



EOLI
Efficient Operation of Urban Wastewater Treatment Plants

Contract Number ICA4-CT-2002-10012

INDIVIDUAL PARTNER REPORT

D1.7 REPORT OF THE ENGINEERING PROJECT FOR THE FIELD SCALE
PILOT PLANT

IBTECH, S.A. DE C.V. (PARTNER 8)

Covering period from November 2002 to October 2003

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1 INTRODUCTION

To develop the engineering project for a pilot-scale SBR reactor that will operate in field conditions for experimentation and data collection according to the following:

- a) Validation of the experimental work performed by Universidad Nacional Autónoma de México (UNAM, partner 6).
- b) Implementation of the Fault Diagnosis and Isolation (FDI) supervision system, according to the work performed by Universidad Nacional Autónoma de México (UNAM, partner 6).
- c) Integration of the supervision and data acquisition.

2 PROCESS DESCRIPTION

2.1 SBR reactor (design parameters)

SBR reactor design

- | | |
|---------------------------------------|---------------------------------------|
| ➤ Reactor volume: | 1.0 m ³ |
| ➤ Volumetric exchange rate (maximum): | 60% |
| ➤ Maximum volume exchanged: | 0.6 m ³ |
| ➤ Maximum volumetric loading rate: | 12 kg/m ³ in 50 hours. |
| ➤ Fill time: | 15 to 20 minutes. |
| ➤ Settling time: | To be determined at field conditions. |
| ➤ Decanting time: | 15 to 20 minutes. |
| ➤ Idle time: | To be determined at field conditions. |

Flexibility

- The Pilot Plant will not operate if power supply fails.
- The Pilot Plant will not operate if air supply fails.
- The process air will be supplied by two-air blowers and a diffuser system, consisting of 3-disc diffuser with flexible EPDM membrane.
- The climatology and geography data correspond to Mexico City, due to the fact that the FSPP will be tested first in the UNAM's wastewater treatment plant. So, these conditions should be changed as needed according to some others future site conditions.

On Line Measurements

The online measurement that has been specified for the field scale reactor are:

- Dissolved Oxygen Concentration. AE/ATO2-104.
- Temperature. Thermometer TE/TT-104.
- pH. AE/ATpH-104.
- Air flow for the oxic phase. FICT-105.
- ORP (if needed in future tests). AE/ATORP-104.
- Water level in SBR reactor. LE/LT-104.
- Time variable would also determine operation of the reactor according to the mode of operation selected by the operator and specified by the control system.

Control platform and SCADA

- National Instruments LabView 7.0.
- Human Machine Interface developed by UNAM Team.
- SCADA as integral part of LabView. Interface developed by UNAM Team.

2.2 Description of the field- scale pilot plant

The field-scale pilot plant will be based on an aerobic process known as activated sludge in the Sequencing Batch Reactor modality, controlled by the system developed by Engineering Institute of UNAM. All tanks and equipment will be mounted on a carbon steel skid and the design will be intended to allow easy transportation of the skid. The skid dimensions are 4.0 meters x 2 meters x 2.70 meters (L x W x H). Area: 8 m².

The influent will be fed from a 1.0 m³ wastewater storage tank (ST-01) to the SBR reactor, which will be an 1.0 m³ HDPE tank with conical bottom.

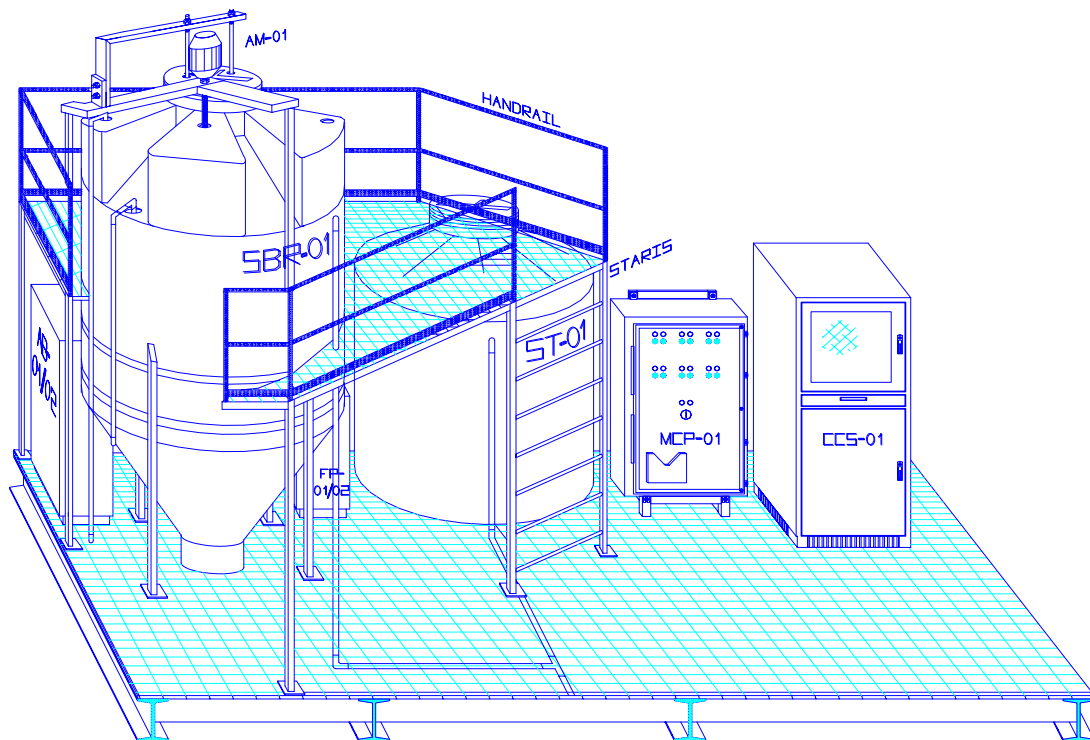
In this process the air is supplied to the reactor by a blower (AB-01/02) and fine diffuser system located at reactor bottom (three diffusers). This air system is also responsible of reactor mixing, and varying the airflow provides the operational flexibility needed depending on the operation mode desired.

The inlet flow rate of the reactor may be controlled by a peristaltic pump (FP-02) with adjustable drive velocity that will be used in the strategy, or by means of a larger flow capacity centrifugal pump for common operating strategy. This reactor is also equipped with a mechanical mixer with manual adjustable speed.

The process will be a batch process with the following conditions:

- Star-up and inoculation (acclimation experiments).
- Regular operation.

The operation of the pilot plant may be continuous, but the operation process is typically carried out in batch condition.



2. BASIC ENGINEERING

2.1. SUMMARYS, INDEXES AND LISTS

	CLIENT: EOLI PROJECT: FILED-SCALE PILOT PLANT DEPARTAMENT: PROCESS	DATE: 17-Sep-03	SPECIFICATION:
	ELECTRICAL EQUIPMENT	BY: A.M.P.V.	AREA: BIOLOGICAL TREATMENT
		REVISED: J.E.L.H.	DEPTO. PROCESS
		APROBE:	SHEET: 1 DE 1

ITEM	DESCRIPTION	CAPACITY	DIMENSIONS (long x wide x high)	VOLTS	RPM	FASES	CYCLES (Hz)	TYPE	AMOUNT	EQUIPMENT IN OPERATION (AMOUNT)	UNIT POWER (HP)	POWER TOTAL (HP)	POWER IN OPERATION (HP)	OPERATION
MA-01	MECHANICAL MIXER	1 m3	20 1/2" X 6 5/8"	110	20-350	1	60	VERTICAL MECHANICAL	1.00	1.00	0.25	0.25	0.25	INTERMITTENT
FP-02	FEEDING PUMP (PERISTALTIC)	0.6-8 l/min	16" X 9 1/2" X 9 5/16"	110	50-650	1	60	PERISTALTIC	1.00	1.00	1/10	0.10	0.10	INTERMITTENT
FP-01	BOMBA DE ALIMENTACIÓN RÁPIDA A REACTOR AEROBIO	64.90 l/min	CDT: 20.89 ft	110	*	1	60	HORIZONTAL	1.00	1.00	0.25	0.25	0.25	INTERMITTENT
EP-01	SUBMERSIBLE CENTRIFUGAL PUMP	1200 l/h	CDT: 35.94 ft	110	*	1	60	SUBMERSIBLE	1.00	1.00	0.17	0.17	**	INTERMITTENT
AB-01/02	AIR BLOWER	11.89 ft3/min	0.41mx0.16mx0.23 m	110	1750	1	60	PALLETS	2.00	1.00	1.00	2.00	1.00	INTERMITTENT
POWER TOTAL:												2.77	1.60	

*BY SUPPLIER

	SUPPLYS CATALOG OF EQUIPMENT AND INSTRUMENTATION	
	CLIENT: EOLI	
	PROJECT: FILED-SCALE PILOT PLANT	PRIORITY: 1
	DEPARTAMENT: PROCESS	

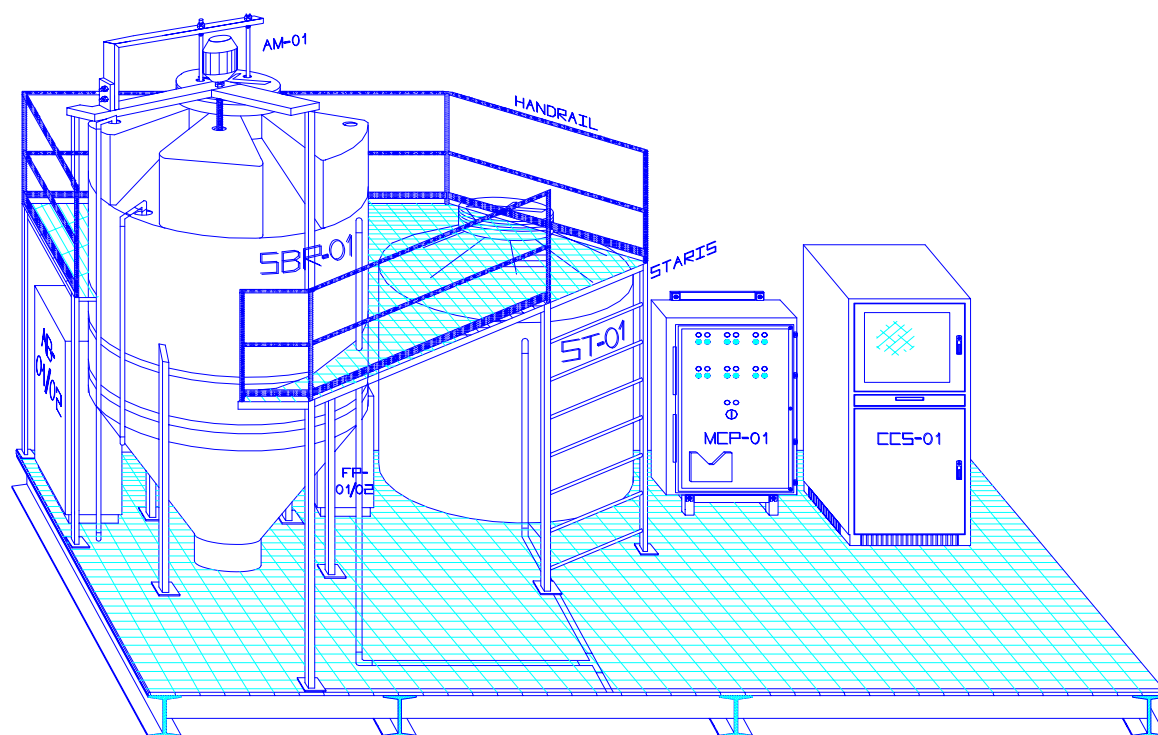
ITEM	DESCRIPTION	UNIT	AMOUNT
EQUIPMENT			
MA-01	Mechanical Agitator, variable speed from 20 to 350 rpm, included 316 SS shaft, 316 SS A-310 impeller aun a drive quill with set screws, motor of 1/4 hp, type motor TENV, dimensions 20 1/2"-x 6-5/8", size impeller 7.6", Lightnin brand.	PIECE	1.0
FP-02	Feeding Pump, computer compatible/Programmable, speed control input 0 to 20 mA, 4 to 20 mA, or 0 to 10V, pumping direction/start/stop/purge, power 115 VAC, reversible 1/10 hp motor, Masterflex brand.	PIECE	1.0
FP-01	Feeding Pump, type horizontal centrifugal, motor TCCV of 1/4 hp, WEG brand.	PIECE	1.0
EP-021	Effluent Pump, type submersible centrifugal, ON/FF control, 1/6 hp motor, Little Giant brand.	PIECE	1.0
AB-01/02	Air Blower, motor of 1 hp, speed 1750 rpm, dimensions 16" x 6.5" x 9", GAST brand.	PIECE	2.0
ST-01	Wastewater Storage Tank, HDPE material, 1100 liters of capacity, dimensions 43.3" x 54.72", Roplas brand.	PIECE	1.0
SBR-01	Sequencing Batch Reactor, HDPE material, 1300 liters of capacity, dimensions 43.3" x 74.4", Rotoplas brand.	PIECE	1.0
	Difuser system	PIECE	3.0
CCS-01	Computer Control System	PIECE	1.0
GAB-01	PC Cabinet, for provide security from unauthorized access as well as protection from harsh enviroments.	PIECE	1.0
MCP-01	Motor Control Panel for harsh enviroments.	PIECE	1.0
INSTRUMENTATION			
LE/LT-104	Pressure transmitter, gauge for hydrostatic level measurement flush mounted contite-sensor, certificate for non-hazardous areas, neck length (60-300 mm), process immersion length (75-3700mm). Endress + Hauser brand.	PIECE	1.0
AE/ATO2-104	Amperometric dissolved oxygen sensor in SS 316L with PG 13.5 thread, membrane simple hygienic style. Includes dissolved oxygen transmitter panel mounted 96 x 96 mm, two lines display, meno in 6 languages.Endress + Hauser brand.	PIECE	1.0
FICT-105	Gas Flow-Control System, flow range 0 to 500 lpm, pressure drop at maximum flow is 1.4 psi, max particulate size is 50 microns, conections 1/8" NPT(F), power 12 to 28 VCD, Cole Parmer brand.	PIECE	1.0
TE/TT-104	Thermometer with threaded proceess conection and neck. Temperature range -50 to 400°C. Terminal head adjustable in operation. Pressure rating at 20°C is at least 50 bar. Endress + Hauser brand.	PIECE	1.0

	CLIENT: EOLI PROJECT: FILED-SCALE PILOT PLANT DEPARTAMENT: PROCESS	DATE 26-Sep-03	
	MOTORS AND PROCESS CONTROL	BY: A.M.P.V.	AREA: BIOLOGICAL TREATMENT
		REVISED: J.E.L.H.	DEPTO. PROCESS
		APROBE: J.E.L.H.	SHEET 1 DE 1

ITEM	DESCRIPTION	SERVICE	VARIABLE	MAIN ELEMENTS	LOCATION		
					FILED	CONTROL PANEL	COMPUTER
MA-01	MECHANICAL MIXER	MIXER	SPEED	SWITCH ON/OFF		X	X
				DRIVE STATE INDICATOR		X	X
				SPEED CONTROL	X (note 1)		
FP-01	FEEDING PUMP (CENTRIFUGAL)	TO FED SBR REACTOR		SWITCH ON/OFF		X	X
				DRIVE STATE INDICATOR		X	X
FP-02	FEEDING PUMP (PERISTALTIC)	CONTROL OF INLET FLOW TO REACTOR	SPEED	SWITCH ON/OFF	X (note 2)	X	X
				SPEED CONTROL		X	X
				SPEED CONTROL	X (note 2)		X
EP-01	SUBMERSIBLE CENTRIFUGAL PUMP	EFFLUENTE PUMPING		SWITCH ON/OFF		X	X
				DRIVE STATE INDICATOR		X	X
AB-01/02	AIR BLOWER	TO PROVIDE THE AIRFLOW		SWITCH ON/OFF		X	X
				SPEED CONTROL		X	X
SBR-01	SEQUENCING BATCH REACTOR	BIOLOGICAL TRATMENT	LEVEL	SENSOR	X		
				TRANSMITTER		X	
				INDICATOR			X
				ALARMS			X
			TEMPERATURE	SENSOR	X		
				TRANSMITTER	X		
				INDICATOR			X
			O2	SENSOR	X		
				TRANSMITTER		X	
				INDICATOR		X	X
			PH	SENSOR	X		
				TRANSMITTER		X	
				INDICATOR		X	X
	AIR LINE	TO PROVIDE THE AIRFLOW	FLOW	SENSOR	X		
				INDICATOR	X (note 3)		X
				CONTROL	X (note 3)		

NOTES:

1. IN THE SAME EQUIPMENT.
2. IN THE SAME EQUIPMENT.



2. BASIC ENGINEERING

2.2. DATA SHEETS (EQUIPMENT)

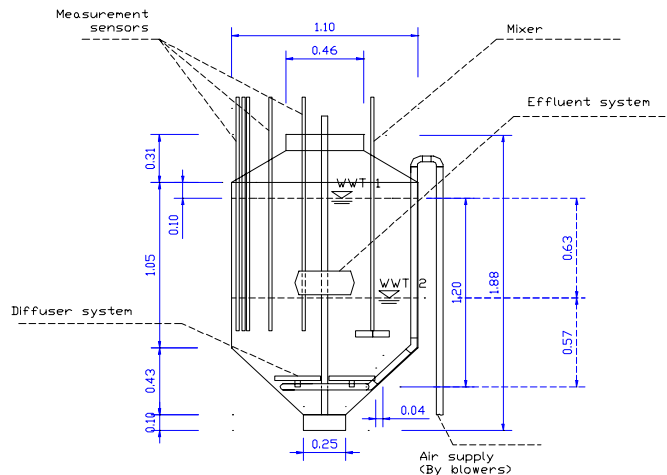
	CLIENT: PROJECT:	EOLI FIELD-SCALE PILOT PLANT	DATE 29-Ago-03	DEPTO . PROCESS
	DATA SHEET MIXERS HDE-001		BY A.M.P.V. CHK'D J.E.L.H.	AREA: BIOLOGICAL TREATMENT
			APPR . J.E.L.H.	SHEET 1 OF 2

1	GENERAL				
2	No.TAG:	MA-01	UNIT:	PIECE	
3	SERVICE:	TO MIX WATER	AMOUNT:	1	
4	SIZE:		MODEL:	EW-50310-00	
5	TYPE:	VARIABLE-SPEED	MOUNTING:	VERTICAL	
6	BRAND:	LIGHTNI	SUPPLIER:	LIGHTNI	
OPERATION CONDITIONS					
7	AGITATION	☒ TO MIX	☐ DISOLUTION	☐ EMULSION	☐ INTERCHANGE HEAT
8		☐ ABSOR. OF GAS	☐ SUSPENSION	☐ OTHERS	FLOCULATION
9	GRADO DE AGITACION	☒ LIGHT	☐ MEDIUM	☐ STRONG	
10	STRONG MIX:	NOT			
11					
12	OPERATION	☒ INTERMITTENT	☐ CONTINUOUS		
13	OPERATION TIME:	VARIABLE			
14	WATER LEVEL:	0.95 m	MAXIMUM LEVEL:	0.98 m	MINIMUM LEVEL: 0.57 m
MIXER MATERIAL					
15	COMPONENTES	VOLUME	DENSITY	VISCOSITY (CP)	TEMP. (°C)
16					
17	WASTEWATER	1.0 m3	1.0	1.0	18.6
18	OPERATION:	FILL:	YES ☒	NOT	☐
19		DECANTING:	YES ☒	NOT	☐
TANK DATA					
20	TYPE:	CILINDRIC TANK (SEE HDE-006)			
21	CAPACITY (LITERS):	1000			
22	BOTTOM TYPE:	CONICAL			
23	OPERATION PRESSURE:	ATM			
24	MATERIAL:	HDPE			
25	MOUNTING:	*			
MECHANICAL DATA *					
26	MOUNTING:	☐ CLAMP	☐ FLANGE	☒ OTHER:	WITH EXTERNAL SUPPORT
27	MIX SPEED	*			
28	IMPELLER	*	DIAMETER:	*	IMPELLERS NO: *
29	SHAFT:	*	DIAMETER	*	LENGHT: *
30	COUPLE TYPE:	*	MOUNTING BY:	*	
31	GASKET:	*	MECHANICAL SEAL:	*	

A	Basic engineering	A.M.P.V.	J.E.L.H.	J.E.L.H.	29-Ago-03
REV.	DESCRIPTION	BY	CHK'D	APPR .	DATE

	CLIENT:	EOLI	DATE	AREA
	PROJECT:	FIELD- SCALE PILOT PLANT	29-Ago-03	BIOLOGICAL TREATMENT
			BY A.M.P.V.	
		DATA SHEET	CHK'D	DEPTO.
		MIXERS	J.E.L.H.	PROCESS
		HDE-001	APPR.	SHEET
				2 OF 2

SHAFT SEAL				
32	LUBRICATION:	*	PRESSURE:	*
33	GASKET:	*	No RINGS:	*
34	MECHANICAL SEAL:	*	MANUFACTURER:	
35	LUBRICATION LIQUID(GPM):	*	MANUFACTURER:	
MATERIALS		MOTOR DATA		
36	IMPELLER:	*	MOTOR SUPPLIER:	*
37	SHAFT:	*	CLASS / DIVISION:	*
38	COUPLE:	*	POWER: 1/4 HP	RPM: 20-350
39	MOUNTING NOZZLE:	*	FAB: *	TIPO: TENV
40	ORINGS:	*	VOLTS / PHASES / HZ	110/1F/60Hz
41	GASKET:	*	LUBRICATION:	*
42	WEIGHT:	*	DATA TRANSMISSION	
43	MOTOR	*	CODE:	*
44	TRANSMISSION	*	MOUNTING BY:	SUPPLIER
45			FAB:	*
46	OTHERS:	*	TYPE / MODEL:	*
47			AGMA CLASS:	*
48			HP AGMA:	*
49	INSTALLATION DIAGRAM			



NOTICES:				
* BY SUPPLIER				
THE MIXER HAVE TO A SPEED CONTROL.				
A	Basic engineering	A.M.P.V.	J.E.L.H.	J.E.L.H.
REV.	DESCRIPTION	BY	CHK'D	APPR.
				29-Ago-03
				DATE

	CLIENT: PROJECT:	EOLI FIELD-SCALE PILOT PLANT	DATE 28-Ago-03	SPECIFICATION SPE-006
			BY A.M.P.V.	AREA: BIOLOGICAL TREATMENT
	DATA SHEET PERISTALTIC PUMP HDE-002		CHK'D J.E.L.H.	DEPTO. PROCESS
			APPR. J.E.L.H.	SHEET 1 OF 2

NOTICE: ☐ BY IBTECH/CLIENT ☒ BY SUPPLIER			
FOR: ☐ TO QUOTE ☒ TO ORDER ☐ CONSTRUCTION			
SERVICE:	TO FEED TO SBR-01 REACTOR	MODEL:	U-07549-52 / 77601-10
MANUFACTURER:	MASTERFLEX	I/P	73
		UNITS:	1 PIECE
		SERIE:	

DATOS GENERALES	
No. DRIVE:	*
MANUFACTURER:	MASTERFLEX
No. TAG:	FP-02

☒ LIQUIDO	☒ OPERATION CONDITIONS
☒ FLUID: WASTEWATER ☒ TEMPERATURA DE BOMBEO (°C) NORMAL: 20° 25°C MAX: 35°C MIN: 10°C ☒ SPECIFIC GRAVITY: 1.00 ☒ VAPOR PRESSURE (PSIA) @ PT: 0.55 ☒ OPERATING VISCOSITY (cP): 1.00 ☒ CORROSIVE FLUID: NOT ☐ CLORUROS CONCENTRATION (ppm) ☐ H2S CONCENTRATION (ppm) FLUID: ☐ TOXIC ☐ INFLAMMABLE ☐ EXPLOSIVE	☒ CAPACITY @ PT (LPM) NORMAL: 0.6 TO 8 ☒ DISCHARGE PRESSURE (PSIG) NORMAL: 30 ☒ POWER (HP) 1/4

☐ SITE DATA	☐ FUNCIONAMIENTO
LOCALIZACIÓN ☒ INTERIOR ☐ EXTERIOR ☐ ELECT. AREA CLASS I GROUP A DIV 1 ☐ PROTECTION SITE DATA: ☐ OPERATION TEMPERATURE: (MIN / MAX) 10 / 30 °C CONDITIONS: ☐ DUST ☐ GAS ☐ SALINE ATMOSPHERE ☐ OTHER: ☒ SERVICE CONDITIONS:	☐ No. PUMP HEADS: 1 NOMINAL CAP. (gph): ☐ NSPH REQUIRED (FT): PHID. TEST (psig): ☐ BHP NOMINAL: BHP ADJUSTABLE PRESSURE: ☐ DIAMETER (in): MAXIMUM PRESSURE (psig): ☐ MOTOR SPEED (rpm): 50-650 ☐ PUMP HEAD: ☐ SPEED MAXIMUM (RPM) 650 ☐ SPEED MINIMUM (RPM): 50 ☐ SPEED CONTROL: +/- 0.25% FLOW RATE WITH I/P73 TUBING: 0.6 TO 8 LPM

CONSTRUCTION			
MOTOR	CONTROL	SHUTDOWN	
VOLTAJE 110 V			CONNECTIONS
HERTZ 60			SIZE
PHASES 1			ANSI CLASIF.
☐ COOLING WATER: ENT. RET. DIS. ☐ TEMPERATURE (°C) MAX MIN ☐ PRESSURE (PSIG) MAX MIN FUENTE ☐ AIR PRESSURE (PSIG) MAX: MIN:			PHASE POSITION SUCTION DISCHARGE GLAND FLUSH DRAINS PURGE

FUENTE: + ☐ MANUAL ☒ REMOTE ☐ LOCAL ☒ AUTOMATIC ☐ LOCAL ☐ ELECTRONIC CONTROL: BY SPEED 50-650 RPM ELECTRONIC (mA): 4-20mA	☒ PERISTALTIC ☐ JACKET REQ.
---	---

MATERIALS	
HEAD: BODY: ROTORES: TUBING: OTHER:	HEAD: BODY: ROTORES: TUBING: OTHER:
REQUIREMENT OTHERS	
☐ RELIEF VALVE ADJUSTMENT PRESSURE: 30 psig TURNING DRIVE: ON / OFF / REVERSE	

REFERENCES						
A	BASIC ENGINEERING	A.M.P.V.	J.E.L.H.	J.E.L.H.	28-Ago-03	
REV.	DESCRIPTION	BY	CHK'D	APPR.	DATE	

	CLIENT: PROJECT:	EOLI FIELD-SCALE PILOT PLANT	DATE 28-Ago-03	SPECIFICATION SPE-006
			BY A.M.P.V.	AREA: BIOLOGICAL TREATMENT
	DATA SHEET PERISTALTIC PUMP HDE-002		CHK'D J.E.L.H.	DEPTO. PROCESS
			APPR. J.E.L.H.	SHEET 2 OF 2

☐ MANOMETER ☐ CONTROL PANEL LUBRICATING FLUID ☐ CARTER ☐ INTERMEDIATE ☐ LUBRICATING FLUID WEIGHT (kg) * ☐ HEAD ☐ TUBING ☐ DRIVE	TESTING ☐ MATERIALS ☐ DIMENSIONS ☐ NOT DESTRUCTIVE ☐ VERIFICATION WITH INSPECTOR TESTS HYDROSTATIC ☒ REQUIRED ☐ TESTIFY ☐ WITHOUT/TESTIFY EXACTITUDE IN STABLE STATE ☒ ☐ ☐ LINEARITY ☒ ☐ ☐			
	ACCESSORIES ☐ REDUCTOR MANUFACTURER ☐ INTEGRATION ☐ SEPARATE ☐ REDUCTION RELATION			
	MOTOR ☐ MOTOR: ☒ ELECTROMAGNETIC ☐ ELECTROMECHANICAL ☐ MANUFACTURER ☐ TYPE: ☐ CONSTANT SPEED (spm) ☒ VARIABLE SPEED ☐ VOLTS 110 ☐ HERTZ 60 m PHASE 1 ☐ ENCAPSULAMIENTO ☐ OF GAS ☐ OF VAPOR ☐ OTHER			
	NOTICES			

1. * BY SUPPLIER

2. THE SUPPLIER HAVE TO SUPPLY THE SYSTEM COMPLETE:

<u>ELEMENT</u>	<u>MODEL</u>
CONSOLE DRIVE	U-07549-52
PUMP HEAD	77601-10
TUBING	I/P 73
PHONE PLUG CONNECTOR, 1/4"	A-07549-99

REFERENCES						
A	BASIC ENGINEERING	A.M.P.V.	J.E.L.H.	J.E.L.H.	28-Ago-03	
REV.	DESCRIPTION	BY	CHK'D	APPR.	DATE	

	CLIENT:	EOLI	DATE	SPECIFICATION
	PROJECT:	FIELD-SCALE PILOT PLANT	28-Ago-03	SPE-001
	DATA SHEET CENTRIFUGAL PUMP HDE-003		BY	AREA:
			A.M.P.V.	BIOLOGICAL TREATMENT
		CHK'D	DEPTO.	
		J.E.L.H.	PROCESS	
		APPR.	SHEET	
		J.E.L.H.	1 DE 1	

GENERAL			
1	No. TAG.	FP-01	4 UNIT: 1
2	SERVICE	TO FEED THE SBR-01 REACTOR	5 SITE PRESSURE (MM. HG.) 750
3	OPERATION	CONTINUOUS ☐ INTERMITTENT ☒	

OPERATION CONDITIONS			
6	LIQUID	WASTEWATER	12 CAPACITY 10.3 G.P.M.
7	TEMPERATURE	18.6 °C	13 SUCTION PRESSURE 1.28 FT H2O
8	SPECIFIC GRAVITY	1.00	14 DISCHARGE PRESSURE 22.17 FT H2O
9	WASTEWATER VISCOSITY	1.00	15 CDT 24.40 FT H2O
10	VAPOR PRESSURE	0.44 PSI	16 N.P.S.H. DISP./REQ. 28.38 FT H2O
11	pH	7-7.5	

PUMP SPECIFICATION			
18	BRAND	SIMENS OR WEG	23 SUCTION: 1 1/4" DISCHARGE: 1"
19	TYPE	HORIZONTAL CENTRIFUGAL	24 SUC/DISCH DIAMETER: *
20	MODEL	*	25 IMPELLER: SEMI-OPEN
21	HYDRAULIC EFFICIENT:	*	26 ROTATION SPEED * RPM
22	SPHERE HOLE:	0.5"	27 POWER (BY SUPPLIER 1/4 HP) BHP

MOTOR			
28	TYPE:	TCCV	32 POWER (BY SUPPLIER 1/4 HP) H.P.
29	CONSTRUCTION	*	33 VOLTS 127 PHASE 1 CYCLES 60 Hz
30	TRANSMISSION ☐ DIRECT ☒ REDUCTOR		34 ROTATION SPEED * R.P.M.
31	CLASS	F	35 BRAND *

MATERIALS		ACCESSORIES	
36	HOUSING	CAST IRON	44 ACOPLAMIENTO FLEXIBLE
37	IMPELLER	CAST IRON	45 COUPLE *
38	SHAFT	*	46 SELLO *
39	SHAFT ACCESSORIES		47 REAR CASING: *
40	ORING(S)		48 MANOMETER (S) BY INSTRUMENTATION
41	GASKET	N/A	
42	MECHANICAL SEAL	*	
43	BASE	*	

NOTICES					
* BY SUPPLIER.					

REFERENCES					
A	BASIC ENGINEERING	A.M.P.V	J.E.L.H.	J.E.L.H.	28-Ago-03
REV.	DESCRIPTION	BY	CHK'D	APPR.	DATE

	CLIENT:	EOLI	DATE	SPECIFICATION
	PROJECT:	FIELD-SCALE PILOT PLANT	29-Ago-03	AREA: BIOLOGICAL TREATMENT
	DATA SHEET BLOWERS HDE-004		BY	
			A.M.P.V.	
		CHK'D	DEPTO.	
		J.E.L.H.	PROCESS	
		APPR.	SHEET	
		J.E.L.H.	1 OF 2	

GENERAL					
---------	--	--	--	--	--

1	No. TAG.	AB-01/02	5	AMOUNT	2 (ONE IN OPERATION)
2	SERVICE	AIR SUPPLY	6	SITE PRESSURE (ATM)	0.79
3	OPERATION	CONTINUOUS ☐ INTERMITTENT ☒	7	CLASIFICATION: 1	GROUP: A DIV.: 1
4	BRAN	GAFT 1423			

OPERATION CONDITIONS					
8	FLUD	CLEAN AIR	12	MINIMUM TEMPERATURE	10 °C
9	AVERAGE TEMPERATURE	18.6 °C	13	MOLECULAR WEIGHT OF AIR	29 kg/kgmol
10	ALTITUDE	2000 MSNM	14	DISCHARGE PRESSURE (BLOWER)	3.45 psig
11	DENSITY@SITE COND.	0.897 kg/m3	15	POWER (BY SUPPLIER)	1.0 bhp

REQUIRED AIR @ SITE CONDITIONS					
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16	TEMPERATURE (°C)	18.6
17	AIR TOTAL FLOW @ SITE COND. (cfm)	11.89

CONSTRUCTION *					
----------------	--	--	--	--	--

	NOZZLE	DIAMETER	ANSI CLASIF.	MACHINATION	MUNTING
18	SUCTION	*	*	*	*
19	DISCHARGE	*	*	*	*
20	HOUSING MOUNTING :	? CENTER ? SUPPORT ? VERTICAL (Type):			
21	ROTOR:	☐ LOBES ? THREE-LOBES ? RAD. TIPO VOLUT/ ☒ OTHER:			
22	PRESSURE:	? MAXIMUN ? HIDROSTATIC TEST:			
23	CONNECTION:	☒ VENTEO ? DRAIN ☒ MANOMETER ? OTHER			
24	MOUNTING:	? SUSPENDED ? GASKETS ☒ OTHER: ? CLOSED			
25	BULLET TYPE :	? RADIAL ? PUSH ? OF TIME			
26	LUBRICATION :	? OIL ? FLOOD ? OIL MIST ☒ WIHTOUT LUBRICATION			
27	COUPLE	? MANUFACTURER ? MODEL			
28	MOTOR MOUNTING BY:	? BLOWER MANUFACTURER ? MOTOR SUPPLIER ☒ CLIENT			
29	GASKET	? FAB. Y TIPO ? SIZE / No. ORINGS			
30	MECHANICAL SEAL :	? MANUFACTURER MODEL ? CLASIF. API CODE ? MANUFACTURER CODE			

AUXILIARY PIPE					
----------------	--	--	--	--	--

31	? TUB. A.E.	? C.U.	? A.I.	? TUBING	? TUBE
32	? TOTAL REQ. (COOLING WATER)		? FLOW REQUIRED VISUAL		
33	? REQ. INYECTION ENF. AT GASKET		? TOTAL GPM		? PSIG
34	? PIPING PLAN (SEAL WASH) :		? CAST IRON	? STAINLESS STEEL	? TUBING ? TUBE
35	? EXTERNAL WASH TO SEAL		? GPM		? PSIG
36	? SEAL AUXILIARY PLAN		? CAST IRON	? STAINLESS STEEL	? TUBING ? TUBE
37	? FLUIDO DE ENF. SELLO AUXILIAR				

ACCESSORIES					
-------------	--	--	--	--	--

38	? PIPE FOR CONNECTION	44	☒ EXPANSION JOINT (FLEXIBLE CONNECTION)
39	☒ BASE FOR BLOWER AND MOTOR	45	☒ FILTER AND SILENCER IN THE SUCTION
40	☒ SILENCER IN TO DISCHARGE.		
41	☒ ACCESSORIE FOR TRANSMISION.		
42	☒ MANOMETER		
43	☒ PRESSURE RELIEF VALVE		

REFERENCES					
------------	--	--	--	--	--

A	BASIC ENGINEERING	A.M.P.V.	J.E.L.H.	J.E.L.H.	29-Ago-03
REV.	DESCRIPTION	BY	CHK'D	APPR.	DATE

	CLIENT: EOLI		DATE 29-Ago-03		SPECIFICATION	
	PROJECT: FIELD-SCALE PILOT PLANT		BY A.M.P.V.		AREA: TREATMENT	
	DATA SHEET BLOWERS HDE-004		CHK'D J.E.L.H.		DEPTO. PROCESS	
			APPR. J.E.L.H.		SHEET 2 OF 2	
MOTOR DATA						
47	HP	1.0	RPM	1725	VOLT / PHASE / Hz	110 / 1 / 60
48	MANUFACTURER		BALEROS		LUBRICATION SIN LUBRICACIÓN	
49	TYPE CLOSED WITH VENTILATING		INSULATE		F TYPE	
50	CAPACITY		INCREASES TEMPERATURE (°C):		AMP. TO TOTAL LOADING	
51	? VHS		? VSS		AMP. TO BLOCKADED ROTOR	
52	TRANSMISSION		☒ DIRECT		? BY "V" ☐ OTHER:	
MATERIALS						
53	HOUSING	ASTM 48X	BASE	ASTM 48X		
54	SHAFT	ASTM 48X	BODY	ASTM 48X	GASKET	*
55	SILENCER (SUCTION)	ASTM 48X			SEAL	*
56	SILENCER (DISCHARGE)	ASTM 48X				
MANUFACTURER TEST						
57	☒ COMPLETE / WITHOUT TESTIFY		? COMPLETE / WITH TESTIFY			
58	? HIDROSTATIC/ WITHOUT TESTIFY		? HIDROSTATIC/ WITH TESTIFY			
59	? MANUFACTURER WITHOUT INPECTOR					
60	? OTHER :					
WEIGHT						
61	BLOWER :	30 kg	BASE :	*	DRIVE :	* kg
62	NOTICES: * BY SUPPLIER.					
THE SUPPLY AIR HAVE TO FEED FREE OF OIL.						
SUCTION AND DISCHARGE: 3/8" NPT						
THE SUPPLIER HAVE TO SUPPLY THE FOLLOWING ACCESSORIES:						
				1. PRESSURE RELIEF VALVE		
				2. PRESSURE MANOMETER		
				3. FILTER AND SILENCER		
REFERENCES						
A	BASIC ENGINEERING		A.M.P.V.	J.E.L.H.	J.E.L.H.	29-Ago-03
REV.	DESCRIPTION		BY	CHK'D	APPR.	DATE

	CLIENT: EOLI PROJECT: FIELD-SCALE PILOT PLANT	DATE: 28/08/03	SPECIFICATION: --
	DATA SHEET HDE-006 SEQUENTIAL BATCH REACTOR SBR-01	BY: A.M.P.V.	AREA: BIOLOGICAL TREATMENT
		CHK'D: J.E.L.H.	DEPTO: PROCESS
		APPR: J.E.L.H.	SHEET: 1 OF 2

TAG. NO.	SBR-01	AREA:	BIOLOGICAL TREATMENT	No DE UNIDADES:	01
SERVICE:	AEROBIC REACTOR	FABRICANTE:	TECNOPLAS		
APLICA PARA:	TO QUOTE ☐	TO ORDER ☒	CONSTRUCTION	☐	

OPERATION CONDITIONS					
POSITION:	VERTICAL ☒		HORIZONTAL ☐		
FLUID:	WASTEWATER		DENSITY (g/ml):	1.0	
VAPOR / GAS:	NOT		VISCOSITY (cp):	1.0	
OPERATION PRESSURE (psig):	ATM		VAPOR PRESSURE (PSIA):	0.44	
OPERATION TEMPERATURE (°C):	20	MAXIMUM:	30	DESIGN:	25

DIMENSIONS AND MATERIALS					
TOTAL HEIGHT (m):	1.88	WIDE (m):			
STRAIGHT HEIGHT (m):	1.05	DIAMETER (m):	1.10	TOTAL VOLUME (m³):	1.30
WATER LWEL (m):	1.20	CONE HEIGHT (m):	0.43	EFFECTIVE VOLUME (m³):	1.10
LEVEL MAXIMUN (m):	1.25	NORMAL:	1.20		
ALARMS:	YES	LEVEL HEIGHT:	1.25	LEVEL LOW:	0.15

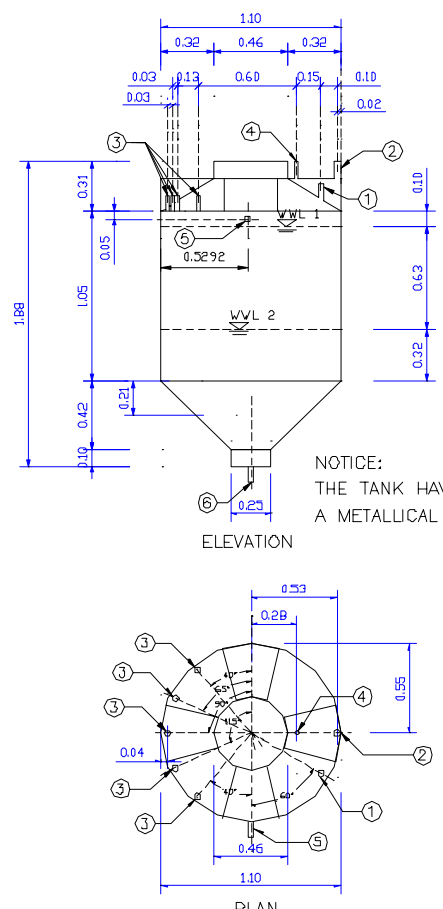
CONSTRUCTION MATERIAL: HIGH DENSITY POLYETHYLENE					
COVER: YES					
COVER DIAMETER (m): 0.46					
CIRCULAR: YES					
CORROSIVE FLUID: NOT					
TANK MATERIAL: 40% REINFORCED					
TANK COLOR: NEUTRAL (WHITE)					
COATING: NOT					

NOZZLES:					
	AMOUNT	φ	NOMINAL	SERVICE	
①	1		1"	FEEDING NOZZLE	
②	1		1.5"	AIR FEEDING	
⑤	1		1.5"	DRAIN NOZZLE	
⑥	1		2"	OUTLET NOZZLE	

HOLES:					
	AMOUNT	φ	NOMINAL	SERVICE	
③	5		1.5"	SENSOR	
④	1		1.5"	MIXER	

NOTICES:					
1) THE NOZZLES PROJECTION WILL BE 5 CENTIMETERS					
2) ALL NOZZLES WILL BE SCREWED.					
(*) BY SUPPLIER.					
WWL: WASTEWATER LEVEL					
THE TANK HAVE TO INCLUDE A METALUCAL SUPPORT.					
THE SUPPLIER HAVE TO CHECK THE NOZZLE POSITION WITH IBTECH BEFORE TO CONSTRUCTION.					

REFERENCES:			
A	BASIC ENGINEERING	J.E.L.H.	26-09-03
REV.	PRELIMINARY	A.M.P.V.	28-08-03
	DESCRIPTION	BY	DATE



ELEVATION

PLAN

DO NOT SCALE

DATA SHEET: HDE-006			
J.E.L.H.	J.E.L.H.	J.E.L.H.	26-09-03
A.M.P.V.	A.M.P.V.	J.E.L.H.	28-08-03
CHK'D	CHK'D	APPROVED	DATE



CLIENT: EDI
PROJECT: FIELD-SCALE PILOT PLANT

DATA SHEET HDE-006
SEQUENTIAL BATCH REACTOR
SBR-01

DATE:
28/08/03

BY:
A.M.P.V.

CHK'D:
J.E.L.H.

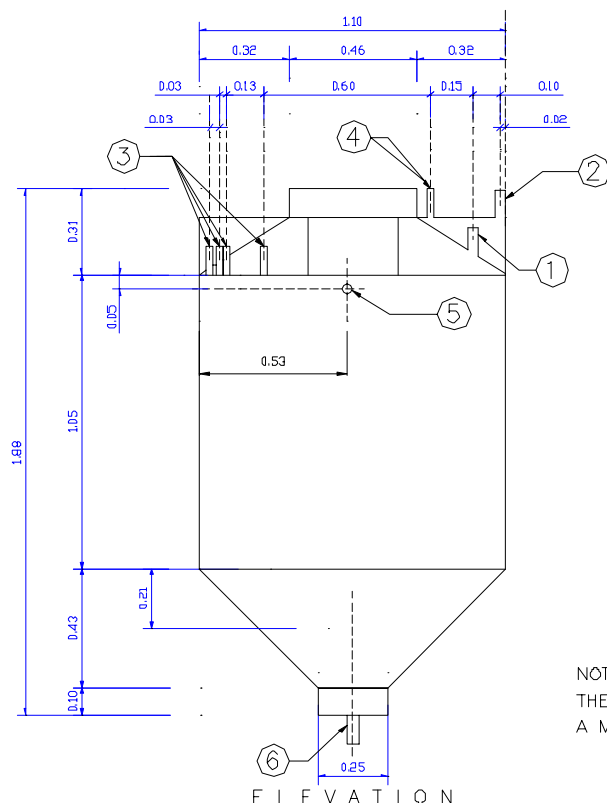
APPR:
J.E.L.H.

SPECIFICATION:

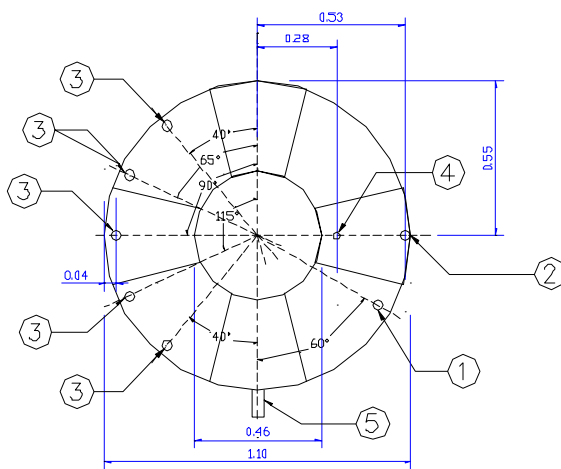
AREA:
BIOLOGICAL TREATMENT

DEPTO.:
PROCESS

SHEET:
2 OF 2



ELEVATION



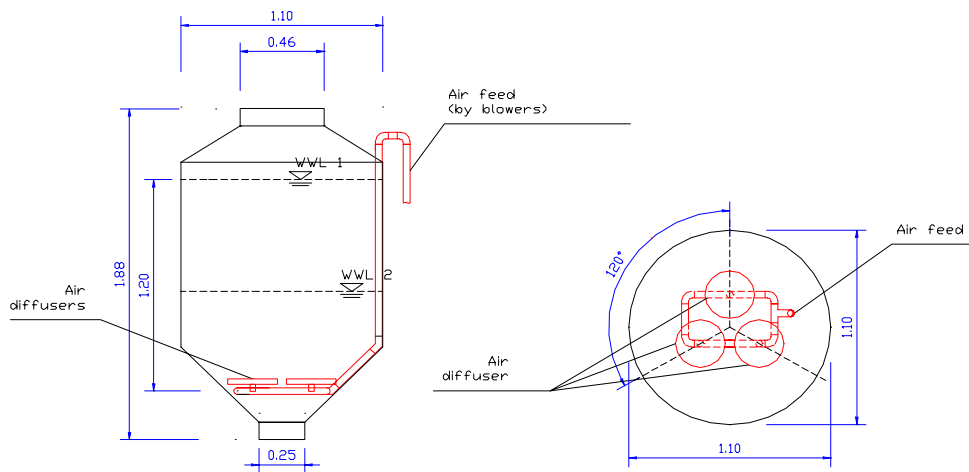
P L A N

DO NOT SCALE

REFERENCES:				DATA SHEET: HDE-006		
	BASIC ENGINEERING			J.E.L.H.	J.E.L.H.	26-09-03
A	PRELIMINARY		A.M.P.V.	A.M.P.V.	J.E.L.H.	28-08-03
REV.	DESCRIPTION		BY	CHK'D	APPROVED	DATE

	CLIENT:	EOLI	DATE	SPECIFICATION
	PROJECT:	FIELD-SCALE PILOT PLANT	28-Ago-03	AREA:
			BY	BIOLOGICAL TREATMENT
			A.M.P.V.	
DATA SHEET AIR DIFFUSER HDE-007			CHK'D	DEPTO.
			J.E.L.H.	PROCESS
			APPR.	SHEET
				1 OF 1

GENERAL					
1	TAG.	DIFFUSERS	4	TYPE	9" DIAMETER FINE BUBBLE DIFFUSER UNIT
2	SERVICIE	AIR SUPPLY	5	AMOUNT	3 PICES
3	OPERATION:	CONTINUOUS ☐ INTERMITTENT ☒	6	DIFFUSER EFFICIENT:	12 %
OPERATION CONDITIONS					
7	FLUID	AIRE ATMOSFÉRICO	15	REACTOR DIAMETER	1.1 m
8	WATER TEMPERATURE	18.6 °C	16	TANK HEIGHT	1.88 m
9	ALTITUDE	2000 MSNM	17	WATER LEVEL	1.2 m
12	DENSITY @ OPERATON COND.	0.897 kg/m3	18	AIR SUPPLY	1.43 cfm
13	MOLECULAR WEIGHT OF AIR	29 kg/kgmol	19	AIR SUPPLY FOR DIFFUSERS	11.89 cfm
14	DISCHARGE PRESSURE (BLOWER)	3.45 psig	20	FLOW BY DIFFUSER:	3.96 cfm
			21	OPERATION TEMPERATURE (MAXIMUM)	35 °C
CONSTRUCTION AND MATERIALS *					
22	DIFFUSER DIAMETER (EXTERNAL)	9 INCHES			
23	MEMBRANE MATERIAL:	EPDM			
24	BODY MATERIAL:	POLYPROPYLENE			
25	OTHER:	3 CONNECTORS 3/4"			
TESTS					
29	?	TOTAL (WITHOUT TESTIFY)		?	TOTAL (WITH TESTIFY)
30	?	HYDROSTATIC (WITHOUT TESTIFY)		?	HYDROSTATIC (WITH TESTIFY)
31	☒	TESTIFY OF MANUFACTURER			



Elevation, reactor

Plant, reactor

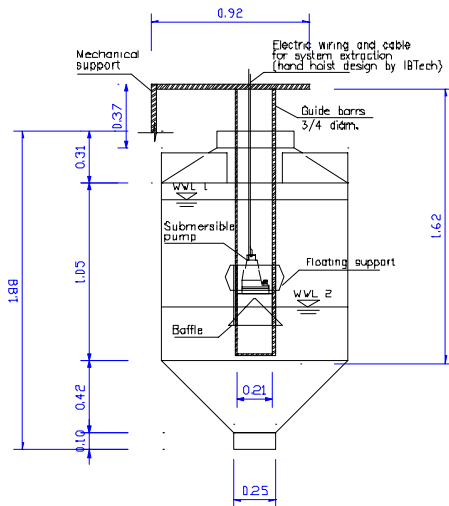
DO NOT SCALE
W W L:W ASTEW ATER LEVEL

NOTE: THE DIFFUSER SUPPLIER HAVE TO SUPPLY THE CONNECTOR.

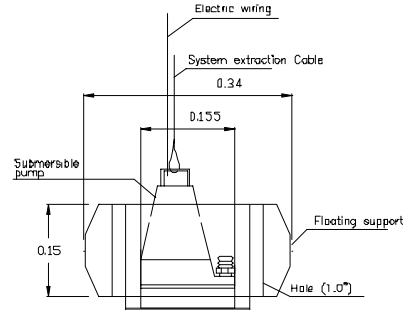
REFERENCES					
A	BASIC ENGINEERING	A.M.P.V.	J.E.L.H.	J.E.L.H.	28-Ago-03
REV.	DESCRIPTION	BY	CHK'D	APPR.	DATE

	CLIENT: EOLI	DATE: 02/10/03	AREA: BIOLOGICAL TREATMENT	
	PROJECT: FIELD-SCALE PILOT PLANT	BY: A.M.P.V.		
	DATA SHEET HDE-008 EFFLUENT PUMPING SYSTEM EP-01		CHK'D: J.E.L.H.	DEPARTMENT: PROCESS
			APPR: J.E.L.H.	SHEET: 1 OF 2

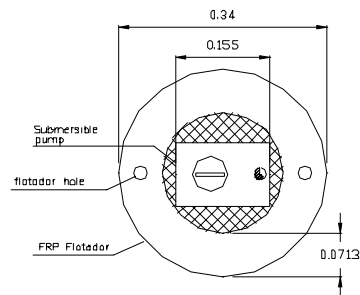
TAG. NO.	EP-01	AREA.	BIOLOGICAL TREATMENT	UNITS:	01
SERVICE:	TO EXTRACT EFFLUENT				
FOR:	TO QUOTE ☒	TO ORDER ☐	CONSTRUCTION ☐		
OPERATION CONDITIONS					
LOCALIZATION:	SEQUENCING BATCH REACTOR, SBR-01				
FLUID:	WASTEWATER	DENSITY (g/ml):	1.0		
OPERATION PRESSURE (psig):	ATM	VISCOSITY (cp):	1.0		
OPERATION TEMPERATURE (°C):	18.6	VAPOR PRESSURE (psig):	0.44		
DIMENSIONS AND MATERIALS					
SUBMERSIBLE PUMP	FLOATING SUPPORT	BAFFLE			
FLUID PUMPED	WASTEWATER	OUTSIDE DIAMETER OF FLOATING SUPPORT(m):	0.34	BAFFLE DIAMETER (m):	0.32
PUMP CAPACITY (gpm)	840	INSIDE DIAMETER OF FLOATING SUPPORT(m):	0.1975	BAFFLE'S HOLE DIAMETER (inches):	1/8
MAXIMUM ELEVATION (m)	7.80	FLOATING SUPPORT'S HOLES DIAMETER (inches):	1.0	BAFFLE HEIGHT (m):	0.843
PUMP DIMENSIONS (m):	0.155X0.109X0.198	FLOTADOR MATERIAL:	PRFV	BAFFLE MATERIAL:	FRP
ALARM (mm):	NOT	BARS GUIDE DIAMETER (inches):	3/4	BAFFLE SUPPORT MATERIAL:	FRP
BRAND/MODEL:	LITTLE GIANT/5-MSP				
NOTICE:	THIS EQUIPMENT BY IBTECH				



ELEVATION
EFFLUENT SYSTEM LOCALIZATION



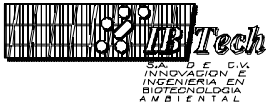
ELEVATION, EFFLUENT SYSTEM

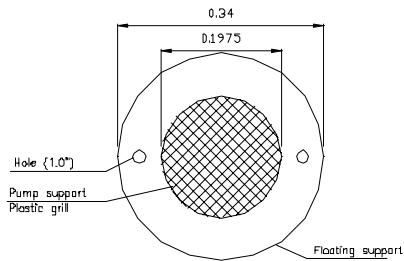


PLAN, EFFLUENT SYSTEM

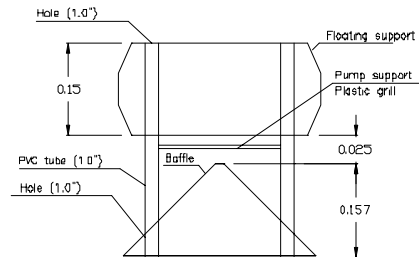
DO NOT SCALE.
WWL: WASTEWATER LEVEL.
FRP: FIBERGLASS REINFORCED PLASTIC.
ALL DIMENSIONS SHOWN ARE IN METERS, UNLESS OTHERWISE NOTED.

REFERENCES:			DATA SHEET: HDE-008
A	BASIC ENGINEERING	J.E.L.H.	J.E.L.H. 26-09-03
	PRELIMINARY	A.M.P.V	J.E.L.H. 02-10-03
REV.	DESCRIPCION	BY	APPROVED DATE

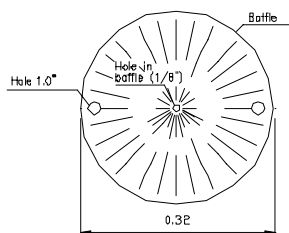
 S.A. DE C.V. INNOVACION E INGENIERIA EN BIOTECNOLOGIA AMBIENTAL	CLIENT: EOLI		DATE: 02/10/03		AREA: BIOLOGICAL TREATMENT
	PROJECT: FIELD-SCALE PILOT PLANT		BY: A.M.P.V.		
	DATA SHEET HDE-008 EFFLUENT PUMPING SYSTEM EP-01		CHK'D: J.E.L.H.		DEPARTMENT: PROCESS
			APPR: J.E.L.H.		SHEET: 2 OF 2



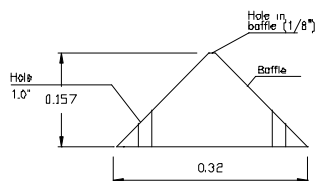
PLAN, FLOATING SUPPORT



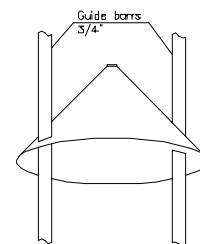
ELEVATION, FLOATING SUPPORT AND BAFFLE



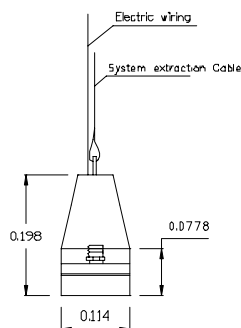
PLAN, BAFFLE



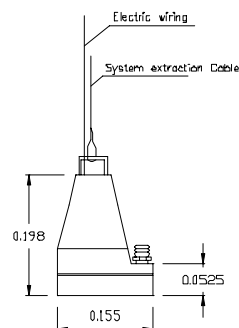
ELEVATION, BAFFLE



BAFFLE



SUBMERSIBLE PUMP



SUBMERSIBLE PUMP

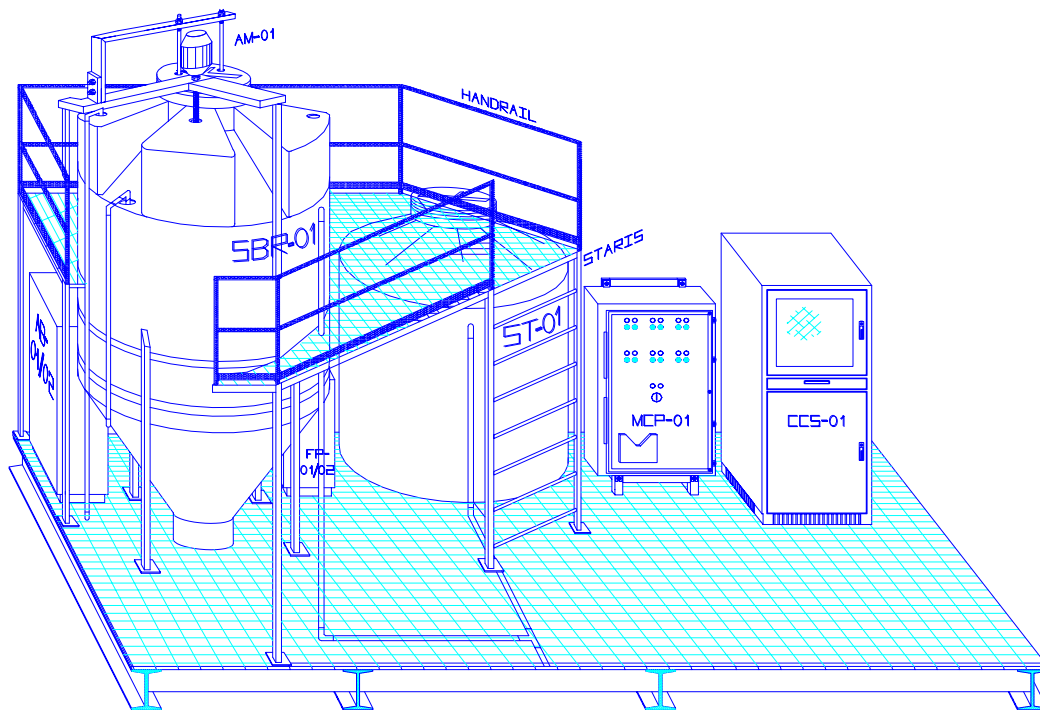
DO NOT SCALE.
FRP: FIBERGLASS REINFORCED PLASTIC.
ALL DIMENSIONS SHOWN ARE IN METERS, UNLESS OTHER WISE NOTED.

REFERENCES:		DATA SHEET: HDE-008	
A	BASIC ENGINEERING	J.E.L.H.	J.E.L.H.
	PRELIMINARY	A.M.P.V.	A.M.P.V.
REV.	DESCRIPTION	BY	CHK'D
			APPROVED
			DATE

	CLIENT: EOLI	DATE	SPECIFICATION
	PROJECT: FIELD-SCALE PILOT PLANT	28-Sep-03	
		BY	AREA: BIOLOGICAL TREATMENT
		A.M.P.V.	
DATA SHEET HDE-016 PC CABINET GAB-01		CHK'D	DEPTO.
		J.E.L.H.	PROCESOS
		APPR.	SHEET
		J.E.L.H.	1 OF 1

GENERAL			
1	No. TG.	PC CABINET	
2	SERVICE	TO PROTECT A PERSONAL COMPUTER.	
3	LOCALIZATION	EXTERIOR	
4	BRANDS:	HOFFMAN	
		DERRANT	
		RITTAL	
		APC	
5	EQUIPMENT:	1	MONITOR
		2	CPU
		1	KEYBOARD
		ACCESSORIES FOR CONTROL (TARGETS)	
6	EQUIPMENT DIMENSIONS:	MONITOR:	17 inches
		CPU:	15" X 7.5" X 18"
7	MOUNTING:	ON A METALLIC PLATAFORM.	
8	WEIGHT:	*	kg

NOTICES					
THE SUPPLIER HAVE TO GIBE THE DIAGRAMS BEFORE TO SUPPLY THE EQUIPMENT.					
* BY SUPPLIER.					
THE CABINET IF FOR EXTERNAL AREA.					
THE SUPPLIER HAVE TO QUOTE ALL ACCESSORIES BY SEPARATED.					
REFERENCES					
A	BASIC ENGINEERING	A.M.P.V.	J.E.L.H.	J.E.L.H.	28-Sep-03
REV.	DESCRIPTION	BY	CHK'D	APPR.	DATE



2. BASIC ENGINEERING

2.3. DATA SHEETS (INSTRUMENTATION)

	PLANT: EOLI		DATA SHEET HDE-010		REV. No. A	
	PROJECT: ICA4-CT-2002-10012		AREA Instrumentation		REF. DWG.:	
	NAME: HYDROSTATIC LEVEL MEASUREMENT		INV.AUT.:		IBT-WWT-EOLI-PID-001	
	BY: A.M.P.V.	CHK'D: J.E.L.H.	APPR. J.E.L.H.	SHEET 1 OF 1		
	DATE: 28/08/2003	DATE: 28/08/2003	DATE: 28/08/2003			

GENERAL	1	Instrument	HYDROSTATIC LEVEL MEASUREMENT	
	2	Service	LEVEL MEASUREMENT	
	3	Description	☒ SENSOR	
	4		☐ INDICATOR	
	5		☒ BLIND	
	6		☐ CONTROLLER	
	7		☒ TRANSMITTER	
SENSOR	8	No. TAG.	LE/LT-104	
	9	Type	HYDROSTATIC LEVEL MEASUREMENT	
	10	Location	SBR-01 REACTOR	
	11	Material	METALLIC MEASURING DIAPHRAGM	
	12	Environment	NOT CORROSIVE	
	13	Mounting	IN THE TOP OF TANK	
	14	Inclination	Vertical	
	15	Measurement range	0-400 mbar	
	16	Position	VERTICAL	
	17	Process connection	1-1/2" NPT	
	18	Brand	ENDRESS + HAUSER	
	19	Model	DB51-AE12BB11EE20	
TRANSMITTER	20	TAG. No.	LIT-101/102	
	21	Output	☐ 0-10 Volts	
			☒ 4-20 mA	
	22	Range	0-400 mbar	
	23	Material	KYNAR	
	24	Case color	STD./FAB.	
	25	Location	INTEGRATED WITH THE SENSOR	
	26	Classification	NEMA 4X	
	27	Electrical supply	INTERNAL	
	28	Brand	ENDRESS + HAUSER	
	29	Model	DB51-AE12BB11EE20	
SBR-01 REACTOR	31	TAG. No.	SBR-01	
	32	Type	CYLINDRICAL	
	33	Dimensions Long	SEE HDE-006	
	34	Wide	SEE HDE-006	
	35	High	SEE HDE-006	
	36	Mixer	YES	
	37	Air system	YES	
	38	Reactor material	HDPE	
	39	Supply	BY OTHERS	
	40			
FLUID	41	Fluid	Wastewater	
	42	Temperature °C	18.60	
	43	Specific gravity	1.06	

NOTES:
1.- The supplier have to Supply a identification plate of SS304, with the instrument service.
2.- The transmitter is integrated in the sensor.

		CLIENT: EOLI		HDE-011		REV. No. A	
		PROJECT: ICA4-CT-2002-10012		AREA INSTRUMENTATION		REF. DWG.: IBT-WWT-EOLI-PID-001	
		NAME:		BY: A.M.P.V.		CHK'D: J.E.L.H.	
		DISSOLVED OXYGEN MEASUREMENT		DATE: 28/08/2003		DATE: 28/08/2003	
				APPR. J.E.L.H.		SHEET 1 OF 1	
GENERAL		1 No. TAG. 2 Service 3 Units 4 Measurement range 5 Operation pressure Operation pH 6 Operation temperature 7 Specific gravity 8 No. DTI 9 Components 10 Case 11 Mounting 12 Electrical classification		AE/AT O2-104 DISSOLVED OXYGEN MEASUREMENT 1 piece 1- 10 mg/l 0.79 atm 0 - 14 (-15°C - 130°C) 1 IBT-WWT-EOLI-PID-001 Registrador ☐ Indicator ☒ Transmitter ☒ Blind ☐ Other ☐ Standard ☒ Size: STD Color: Standard Other: Note 1 Surface ☐ Al ras ☐ Yuke ☐ Other: Tube 1.5" diameter Interior area ☐ Exterior area ☒ Hazardous areas ☐ Class: _____ Group: _____ Division: _____ For non-hazardous reas ☐ 117V 60Hz Other: _____ ca: 115 VAC 1/2" ☒ 3/4"NPT ☐ Other: _____ Lineal ☐ 12" circular ☐ Other: _____ Rango: _____ No: _____ Elec. ☐ Spring ☐ Other: _____ 24Hr ☐ Other: _____ Type: _____ Range 1 _____ 2 _____ 3 _____ Internal ☐ External ☐ Remote ☐ Other: _____			
TRANSMISOR		19 Units 20 Model Transmitter type Case size 21 Communication protocol 22 Output signal Notes		1 piece COM223-DX1105 Neum. ☐ Elec. ☐ Intelligent electronic ☐ Other: Normal electronic 96 mm x 96 mm x 146 mm Hart ☐ Fieldbus ☐ Other: _____ 4-20 mA ☒ 10-50 mA ☐ 3-15 psig ☐ Other: _____			
CONTROL		23 Control type 24 Action 25 Auto-manual switch 26 Ajuste Set Point 27 Manual regulation 28 Output signal 29 Comunication protocol		 P ☐ PI ☐ PD ☐ PID ☐ slow ☐ Quick ☒ Other: _____ Direct ☐ Back ☐ Other: _____ Manual ☐ External ☐ Remote ☐ Other: _____ 4-20 mA ☐ 10-50 mA ☐ 3-15 psig ☐ Other: _____ Hart ☐ Fieldbus ☐ Other: _____ 			
SENSOR		30 Type Units Model 32 Enveloping material Process connection 35 Electrode material 36 Immersion length 37 Reference electrode 38 Temperature compensation		Inserción ☐ Profundidad de inserción _____ Inmersión ☒ Other: _____ 1 pza COS21-1K0 Acero ☐ ☒ SS 316L 316 L PG 13.5 thread 3/4" NPT ☒ 1" NPT ☐ Glass ☒ Platino ☐ Other: _____ 120mm. Required ☒ Not required ☐ Required ☒ Not required ☐			
ACCESSORIES		39 Accessories Note		Electrolyte for COS 21, 50 ml in single dispensing bottle. 51505873 Cable four-core, coaxial with standard connector (10.0 meters) ☒ Other: _____ Model: COK 21 51505868			
Note 1: The instrument have to has aplate identification. Note 2: To chek the instrument aplication with supplier. Note 3: Supplier: Endress + Hauser. Note 4.- The sensor and transmitter wil be separates, for that reason the supplier have to supply a cable for connection between they. This cable will be 10.0 meter of length.							



CLIENT: EOLI	HDE-012 FLOWMETER / CONTROLLER	SPEC. No.	REV. No. A
PROJECT: 6100-27, DGO UNAM	AREA No. INSTRUMENTATION INV.AUT.:	REF. DWG.: IBT-WWT-EOLI-PID-001	REV. No.
NAME: MEDICIÓN DE AIRE	BY: A.M.P.V. DATE:	CHK'D: J.E.L.H. DATE: 28/08/2003	APPR. J.E.L.H. DATE: 28/08/2003
			SHEET 1 OF 1

GENERAL	1	No. TAG.	FITC-105	
	2	Service	AIR CONTROLLER	
	3	No. DTI	IBT-WWT-EOLI-PID-001	
SENSOR AND CONTROLLER	4	Size	1.5"	
	5	Connectios	SCREWED	
	6	Materials	STAINLESS STEEL AND VITON	
	7	Accuracy	+/- 2% FULL SCALE	
	8	Repeatability	+/- 2% FULL SCALE	
	9	Connectios	1/4" NPT	
	10	Operation flow	336.72 L/min	
	11	Flow range	0 - 500 L/min	
	12	Turndown ratio	50:1	
	13	Response time	2.0 seconds	
	14	Temperature range	-10 A 70°C	
	15	Density range	0 - 5 g /cc	
	16	Differential pressure	20% OF SUPPLY PRESSURE	
	17	Min DP	5 psi	
	18	Maximum pressure	200 psig	
	19	Analog setpoint	0-5 VCD	
TRANSMITTER	20	Type	ELECTRONIC	
	21	Case		
	22	Power		
	23	Voltege output	12 VCD (+/- 5%)	
	24	mA output	13 VCD (+/- 5%)	
	25	Current consumption	<250 mA DC	
	26	Accuracy	+/- 2% FULL SCALE	
	27	Repeatability	+/- 2% FULL SCALE	
	28	Analog setpoint	0-5 VCD	
DATA OPERATION	29	Fluid	AIRE ATMOSFÉRICO	
	30	Calibration range	*	
	31	Maximun speed	4000 ft/min	
	32	Flow	336.72 L/min	
	33	Operation pressure	2.4 psig	
	34	Temperature	18.6°C	
	35	Site pressure	0.79 atm	
	36	Density, kg/m3	0.89 kg/m3	
	37	Compressibility factor	1	
	38	Manufacturer	OMEGA	
	39	Sensor model	FMA-78P2	
	40	Transmitter model	FMA-876A-V	
	41	Controller model	FMA-876A-V	
	42	Connection model (cable)	FMA-78C25	

NOTICES:

To chek the instrument application with supplier.
* By supplier.

		PLANTA:		HDE-013		SPEC. No.		REV. No.	
		EOLI		THERMOMETER				A	
		PROJECT:		AREA Instrumentation		REF. DWG.:			
		ICA4-CT-2002-10012		INV.AUT.:		IBT-WWT-EOLI-PID-001			
NAME:		BY: A.M.P.V.		CHK'D: J.E.L.H.		APPR. J.E.L.H.		SHEET 1 OF 1	
THERMOMETER		DATE: 28/08/2003		DATE:		DATE: 28/08/2003			

GENERAL	1	No. TAG.	TE/TT-104
	2	Service	MEDICIÓN DE TEMPERATURA
	3	Units	1 piece
	4	Type	Thermometer with threaded process connection and neck.
	5	Model	TST10-CE2XCS2BA2R
	6	Temperature range	-50°C - 400°C
	7	Operation pressure	0.79 atm
	8	Operation temperature	35°C
	9	Specific gravity	1
	10	No. DTI	IBT-WWT-EOLI-PID-001
	11	Función	Sensor ☒ Indicator ☐ Transmitter ☒ Blind ☒ Other ☐
	12	Case	Standar ☒ Size: STD Color: Standar Other: Note 1
	13	Mounting:	Surfase ☐ Yuke ☐ Other: Tube of 1.5"
	14	Classification:	Interior area ☐ Exterior area ☒ Hazardous areas ☐
		Class:	Group: Division:
		For non-hazardous reas	Other: Computer control ca: 1/2" 3/4"NPT Other: Range: No: Elec. Spring Other: 24Hr Other: Type: Range 1 2 3 Internal External Remote Other:
	15	Electrical feed	
	16	Connection size (conduit)	
	17	Chart range	
	18	Chart drive	
19	Scale		
20	Calibration		
TRANSMITTER	21	Transmitter type	Neum. ☐ Elec. ☐ Intelligent electronic ☒ Other:
	22	Transmitter	In the top of the tank
	23	Units	1 piece
	24	Communication protocol	Hart ☒ Fielbus ☐ Other:
	25	Output signal	4-20 mA ☒ 10-50 mA ☐ 3-15 psig ☐ Other:
	26	Notice	Terminal head adjust. In orientation
	27	Control type	P ☐ PI ☐ PD ☐ PID ☐ slow ☐ Quick ☒
	28		Other: Direct ☐ Back ☐ Other:
CONTROL	29	Action	Manual ☐ External ☐ Remote ☐ Other:
	30	Manual switch	
	31	Set Point	
	32	Manual regulation	
	33	Output signal	4-20 mA ☐ 10-50 mA ☐ 3-15 psig ☐ Other:
	34	Communication protocol	Hart ☐ Fielbus ☐ Other:
	35	Type	Insertion ☐ Profundidad de inserción Imersion ☒ Other:
	SENSOR	36	Assemble
37		Enveloping material	Steel ☐ SS316L ☐ Other:
38		Process connection	3/4" NPT ☒ 1" NPT ☐
39		Process immersion length	75-3700 mm
40		Immersion length to espec.	100 mm
41		Sensor material	Glass ☐ Platino ☒ Other: Pt 100
42		Electrode reference	Required ☒ Not required ☐
43		Temperature compensation	Required ☒ Not required ☐
ACCESSORIES	44	Accessories	

Note 1: The instrument have to has aplate identification.

Note 2: To chek the instrument aplication with supplier.

Note 3: Supplier: Endress + Hauser.

Note 4.- The transmitter is intregated with the sensor.

		PLANTA:	HDE-014		SPEC. No.	REV. No.
		EOLI	PH MEASUREMENT			A
		PROJECT:	AREA Instrumentation		REF. DWG.:	
		ICA4-CT-2002-10012	INV.AUT.:		IBT-WWT-EOLI-PID-001	
NAME:		BY: A.M.P.V.	CHK'D: J.E.L.H.	APPR. J.E.L.H.	SHEET 1 OF 1	
PH MEASUREMENT		DATE: #####	DATE:	DATE: 28/08/2003		
GENERAL	1 No. TAG.	AE/AT PH-104				
	2 Service	PH MEASUREMENT				
	3 Units	1 sensor + 1 transmitter				
	4 Measurement range	1-12 pH				
	5 Operation pressure	0.79 atm				
	6 Operation temperature	(-15°C) - (80°C)				
	7 Specific gravity	1				
	8 No. DTI	IBT-WWT-EOLI-PID-001				
	9 Components	Sensor ☐ Indicator ☒ Transmitter ☒ Blind ☐ Other ☐				
	11 Case	Standard ☒ Tamaño: STD Color: Standard Other: Note 1				
12 Sensor mounting	Surface ☐ Yuke ☐ Other: Tube 1.5" diameter					
14 Electrical classification	In motor control panel Interior area ☐ Exterior area ☒ Hazardous areas ☐ Class: _____ Group: _____ Division: _____ For non-hazardous reas ☐					
15 Electrical feed	117V 60Hz Other: _____ ca: 115 VAC					
16 Connection size (conduit)	1/2" ☒ 3/4"NPT ☐ Other: _____					
17 Chart range	Lineal ☐ 12" circular ☐ Other: _____ Range: _____ No: _____					
18 Chart drive	Elec. ☐ Spring ☐ Other: _____ 24Hr ☐ Other: _____					
19 Scale	Tipo: Range 1 _____ 2 _____ 3 _____					
20 Calibration	Internal ☐ External ☐ Remote ☐ Other: _____					
TRANSMITTER	21 Transmitter type	Neum. ☐ Elec. ☐ Intelligent electronic ☐ Other: Normal electronic				
	22 Units	1 piece				
	23 Model	CPM223-PR1105				
	24 Case suze	96 mm x 96 mm x 146 mm				
	25 Power	115 VAC				
	26 Comuication protocol	Hart ☐ Fielbus ☐ Other: _____				
27 Output information	pH / ORP and temperature					
28 Output signal	4-20 mA ☒ 10-50 mA ☐ 3-15 psig ☐ Other: _____					
29 Notes:	Sin relevador adicional					
CONTROL	30 Control mode	P ☐ PI ☐ PD ☐ PID ☐ slow ☐ Quick ☒				
	31 Action	Other: _____				
	32 Auto-manual switch	Direct ☐ Back ☐ Other: _____				
	33 Set Point	Manual External ☐ Remote ☐ Other: _____				
	34 Manual reguration	4-20 mA ☐ 10-50 mA ☐ 3-15 psig ☐ Other: _____				
	35 Output signal	Hart ☐ Fielbus ☐ Other: _____				
SENSOR	37 Type	Inserion ☐ immersion ☒ Other: _____				
	38 Model	CPS11-2AS2ESA				
	39 Enveloping material	pH combination electrode with PTFE ring diaphragm, Polytex-gel electrolyte.				
	40 Process connection	3/4" NPT ☒ 1" NPT ☐				
	41 Immersion length	120 mm				
	42 Electrode material	Glass ☐ Platino ☒ Other: With PT 100				
43 Reference electrode	Required ☒ Not required ☐					
44 Temperature compensation	Required ☒ Not required ☐					
ACCESSORIES	45 Accessories	Measuring cable CPK 9 for sensor ☒ 10 m cable Other: _____				
	46	Model CPK9-NBA3A				
Note 1: The instrument have to has aplate identification. Note 2: To chek the instrument aplication with supplier. Note 3: Supplier: Endress + Hauser. Note 4.- The sensor and transmitter wil be separates, for that reason the supplier have to supply a cable for connection between they. This cable will be 10.0 meter of length.						

		CLIENT:	HDE-015		SPEC. No.	REV. No.
		EOLI	ORP/ REDOX MEASUREMENT		A	
		PROJECT:	AREA Instrumentación		REF. DWG.:	
		ICA4-CT-2002-10012	INV.AUT.:		IBT-WWT-EOLI-PID-001	
NAME:		BY: A.M.P.V.	CHK'D: J.E.L.H.	APPR. J.E.L.H.	SHEET 1 OF 1	
ORP MEASUREMENT		DATE: 28/08/2003	DATE:	DATE: 28/08/2003		

GENERAL	1	No. TAG:	AE/AT ORP-104
	2	Service	ORP/Redox MEASUREMENT
	3	Units	1 sensor y 1 transmisor
	4	Measurement range	0-14 pH
	5	Operation pressure	0.79 atm
	6	Operation temperature	(-15°C) - (130°C)
	7	Specific gravity	1
	8	No. DTI	IBT-WWT-EOLI-PID-001
	9	Components	Sensor ☐ Indicator ☒ Transmitter ☒ Blind ☐ Other ☐
	11	Case	Standard ☒ Size: STD Color: Standard Other: Note 1
12	Montaje de sensor:	Surfase ☐ Back ☐ Yuke ☐ Other: Tube 1.5" diameter	
13	Montaje de transmisor:	In motor control panel	
14	Clasificación eléctrica	General ☐ Exterior area ☒ Hazardous areas ☐	
15	Electrical feed	Clase: _____ Grupo: _____ División: _____	
16	Connection size (conduit)	For non-hazardous reas ☐ Other: _____ CA: 115 VAC	
17	Chart range	1/2" ☒ 3/4"NPT ☐ Other: _____	
18	Chart drive	Lineal ☐ 12" circular ☐ Other: _____ Rango: _____ No: _____	
19	Scale	Elec. ☐ Spring ☐ Otro: 24Hr ☐ Other: _____	
20	Calibration	Tipo: Range 1 ☐ 2 ☐ 3 ☐ Other: _____	
TRANSMITTER	21	Transmitter type	Neum. ☐ Elec. ☐ Intelligent electronic ☐ Other: Normal electronic
	22	Units	1 pice
	23	Model	CPM223-PR1005
	24	Power	115 VAC
	25	Comunication protocol	Hart ☐ Fielbus ☐ Other: _____
	26	Output information	pH / ORP
27	Output signal	4-20 mA ☒ 10-50 mA ☐ 3-15 psig ☐ Other: _____	
28	Case size	96 mm x 96 mm x 146 mm	
29	Notes:		
CONTROL	30	Control mode	P ☐ PI ☐ PD ☐ PID ☐ slow ☐ Quick ☒
	31	Action	Other: _____ Direct ☐ Back ☐ Other: _____
	32	Auto-manual switch	Manual ☐ External ☐ Remote ☐ Other: _____
	33	Set Point	4-20 mA ☐ 10-50 mA ☐ 3-15 psig ☐ Other: _____
	34	Manual reguration	Hart ☐ Fielbus ☐ Other: _____
	35	Output signal	4-20 mA ☐ 10-50 mA ☐ 3-15 psig ☐ Other: _____
SENSOR	36	Comunication protocol	4-20 mA ☐ 10-50 mA ☐ 3-15 psig ☐ Other: _____
	37	Type	Inserion ☐ Immersion ☒ Other: _____
	38	Model	CPS12-0PA2ESA
	39	Enveloping material	Electrodo de PTFE, diafragma de Polytex-gel electrolítico y encapsulado.
	40	Process connection	3/4" NPT ☒ 1" NPT ☐
	41	Immersion length	120 mm
	42	Electrode material	Glass ☐ Platino ☒ Other: PT 100
43	Reference electrode	Required ☒ Not required ☐	
44	Temperature compensation	Required ☒ Not required ☐	
ACCESSORIES	45	Accessories	Measuring cable CPK 9 for sensor ☒ 10 m cable Other: _____
	46		Model CPK9-NBA1A

Note 1: The instrument have to has aplate identification.

Note 2: To chek the instrument aplication with supplier.

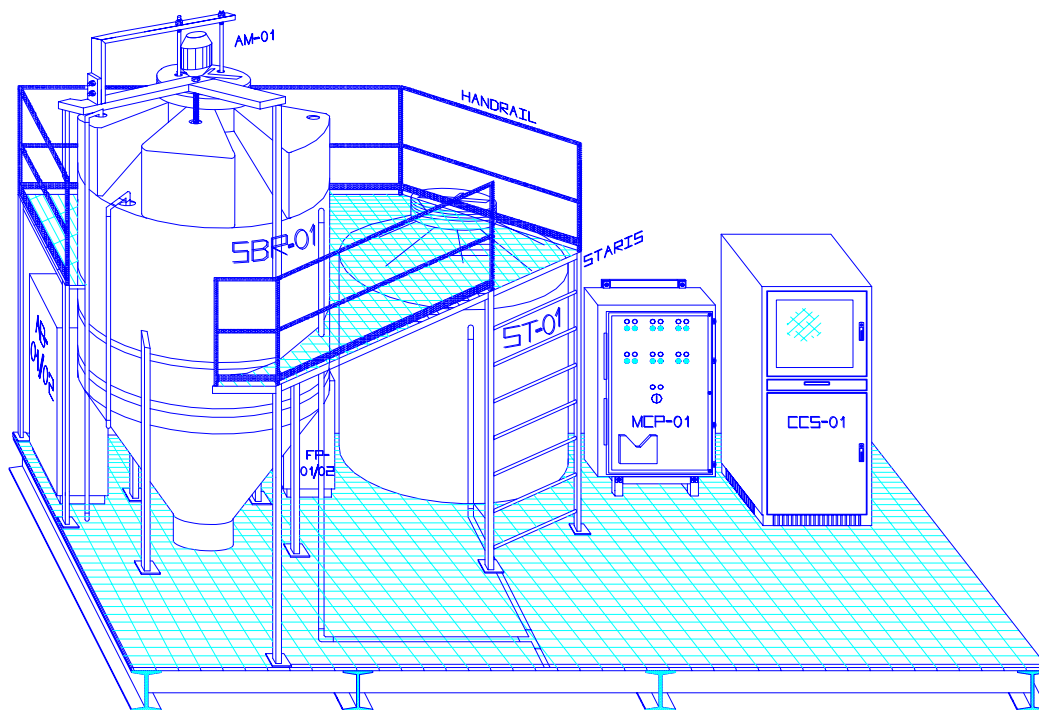
Note 3: Supplier: Endress + Hauser.

Note 4.- The sensor and transmitter wil be separates, for that reason the supplier have to supply a cable for connection between they. This cable will be 10.0 meter of length.

	PLANT: EOLI		HDE-017 VALVE ON / OFF		REV. No. A	
	PROJECT: ICA4-CT-2002-10012		AREA Instrumentation		REF. DWG.: IBT-EOLI-WWT-PID-001	
	NAME: MEDIDOR TRANSMISOR DE NIVEL		BY: A.M.P.V. DATE: 06/10/2003	CHK'D: J.E.L.H. DATE: 06/10/2003	APPR. J.E.L.H. DATE: 06/10/2003	SHEET 1 OF 1
GENERAL	1	No. TAG.	FCV-01			
	2	Service	Process sludge			
	3	Line No.	1.5"-PVC-SP-09			
	4	Line diameter	1.5"			
	5	Schedule and material line	PVC 40			
VALVE AND POSITIONER	6	Body type	BOLA			
	7	Body size	1.5"			
	8	Connection type	SCREWED			
	9	Body material	PVC			
	10	Seal material	TEFLON			
	11	Materials				
	12	Body	PVC			
	13	Plug & seat	PVC			
	14	Operation	Direct			
	15	No. de modelo y tamaño	*			
ACTUATOR	16	Actuator type	Elec.			
	17	Air fails valve	Close			
	18	Action	Open/close			
	19	Other	---			
	20	Encapsulado	NEMA 4			
	21	Volts	120 volts / 1 phase			
	22	Hertz	60			
	23	Spoll type	H			
	24	Spoll operation	EASY			
SERVICE	25	Fluid	Process sludge			
	26	Flow unit	l/min			
	27	Qty. Max.				
	28	Qty. Normal				
	29	Operation pressure	74.5" in H2O			
	30	Pressure maximum	74.5" in H2O			
	31	Operation temperature	18.6°C			
	32	Specific gravity	1.06			
	33	Viscosity				
	34	Brand	*			
	35	Model	*			
	36	D.T.I.	IBT-WWT-EOLI-PID-001			

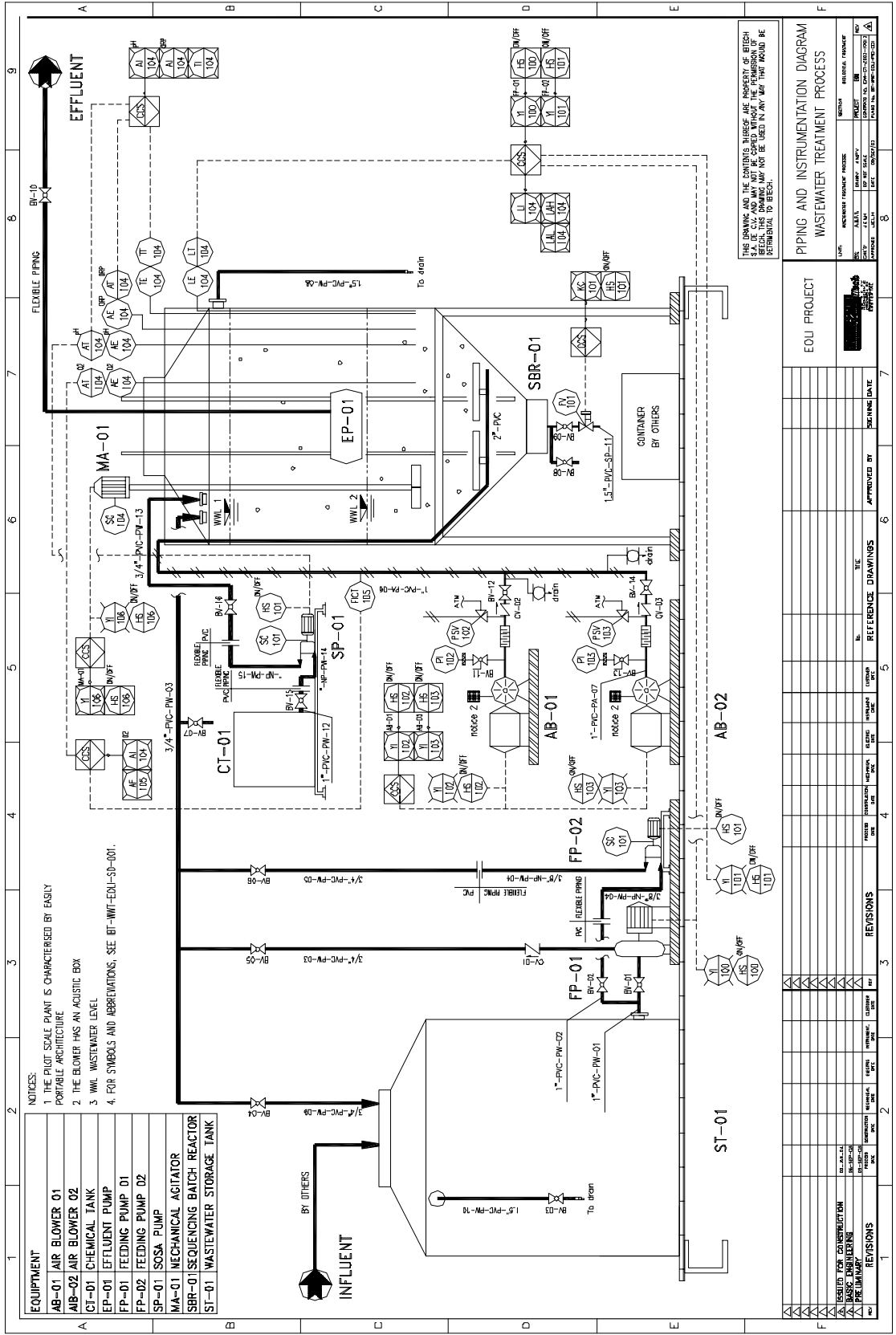
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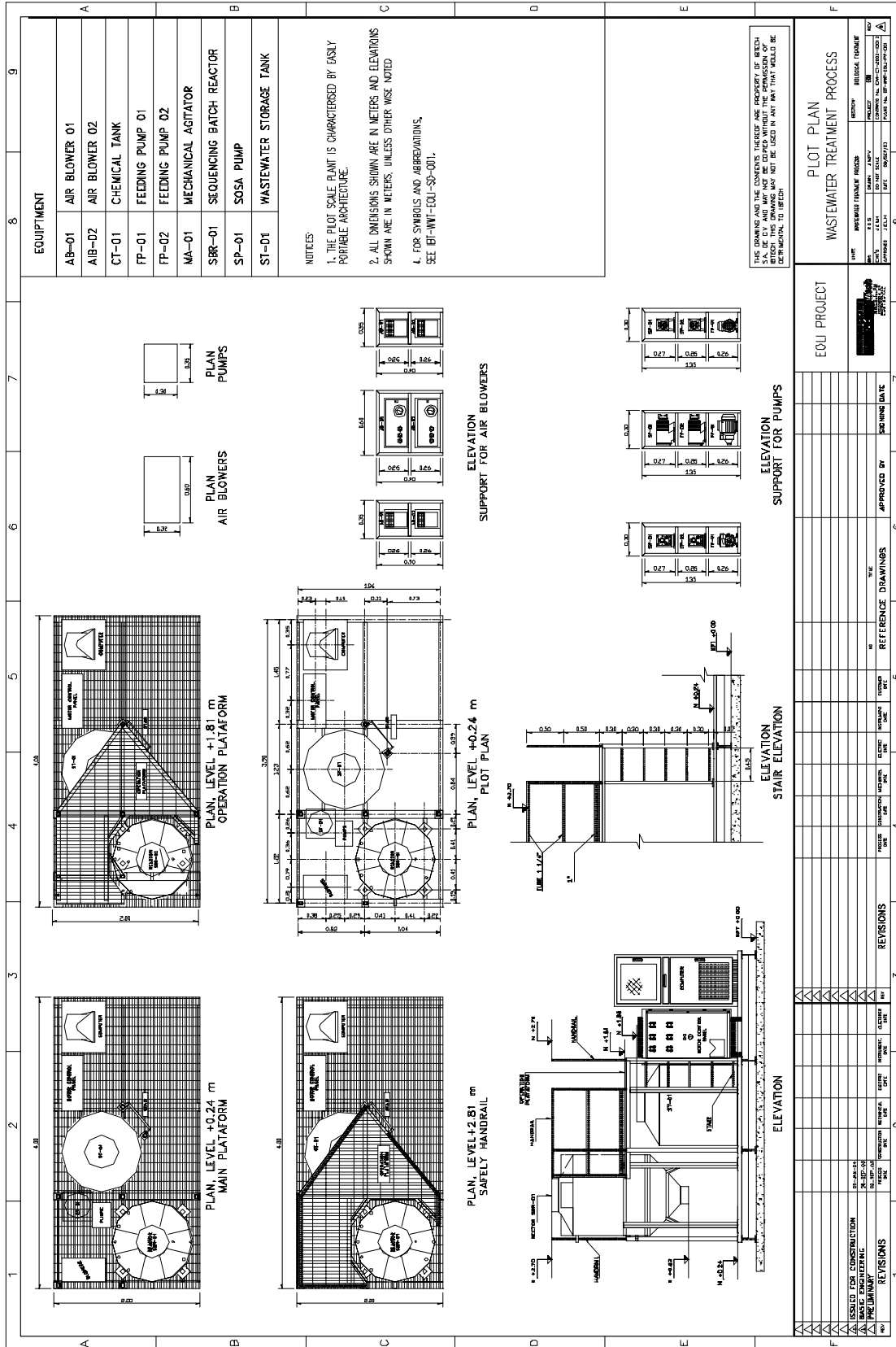
- 1.- * By supplier.
- 2.- The valve will can close or open in manual manner.



2. BASIC ENGINEERING

2.4. DIAGRAMS AND DRAWINGS





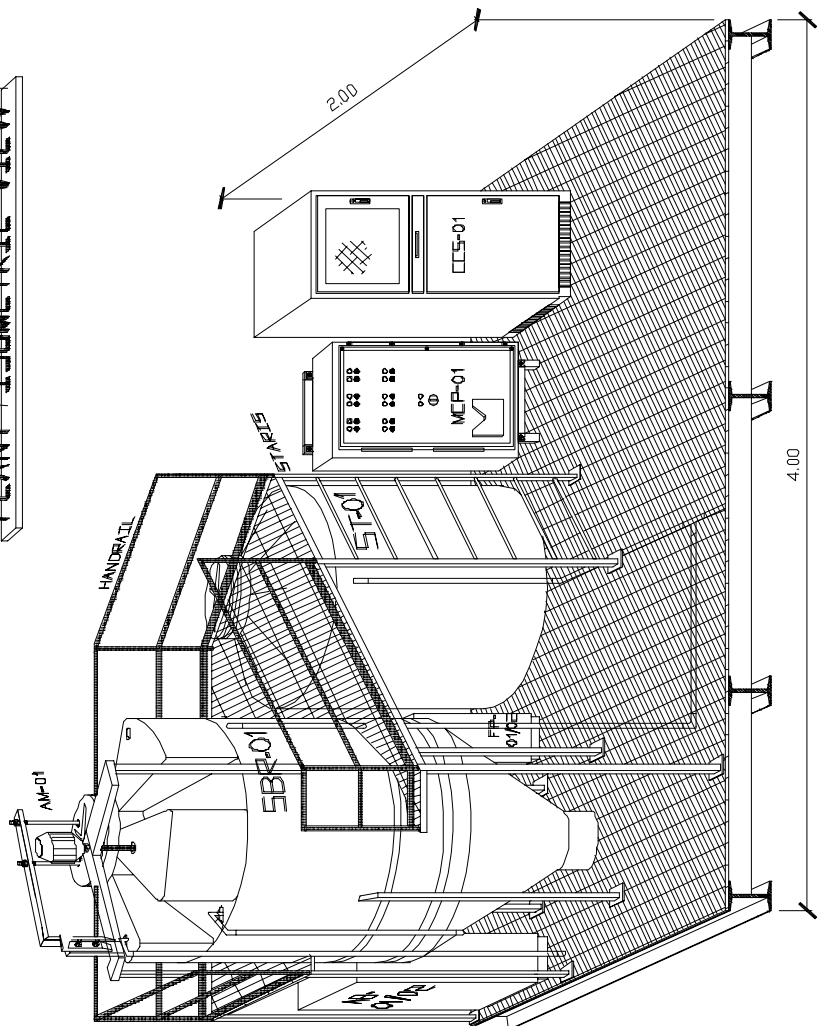
EQUIPMENT
AB-01 AIR BLOWER 01
AIB-02 AIR BLOWER 02
FP-01 FEEDING PUMP 01
FP-02 FEEDING PUMP 02
MA-01 MECHANICAL AGITATOR
SBR-01 SEQUENCING BATCH REACTOR
ST-01 WASTEWATER STORAGE TANK

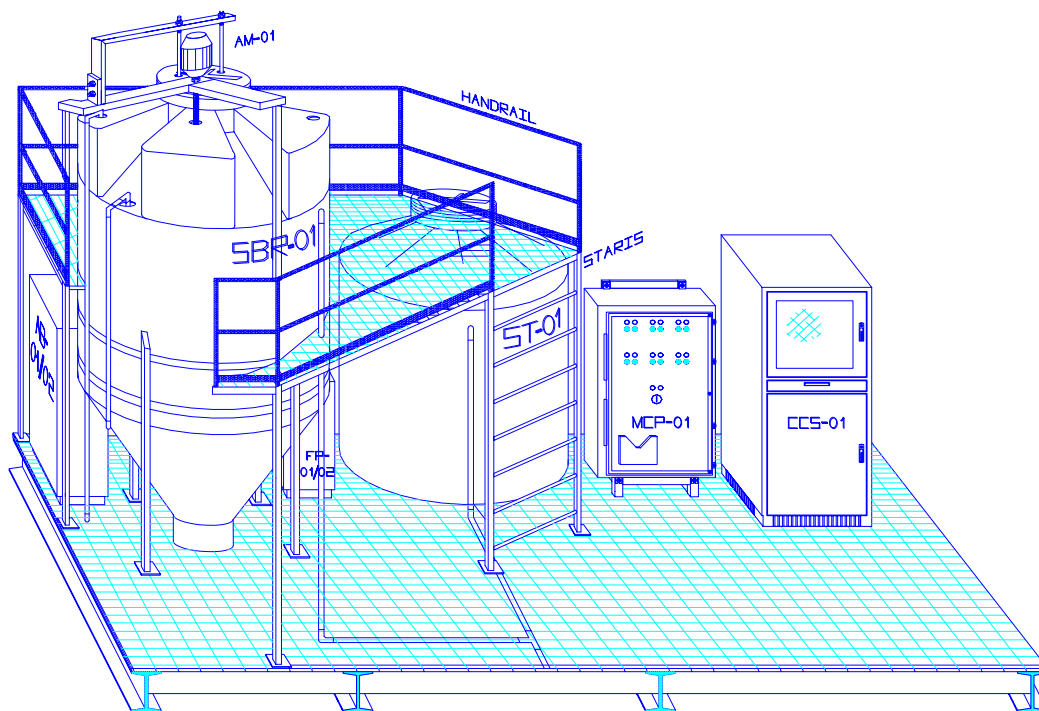
EQUIPMENT
AB-01 AIR BLOWER 01
AIB-02 AIR BLOWER 02
FP-01 FEEDING PUMP 01
FP-02 FEEDING PUMP 02
MA-01 MECHANICAL AGITATOR
SBR-01 SEQUENCING BATCH REACTOR
ST-01 WASTEWATER STORAGE TANK

NOTICES:

1. THE PILOT SCALE PLANT IS CHARACTERISED BY EASILY PORTABLE ARCHITECTURE.

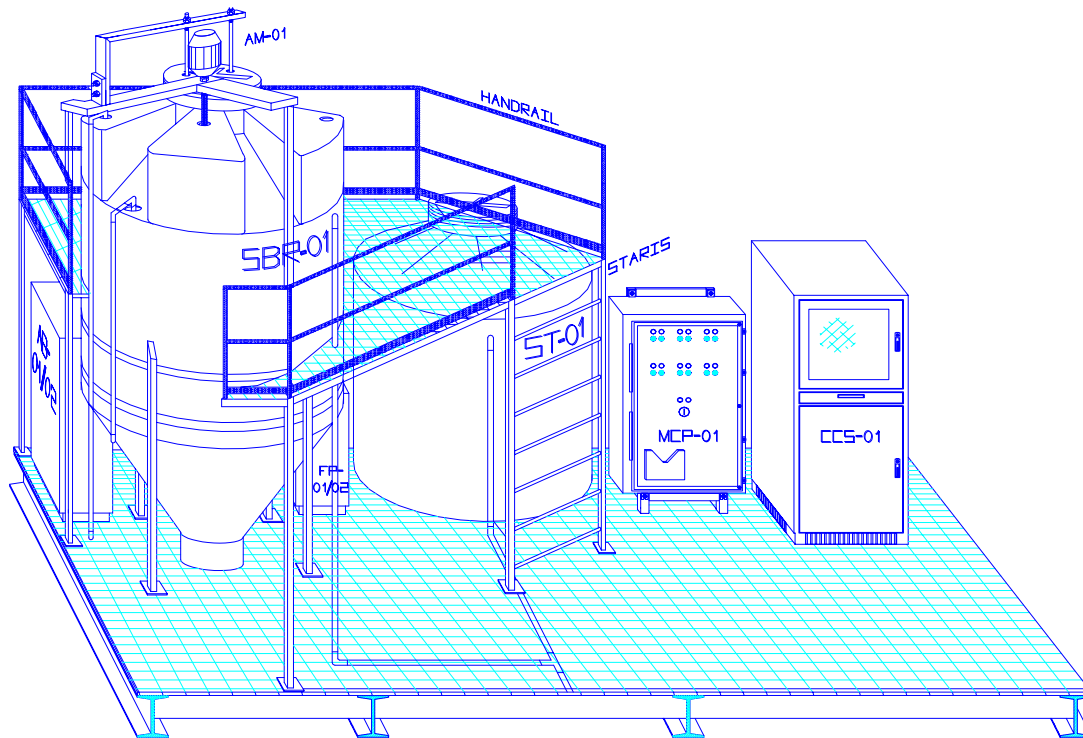
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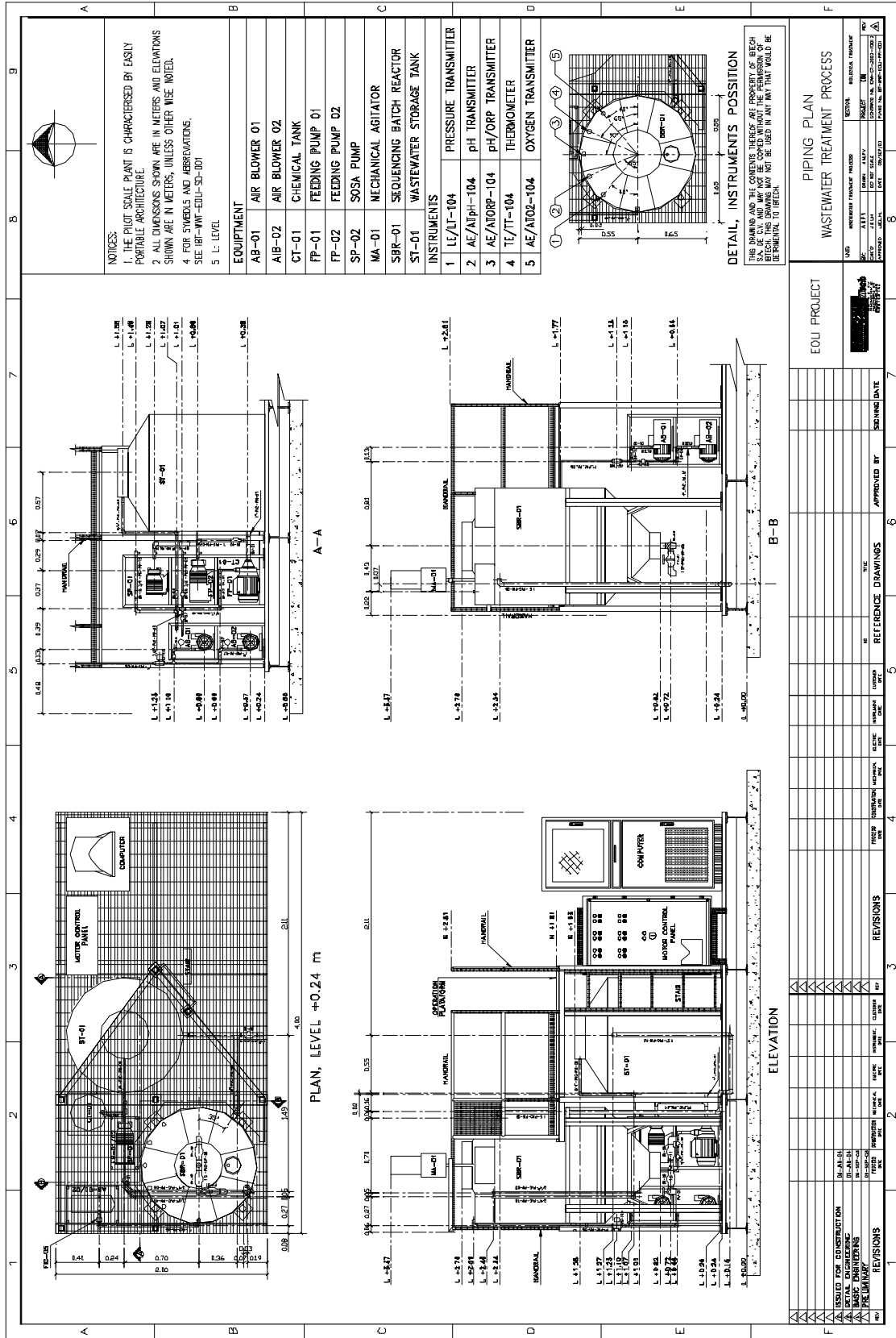
3. DETAIL ENGINEERING

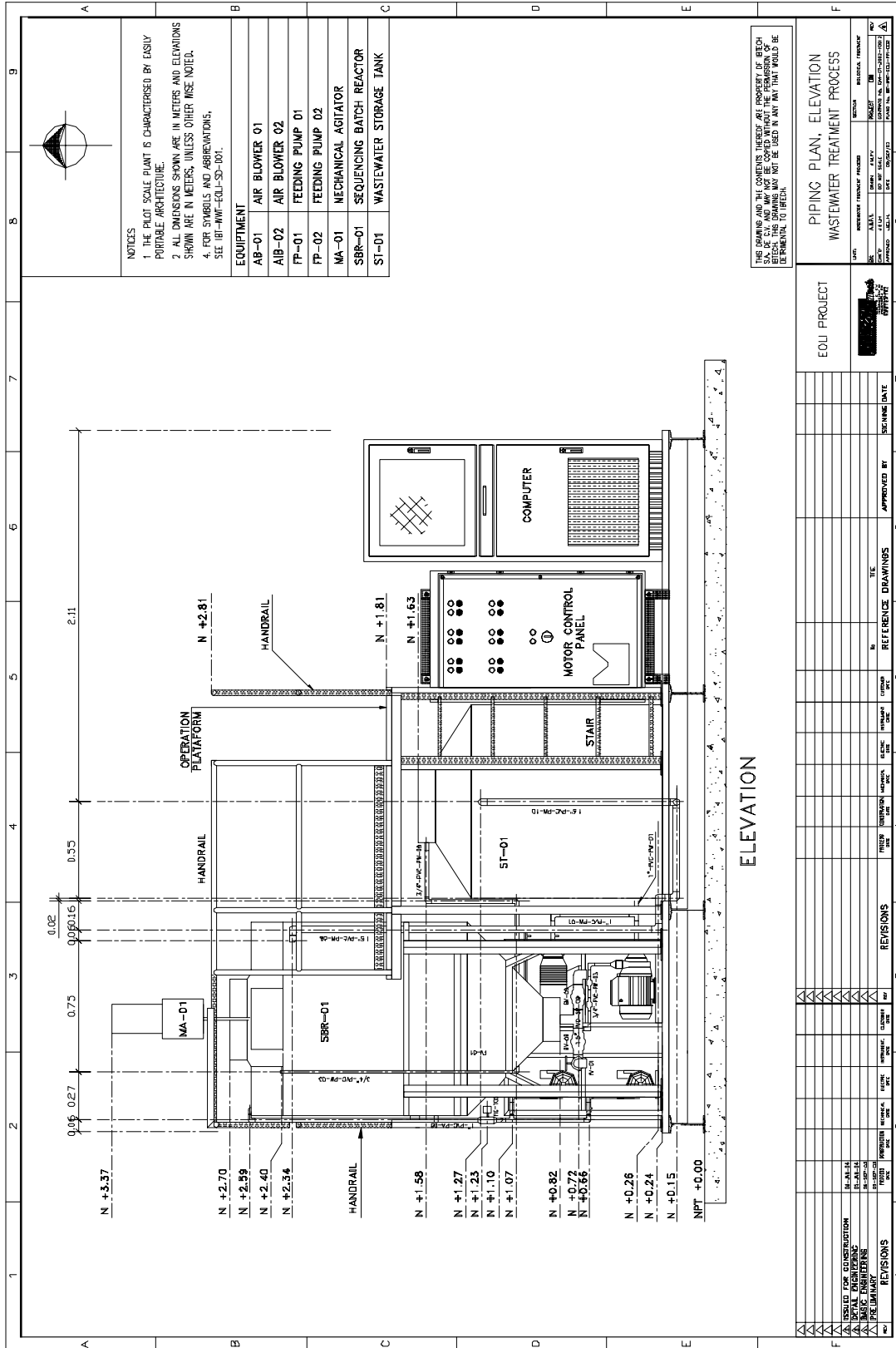
3.1. STRUCTURE AND SUPPORTS PROJECT

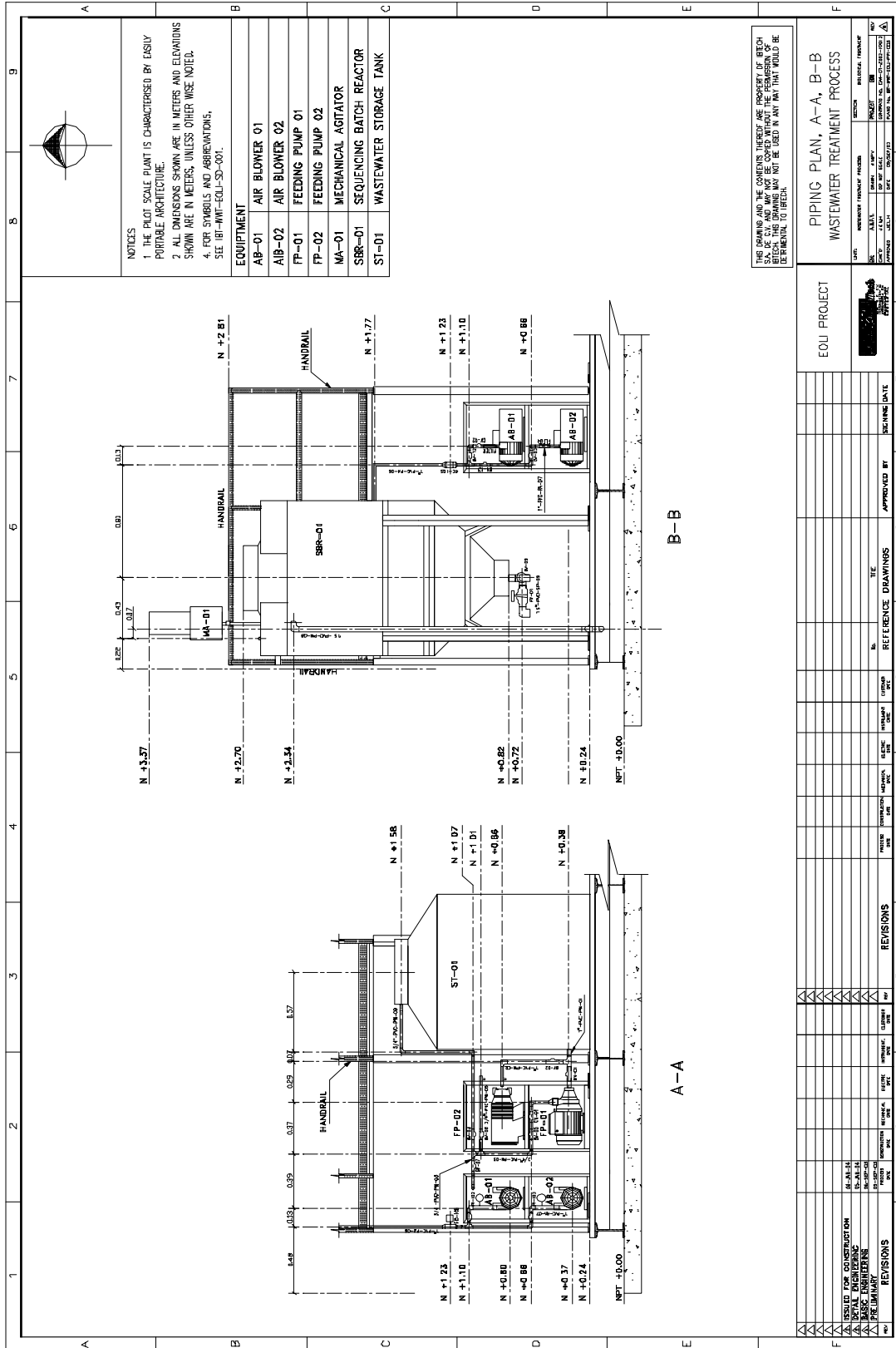


3. DETAIL ENGINEERING

3.2. PIPING PROJECT







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PIPING PLAN, A-A, B-B			
WASTEWATER TREATMENT PROCESS			
DATE	REVISION	PROJECT	SECTION
2023-01-10	1	IBT	IBT
2023-01-10	2	IBT	IBT
2023-01-10	3	IBT	IBT
2023-01-10	4	IBT	IBT
2023-01-10	5	IBT	IBT
2023-01-10	6	IBT	IBT
2023-01-10	7	IBT	IBT
2023-01-10	8	IBT	IBT
2023-01-10	9	IBT	IBT
2023-01-10	10	IBT	IBT

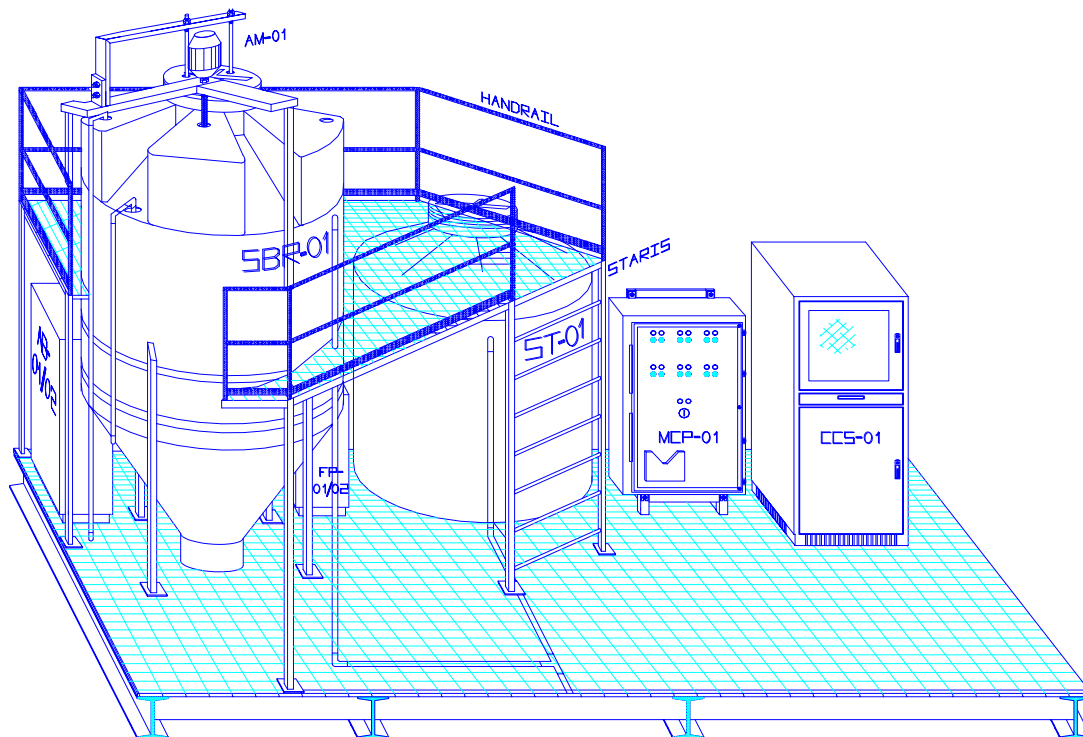
EQU PROJECT			
DATE	REVISION	PROJECT	SECTION
2023-01-10	1	IBT	IBT
2023-01-10	2	IBT	IBT
2023-01-10	3	IBT	IBT
2023-01-10	4	IBT	IBT
2023-01-10	5	IBT	IBT
2023-01-10	6	IBT	IBT
2023-01-10	7	IBT	IBT
2023-01-10	8	IBT	IBT
2023-01-10	9	IBT	IBT
2023-01-10	10	IBT	IBT



BILL OF MATERIAL

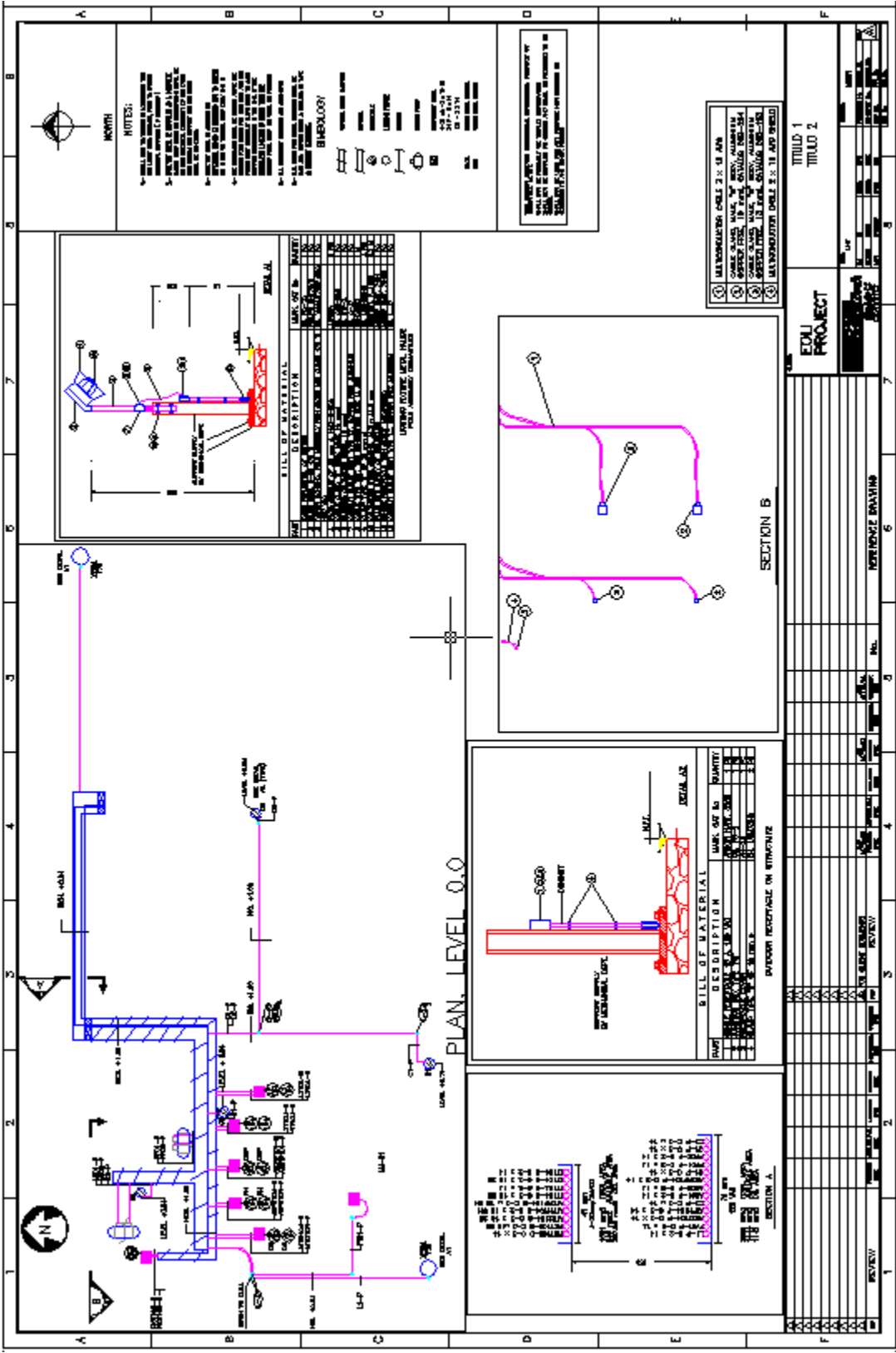
Date: 30/03/2004
 By: AMPV
 Chk'd: ROS
 Approved: ROS

ITEM	DESCRIPTION	UNIT	QUANTITY
1.0	PVC hydraulic pipe 3/4".	meter	12
2.0	PVC hydraulic pipe 1".	meter	6.0
3.0	PVC hydraulic pipe 1 1/2".	meter	6
4.0	PVC hydraulic pipe 2".	meter	6
5.0	90 deg. elbow 3/4", PVC hydraulic.	pc	6
6.0	90 deg. elbow 1", PVC hydraulic.	pc	4
7.0	90 deg. elbow 1 1/2", PVC hydraulic.	pc	3
8.0	90 deg. elbow 2", PVC hydraulic.	pc	4
9.0	Ball valve 3/4", PVC hydraulic.	pc	5
10.0	Ball valve 1", PVC hydraulic.	pc	4
11.0	Ball valve 1 1/2", PVC hydraulic.	pc	1
12.0	Check valve 3/4", PVC hydraulic.	pc	3
13.0	Tee 3/4", PVC hydraulic.	pc	1
14.0	Tee 1", PVC hydraulic.	pc	1
15.0	Tee 1 1/2", PVC hydraulic.	pc	1
16.0	Tee 2", PVC hydraulic.	pc	1
17.0	Adapter 3/4", PVC hydraulic.	pc	2
18.0	Adapter 1", PVC hydraulic.	pc	1
19.0	Adapter 1" 1/2", PVC hydraulic.	pc	3
20.0	Adapter 3/4", PVC hydraulic.	pc	1
21.0	Adapter 1", PVC hydraulic.	pc	1
22.0	Reducer 2" x 1", PVC hydraulic.	pc	1
23.0	Reducer 1" x 3/4", PVC hydraulic.	pc	2



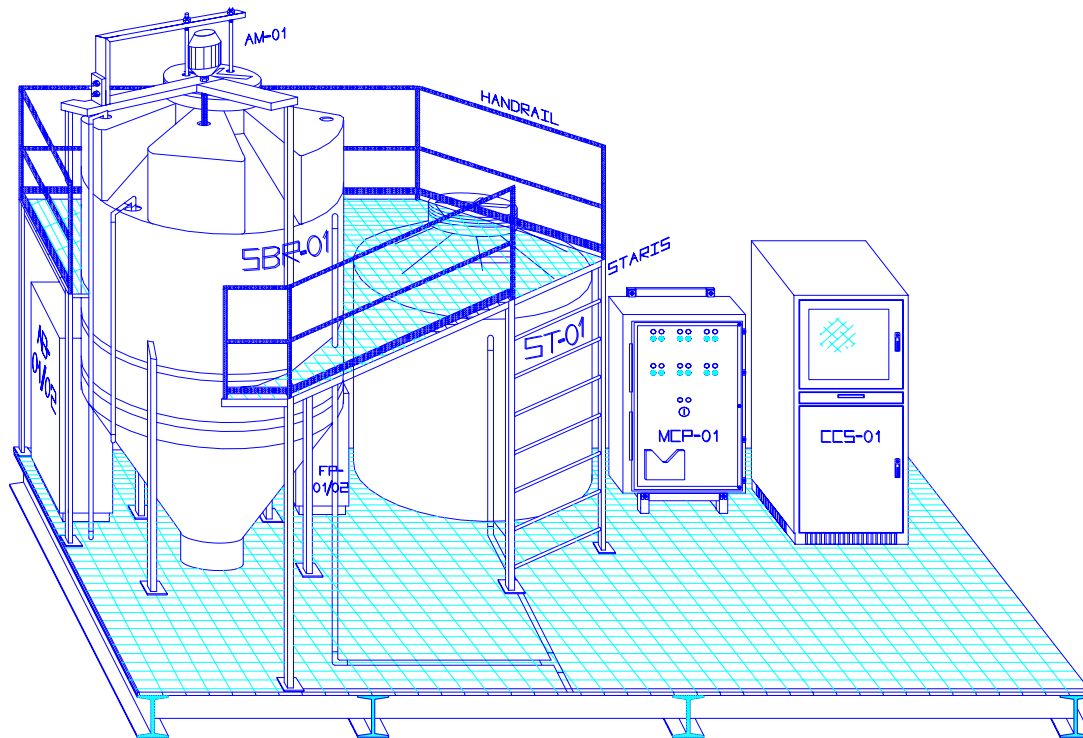
3. DETAIL ENGINEERING

3.3. POWER AND CONTROL (ELECTRICAL PROJECT)



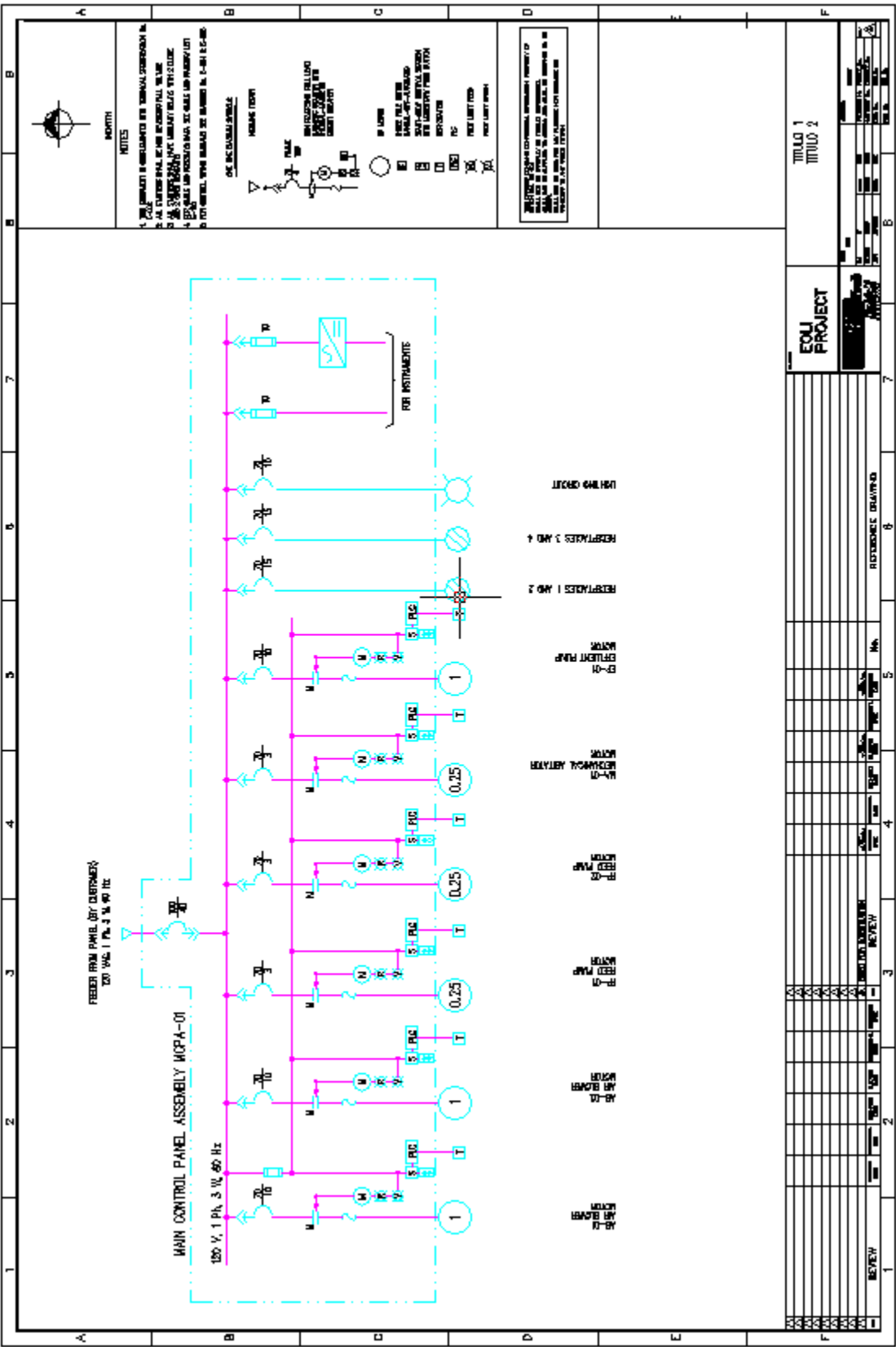
ITEM	DESCRIPTION	UNIT	QUANTITY
1	GALVANIZED STEEL RECEPTACLE COVER, FOR JUNCTION BOX RECTANGULAR, STANDARD FINISHED, 19 mm OF DIAMETER MARK ARROW HART, CATALOG AH-23	PC	4
2	CONDUIT OUTLET BODY TYPE "L" ALUMINIUM COPPER FREE STANDARD FINISHED, 32 mm OF DIAMETER MARK CROUSE HINDS DOMEX, CATALOG L-47	PC	2
3	CONDUIT OUTLET BODY TYPE "C" ALUMINIUM COPPER FREE STANDARD FINISHED, 32 mm OF DIAMETER MARK CROUSE HINDS DOMEX, CATALOG C-47	PC	2
4	JUNCTION BOX TYPE "T" ALUMINIUM COPPER FREE STANDARD FINISHED, 32 mm OF DIAMETER MARK CROUSE HINDS DOMEX, CATALOG T-47	PC	1
5	JUNCTION BOX TYPE "FS" ALUMINIUM COPPER FREE STANDARD FINISHED, 19 mm OF DIAMETER MARK CROUSE HINDS DOMEX, CATALOG FS-2	PC	4
6	JUNCTION BOX TYPE "L" ALUMINIUM COPPER FREE STANDARD FINISHED, 19 mm OF DIAMETER MARK CROUSE HINDS DOMEX, CATALOG L-27	PC	2
7	SINGLE RECEPTACLE 15 A, 120 VAC MARK ARROW HART, CATALOG 5250	PC	4
8	DOME REFLECTOR KRYDON, MARK CROUSE HINDS, CATALOG RD-70	PC	2
9	BULB ED28, E-39, 175 W, MARK PHILIPS, CATALOG MH175/U	PC	2
10	VAPORTIGHT LIGHTING,POLE ASSEMBLY WITH GLOBE AND GUARD 175 W, MARK CROUSE HINDS, CATALOG VMVMJ175GP	PC	2
11	RIGID CONDUIT, GALVANIZED STEEL, THREADED IN THE EXTREME IN ACCORDANCE TO STANDARD NMX-B-209, WITH PROTECT INSIDE AND OUTSIDE, 150 Gr/m2 OF ZINC, 3050 mm OF LENGHT AND 19 mm OF DIAMETER, MARK JUPITER	PC	2
12	RIGID CONDUIT, GALVANIZED STEEL, THREADED IN THE EXTREME IN ACCORDANCE TO STANDARD NMX-B-209, WITH PROTECT INSIDE AND OUTSIDE, 150 Gr/m2 OF ZINC, 3050 mm OF LENGHT AND 32 mm OF DIAMETER, MARK JUPITER	PC	5
13	SINGLE CHANNEL OF 76.2 OF WIDTH, GALVANIZED STEEL SIZE 14, OF 2.8 KG/M 3660 mm OF LENGHT MARK CROUSE HINDS, CATALOG CTR-1	PC	2
14	SINGLE CHANNEL OF 41.3 OF WIDTH, GALVANIZED STEEL SIZE 12, OF 2.8 KG/M 3050 mm OF LENGHT MARK UNISTRUT, CATALOG P-1000	PC	3

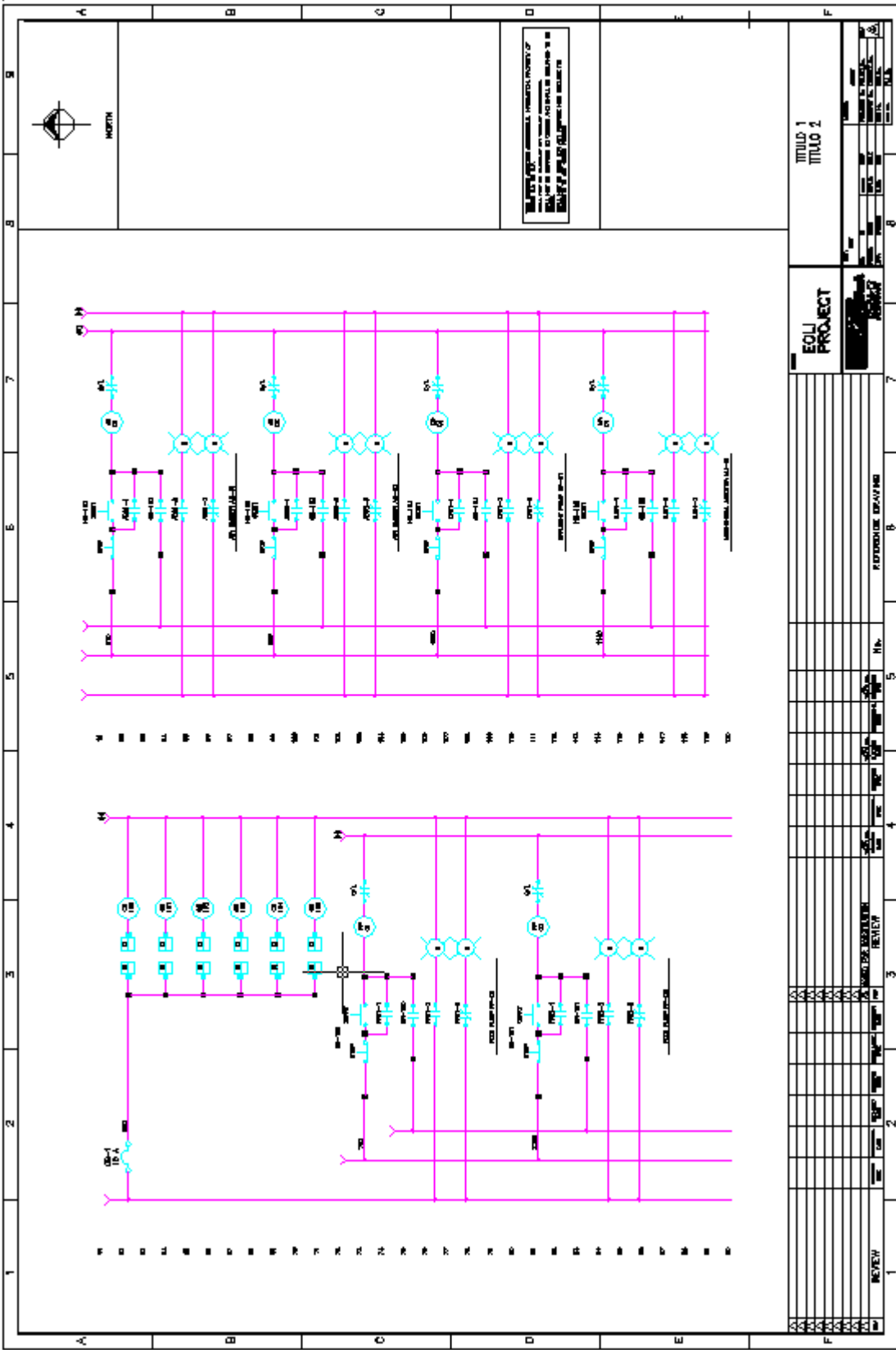
ITEM	DESCRIPTION	UNIT	QUANTITY
15	CLAMP TYPE "U" 32 mm OF DIAMETER, FOR CONDUIT MARK CROUSE HINDS, CATALOG UBM125HD	PC	8
16	CLAMP TYPE "U" 19 mm OF DIAMETER, FOR CONDUIT MARK CROUSE HINDS, CATALOG UBM75HD	PC	8
17	MULTICONDUCTOR CONTROL CABLE, SOFT COPPER WITH INSULATION TYPE THW-LS-PVC, 75 °C OF TEMPERATURE OF OPERATION, FOR 600 V, 2 CONDUCTORS, SIZE 14 AWG MARK CONDUMEX OR SIMILAR	M	159
18	MULTICONDUCTOR INSTRUMENTATION CABLE, OF COPPER TINED WITH INSULATION TYPE PVC, 75 °C OF TEMPERATURE OF OPERATION, 6 TRIAD WITH SINGLE SCREEN SIZE 16 AWG, MARK DECORON OR SIMILAR	M	56
19	CABLE GLAND "C" BODY, MALE 19 mm OF DIAMETER MARK CROUSE HINDS, CATALOG CGB-295	PC	2
20	CABLE TYPE "SO", TWO CONDUCTORS, SIZE 14 AWG MARK CONDUMEX OR SIMILAR	M	2
21	GALVANIZED STEEL CHANNEL, OF 41.3 x 41.3 mm MARK UNISTRUT, CATALOG P-1000	M	0.6
22	PLUG WITH SAFETY OF MEDAROUND, MARK ARROW HART, CATALOG 7101	PC	2
23	SINGLE RECEPTACLE WITH SAFETY MEDAROUND, MARK ARROW HART, CATALOG 7210B	PC	2
24	REDUCER BUSHING ALUMINIUM, 32 mm OF DIAMETER TO 19 mm OF DIAMETER, MARK CROUSE HINDS DOMEX, CATALOG RE-42	PC	2
25	BUSHING GALVANIZED STEEL, 19 mm OF DIAMETER, MARK CE, CATALOG CTF-3	PC	2
26	CABLE GLAND, MALE, "B" BODY, ALUMINIUM COPPER FREE, 13 mm OF DIAMETER, MARK CROUSE HINDS, CATALOG CGB-193	PC	1
27	CABLE GLAND, MALE, "B" BODY, ALUMINIUM COPPER FREE, 19 mm OF DIAMETER, MARK CROUSE HINDS, CATALOG CGB-294	PC	4

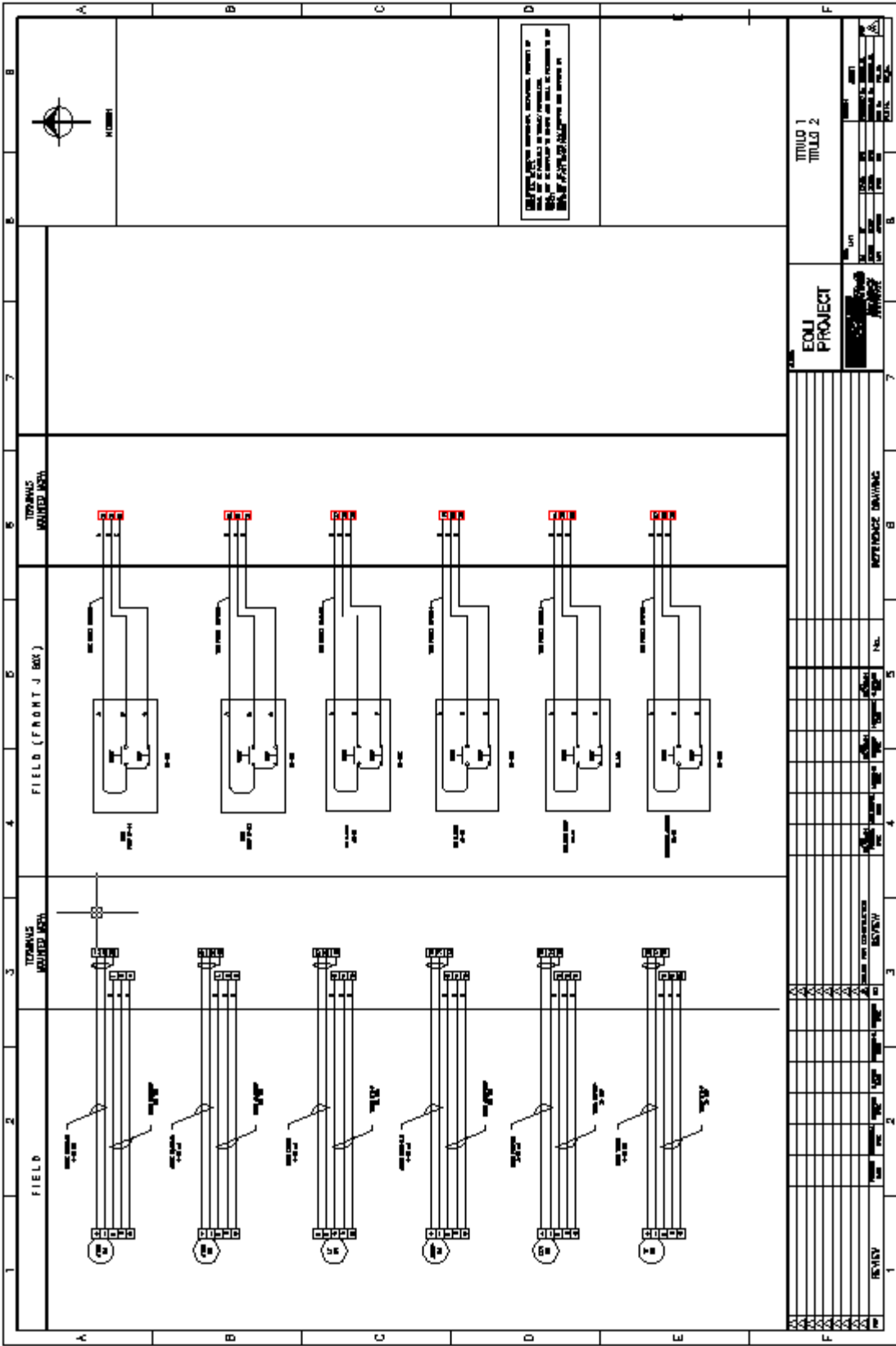


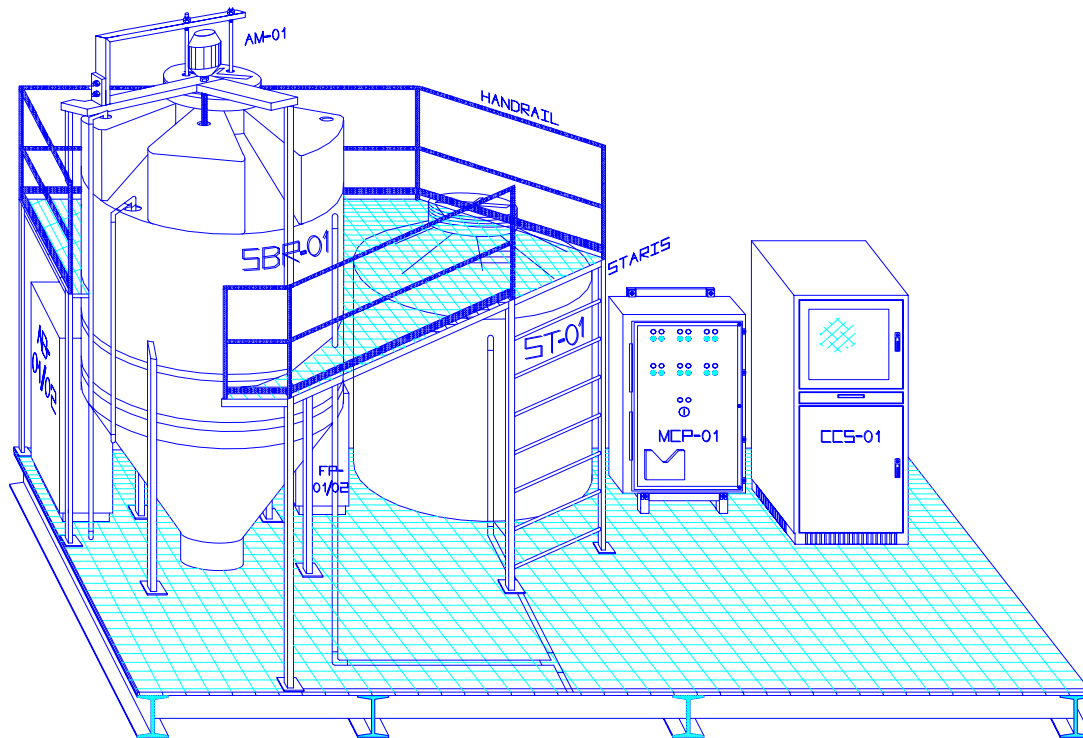
3. DETAIL ENGINEERING

3.4. WIRING CONTROL DIAGRAM









3. DETAIL ENGINEERING

3.5. Rb MAIN CONTROL PANEL

PLANT: E O L I DATE NO. ESPEC. PROJECT: WASTE WATER EFFLUENT TREATMENT PILOT PLANT
 3-10-03 IBT-WWT-EOLI-E-101 BY AREA: V.L.Z.B. PTAR REVIEW DEPT: J.S.R. ELÉCTRICAL
 APPROVAL SHEET MAIN CONTROL PANEL ASSEMBLY A.M.P. 1 OF 1

B	For Quotation
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MAIN CONTROL PANEL SPECIFICATION

OF 120 VOLTS

No. MCPA-01

B/25-03-04	F.C.S.R.	V.L.Z.B.	J.S.R.	FOR QUOTATION
A/28-09-03	F.C.S.R.	V.L.Z.B.	J.S.R.	FOR CLIENT COMMENTS
REVIEW /DATE	BY	CHECKED	APPROVED	DESCRIPTION

PLANT: E O L I DATE NO. ESPEC. PROJECT: WASTE WATER EFFLUENT TREATMENT PILOT PLANT
3-10-03 IBT-WWT-EOLI-E-101 BY AREA: V.L.Z.B. PTAR REVIEW DEPT: J.S.R. ELÉCTRICAL
APPROVAL SHEET MAIN CONTROL PANEL ASSEMBLY A.M.P. 2 OF 2

I N D E X

A. SCOPE

1. Working Included
2. Working not included

B. Compliance with codes and standards

C. Technical Requirements

1. General
2. Enclosures, wiring and nameplates
3. Incoming line and starters
4. Buses and connections
5. Accessories

D. Tests and Inspections

E. PACKAGE AND SHIPMENT

1. Package

2. Shipment

F. GUARANTY

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APPROVAL SHEET MAIN CONTROL PANEL ASSEMBLY A.M.P. 3 OF 3

A. SCOPE

I. Working included

1.1 This specification cover design, manufacturer, test and operation of main control panel, totally assembled in accordance with requirements indicated in this specification.

1.2 Any discrepancy between requirement in this specification and technical data, shall be cleared and listed exceptions and deviations to specificated.

The manufacturer accept the indicated in this specification and not mentioned with exception or deviation, shall be included in the supply

2. Working not included

The following working not included in the manufacturer vendor

2.1 foundations.

2.2 installation materials except materials indicated in this specification.

2.3 connections with others equipments.

B. COMPLIANCE WITH CODES AND STANDARDS.

The equipment shall be compliance the assembled with following codes and standards

Norma Oficial Mexicana NOM-001 SEDE-1999 de la Secretaría de Energía-

National Electric Code (NEC)

Institute of Electrical and Electronics Engineers (IEEE).

National Electrical Manufactures Association (NEMA)

American National Standards Institute (ANSI).

International Electrotechnical Commission (IEC)

American Welding Society (AWS)

Asociación Nacional de Certificación Eléctrica (ANCE)

C. TECHNICAL REQUIREMENTS

1. General

1.1 The assembly shall be in accordance with designation of Dirección General de Normas NOM, voltage, phases, wires, frequency, class, wiring type, bracing and complementary data, shall be indicated in technical data.

1.2 Main control panel to outdoor service, shall consist of metallic junction box, bolted and gasket door, inside the control panel shall be equipment described on the oneline diagram and control diagram, and assembly in accordance with reference drawings.

1.3 Temperature bus and main connections not shall be exceed to 50 °C above ambient temperature at 40 ° C in outdoor assembly

1.4 the over temperature in cable terminals not shall be exceed to 55 ° C. This temperature is equipment operated with nominal current.

1.5 All materials used in the construction for equipment supply, shall be approved for standards. The material and accessories shall be approved for the proprietary or IBTech S.A. de C.V.

1.6 All parts and drawings shall be made with precision used metric system, with conversion to English system. All nameplates titles shall be indicated in English.

1.7 All working shall be made for technical specialist in any working and followed advanced techniques for equipments required. The codes and standards indicated in paragraph B, shall be more actualized.

Unless otherwise noted, the materials and equipment to supply shall be compliance with following general technical conditions.

2. Enclosures, Wiring and Nameplates.

2.1 The MCPA enclosure shall be outdoor-purpose, 3R NEMA, suitable for installation in the environment described in paragraph C 1.2

2.2 Enclosures shall be junction box with bolted and gasket door.

2.3 The assembly shall be painted light gray, ANSI No 61 after fabrication and prior to painting, all steel work shall be thoroughly cleaned, given a rust-preventive treatment, and painted with a rust-resistive priming coat.

2.4 MCPA shall be grounded to a common copper ground terminal. The ground bus shall be provide one (1) compression lugs, suitable for terminating 2/0 AWG(60 MM²) copper conductors.

2.5 All terminal connectors for power supply cables shall be provided by vendor. Cable sizes shall be given in the corresponding oneline diagram (in accordance to hp power). Connectors shall be mechanic, provided with bolts and nuts.

2.6 Wiring of the starters shall be in accordance with NEMA class I type A.

2.7 All control wiring in the MCPA shall be made with a minimum cable size of 14 AWG.

2.8 The wiring for external circuits connections shall be taken to terminal boards. Contacts for relays, control selector, etc., shall be wired to terminal boards in order to enable their connection for external circuits. Terminal boards shall be 600 V with protective barriers and number for identification. A minimum 30 % terminals per board shall be left as spares, in each starter.

3. Incoming line and starters

3.1 The main thermalmagnetic circuit breakers in the MCPA shall be, manual or electrical operation, one pole, removable mounting. For characteristics see oneline diagram.

3.2 The power supply shall be by means plug 2 poles 3 wires, 50 A, NEMA 3R, incoming with cable cord with cable gland bottom. Cable length shall be 30 meters and FRP reel.

3.3 Combinations shall consist in a magnetic starter, for providing protection against over load, and thermalmagnetic circuit breaker. Starters shall be full voltage, non reversing, to be used with squirrel cage induction motors.

3.4 Starters shall have one (1) overload relay with manual or automatic reset. Thermal elements shall be select so as to provide adequate protection to the motor either against overloads or against blocked rotor current and also to allow in to accelerate driven load.

3.5 Control shall be at 120 VAC by means control bus for all starter.

3.6 Each starter shall include as a minimum two (2) normally open and two (2) normally closed dry contacts for use by others. Contacts shall be wired out to terminal blocks.

4. Buses y Connections.

4.1 power bus for MCP shall be continuous current carrying capacity, in accordance with oneline diagram. Main buses horizontal and vertical, shall be made copper cable in accordance with rules and standards.

4.2 Joint connections for all cables shall be terminal blocks and each connection shall be with copper terminal in accordance with reference drawings, unless vendor supply other assembly approved by IBTech S.A. de C.V.

4.3 All cables connections shall be supported with channels.

5. ACCESORIES

5.1. General

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3-10-03 IBT-WWT-EOLI-E-101 BY AREA: V.L.Z.B. PTAR REVIEW DEPT: J.S.R. ELÉCTRICAL
APPROVAL SHEET MAIN CONTROL PANEL ASSEMBLY A.M.P. 6 OF 6

All accessories specified, pilots light, push bottom stations, switches, shall be mounted in door, instrument starters relays, terminal blocks shall be mounted in channels and supports required.

All accessories shall be operated voltage 115 V 60 Hz

Main control panel shall be following equipment for each starter an branch circuit.:

- 1.1 green and red pilot light.
- 1.2 Restore bottom for thermal elements.
- 1.3 bimetallic thermal overload relay
- 1.4 push bottoms for start stop
- 1.5 identified plate for each starter or branch circuit.
- 1.6 For wiring diagram see reference drawing

IBT-WWT-EOLI-E-001 ONELINE DIAGRAM

IBT-WWT-EOLI-E-002 CONTROL DIAGRAM GENERAL NOTES AND LEGEND

IBT-WWT-EOLI-E-003 CONTROL DIAGRAM SYMBOLS

IBT-WWT-EOLI-E-004 CONTROL DIAGRAM 120 VAC

IBT-WWT-EOLI-E-005 CONTROL DIAGRAM 120 VAC

IBT-WWT-EOLI-E-006 MAIN CONTROL PANEL ASSEMBLY

IBT-WWT-EOLI-E-007 MAIN CONTROL PANEL ASSEMBLY PLC RACK

IBT-WWT-EOLI-E-008 WIRING CONTROL DIAGRAM INSTRUMENT & PB

IBT-WWT-EOLI-E-009 WIRING CONTROL DIAGRAM I/O

IBT-WWT-EOLI-E-010 WIRING CONTROL DIAGRAM ANALOG

The main control panel shall have an main identified plate for total assembly in top front "MAIN CONTROL PANEL EOLI PTAR No. MCPA -01"

D. TESTS AND INSPECTIONS

1. General

The routine tests identified in codes and standard on each item and shall be witnessed, unless waived, by the purchaser, purchaser's representative and any triad party inspectors determined by the purchaser

2. Mechanical tests

Equipment dimensions, construction, materials, connections, ratings, painting, etc are to be verified in accordance with "accepted" vendor drawings and purchaser's specifications

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APPROVAL SHEET MAIN CONTROL PANEL ASSEMBLY A.M.P. 7 OF 7

A mechanical operation test shall be performed for each unit to verify satisfactory operation. These test shall include checking withdrawable mechanisms, operating mechanisms and interlock devices.

3. Electrical tests

In accordance with appliance codes and standards, shall be test in addition to manufacturer. Certified test reports will be required and shall be submitted in final form to the purchaser within seven (7) working days after shop inspections and tests have been completed. The reports shall include specific test data for the particular units

Type test reports for non specific unit tests shall be submitted upon request.
The cost for all material for test made in plant, shall be cover with manufacturer

Minimum Test

- bus voltage.
- grounding equipment.
- insulation.
- control and protection equipment supply.
- control

By vendor supply following drawings and reports

- Dimensional drawing
- Diagrams drawing
- Part list
- Nameplates

By vendor not procedure the manufacturer equipment to all drawings shall be comments and approval by purchaser

E. PACKAGE & SHIPMENT

1. Package

Packing for main control panel shall be supplied by vendor, and it shall also have to comply with following requirements.

- 1.1 During transportation and storage rain is not to get inside MCPA neither inside the top nor the sides.
- 1.2 MCPA shall be protected against strikes due to handling and transportation.
- 1.3 External parts of fixtures located at front of MCPA shall be protected mechanical.
- 1.4 Lifting devices shall be free for not package damage

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APPROVAL SHEET MAIN CONTROL PANEL ASSEMBLY A.M.P. 8 OF 8

1.5 Vendor supply and replace all damage parts during transportation without cost

1.6 Packing shall be so as to allow marking with black paint of the following data

Name and address
Equipment number
Total number of packages shipment
Order number

F. GUARANTY.

1. General

1.1 The vendor supply guaranty against manufacturer or material damages performed Main Control panel

1.2 This guaranty shall be for one(1) years or (18) eighteen month after shipment.

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 APPROVAL SHEET TECHNICAL DATA SHEETS MAIN CONTROL PANEL ASSEMBLY A.M.P. 1 OF 1

B	For Quotation
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TECHNICAL DATA SHEETS
MAIN CONTROL PANEL ASSEMBLY
120 VAC
No. MCPA-01

B./25-03-04	V.L.Z.B.	J.S.R.	A.M.P.V.		FOR QUOTATION
A./03-10-03	V.L.Z.B.	J.S.R.	A.M.P.V.		FOR CLIENT COMMENTS
REV/DATE	BY	REVIEW	APPROVED	CLIENT	DESCRIPTI ON

GENERAL :

Main control panel 120 Volts. Item MCPA-01

Supply junction box

Type outdoor 3R NEMA / IEC 1/IP65

Operation Voltage 120 V. Insulation voltage 600 V.

Phase No. 1 Wire No. 3 Frequency 60 Hz.

Wiring NEMA: Class I Type A

The main control panel assembly shall be included the following equipment:

Main thermal magnetic circuit breaker, 1 pole, 40 A, 120 VAC.

Operation electric Manual

External Plug 2 wires 3 poles, for main supply NEMA 3R, with flexible cord sunlight resistance, and cable gland for bottom incoming.

And following legend:

2.3 MAIN CIRCUIT BREAKER

selector switch, two position "M-A"

fuse panel, quantity 8 – 2 A, 3 – 10 A

red-yellow pilot light

4 starters with protector tipe THERMAL MAGNETIC

MAGNETIC STARTER Full voltage

Motor squirrel cage :

1 Phase 60 Hz. 0.25 HP 120 VAC

accessories:

start-stop pushbottom.

PLANT: E OL I DATE NO. ESPEC. PROJECT: WASTE WATER EFFLUENT TREATMENT PILOT PLANT
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APPROVAL SHEET TECHNICAL DATA SHEETS MAIN CONTROL PANEL ASSEMBLY A.M.P. 3 OF 3

red-green pilot light
overload pushbottom reestablished.
four auxiliary contacts; two normally open and two normally closed
legend plates:

FP-01 FEED PUMP MOTOR
FP-02 FEED PUMP MOTOR
MA-01 MECHANICAL AGITATOR
E P-01 EFFLUENT PUMP MOTOR

2 starters with protector tipe **THERMAL MAGNETIC**
MAGNETIC STARTER Full voltage
Motor squirrel cage :

1 Phase 60 Hz. 1.0 HP 120 VAC

accessories:

start-stop pushbottom.
red-green pilot light
overload pushbottom reestablished.
four auxiliary contacts; two normally open and two normally closed
legend plates:

AB-01 AIR BLOWER MOTOR
AB-02 AIR BLOWER MOTOR

2 Fuses 10 A
24 VDC power supply
6 unit control relays

PLANT: EOLI DATE NO. ESPEC. PROJECT: WASTE WATER EFFLUENT TREATMENT PILOT PLANT
3-10-03 HD-IBT-WWT-EOLI-E-101 BY AREA: V.L.Z.B. PTAR REVIEW DEPT: J.S.R. ELÉCTRICAL
APPROVAL SHEET TECHNICAL DATA SHEETS MAIN CONTROL PANEL ASSEMBLY A.M.P. 4 OF 4

 1 PLC POWER 1746-P4 ALLEN BRADLEY

 1 PLC 1747-L552 ALLEN BRADLEY

 2 PLC 1746-N14 ALLEN BRADLEY

 1 PLC 1746-N041 ALLEN BRADLEY

 1 PLC 1746-OA16 ALLEN BRADLEY

 1 PLC 1746-IA16 ALLEN BRADLEY

 1 SERIAL PORT RS-232 & RS-485 FOR WORKSTATION COMUNICATION
200 TERMINAL BLOCK

Water resistance external Serial port for communication with workstation
ONE CONFIGURATION IN ACCORDANCE WITH LOGIC OPERATION SECUENCE
Add inside junction box, shall be mounting following instruments
FICT-105 Supply by customer
AT-104 supply by customer
Reference drawings

IBT-WWT-EOLI-E-001 ONELINE DIAGRAM

IBT-WWT-EOLI-E-002 CONTROL DIAGRAM GENERAL NOTES AND LEGEND

IBT-WWT-EOLI-E-003 CONTROL DIAGRAM SYMBOLS

IBT-WWT-EOLI-E-004 CONTROL DIAGRAM 120 VAC

IBT-WWT-EOLI-E-005 CONTROL DIAGRAM 120 VAC

IBT-WWT-EOLI-E-006 MAIN CONTROL PANEL ASSEMBLY

IBT-WWT-EOLI-E-007 MAIN CONTROL PANEL ASSEMBLY PLC RACK

IBT-WWT-EOLI-E-008 WIRING CONTROL DIAGRAM INSTRUMENT & PB

IBT-WWT-EOLI-E-009 WIRING CONTROL DIAGRAM I/O

IBT-WWT-EOLI-E-010 WIRING CONTROL DIAGRAM ANALOG