i>DESIGNED BY</i>	<i>DRAWN BY</i>	<i>CHECKED BY</i>
509W-RS02-C08-09	W. SEIFEDDINE	W. SEIFEDDINE	W. SEIFEDDINE

<i>DATE</i>	<i>SCALE</i>	<i>SHEET No.</i>	<i>SEQ. No.</i>
JULY 2019	1:50-1:20-1:10	1/2	509W-RS02-C08

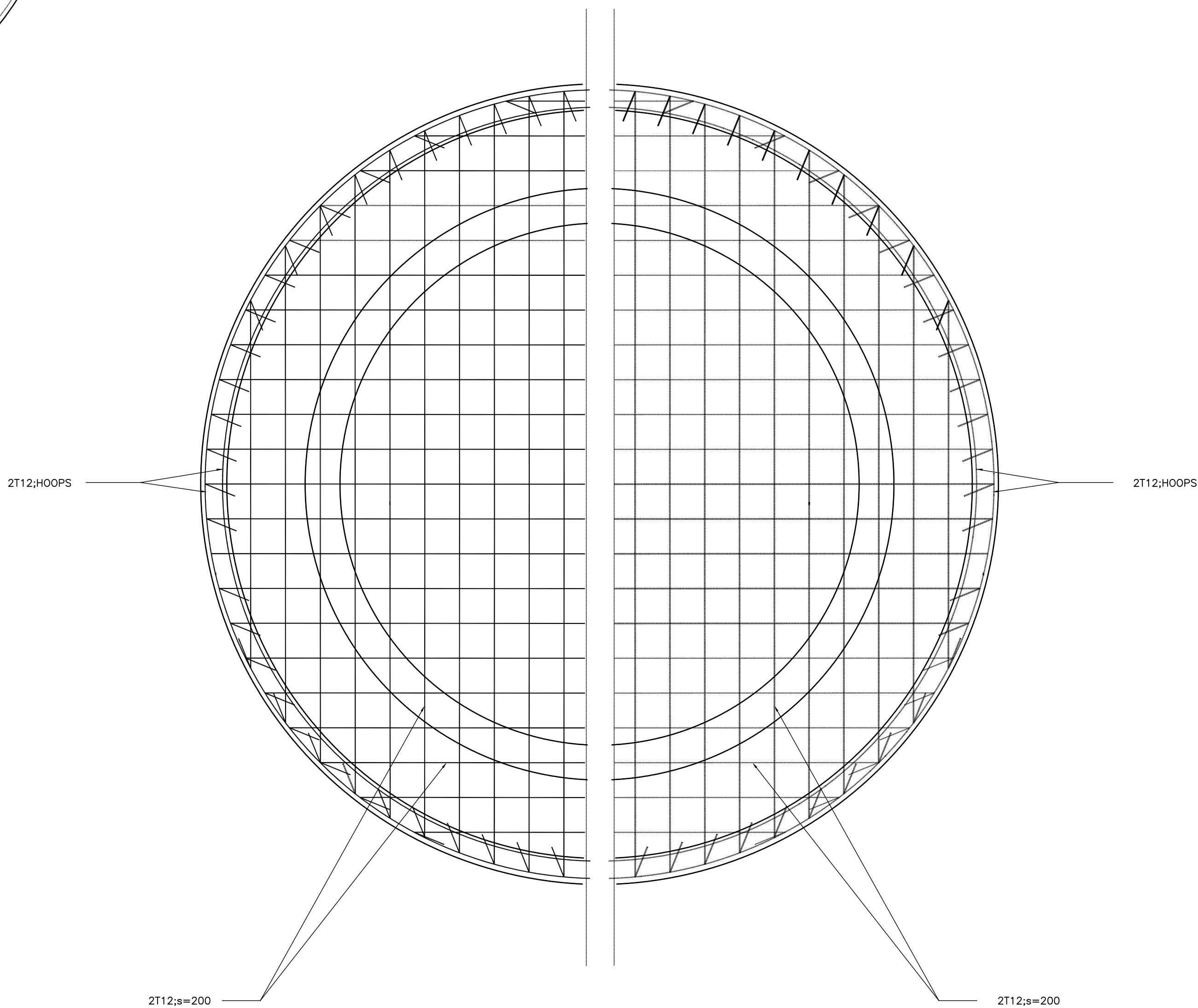
SCALE 1:20



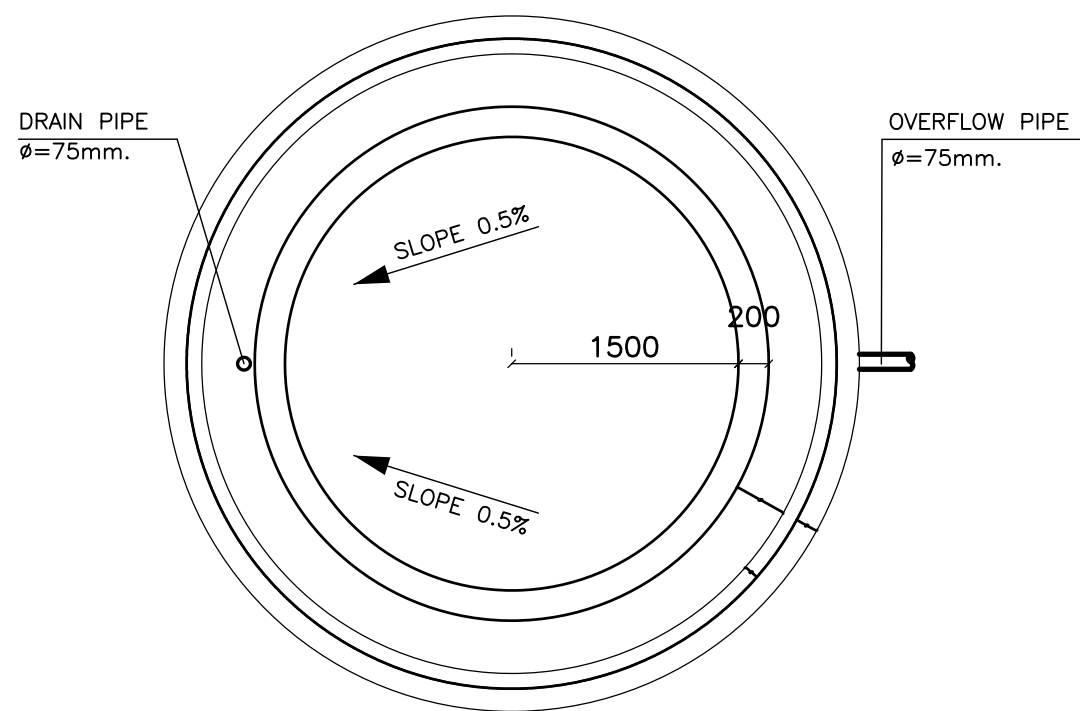
SCALE 1:50



SCALE 1:20



SCALE 1:50



REINFORCED CONCRETE:

REINFORCED CONCRETE SHALL BE MADE OF ORDINARY PORTLAND CEMENT AND SHALL BE OF GRADE C30.
THE MINIMUM CEMENT CONTENT IN CONCRETE FOR WALLS, FLOOR SLABS AND RESERVOIR DOME SHALL BE 350 KG PER 1 M3

LEAN CONCRETE/CYCLOPEAN CONCRETE:

LEAN AND CYCLOPEAN CONCRETES SHALL BE MADE OF ORDINARY PORTLAND CEMENT,
AND SHALL BE OF GRADE C20.
THE MINIMUM CEMENT CONTENT SHALL BE 250 KG PER 1 M3

REINFORCEMENT:

DEFORMED HIGH STRENGTH STEEL BARS: SYMBOL T YIELD STRESS: $F_y = 400 \text{ N/mm}^2$.
MILD STEEL BARS : SYMBOL $\emptyset$ YIELD STRESS: $F_y = 215 \text{ N/mm}^2$.

CONCRETE STRENGTH:

SEVERE CONTROL.	
CONCRETE COMPRESSIVE STRENGTH AT 28 DAYS:	
- ON A CUBE SAMPLES (DIMENSIONS= 150 x 150 x 150 mm):	37.5 N/mm ²
- ON A CYLINDER SAMPLES (DIAMETER= 160mm, HEIGHT= 320mm):	30 N/mm ²
CONCRETE TENSILE STRENGTH AT 28 DAYS :	
MAXIMUM FREE DROP HEIGHT:	2.4 N/mm ² 1500 mm

CONSTRUCTION JOINTS:

CONSTRUCTION JOINTS SHALL BE FORMED ONLY IN THE POSITIONS SHOWN ON THE DRAWINGS OR AS INDICATED BY THE ENGINEER AND CONCRETING SHALL BE CARRIED OUT CONTINUOUSLY BETWEEN AND UP TO JOINTS.

WATER-STOP JOINTS SHALL BE INCORPORATED IN CONSTRUCTION JOINTS FOR RETAINING AQUEOUS LIQUIDS IN PROPERLY CONSTRUCTED JOINTS.

AD MIXTURES:

SETTING RETARDERS (CONSTRUCTION JOINTS).
WATERPROOFING ADMIXTURE; TO ACHIEVE WATERTIGHT CONCRETE STRUCTURES
THE USE OF CHLORINE BASED ADMIXTURES IS NOT ALLOWED.
ALL ADMIXTURES SHALL BE APPROVED BY THE ENGINEER.

CONCRETE COVER:

40 mm COVER OVER REINFORCEMENT, INCLUDING STIRRUPS AND DISTRIBUTION BARS FOR RESERVOIR FLOOR SLABS AND WALLS, AND 30 mm ELSEWHERE.

BARS OVERLAPPING:

MINIMUM LENGTH OF OVERLAP WILL BE 50 TIMES THE DIAMETER OF THE BARS.
LAPS OF ADJACENT PARALLEL REINFORCEMENT BARS SHALL BE STAGGERED.
FABRIC REINFORCEMENT SHALL BE LAPPED AT LEAST 40 DIAMETERS OR TWO SQUARES,
WHICHEVER IS THE GREATER.
ALL LAPS OF BARS ARE TO BE TIED TIGHTLY WITH SIX LAPS OF 1.5 mm ANNEALED
IRON WIRE AT INTERVALS OF TEN DIAMETERS OF THE BARS.

BENDING:

$\phi > 12\text{mm}$ MECHANICAL.
 $\phi \leq 12\text{mm}$ MANUAL (POSSIBLY).
 STRAIGHTENING OF BENDED BARS IS NOT ALLOWED.

FORMWORK:

FAIR FACE CONCRETE FORMWORK SHALL BE EMPLOYED FOR ALL EXPOSED CONCRETE
FACES OR AS DIRECTED BY THE ENGINEER.
EMBEDDED WIRE TIES FOR HOLDING FORMS WILL NOT BE PERMITTED IN CONCRETE
WALLS WHICH ARE TO COME INTO CONTACT WITH LIQUIDS.
WIRE TIES MAY BE USED FOR CONCRETE WALLS TO BE PLASTERED AND SHALL BE CUT
BACK AT LEAST 15 mm FROM THE FACE OF THE CONCRETE.
HOLES LEFT IN THE CONCRETE SURFACES AFTER CUTTING BACK OF WIRE TIES AND
REMOVAL OF FASTENERS OR HOLDING RODS OR SLEEVES, AND THE INSIDES OF SLEEVES
WHERE SLEEVES ARE USED, SHALL BE COMPLETELY FILLED WITH AN APPROVED
NON-SHRINKING MORTAR.

COVER WATERPROOFING CONSISTING OF A WATERPROOFING MEMBRANE
AND ITS PROTECTION

WATERPROOFING

- SBS/OR/APP $t_{total} \geq 4mm$
WITH MINERAL PROTECTION.
- SEMI-ADHERENCE OR TOTAL ADHERENCE APPLICATION.

PROTECTION

- IN FACTORY MINERAL AUTOPROTECTION

REMARKS:

- * ALL THE DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
- * DO NOT SCALE FROM THE DRAWINGS; DIMENSIONS SHALL BE INDICATED OR COMPUTED FROM THE DRAWINGS.
- * FLOOR SLAB INVERT LEVEL ± 0.00 : SEE LAYOUT DRAWINGS.
- * DOUBLE THREADED WATERPROOF CONNECTION SLEEVES SHALL BE USED FOR RESERVOIR FORMWORKS TIE-RODS.
- * HOLES MADE BY THE TIE-RODS SHALL BE FILLED WITH A NON SHRINK GROUT BY MEANS OF SPECIAL INJECTION METHODS.
- * PROVIDE PERFORATED DRAIN PIPES, 64" IN THE GRAVEL PROTECTION LAYER.

BOTTOM STEEL REINFORCEMENT
TOP STEEL REINFORCEMENT

<i>Rev.</i>	<i>Date</i>	<i>Dsgn</i>	<i>Drwn</i>	<i>Chk'd</i>	<i>Appr'd</i>

REPUBLIC OF LEBANON
COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION



BUREAU TECHNIQUE POUR LE DEVELOPPEMENT

JALL ED DIB – HAJAL Bldg
P.O.BOX:70492 – ANTELIAS

TEL:(04) 712157/712158
FAX:(04) 712159

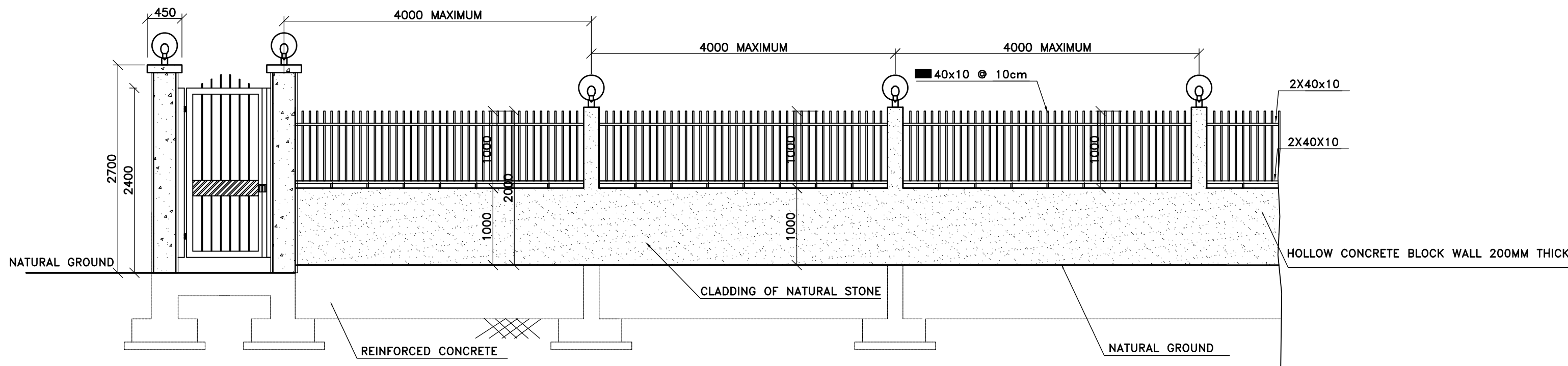
CONSTRUCTION OF WATER WORKS IN OUADI ED DELEM-QABB ELIAS AND MRAIJAT

QABB ELIAS VALVE CHAMBER
INSIDE DIAMETER 300 cm
INSIDE HEIGHT VARIABLE BETWEEN
300 & 600cm DEPENDING ON
THE GROUND LEVEL

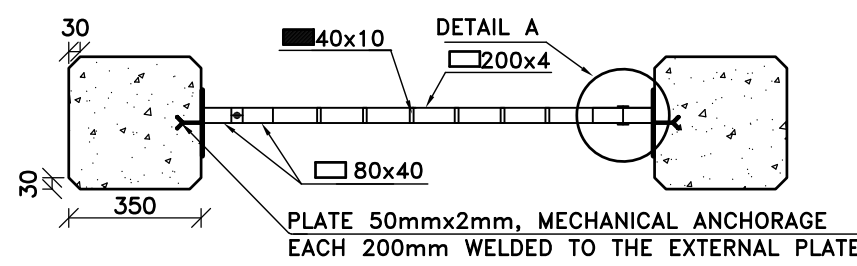
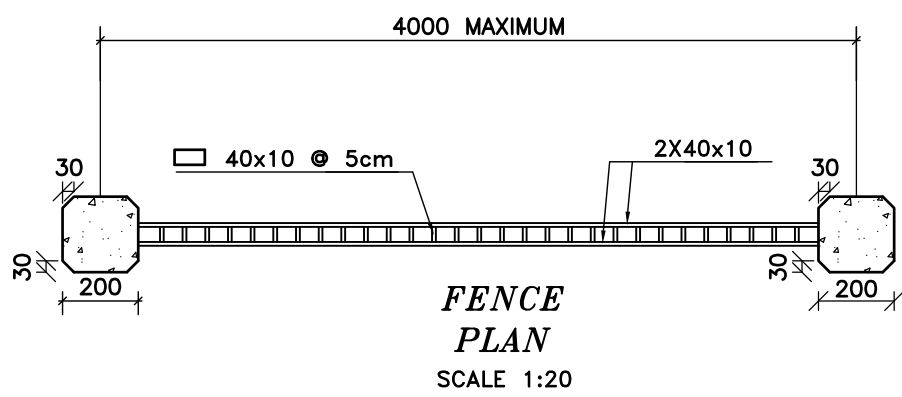
FORMWORK
REINFORCEMENT

<i>DRAWING No.</i>	<i>DESIGNED BY</i>	<i>DRAWN BY</i>	<i>CHECKED BY</i>
509W-RS02-C08-09	W. SEIFEDDINE	W. SEIFEDDINE	W. SEIFEDDINE

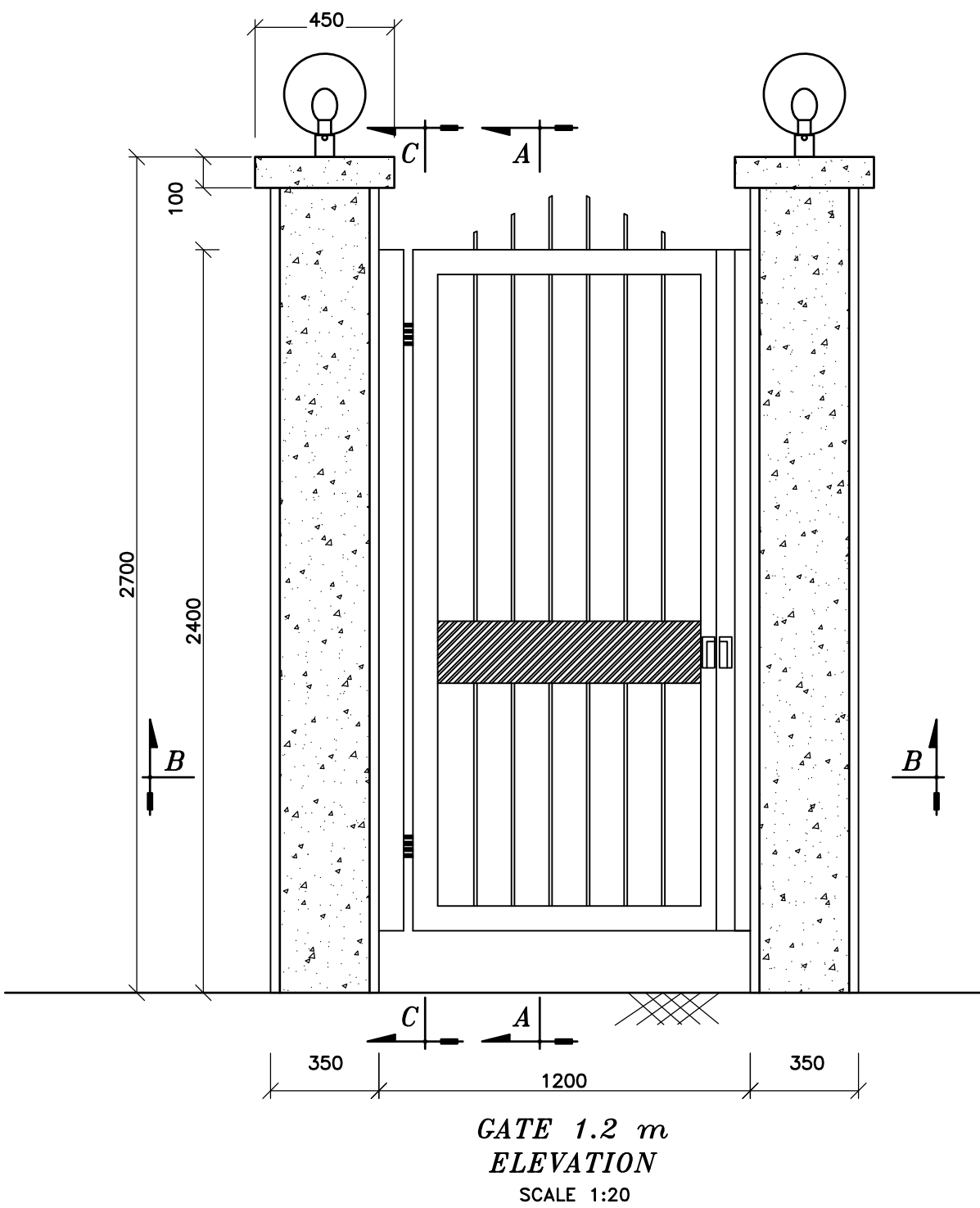
<i>DATE</i>	<i>SCALE</i>	<i>SHEET No.</i>	<i>SEQ. No.</i>
JULY 2019	1:50-1:20	2/2	509W-RS02-C09



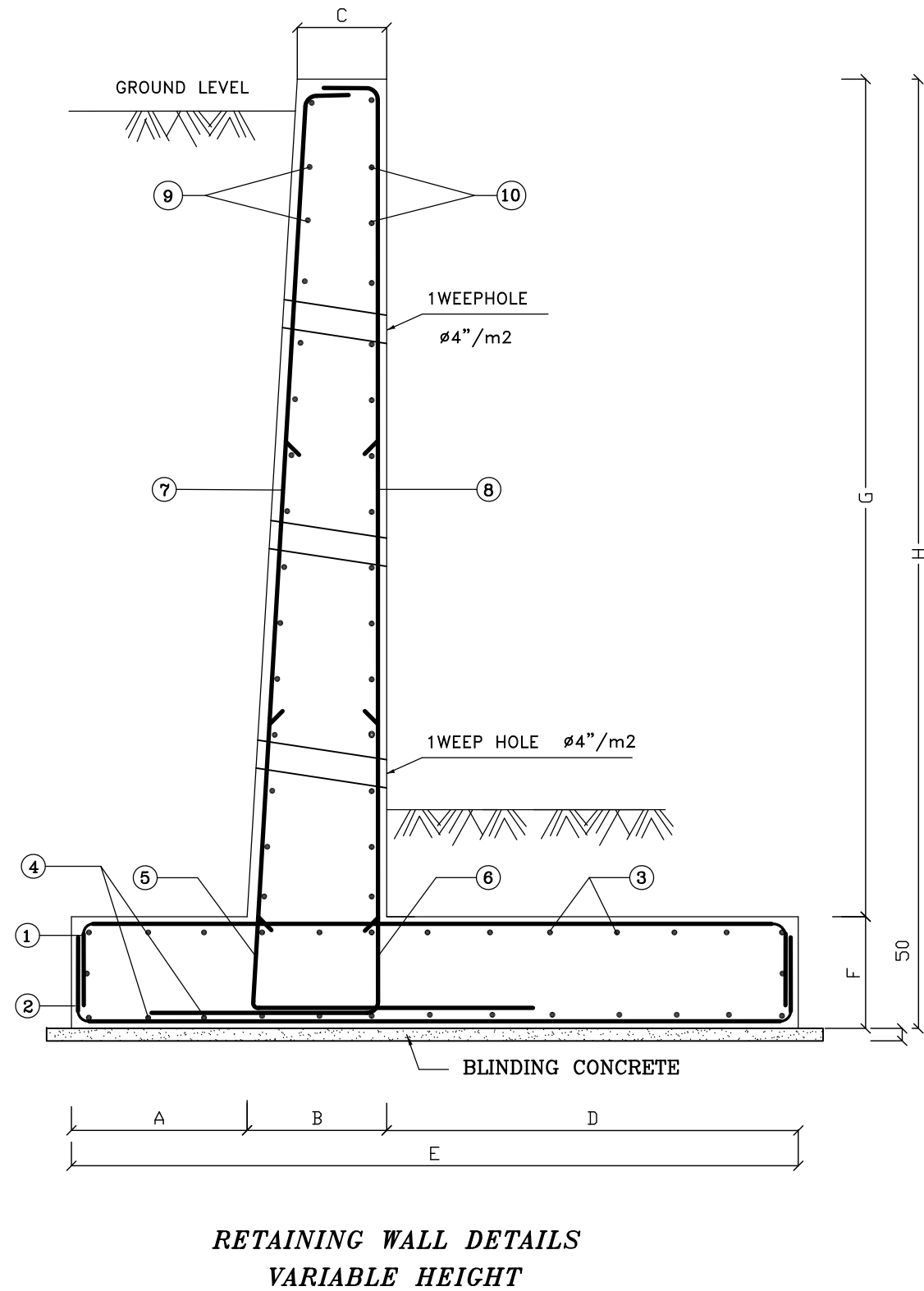
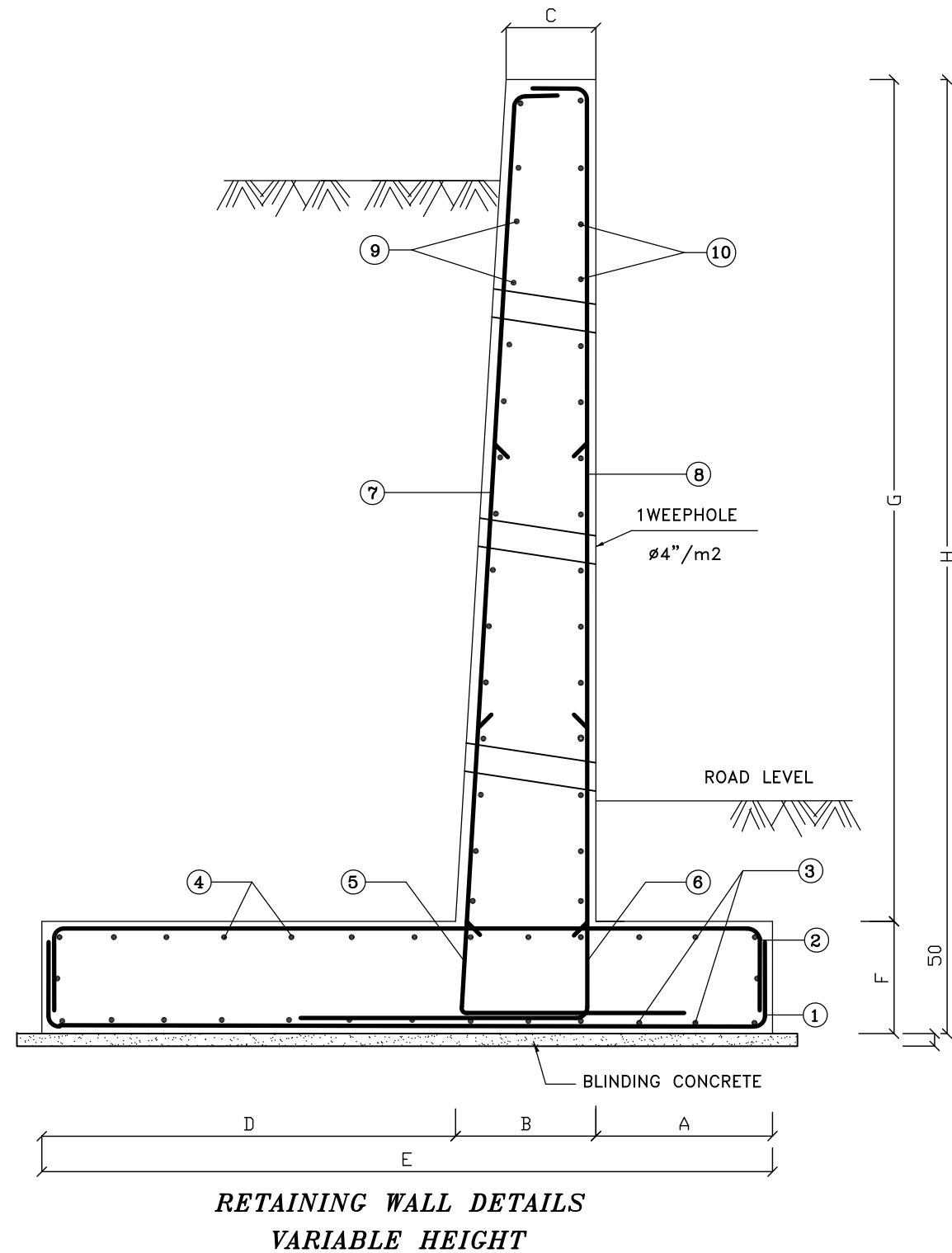
GATE ELEVATION 1.2 m
SCALE 1:50



SECTION B-B
SCALE 1:20



GATE 1.2 m
ELEVATION
SCALE 1:20



DIMENSIONS	FORMWORK SCHEDULE							
	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	H (mm)
TYPE I (1000)	200	200	200	400	800	200	1000	1200
TYPE II (1500)	200	200	200	700	1100	200	1500	1700
TYPE III (2000)	300	200	200	1000	1500	200	2000	2200
TYPE IV (2500)	300	250	200	1300	1850	250	2500	2750
TYPE V (3000)	400	300	200	1500	2200	300	3000	3300
TYPE VI (3500)	400	350	200	1800	2550	350	3500	3850

REINFORCEMENT (HEIGHT (mm))	REINFORCEMENT DETAILS									
	1	2	3	4	5	6	7	8	9	10
TYPE I (1000)	T12 Ø200 L=1000	T12 Ø20 L=1000	T12 Ø200 L=6000	T12 Ø200 L=6000	T12 Ø200 L=1500	T12 Ø200 L=1500			T12 Ø200 L=6000	T12 Ø200 L=6000
TYPE II (1500)	T12 Ø200 L=1250	T12 Ø200 L=1250	T12 Ø200 L=6000	T12 Ø200 L=6000	T12 Ø200 L=2000	T12 Ø200 L=2000			T12 Ø200 L=6000	T12 Ø200 L=6000
TYPE III (2000)	T12 Ø200 L=1750	T12 Ø200 L=1750	T12 Ø200 L=6000	T12 Ø200 L=6000	T12 Ø200 L=2500	T12 Ø200 L=2500			T12 Ø200 L=6000	T12 Ø200 L=6000
TYPE IV (2500)	T12 Ø200 L=2250	T14 Ø200 L=2250	T12 Ø200 L=6000	T12 Ø200 L=6000	T14 Ø200 L=2000	T12 Ø200 L=2000	T14 Ø200 L=2500	T12 Ø200 L=2500	T12 Ø200 L=6000	T12 Ø200 L=6000
TYPE V (3000)	T12 Ø165 L=2500	T14 Ø165 L=2500	T12 Ø200 L=6000	T12 Ø200 L=6000	T14 Ø165 L=2000	T12 Ø165 L=2000	T14 Ø165 L=3000	T12 Ø165 L=3000	T12 Ø200 L=6000	T12 Ø200 L=6000
TYPE VI (3500)	T14 Ø165 L=3000	T16 Ø165 L=3000	T12 Ø200 L=6000	T12 Ø200 L=6000	T16 Ø165 L=2500	T14 Ø165 L=2500	T16 Ø165 L=3500	T12 Ø165 L=3500	T12 Ø200 L=6000	T12 Ø200 L=6000

NOTES FOR RESERVOIRS:

REINFORCED CONCRETE:
CONCRETE GRADE C30 FOR ALL STRUCTURES.

MIX ELEMENTS:
ORDINARY PORTLAND CEMENT(400 kg/m³ FOR LATERAL WALLS, FLOOR SLAB, AND THE COVER SLAB; 350 kg/m³ ELSEWHERE) SHOULD COMPLY WITH BS12.
AGGREGATES (SAND AND GRAVELS) FROM NATURAL QUARRIES, SHOULD COMPLY WITH BS882.
WATER SHOULD COMPLY WITH THE REQUIREMENTS OF BS5328.

LEAN CONCRETE / CYCLOPEAN CONCRETE:
MIX MADE WITH ORDINARY PORTLAND CEMENT, CONCRETE GRADE C20
DOSING 250 kg/m³.

REINFORCEMENT:
DEFORMED HIGH STRENGTH STEEL BARS: SYMBOL T YIELD STRESS: Fy=420 MPa.
MILD STEEL BARS: SYMBOL Ø YIELD STRESS: Fy=250 MPa.

STRESSES:
SEVERE CONTROL
CONCRETE COMPRESSIVE STRENGTH AT 28 DAYS:
- ON A CUBE, ø=150mm: 30 N/mm²
- ON A CYLINDER, ø=150mm, h=30mm: 25 N/mm²
CONCRETE TENSILE STRENGTH AT 28 DAYS: 2.1 N/mm².

CONSTRUCTION JOINTS:
PROHIBITED IN RESERVOIR WALLS.
REDUCED TO THE STRICT MINIMUM ELSEWHERE PROVIDED THAT NECESSARY PRECAUTIONS ARE TAKEN, SUCH AS: SETTING RETARDERS, BONDING MATERIALS, WATER-STOP JOINTS.
MAXIMUM POURING HEIGHT: 1.50 m.

ADMIXTURES:
SETTING RETARDERS (CONSTRUCTION JOINTS).
WATERPROOFING ADMIXTURE (TO IMPROVE WATER PROOFNESS OF WALLS, FLOOR SLAB AND COVER SLAB).
THE USE OF CHLORINE BASED ADMIXTURES IS NOT ALLOWED.
EVERY ADMIXTURE SHALL BE APPROVED BY THE ADMINISTRATION.

CONCRETE COVER:
CLEARANCE BETWEEN THE EXTERNAL GENERATRIX OF BARS AND THE FACINGS SHALL BE 4 cm FOR THE RESERVOIR FLOOR SLAB AND WALLS, 3 cm ELSEWHERE.

OVERLAPPING:
LAPS SHALL NOT BE LESS THAN FIFTY TIMES THE BAR DIAMETER.
WHERE SPLICE BARS ARE USED, THEIR LENGTH SHALL NOT BE LESS THAN 2x50ø.
(ø= NOMINAL DIAMETER OF BAR).
LAPS SHALL BE STAGGERED FROM ONE HOOP TO THE OTHER AND/OR ONE BAR TO THE OTHER IN ORDER TO REDUCE THE NUMBER OF LAPS IN THE SAME SECTION.
STIRRUPS ø8 SHALL BE USED ON EACH LAP.

BENDING:
ø > 12mm MECHANICAL.
ø ≤ 12mm MANUEL (POSSIBLY).
STRAIGHTENING OF BENDED BARS IS NOT ALLOWED.

DRAWINGS CONSIDERATION:
--- TOP BARS
--- BOTTOM BARS

FORMWORK:
ALL EXECUTED CONCRETE SHALL BE FAIR FACE CONCRETE (METALLIC OR PLYWOOD FORMWORK).

WATERPROOFING:
SURFACE WATERPROOFING TREATMENT OF RESERVOIR WALLS, COVER AND FLOOR SLAB.
COVER WATERPROOFING CONSISTING OF A VAPOUR BARRIER, A THERMAL INSULATION, A WATERPROOFING MEMBRANE AND ITS PROTECTION.

WATERPROOFING DETAILS:
(1) S.B. - SBS/OR/APP (≥2.5mm)
- ADHERENCE OR SEMI-ADHERENCE APPLICATION
(2) INSULATION - t=variable min. t=50mm
- EXPANDED POLYSTYRENE (λ=0.037kcal/h.m2.°C)
- WITH t₁ = t₂ / λ₁ λ₂
- SEMI-ADHERENCE OR TOTAL ADHERENCE
APPLICATION ON VAPOUR BARRIER.
(3) WATERPROOFING - SBS/OR/APP t_{total} ≥4mm
WITH MINERAL PROTECTION.
- SEMI-ADHERENCE OR TOTAL ADHERENCE APPLICATION.
- IN FACTORY MINERAL AUTOPROTECTION.
(4) PROTECTION - IN FACTORY MINERAL AUTOPROTECTION.
(5) H> 150mm (NIL SLOPE)

REMARKS:
• FLOOR SLAB INVERT LEVEL ±0.00: SEE LAYOUT DAWINGS.
• DOUBLE THREADED WATERPROOF CONNECTION SLEEVES SHALL BE USED FOR RESERVOIR FORMWORKS TIE-RODS.
• HOLES MADE BY THE TIE-RODS SHALL BE FILLED WITH A NON SHRINK GROUT BY MEANS OF SPECIAL INJECTION METHODS.
• ALL THE DIMENSIONS ARE IN mm.
• SCALING FROM THESE DRAWINGS IS NOT ALLOWED.
• PROVIDE PERFORATED DRAIN PIPES, ø4" IN THE GRAVEL PROTECTION LAYER.

Rev.	Date	Dsgn	Drwn	Chk'd	Appr'd
------	------	------	------	-------	--------

REPUBLIC OF LEBANON

COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

BUREAU TECHNIQUE POUR LE DEVELOPPEMENT
JALL ED DIB - HAJAL Bldg TEL:(04) 712157 / 712158
P.O.BOX:70492 - ANTELIAS FAX: (04) 712159

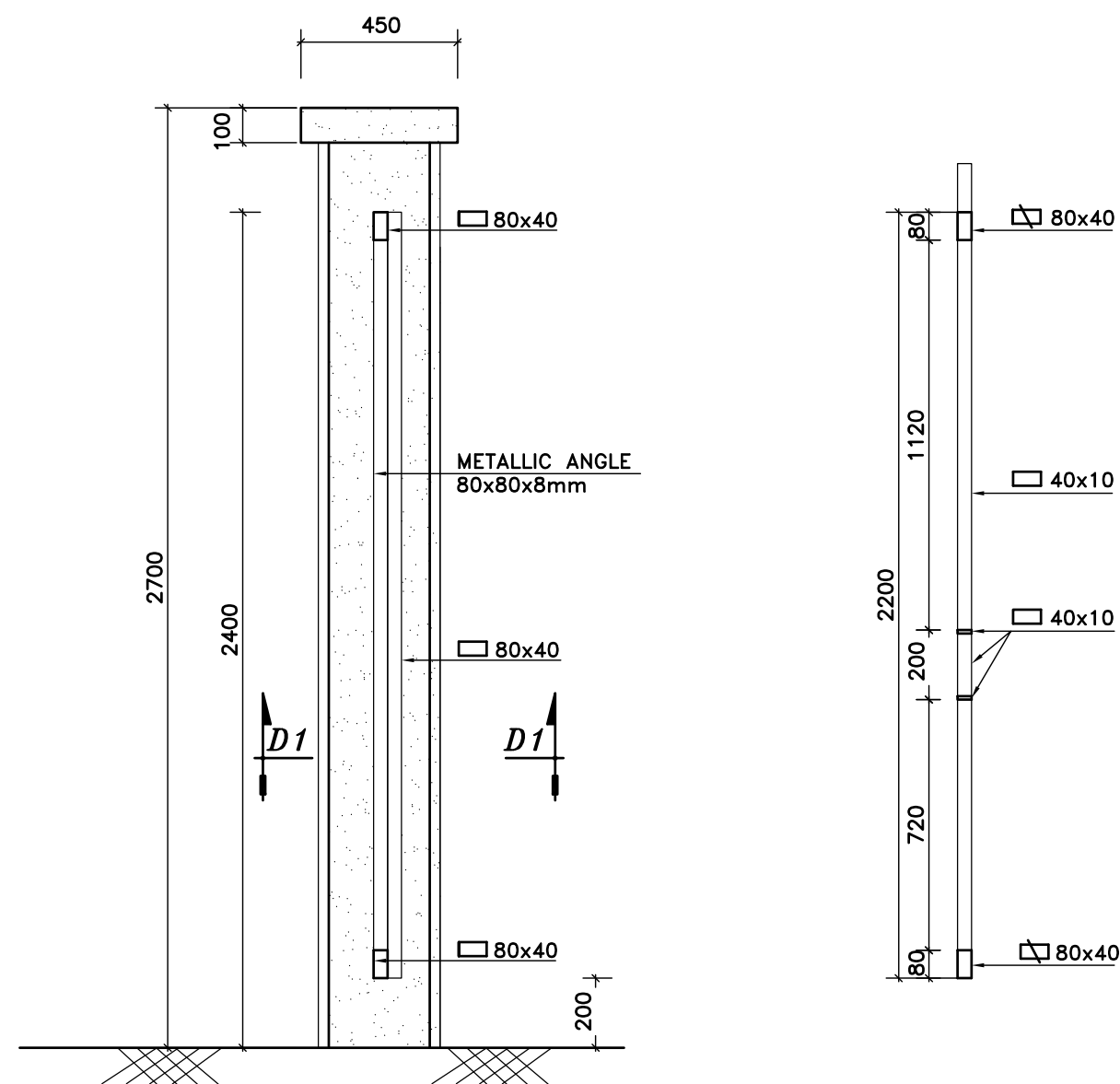
CONSTRUCTION OF WATER WORKS IN QUADI ED DELEM-QABB ELIAS AND MRAIJAT

QABB ELIAS RESERVOIRS
(CAPACITY 2X400 m³)

FENCE ELEVATIONS
SECTIONS AND DETAILS
RETAINING WALL DETAILS

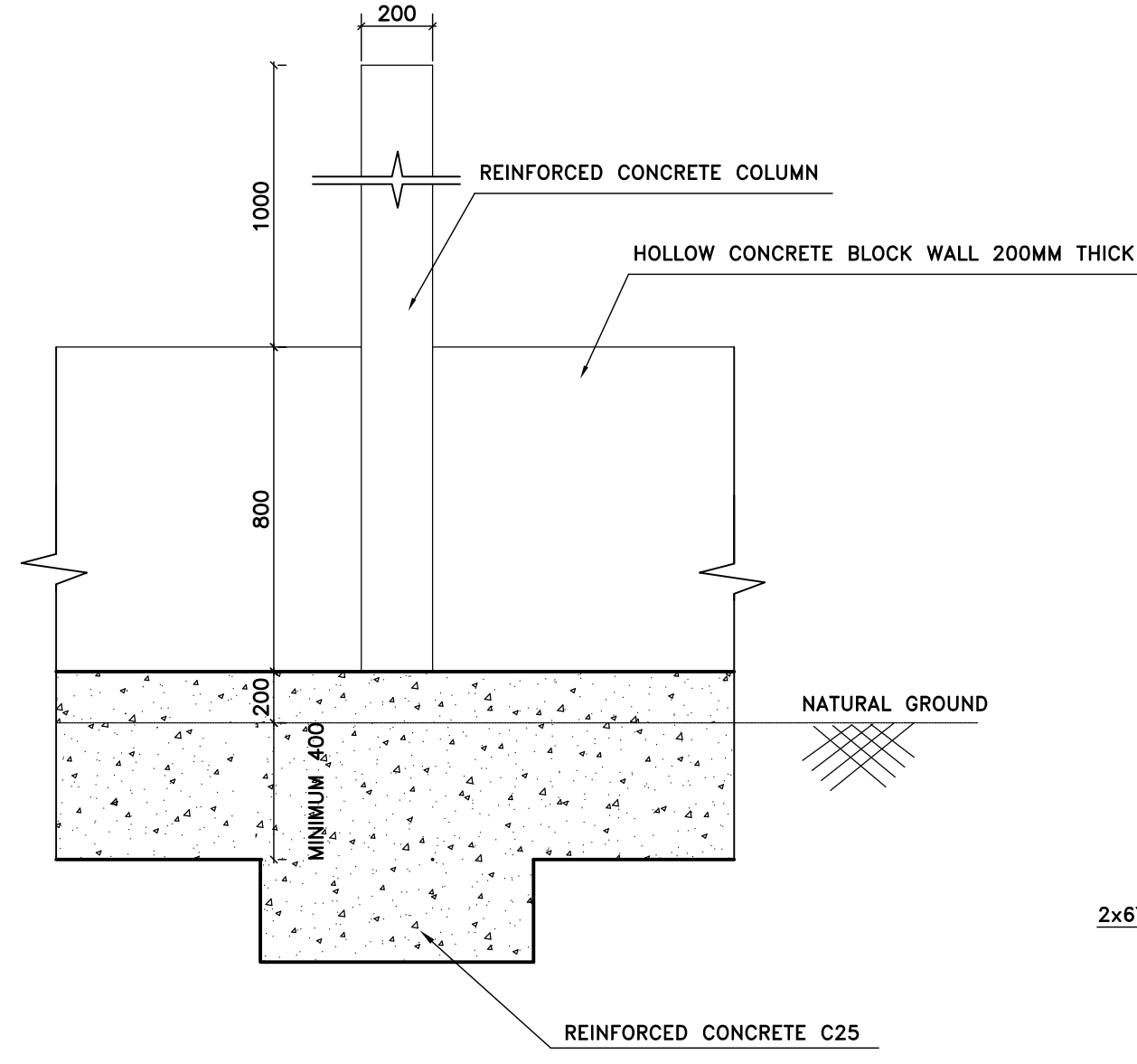
FILE No.	DESIGNED BY	DRAWN BY	CHECKED BY
509W-RS02-SF01-02	BTD	BTD	BTD

DATE	SCALE	SHEET No.	DRAWING. No.
JULY 2019	1:50 - 1:20	1/2	509W-RS02-SF01

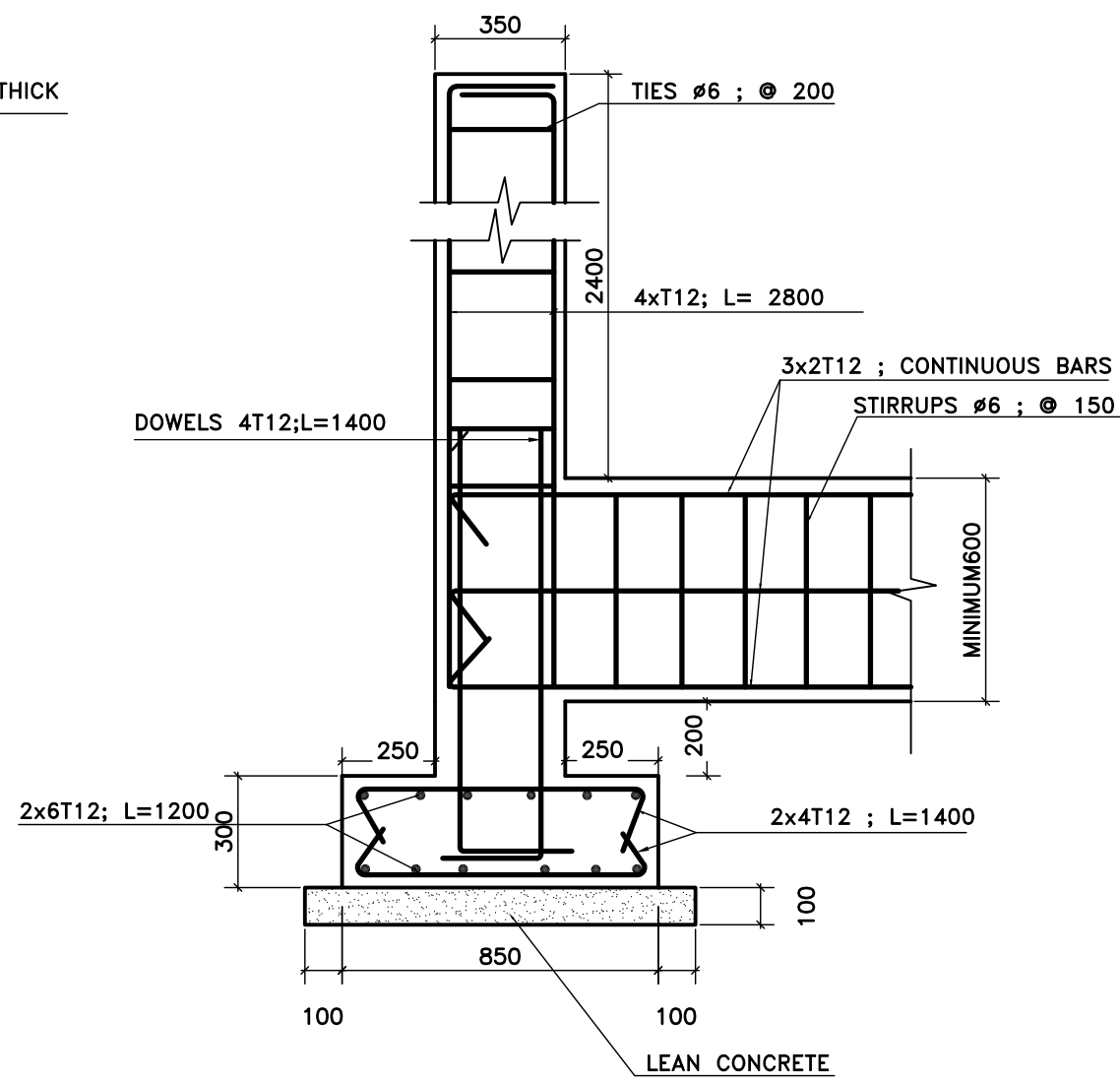


SECTION C-C
SCALE 1:20

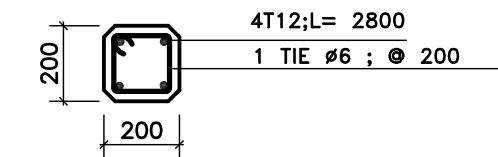
SECTION A-A
SCALE 1:20



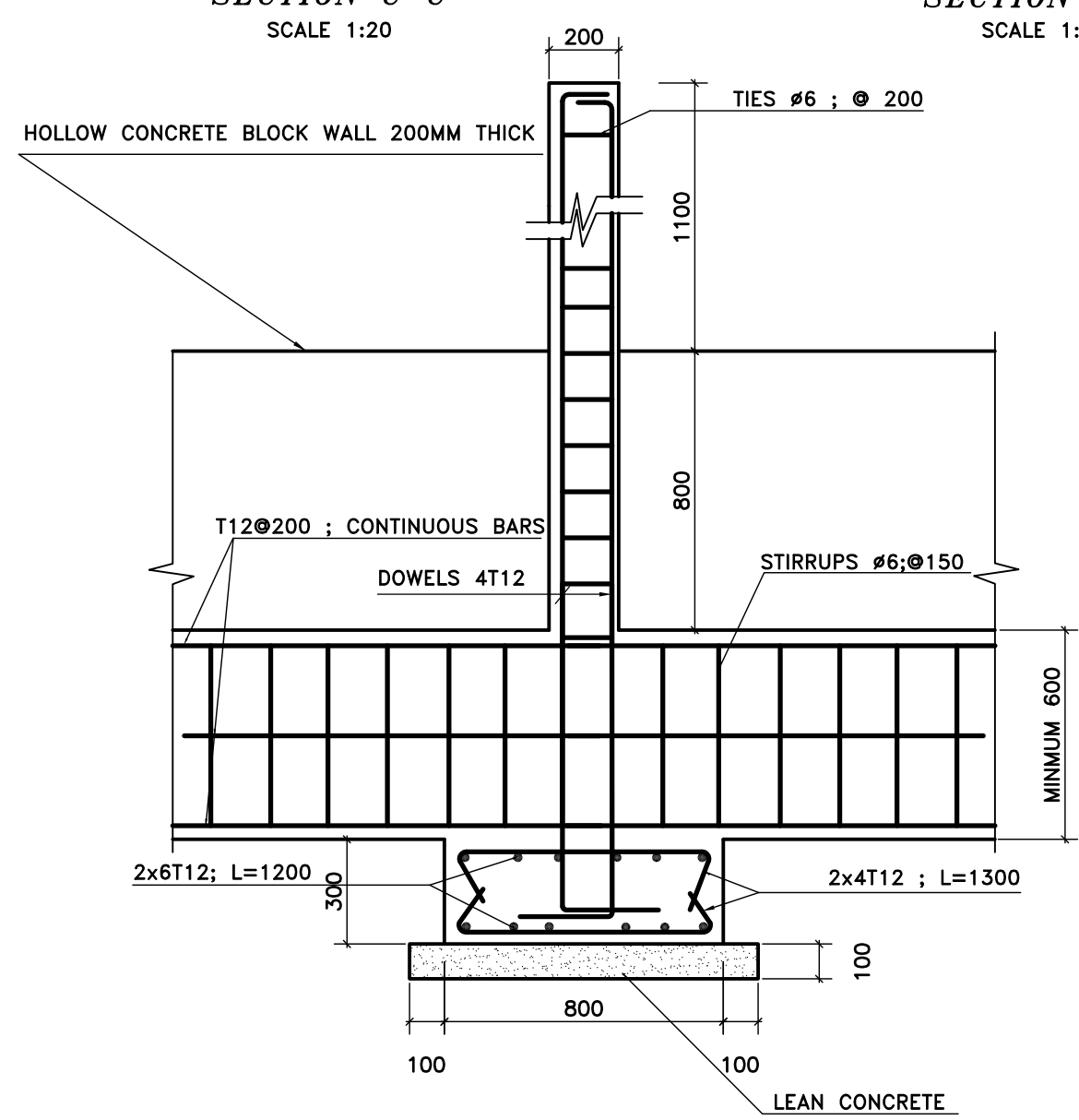
TYPICAL FENCE COLUMN
SCALE 1:20



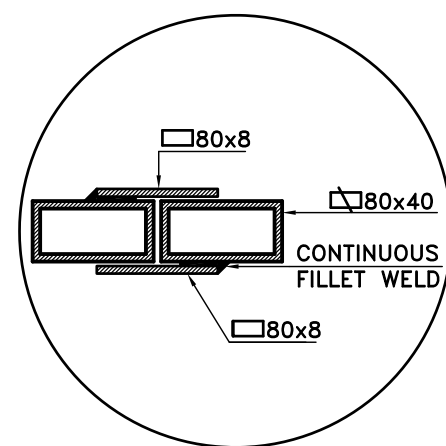
REINFORCEMENT OF TYPICAL ACCESS GATE COLUMN AND FOOTING
SCALE 1:20



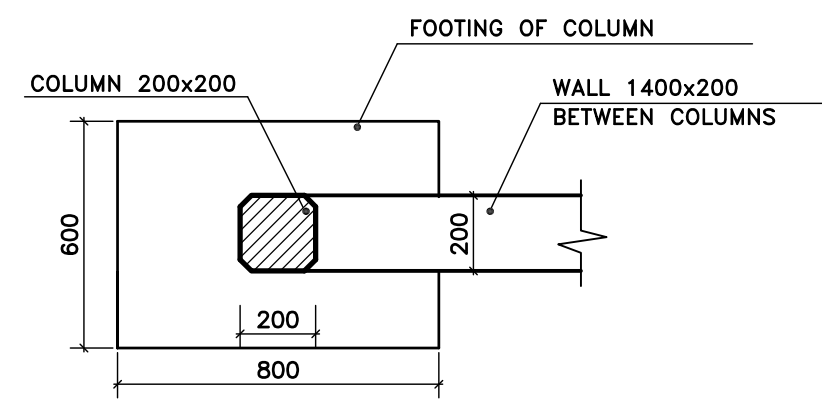
HORIZONTAL SECTION
OF COLUMN
SCALE 1:20



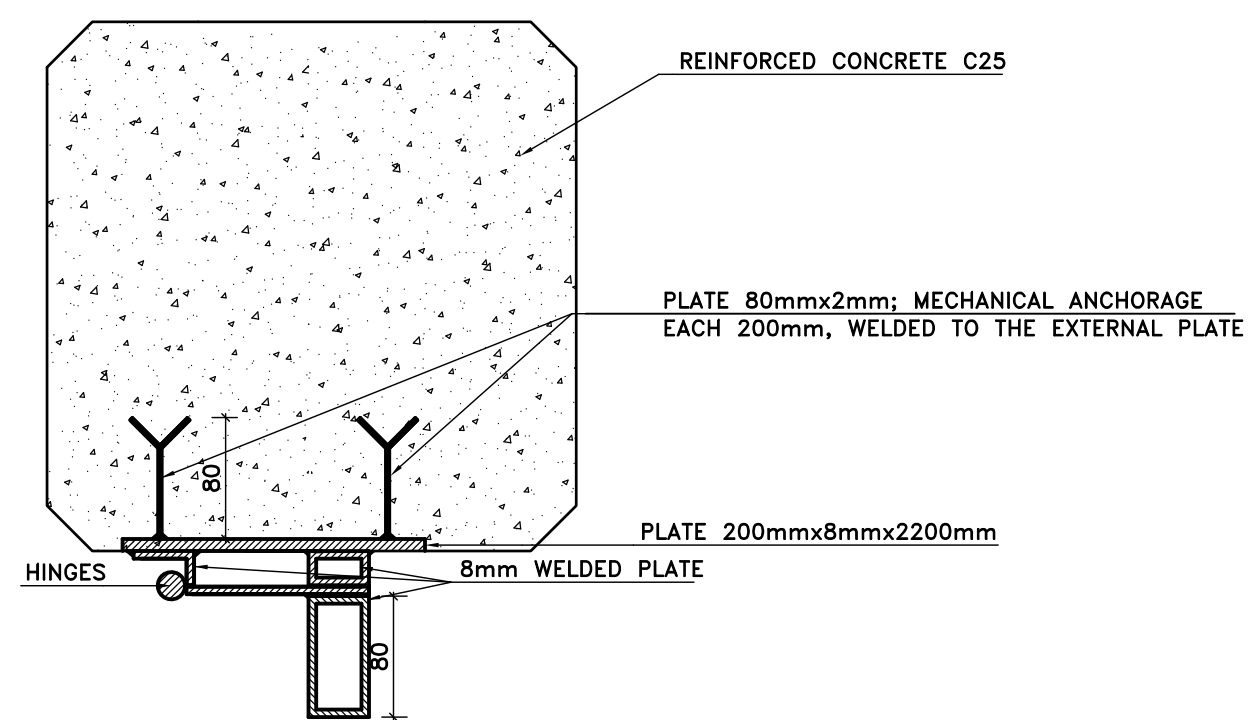
REINFORCEMENT OF TYPICAL COLUMN AND FOOTING
SCALE 1:20



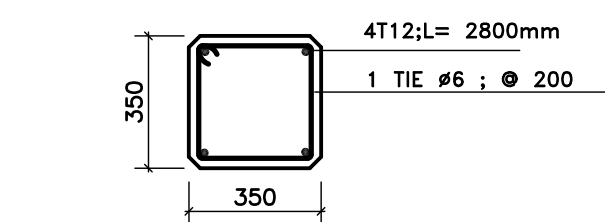
DETAIL A
SCALE 1:5



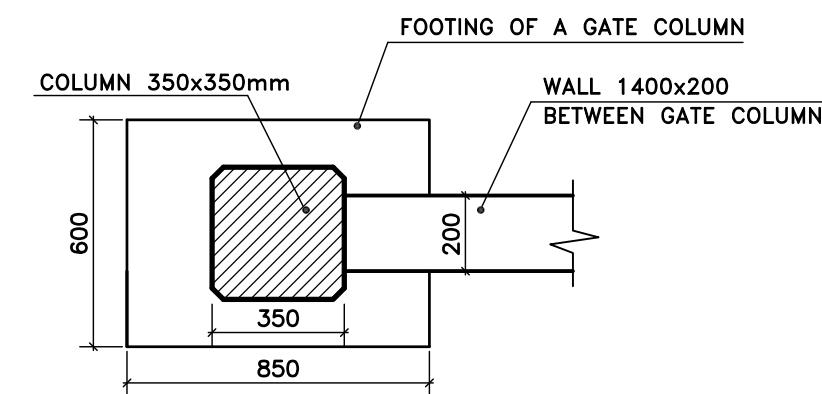
FOOTING
SCALE 1:20



SECTION D-D
SCALE 1:5



HORIZONTAL SECTION
OF GATE COLUMN
SCALE 1:20



FOOTING
SCALE 1:20

Rev.	Date	Dsgn	Drwn	Chk'd	Appr'd
------	------	------	------	-------	--------

REPUBLIC OF LEBANON

COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

BUREAU TECHNIQUE POUR LE DEVELOPPEMENT
JALL ED DIB - HAJAL Bldg TEL:(04) 712157 / 712158
P.O.BOX:70492 - ANTELIA FAX: (04) 712159

CONSTRUCTION OF WATER WORKS IN
OUADI ED DELEM-QABB ELIAS AND MRAIJAT

QABB ELIAS RESERVOIRS
(CAPACITY 2X400 m³)

FENCE ELEVATIONS
SECTIONS AND DETAILS

FILE No.	DESIGNED BY	DRAWN BY	CHECKED BY
509W-RS02-SF01-02	BTD	BTD	BTD
DATE	SCALE	SHEET No.	DRAWING. No.
JULY 2019	1:5 - 1:20	2/2	509W-RS02-SF02