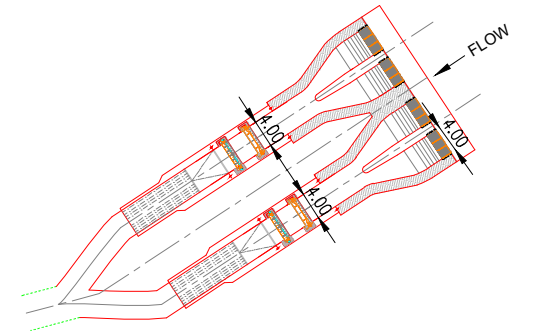
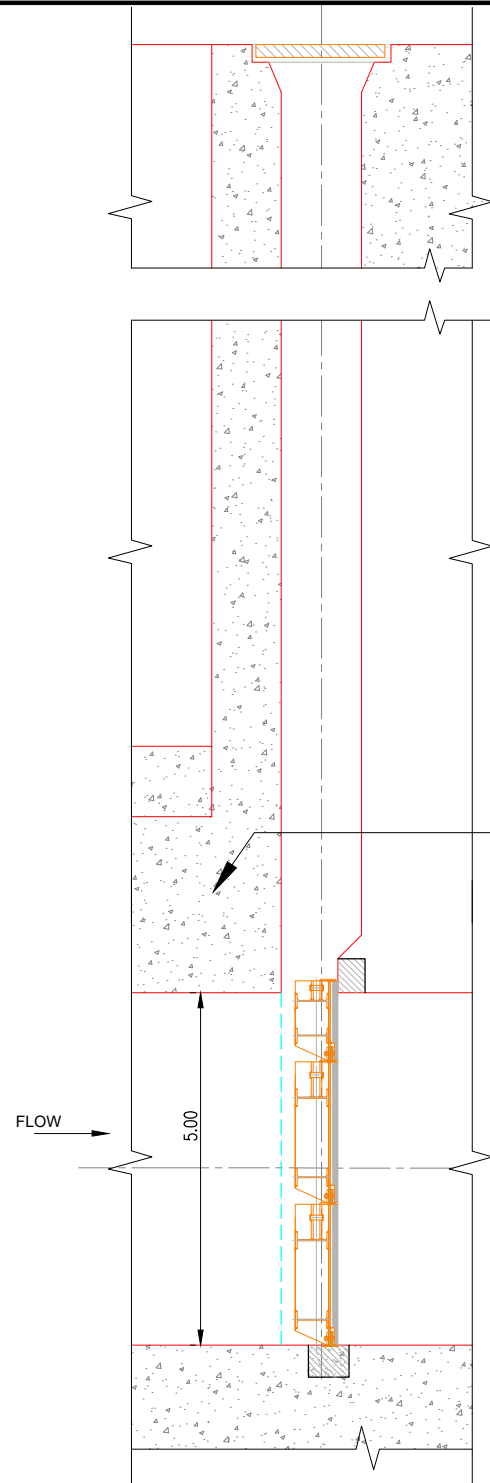
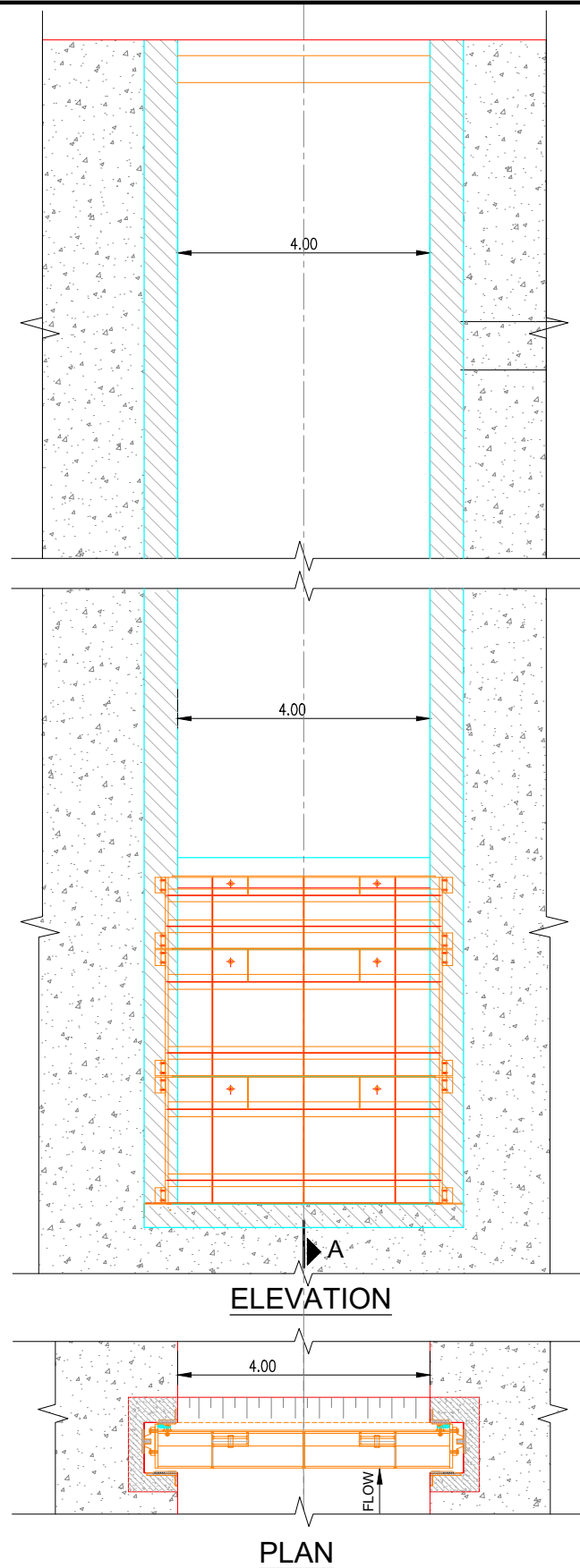




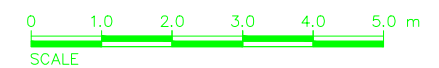
CONCRETE CLASS 'B'
(21 MPa AT 28 DAYS)

DISCLAIMER:

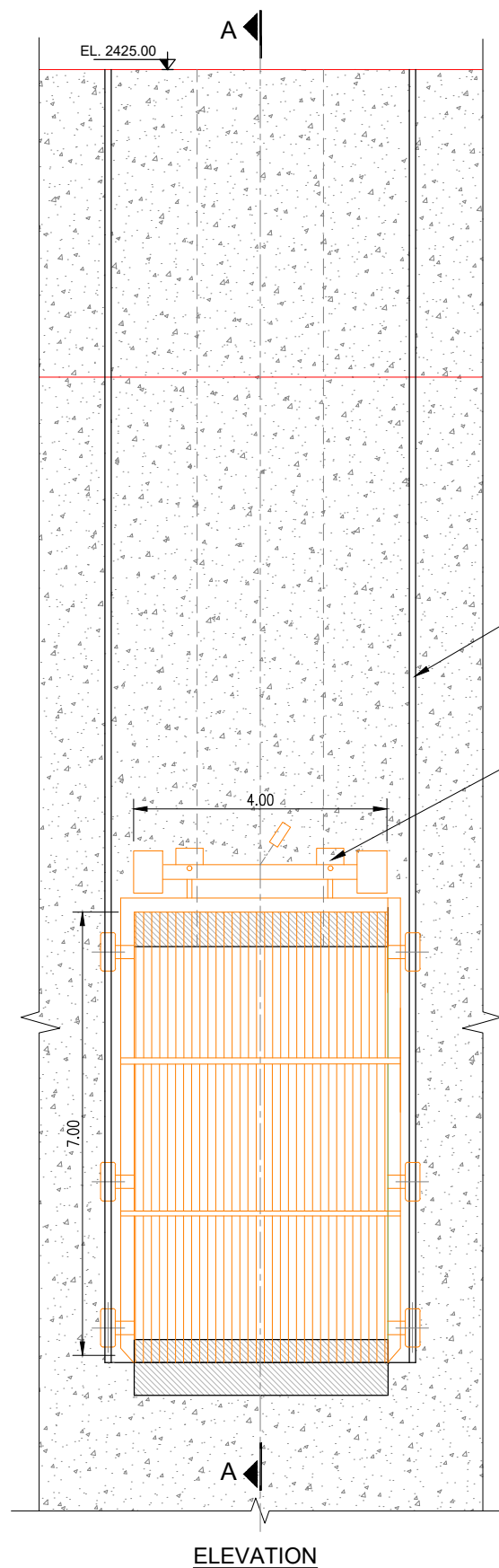
THIS IS CONCEPT LEVEL DRAWING WITH NO GUARANTEE OF COMPLETENESS OR PRECISION. EPC CONTRACTOR WILL BE FULLY RESPONSIBLE FOR THE ACTUAL DESIGN AND DRAWINGS TO ENSURE THE APPROPRIATE CONSTRUCTION, FUNCTIONALITY & EFFECTIVE OPERATION OF THE PROJECT (AS PER CONTRACT).

NOTE:

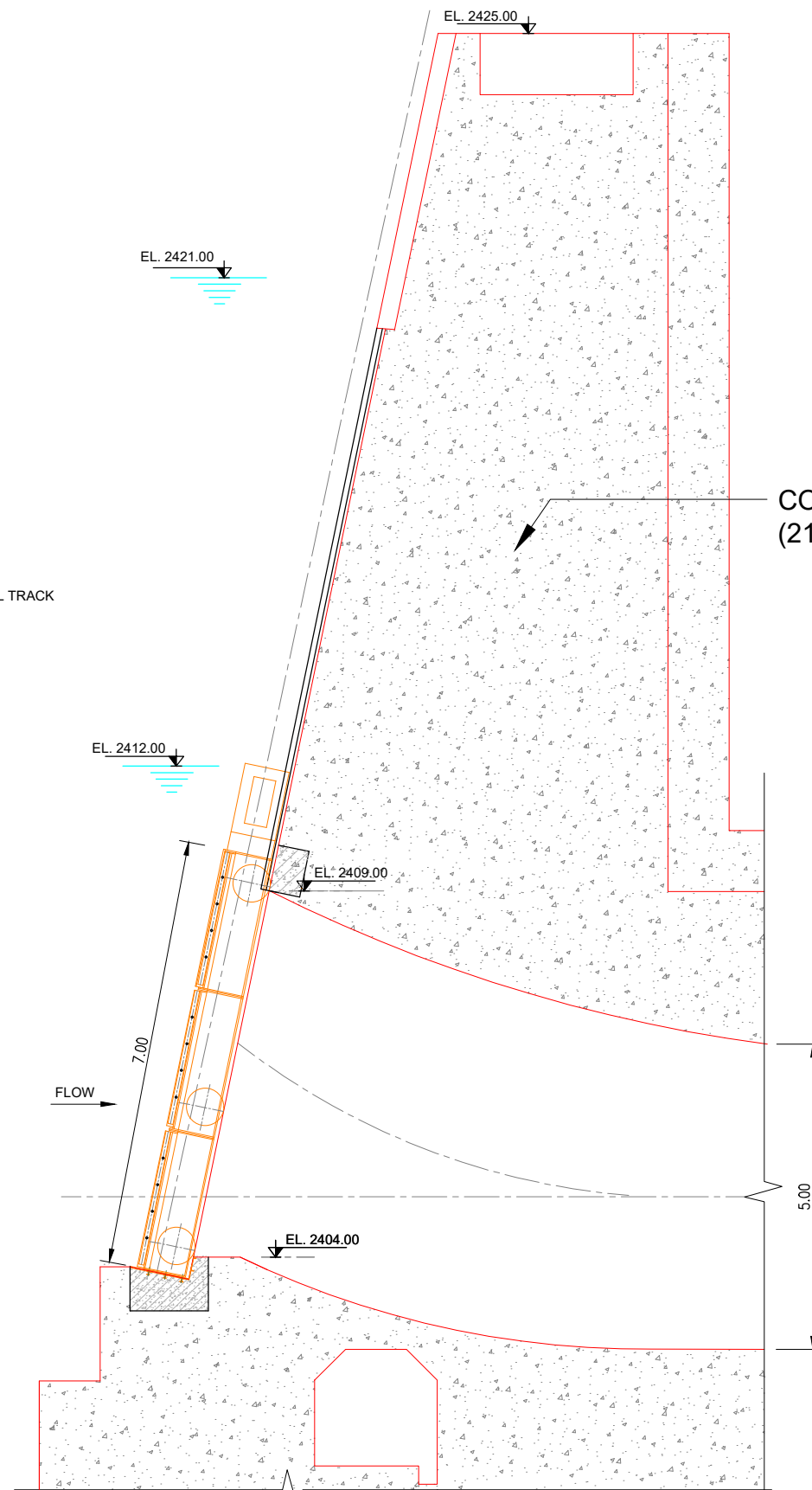
1. ALL THE UNITS IN METERS UNLESS OTHERWISE NOTED.
2. ALL STRUCTURAL CONCRETE IS CLASS 'B' (21 MPa AT 28 DAYS) UNLESS NOTED OTHERWISE.



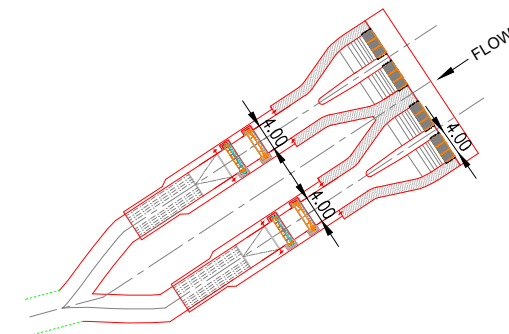
CLIENT:  PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY	CONSULTANT:  ATTABAD HYDROPOWER MANAGEMENT CONSULTANTS JOINT VENTURE OF:  NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LTD. (LEAD FIRM)  ASSOCIATED CONSULTING ENGINEERS (PVT.) LTD.  BARQAAB CONSULTING SERVICES (PVT.) LTD.  DOLSAR ENGINEERING INC. CO.	04				DRAWN	ASIF SAMI	POWER INTAKE STOPLOG ARRANGEMENT		SCALE
		03				RECOMMENDED	-			AS SHOWN
		02				CHD./VER.	-			
		01				APPROVED	-			
		PROJECT: ATTABAD LAKE HYDROPOWER PROJECT (54 MW)		REV.	DATE	DESCRIPTION	APPROVED	APPROVED	-	DATE : MARCH, 2026



ELEVATION



SECTION A-A



KEY PLAN

CONCRETE CLASS 'B'
(21 MPa AT 28 DAYS)

DISCLAIMER:

THIS IS CONCEPT LEVEL DRAWING WITH NO GUARANTEE OF COMPLETENESS OR PRECISION. EPC CONTRACTOR WILL BE FULLY RESPONSIBLE FOR THE ACTUAL DESIGN AND DRAWINGS TO ENSURE THE APPROPRIATE CONSTRUCTION, FUNCTIONALITY & EFFECTIVE OPERATION OF THE PROJECT (AS PER CONTRACT).

NOTES:

1. ALL DIMENSIONS ARE IN METERS.
2. ELEVATIONS AND LEVELS ARE BASED ON THE TOPOGRAPHIC SURVEY ATTACHED IN PACKAGE III, VOLUME III OF THE BIDDING DOCUMENT. VERIFICATION OF THESE ELEVATIONS IS RESPONSIBILITY OF THE EPC CONTRACTOR.
3. ALL STRUCTURAL CONCRETE IS CLASS 'B' (21 MPa AT 28 DAYS) UNLESS NOTED OTHERWISE.



CLIENT: **PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY**

PROJECT: **ATTABAD LAKE HYDROPOWER PROJECT (54 MW)**

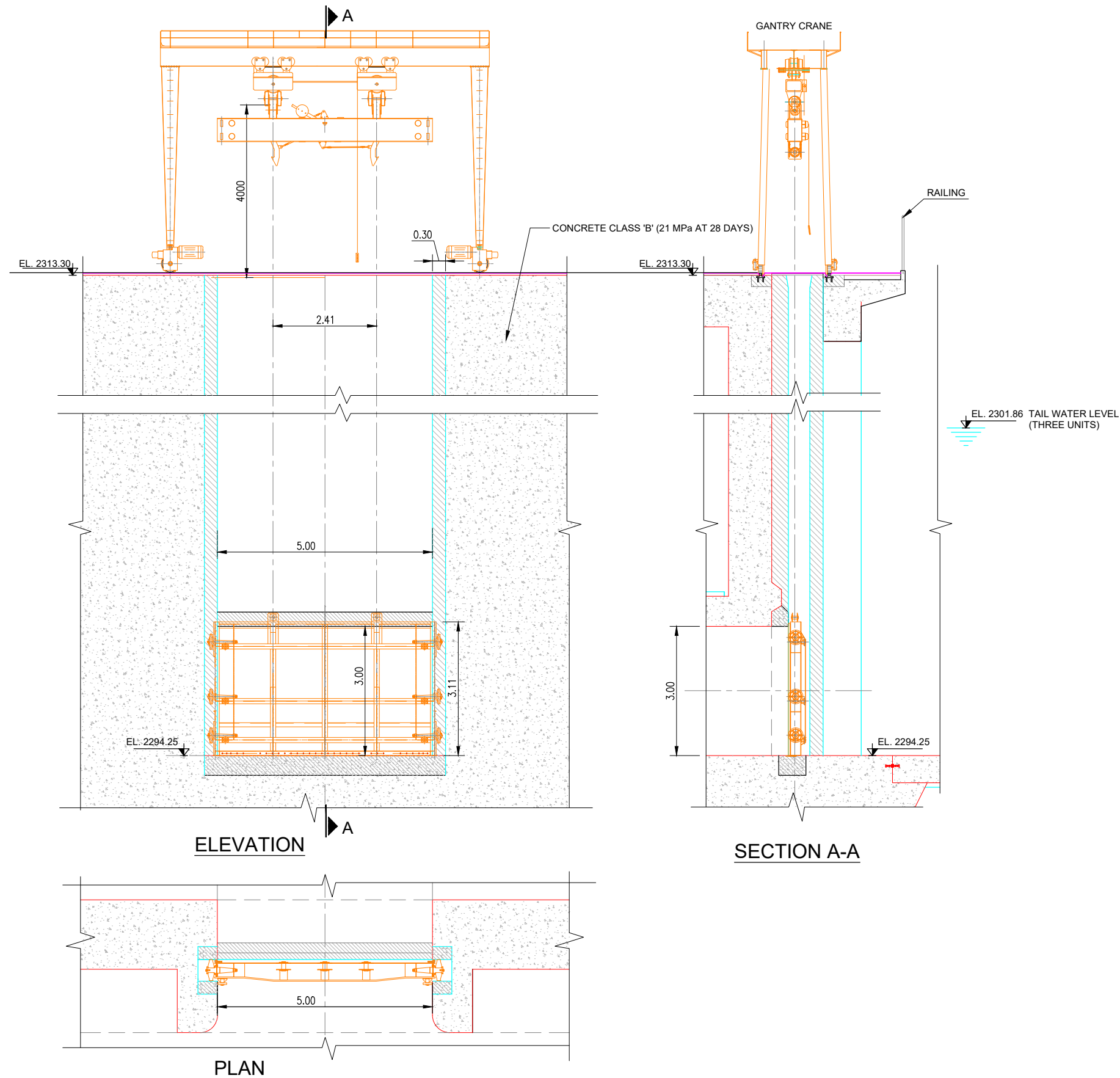
CONSULTANT: **AMC** **ATTABAD HYDROPOWER MANAGEMENT CONSULTANTS**

JOINT VENTURE OF:
NATIONAL ENGINEERING SERVICES (PVT.) LTD. (LEAD FIRM)
ASSOCIATED CONSULTING ENGINEERS (PVT.) LTD.
PAKISTAN ENGINEERING SERVICES (PVT.) LTD.

BARQAAB CONSULTING SERVICES (PVT.) LTD.
DOLSAR ENGINEERING INC. CO.

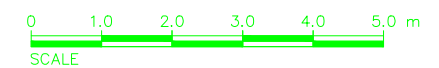
04				DRAWN	ASIF SAMI
03				RECOMMENDED	-
02				CHD./VER.	-
01				APPROVED	-
REV.	DATE	DESCRIPTION	APPROVED	APPROVED	-

POWER INTAKE TRASHRACK ARRANGEMENT		SCALE
DATE : MARCH, 2026		AS SHOWN
DRAWING No. ALHPP-HSS-0408		REV.



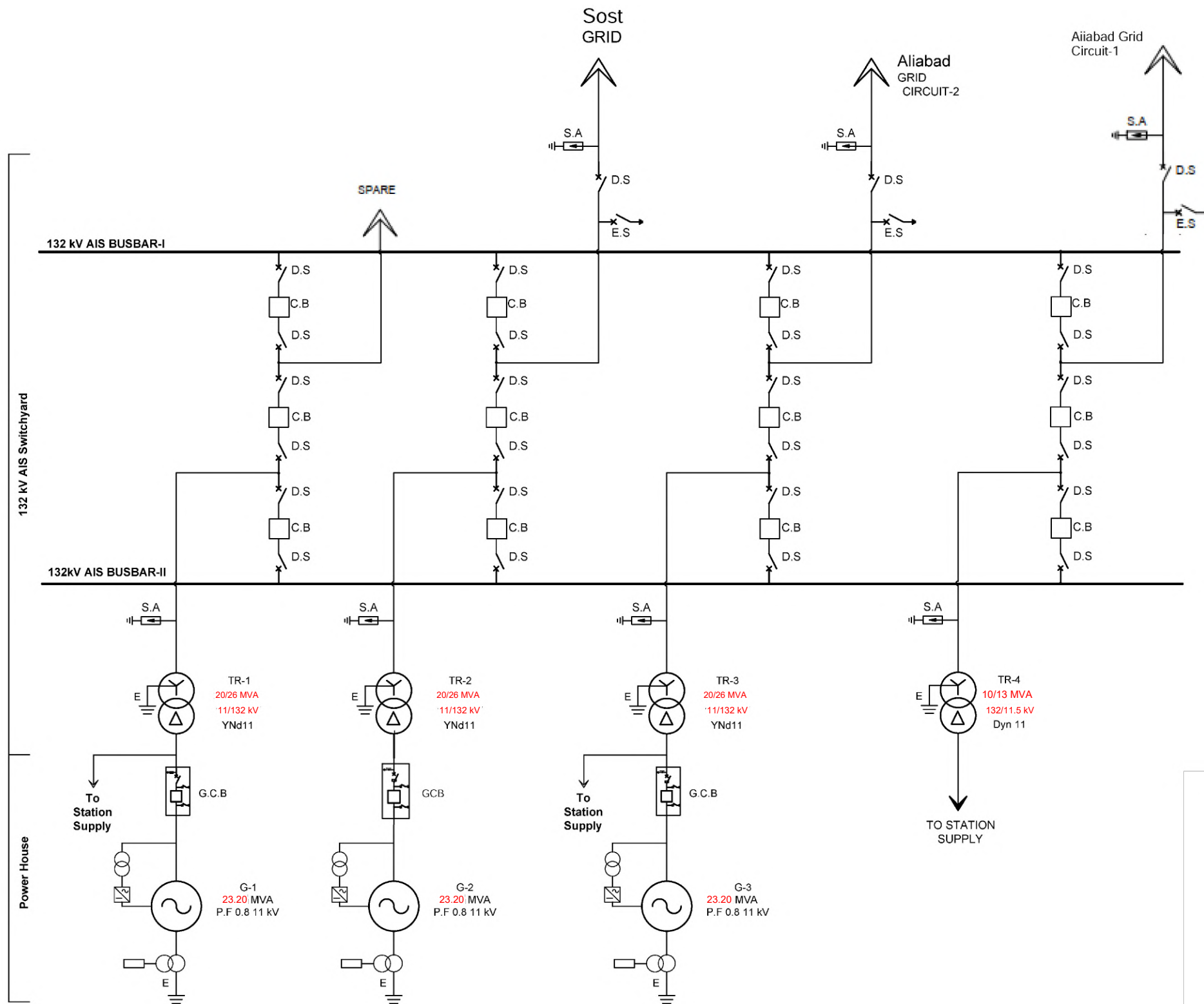
DISCLAIMER:
THIS IS CONCEPT LEVEL DRAWING WITH NO GUARANTEE OF COMPLETENESS OR PRECISION. EPC CONTRACTOR WILL BE FULLY RESPONSIBLE FOR THE ACTUAL DESIGN AND DRAWINGS TO ENSURE THE APPROPRIATE CONSTRUCTION, FUNCTIONALITY & EFFECTIVE OPERATION OF THE PROJECT (AS PER CONTRACT).

NOTES:
1. ALL DIMENSIONS ARE IN METERS.
2. ELEVATIONS AND LEVELS ARE BASED ON THE TOPOGRAPHIC SURVEY ATTACHED IN PACKAGE III, VOLUME III OF THE BIDDING DOCUMENT. VERIFICATION OF THESE ELEVATIONS IS RESPONSIBILITY OF THE EPC CONTRACTOR.



CLIENT: PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY	CONSULTANT: ATTABAD HYDROPOWER MANAGEMENT CONSULTANTS JOINT VENTURE OF: NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LTD. (LEAD FIRM) ASSOCIATED CONSULTING ENGINEERS (PVT.) LTD. PAKISTAN ENGINEERING SERVICES (PVT.) LTD. BARQAAB CONSULTING SERVICES (PVT.) LTD. DOLSAR ENGINEERING INC. CO.	04				DRAWN	ASIF SAMI	POWERHOUSE DRAFT TUBE GATE ARRANGEMENT		SCALE
		03				RECOMMENDED	-			AS SHOWN
PROJECT: ATTABAD LAKE HYDROPOWER PROJECT (54 MW)		02				CHD./VER.	-	DATE : MARCH, 2026	DRAWING No. ALHPP-HSS-0409	REV.
		01				APPROVED	-			
		REV.	DATE	DESCRIPTION	APPROVED	APPROVED	-			

E- POWERPLANT ELECTRICAL

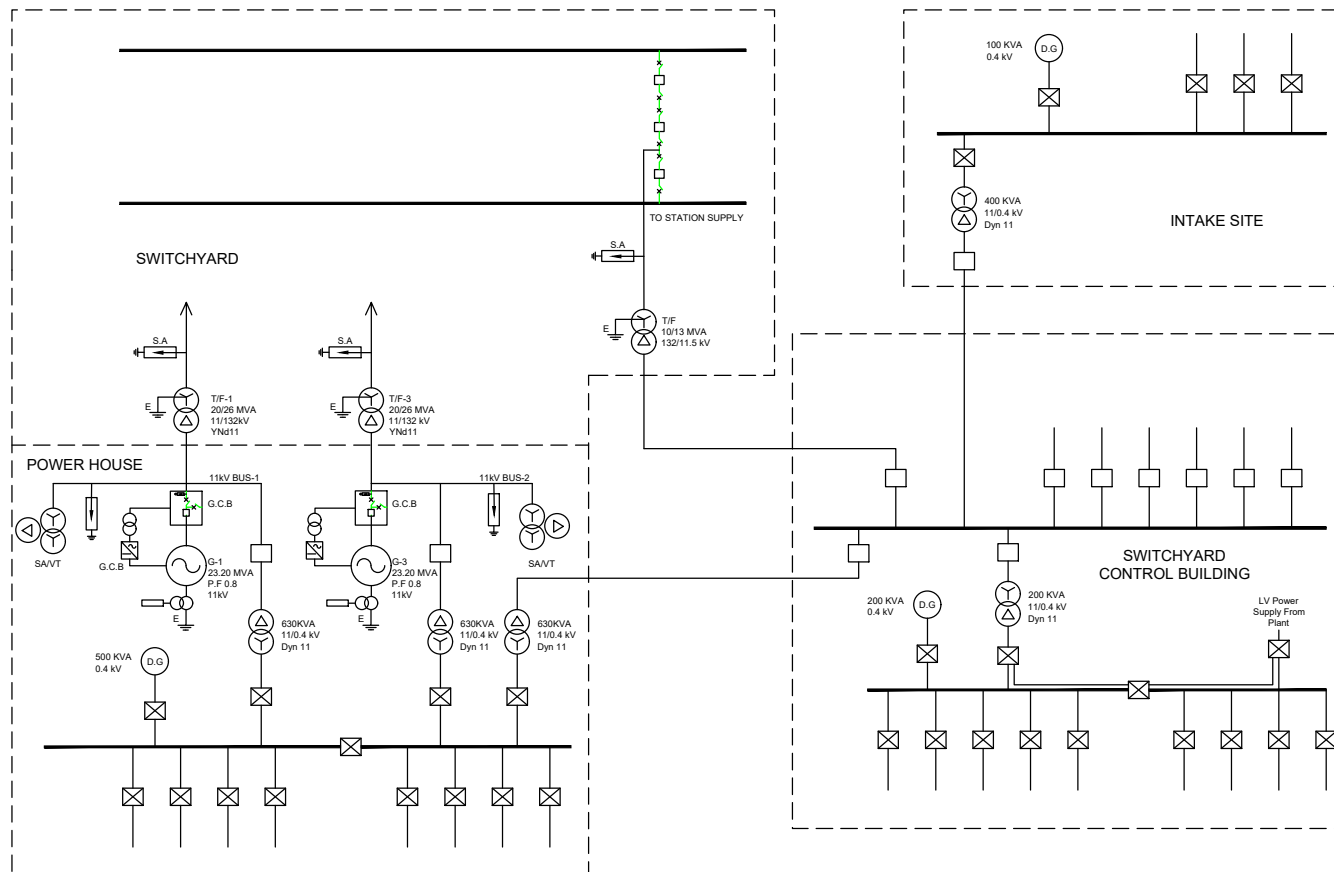


LEGEND:	
SYMBOL	DESCRIPTION
	3~ GENERATOR
	132 kV CIRCUIT BREAKER
	TRANSFORMER
	TRANSMISSION LINE
	SURGE ARRESTER
	EARTH/GROUND
	NEUTRAL GROUND RESISTOR
	EARTHING SWITCH
	DISCONNECTOR SWITCH
	11 kV GENERATOR C.B

DISCLAIMER:
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- NOTES:**
- DRAWING SHOWS THE BASIC CONCEPT OF ELECTRICAL SYSTEM. FINAL DESIGN SHALL BE DEVELOPED BY CONTRACTOR DURING DETAIL DESIGN STAGE.
 - FINAL RATINGS OF VARIOUS EQUIPMENT SHALL BE DETERMINED ON DETAILED DESIGN STAGE.
 - THIS DRAWING IS PREPARED BASED ON FEASIBILITY DRAWING NO. AFS-EM-451.

CLIENT:  PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY	CONSULTANT: ATTABAD HYDROPOWER MANAGEMENT CONSULTANTS JOINT VENTURE OF: NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LTD. (LEAD FIRM) ASSOCIATED CONSULTING ENGINEERS (PVT.) LTD. PAKISTAN ENGINEERING SERVICES (PVT.) LTD. BARQAAB CONSULTING SERVICES (PVT.) LTD. DOLSAR ENGINEERING INC.CO.	04				DRAWN	ASIF SAMI	MAIN SINGLE LINE DIAGRAM		SCALE	
		03				RECOMMENDED	-				AS SHOWN
		02				CHD./VER.	-				
		01									
		PROJECT: ATTABAD LAKE HYDROPOWER PROJECT (54 MW)		REV.	DATE	DESCRIPTION	APPROVED	APPROVED	-	DATE : MARCH, 2026	DRAWING No. ALHPP-PPE-0501

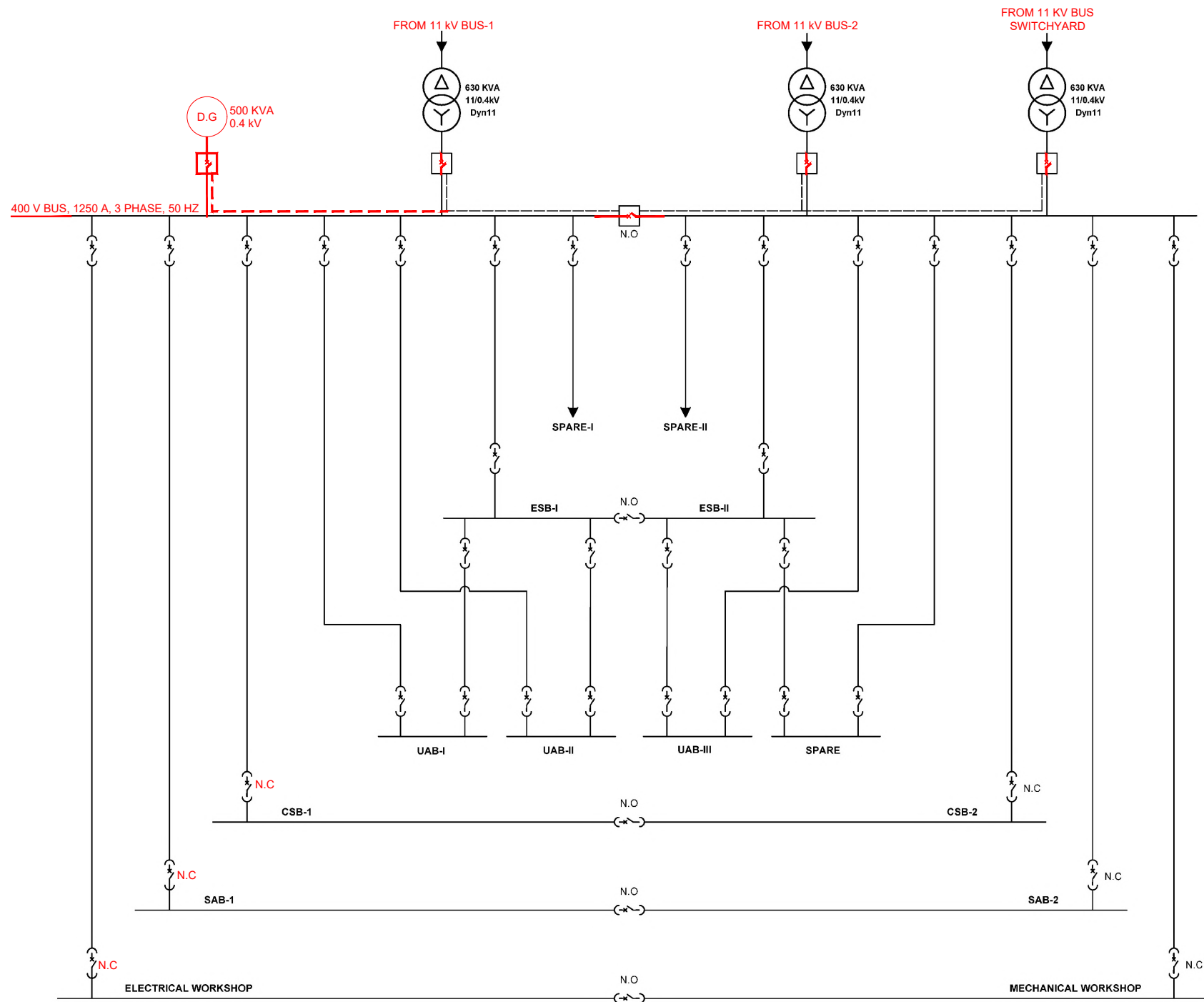


LEGEND:	
SYMBOL	DESCRIPTION
	MV CIRCUIT BREAKER
	LV CIRCUIT BREAKER
	TRANSFORMER
	DIESEL GENERATOR
N.C	NORMALLY CLOSE
N.O	NORMALLY OPEN

DISCLAIMER:
THIS IS CONCEPT LEVEL DRAWING WITH NO GUARANTEE OF COMPLETENESS OR PRECISION. EPC CONTRACTOR WILL BE FULLY RESPONSIBLE FOR THE DETAIL DESIGN AND PREPARATION OF REQUIRED DRAWINGS TO ENSURE THE APPROPRIATE CONSTRUCTION, FUNCTIONALITY & EFFECTIVE OPERATION OF THE PROJECT (AS PER CONTRACT).

- NOTES:**
- DRAWING SHOWS THE BASIC CONCEPT OF ELECTRICAL SYSTEM. FINAL DESIGN SHALL BE DEVELOPED BY CONTRACTOR DURING DETAIL DESIGN STAGE.
 - FINAL RATINGS OF VARIOUS EQUIPMENT SHALL BE DETERMINED ON DETAILED DESIGN STAGE.
 - THE NUMBER OF CIRCUITS FOR 11kV & 400V SUPPLY SHALL BE DETERMINED BY THE ENGINEER/CONTRACTOR BASED ON THE AUXILIARY LOAD OF THE PLANT.
 - THIS DRAWING IS PREPARED BASED ON FEASIBILITY DRAWING NO. AFS-EM-452.

CLIENT: PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY	CONSULTANT: ATTABAD HYDROPOWER MANAGEMENT CONSULTANTS JOINT VENTURE OF: NATIONAL ENGINEERING SERVICES (PAKISTAN PVT.) LTD. (LEAD FIRM) ASSOCIATED CONSULTING ENGINEERS (PVT.) LTD. PAKISTAN ENGINEERING SERVICES (PVT.) LTD. BARGOAB CONSULTING SERVICES (PVT.) LTD. DOLSAAR ENGINEERING INC. CO.	04				DRAWN	ASIF SAMI	AC SUPPLY SYSTEM (OVERALL SCHEME)	SCALE AS SHOWN
		03				RECOMMENDED	-		
		02				CHD./VER.	-		
		01				APPROVED	-		
PROJECT: ATTABAD LAKE HYDROPOWER PROJECT (54 MW)		REV.	DATE	DESCRIPTION	APPROVED	APPROVED	-	DATE :	REV.
								MARCH, 2026	DRAWING No. ALHPP-PPE-0502

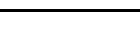


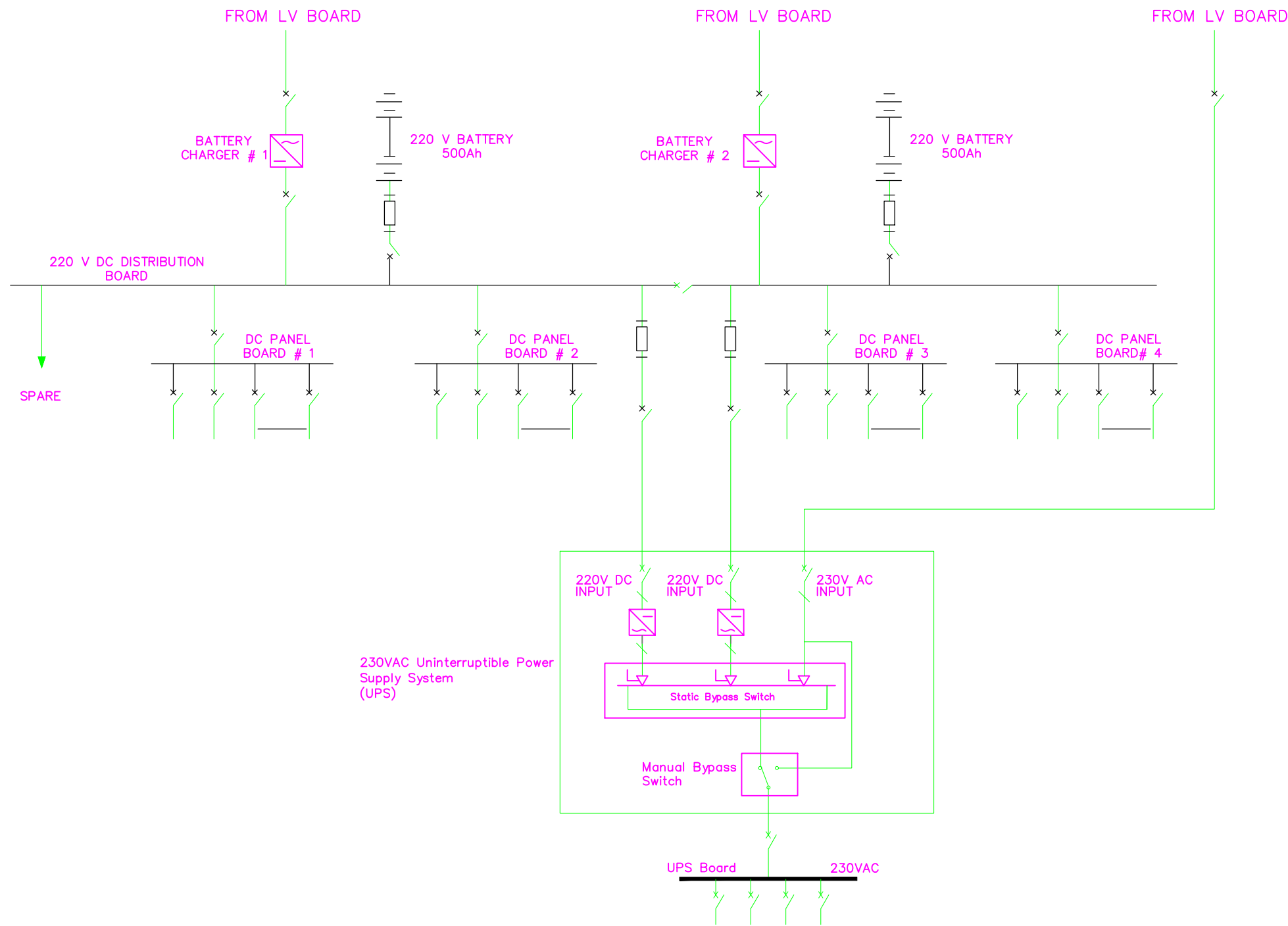
LEGEND:	
SYMBOL	DESCRIPTION
	LV CIRCUIT BREAKER
	TRANSFORMER
	DIESEL GENERATOR
N.C	NORMALLY CLOSE
N.O	NORMALLY OPEN

DISCLAIMER:

THIS IS CONCEPT LEVEL DRAWING WITH NO GUARANTEE OF COMPLETENESS OR PRECISION. EPC CONTRACTOR WILL BE FULLY RESPONSIBLE FOR THE DETAIL DESIGN AND PREPARATION OF REQUIRED DRAWINGS TO ENSURE THE APPROPRIATE CONSTRUCTION, FUNCTIONALITY & EFFECTIVE OPERATION OF THE PROJECT (AS PER CONTRACT).

- NOTES:**
- DRAWING SHOWS THE BASIC CONCEPT OF ELECTRICAL SYSTEM. FINAL DESIGN SHALL BE DEVELOPED BY CONTRACTOR DURING DETAIL DESIGN STAGE.
 - FINAL RATINGS OF VARIOUS EQUIPMENT SHALL BE DETERMINED ON DETAILED DESIGN STAGE.
 - THE NUMBER OF CIRCUITS FOR 400V SUPPLY SHALL BE DETERMINED BY THE ENGINEER/CONTRACTOR BASED ON THE AUXILIARY LOAD OF THE PLANT.
 - THIS DRAWING IS PREPARED BASED ON FEASIBILITY DRAWING NO. AFS-EM-453.

CLIENT:  PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY	CONSULTANT:  ATTABAD HYDROPOWER MANAGEMENT CONSULTANTS JOINT VENTURE OF:  NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LTD. (LEAD FIRM)  ASSOCIATED CONSULTING ENGINEERS (PVT.) LTD.  PAKISTAN ENGINEERING SERVICES (PVT.) LTD.  DOLARSAR ENGINEERING INC. CO.  BARQAAB CONSULTING SERVICES (PVT.) LTD.	04				DRAWN	ASIF SAMI	POWER HOUSE AC LV SUPPLY SYSTEM		SCALE
		03				RECOMMENDED	-			AS SHOWN
		02				CHD./VER.	-			
		01				APPROVED	-			
		REV.	DATE	DESCRIPTION	APPROVED	APPROVED	-	DATE :	DRAWING No.	REV.
PROJECT: ATTABAD LAKE HYDROPOWER PROJECT (54 MW)							MARCH, 2026	ALHPP-PPE-0503		

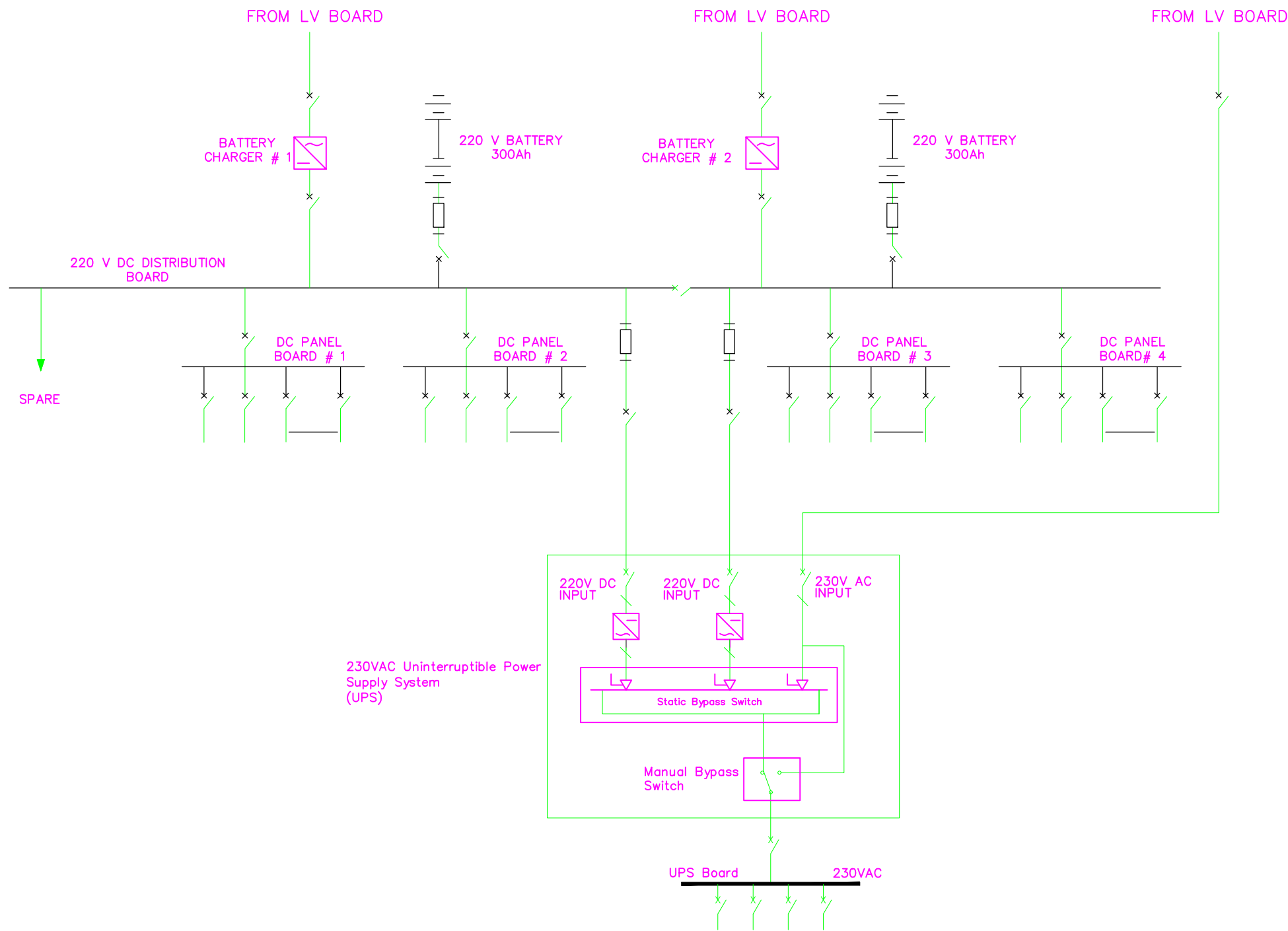


LEGEND	
	LV CIRCUIT BREAKER
	FUSE

DISCLAIMER:
THIS IS CONCEPT LEVEL DRAWING WITH NO GUARANTEE OF COMPLETENESS OR PRECISION. EPC CONTRACTOR WILL BE FULLY RESPONSIBLE FOR THE DETAIL DESIGN AND PREPARATION OF REQUIRED DRAWINGS TO ENSURE THE APPROPRIATE CONSTRUCTION, FUNCTIONALITY & EFFECTIVE OPERATION OF THE PROJECT (AS PER CONTRACT).

- NOTES:
- THE DRAWING DETAILS THE BASIC CONCEPT OF THE DC & AC ESSENTIAL SYSTEM. FINAL DETAILS SHALL BE DEVELOPED BY THE EPC CONTRACTOR DURING DETAILED DESIGN STAGE.
 - DETAILS, RATINGS AND LOAD PROFILES OF THE FOLLOWING EQUIPMENT SHALL BE DEFINED BY THE EPC CONTRACTOR:
 - BATTERY CHARGERS
 - BATTERY
 - INVERTER SYSTEM
 - DC SWITCHGEAR & PANEL BOARDS
 - THE NUMBER OF FEEDERS OF DC & AC PANEL BOARDS ARE FOR INDICATIVE PURPOSE ONLY, THE EXACT NUMBER OF FEEDERS REQUIRED SHALL BE DEFINED BY THE EPC CONTRACTOR.

CLIENT:  PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY	CONSULTANT:  ATTABAD HYDROPOWER MANAGEMENT CONSULTANTS JOINT VENTURE OF:  NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LTD. (LEAD FIRM)  ASSOCIATED CONSULTING ENGINEERS (PVT.) LTD.  PAKISTAN ENGINEERING SERVICES (PVT.) LTD.  DOLSAAR ENGINEERING INC. CO.  BARQAAB CONSULTING SERVICES (PVT.) LTD.	04				DRAWN	ASIF SAMI	POWER HOUSE DC SUPPLY SYSTEM		SCALE
		03				RECOMMENDED	-			AS SHOWN
		02				CHD./VER.	-	DATE : MARCH, 2026	DRAWING No. ALHPP-PPE-0504	REV. 
		01				APPROVED	-			
		REV.	DATE	DESCRIPTION	APPROVED	APPROVED	-			

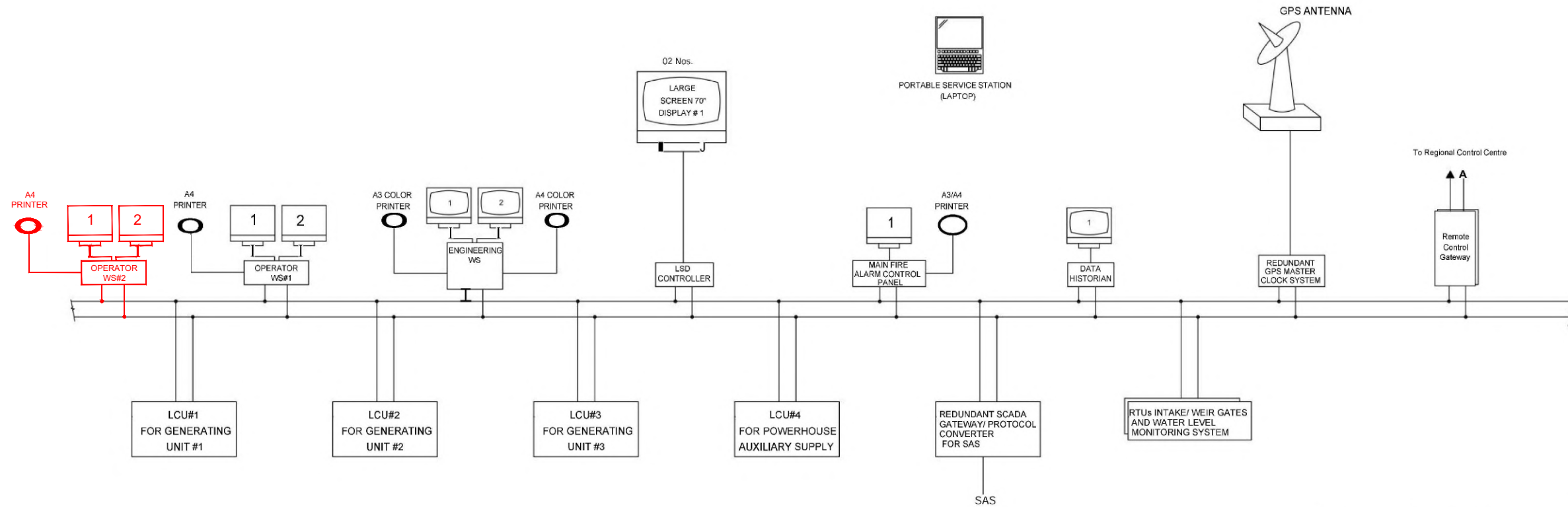


LEGEND	
	LV CIRCUIT BREAKER
	FUSE

DISCLAIMER:
THIS IS CONCEPT LEVEL DRAWING WITH NO GUARANTEE OF COMPLETENESS OR PRECISION. EPC CONTRACTOR WILL BE FULLY RESPONSIBLE FOR THE DETAIL DESIGN AND PREPARATION OF REQUIRED DRAWINGS TO ENSURE THE APPROPRIATE CONSTRUCTION, FUNCTIONALITY & EFFECTIVE OPERATION OF THE PROJECT (AS PER CONTRACT).

- NOTES:
1. THE DRAWING DETAILS THE BASIC CONCEPT OF THE DC & AC ESSENTIAL SYSTEM. FINAL DETAILS SHALL BE DEVELOPED BY THE EPC CONTRACTOR DURING DETAILED DESIGN STAGE.
 2. DETAILS, RATINGS AND LOAD PROFILES OF THE FOLLOWING EQUIPMENT SHALL BE DEFINED BY THE EPC CONTRACTOR:
 - BATTERY CHARGERS
 - BATTERY
 - INVERTER SYSTEM
 - DC SWITCHGEAR & PANEL BOARDS
 3. THE NUMBER OF FEEDERS OF DC & AC PANEL BOARDS ARE FOR INDICATIVE PURPOSE ONLY, THE EXACT NUMBER OF FEEDERS REQUIRED SHALL BE DEFINED BY THE EPC CONTRACTOR.

CLIENT:  PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY	CONSULTANT:  ATTABAD HYDROPOWER MANAGEMENT CONSULTANTS JOINT VENTURE OF:  NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LTD. (LEAD FIRM)  ASSOCIATED CONSULTING ENGINEERS (PVT.) LTD.  PAKISTAN ENGINEERING SERVICES (PVT.) LTD.  DOLSAR ENGINEERING INC. CO.  BARQAAB CONSULTING SERVICES (PVT.) LTD.	04				DRAWN	ASIF SAMI	POWER INTAKE DC SUPPLY SYSTEM		SCALE	
		03				RECOMMENDED	-			AS SHOWN	
		02				CHD./VER.	-				
		01									
		REV.	DATE	DESCRIPTION	APPROVED	APPROVED	-			DATE : MARCH, 2026	DRAWING No. ALHPP-PPE-0505

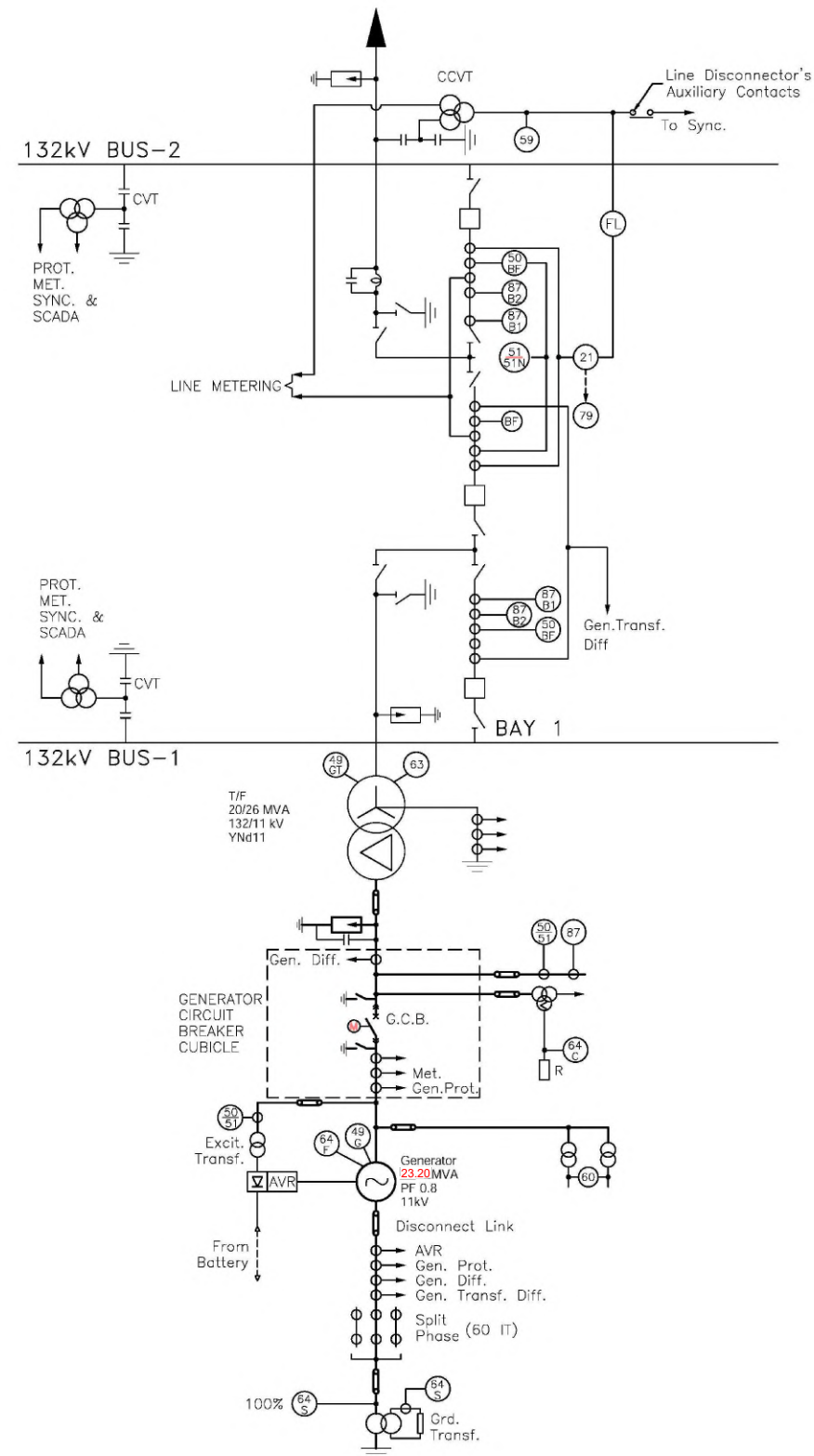


LEGEND	
LCU	LOCAL CONTROL UNIT
LSD	LARGE SCREEN DISPLAY
GPS	GLOBAL POSITIONING SYSTEM
WS	WORKSTATION

DISCLAIMER:
THIS IS CONCEPT LEVEL DRAWING WITH NO GUARANTEE OF COMPLETENESS OR PRECISION. EPC CONTRACTOR WILL BE FULLY RESPONSIBLE FOR THE DETAIL DESIGN AND PREPARATION OF REQUIRED DRAWINGS TO ENSURE THE APPROPRIATE CONSTRUCTION, FUNCTIONALITY & EFFECTIVE OPERATION OF THE PROJECT (AS PER CONTRACT).

NOTES:
1. THE DRAWING SHOWS THE BASIC CONCEPT OF PCS CONFIGURATION, FINAL DETAIL SHALL BE DEVELOPED BY THE EPC CONTRACTOR DURING DESIGN STAGE.

CLIENT:  PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY	CONSULTANT:  ATTABAD HYDROPOWER MANAGEMENT CONSULTANTS JOINT VENTURE OF:  NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LTD. (LEAD FIRM)  ASSOCIATED CONSULTING ENGINEERS (PVT.) LTD.  DOLSAR ENGINEERING INC. CO.  BARQAAB CONSULTING SERVICES (PVT.) LTD.	04				DRAWN	ASIF SAMI	PCS CONCEPTUAL LAYOUT		SCALE			
		03				RECOMMENDED	-			AS SHOWN			
		02				CHD./VER.	-						
		01				APPROVED	-	DATE :	MARCH, 2026	DRAWING No.	ALHPP-PPE-0506	REV.	
		PROJECT: ATTABAD LAKE HYDROPOWER PROJECT (54 MW)		REV.	DATE	DESCRIPTION	APPROVED	APPROVED	-				

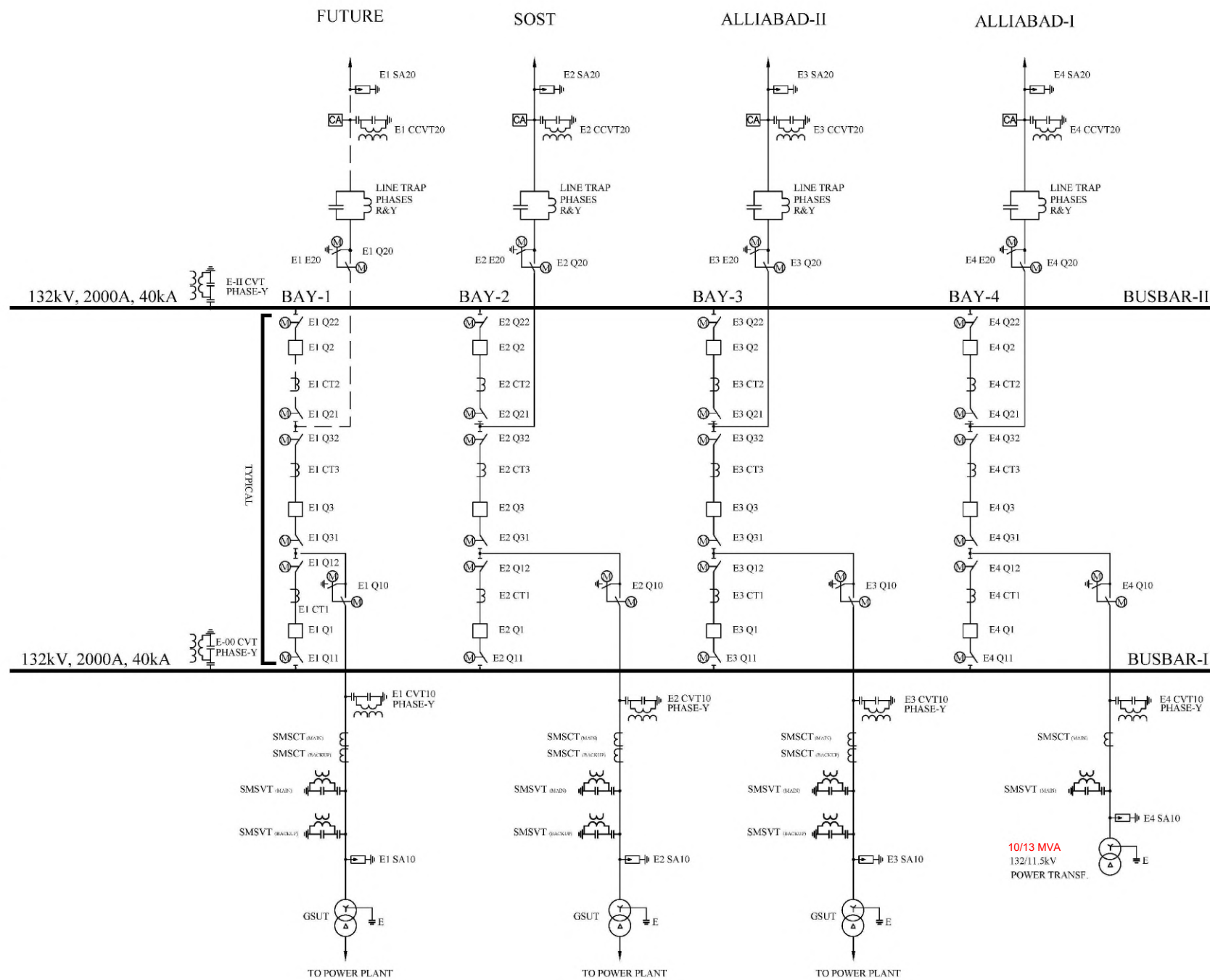


DISCLAIMER:
THIS IS CONCEPT LEVEL DRAWING WITH NO GUARANTEE OF COMPLETENESS OR PRECISION. EPC CONTRACTOR WILL BE FULLY RESPONSIBLE FOR THE DETAIL DESIGN AND PREPARATION OF REQUIRED DRAWINGS TO ENSURE THE APPROPRIATE CONSTRUCTION, FUNCTIONALITY & EFFECTIVE OPERATION OF THE PROJECT (AS PER CONTRACT).

NOTE:
1. DRAWING SHOWS THE BASIC CONCEPT OF ELECTRICAL PROTECTION SYSTEM. FINAL PROTECTION DESIGN EQUIPMENT RATINGS SHALL BE DETERMINED BY ENGINEER/CONTRACTOR DURING DETAIL DESIGN STAGE.
2. THIS DRAWING IS PREPARED BASED ON FEASIBILITY DRAWING NO. AFS-EM-457.

CLIENT:  PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY	CONSULTANT:  ATTABAD HYDROPOWER MANAGEMENT CONSULTANTS JOINT VENTURE OF:  NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LTD. (LEAD FIRM)  ASSOCIATED CONSULTING ENGINEERS (PVT.) LTD.  PAKISTAN ENGINEERING SERVICES (PVT.) LTD.  BARQAAB CONSULTING SERVICES (PVT.) LTD.  DOLSAAR ENGINEERING INC. CO.	04				DRAWN	ASIF SAMI	PROTECTION SCHEMES		SCALE		
		03				RECOMMENDED	-			AS SHOWN		
		02				CHD./VER.	-					
		01								DATE :	DRAWING No.	REV.
		REV.	DATE	DESCRIPTION	APPROVED	APPROVED	-	MARCH, 2026	ALHPP-PPE-0507			

F- SWITCHYARD ELECTRICAL



LEGEND:-

SYMEOLS	DESCRIPTION	132kV
	POWER TRANSFORMER (PTR), STATION AUXILIARY TRANSFORMER (PMT)	10/13 MVA
	CIRCUIT BREAKER	2000A, 40kA
	MOTOR OPERATED DISCONNECTER	2000A, 40kA
	DISCONNECTER WITH EARTHING SWITCH (MOTOR OPERATED)	2000A, 40kA
	CURRENT TRANSFORMER	FOR CB 1600/800/400/150/1A SIDE CT 1600/800/400/150/1A SIDE CT 1600/400/150/1A
	CAPACITOR VOLTAGE TRANSFORMER (CVT) SMS	132kV/√3/110/√3 V/110V 0.2 + 3P, 3P
	CURRENT TRANSFORMER (CT) SMS	
	SURGE ARRESTER	120kV, 98kV
	LINE TRAP	-
	SECURE METERING SYSTEM VOLTAGE TRANSFORMER (SMSVT)	132kV/√3/110/√3 V/110V 0.2
	COUPLING CAPACITOR VOLTAGE TRANSFORMER (CCVT) WITH CARRIER FREQUENCY FACILITY	132kV/√3/110/√3 V/110V 0.2 + 3P, 3P

LEGEND:-

—————	SCOPE OF WORK
-----	FOR FUTURE

NOTES:

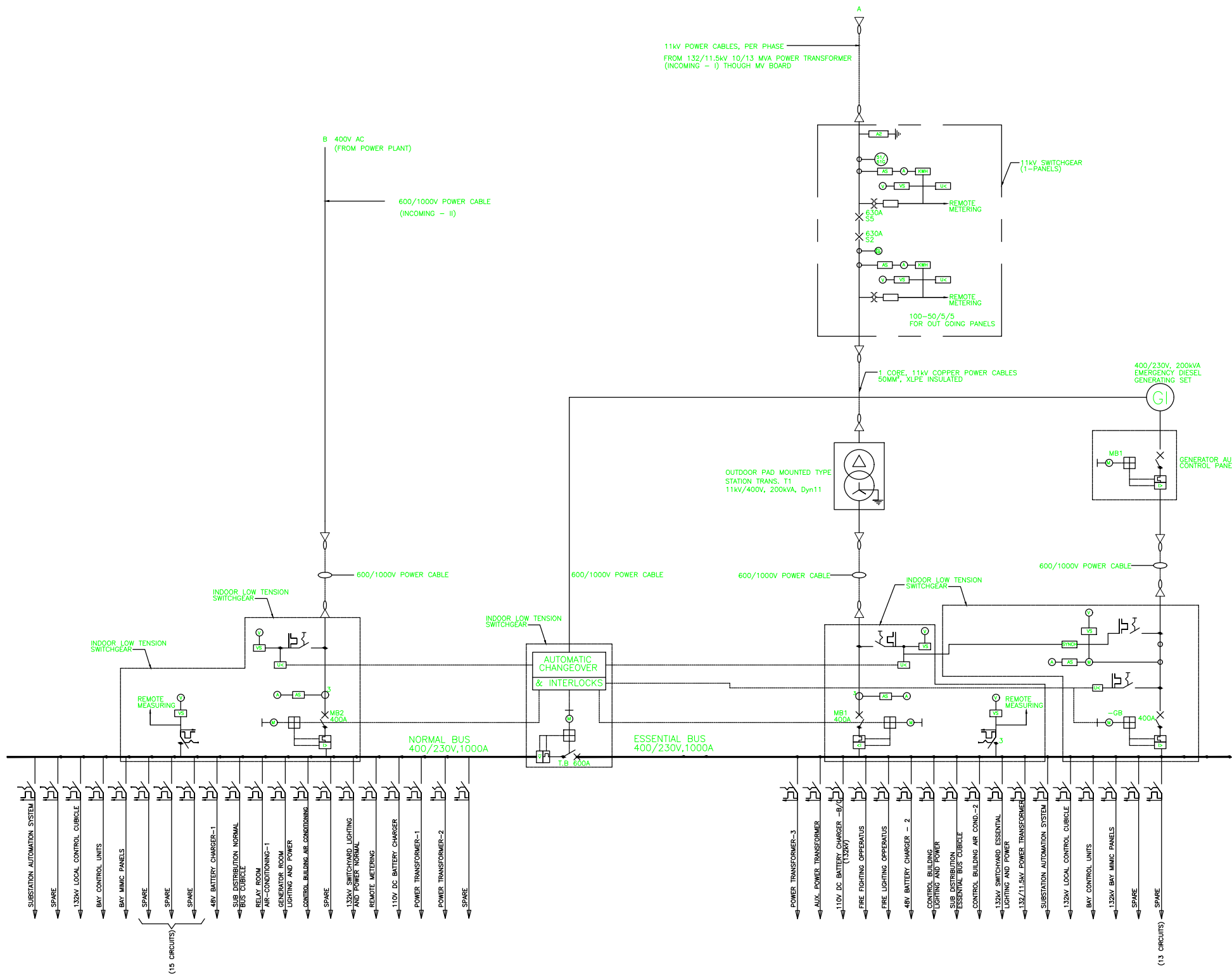
- ALL 5P20 CLASS CTs SHALL BE AS PER IEC 61869-2.
- 132kV BAY EQUIPMENT ARE RATED 2000A, 40kA.

DISCLAIMER:

THIS IS CONCEPT LEVEL DRAWING WITH NO GUARANTEE OF COMPLETENESS OR PRECISION. EPC CONTRACTOR WILL BE FULLY RESPONSIBLE FOR THE DETAIL DESIGN AND PREPARATION OF REQUIRED DRAWINGS TO ENSURE THE APPROPRIATE CONSTRUCTION, FUNCTIONALITY & EFFECTIVE OPERATION OF THE PROJECT (AS PER CONTRACT).

CLIENT:  PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY	CONSULTANT:  ATTABAD HYDROPOWER MANAGEMENT CONSULTANTS JOINT VENTURE OF:  NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LTD. (LEAD FIRM)  ASSOCIATED CONSULTING ENGINEERS (PVT.) LTD.  PAKISTAN ENGINEERING SERVICES (PVT.) LTD.  DOLSAAR ENGINEERING INC. CO.  BARO AAB CONSULTING SERVICES (PVT.) LTD. DOLSAAR ENGINEERING INC. CO.	04				DRAWN	ASIF SAMI	132 kV SWITCHYARD SINGLE LINE DIAGRAM	SCALE	
		03					RECOMMENDED		-	AS SHOWN
		02					CHD./VER.		-	
		01					APPROVED		-	
		REV.	DATE	DESCRIPTION	APPROVED	APPROVED	-			

DATE :	DRAWING No.	REV.
MARCH, 2023	ALHPP-SY-0601	



LEGEND:-

SYMBOL	DESCRIPTION
(M)	MOTOR OPERATED CONTROL
	MOLDED CASE CIRCUIT BREAKER
(G1)	DIESEL GENERATING SET
(50)	DEFINITE TIME OVER CURRENT RELAY
(50/G)	GROUND FAULT RELAY
(87)	POWER TRANSFORMER DIFFERENTIAL CURRENT PROTECTION
	STATION AUXILIARY TRANSFORMER
(SYNH)	SYNCHROSCOPE
(W)	WATT - METER
(VS)	VOLT METER SELECTOR SWITCH
(AS)	AMMETER SELECTOR SWITCH
(KWH)	KILOWATT - HOUR METER
(VH)	VAR - HOUR METER
(U<)	UNDER VOLTAGE RELAY
	RESISTOR
	SURGE ARRESTOR
	AIR CIRCUIT BREAKER (MOTOR OPERATED)
	CURRENT TRANSFORMER
(A)	AMMETER
(V)	VOLTMETER
	VACUUM CIRCUIT BREAKER (11kV)
	POTENTIAL TRANSFORMER
G.B	GENERATOR BREAKER
M.B	MAIN BREAKER
T.B	TIE BREAKER

- NOTES:
- THIS DRAWING SHOWS ONLY TYPICAL AC OUTGOING CIRCUITS.
 - EMERGENCY DIESEL GENERATING SET SHALL BE SUPPLIED COMPLETE WITH CONTROL, PROTECTION, METERING, INDICATION AND ANNUNCIATION SYSTEMS AS SPECIFIED.
 - FOLLOWING REMOTE CONTROLS OF THE DIESEL GENERATOR/DIESEL ENGINE SHALL BE PROVIDED ON THE DIESEL GENERATOR PANEL IN CONTROL ROOM:
A) DIESEL GENERATOR START.
B) GENERATOR STOP.
C) VOLTAGE AND CURRENT INDICATION.
D) FREQUENCY INDICATION.
 - DETAILS FOR CONTROL, METERING, INDICATIONS AND OTHER INSTRUMENTS RELEVANT TO AC SYSTEM SHALL BE FINALIZED AT THE DETAIL DESIGN STAGE.
 - THE SIZES OF THE CABLES ON THIS DRAWING ARE APPROXIMATE SIZES. THE CONTRACTOR SHALL SUBMIT CALCULATIONS FOR APPROVAL OF THE EMPLOYER'S REPRESENTATIVE FOR THE SELECTION OF CABLES STAGE.
 - THE CONTRACTOR SHALL PROVIDE SUB-DISTRIBUTION BOARDS AS SPECIFIED / REQUIRED BY THE EMPLOYER'S REPRESENTATIVE.
 - THE SIZE OF BUSBAR AND MCBs SHALL BE DETERMINED BY THE CONTRACTOR AND SHALL BE SUBJECT TO APPROVAL BY THE EMPLOYER'S REPRESENTATIVE. FRAME SIZES OF MCBs SHALL BE 250A MINIMUM.
 - BCU SHALL BE PROVIDED TO COVER ALL 11kV SWGR SIGNALS TO SAS.
 - ENERGY METERS FOR 400V SHALL BE HOUSED IN EACH PAD MOUNTED TRANSFORMER.

DISCLAIMER:

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CLIENT: **PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY**

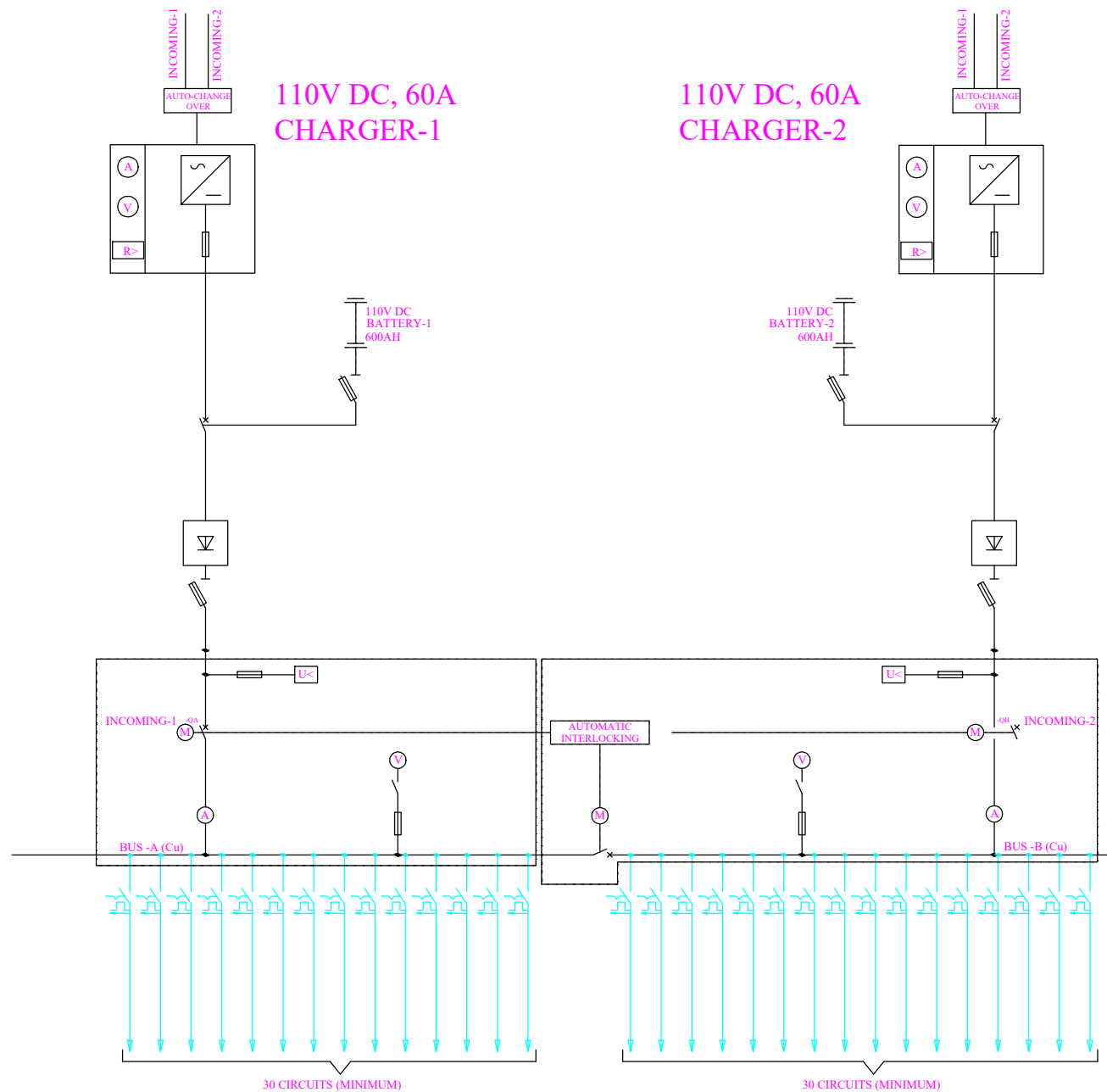
PROJECT: **ATTABAD LAKE HYDROPOWER PROJECT (54 MW)**

CONSULTANT: **ATTABAD HYDROPOWER MANAGEMENT CONSULTANTS**

JOINT VENTURE OF:
NATIONAL ENGINEERING SERVICES (PAKISTAN (PVT.) LTD. (LEAD FIRM))
ASSOCIATED CONSULTING ENGINEERS (PVT.) LTD.
PAKISTAN ENGINEERING SERVICES (PVT.) LTD.
BARQAAB CONSULTING SERVICES (PVT.) LTD.
DOLSAR ENGINEERING INC. CO.

04						DRAWN	ASIF SAMI
03						RECOMMENDED	-
02						CHD./VER.	-
01						APPROVED	-
REV.	DATE	DESCRIPTION	APPROVED	APPROVED			

132 kV SWITCHYARD AC AUXILIARY SERVICES SYSTEM (TYPICAL)		SCALE
DATE : MARCH, 2023	DRAWING No. ALHPP-SY-0603	REV.



LEGEND:-

SYMBOL	DESCRIPTION
	MOTOR OPERATED CIRCUIT BREAKER
	MINIATURE CIRCUIT BREAKER
	FUSE
	FUSED ISOLATOR
	AMMETER
	VOLTMETER
	UNDER VOLTAGE RELAY
	EARTH LEAKAGE RELAY
	VOLTAGE DROPPING DIODES
	CHANGE-OVER SWITCH
	HIGH FREQUENCY BATTERY CHARGER

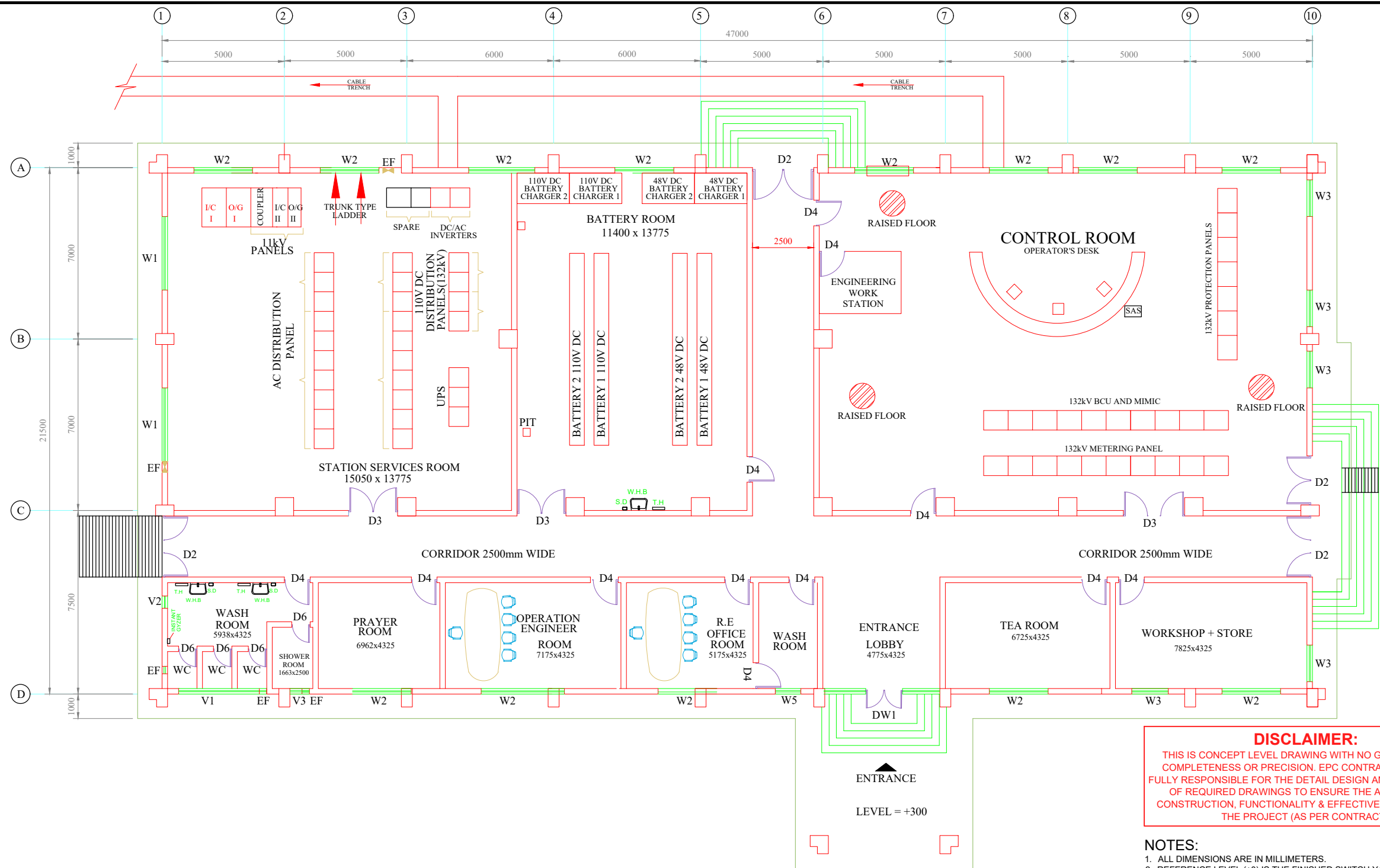
NOTES:

- ALL THE INDICATED INSTRUMENTS ARE TENTATIVE TO DESCRIBE GENERAL DESIGN PARAMETERS & METHODOLOGY AND DO NOT RELIEVE THE CONTRACTOR FROM ANY OF HIS OBLIGATIONS IN COMPLETION OF ENTIRE SCOPE OF WORK UNDER THIS CONTRACT.
- THIS DRAWING SHOWS THE SCHEMATIC ARRANGEMENT OF 110V DC STATION SERVICES AUXILIARY SUPPLY.
- THE ALLOCATION / ARRANGEMENT OF OUTGOING CIRCUITS SHALL BE AS PER SPECIFICATIONS.
- THE SIZES OF 110V DC DISTRIBUTION PANEL CIRCUIT BREAKERS SHALL BE DETERMINED BY THE CONTRACTOR AS PER THE LOAD REQUIREMENT AND SHALL BE SUBJECT TO APPROVAL AT DETAIL DESIGN STAGE.
- AUDIBLE AND VISUAL ALARMS SHALL BE PROVIDED ON SAS/ 132KV CONTROL PANEL (BUS PANEL) AND RESPECTIVE DISTRIBUTION PANEL TO INDICATE TRIPPING OF ANY OF THE 110V DC CIRCUIT BREAKER.
- 110V DC BUS VOLTAGE SHALL ALSO BE INDICATED ON THE SAS/132KV COMMON CONTROL BOARD (COMMON ALARMS).
- FOLLOWING SHALL BE FINALIZED AT DETAIL DESIGN STAGE SUBJECT TO APPROVAL OF ENGINEER.
(A) NO. OF CIRCUIT TO VARIOUS LOADS.
(B) SIZE OF BUSBAR, MCB'S AND SPAREMCB'S BREAKERS.
(C) RATING OF ALL INCOMING & OUT CIRCUIT BREAKERS.
- HIGH FREQUENCY BATTERY CHARGER AS WELL AS SCR BASED CHARGER CAN BE OFFERED WITH FOLLOWING ARRANGEMENT.
(A) (N+2) MODULE BATTERY CHARGER AGAINST HIGH FREQUENCY ARRANGEMENT.
(B) 03 NOS. BATTERY CHARGER AGAINST SCR BASED ARRANGEMENT WITH 01 NO. STANDBY BATTERY CHARGER ALONG WITH AUTO TRANSFER SWITCH IN CASE OF FAILLURE OF ANY BATTERY CHARGER.

DISCLAIMER:

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CLIENT: PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY PROJECT: ATTABAD LAKE HYDROPOWER PROJECT (54 MW)	CONSULTANT: ATTABAD HYDROPOWER MANAGEMENT CONSULTANTS JOINT VENTURE OF: NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LTD.(LEAD FIRM) ASSOCIATED CONSULTING ENGINEERS (PVT.) LTD. PAKISTAN ENGINEERING SERVICES (PVT.) LTD. DOLSAR ENGINEERING INC.CO.	04				DRAWN	ASIF SAMI	110V DC (FOR 132kv SWITCHYARD) AUXILIARY SERVICES SYSTEM (TYPICAL) DATE : MARCH, 2026 DRAWING No. ALHPP-SY-0604	SCALE
		03				RECOMMENDED	-		AS SHOWN
		02				CHD./VER.	-		REV.
		01				APPROVED	-		
		REV.	DATE	DESCRIPTION	APPROVED	APPROVED	-		



CLIENT:

PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY

PROJECT:
ATTABAD LAKE HYDROPOWER PROJECT (54 MW)

CONSULTANT:
 **ATTABAD HYDROPOWER MANAGEMENT CONSULTANTS**

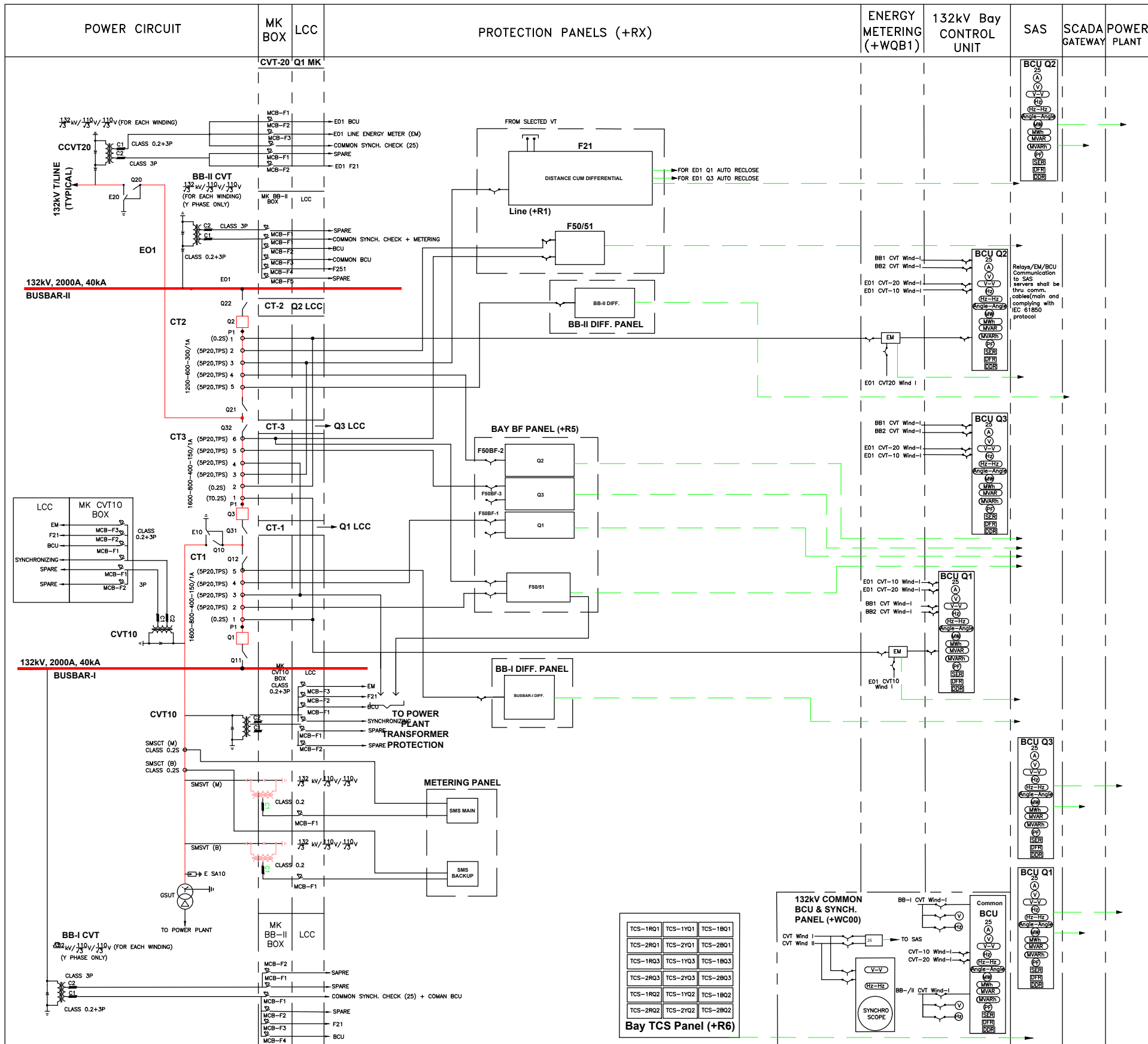
JOINT VENTURE OF:
NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LTD.(LEAD FIRM)

ASSOCIATED CONSULTING ENGINEERS (PVT.) LTD.
PAKISTAN ENGINEERING SERVICES (PVT.) LTD.

BARQAAB CONSULTING SERVICES (PVT.) LTD.
DOLSAR ENGINEERING INC.CO.

04				DRAWN	ASIF SAMI
03				RECOMMENDED	-
02				CHD./VER.	-
01				APPROVED	-
REV.	DATE	DESCRIPTION	APPROVED	APPROVED	-

132 kV SWITCHYARD CONTROL HOUSE BUILDING LAYOUT PLAN		SCALE	
		AS SHOWN	
DATE :	DRAWING No.	REV.	
MARCH, 2023	ALHPP-SY-0605		



LEGEND :-			
ITEM	DESCRIPTION	ITEM	DESCRIPTION
21	Distance cum differential relay	95	CT Supervision Relay
24	Volts per hertz/Over excitation	Angle	Phase Angle Meter/Angle measurement
25	Synchronism-check device	A	Ammeter/Ampere Measurement
50	Instantaneous Overcurrent Relay	⊖	Frequency Meter/Frequency measurement
50N	Neutral Instantaneous Overcurrent	⊖	Double Frequency Meter/Double Frequency measurement
50BF	Breaker Failure Relay	⊖	Megawatt Meter/MW Power measurement
50EF	End Fault Protection	⊖	Megawattour Meter/MWh Energy Measurement
51	AC Time Overcurrent Relay	⊖	Megavar Meter/MVAR Power measurement
51N	Neutral Time Overcurrent	⊖	Megawattour Meter/MVARh Energy measurement
67	AC Directional Overcurrent	⊖	Power Factor Meter/PF Measurement
67N	Neutral Directional Overcurrent	⊖	Voltmeter/Voltage Measurement
68	Power Swing Blocking	⊖	Double Voltmeter
74	Alarm Relay	BCU	Bay Controller Unit
79	Auto Reclose	⊖	Dynamic Disturbance Recorder
81	Frequency	⊖	Digital Fault Recorder
86	Lock-out Relay	⊖	Energy Meter
87B	Busbar Differential Relay	FL	Distance Fault Locator
94	Self Reset/Tripping Relay	PQM	Power Quality Monitor
FR	Fault Recorder	⊖	Sequence of Events Recorder
---	Panel	SOTF	Switch On To Fault
.....	Status/Control/Metering To SAS/SCADA	TCS	Trip Circuit Supervision Relay
⚡	Test Switch	VTFF	VT Fuse Fail

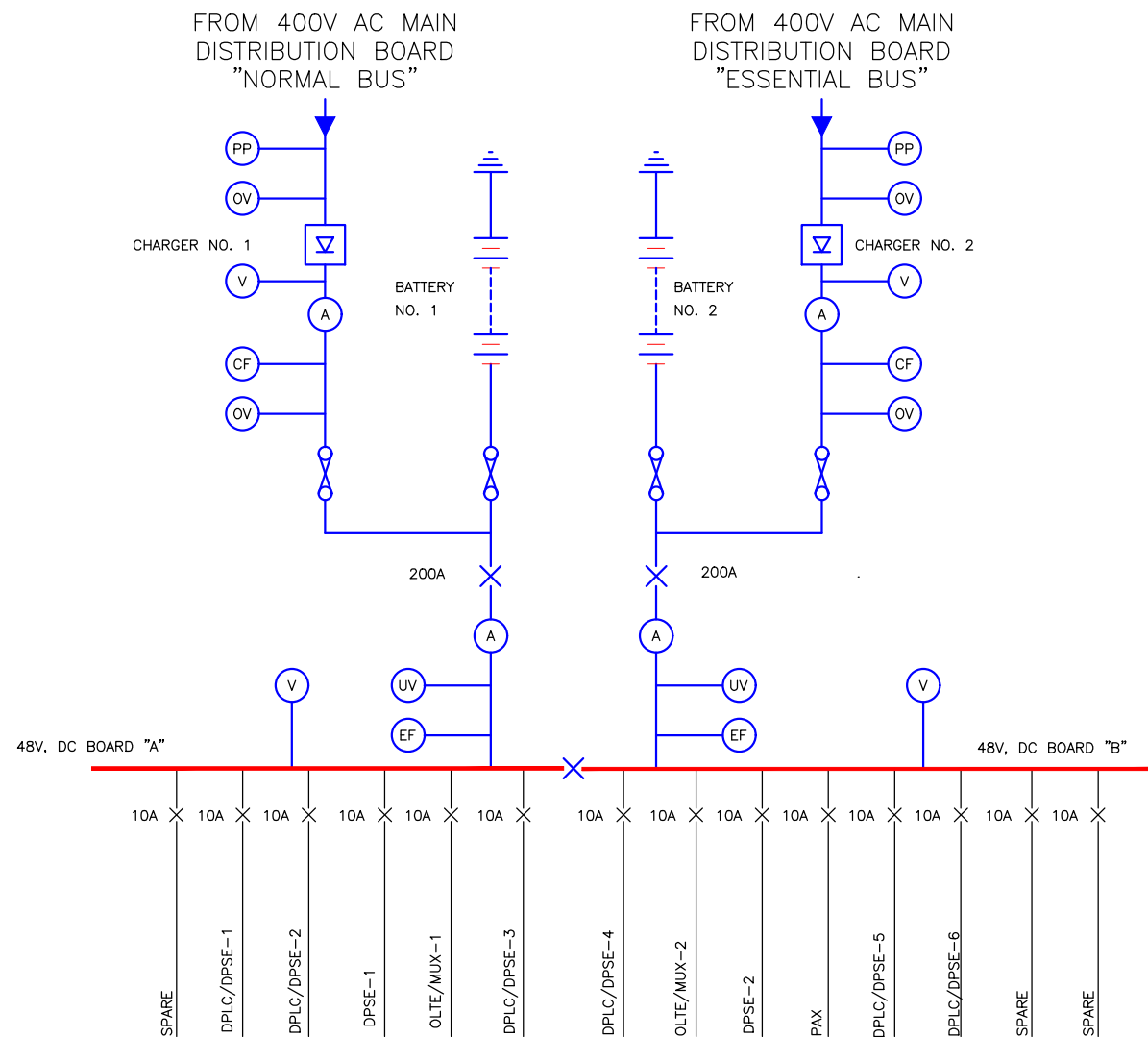
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- NOTES.**
1. POSITION SCHEMES ARE BASED ON MULTIFUNCTION RELAYS. HOWEVER IF SOME FUNCTIONS ARE NOT POSSIBLE TO ACCOMODATE WITHIN RELAY SEPARATE RELAY SHALL BE PROVIDED.
 2. ALL FOUR CVTs SHALL BE PROVIDED TO BCU FOR SYNCHROCHECK AND FOR SPECIFIC BREAKER VT SELECTION SHALL BE WITHIN BCU.
 3. CVT MCB SHALL BE PROVIDED BEFORE BCU, RELAY & ENERGY METER.
 4. BCU SHALL BE PROVIDED PER CIRCUIT BREAKER.
 5. E01, E02 & E03 ARE TYPICAL.

SHEET NO. 1 OF 2

CLIENT:  PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY	CONSULTANT: ATTABAD HYDROPOWER MANAGEMENT CONSULTANTS JOINT VENTURE OF: NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LTD. (LEAD FIRM) ASSOCIATED CONSULTING ENGINEERS (PVT.) LTD. PAKISTAN ENGINEERING SERVICES (PVT.) LTD. BARQAAB CONSULTING SERVICES (PVT.) LTD. DOLSAAR ENGINEERING INC.CO.	04				DRAWN	ASIF SAMI	PROTECTION & METERING SYSTEM 132kV SINGLE LINE DIAGRAM		SCALE
		03				RECOMMENDED	-			AS SHOWN
		02				CHD./VER.	-	DATE : MARCH, 2023	DRAWING No. ALHPP-SY-0606	REV. 
		01				APPROVED	-			
		REV.	DATE	DESCRIPTION			APPROVED			

G- TELECOM (SCADA)

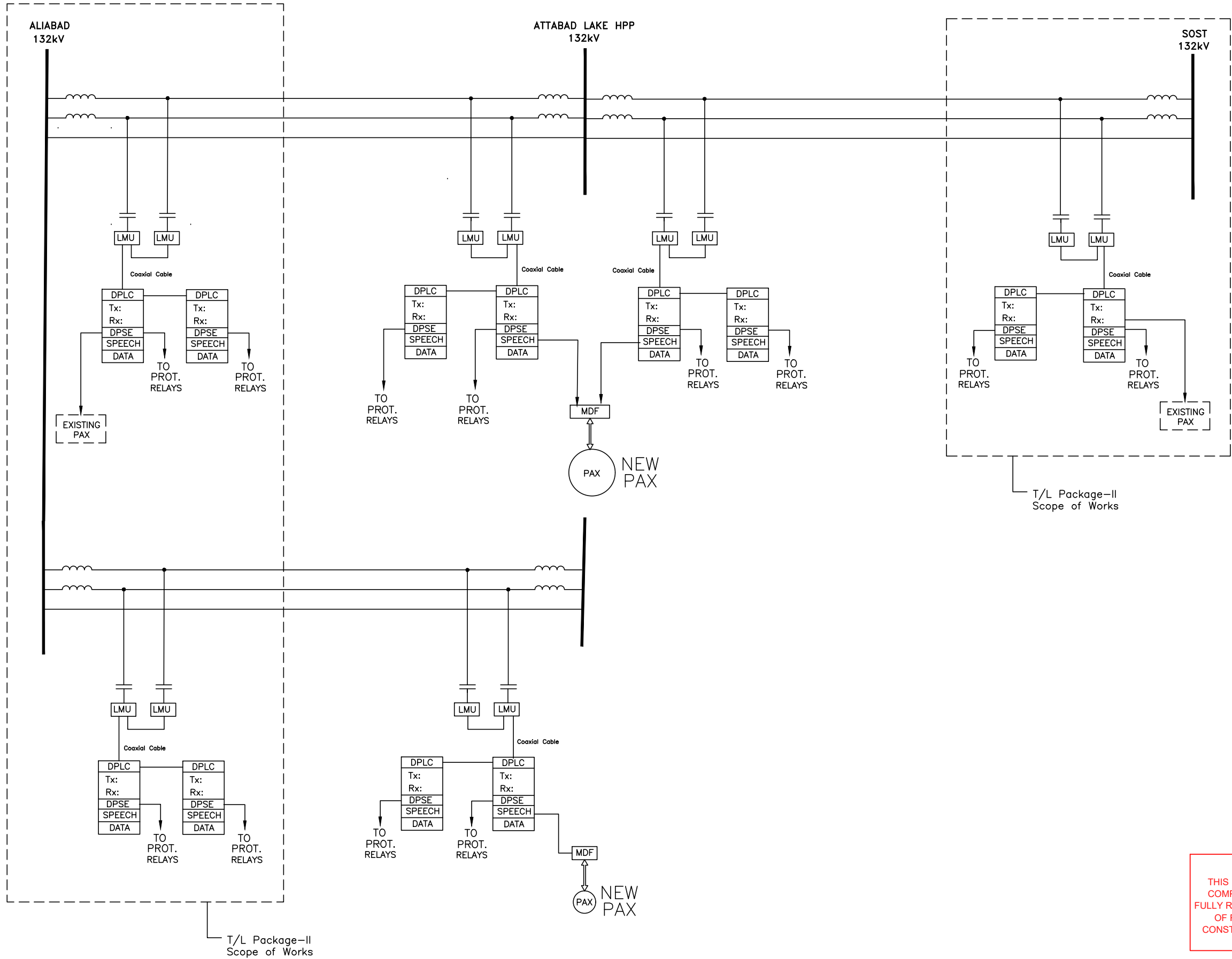


LEGEND:—

SYMBOL	DESCRIPTION
	CHARGER
	MINIATURE CIRCUIT BREAKER
	FUSE
	BATTERY
	VOLTMETER
	AMMETER
	UNDERVOLTAGE RELAY
	OVERVOLTAGE RELAY
	EARTH FAULT RELAY
	PHASE FAILURE RELAY
	CHARGER FAILURE PROTECTION

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CLIENT:  PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY	CONSULTANT:  ATTABAD HYDROPOWER MANAGEMENT CONSULTANTS JOINT VENTURE OF:  NATIONAL ENGINEERING SERVICES (PVT.) LTD. (LEAD FIRM)  ASSOCIATED CONSULTING ENGINEERS (PVT.) LTD.  PAKISTAN ENGINEERING SERVICES (PVT.) LTD.  DOLSAAR ENGINEERING INC. CO.	04					DRAWN	ASIF SAMI	132 kV SWITCHYARD 48V DC SYSTEM		SCALE		
		03						RECOMMENDED			-	AS SHOWN	
		02						CHD./VER.			-		
		01						APPROVED			-		
		PROJECT: ATTABAD LAKE HYDROPOWER PROJECT (54 MW)		REV.	DATE	DESCRIPTION	APPROVED	APPROVED	-	DATE :	MARCH, 2026	DRAWING No.	ALHPP-TC-0701



LEGEND:

SYMBOL	DESCRIPTION
	LINE TRAP
	CCVT/CVT
	LINE MATCHING UNIT
	DIGITAL PLC TERMINAL Tx: f2 Rx: f1 PSE SPEECH DATA
	MAIN DISTRIBUTION FRAME
	PRIVATE AUTOMATIC EXCHANGE
	VF CHANNELS
	EXISTING EQUIPMENT

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CLIENT:



PAKISTAN
WATER & POWER
DEVELOPMENT AUTHORITY

PROJECT:

ATTABAD LAKE HYDROPOWER
PROJECT (54 MW)

CONSULTANT:



ATTABAD HYDROPOWER
MANAGEMENT CONSULTANTS

JOINT VENTURE OF:
NATIONAL ENGINEERING SERVICES
PAKISTAN (PVT.) LTD. (LEAD FIRM)



ASSOCIATED CONSULTING ENGINEERS
(PVT.) LTD.
PAKISTAN ENGINEERING SERVICES
(PVT.) LTD.



BARQAAB CONSULTING SERVICES
(PVT.) LTD.
DOLSAR ENGINEERING INC.CO.

04

03

02

01

REV.

DATE

DESCRIPTION

DRAWN

ASIF SAMI

RECOMMENDED

CHD./VER.

APPROVED

DATE :

MARCH, 2026

DRAWING No.

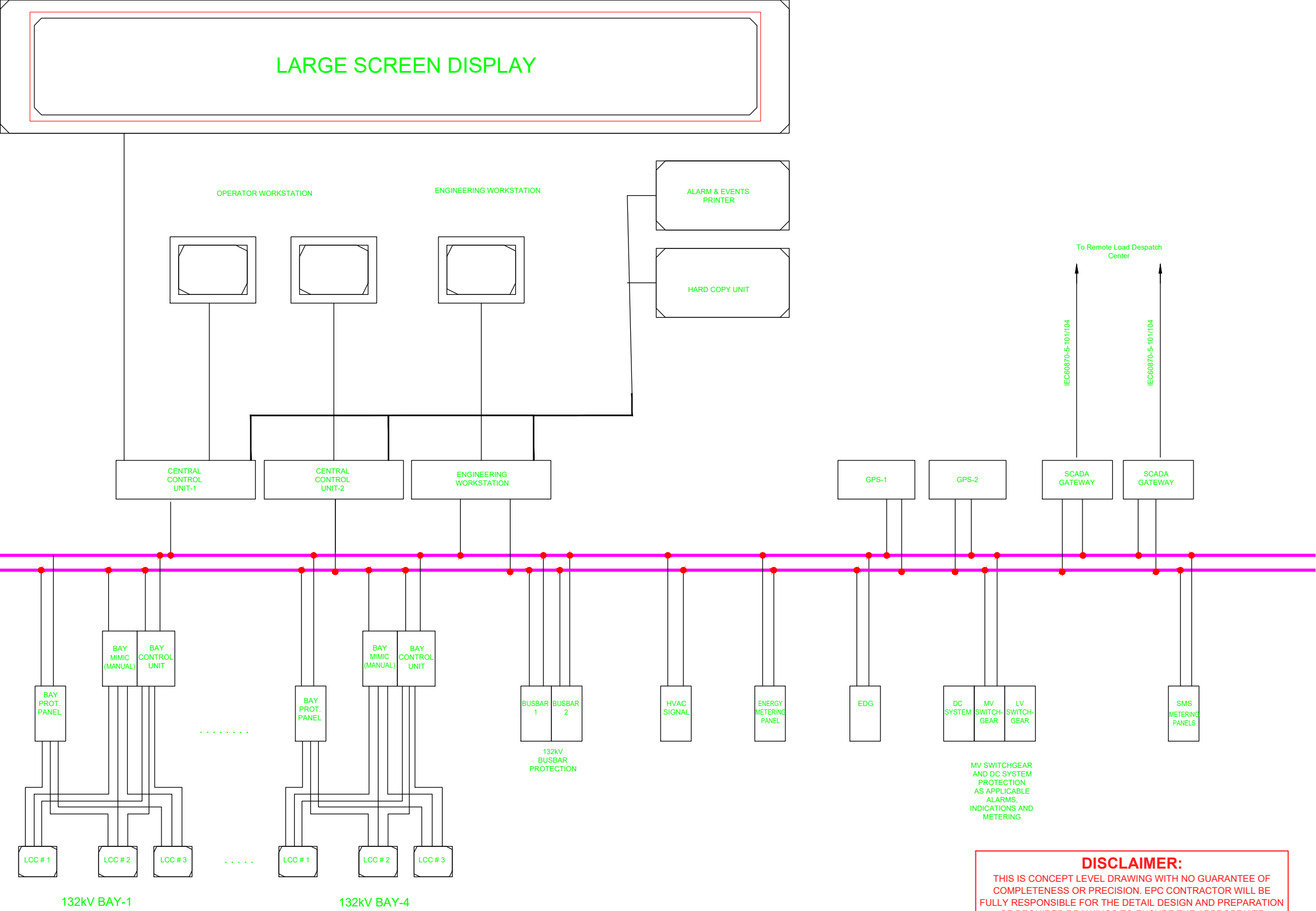
ALHPP-TC-0702

SCALE

AS SHOWN

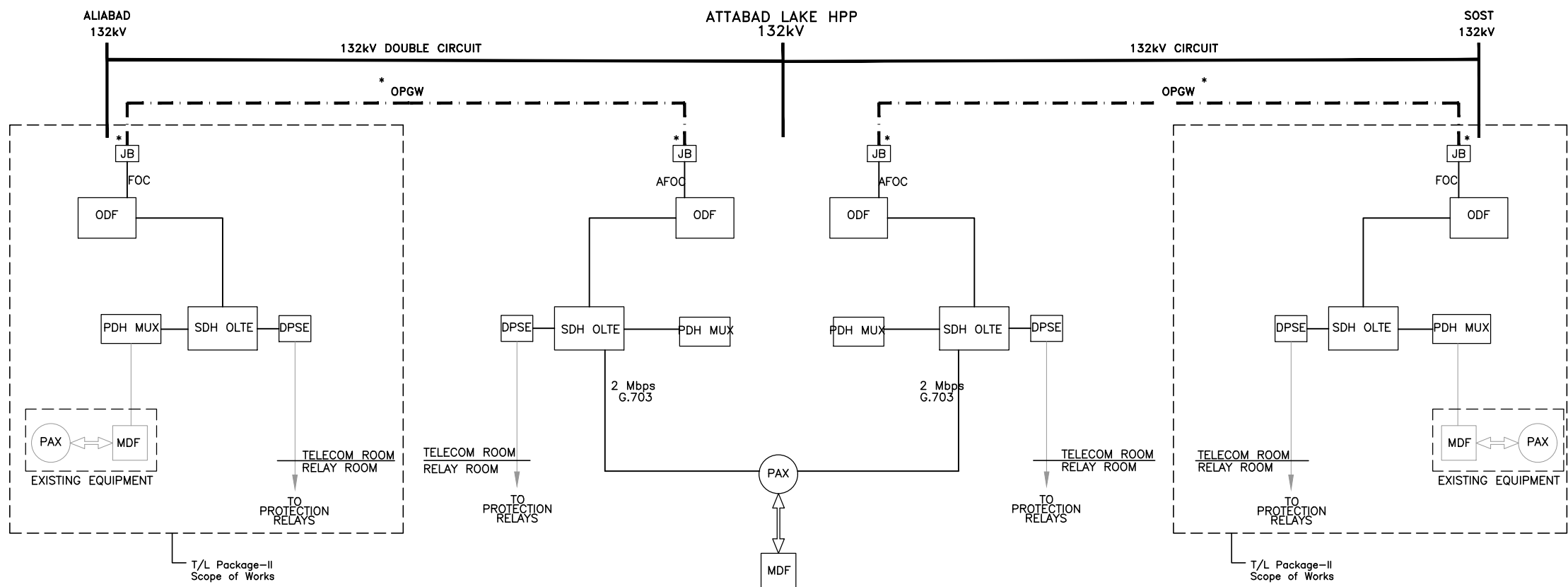
REV.





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CLIENT:  PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY PROJECT: ATTABAD LAKE HYDROPOWER PROJECT (54 MW)	CONSULTANT: ATTABAD HYDROPOWER MANAGEMENT CONSULTANTS JOINT VENTURE OF: NATIONAL ENGINEERING SERVICES (PVT.) LTD. (LEAD FIRM) ASSOCIATED CONSULTING ENGINEERS (PVT.) LTD. PAKISTAN ENGINEERING SERVICES (PVT.) LTD. BARQAAB CONSULTING SERVICES (PVT.) LTD. DOLSAR ENGINEERING INC. CO.	04				DRAWN	ASIF SAMI	132 kV SWITCHYARD SCADA SYSTEM DATE : MARCH, 2026 DRAWING No. ALHPP-TC-0703	SCALE
		03				RECOMMENDED	-		AS SHOWN
		02				CHD./VER.	-		REV.
		01				APPROVED	-		
		REV.	DATE	DESCRIPTION	APPROVED	APPROVED	-		



LEGEND:	
SYMBOL	DESCRIPTION
	OPGW CABLE
	JUNCTION BOX OP6W/FOC
	JUNCTION BOX OP6W/OPGW/OPGW
	OPTICAL AMPLIFIER 1+1
	OPTICAL LINE TERMINAL EQUIPMENT 1+1
	DIGITAL MULTIPLEXER
	DIGITAL PROTECTION SIGNALLING EQUIPMENT
	VF CHANNELS
	PRIVATE AUTOMATIC EXCHANGE
	OPTICAL DISTRIBUTION FRAME
	FIBER OPTIC APPROACH CABLE
	TO BE SUPPLIED BY OTHERS

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CLIENT:  PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY	CONSULTANT: ATTABAD HYDROPOWER MANAGEMENT CONSULTANTS JOINT VENTURE OF: NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LTD. (LEAD FIRM) ASSOCIATED CONSULTING ENGINEERS (PVT.) LTD. PAKISTAN ENGINEERING SERVICES (PVT.) LTD. BARQAAB CONSULTING SERVICES (PVT.) LTD. DOLSAR ENGINEERING INC.CO.	04				DRAWN	ASIF SAMI	132 kV SWITCHYARD FIBER OPTIC SYSTEM		SCALE		
		03				RECOMMENDED	-			AS SHOWN		
		02				CHD./VER.	-					
		PROJECT: ATTABAD LAKE HYDROPOWER PROJECT (54 MW)	01							DATE :	DRAWING No.	REV.
			REV.	DATE	DESCRIPTION			APPROVED	APPROVED	MARCH, 2026	ALHPP-TC-0704	