

**Republic of Malawi
Ministry of Energy
Department of Energy Affairs (DOE)
Electricity Supply Corporation of Malawi (ESCOM)**

**THE PREPARATORY SURVEY
FOR
EXTENSION OF TEDZANI HYDROPOWER STATION PROJECT
IN
REPUBLIC OF MALAWI

OUTLINE DESIGN DRAWINGS**

MARCH 2014

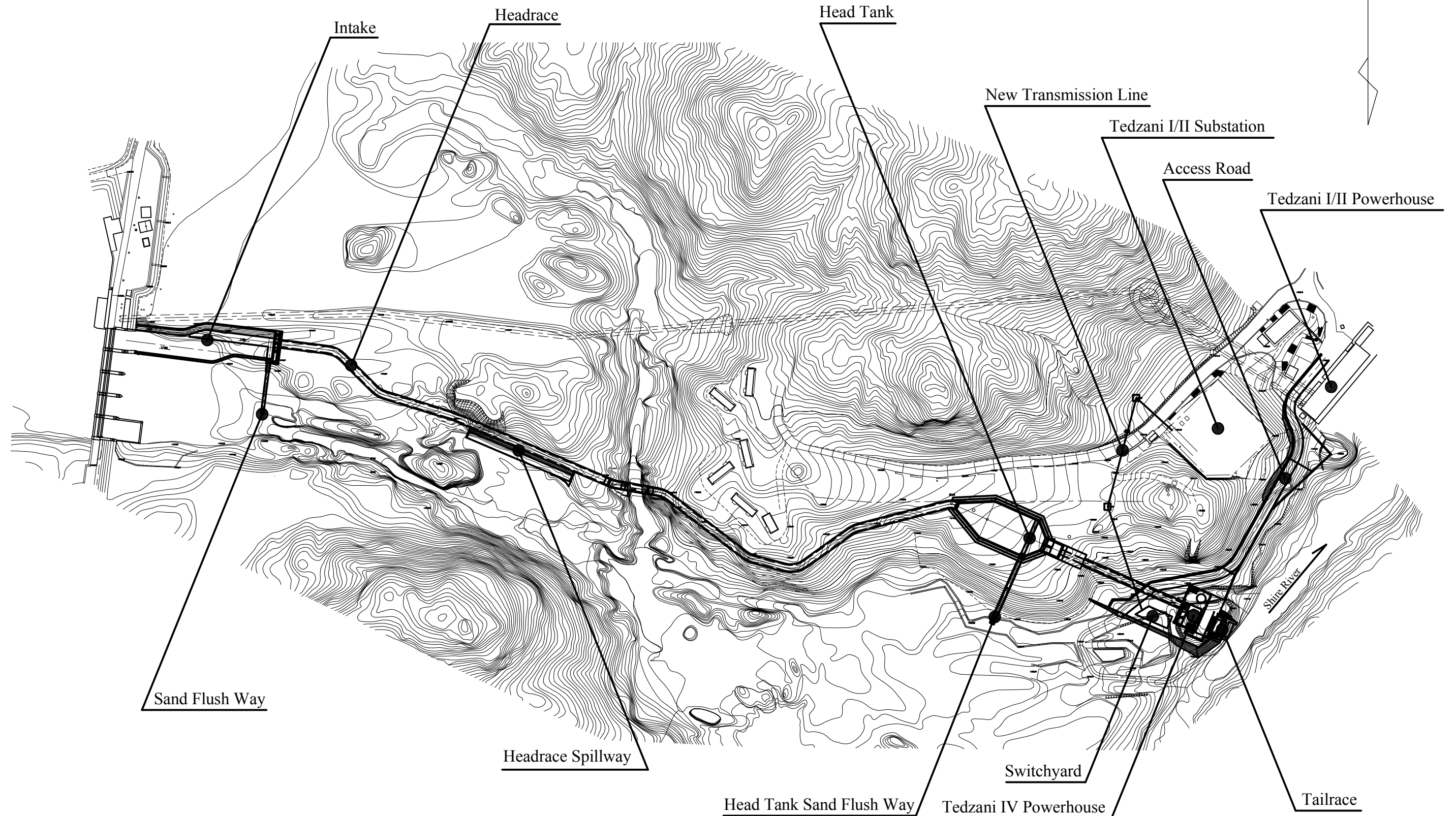
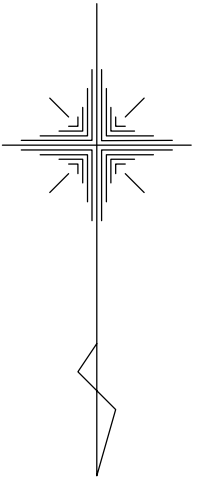
JAPAN INTERNATIONAL COOPERATION AGENCY
TOKYO ELECTRIC POWER SERVICES CO.,LTD

IL
CR (2)
14-054

LIST OF DRAWINGS

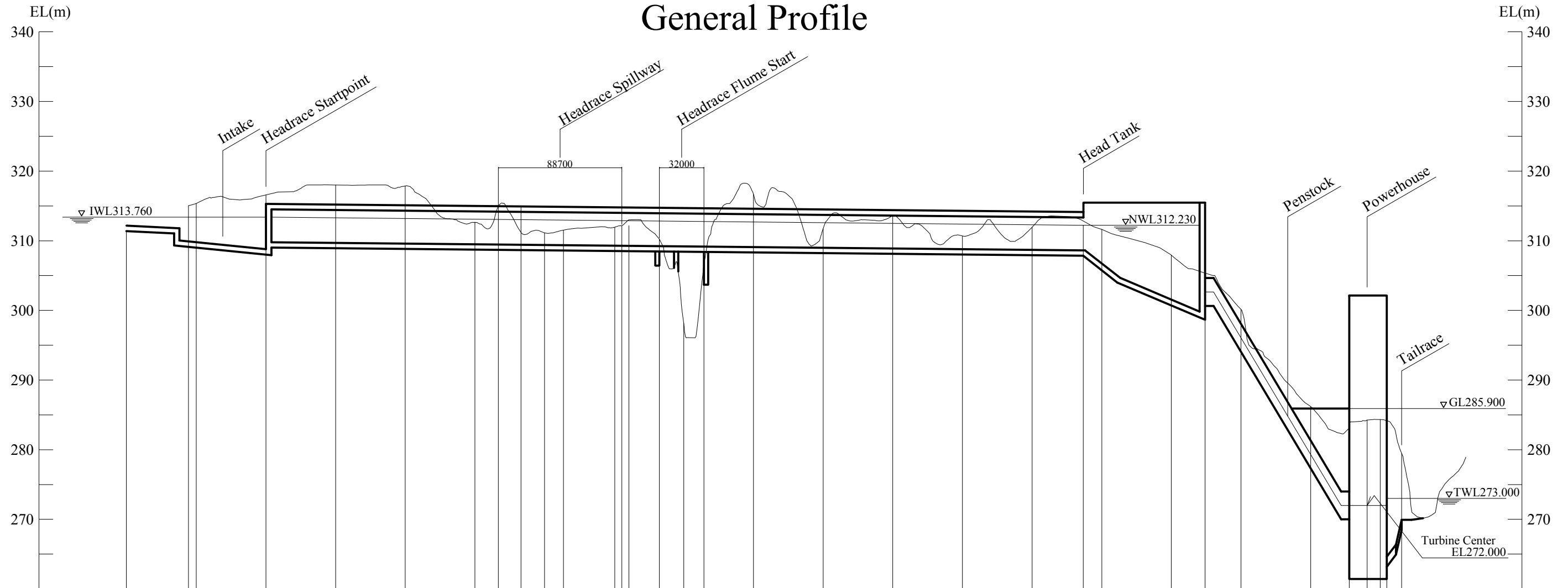
NO.	DWG NO.	TITLE		NO.	DWG NO.	TITLE	
[General]				26.	TD-C-PH-024	Powerhouse	Powerhouse GF Unloading Floor
1.	TD-G-GL-001	General Layout	General Plan	27.	TD-C-PH-025	Powerhouse	Powerhouse B1F Machine Hall Floor
2.	TD-G-GL-002	General Layout	General Profile	28.	TD-C-PH-026	Powerhouse	Powerhouse B2F Generator Floor
[Civil Works]				29.	TD-C-PH-027	Powerhouse	Powerhouse B3F Turbine Floor
3.	TD-C-IT-001	Intake	Intake Plan and Profile	30.	TD-C-PH-028	Powerhouse	Powerhouse B4F Draft Tube Floor
4.	TD-C-IT-002	Intake	Intake Sections (1/3)	31.	TD-C-PH-029	Powerhouse	Powerhouse B5F Drainage Gallery
5.	TD-C-IT-003	Intake	Intake Sections (2/3)	32.	TD-C-PH-030	Powerhouse	Powerhouse Elevation View
6.	TD-C-IT-004	Intake	Intake Sections (3/3)	33.	TD-C-PH-031	Powerhouse	Powerhouse Detail Sections
7.	TD-C-HR-005	Headrace	Headrace Typical Sections	34.	TD-C-TR-032	Tailrace	Tailrace Plan and Profile
8.	TD-C-HR-006	Headrace	Headrace Plan (1/4)	35.	TD-C-TR-033	Tailrace	Tailrace Sections
9.	TD-C-HR-007	Headrace	Headrace Plan (2/4)	36.	TD-C-TR-034	Tailrace	Stoplog Access Road
10.	TD-C-HR-008	Headrace	Headrace Plan (3/4)	37.	TD-C-AR-035	Access Road	Access Road Plan and Profile
11.	TD-C-HR-009	Headrace	Headrace Plan (4/4)	38.	TD-C-AR-036	Access Road	Access Road Sections (1/5)
12.	TD-C-HR-010	Headrace	Headrace Sections (1/4)	39.	TD-C-AR-037	Access Road	Access Road Sections (2/5)
13.	TD-C-HR-011	Headrace	Headrace Sections (2/4)	40.	TD-C-AR-038	Access Road	Access Road Sections (3/5)
14.	TD-C-HR-012	Headrace	Headrace Sections (3/4)	41.	TD-C-AR-039	Access Road	Access Road Sections (4/5)
15.	TD-C-HR-013	Headrace	Headrace Sections (4/4)	42.	TD-C-AR-040	Access Road	Access Road Sections (5/5)
16.	TD-C-HR-014	Headrace	Headrace Flume Plan and Profile	43.	TD-C-GH-041	Guard House	Guard House (1/2)
17.	TD-C-HR-015	Headrace	Headrace Flume Sections	44.	TD-C-GH-042	Guard House	Guard House (2/2)
18.	TD-C-HT-016	Head Tank	Head Tank Plan and Profile	[Electro-mechanical Works]			
19.	TD-C-HT-017	Head Tank	Head Tank Typical Sections (1/2)	45.	TD-E-GN-001	Generator	Single Line Diagram
20.	TD-C-HT-018	Head Tank	Head Tank Typical Sections (2/2)	46.	TD-E-TL-002	Transmission Line	Transmission Line Plan and Profile
21.	TD-C-PS-019	Penstock	Penstock Plan and Profile	47.	TD-E-TL-003	Transmission Line	66kV Transmission Line Tower Type D1
22.	TD-C-PS-020	Penstock	Penstock Typical Sections	48.	TD-E-TL-004	Transmission Line	66kV Transmission Line Tower Type D2
23.	TD-C-PH-021	Powerhouse	Powerhouse Plan	49.	TD-E-TL-005	Transmission Line	66kV Transmission Line Foundation for Tower Type D
24.	TD-C-PH-022	Powerhouse	Powerhouse Sections	50.	TD-E-TL-006	Transmission Line	66kV Transmission Line Gantry 1 and 2
25.	TD-C-PH-023	Powerhouse	Powerhouse Profile	51.	TD-E-TL-007	Transmission Line	66kV Transmission Line Foundation for Gantry 1 and 2

General Plan

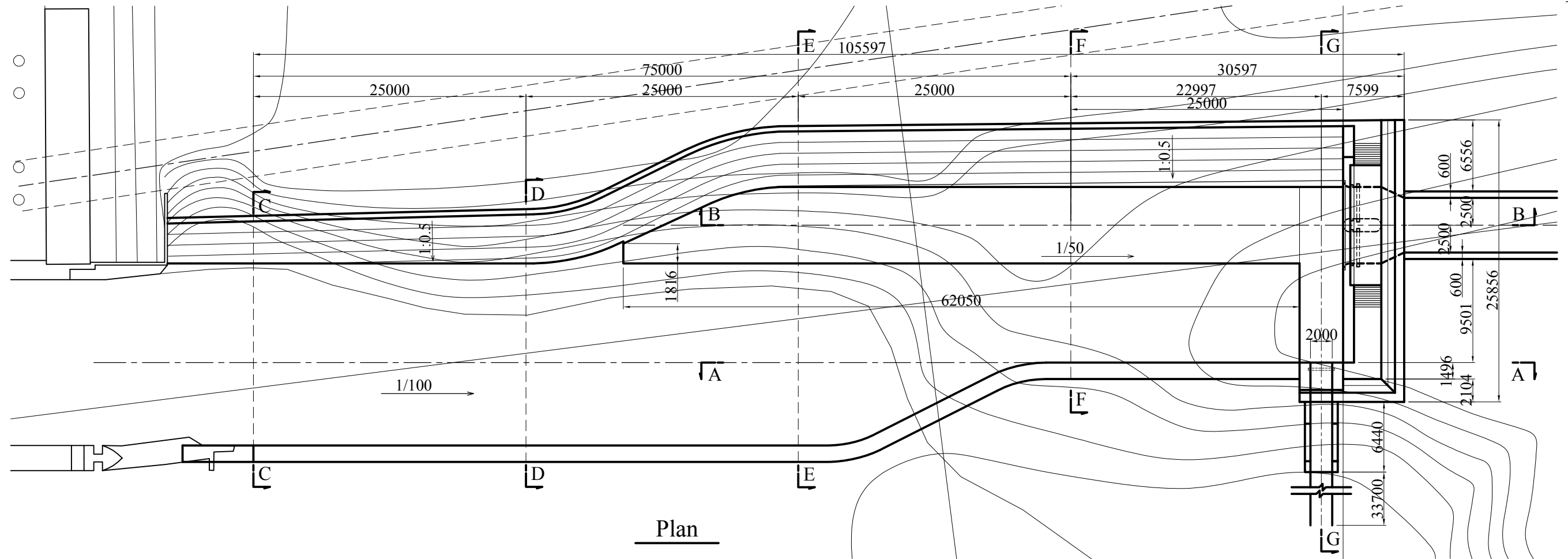


Preparatory Survey on the Project for The Extension of Tedzani Hydropower Station in the Republic of Malawi	The Extension of Tedzani Hydropower Station	TITLE : General Plan	SCALE : 1:3000 (A3)	DRAWING No : TD-G-GL-001	Rev.
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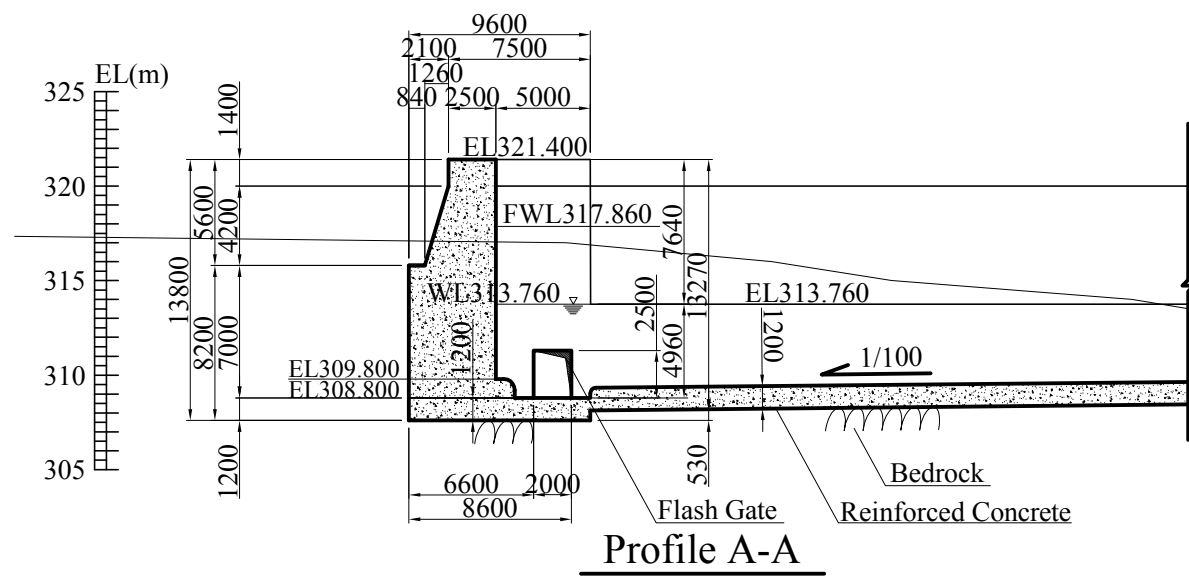
General Profile



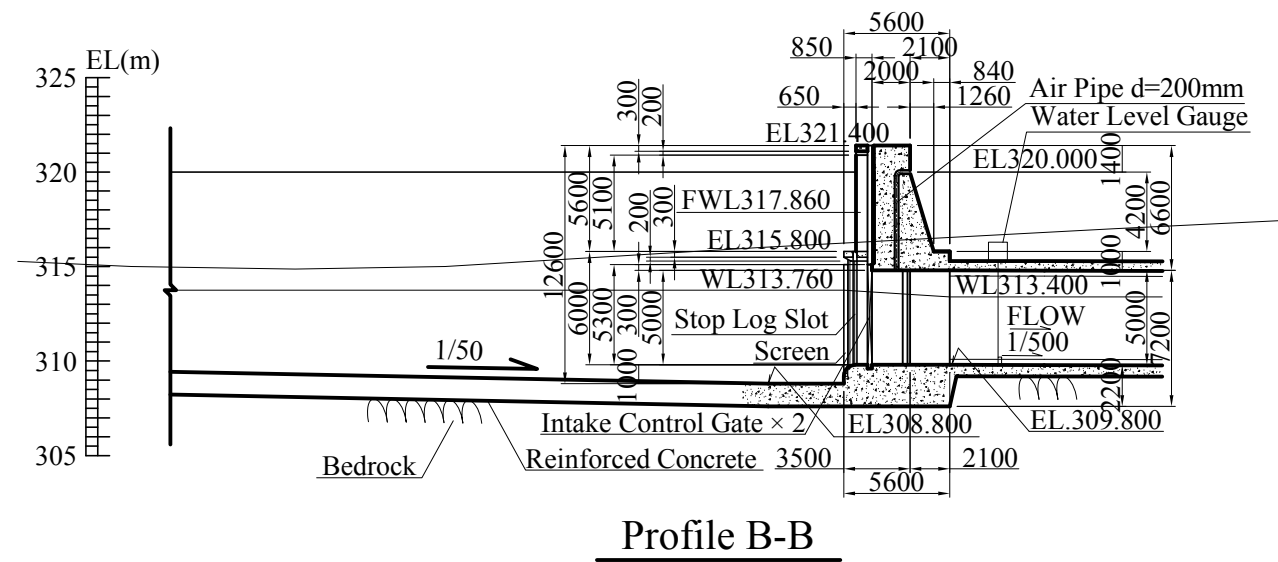
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Location	-150.000	-100.000	-55.597	-50.000	0.000	50.000	100.000	150.000	166.358	200.000	250.000	255.058	282.500	300.000	314.500	350.000	400.000	450.000	500.000	550.000	586.158	600.000	611.158	650.000	673.658	700.000	750.000	777.700	790.500	800.000	804.700	815.350
Distance	0.000	50.000	44.403	5.597	50.000	50.000	50.000	16.358	33.642	50.000	5.058	27.442	17.500	14.500	35.500	50.000	50.000	50.000	50.000	36.158	13.842	11.158	38.842	38.842	50.000	50.000	27.700	12.800	9.500	4.700	10.650	
Invert Elevation		312.290	309.800	309.800	309.700	309.600	309.500	309.467	309.400	309.300	309.290	309.235	309.200	319.171	309.100	390.000	308.900	308.800	308.700	308.630	306.464	304.700	303.300	299.300	294.310	276.660	269.000	284.006	284.257	284.335	284.173	270.500
Ground Elevation			315.049	315.352	316.591	318.007	317.874	312.652	315.070	311.146	311.929	312.161	310.206	298.203	306.644	316.663	311.708	313.606	310.684	311.952	312.900	311.630	307.927	307.927	300.140	286.199	284.006	284.257	284.335	284.173	279.466	
Water Level			313.760	313.760	313.400	313.300	313.200	313.100	313.067	313.000	312.900	312.890	312.835	312.800	312.771	312.700	312.600	312.500	312.400	312.300	312.230	312.230	312.230	312.230					273.000	273.000	273.000	273.000



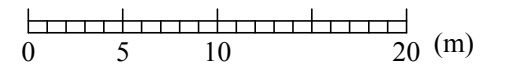
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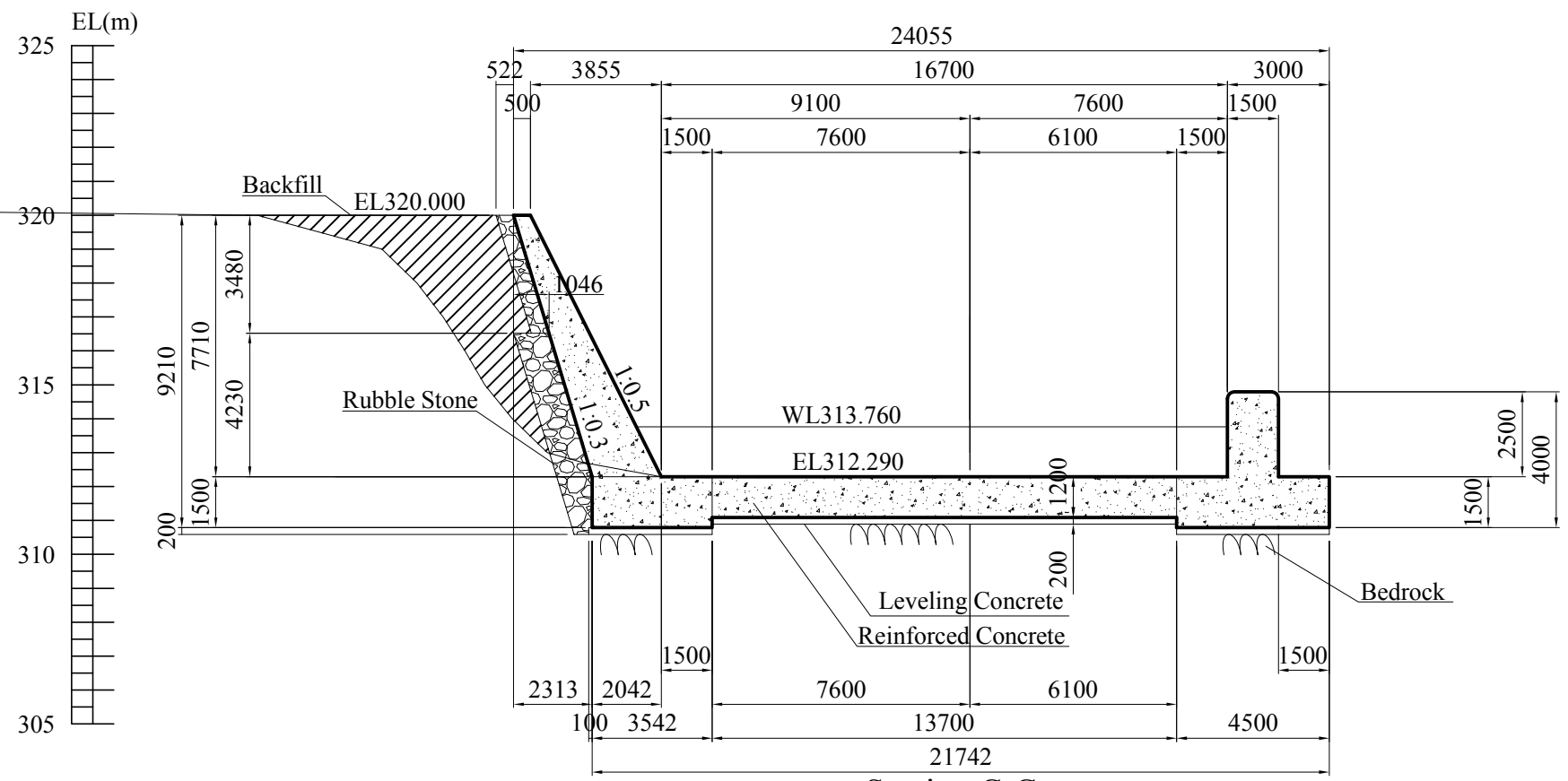


Profile A-A

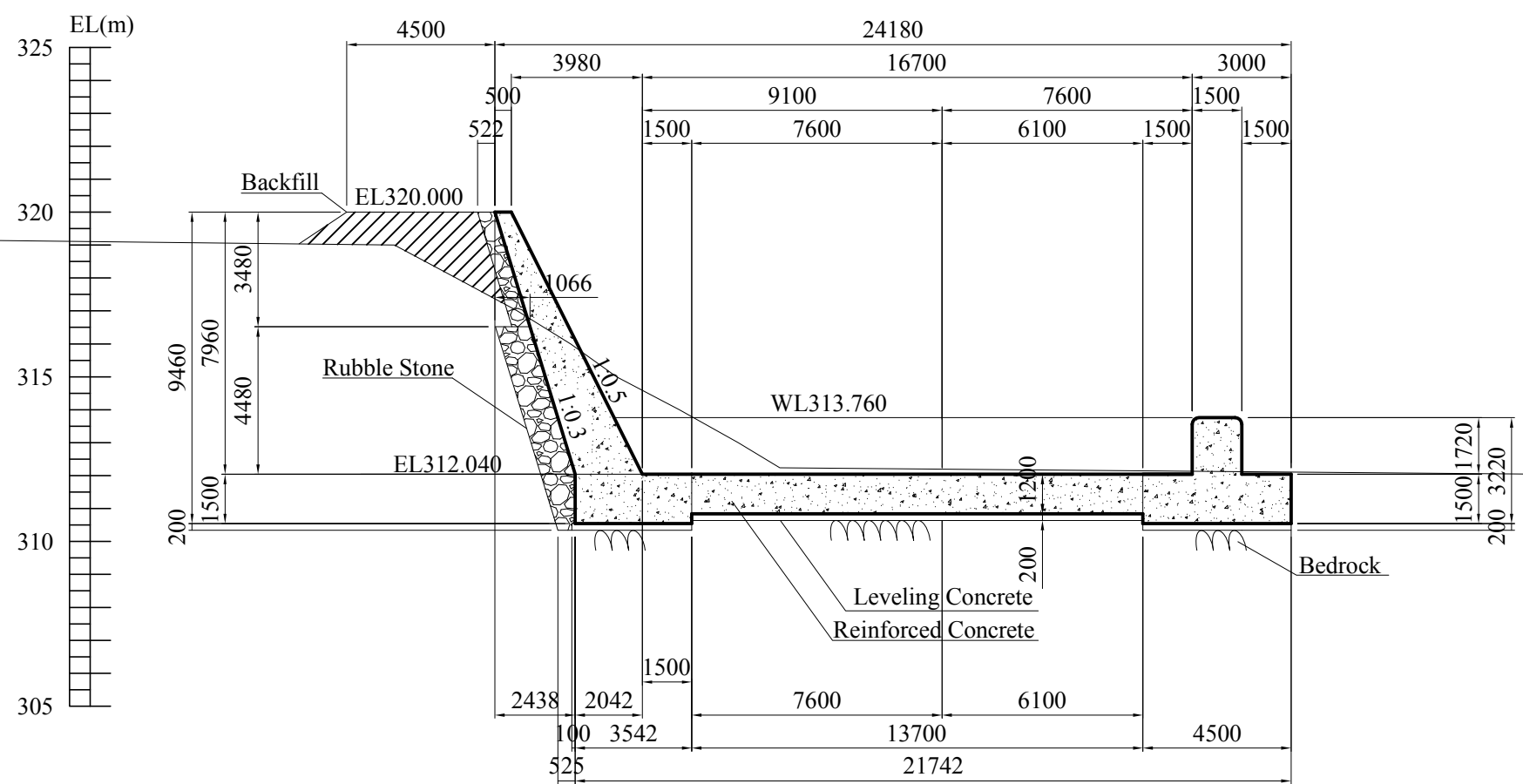


Profile B-B

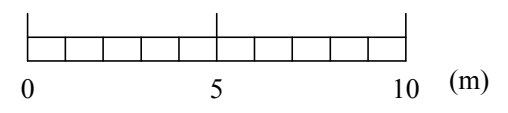




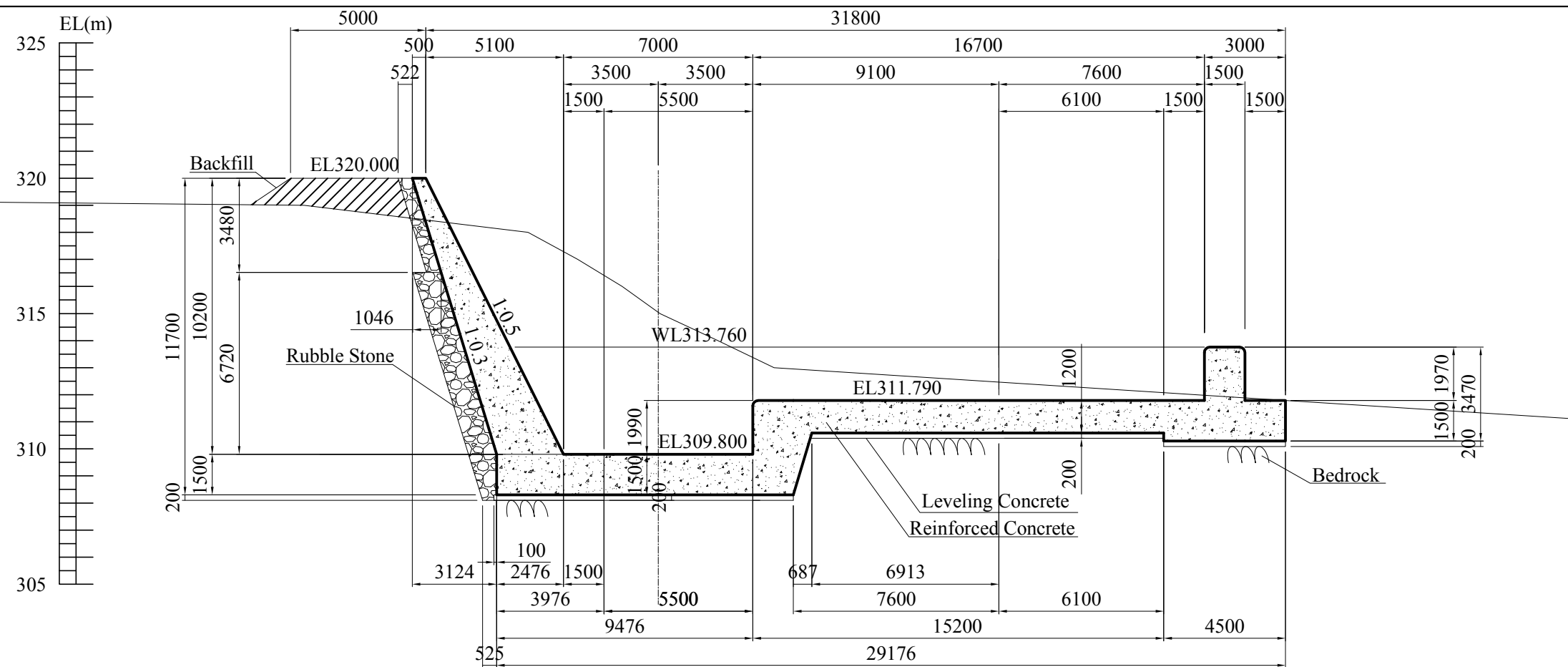
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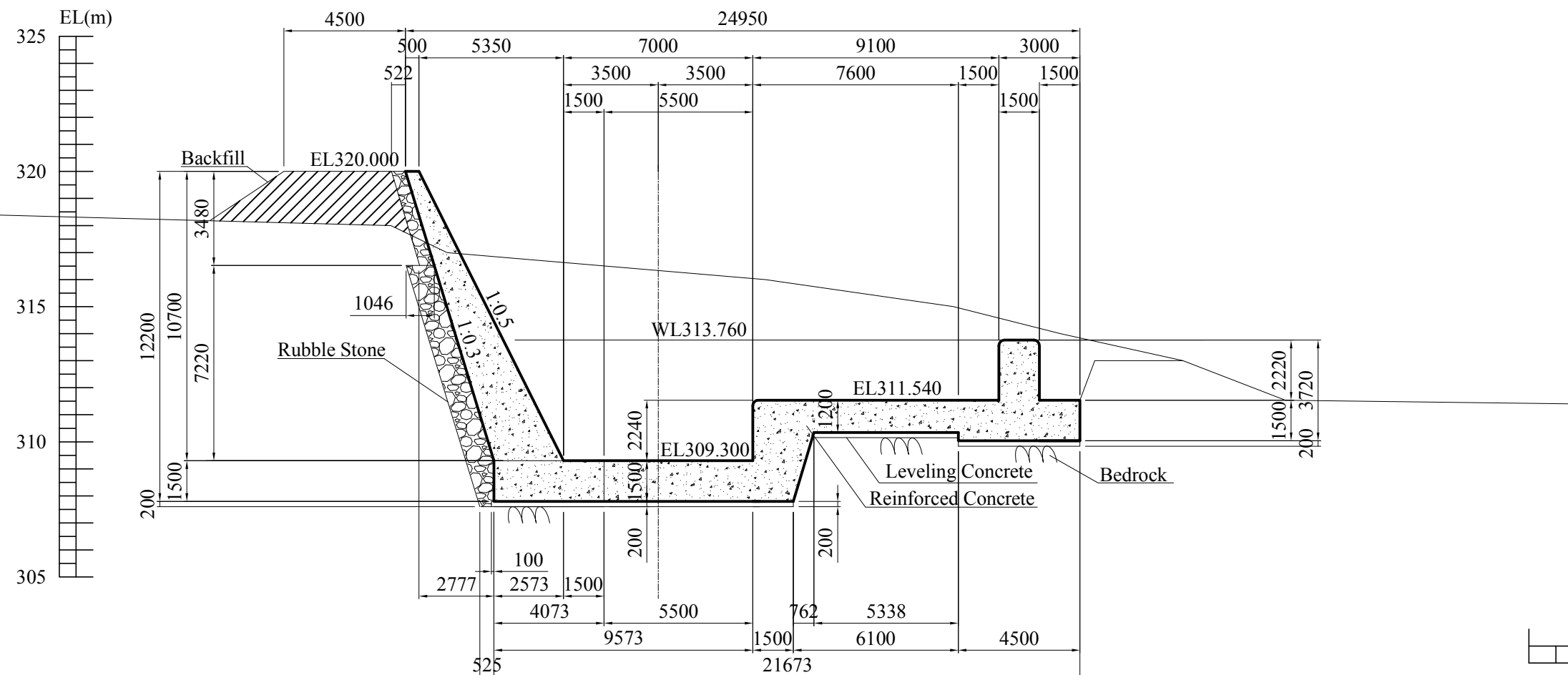
Section D-D



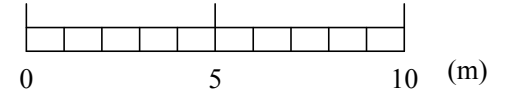
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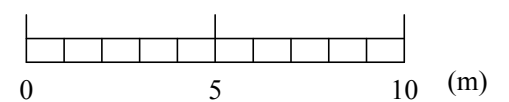
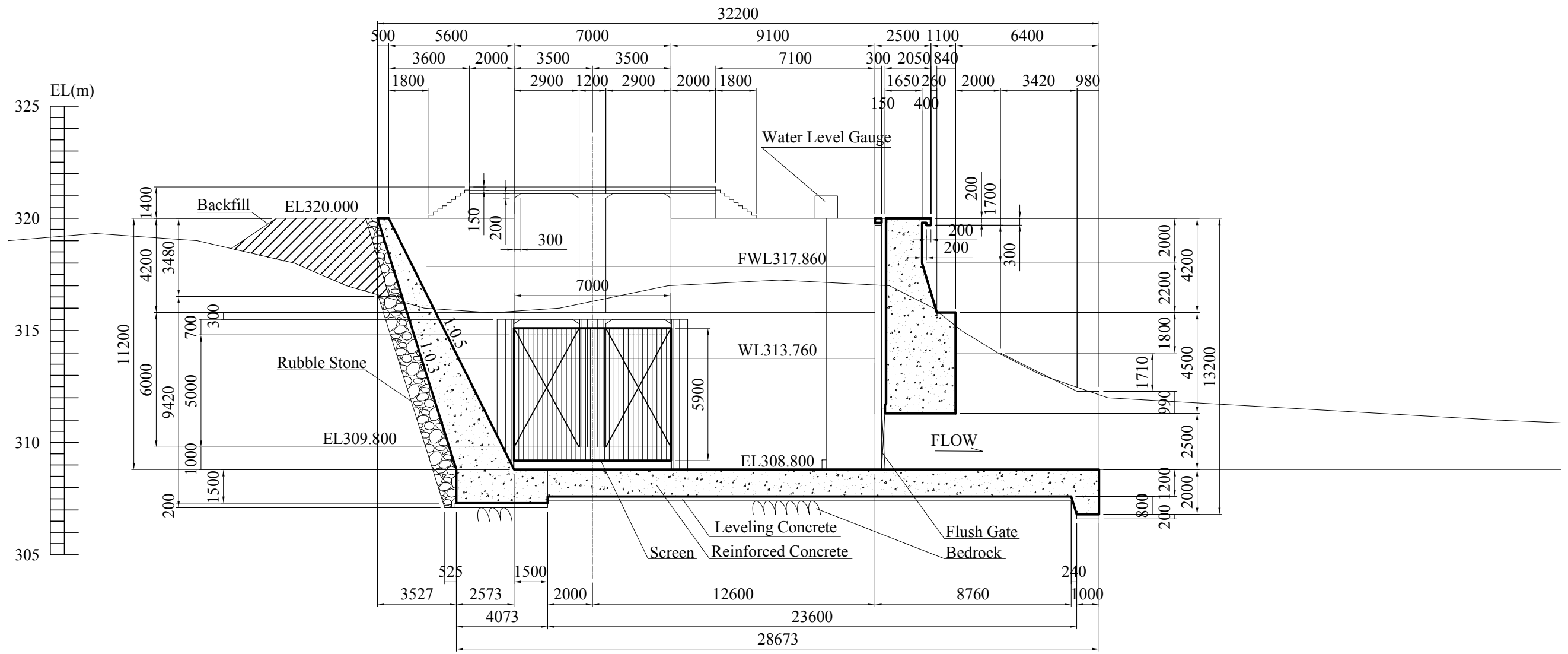


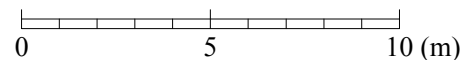
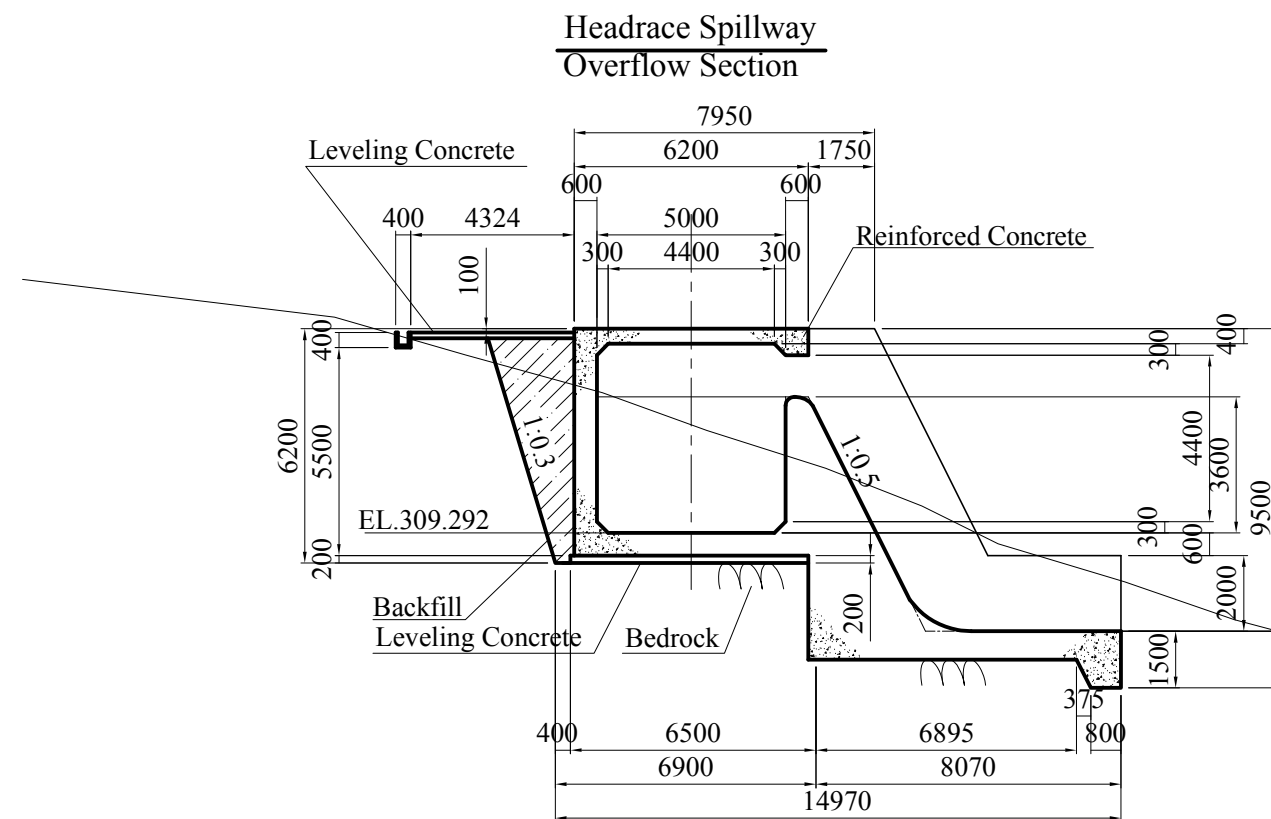
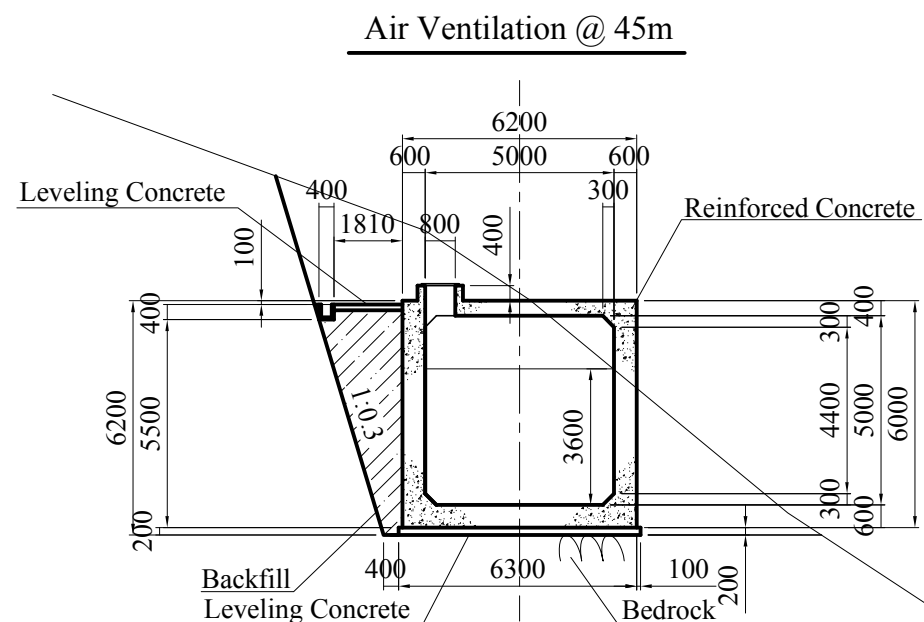
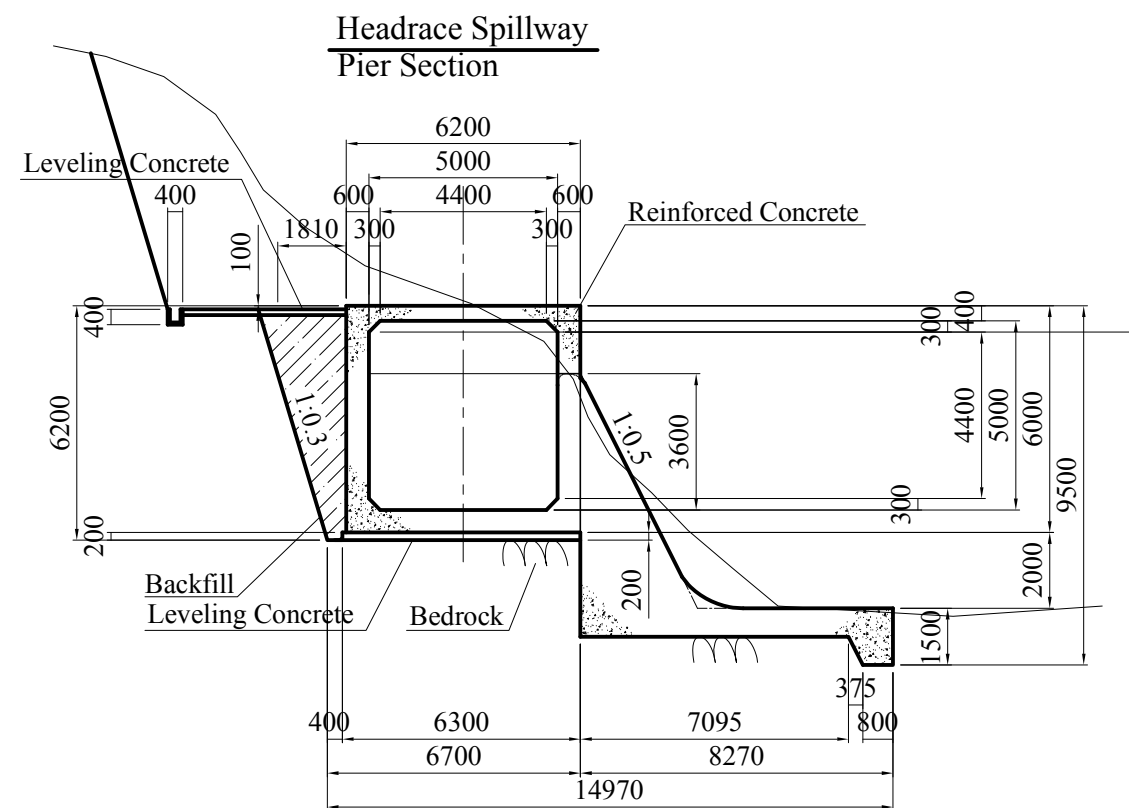
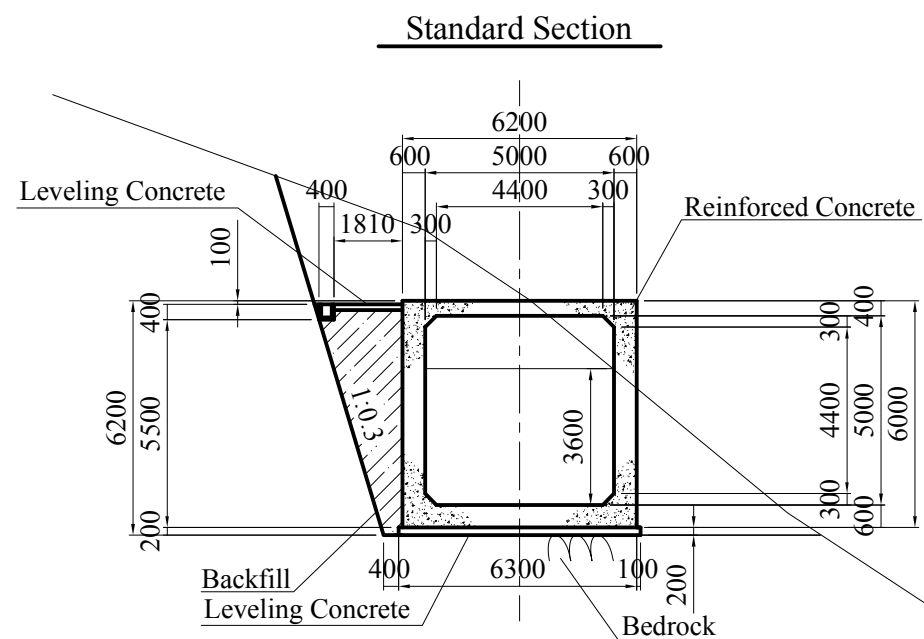
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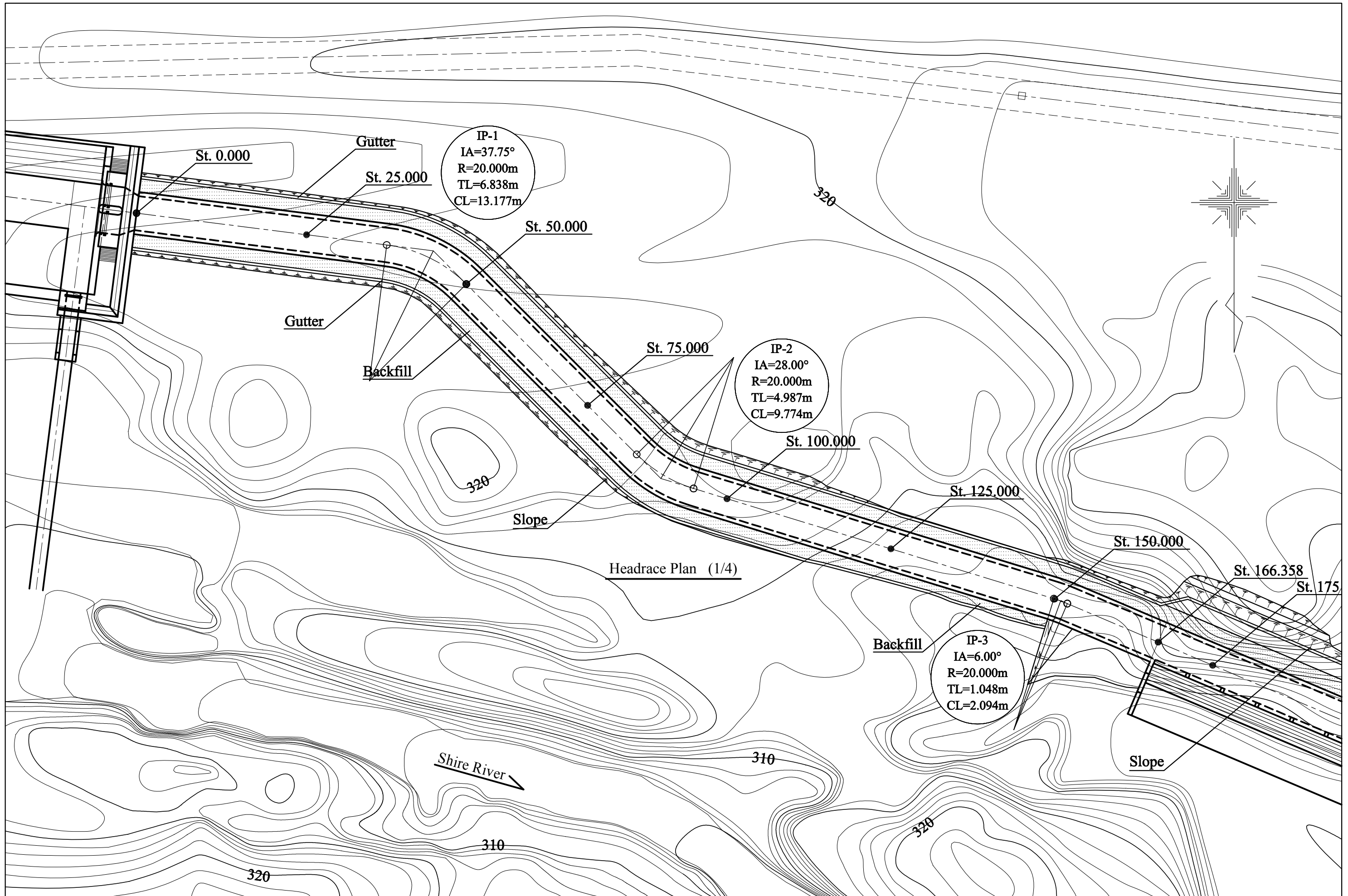


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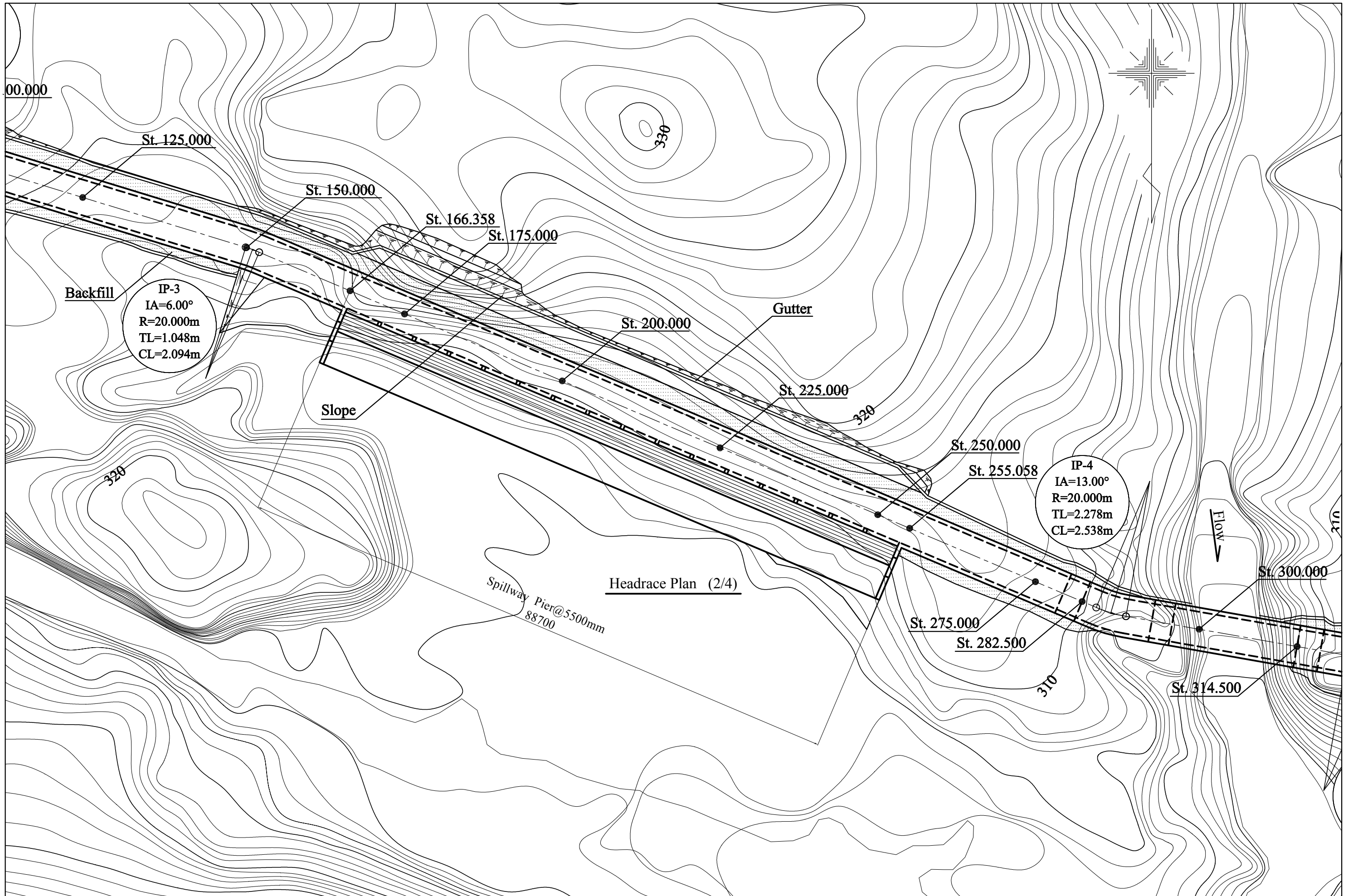


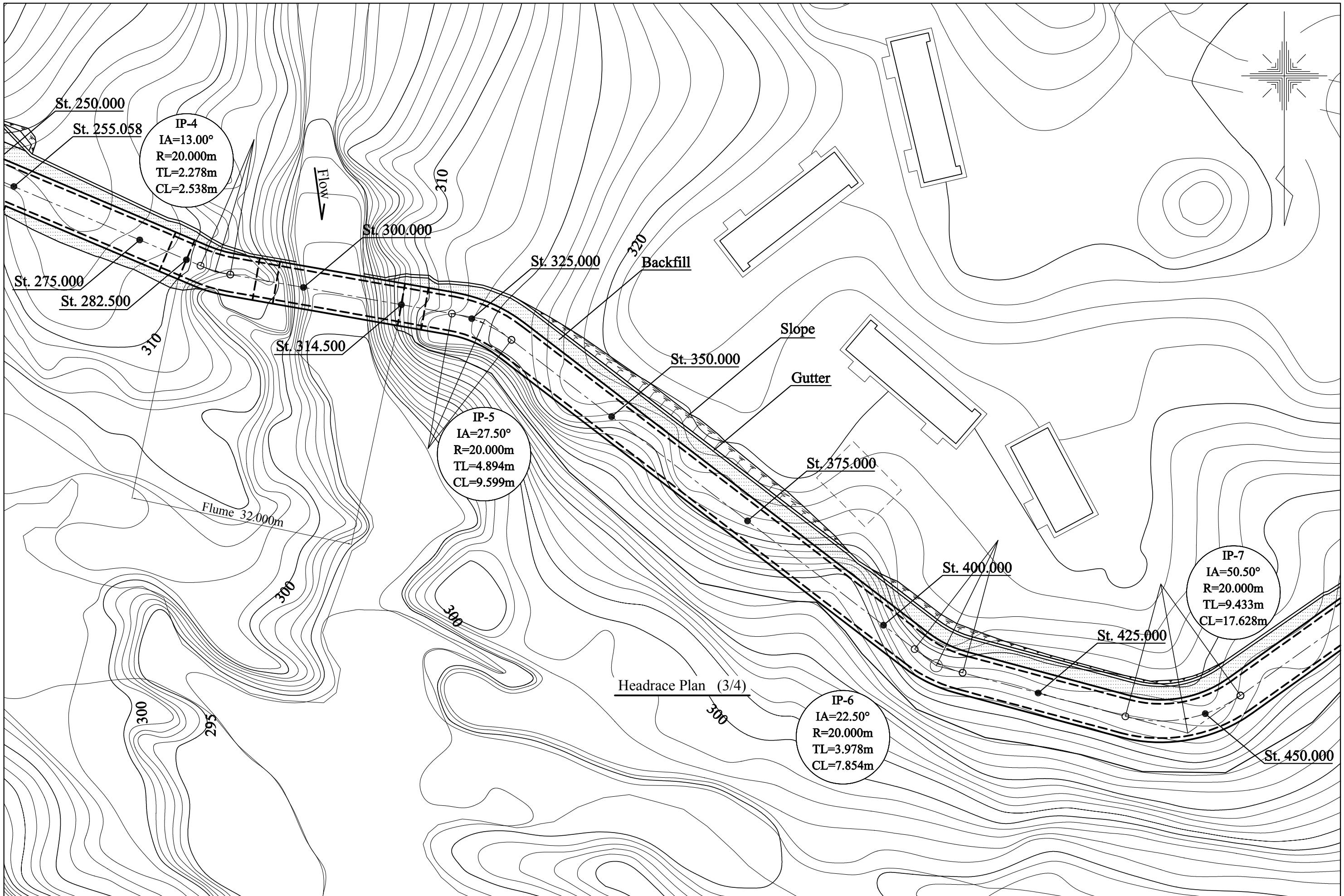


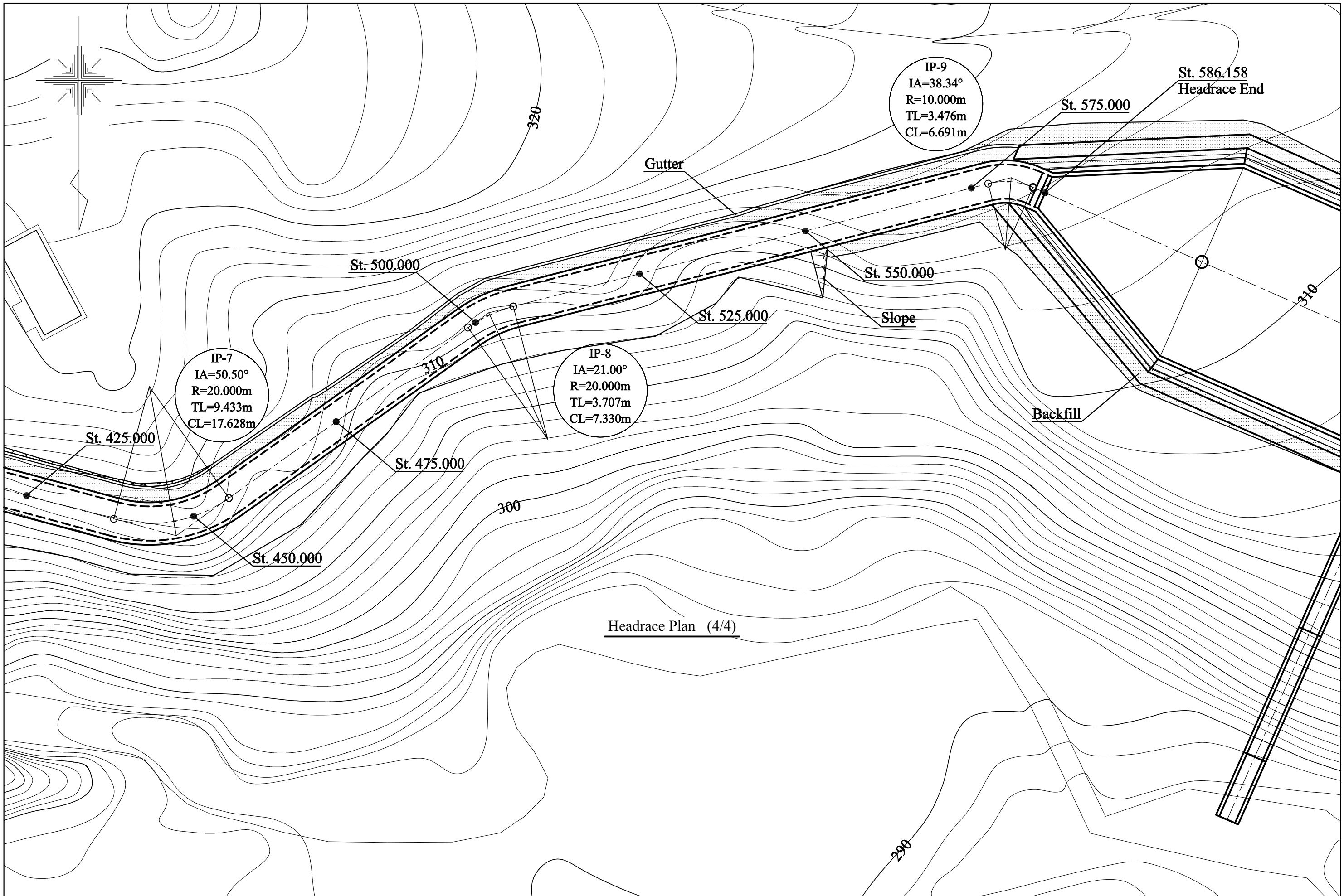




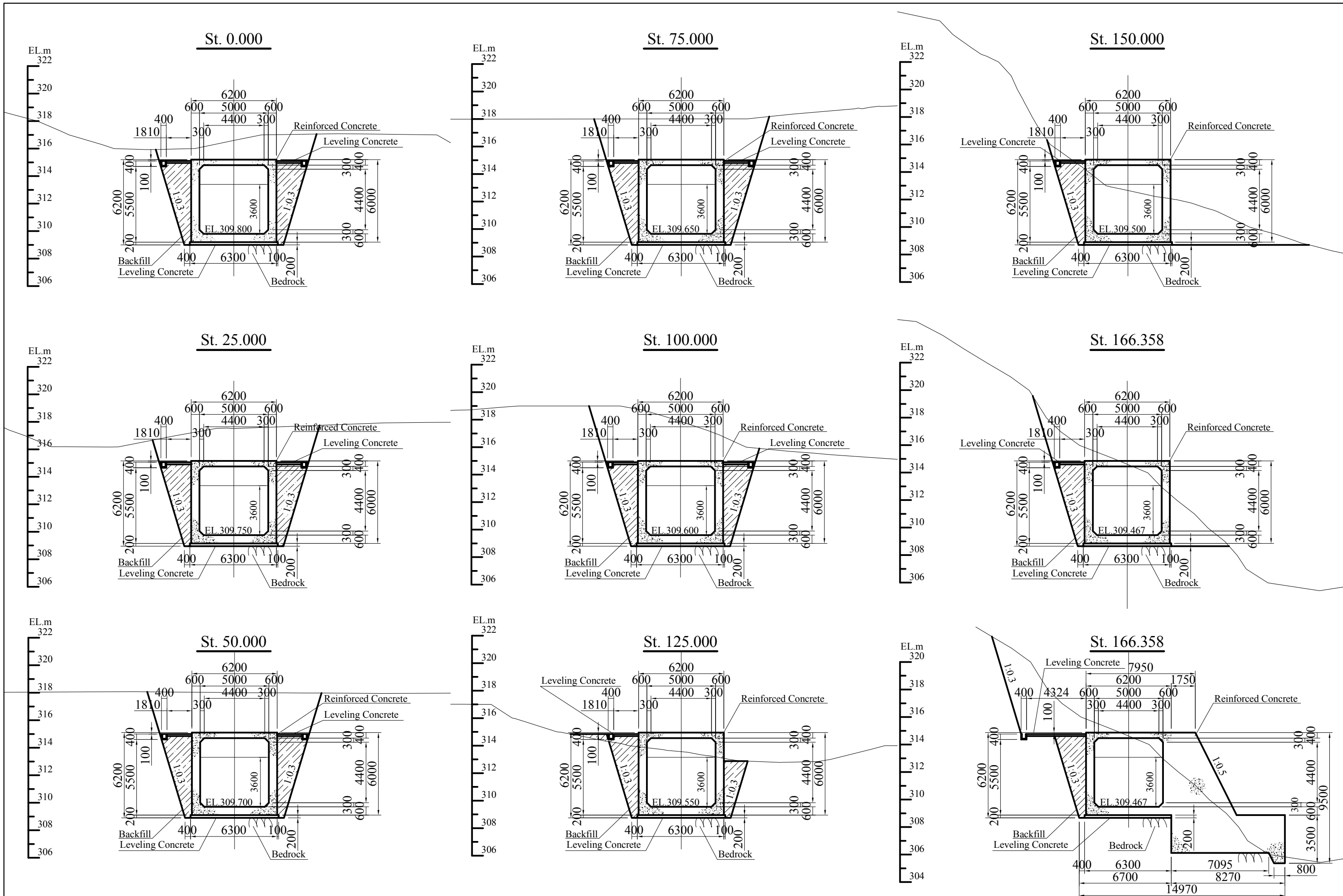
Headrace Plan (1/4)

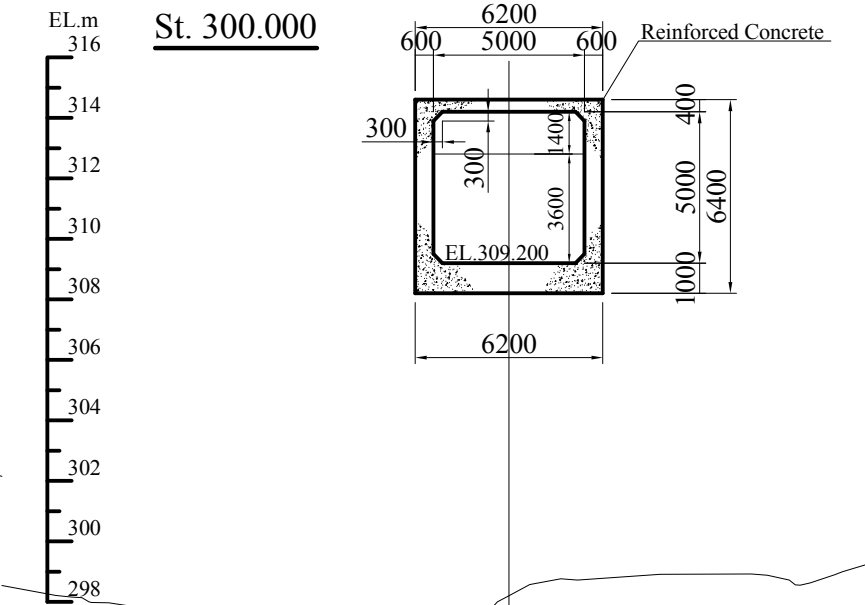
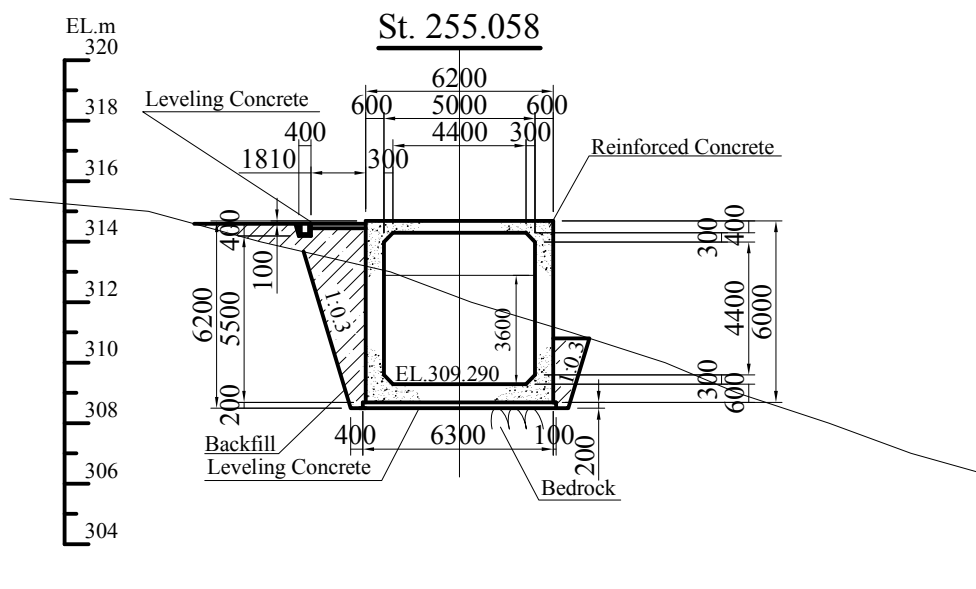
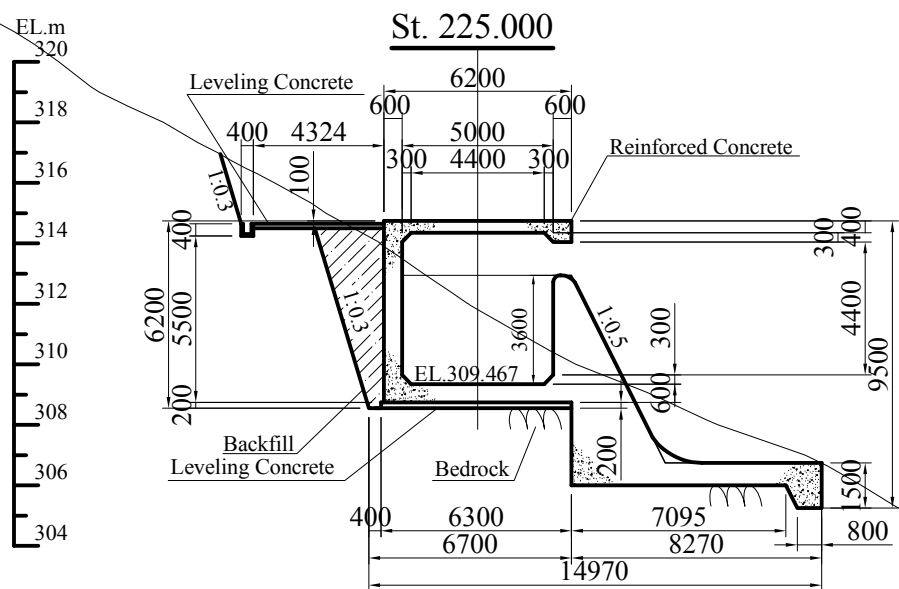
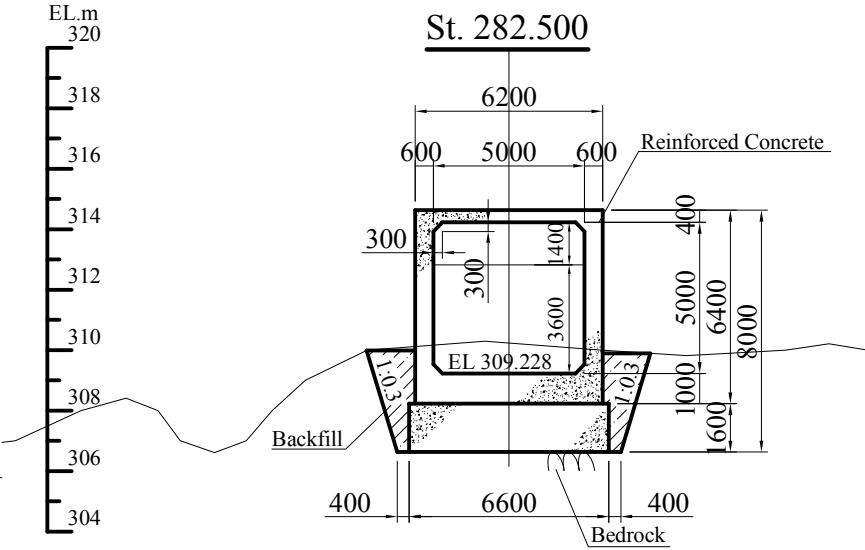
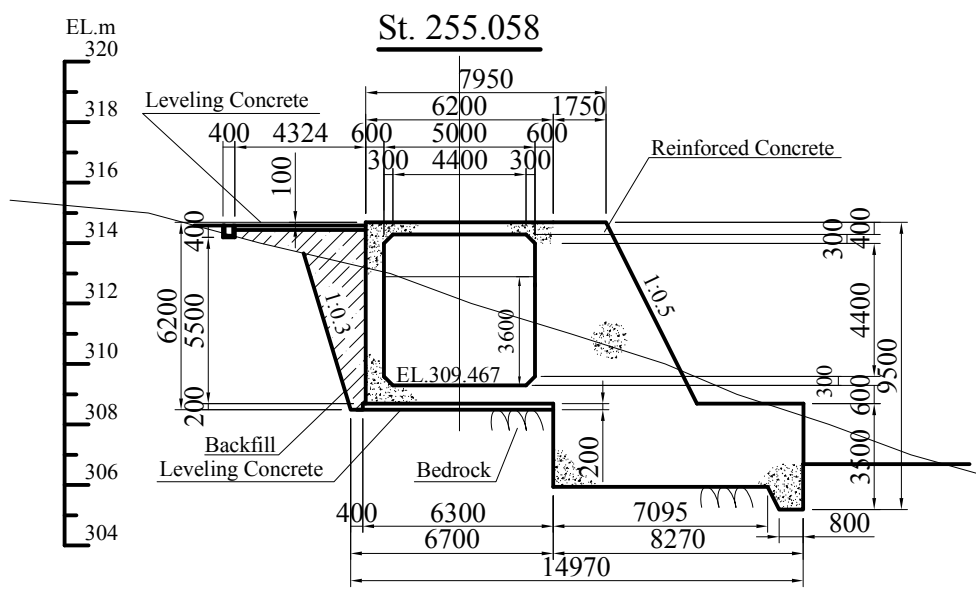
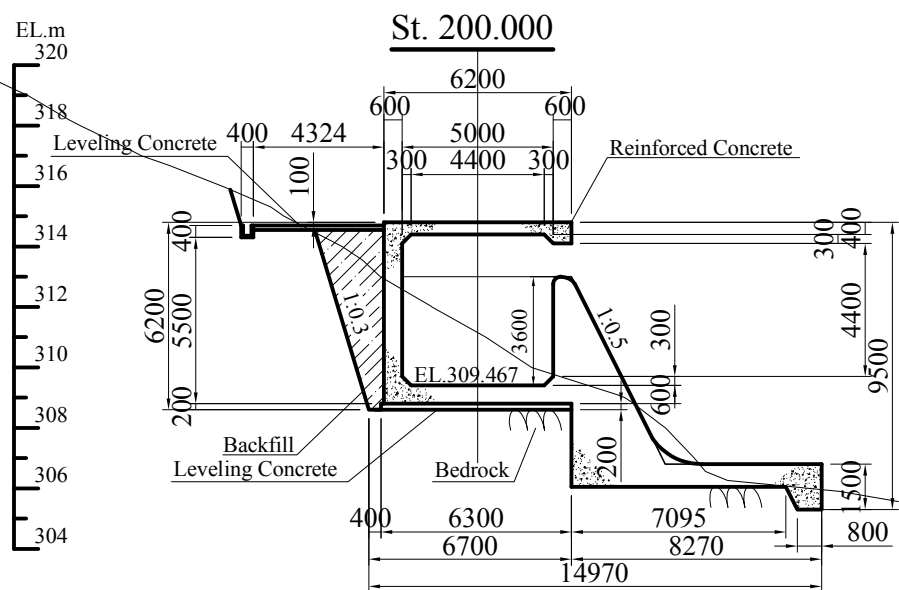
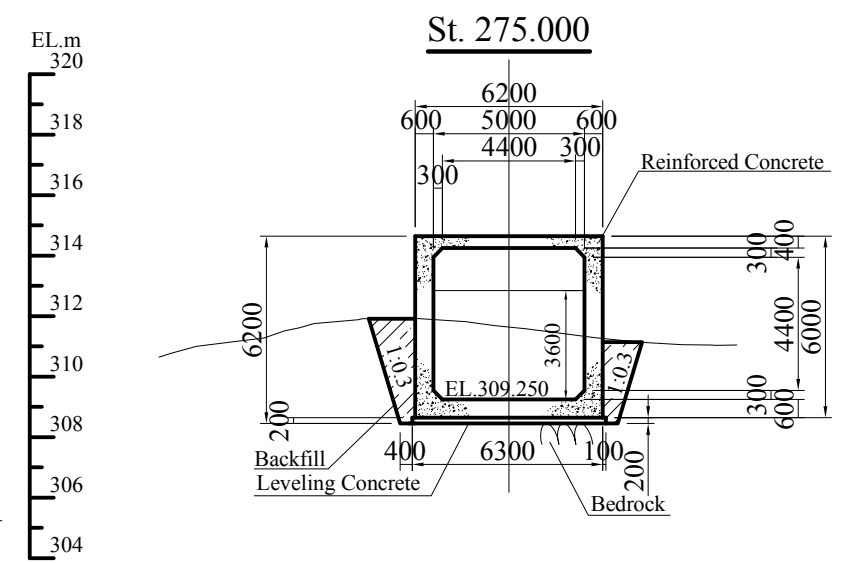
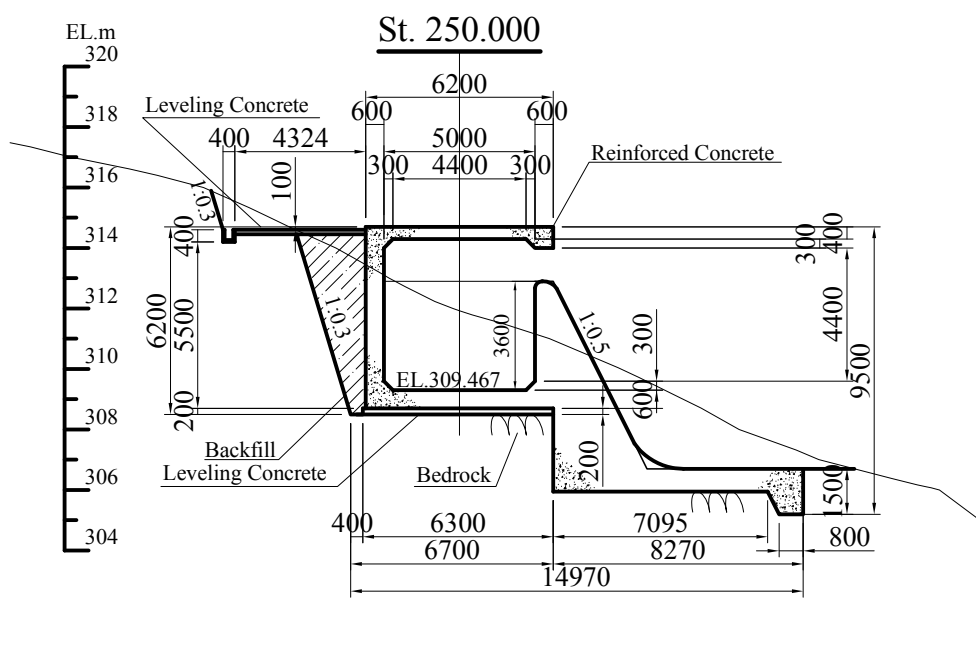
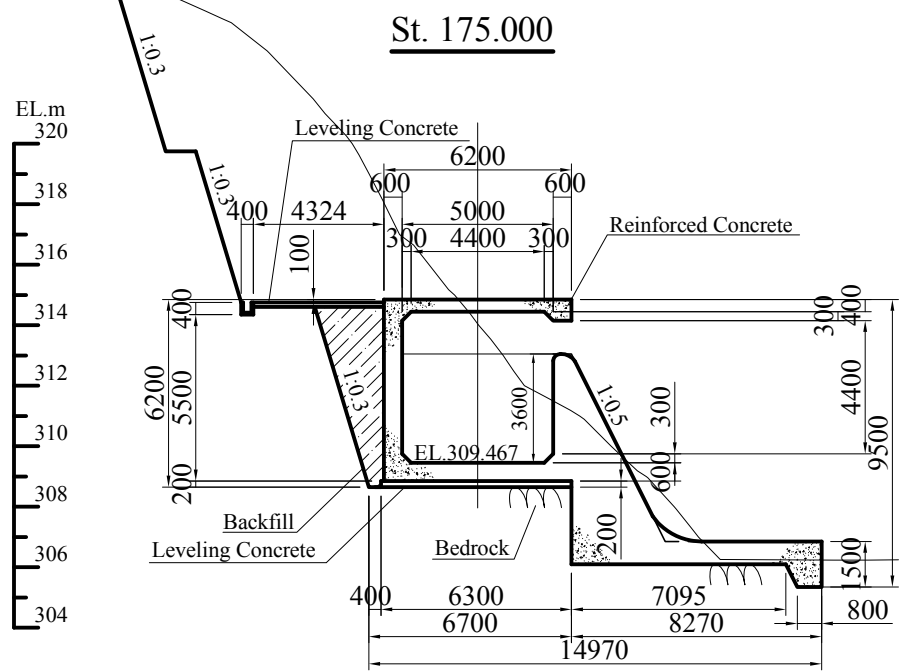


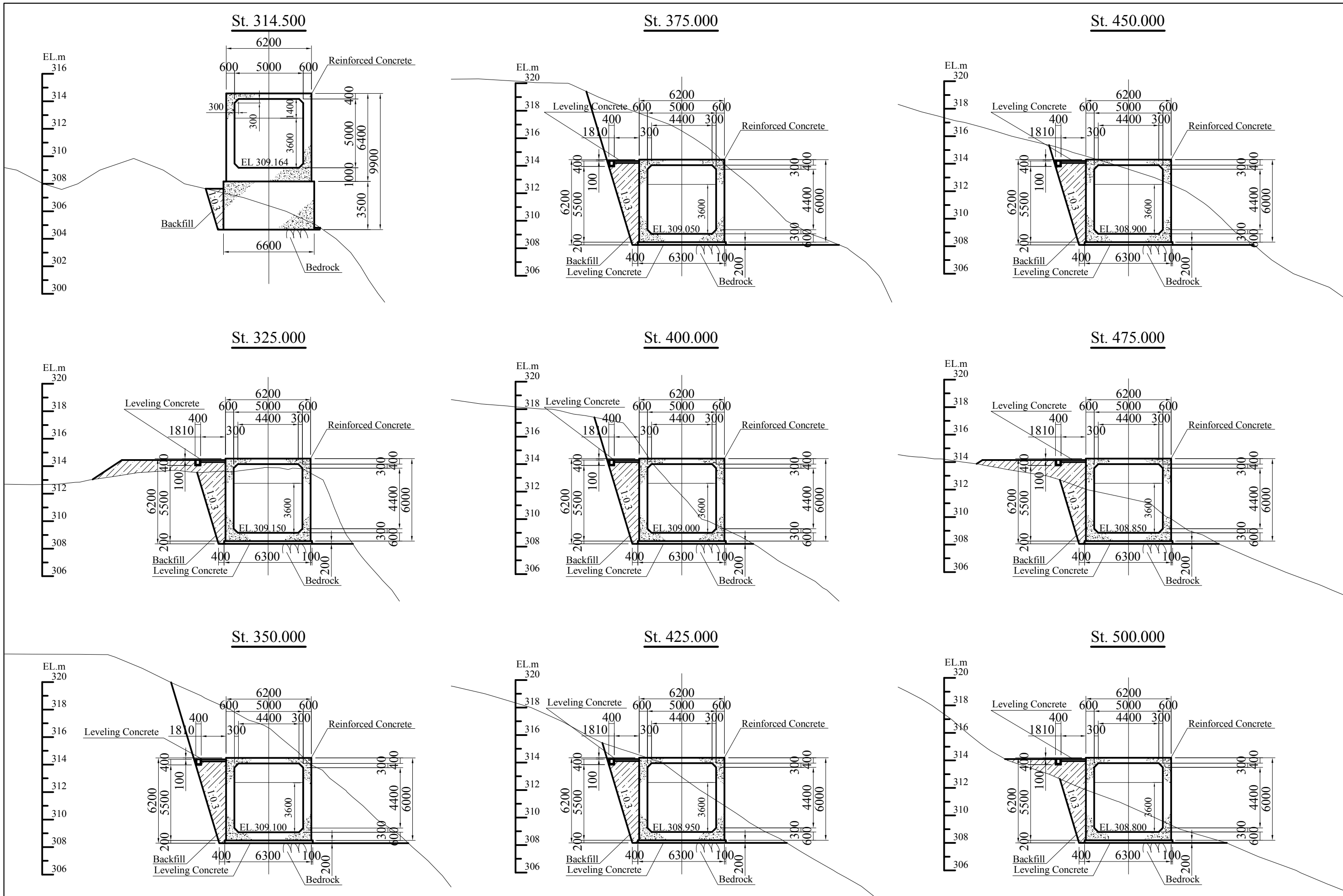


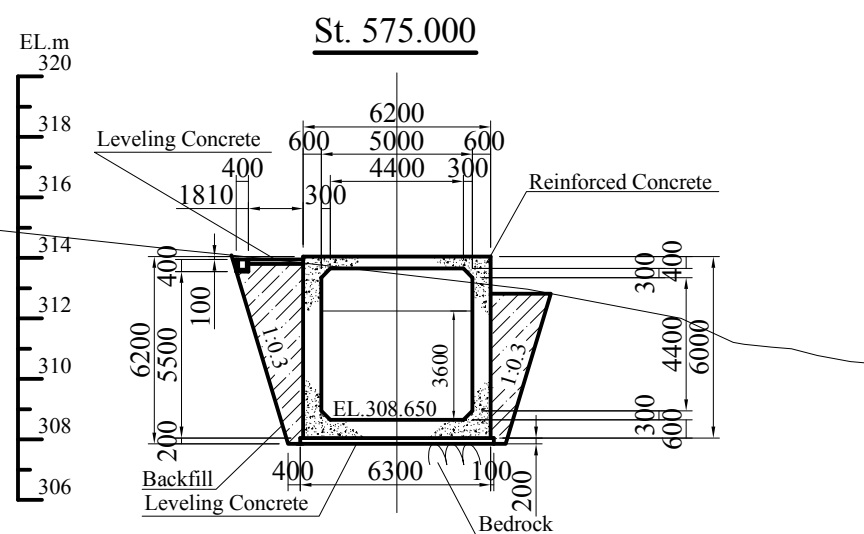
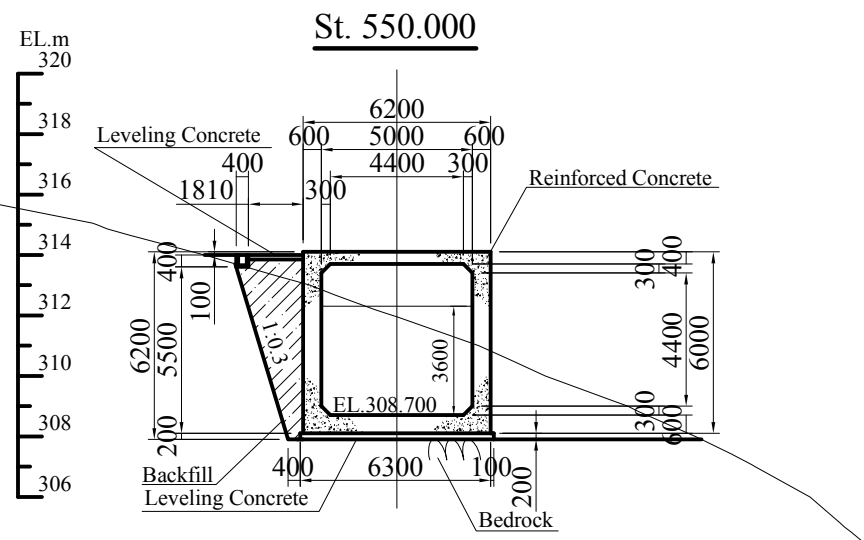
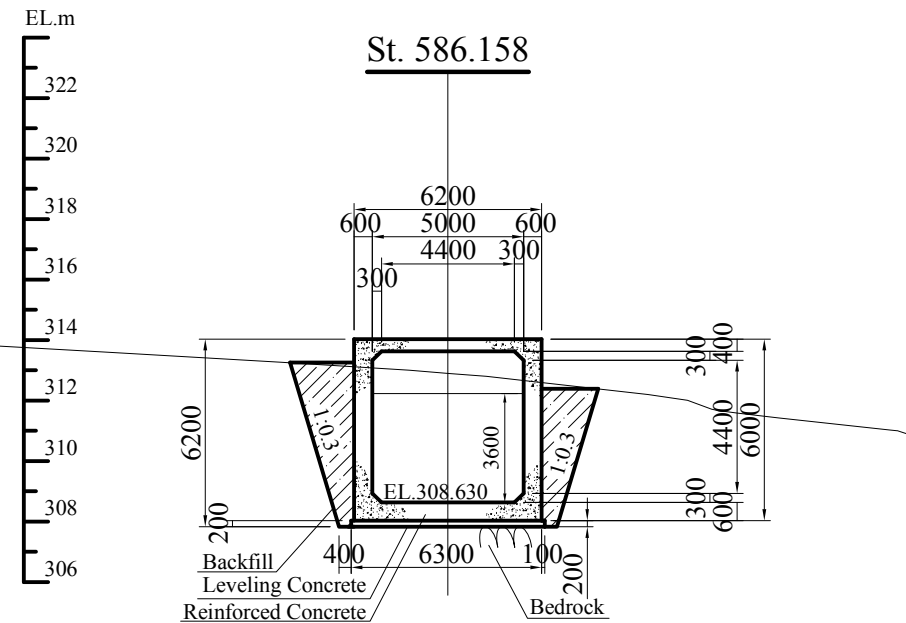
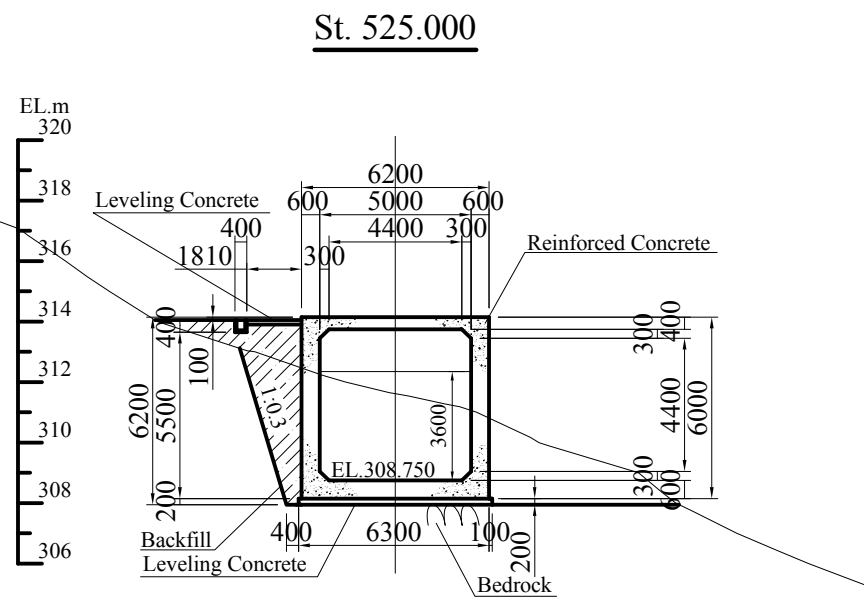


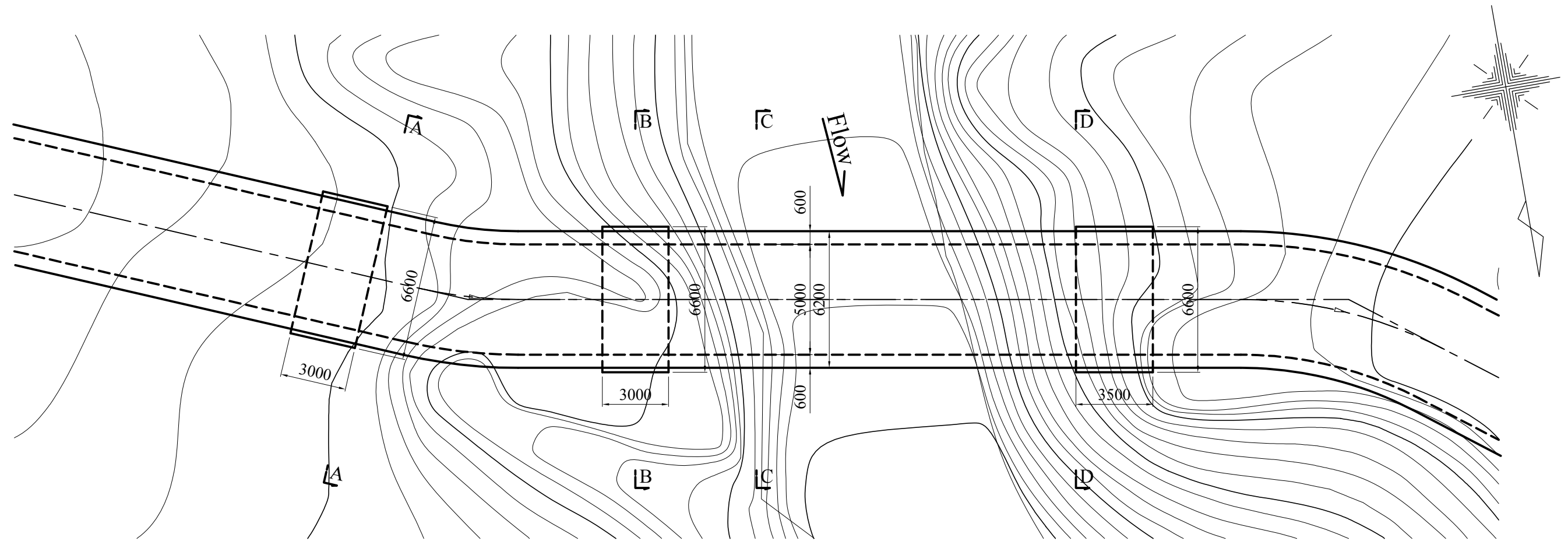
Headrace Plan (4/4)



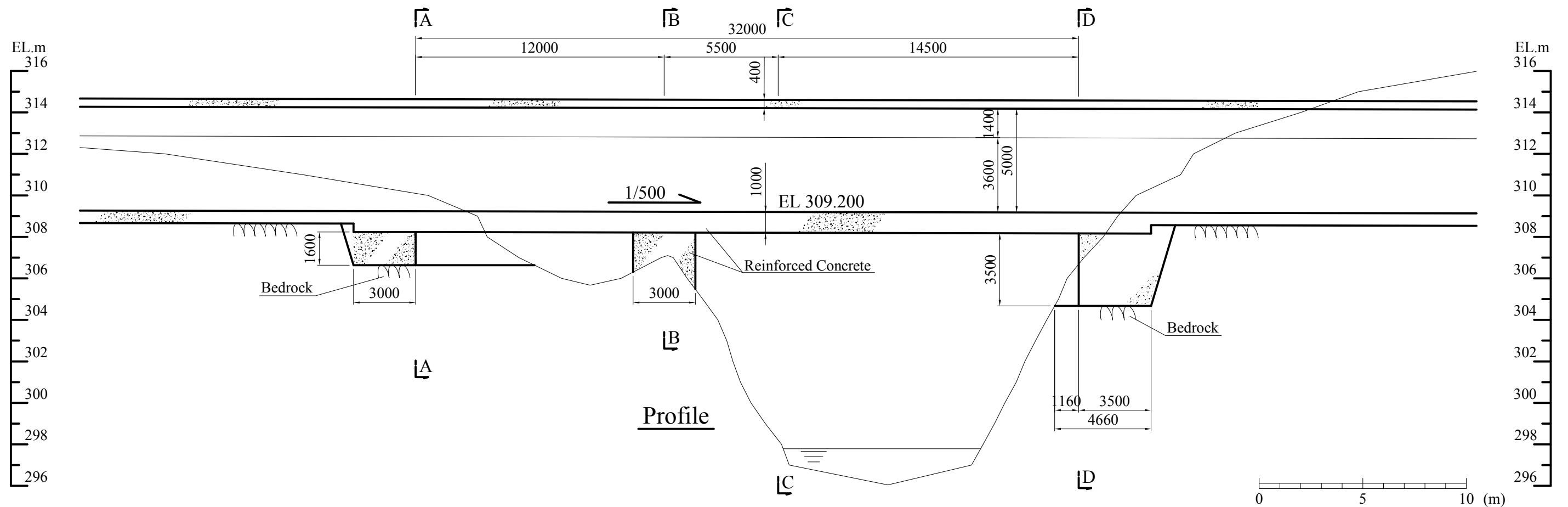




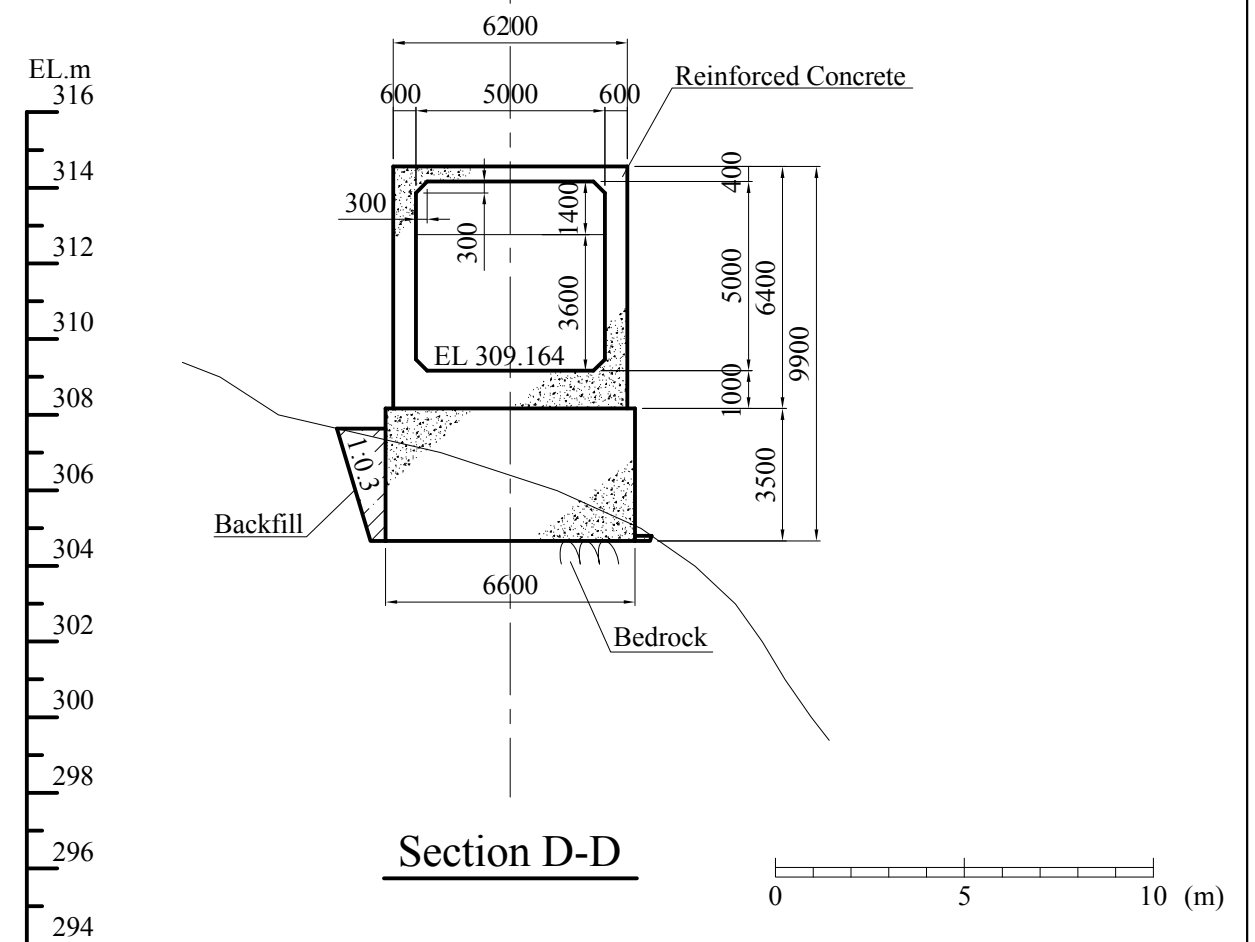
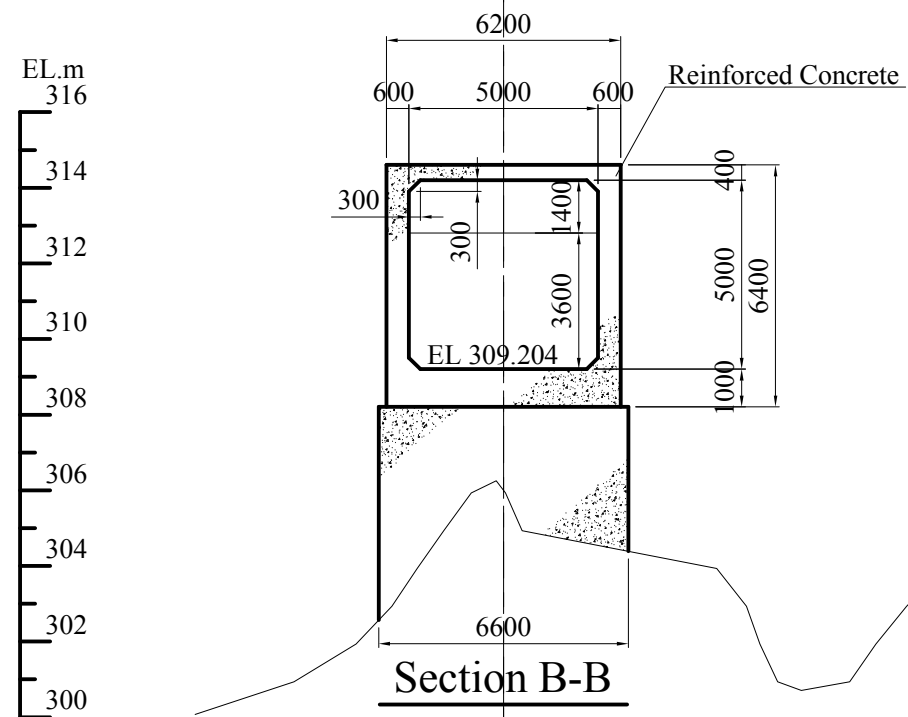
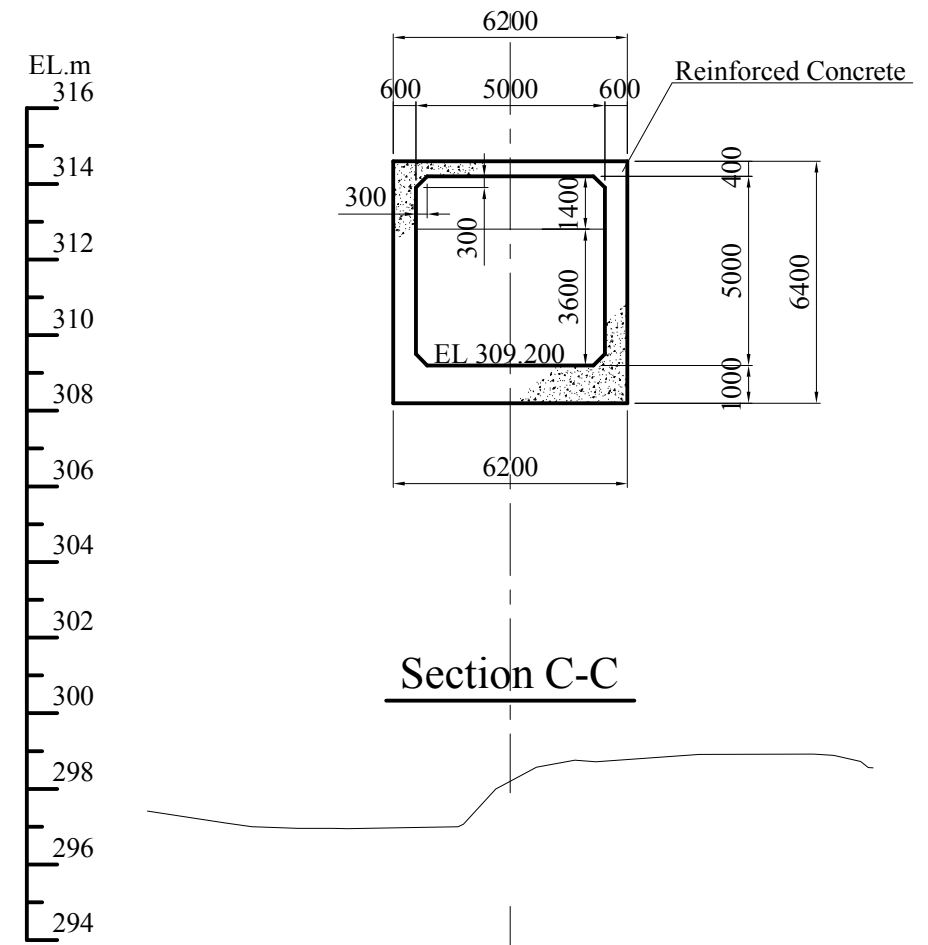
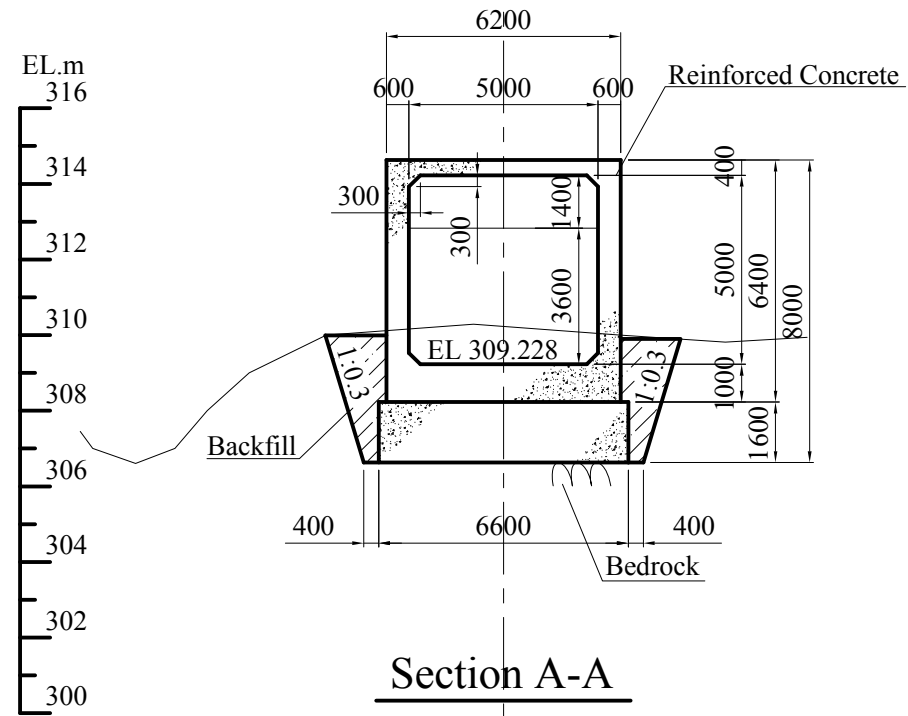


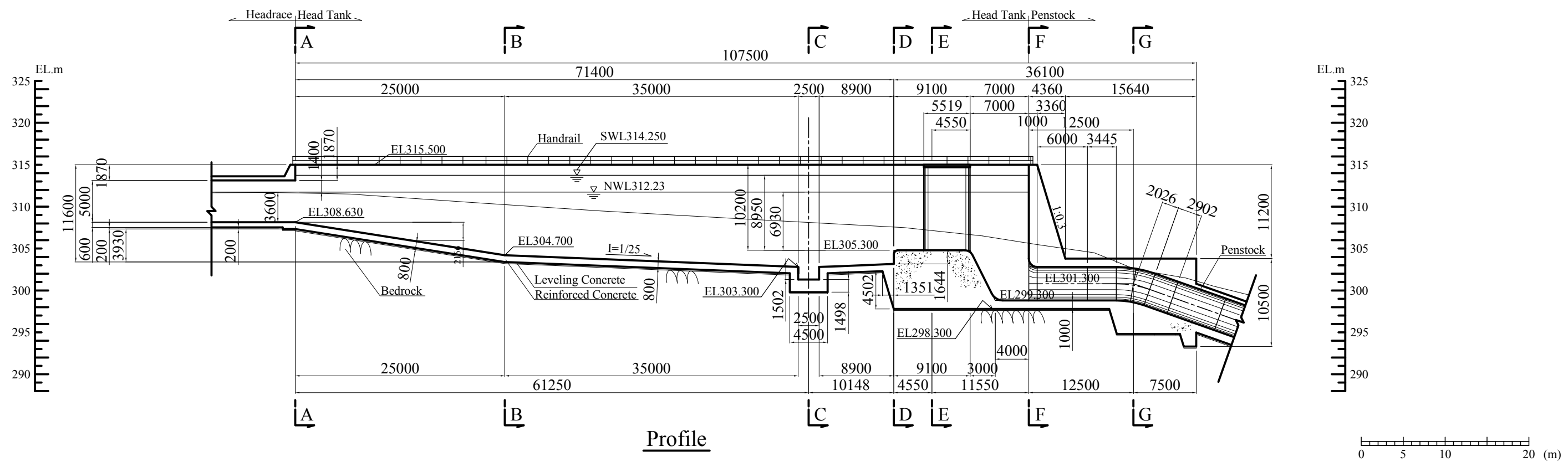
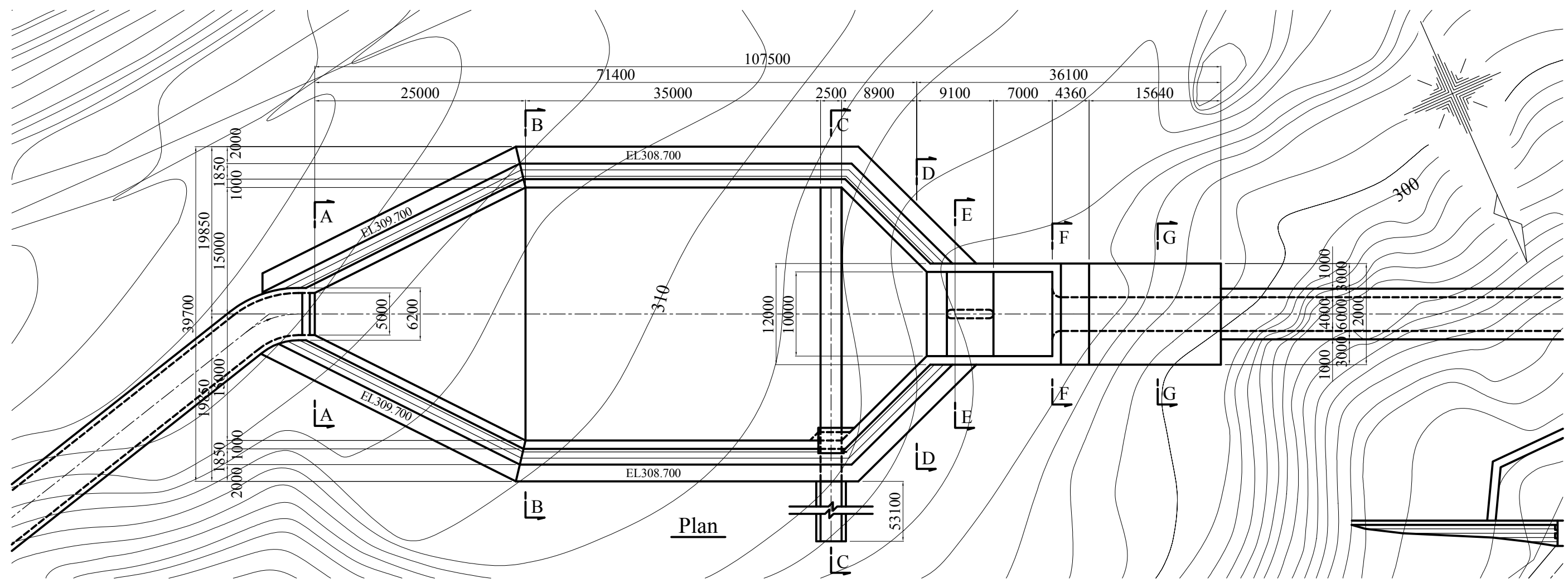


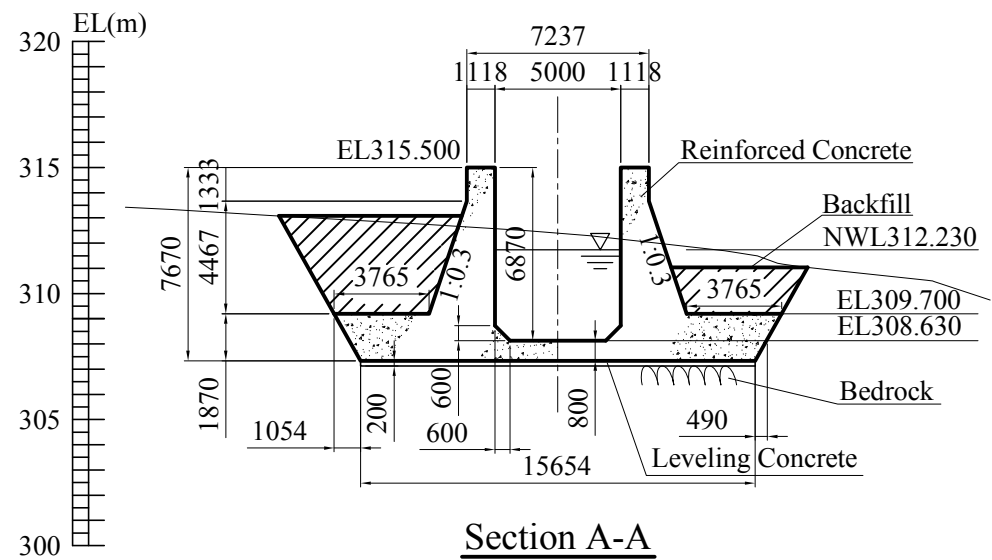
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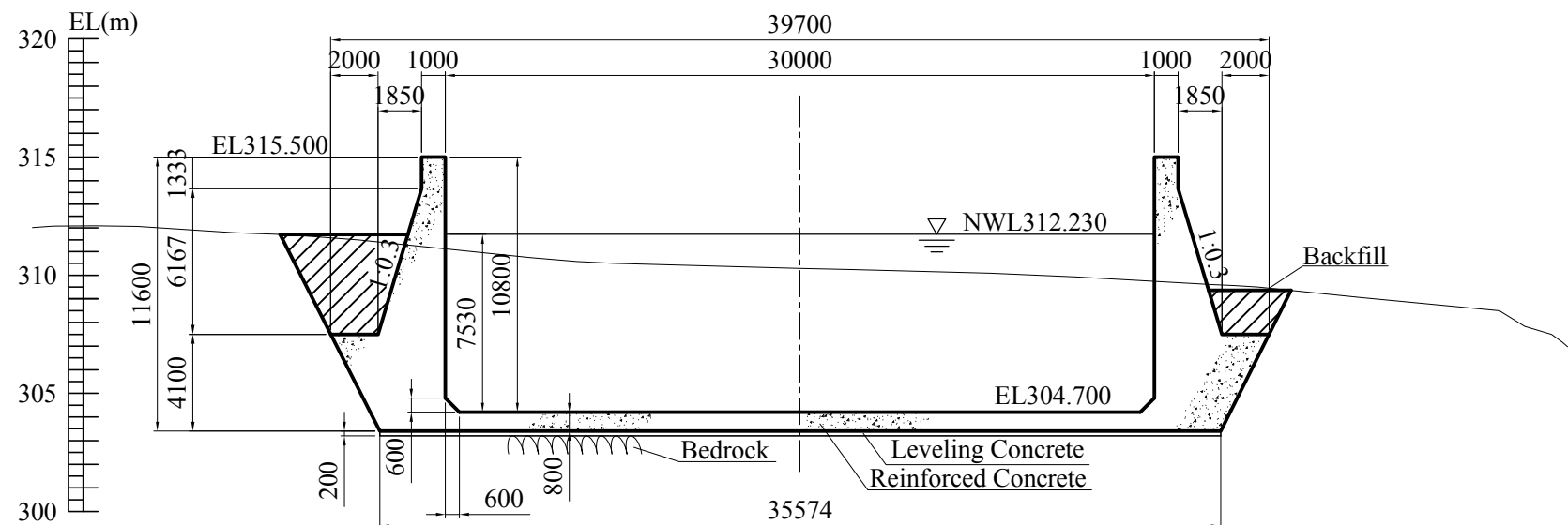
Profile



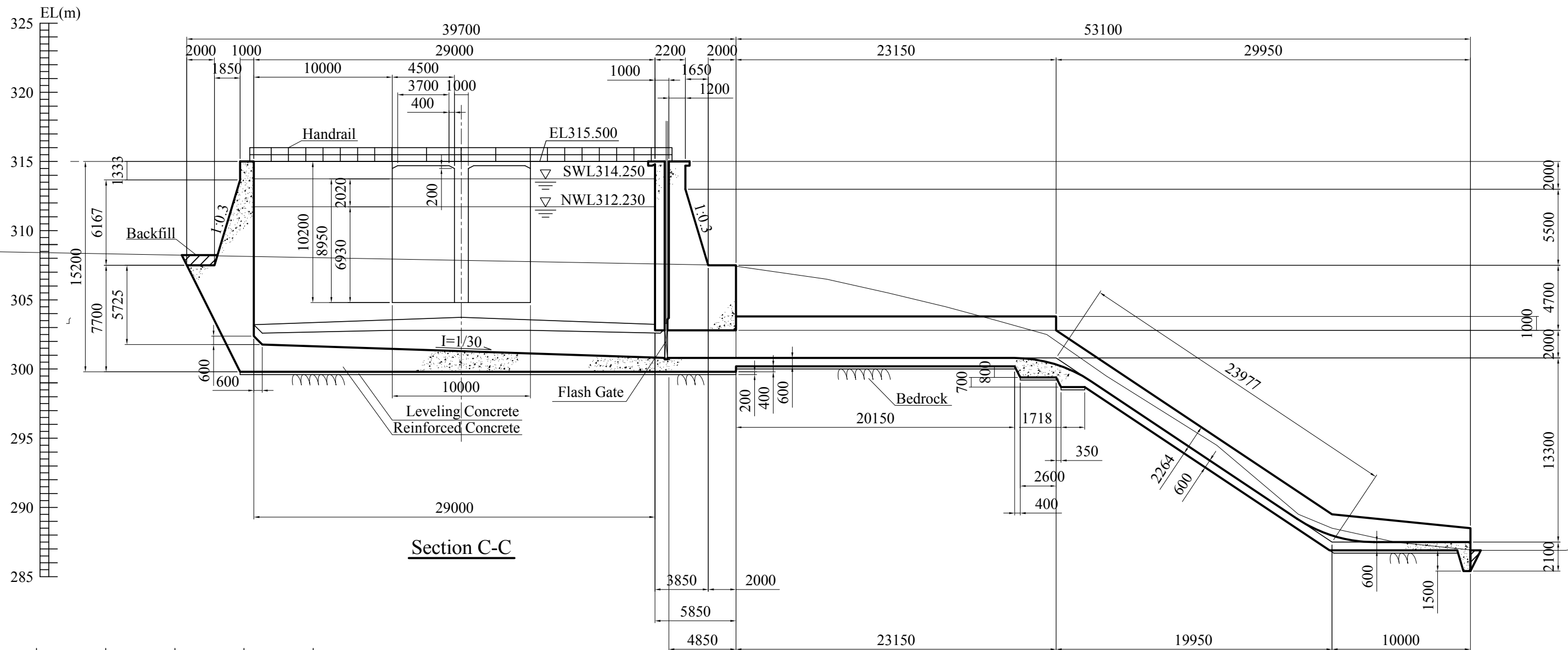




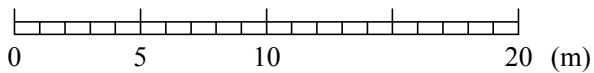
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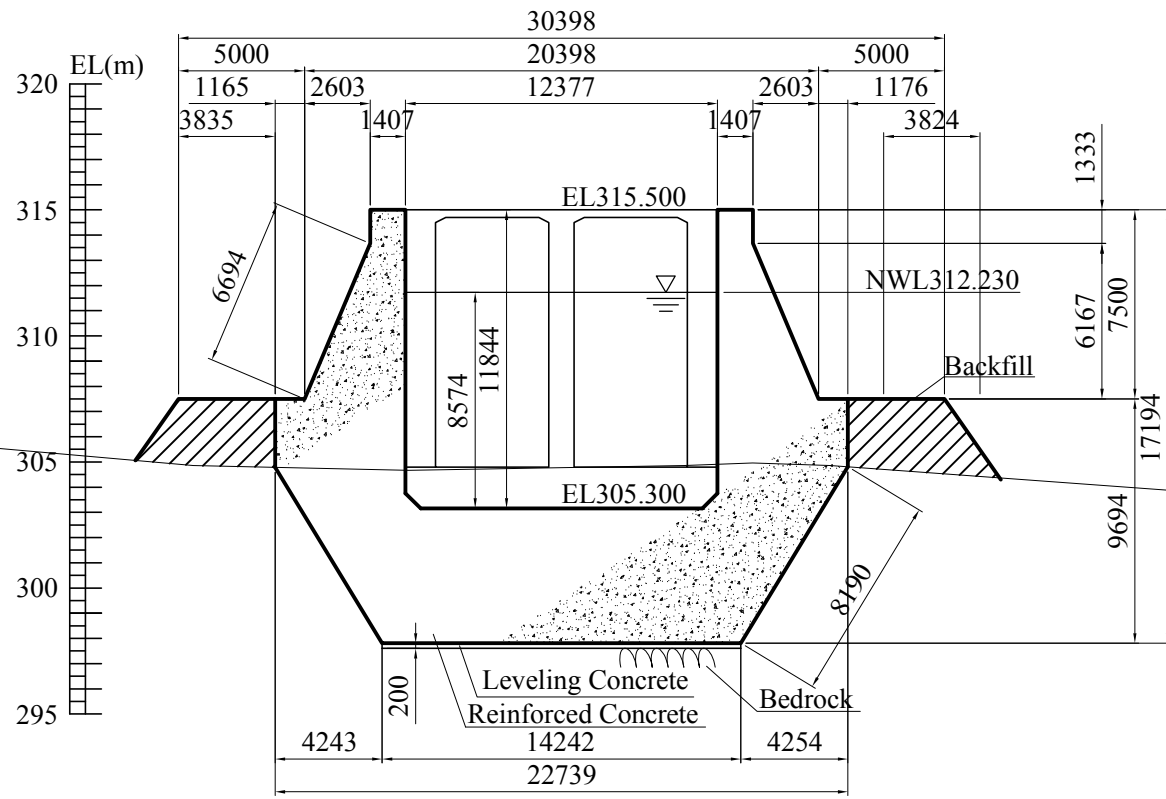


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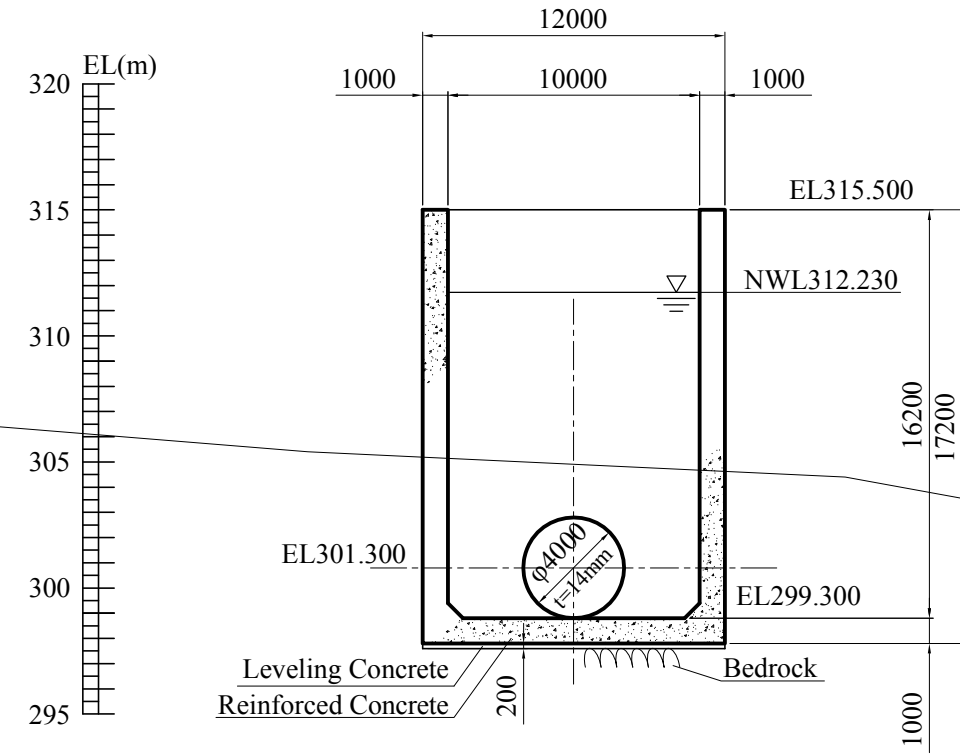


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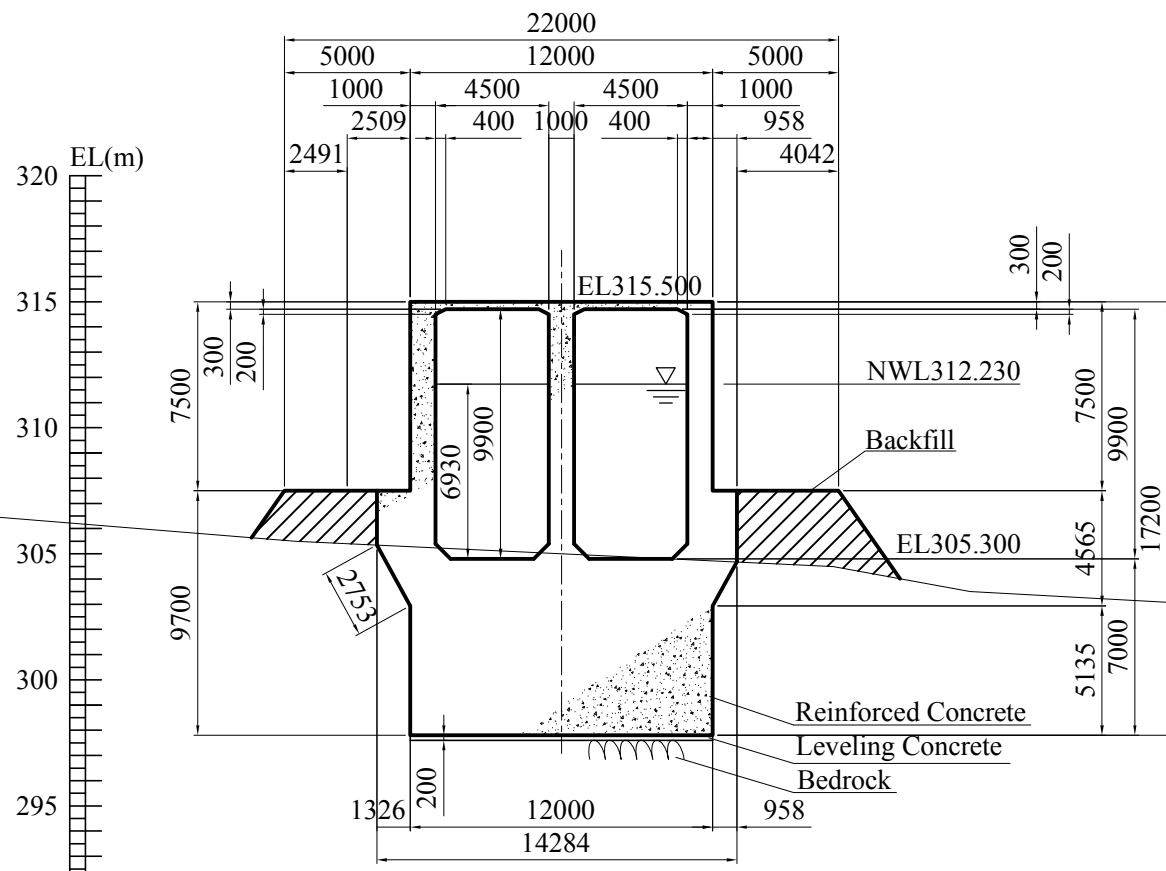




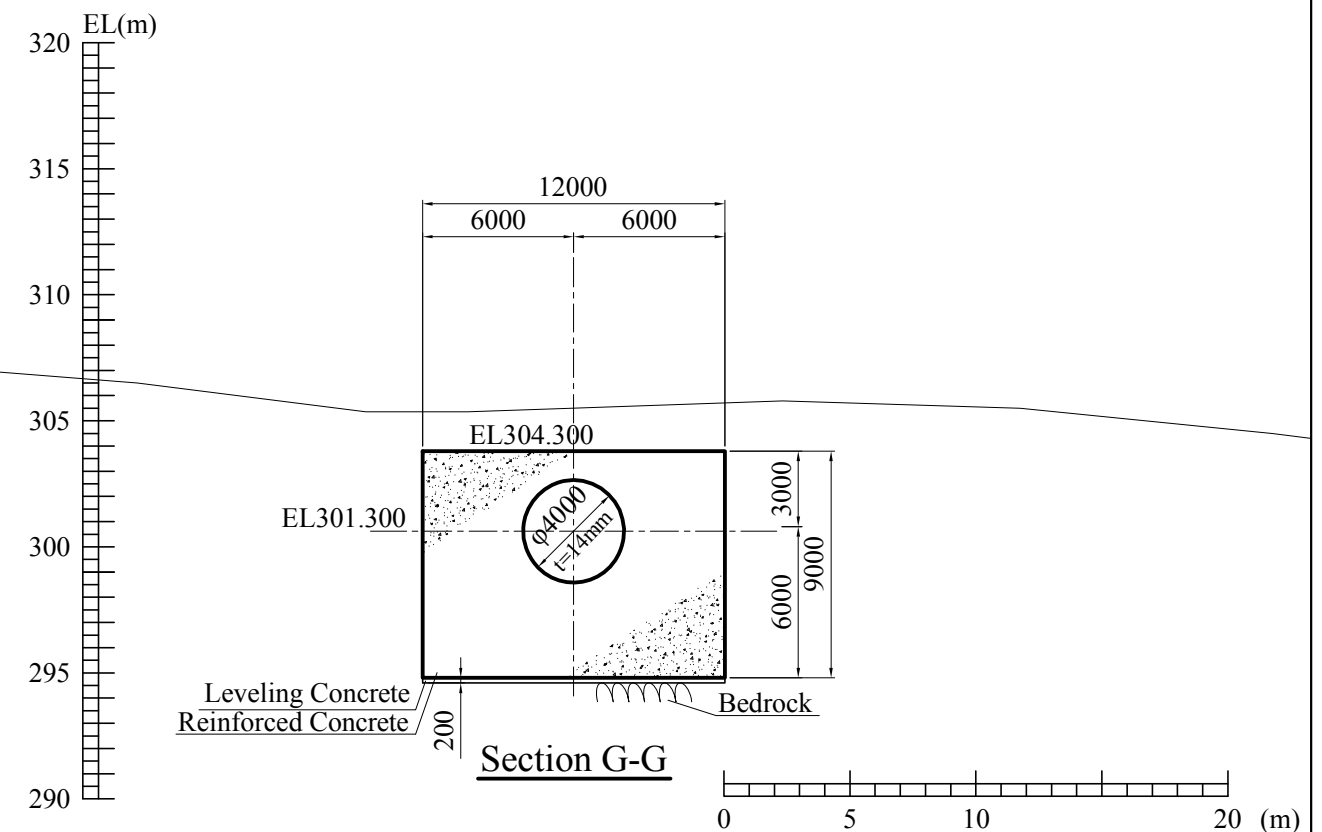
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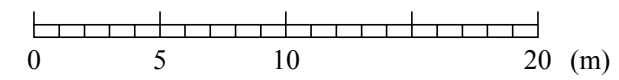
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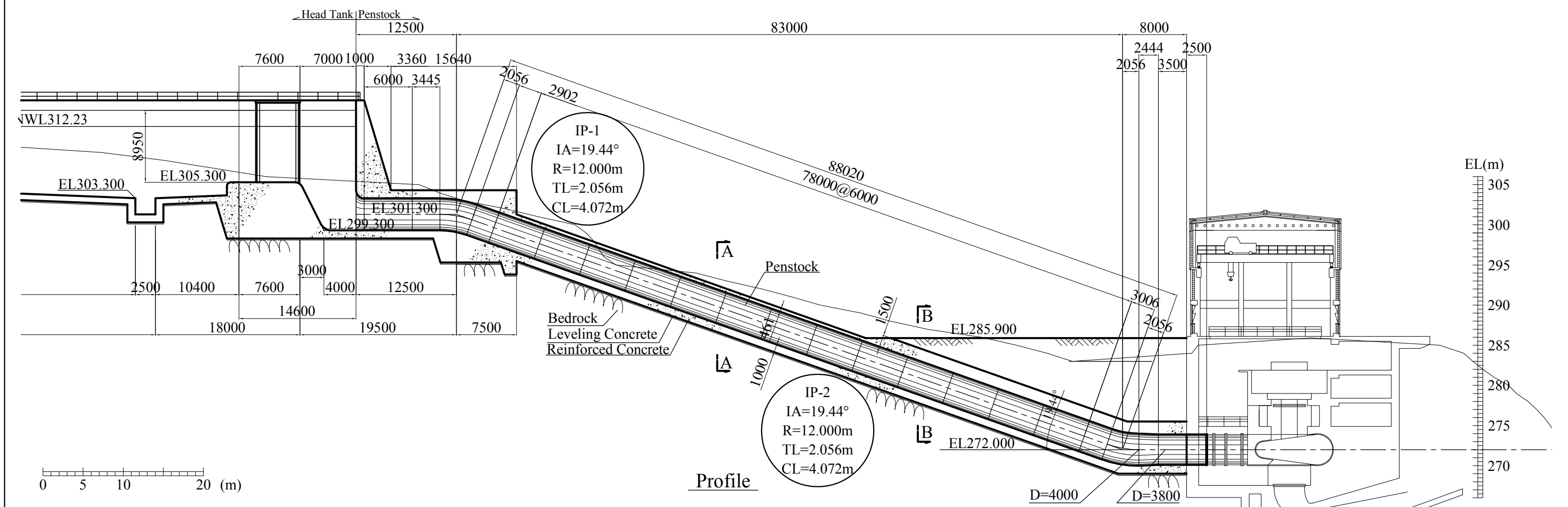
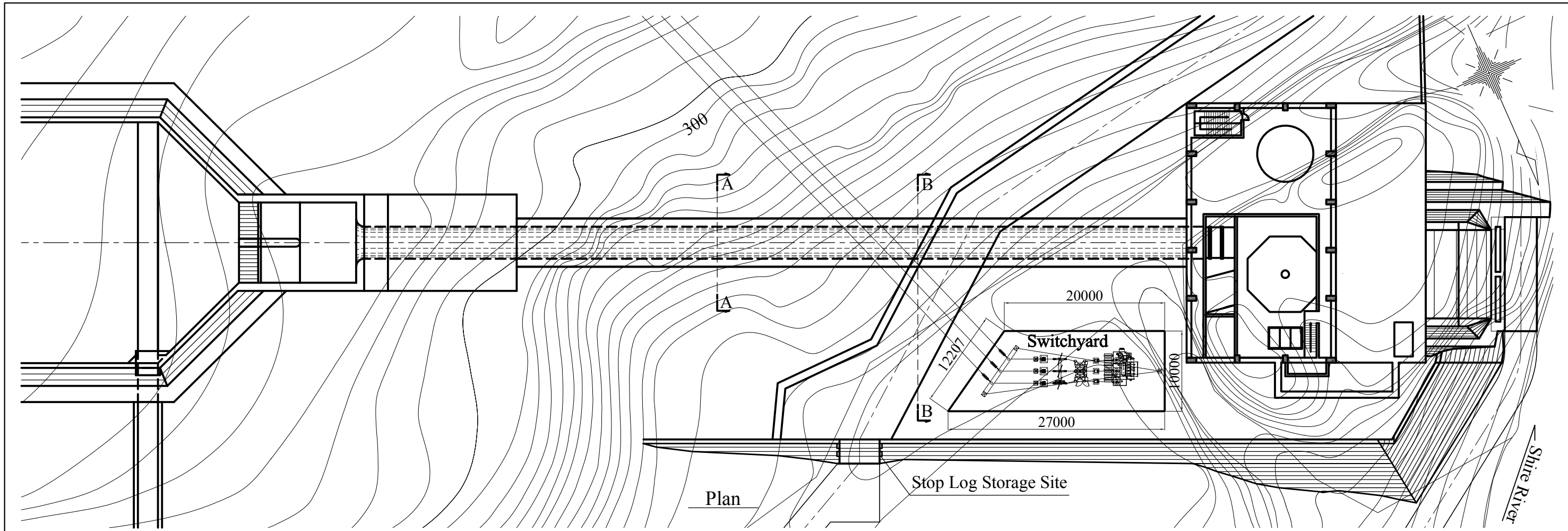


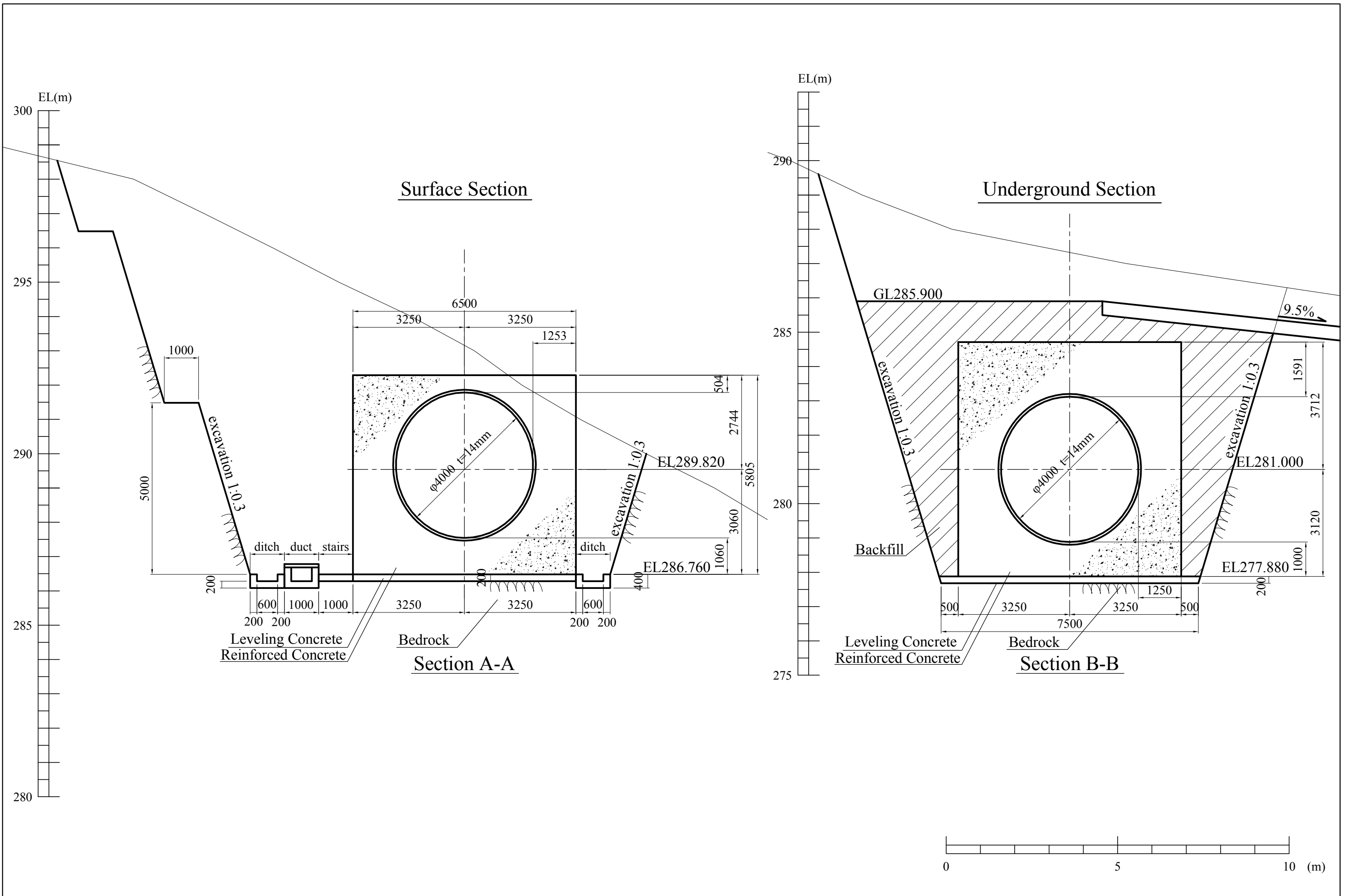
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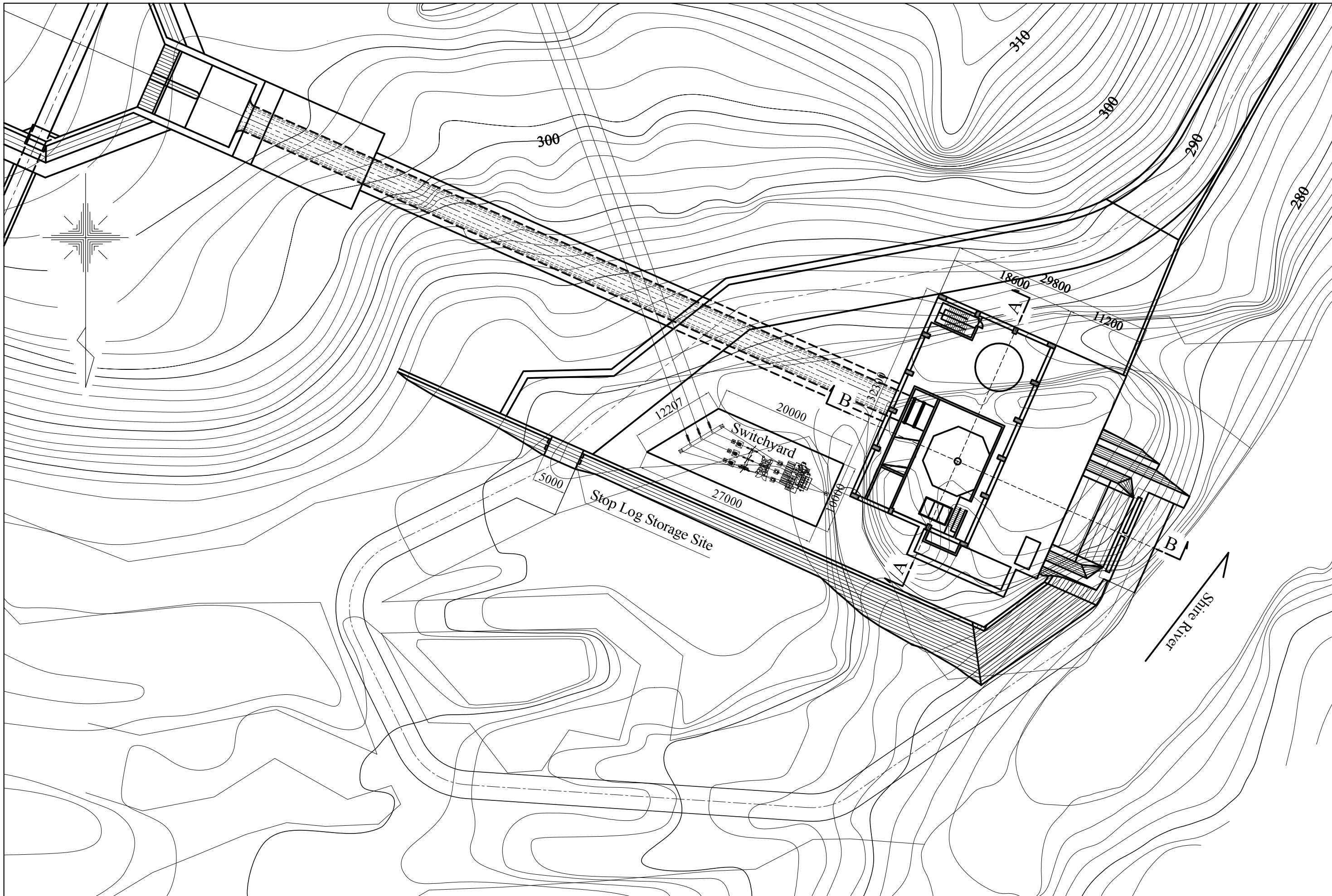


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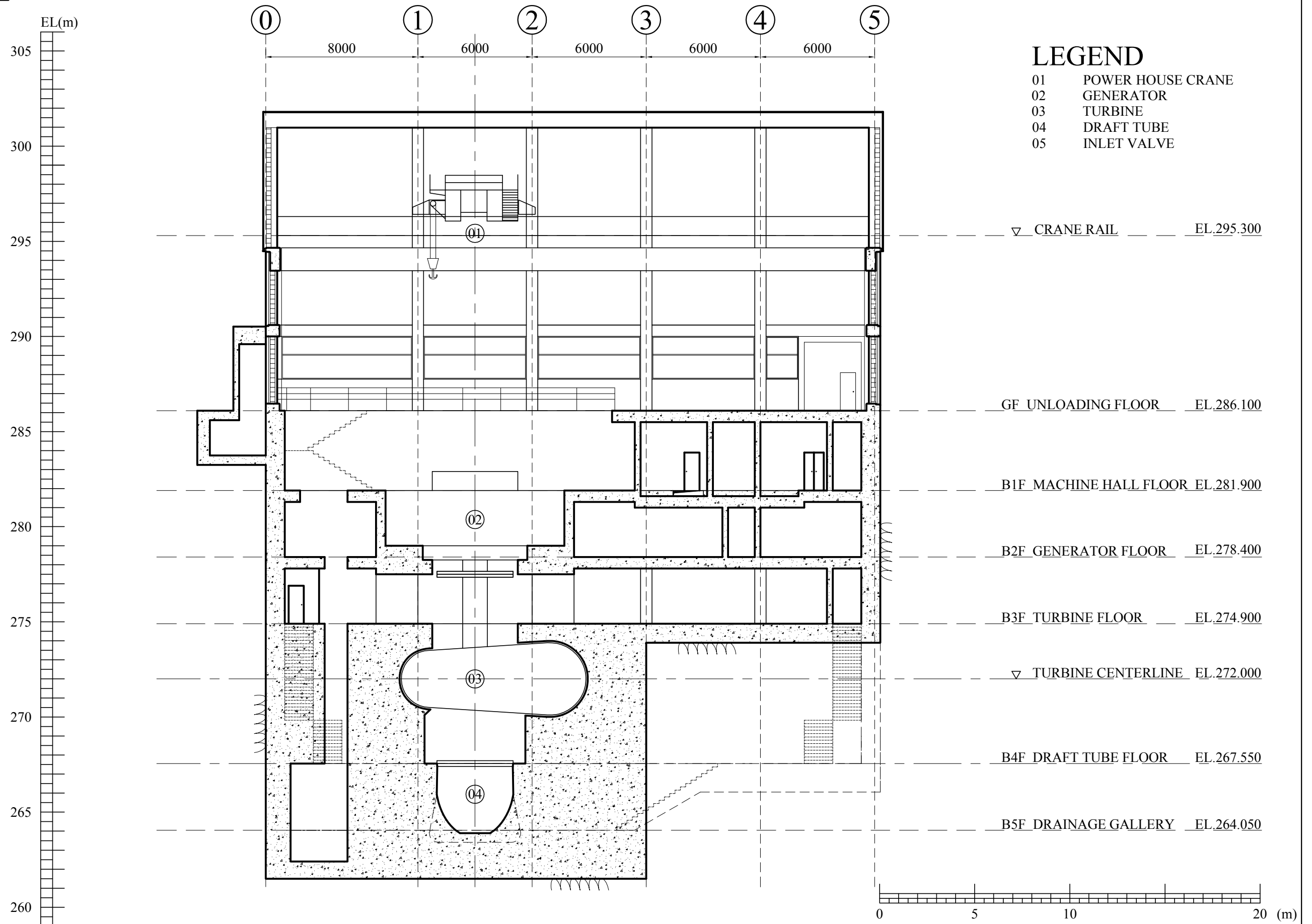






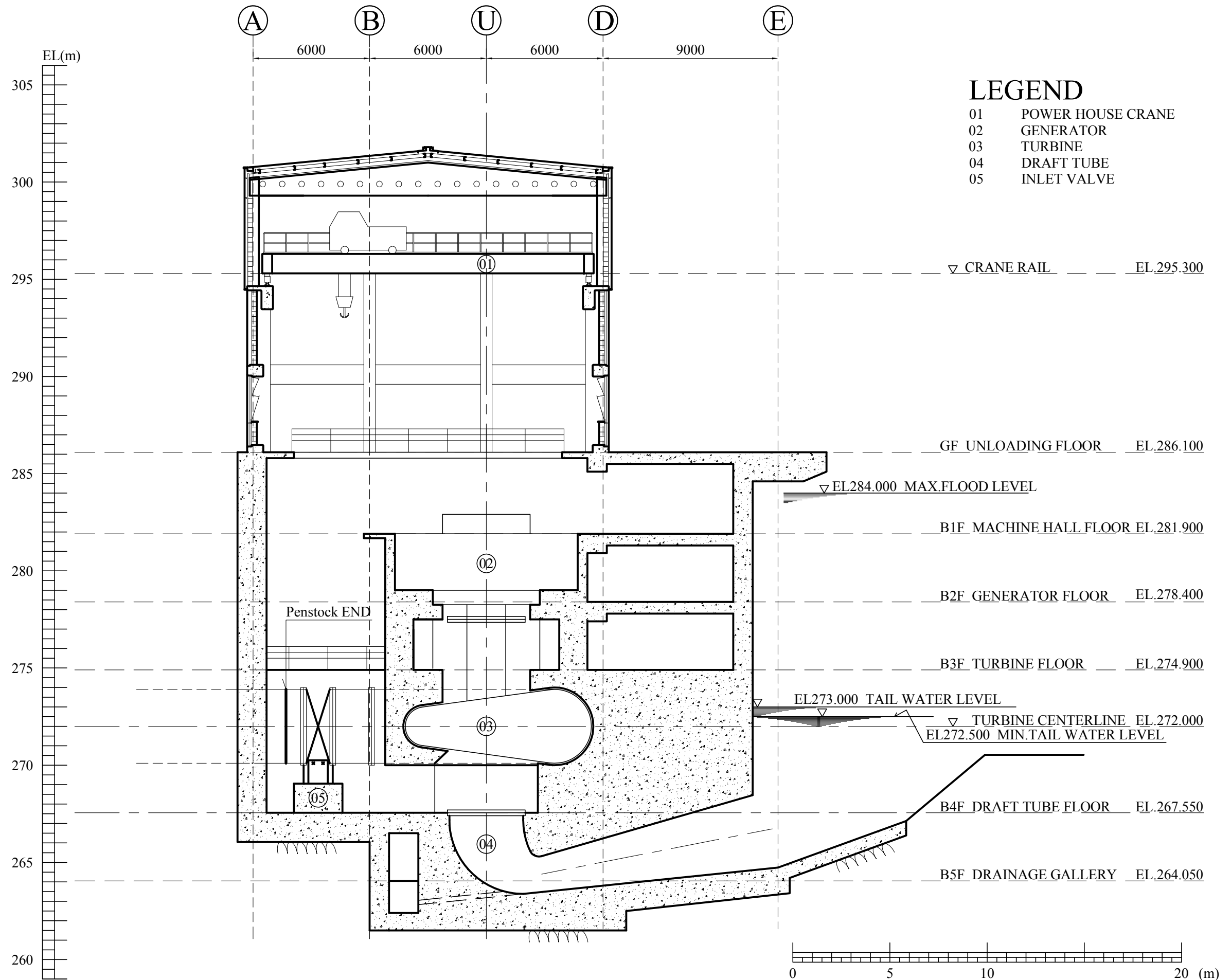


Sections A-A



- LEGEND**
- 01 POWER HOUSE CRANE
 - 02 GENERATOR
 - 03 TURBINE
 - 04 DRAFT TUBE
 - 05 INLET VALVE

Profile B-B



LEGEND

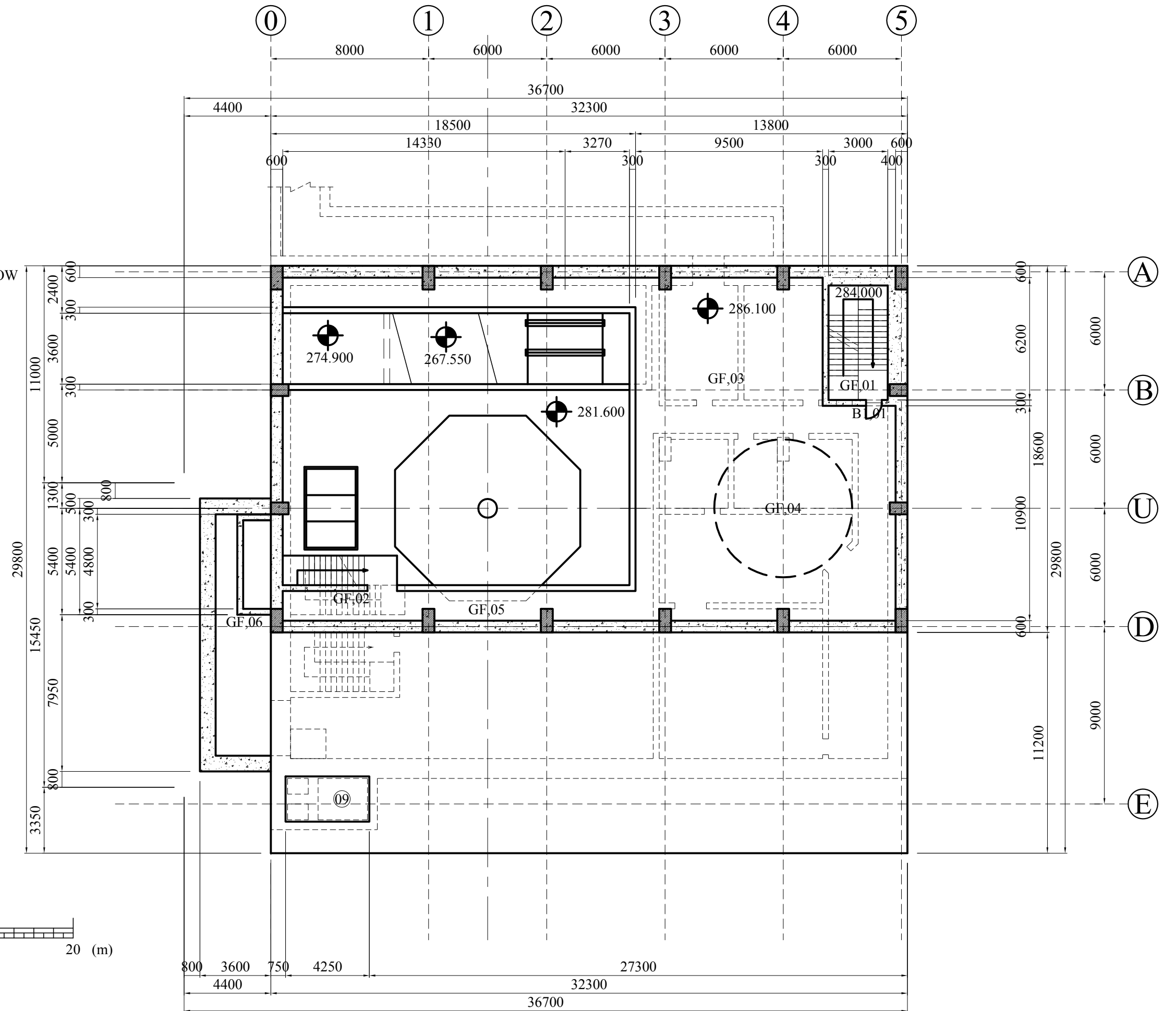
- 01 POWER HOUSE CRANE
- 02 GENERATOR
- 03 TURBINE
- 04 DRAFT TUBE
- 05 INLET VALVE

LEGEND

- GF - UNLOADING FLOOR
- GF.01 MAIN STAIR CASE
- GF.02 SECONDARY STAIR
- GF.03 UNLOADING AREA
- GF.04 GENERATOR ERECTION AREA
- GF.05 GALLERY
- GF.06 GANTRY CRANE PLATFORM

GENERAL

- 09 COVER FOR COOLINGWATER OVER FLOW



LEGEND

B1 - MACHINE HALL FLOOR

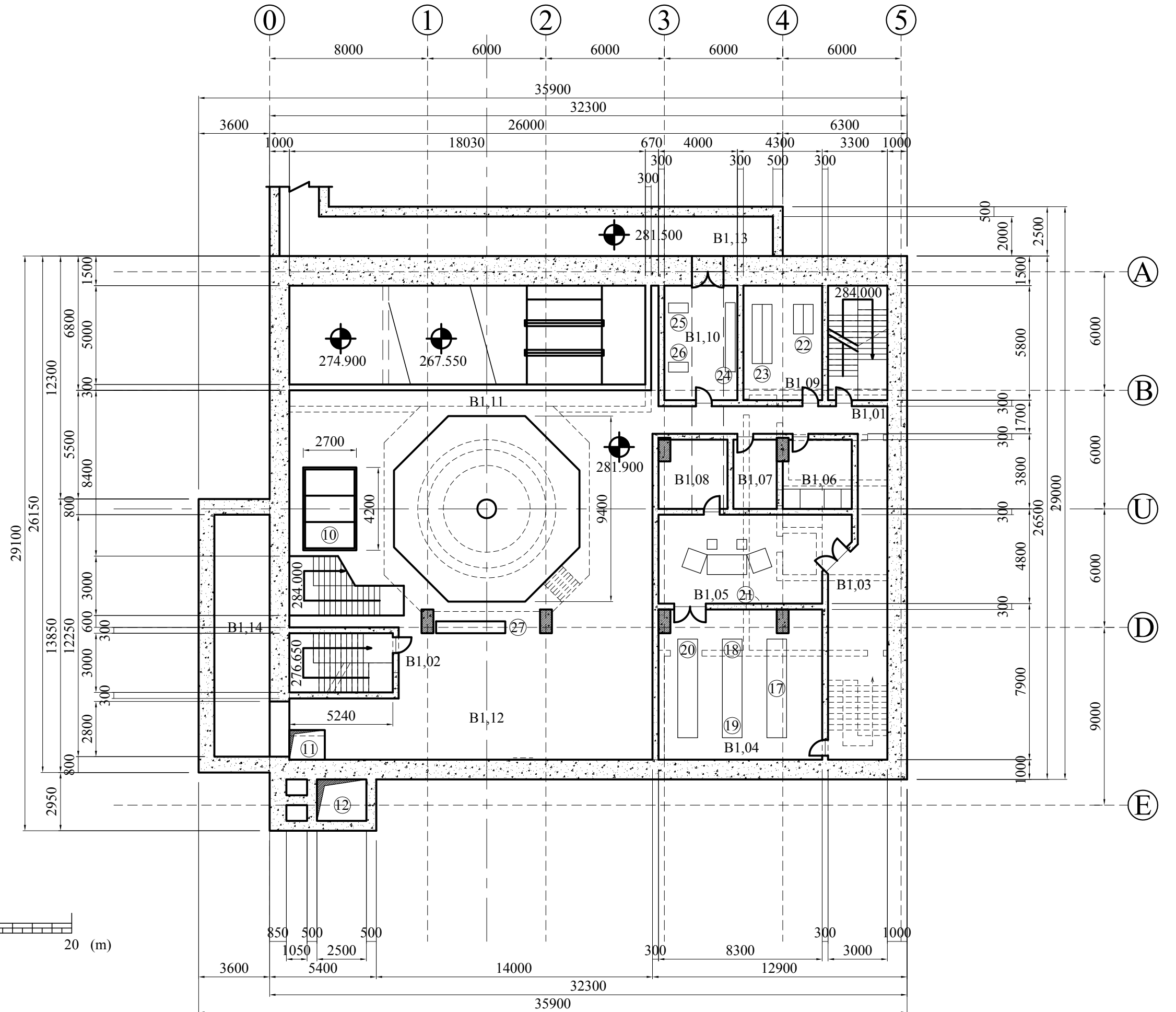
- B1.01 MAIN STAIR CASE
- B1.02 SECONDARY STAIR CASE
- B1.03 CORRIDOR
- B1.04 ELECTRONIC ROOM
- B1.05 CONTROL ROOM
- B1.06 TEA KITCHEN
- B1.07 TOILET
- B1.08 ARCHIVE
- B1.09 BATTERY ROOM
- B1.10 D.C.SWITCHGEAR ROOM
- B1.11 MACHINE HALL FLOOR
- B1.12 VENTILATION EQUIPMENT
- B1.13 CABLE GALLERY TO SWITCHYARD
- B1.14 FRESH AIR GALLERY

GENERAL

- 10 ERECTION HATCH
- 11 BLOCKOUT FOR VENTILATION DUCTS
- 12 COOLING WATER OVERFLOW SHAFT

ELECTRICAL EQUIPMENT

- 17 PROTECTION
- 18 COMMUNICATION
- 19 ALARM
- 20 INTERFACE
- 21 CENTRAL CONTROL PANEL
- 22 50V BATTERIES
- 23 110V BATTERIES
- 24 BATTERY CHARGERS
- 25 50V SWITCHGEAR
- 26 110V SWITCHGEAR
- 27 EXITATION EQUIPMENT



LEGEND

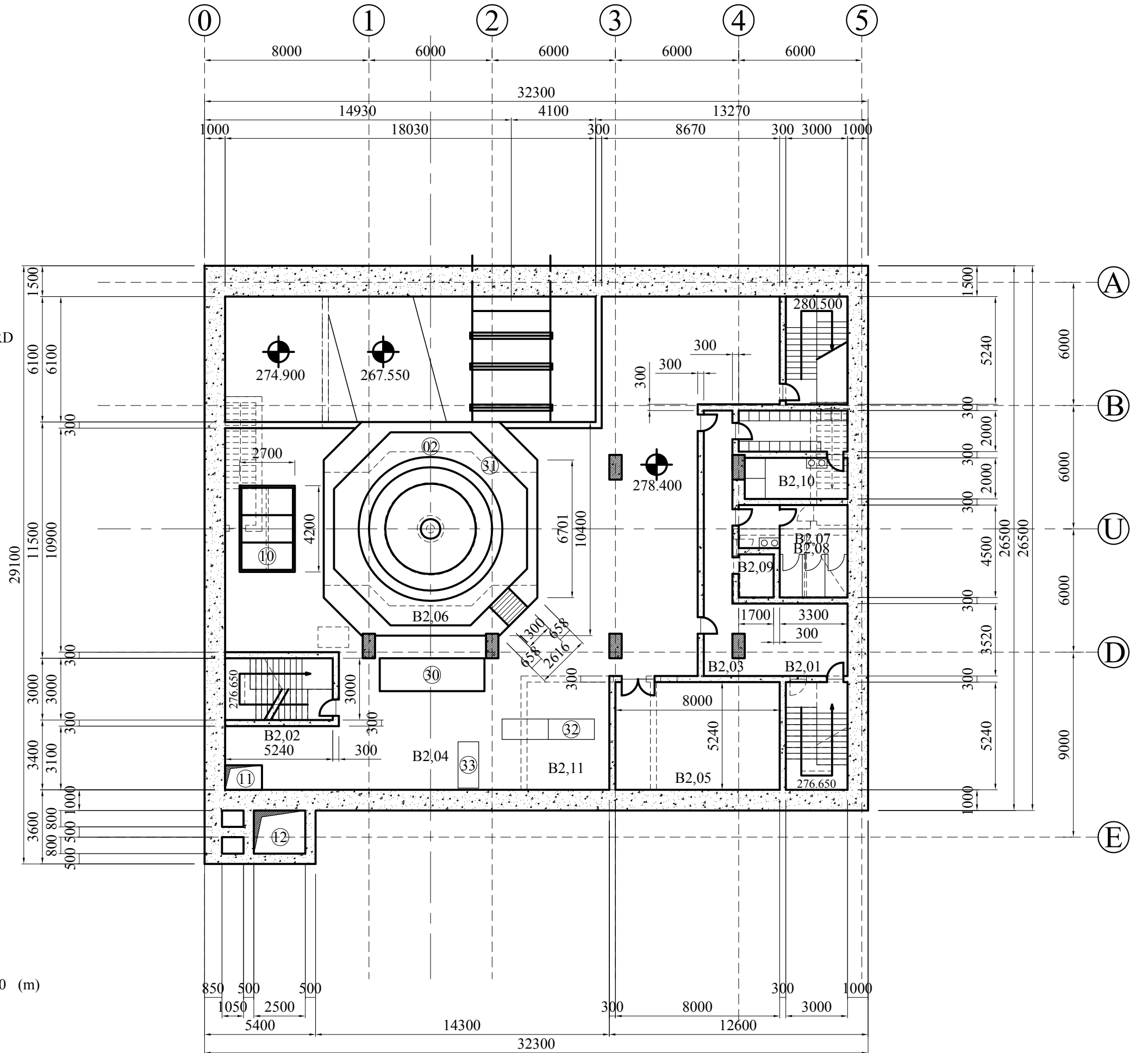
- B2 - GENERATOR FLOOR
- B2.01 MAIN STAIR CASE
- B2.02 SECONDARY STAIR CASE
- B2.03 CORRIDOR
- B2.04 GENERATOR FLOOR
- B2.05 AIR CONDITIONING PLANT ROOM
- B2.06 GENERATOR PIT
- B2.07 GENERATOR PIT
- B2.08 TOILET
- B2.09 CLEANING FACILITIES
- B2.10 LOCKER ROOM
- B2.11 SHOWER ROOM
- B2.12 STATIONTRANSFORMAR/LV.MAINSWICHBOARD

GENERAL

- 10 ERECTION HATCH
- 11 BLOCKOUT FOR VENTILATION DUCTS
- 12 COOLING WATER OVERFLOW SHAFT

ELECTRICAL EQUIPMENT

- 02 GENERATOR OUTLINE
- 30 GENERAL LINE CUBICLE
- 31 GENERAL NEUTRAL EARTHING CUBICLE
- 32 L.V.MAIN SWITCHBOARD
- 33 STATION TRANSFORMER



LEGEND

- B3 - TURBINE FLOOR
- B3.01 MAIN STAIR CASE
- B3.02 SECONDARY STAIR CASE
- B3.03 TURBINE FLOOR
- B3.04 SEWAGE PUMP STATION
- B3.05 WORKSHOP ROOM
- B3.06 STORE
- B3.07 UNLOADING PLATFORM

GENERAL

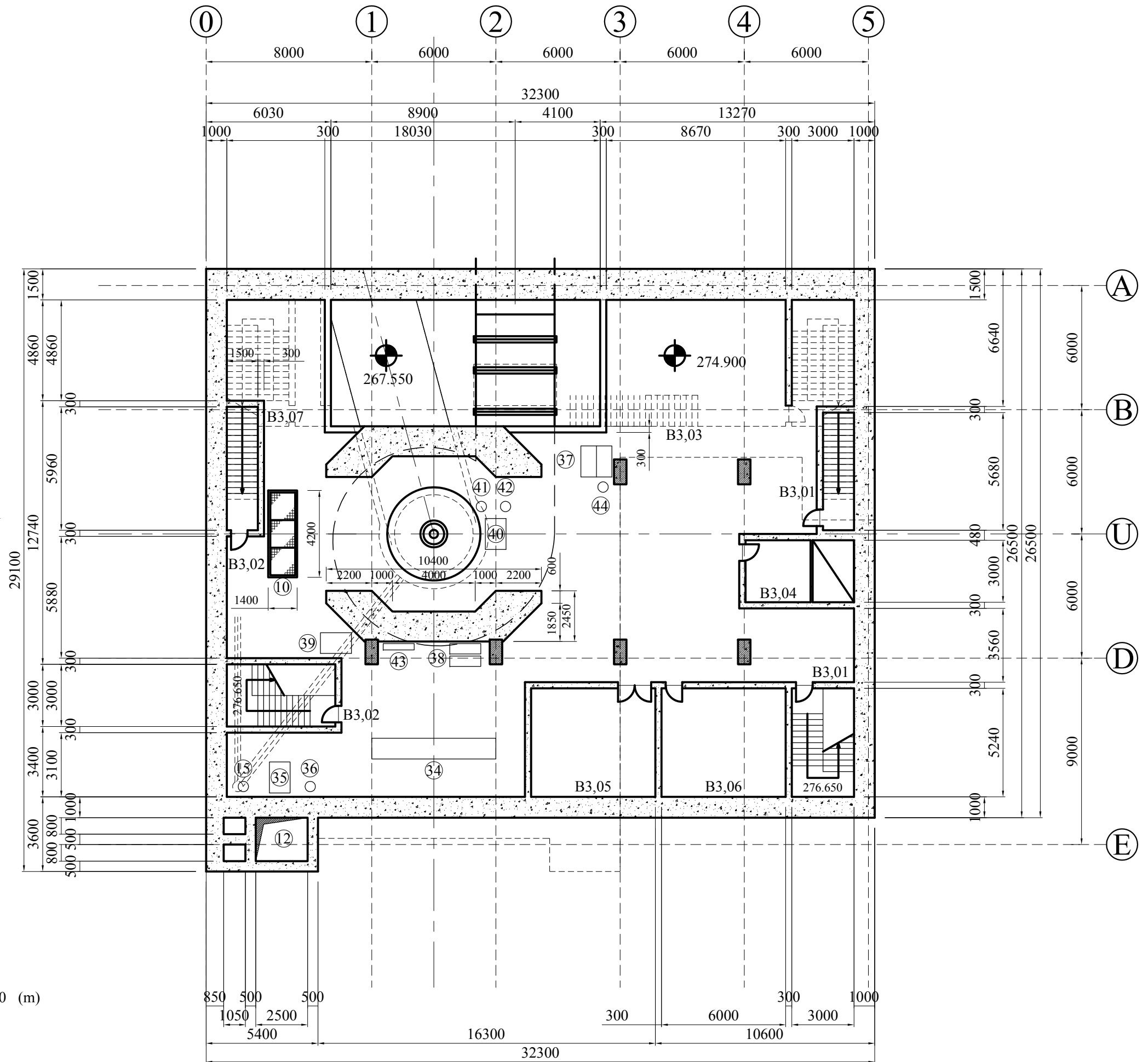
- 10 ERECTION HATCH
- 12 COOLING WATER OVERFLOW SHAFT
- 15 VENTILATION PIPE

ELECTRICAL EQUIPMENT

- 34 UNIT CONTROL BOARD + MCC

MECHANICAL EQUIPMENT

- 35 COMPRESSOR FOR SERVICE AIR
- 36 PRESSER VESSEL FOR SERVICE AIR
- 37 COMPRESSOR FOR GOVERNOR
- 38 COOLING WATER PUMP STATION
- 39 COMPRESSOR FOR STABILIZATION / CAVITATION AIR
- 40 HYDRAULIC UNIT OF GOVERNOR
- 41 OIL / AIR PRESSURE VESSEL FOR GOVERNOR
- 42 MAN HOLE
- 43 COOLING WATER DISTRIBUTION
- 44 AUXILIARY PRESSURE VESSEL FOR GOVERNORS



LEGEND

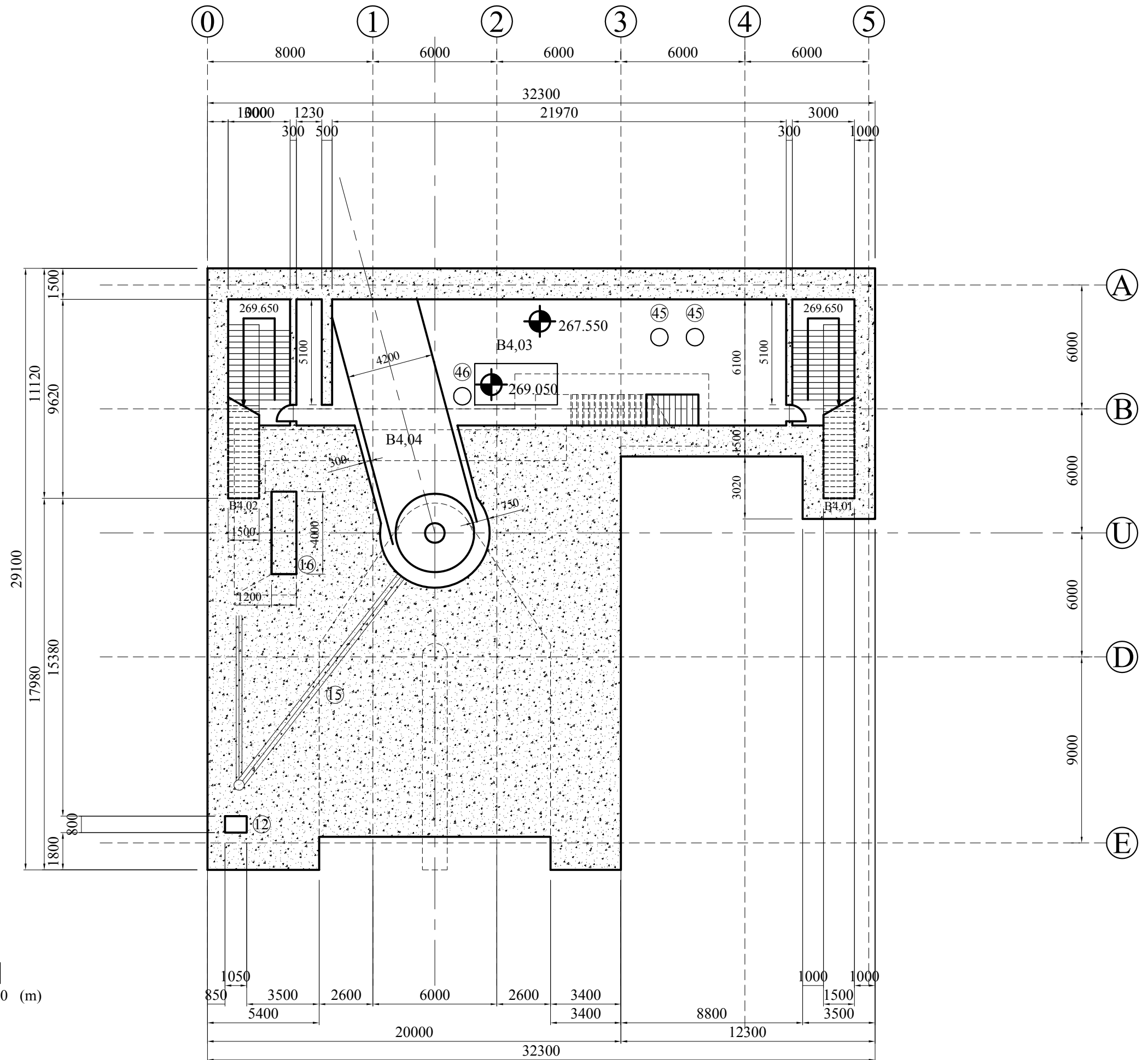
- B4 - DRAFT TUBE FLOOR
- B4.01 MAIN STAIRCASE
- B4.02 SECONDARY STAIR
- B4.03 DRAFT TUBE FLOOR
- B4.04 ACCESS TO CONE OF UNIT1

GENERAL

- 12 COOLING WATER OVERFLOW SHAFT
- 13 BULKHEAD SLOT
- 15 VENTILATION PIPE
- 16 SHAFT FOR PUMPS ERECTION
- 17 RAW WATER FEEDER PIPE

MECHANICAL EQUIPMENT

- 45 ROTARY STRAINERS
- 46 HEAT EXCHANGER

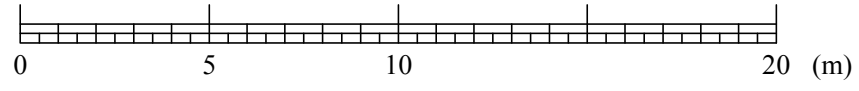
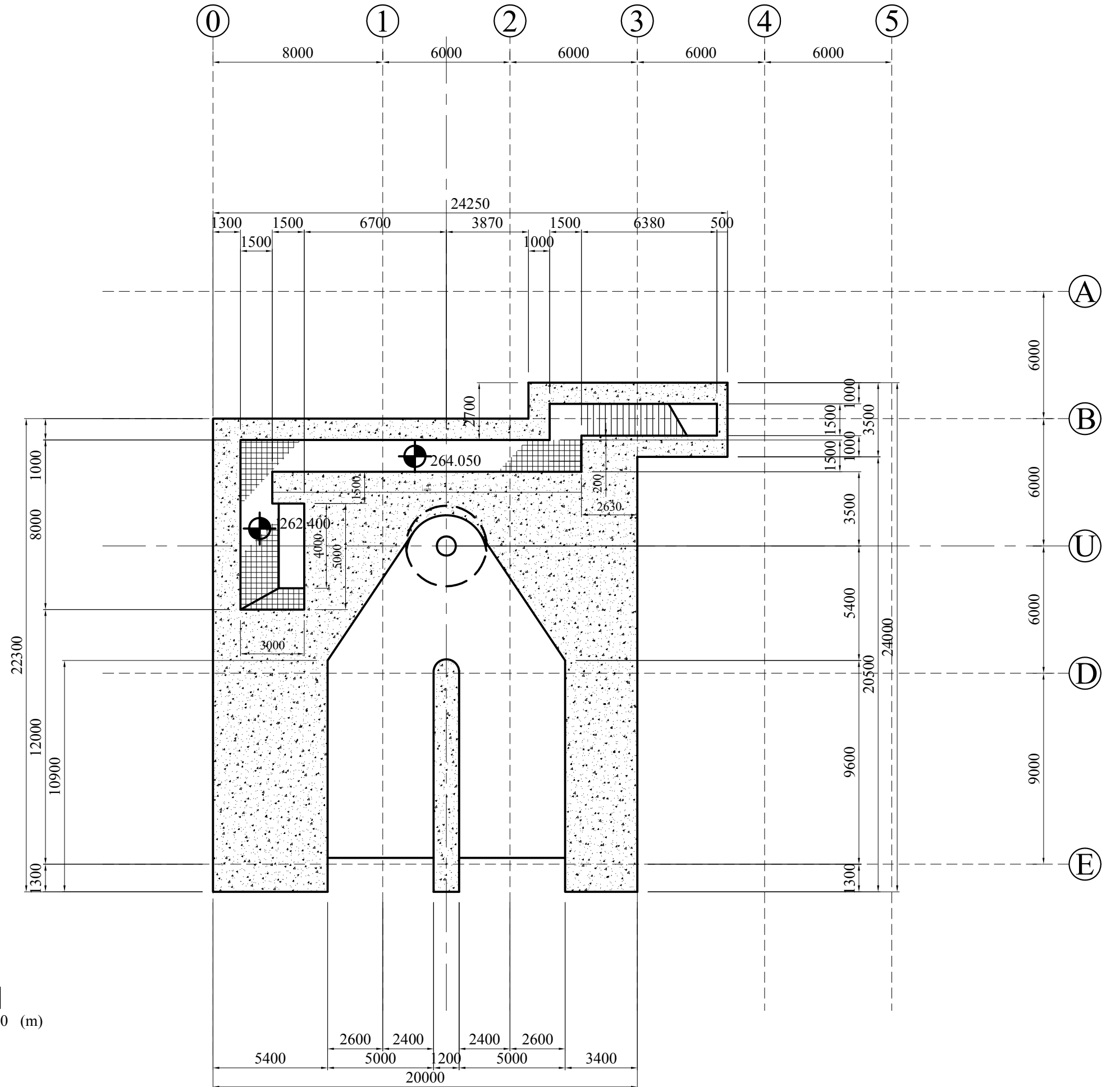


LEGEND

- B5 - DRAINAGE GALLERY
- B5.01 MAIN STAIRCASE
- B5.02 SECONDARY STAIR
- B5.03 DRAFT TUBE FLOOR
- B5.04 ACCESS TO CONE OF UNIT1

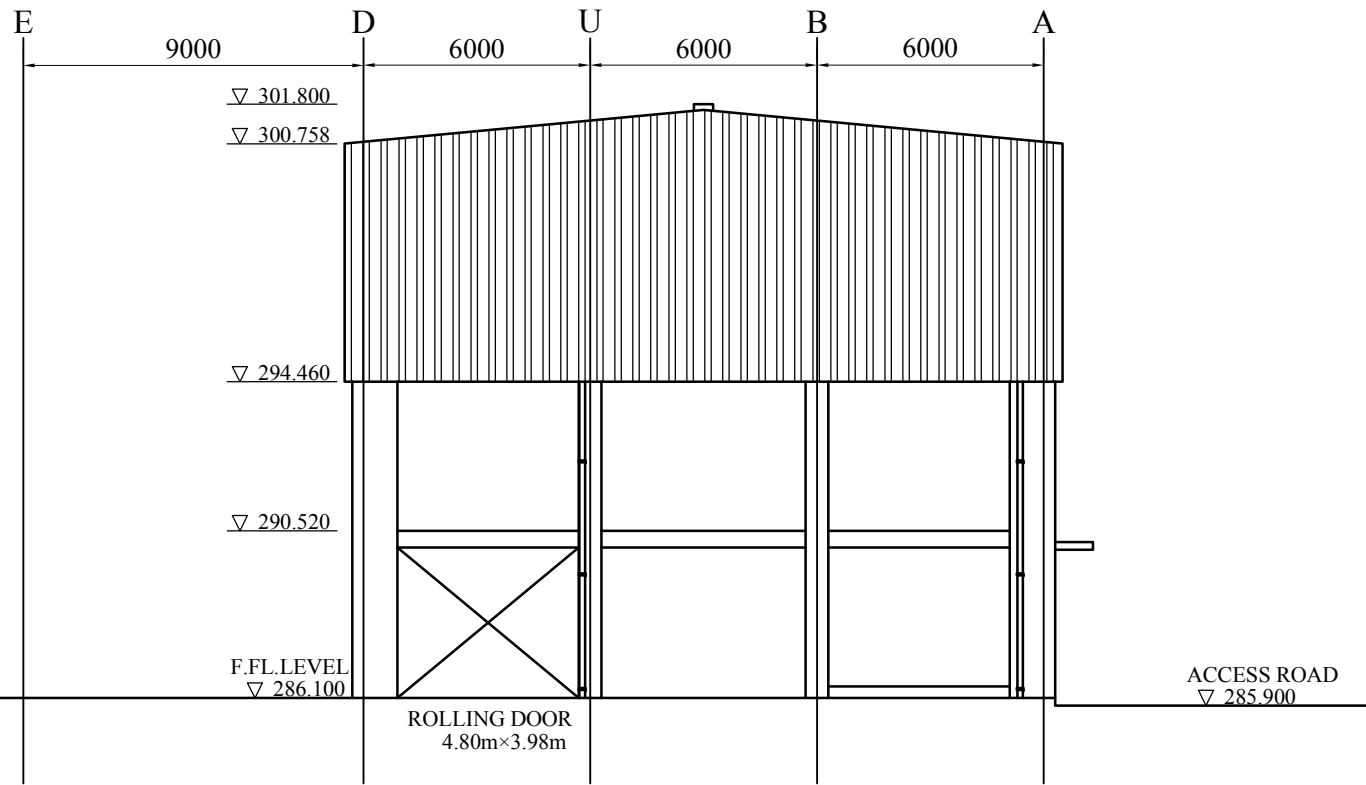
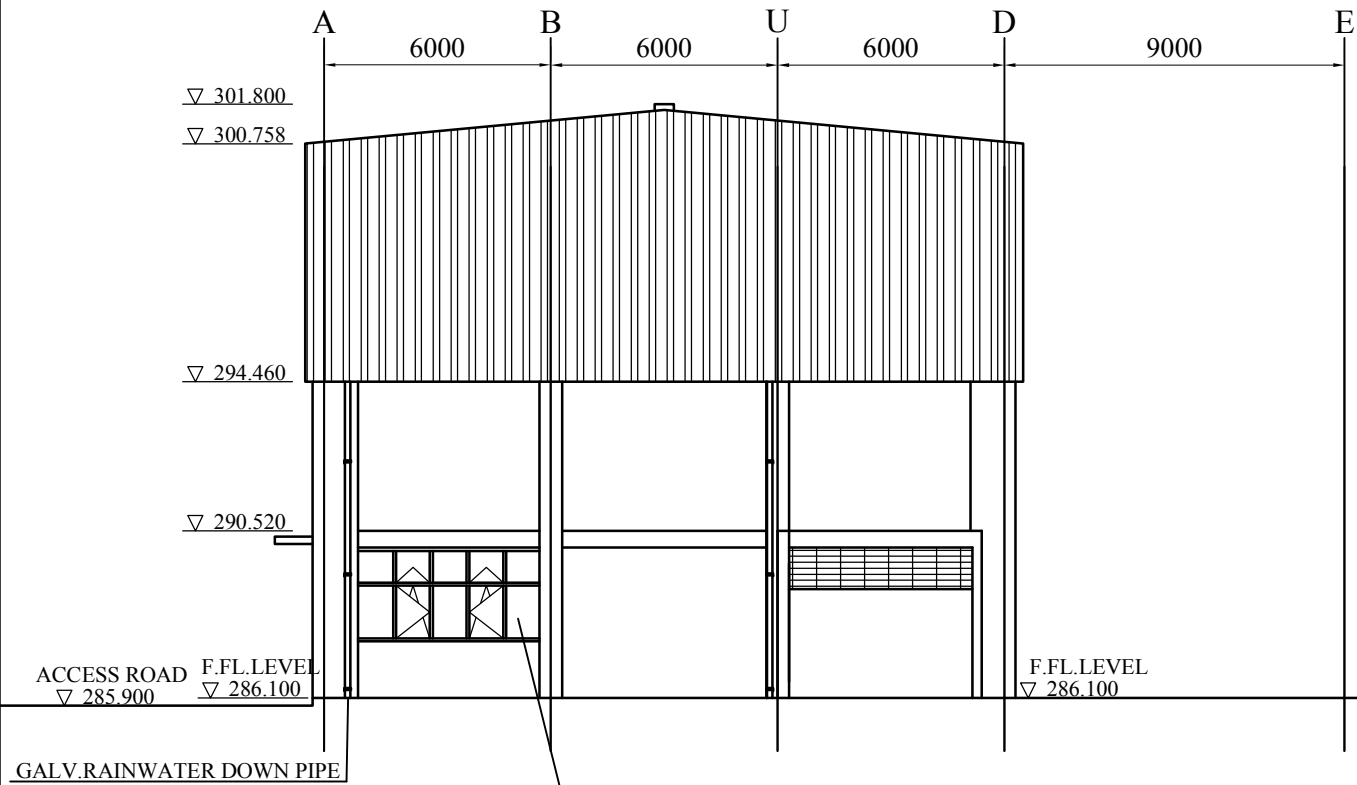
MECHANICAL EQUIPMENT

- 48 DEWATERING PUMPS
- 49 DRAINAGE PUMPS
- 50 DRAFT TUBE DEWATERING
- 51 PENSTOCK DEWATERING



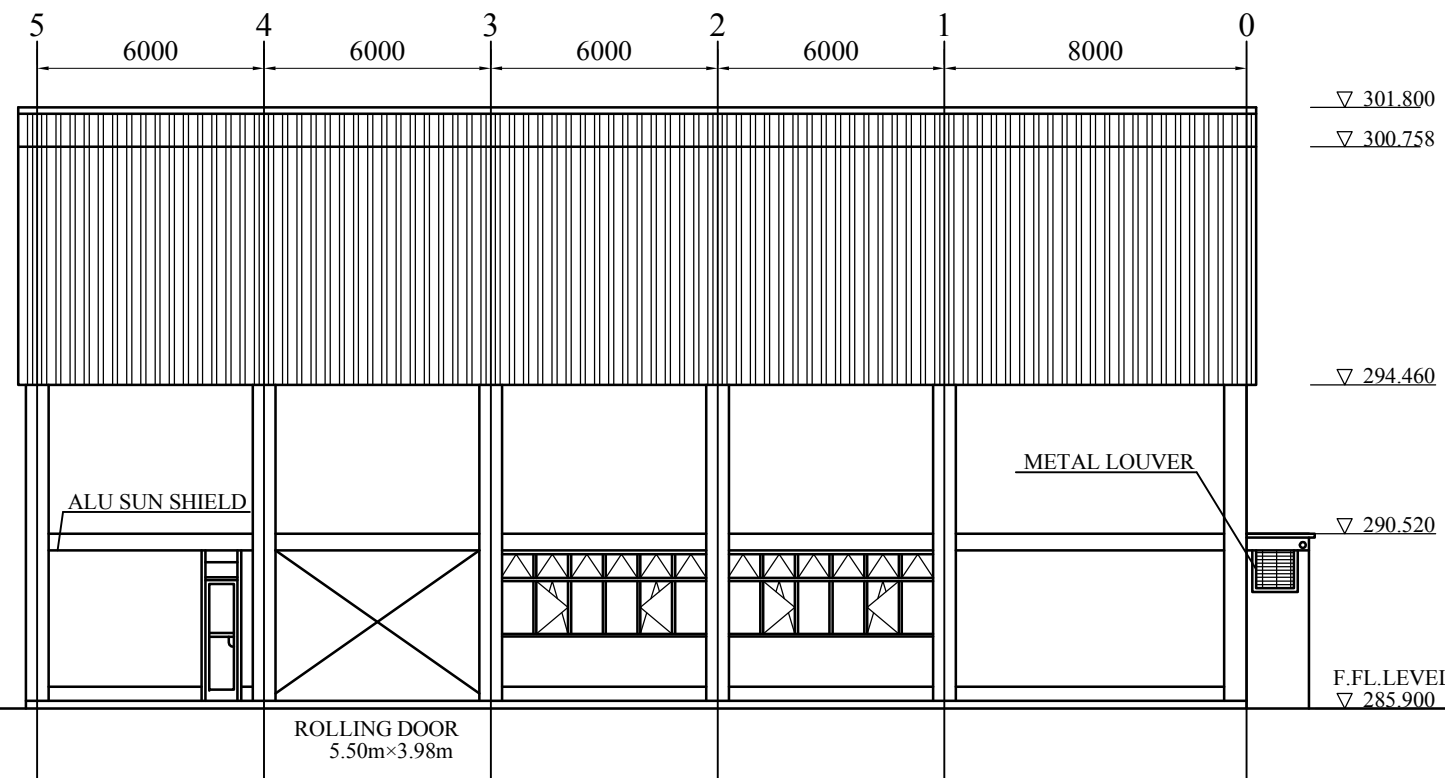
RIGHT BANK-ELEVATION

LEFT BANK-ELEVATION

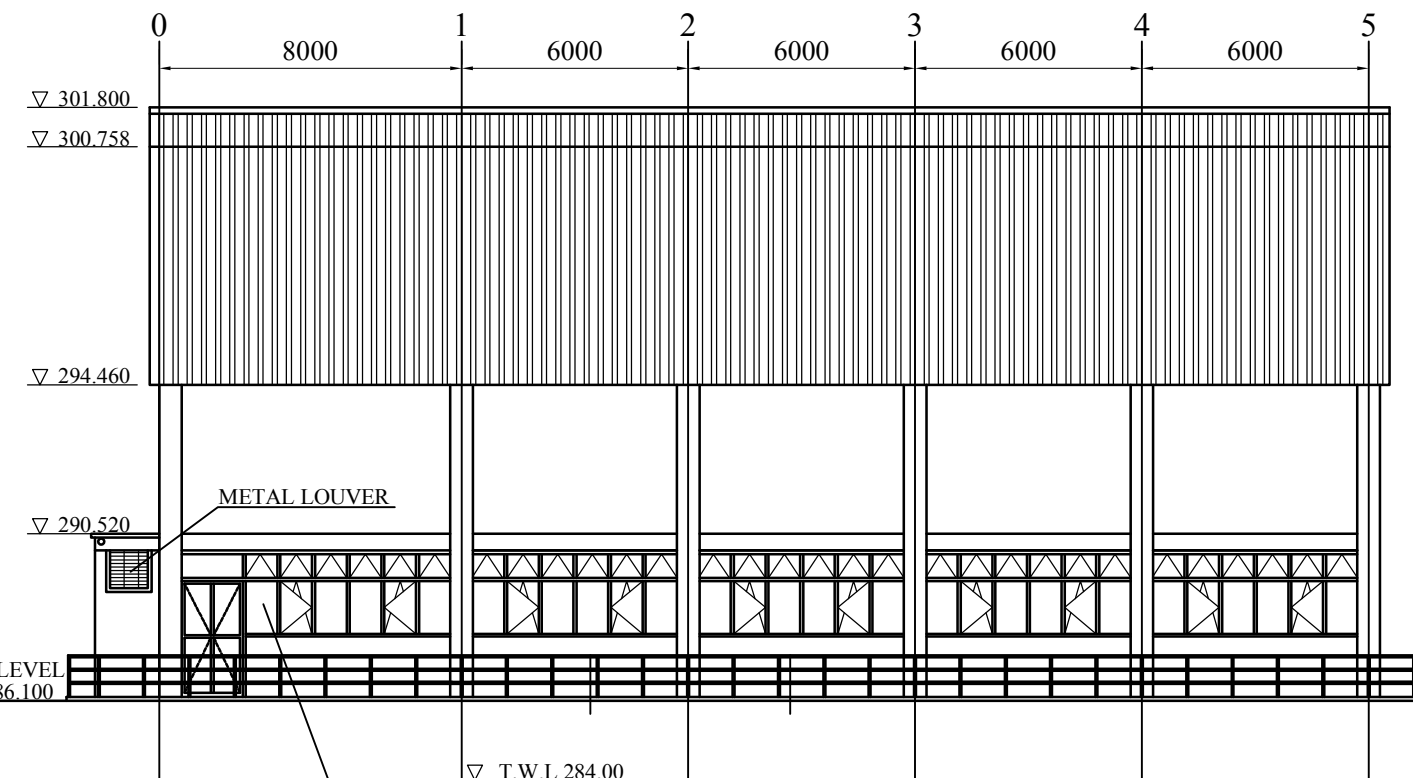


ALU FRAME WINDOW
WITH COATING FINISH
DOUBLE GLAZING/SUNPROOF

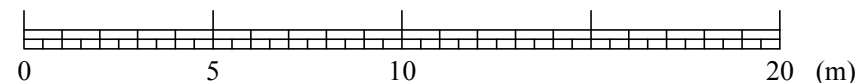
UPSTREAM-ELEVATION



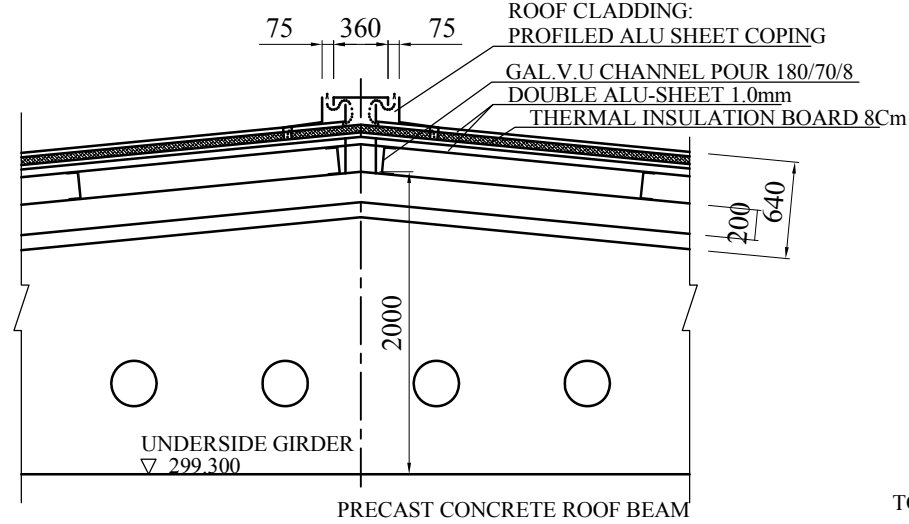
DOWNSTREAM-ELEVATION



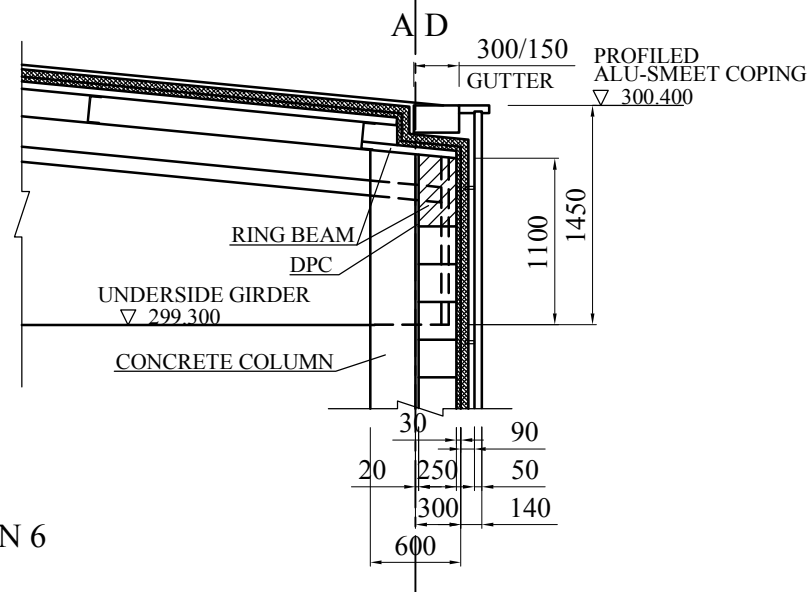
ALU FRAME WINDOW
WITH COATING FINISH
DOUBLE GLAZING/SUNPROOF



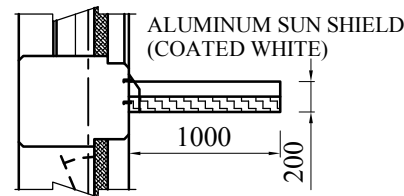
DETAIL - SECTION 3



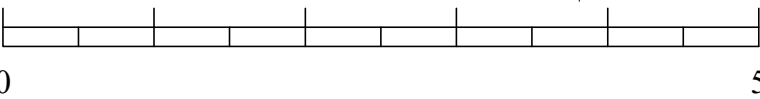
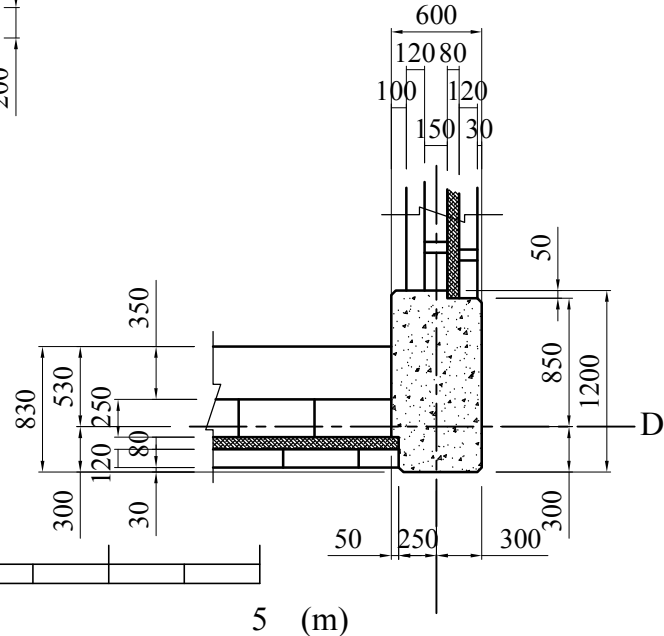
DETAIL - SECTION 2



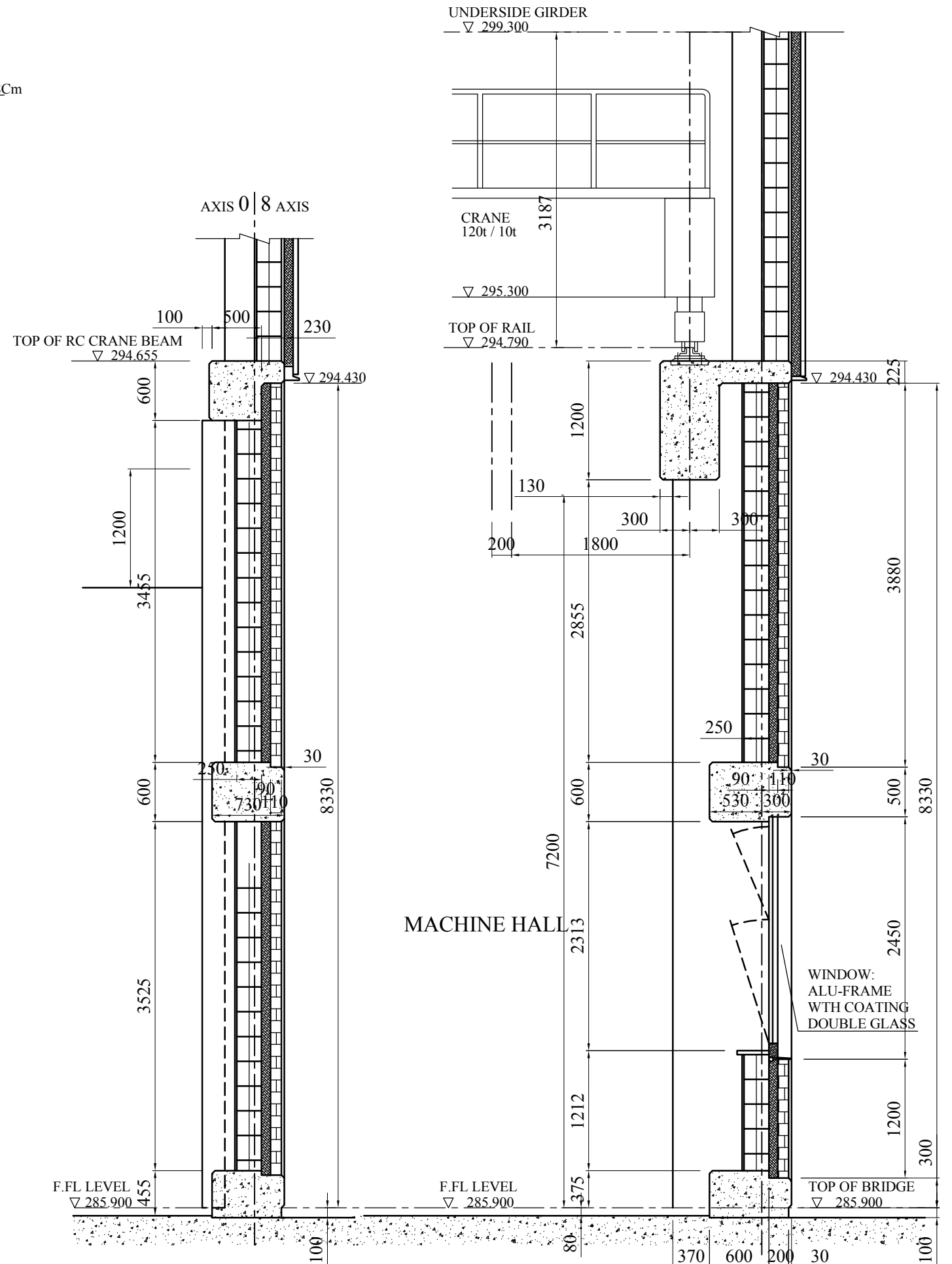
DETAIL - SECTION 6

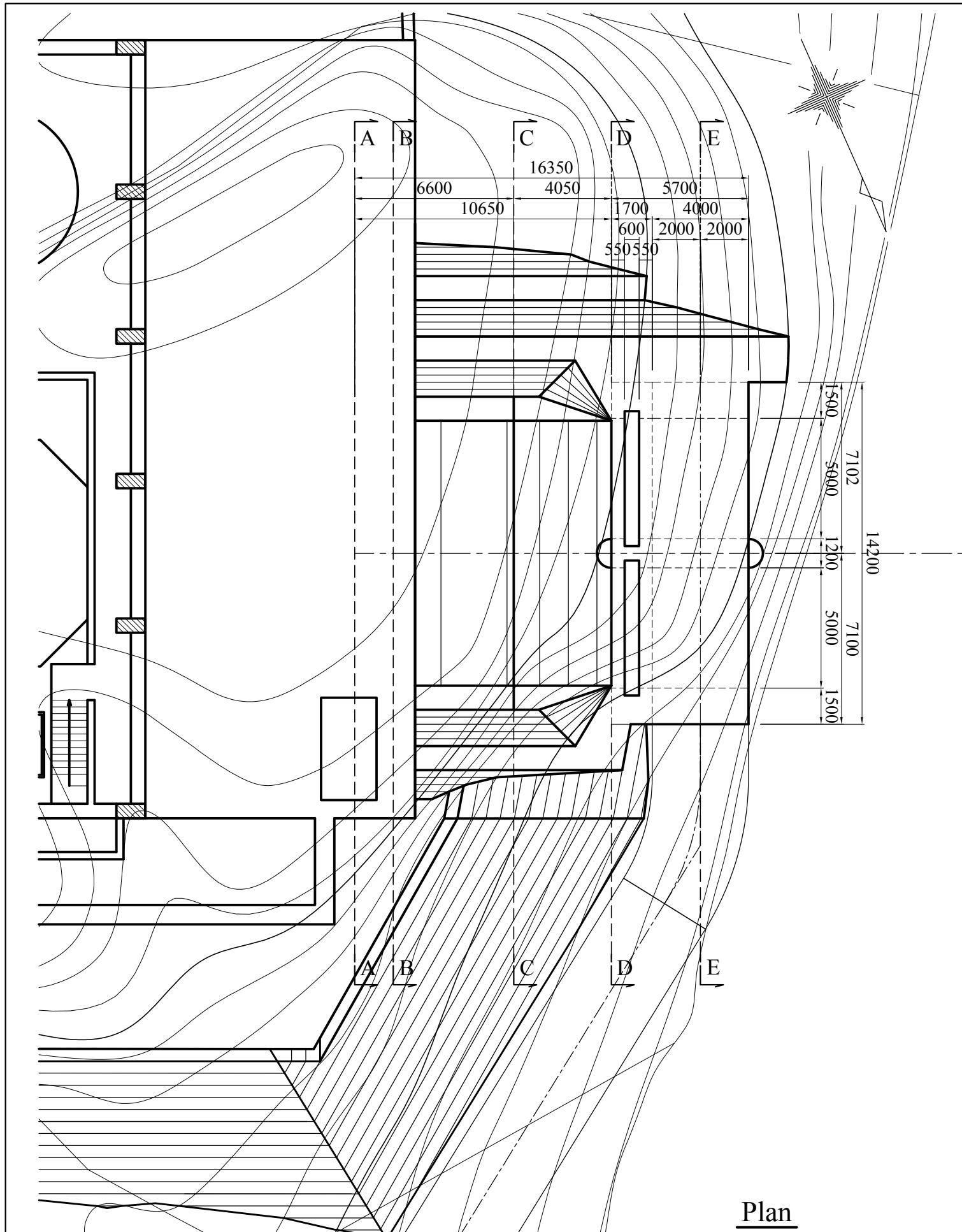


DETAIL - SECTION 5

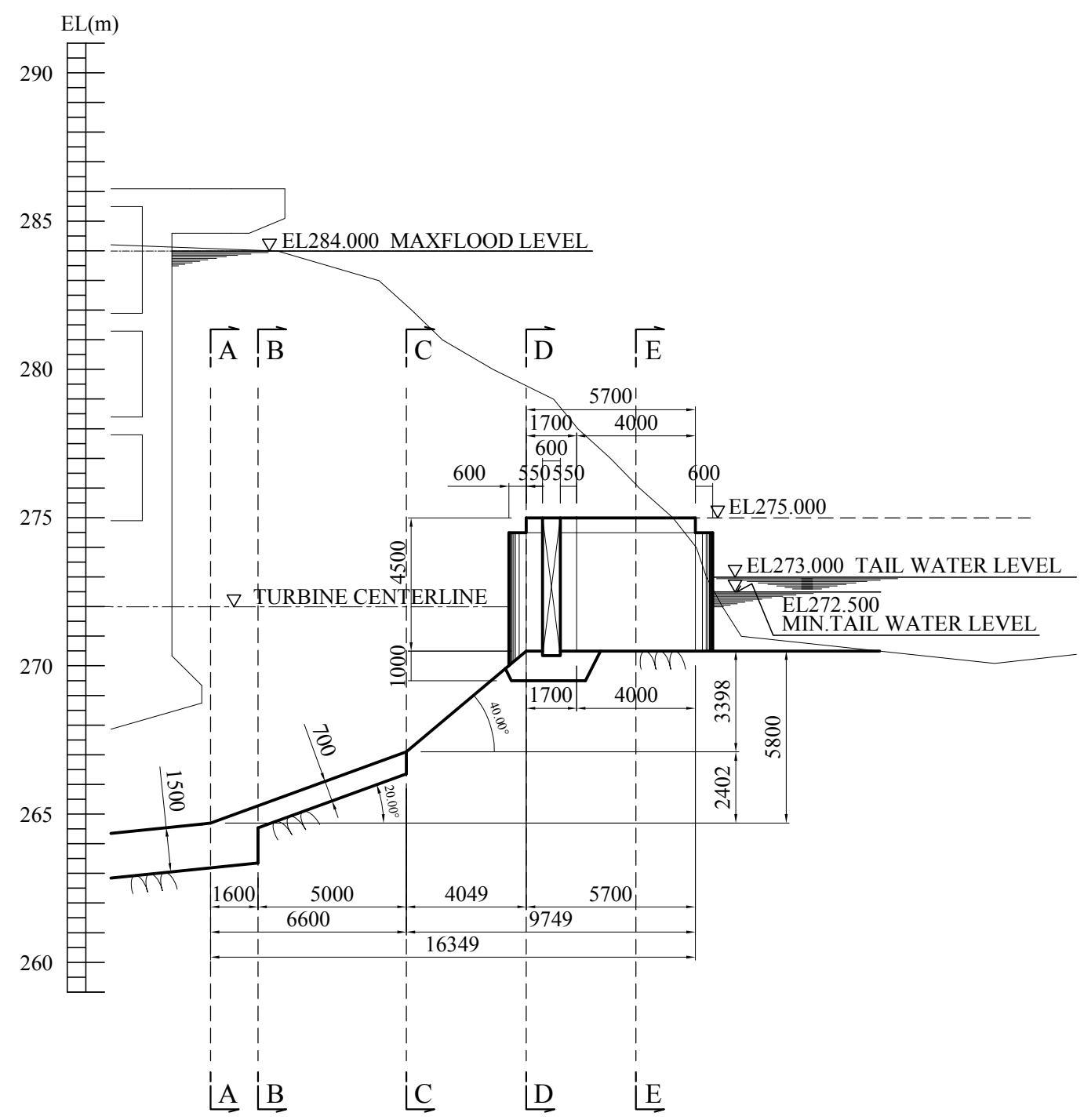


AXIS 0 | 8 AXIS

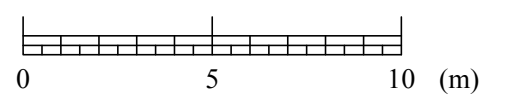


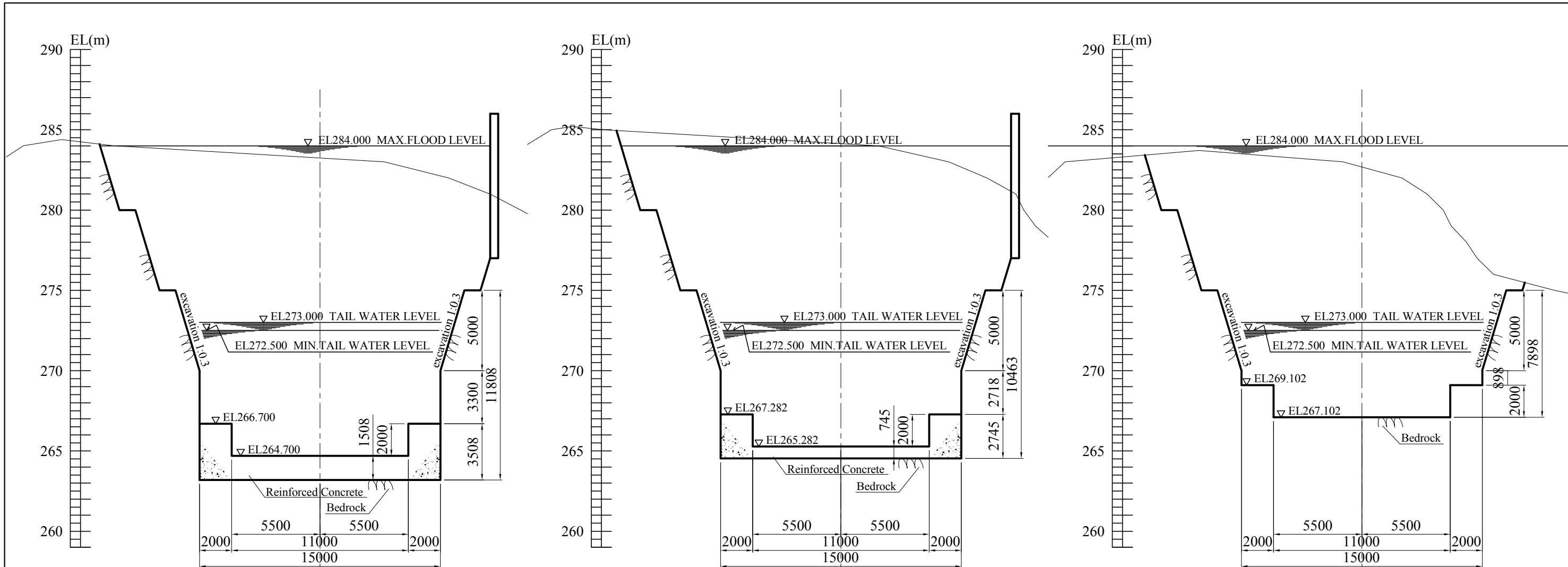


Plan



Profile





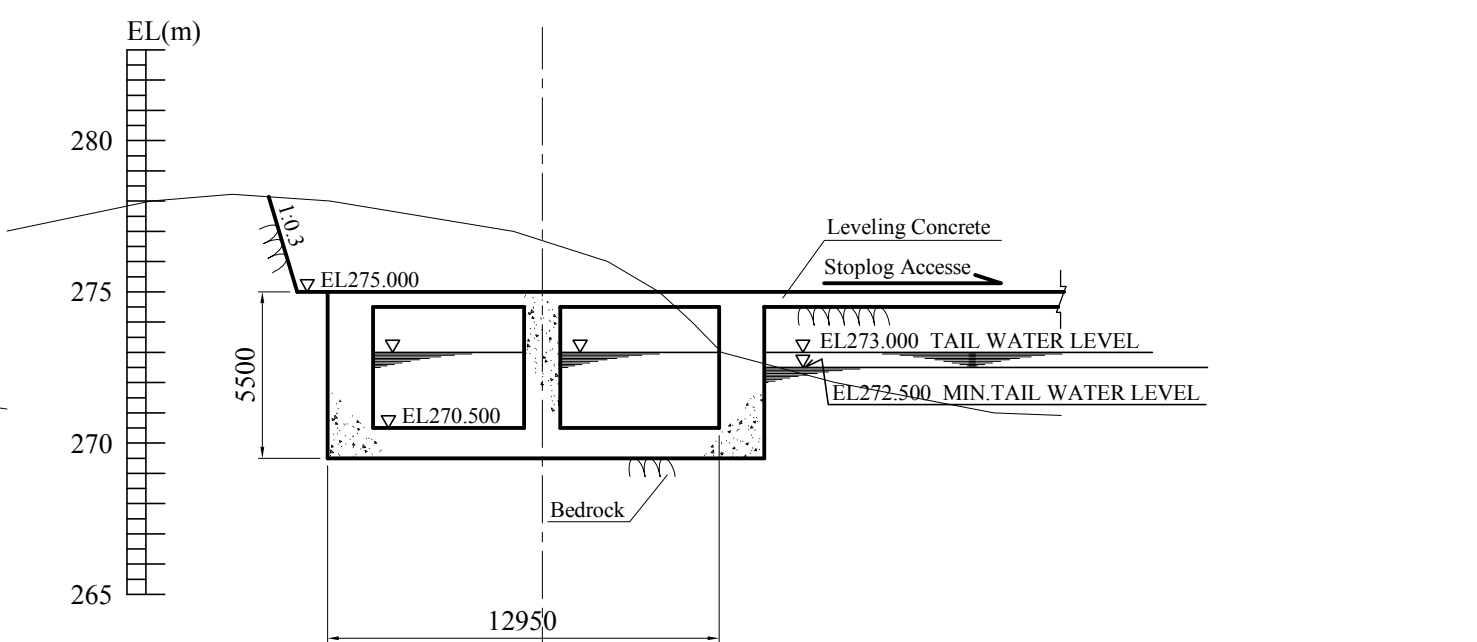
Section A-A

Section B-B

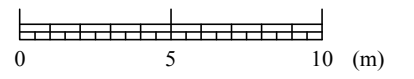
Section C-C



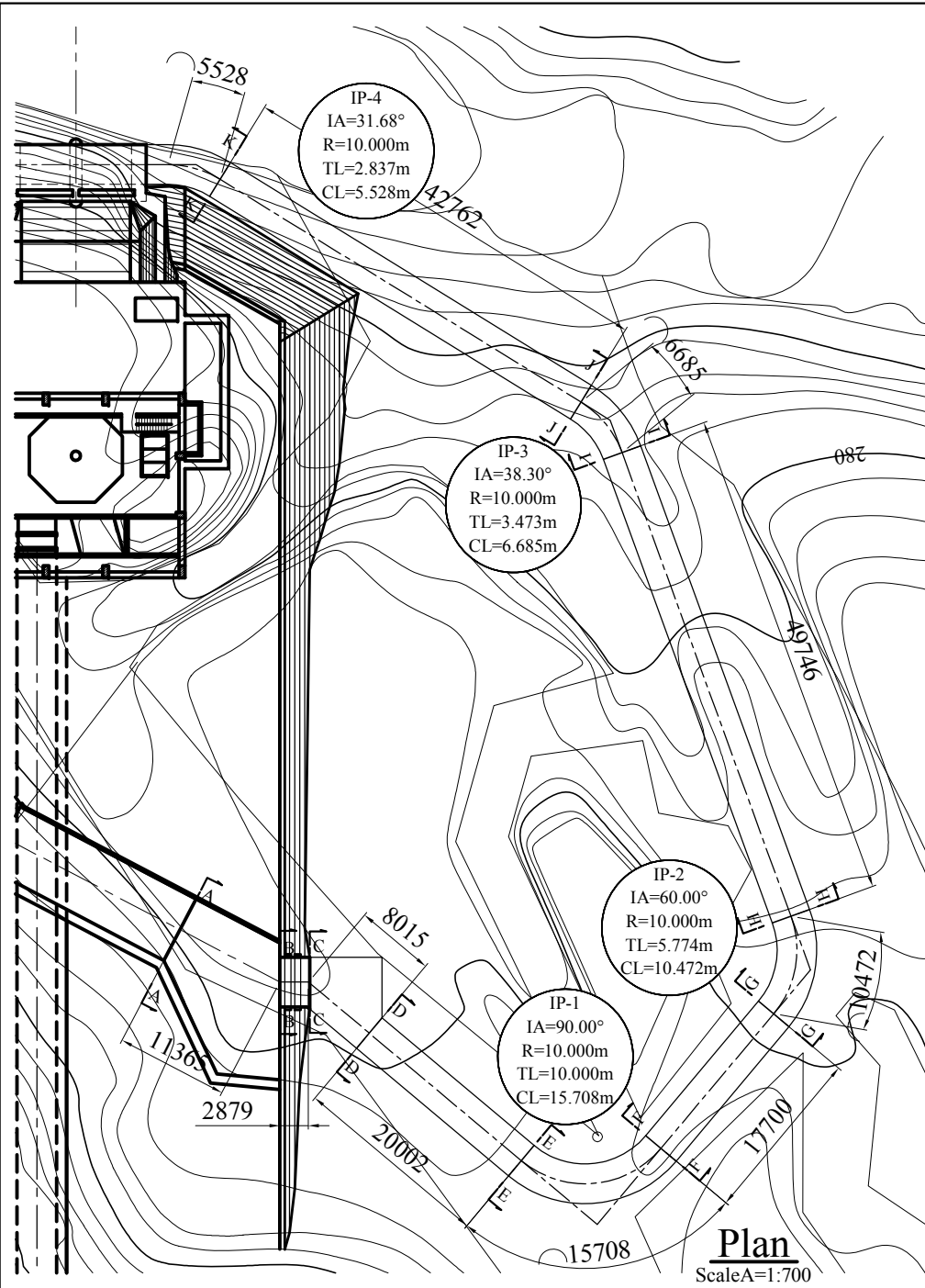
Section D-D



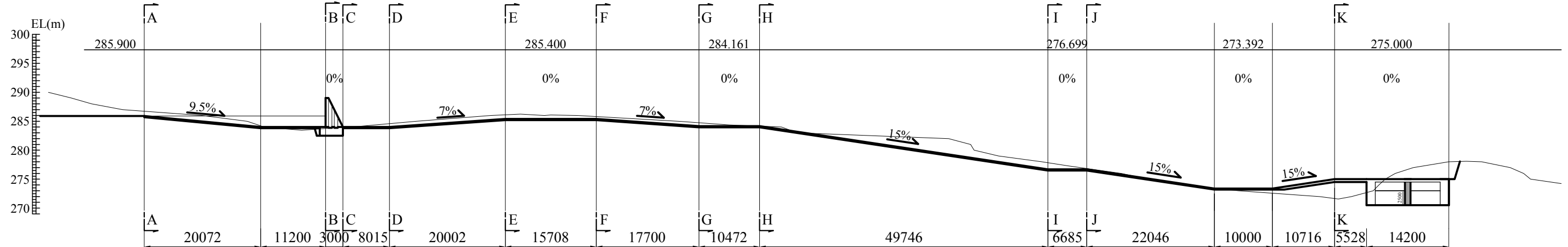
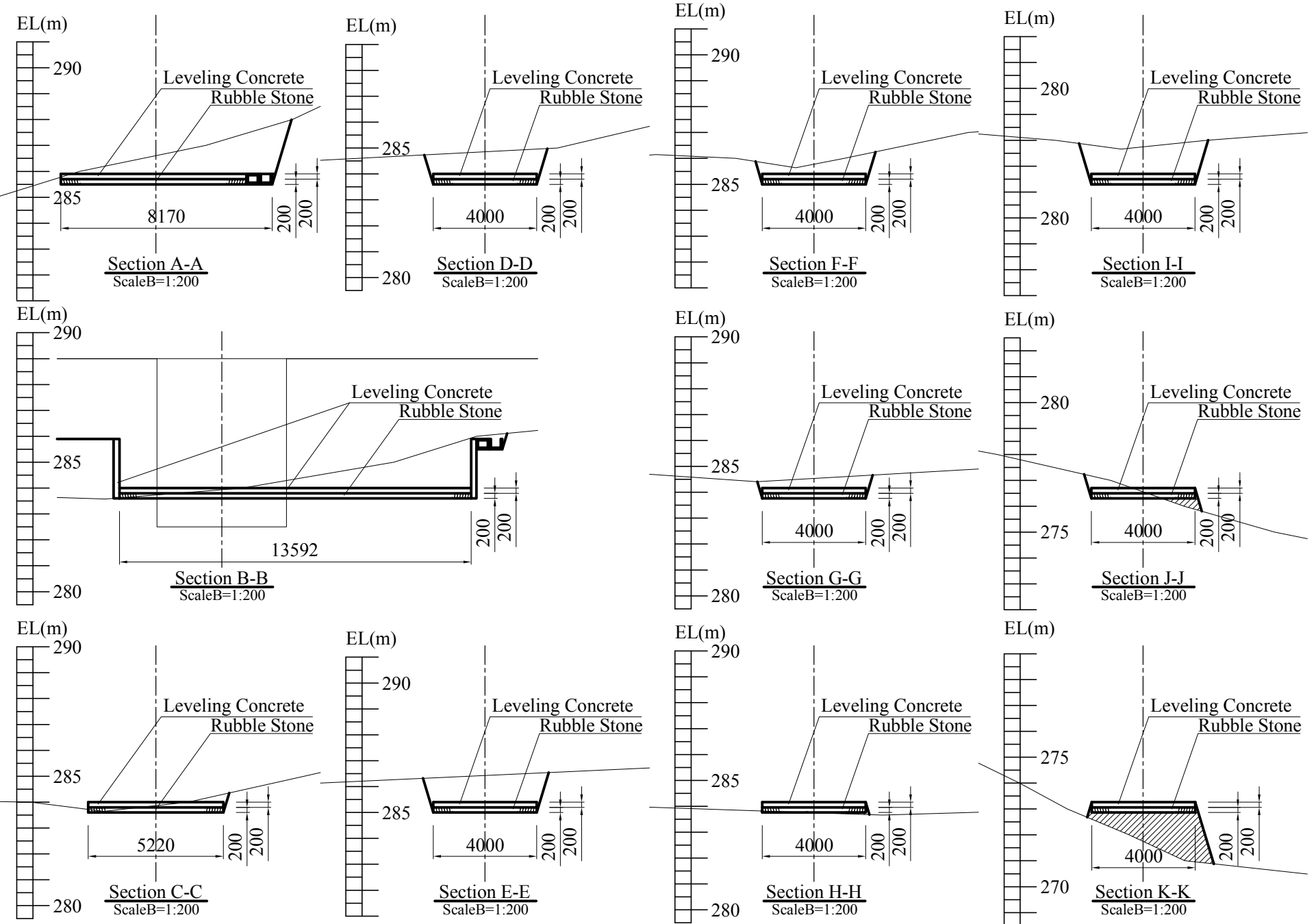
Section E-E



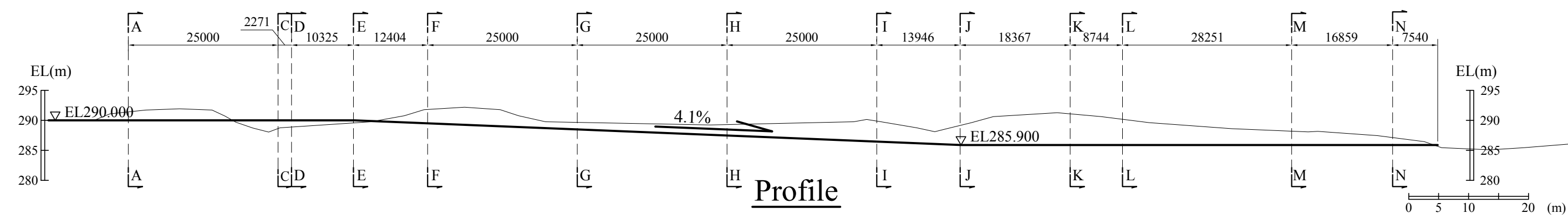
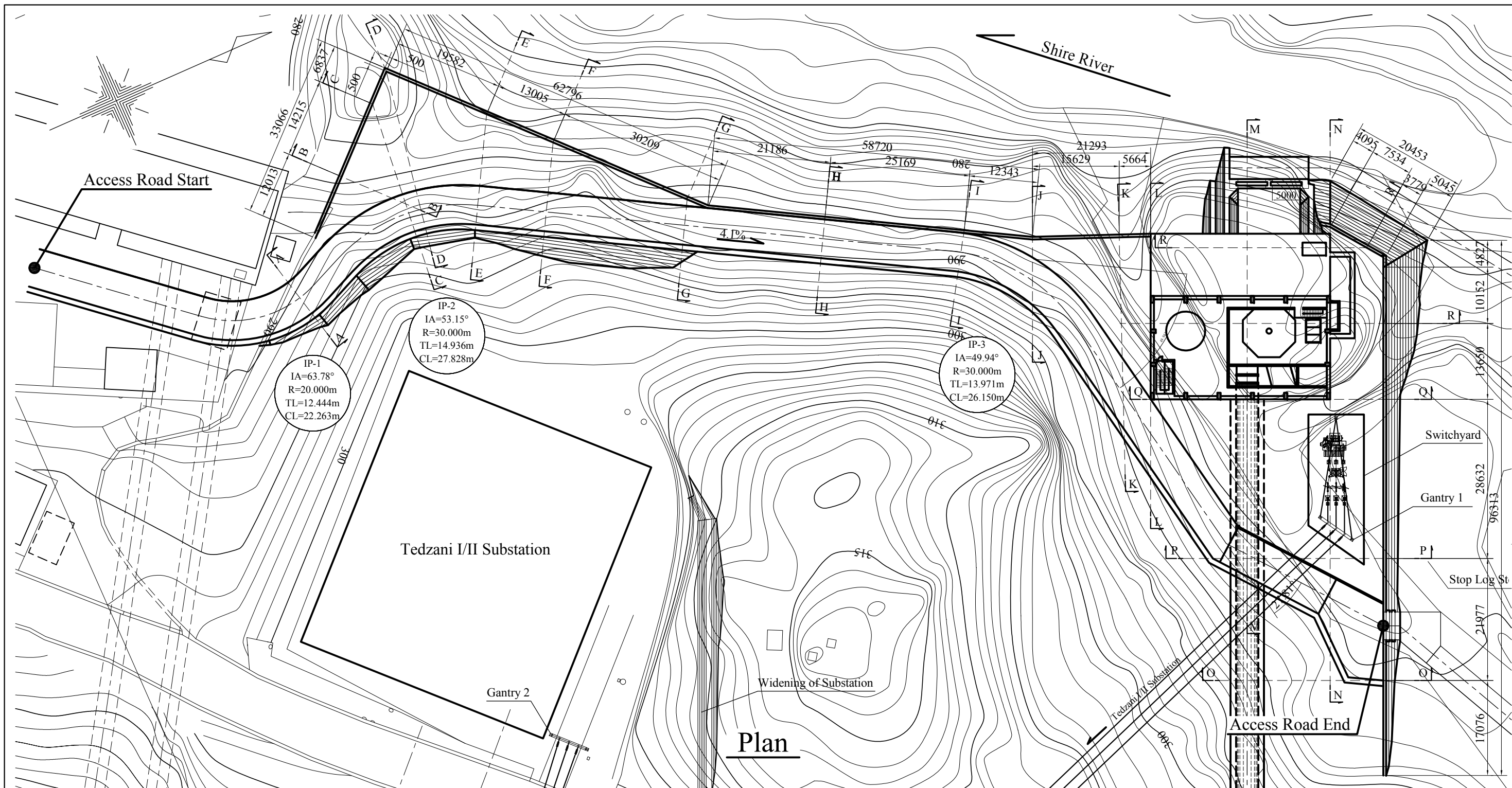
Preparatory Survey on the Project for The Extension of Tedzani Hydropower Station in the Republic of Malawi	The Extension of Tedzani Hydropower Station	TITLE : Tailrace Sections	SCALE : 1:100 (A3)	DRAWING No : TD-C-TR-033	Rev.
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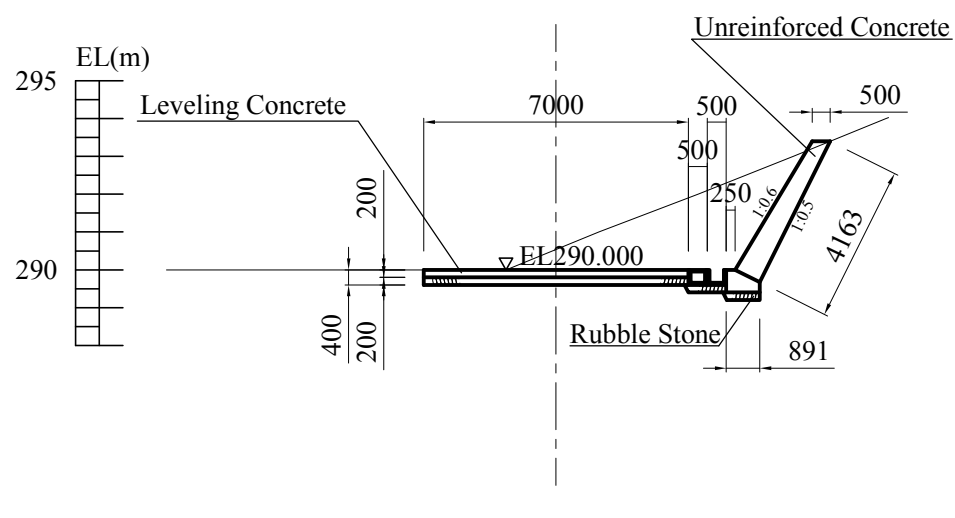
Plan
Scale A=1:700



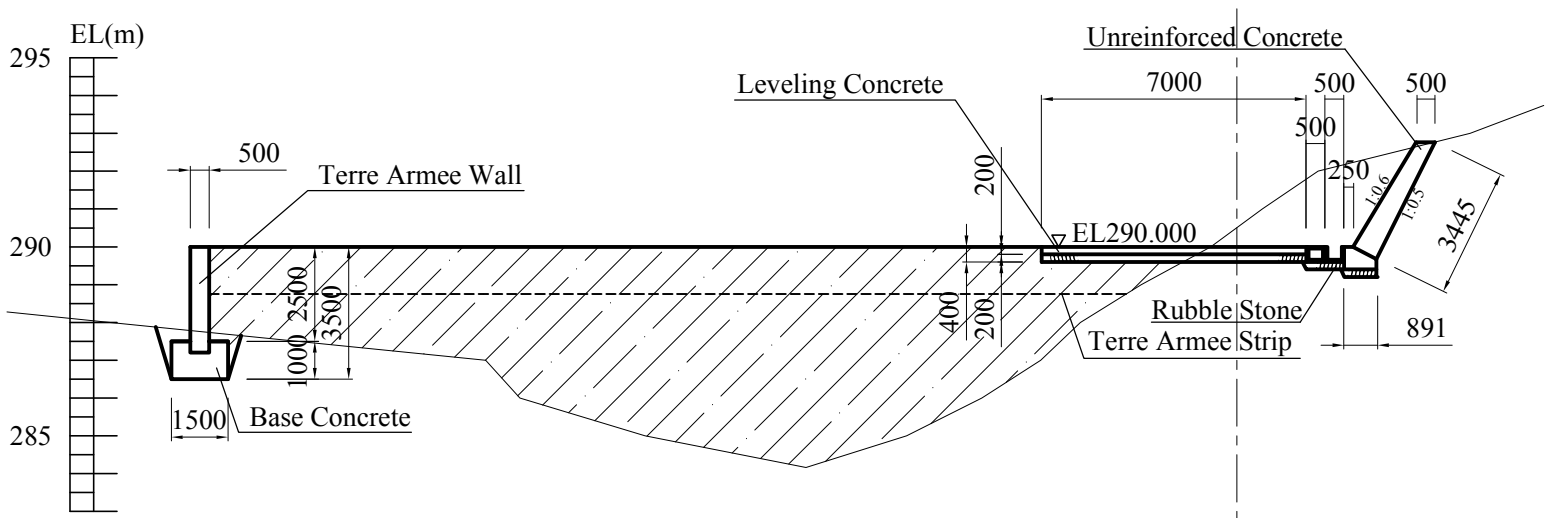
Profile
Scale A=1:700



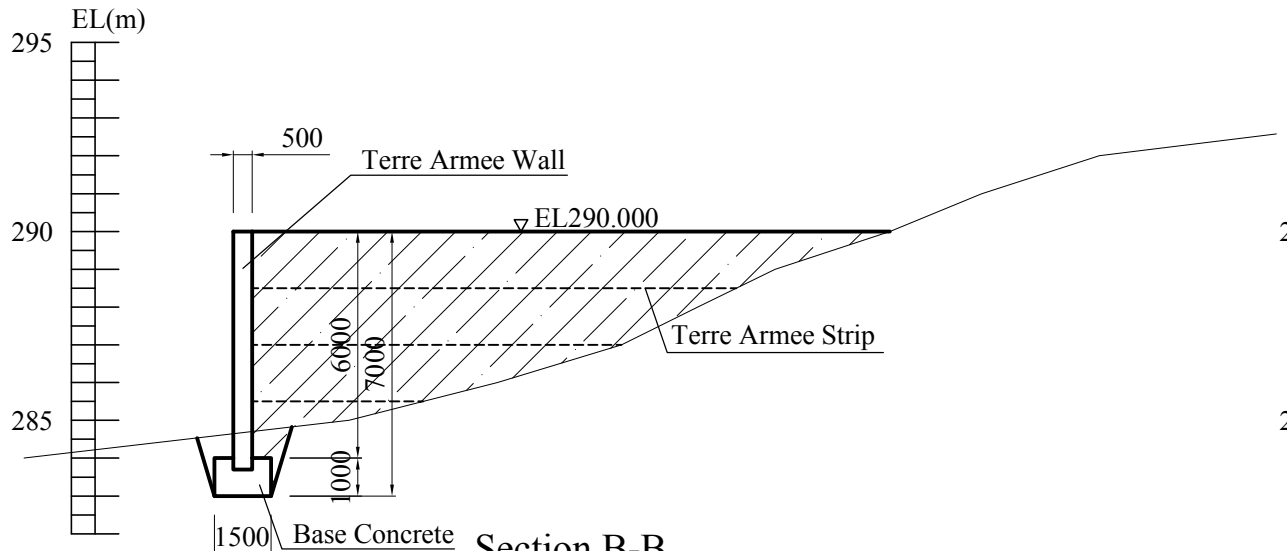
Preparatory Survey on the Project for The Extension of Tedzani Hydropower Station in the Republic of Malawi	The Extension of Tedzani Hydropower Station	TITLE: Access Road Plan and Profile	SCALE: 1:700 (A3)	DRAWING No: TD-C-AR-035	Rev.
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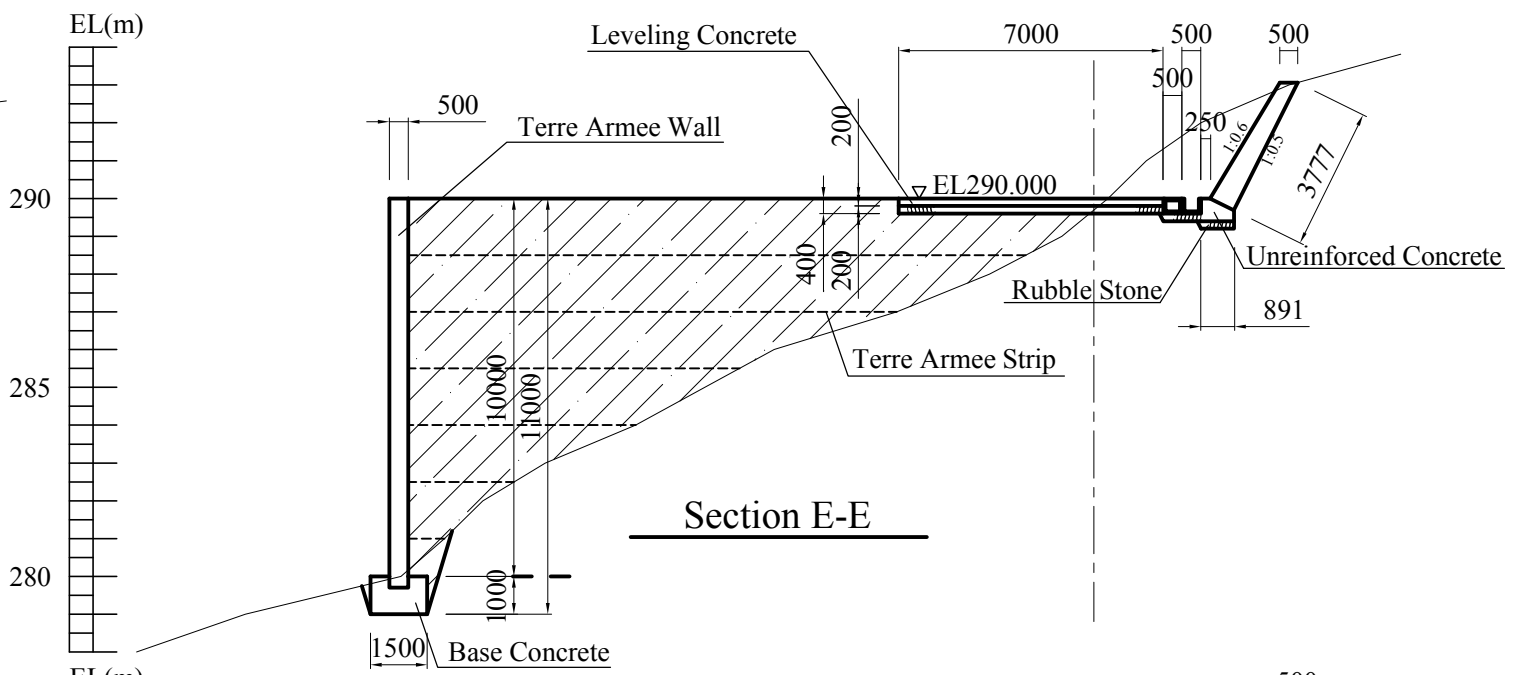
Section A-A



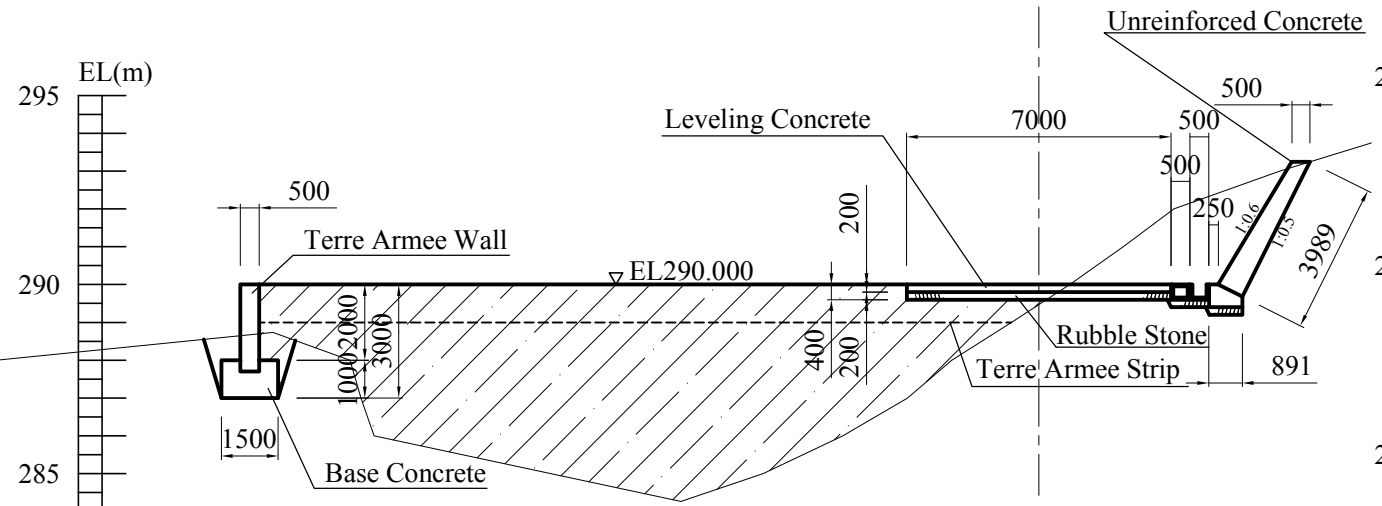
Section D-D



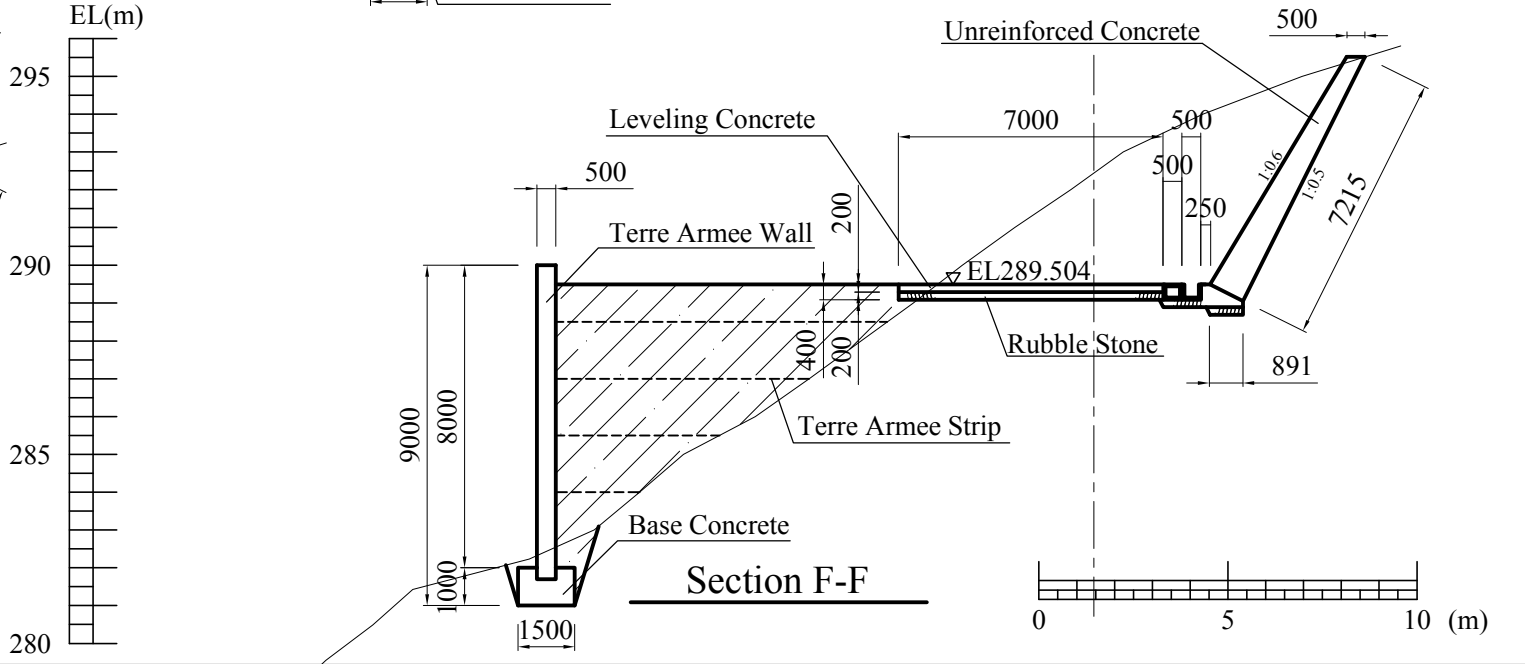
Section B-B



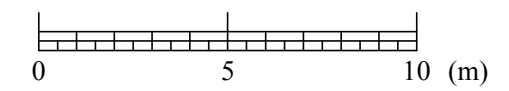
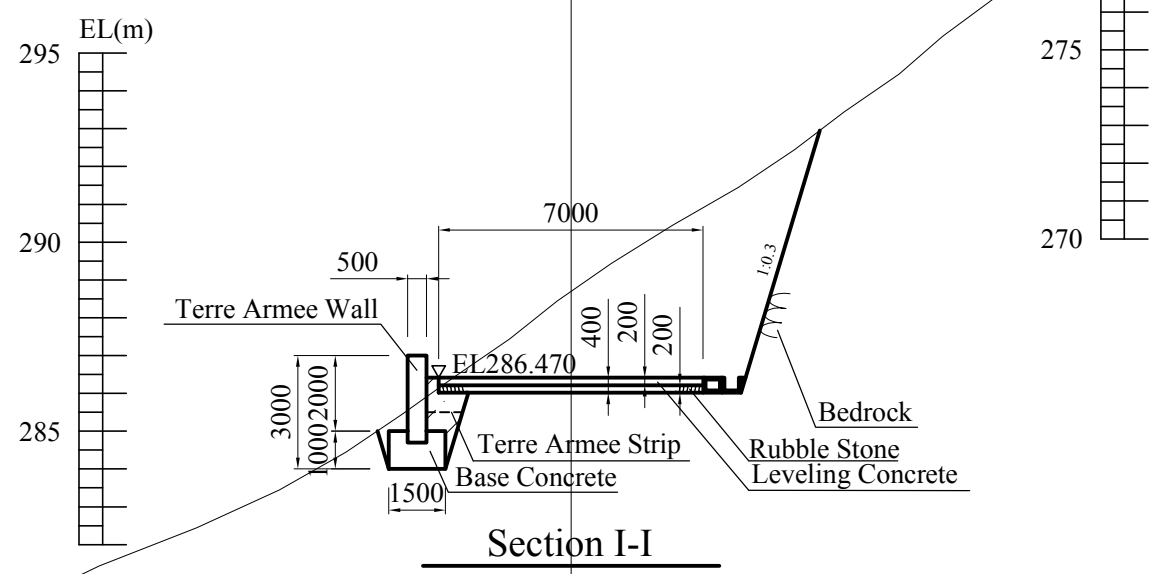
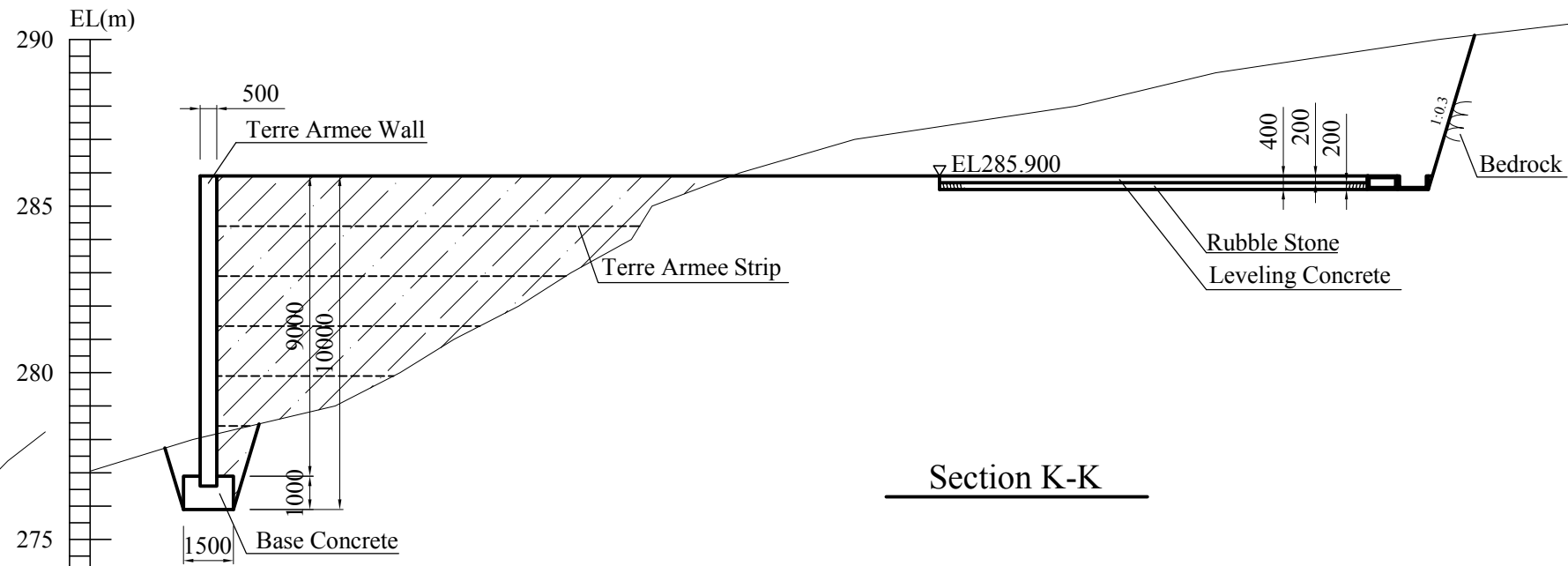
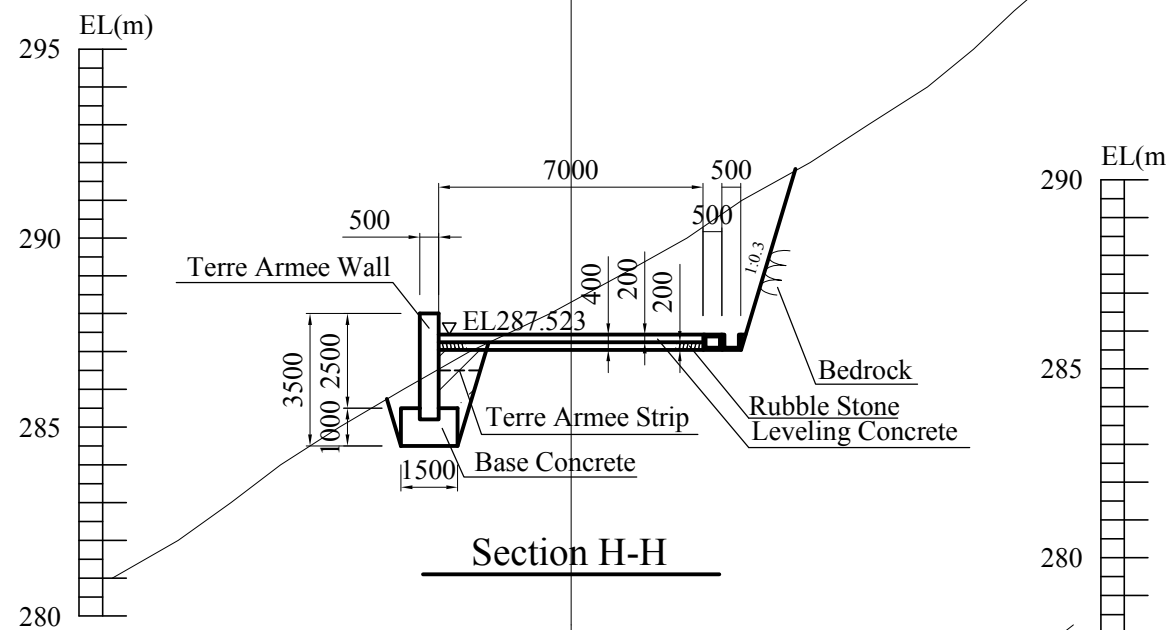
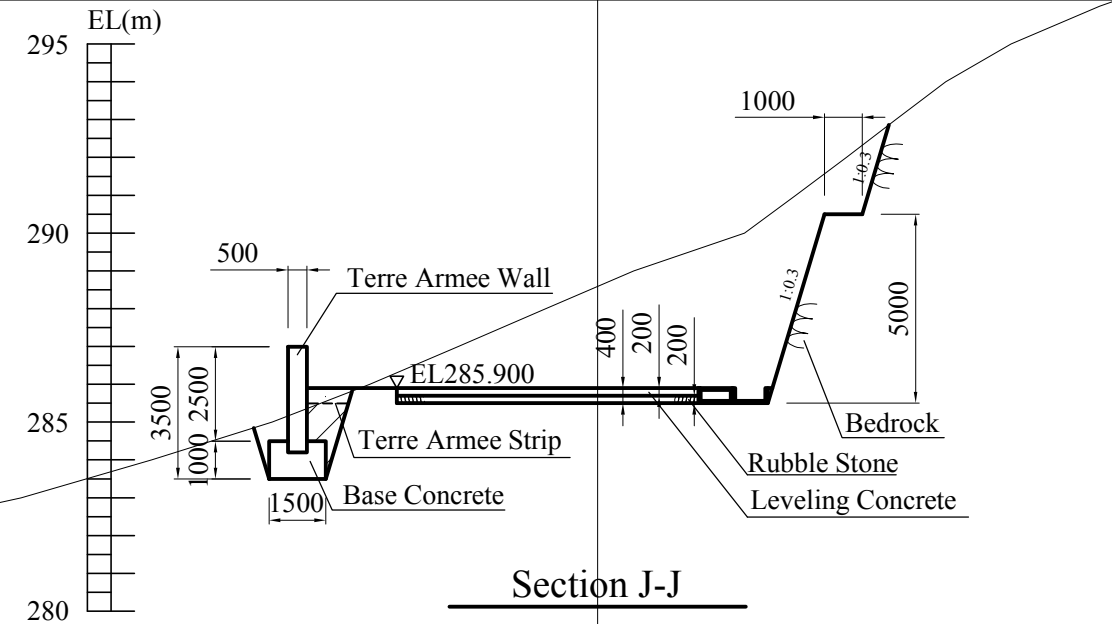
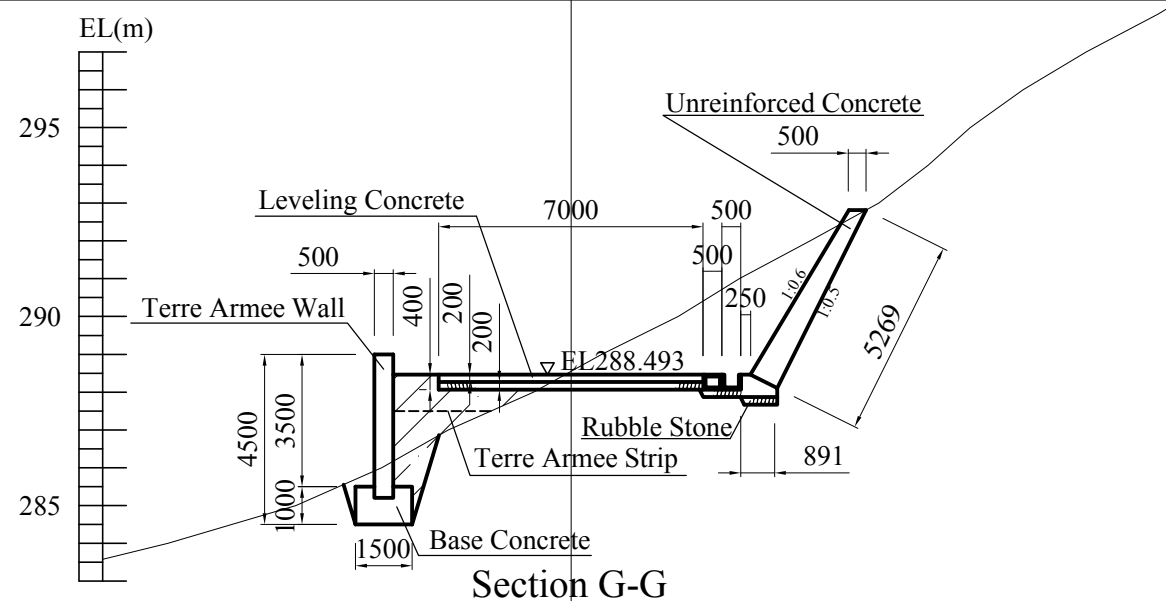
Section E-E

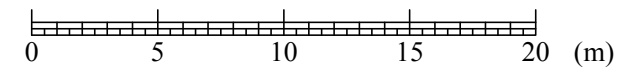
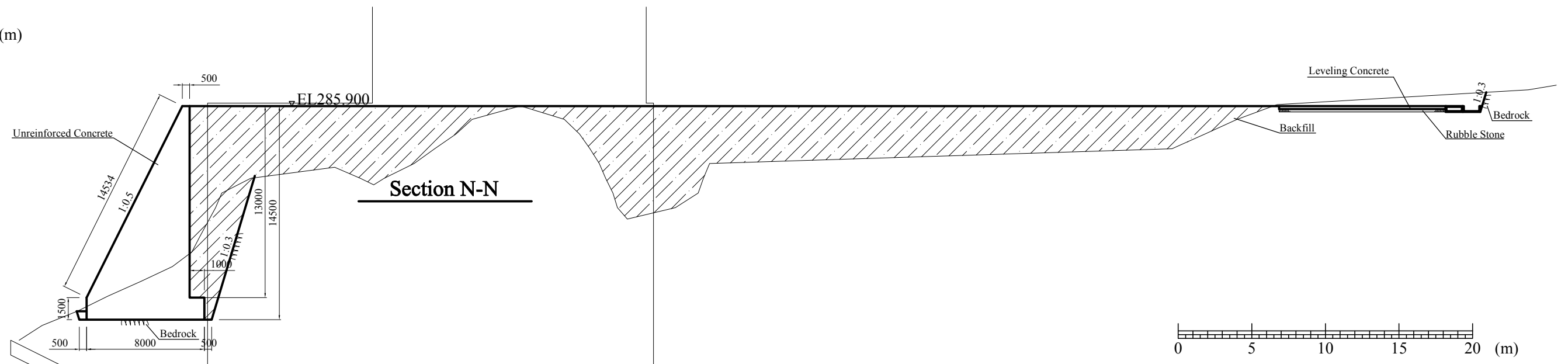
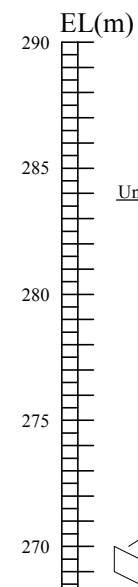
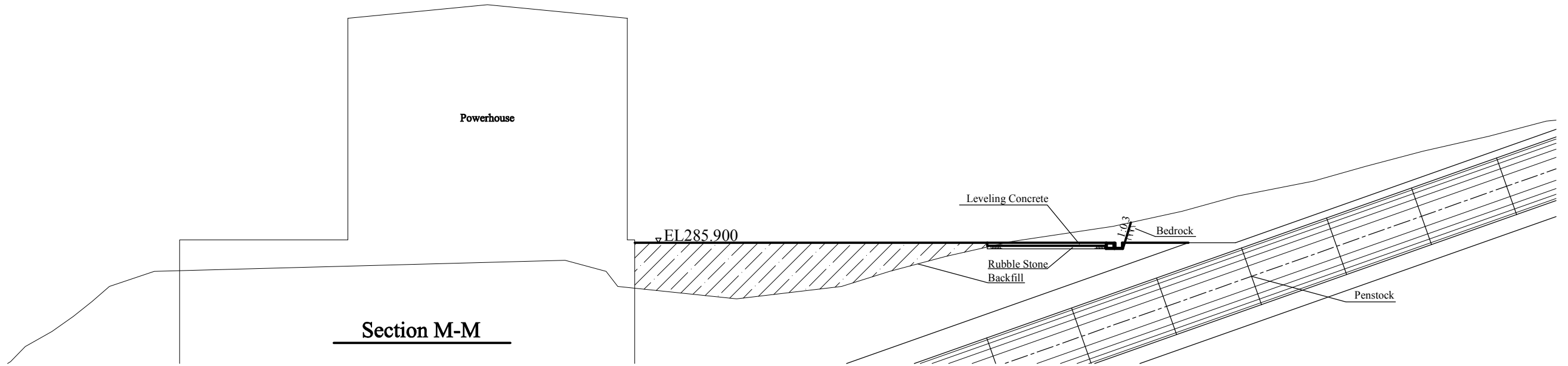
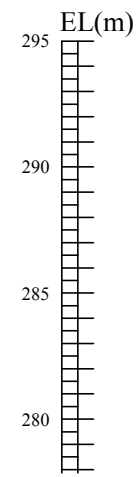
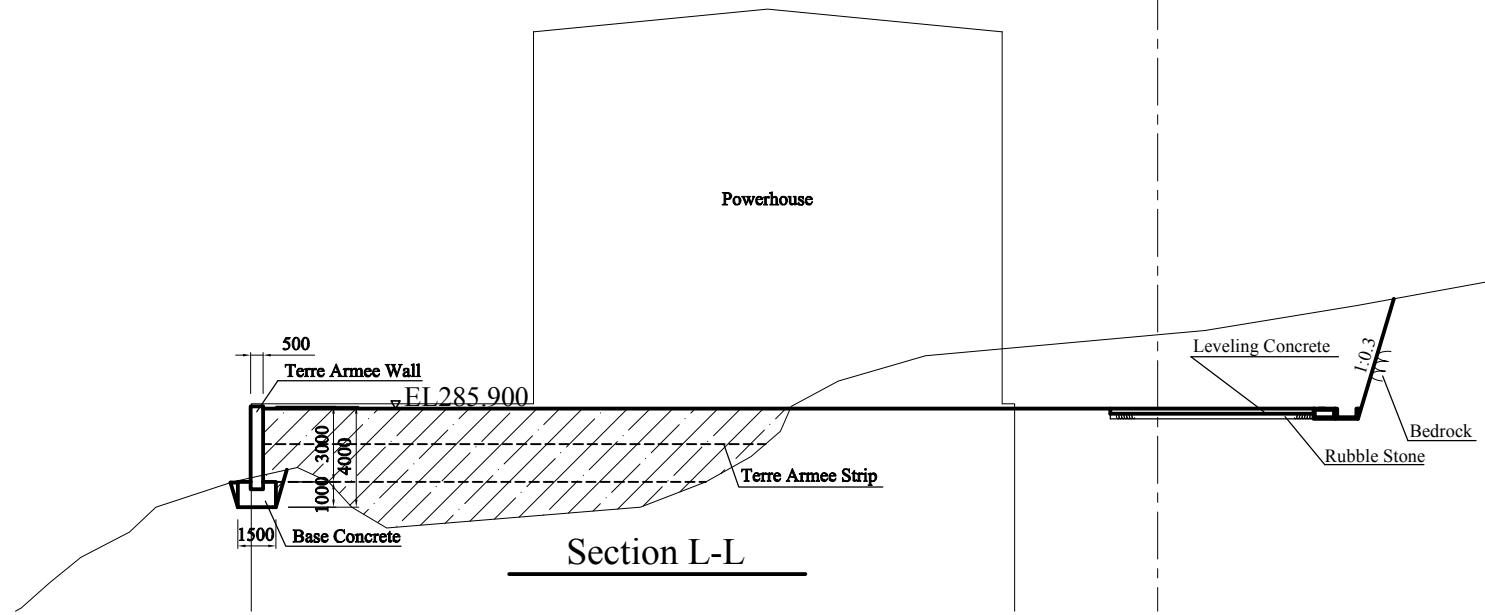
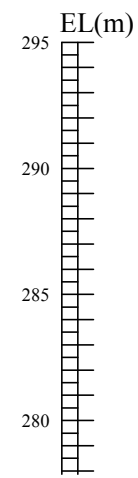


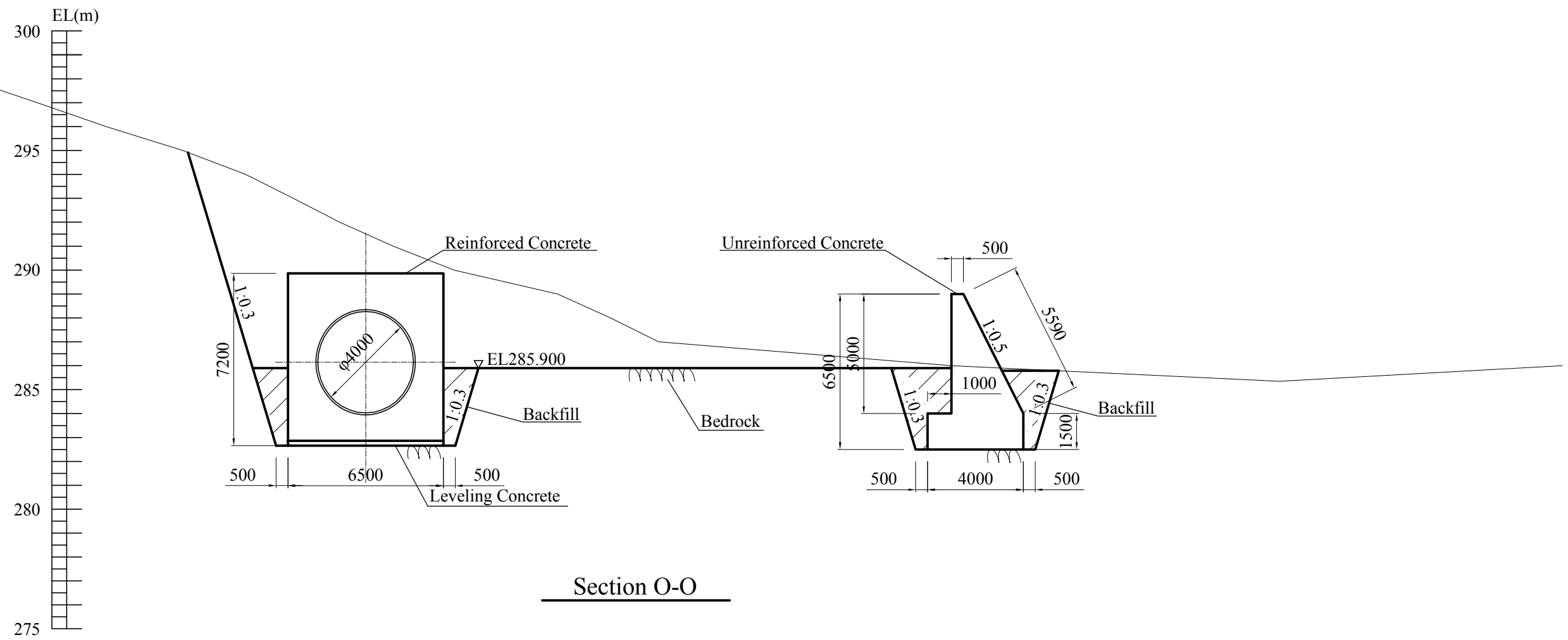
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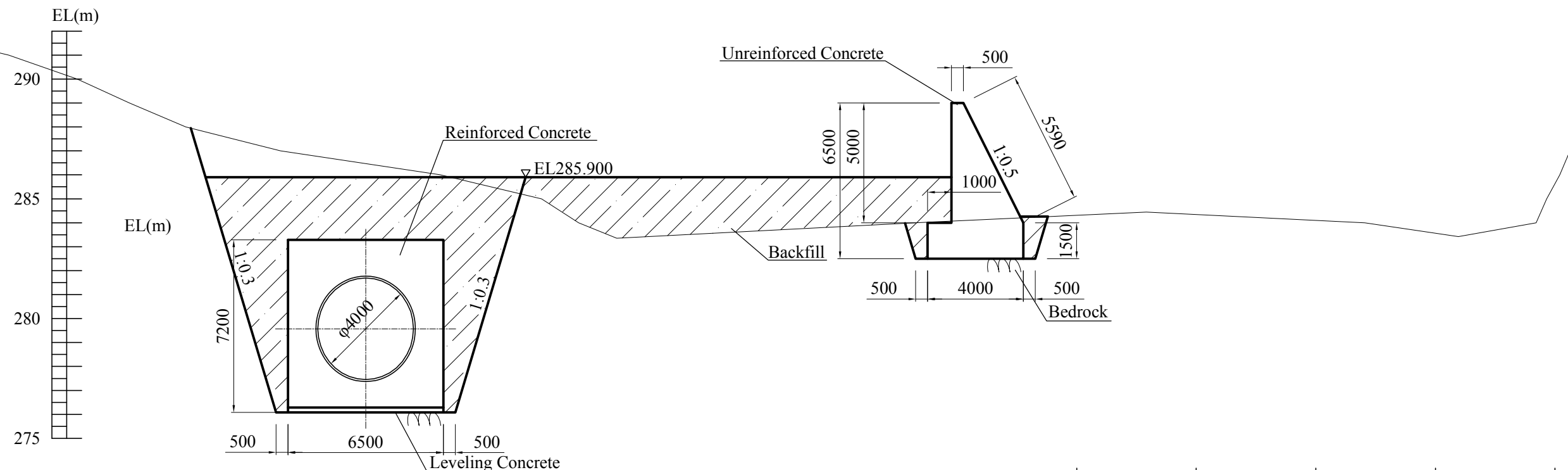
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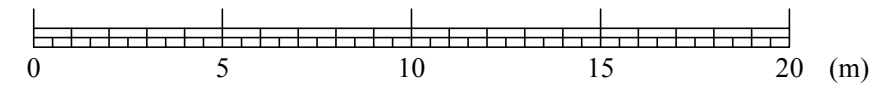




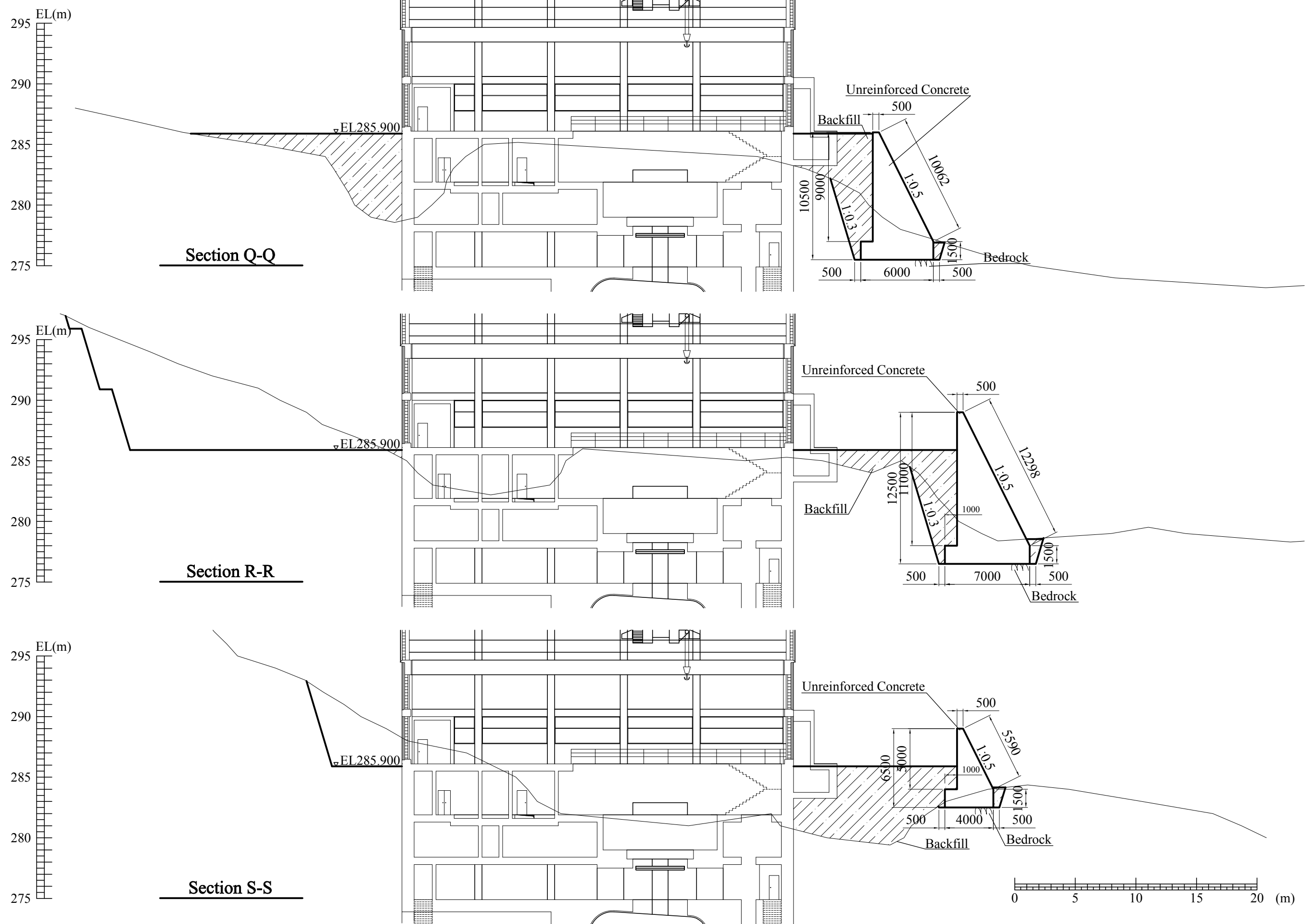
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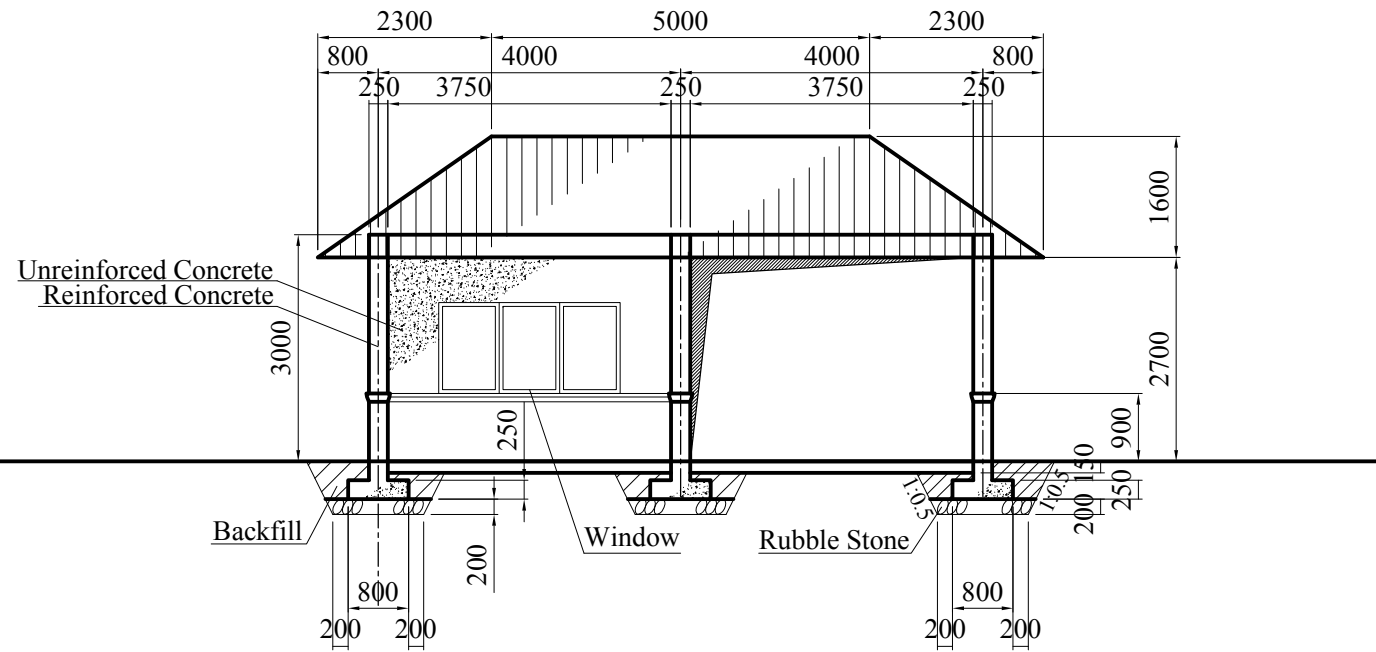
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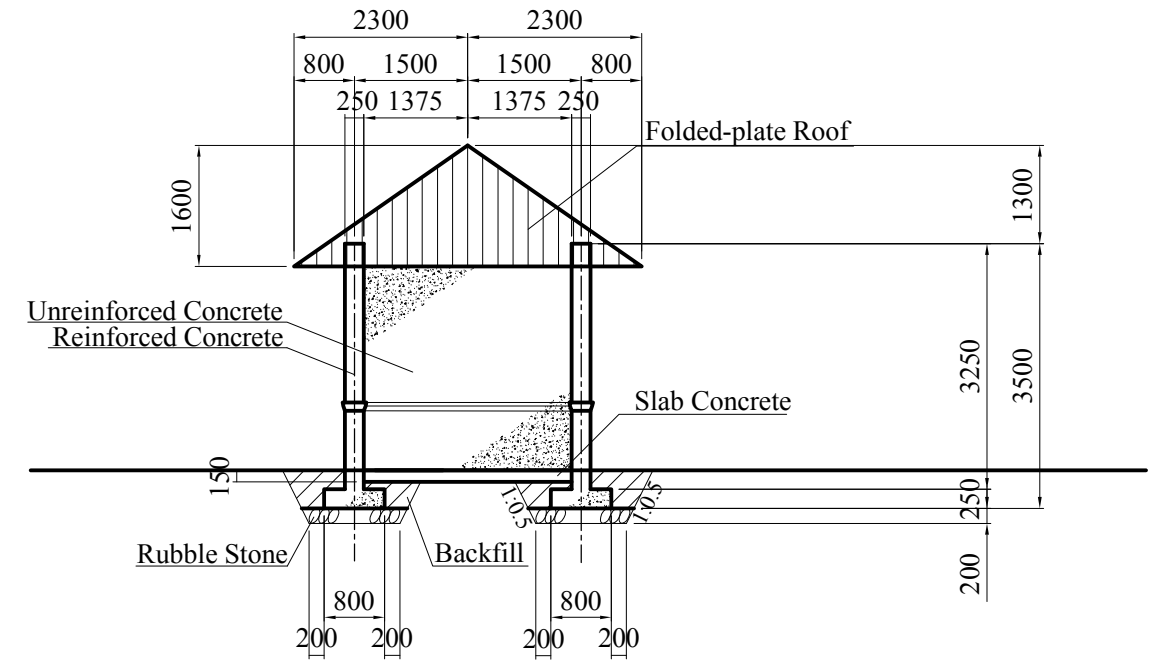
Preparatory Survey on the Project for The Extension of Tedzani Hydropower Station in the Republic of Malawi	The Extension of Tedzani Hydropower Station	TITLE : Access Road Sections (4/5)	SCALE : 1:200 (A3)	DRAWING No : TD-C-AR-039	Rev.
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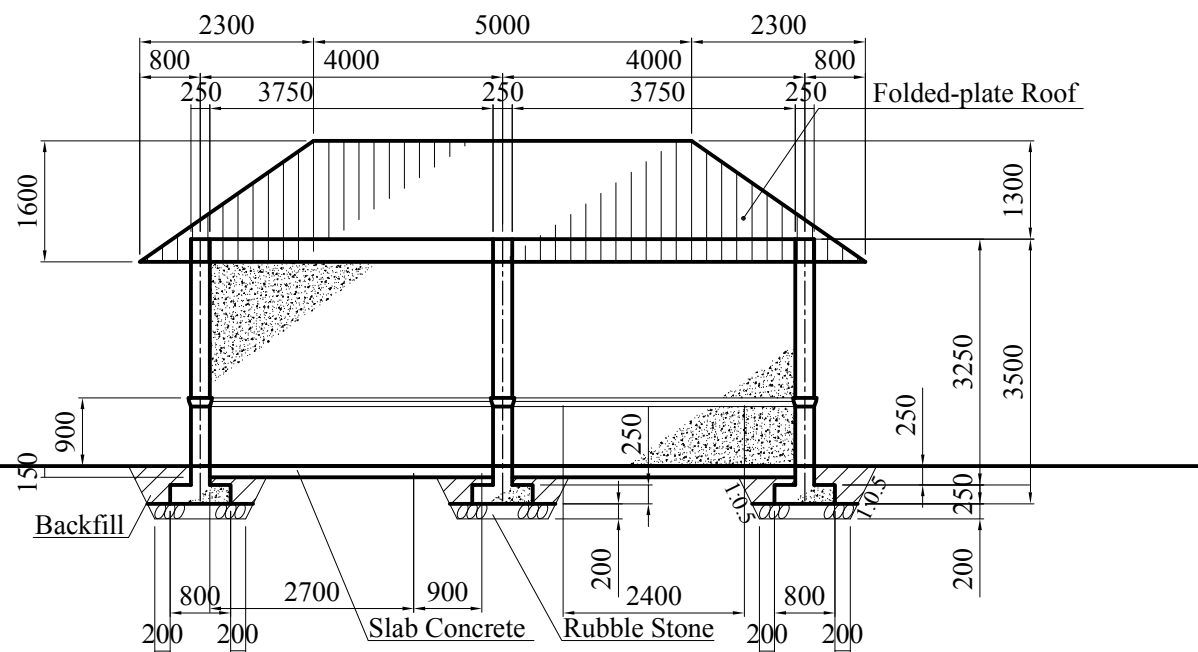
Front View



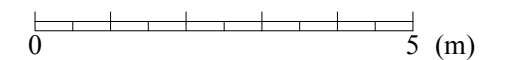
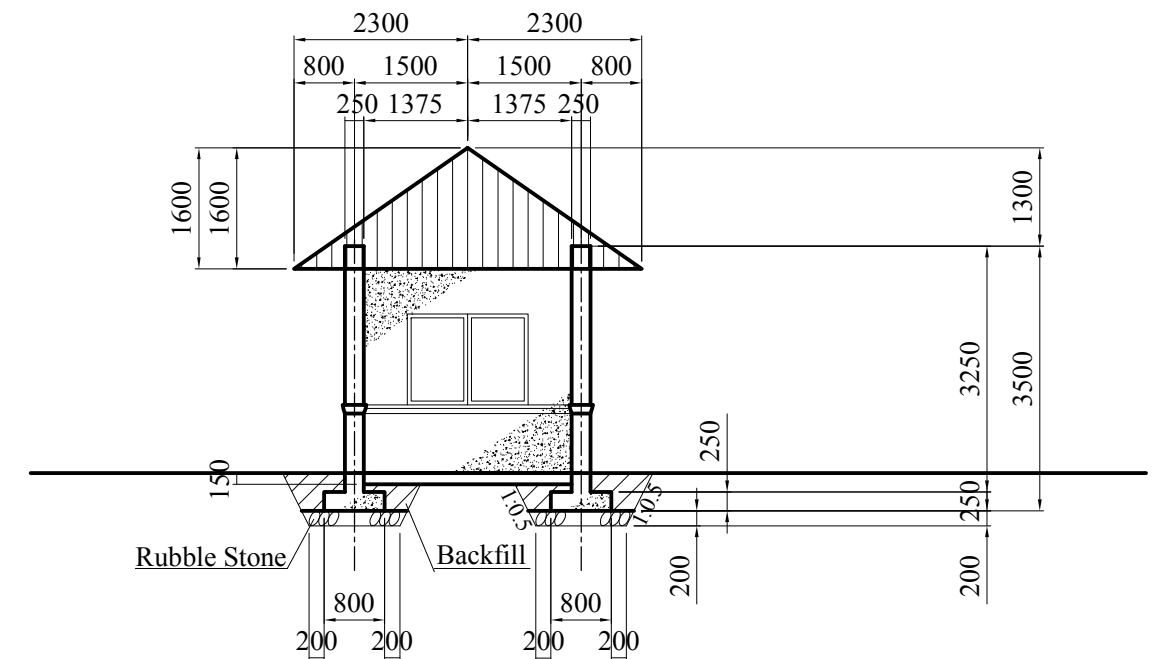
Side View



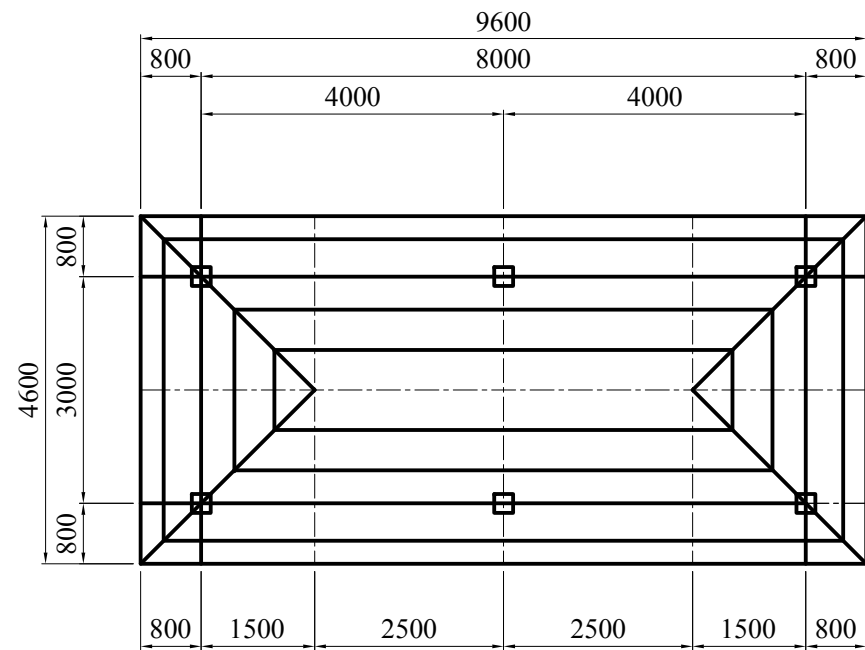
Back View



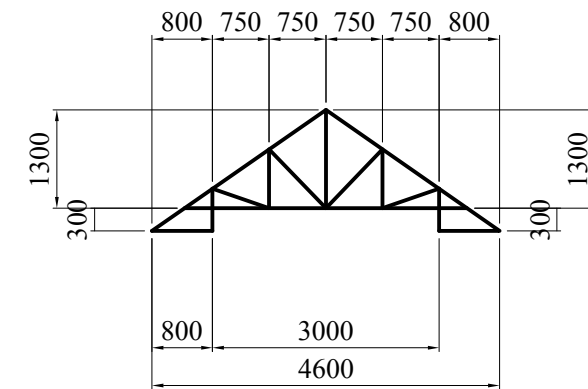
Side View



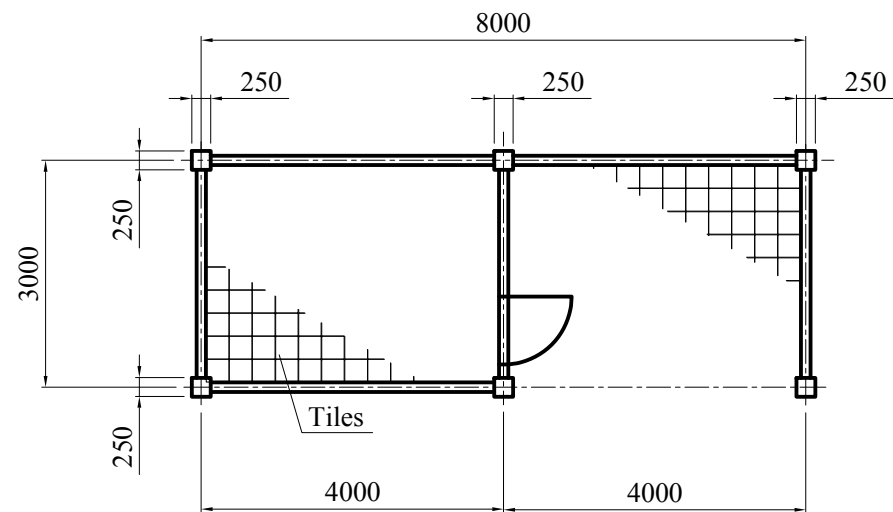
Roof Structure
PLAN



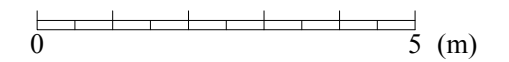
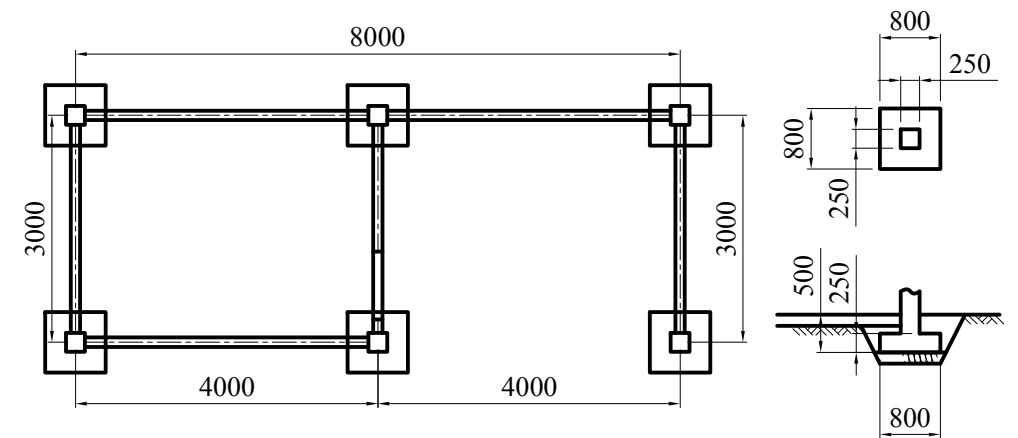
Roof Structure
CROSS SECTION

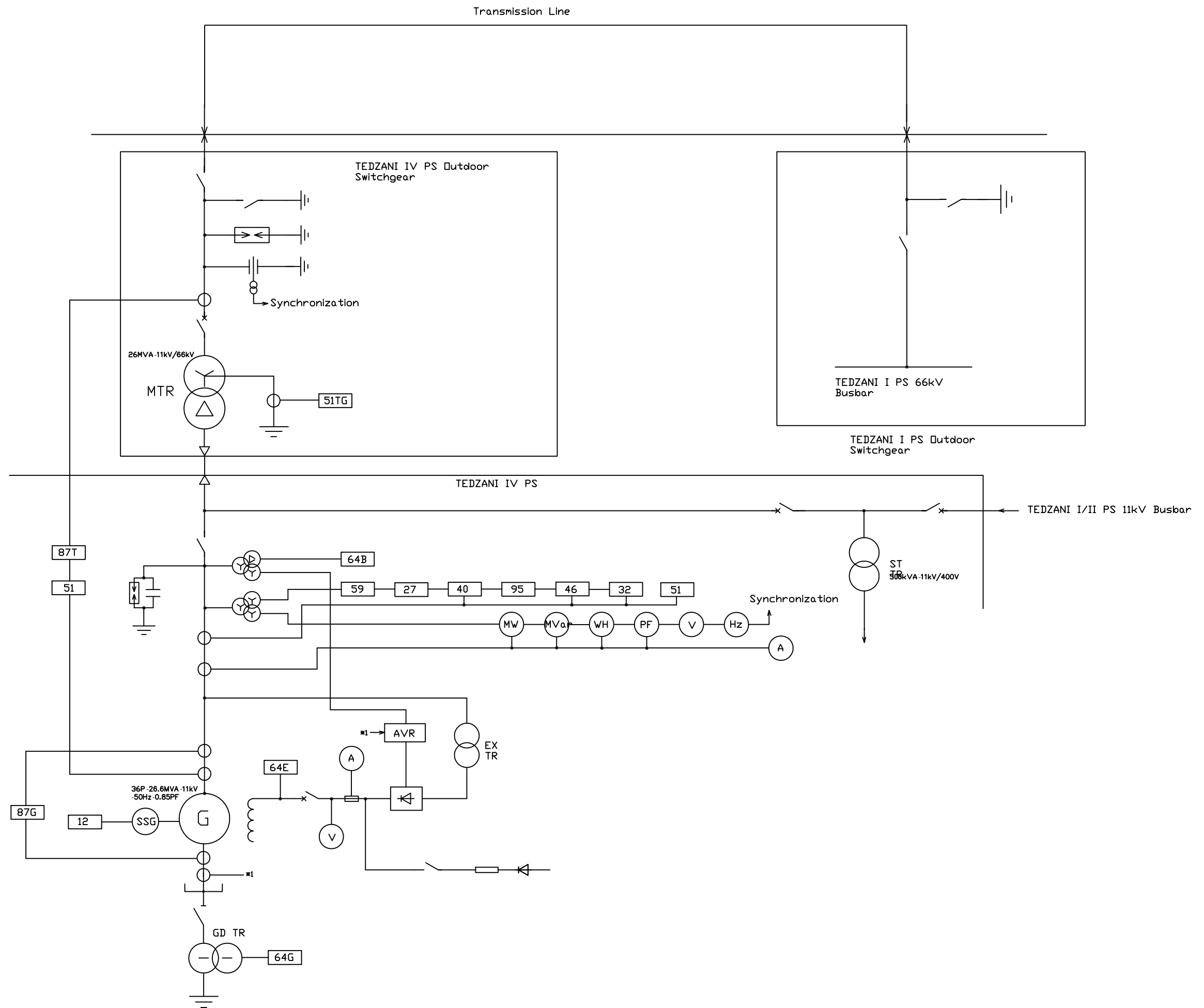


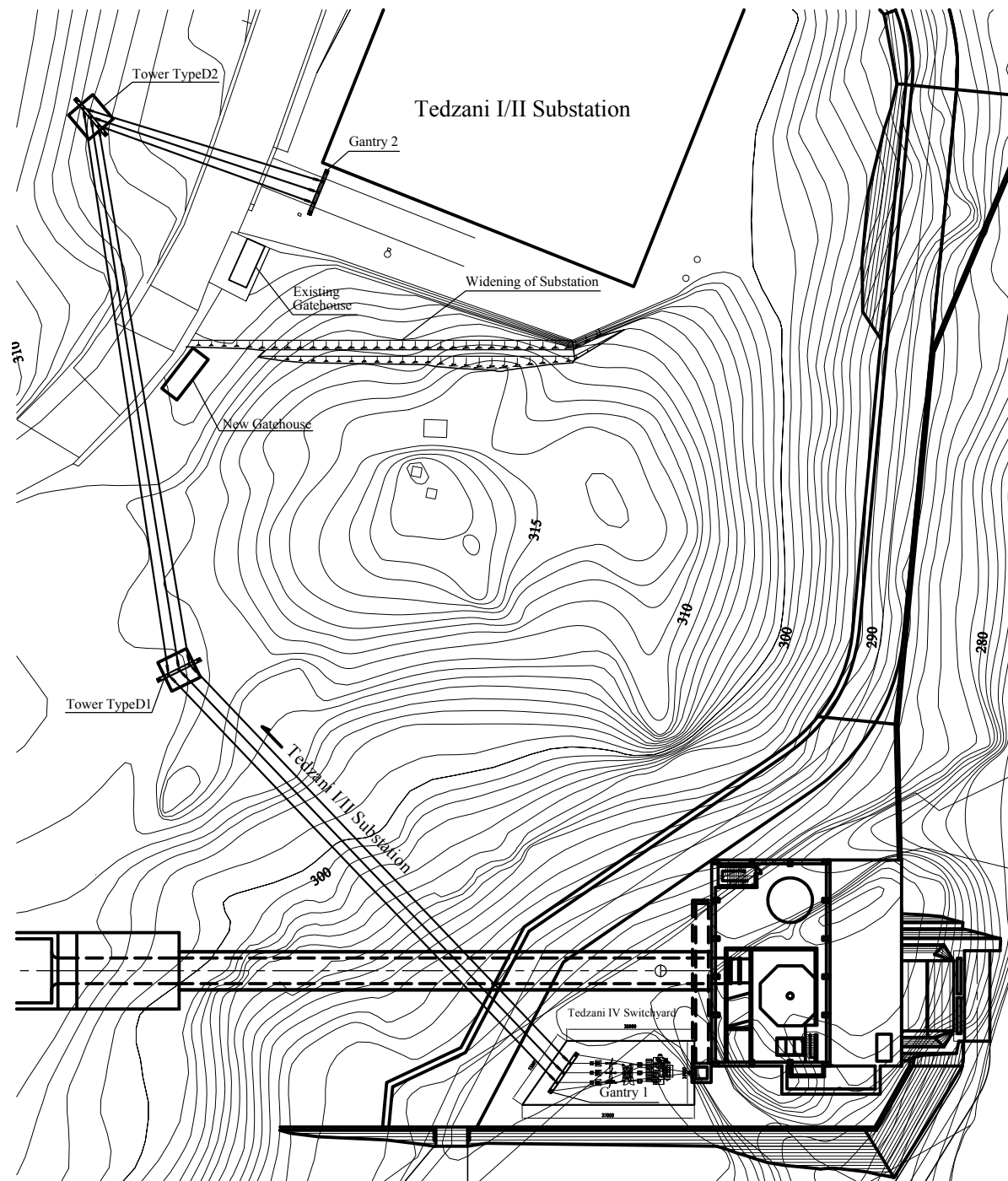
Floor Plan



Column Structure
Detail Plan

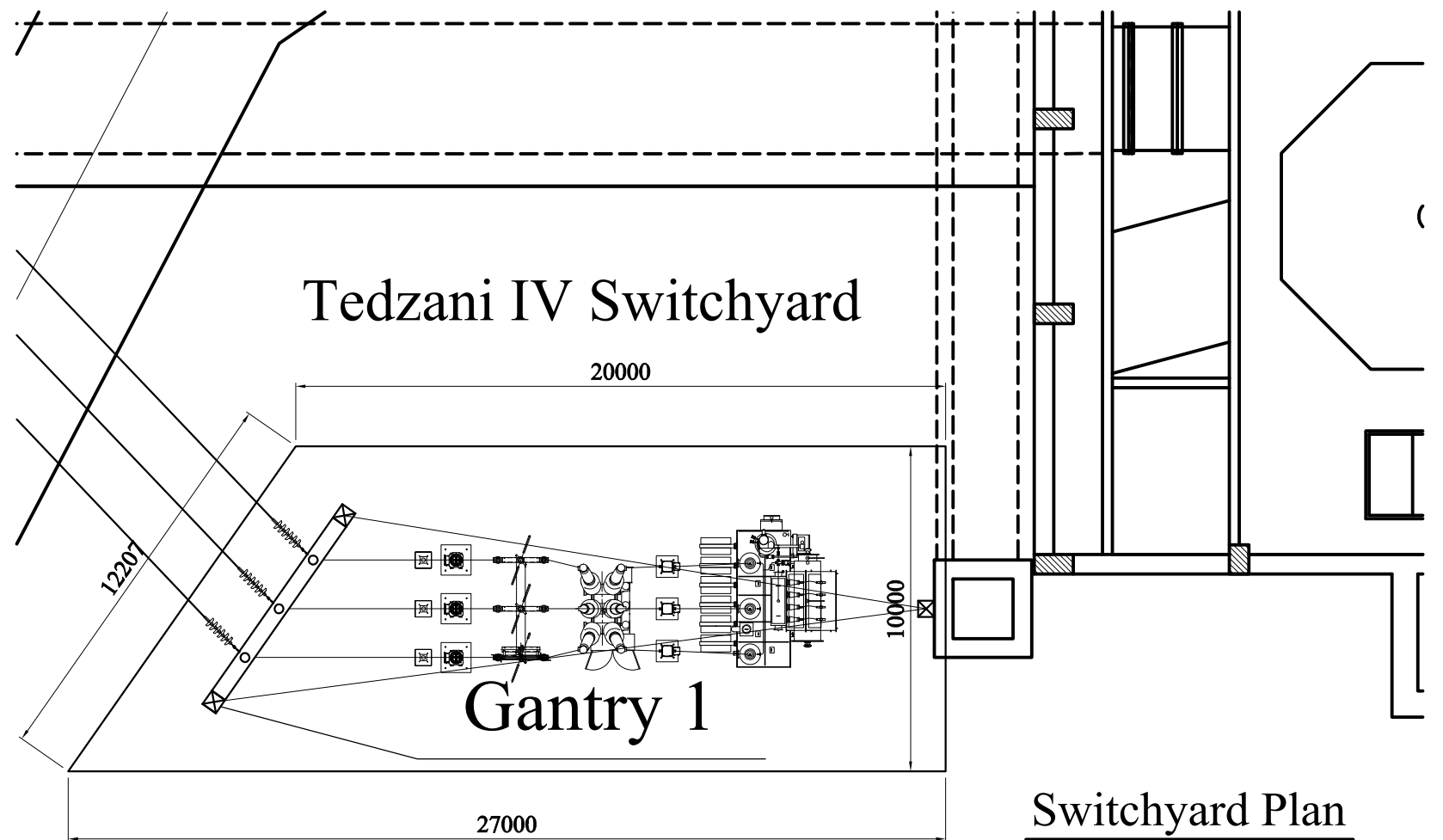






Transmission Line Plan

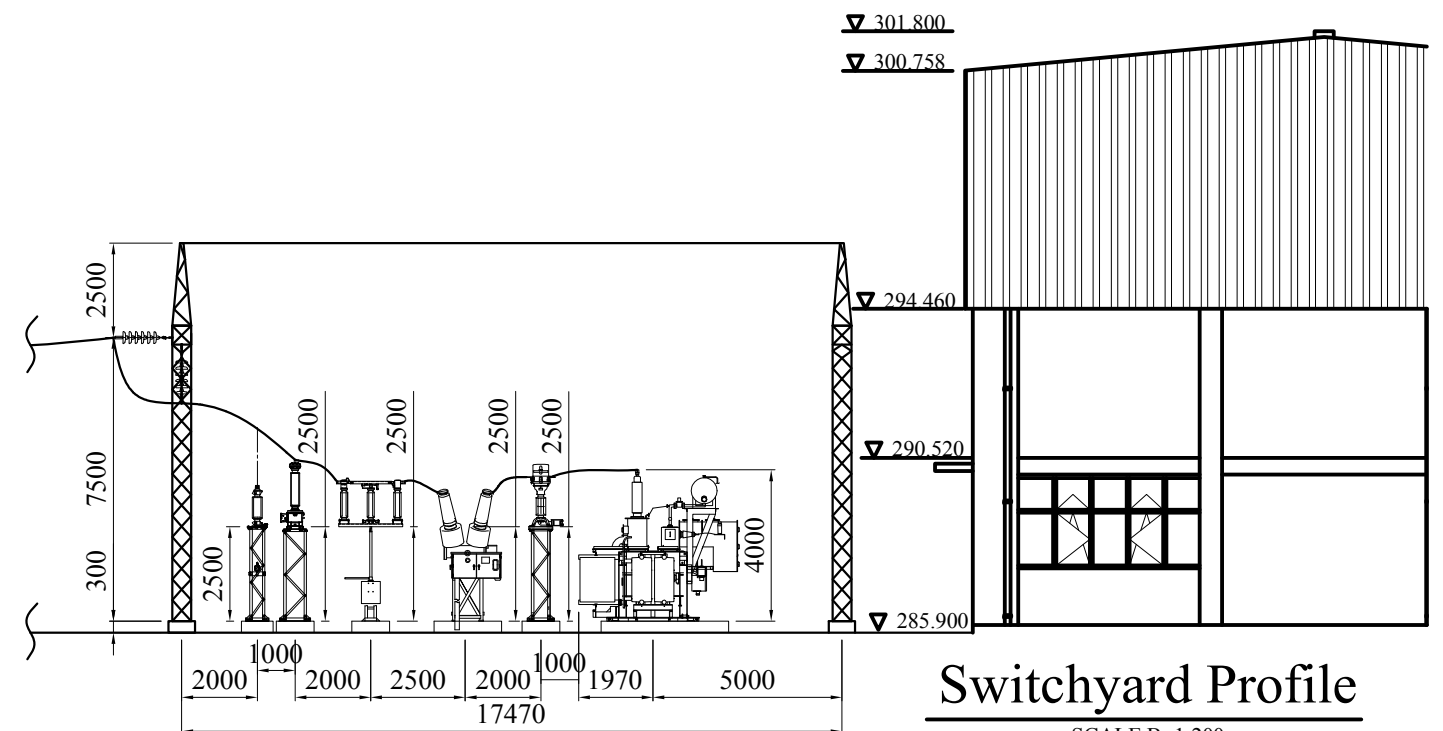
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Switchyard Plan

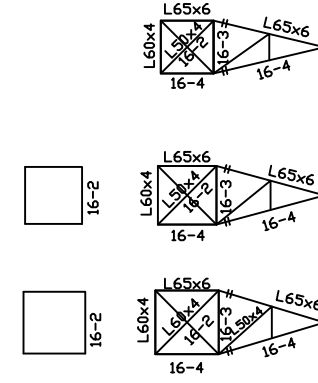
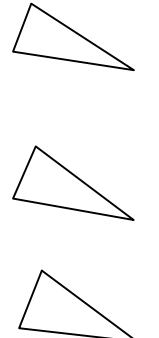
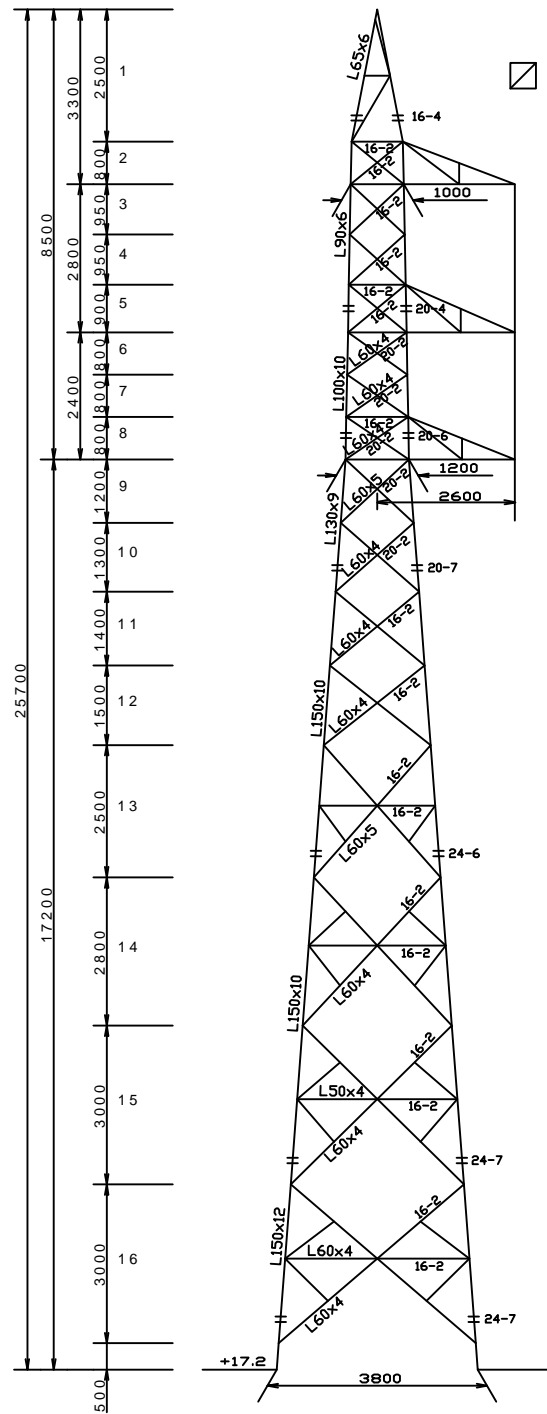
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RIGHT BANK-ELEVATION

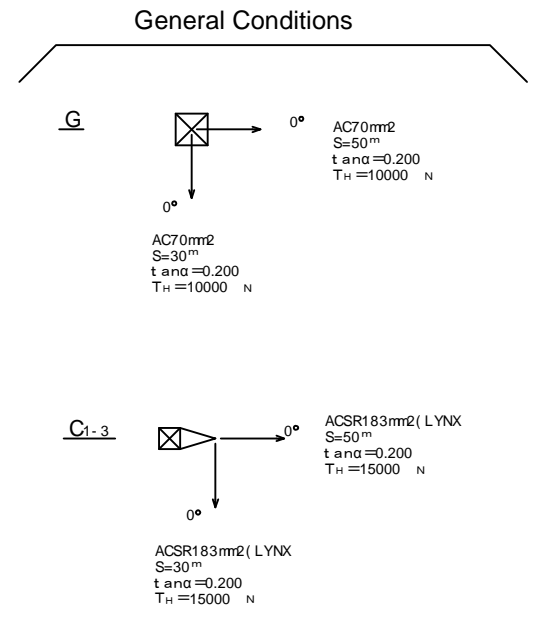


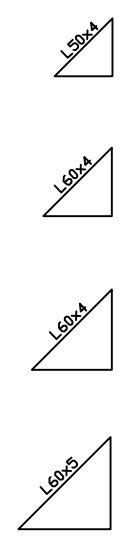
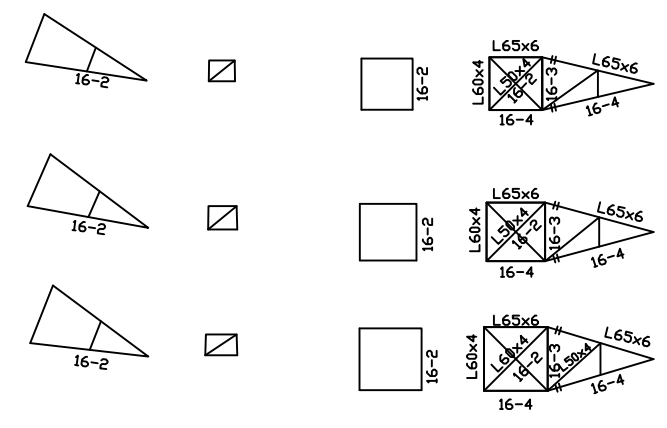
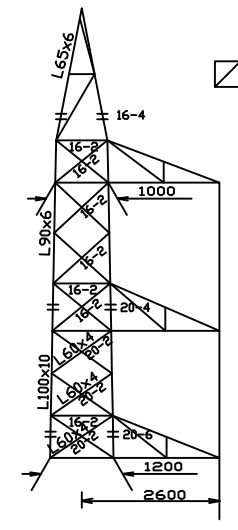
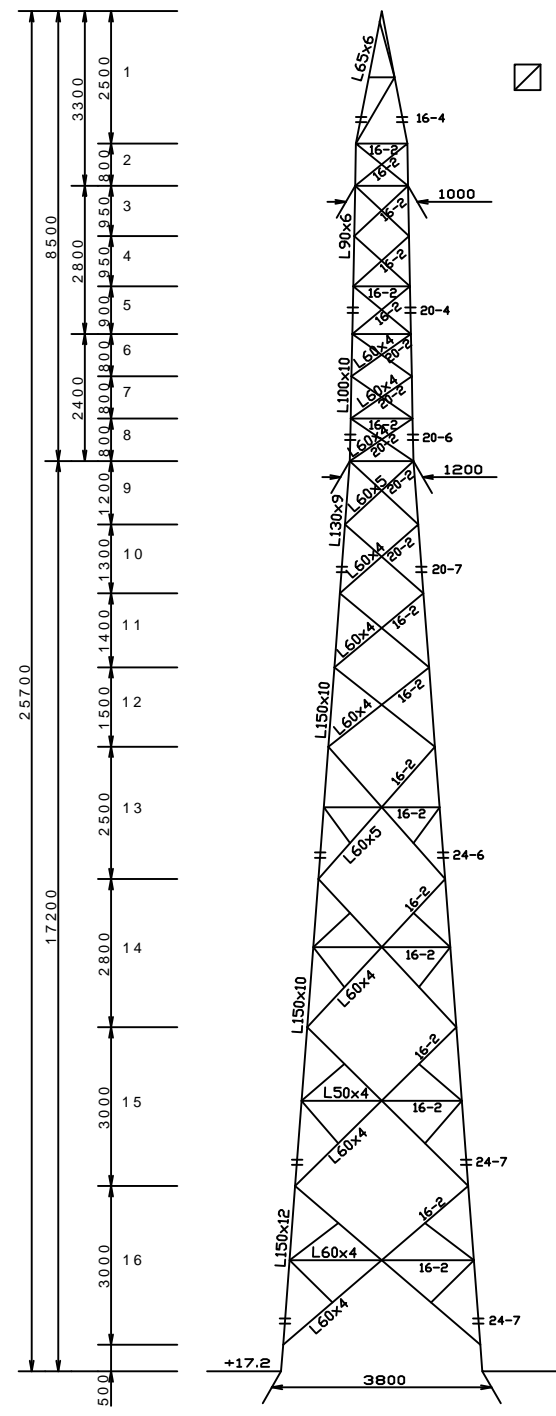
Switchyard Profile

SCALE B=1:200

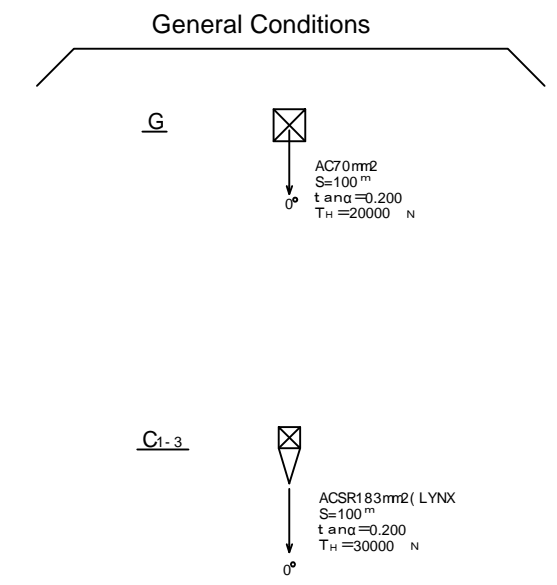


Design Conditions						
		G	W	Cond.		
				C1 - C3		
Nominal Voltages	k v	---	---	66	66	
Number of Circuits	c c t	---	---	1	1	
Wind Span	m	30	50	30	50	
Horizontal Angle		---	---	---	---	
Vertical Angle	Down	0.200	0.200	0.200	0.200	
	Up	---	---	---	---	
Wire	Designation	AC70 mm2	AC70 mm2	ACSR183mm2(LYNX)	ACSR183mm2(LYNX)	
	Number of Wire	1	1	1	1	
	Overall Diameter	mm	10.50	10.50	19.50	19.50
	Weight	kg / m	0.4360	0.4360	0.8416	0.8416
	Strength	High N	10000	10000	15000	15000
Insulators	Designation	---	---	250mm Ball & socket type	250mm Ball & socket type	
	Number of Disc	Disc/string	---	8	8	
	Weight	kg/supporting point	---	---	85	85
Wind Pressure	Tower Body Angle	High Pa	---	1400		
	Cross Arm Angle	High Pa	---	1400		
	Wire	High Pa	530	530	530	
	Insulators	High N/supporting point	---	---	135	135
Steelwork	Angle	SS400				
Bolts & Nuts		5.8;16	6.8;20,24			
None indicate steelwork		L45x4,16-1				
None indicate bolts & Nuts						
Remarks	Safety guide rail:None					

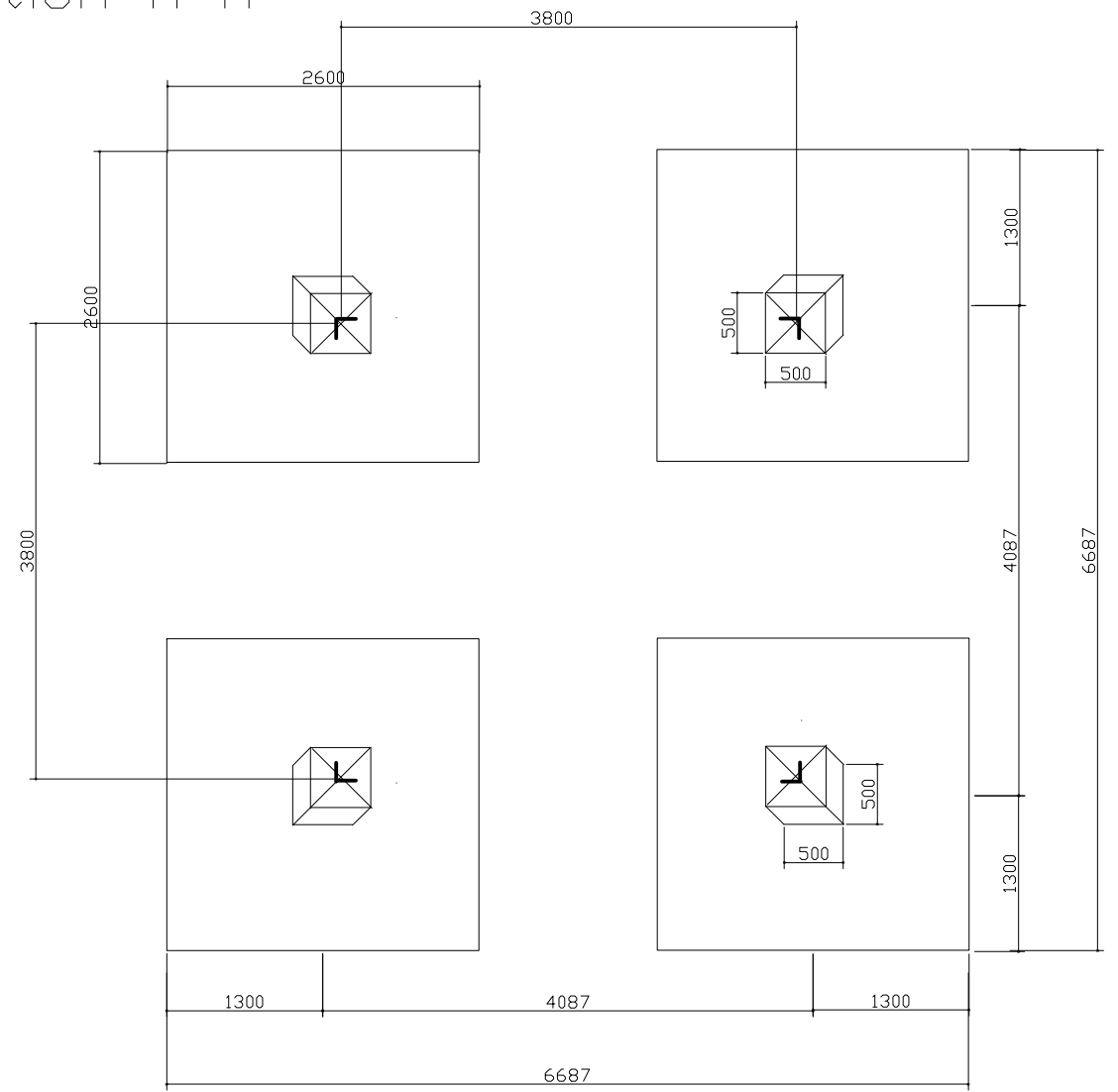
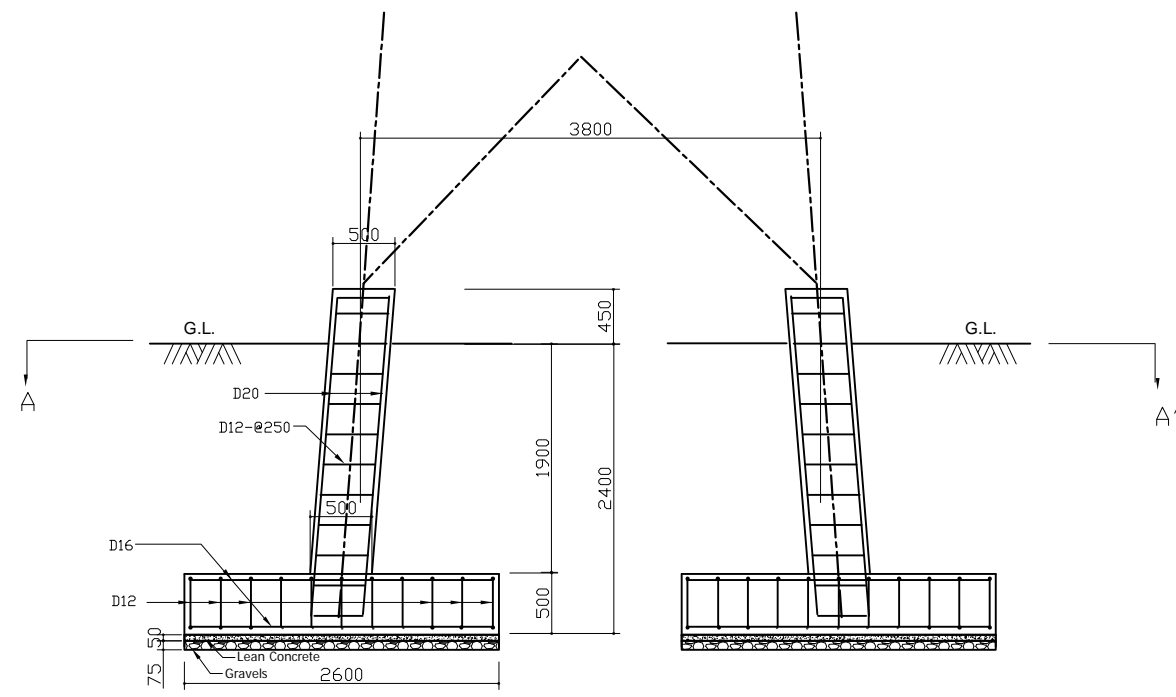


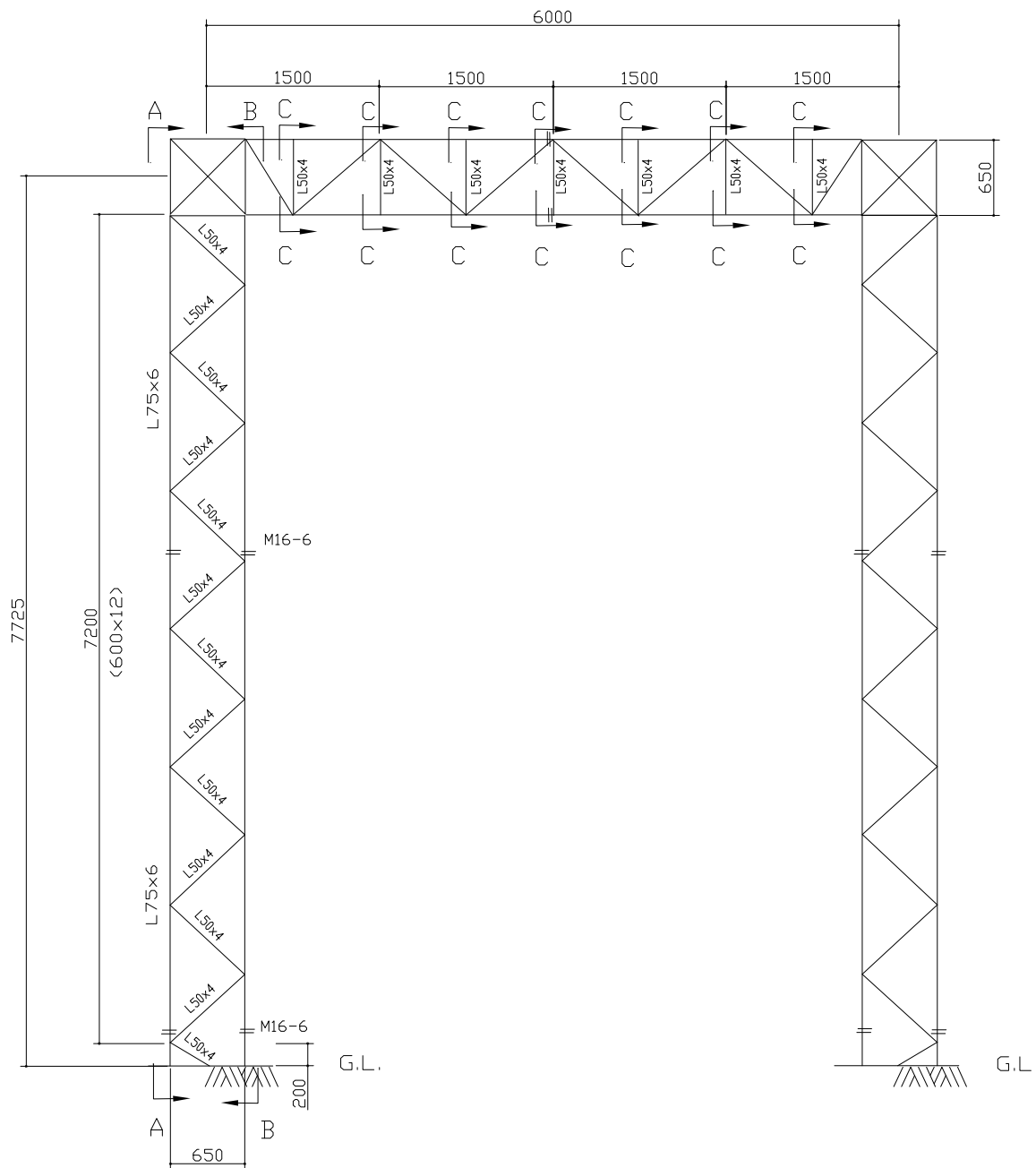
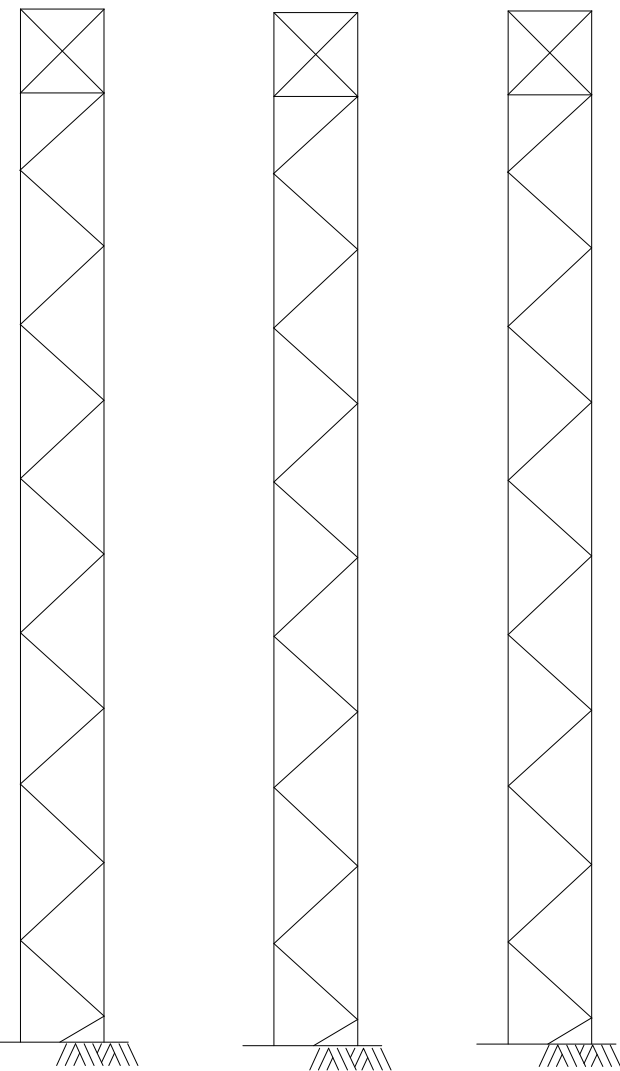
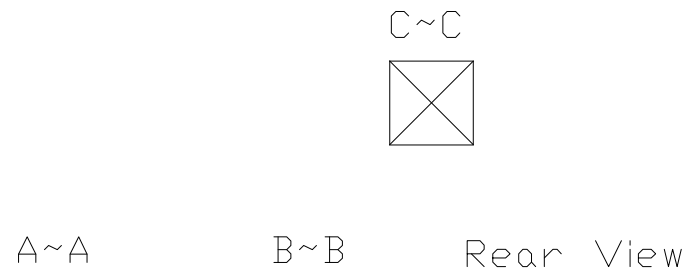


Design Conditions						
		G	W	Cond.		
				C1 - C3		
Nominal Voltages	k v	---	---	66	66	
Number of Circuits	c c t	---	---	1	1	
Wind Span	m	30	50	30	50	
Horizontal Angle		---	---	---	---	
Vertical Angle	Down	0.200	0.200	0.200	0.200	
	Up	---	---	---	---	
Wire	Designation	AC70 mm2	AC70 mm2	ACSR183mm2(LYNX)	ACSR183mm2(LYNX)	
	Number of Wire	1	1	1	1	
	Overall Diameter	mm	10.50	10.50	19.50	19.50
	Weight	kg / m	0.4360	0.4360	0.8416	0.8416
Strength	High	N	10000	10000	15000	15000
Insulators	Designation			250mm Ball & socket type	250mm Ball & socket type	
	Number of Disc	Disc/string	---	8	8	
Weight	kg/supporting point	---	---	85	85	
Wind Pressure	Tower Body	Angle	High	Pa	1400	
	Cross Arm	Angle	High	Pa	1400	
	Wire	High	Pa	530	530	
	Insulators	High	N/supporting point	---	135	135
Steelwork	Angle	SS400				
Bolts & Nuts		5.8;16	6.8;20,24			
None indicate steelwork		L45x4,16-1				
None indicate bolts & Nuts						
Remarks	Safety guide rail:None					

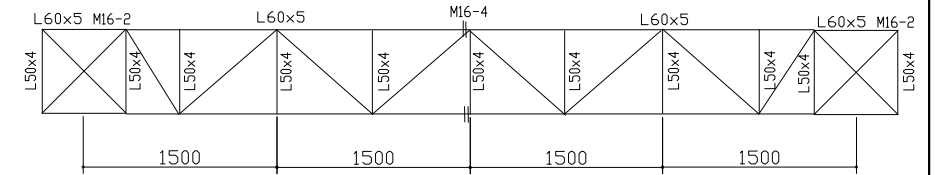


Section A-A'

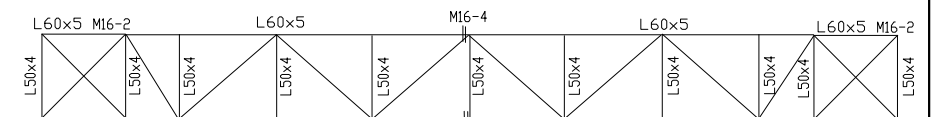




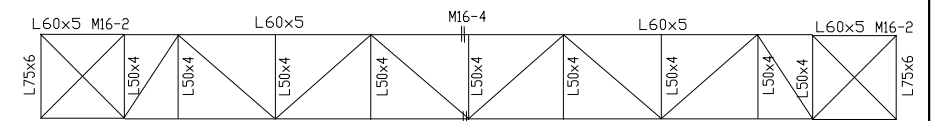
Top View



Bottom View



Rear View



Remarks	
Materials	SS400
Bolts & Nuts	5.8:M16
None indicate steelwork	L45x4
None indicate bolts & nuts	M16-1
Weights (kg)	1783

