

**JABATAN BEKALAN AIR LUAR BANDAR (JBALB) SARAWAK**



**TESTING AND COMMISSIONING DOCUMENT**

**FOR**

**BOOSTER PUMPING STATION**

..... **WATER SUPPLY,**

..... **DIVISION**

**WORK CONTRACT NO: .....**

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**PROCESS FLOW FOR  
COMMISSIONING OF  
BOOSTER PUMP STATION**

## COMMISSIONING OF NEW JBALB BOOSTER PUMP STATIONS

### 1.0 Commissioning Team

The commissioning of all new JBALB booster pump stations shall be carried out by designated officers coordinated Jabatan Bekalan Air Luar Bandar (JBALB) Headquarters. The commissioning team shall consist of the following:-

#### 1.1 JBALB Headquarters

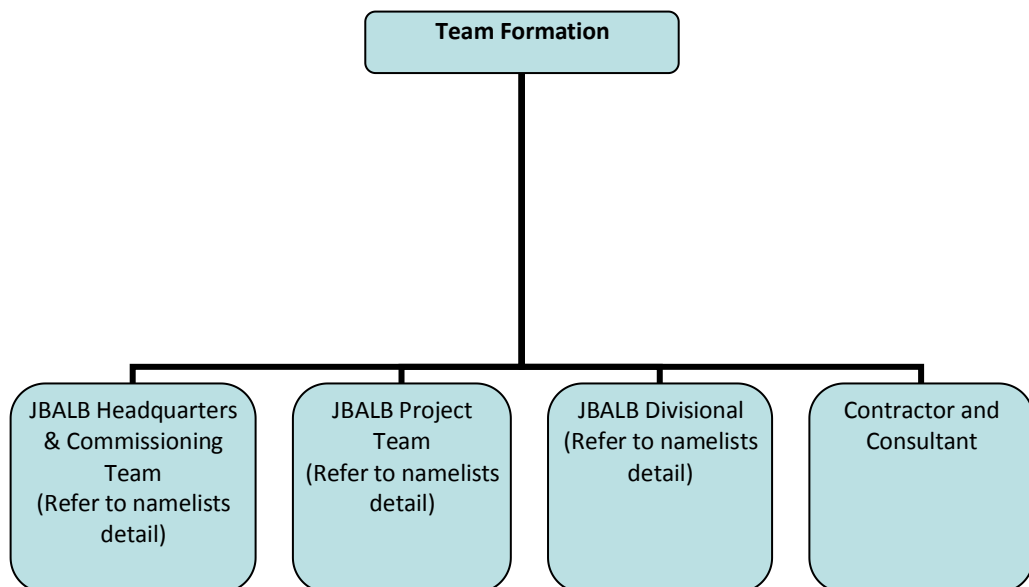
- a) Jurutera Mekanikal
- b) Jurutera Elektrik
- c) Jurutera Awam (Projek Berkenaan)
- d) Ahli Kimia
- e) Penolong Jurutera

#### 1.2 JBALB Divisional

- a) Jurutera Air Bahagian (DWE)/Pegawai Meguasa Bahagian(OIC)
- b) Penolong Jurutera J29

#### 1.3 JBALB Project Management Team

- a) DWE/OIC
- b) Penolong Jurutera J29

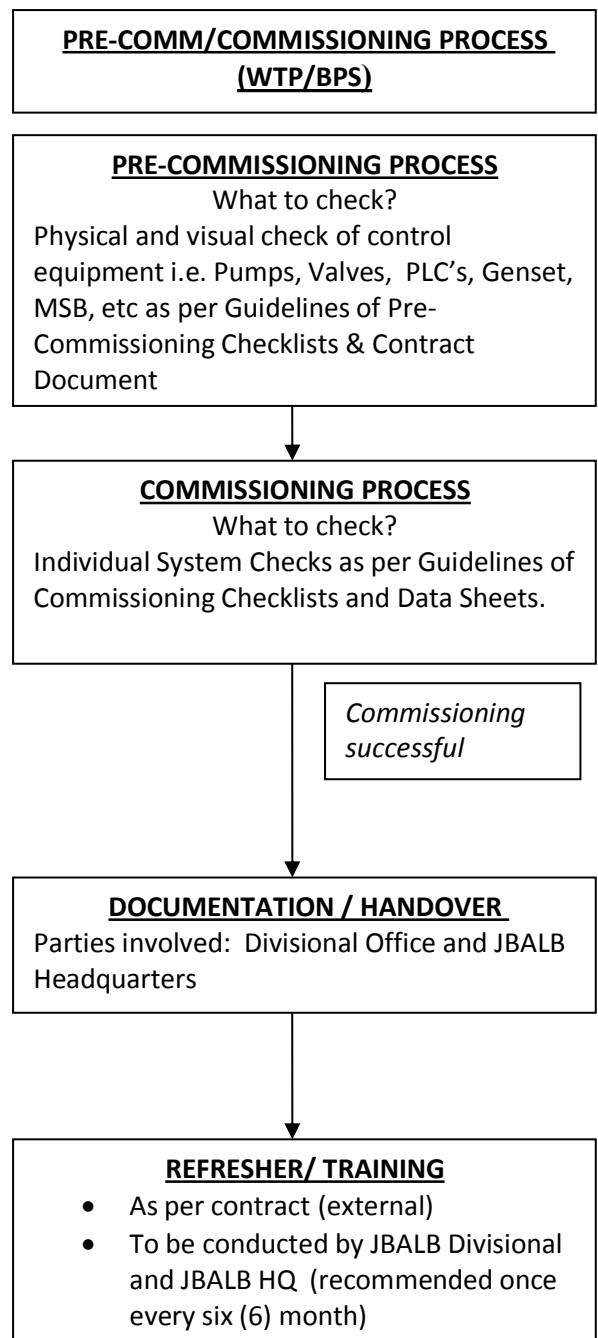


## 2.0 Methodology

2.1 The Jurutera Mekanikal from JBALB Headquarters will head the commissioning team and the Jurutera Air Bahagian (DWE), Penolong Jurutera and Pembantu Teknik/Juruteknik are allocated the following tasks to assist in the commissioning.

2.2 Pembantu Kemahiran H17 & Pembantu Awam H11/14 will assist the commissioning teams and will take over the plant operation after successful commissioning and handing over. In this respect, they will get hands-on experience in the plant operation.

2.3 Project Management Team from JBALB Divisional/Regional Office's role is to be the coordinator to instruct consultant/contractor to execute and implement the commissioning process as per guidelines and checklist. They will also be responsible to coordinate with JBALB Headquarters JBALB Bahagian & JBALB District with the Commissioning Team to ensure that proper guidelines and procedure is implemented prior to ensuring the commissioning of related Water Treatment Plant / Booster Pump Station are in accordance with the guidelines before handing over to JBALB Bahagian.



## 3.0 Tasks and Duties

- i) **The commissioning team will witness the testing of** all items of equipment, pipework, fittings and appurtenant (accessories) works to ensure that they are correctly installed and capable of proper operation.
- ii) The team will witness start up and running each item of equipment separately until they are satisfied that it is capable of proper operation.
- iii) After each item of equipment has been tested separately, the various items will be run concurrently to commission the plant.

**3.1 In carrying out (i) to (iii) above, the team shall ensure that :-**

- i) The correct sequence of operation of the plant is checked and documented.
- ii) Plant control systems are checked.
- iii) Calibration of instruments is carried out.
- iv) Switchboards, control panels, alarm systems, overloads, and safety equipment are tested.
- v) The alignment, mounting and configuration of pumps and drives, including the direction of rotation are checked.
- vi) The various lubrication systems and greasing systems are checked, including pump shaft lubrication and stuffing box seal requirements.
- vii) The pipework valves and gauges are correctly installed and operate satisfactorily. The appropriate valve positions shall be determined for the different modes of operation of the plant and documented.
- viii) The chemical mixing, feeding and dosing equipment shall be tested and calibrated.
- ix) Load tests are carried out on lifting equipment.
- x) The necessary chemical testing equipment is provided and in working order.
- xi) All other tools and equipment necessary have been provided and are in working order.

**3.2 During the commissioning of the plant, the team shall ensure that:-**

- i) The limits of hydraulic operation of the various units of the plant are determined.
- ii) The appropriate flow rate through the plant is determined to minimize “on-off” operation. Guides on pumping rates for the raw water and treated water pumps shall be established.
- iii) The clarifiers are operated with the appropriate level of coagulant to achieve a well developed floc blanket.
- iv) The rate of de-sludging of the clarifiers is determined.
- v) The filters are operated sufficiently long to establish head loss characteristics and backwash requirements.
- vi) The filter backwash system and air scour are operated correctly. The correct procedure for backwashing of the filters is determined and documented.
- vii) As far as possible, the appropriate levels of dosing of chemicals for the plant are determined. In particular the appropriate level of post dosing for pH correction is determined.

### **3.3 Documents and operation manuals**

The following documents shall form part of the commissioning:

- i) JKR MS ISO 9001 quality procedures on water treatment process;
- ii) Buku Panduan Kerja Pertukangan Atenden Loji Bekalan Air;
- iii) Buku Panduan Kerja Pertukangan Atenden Pam Bekalan Air;
- iv) Buku Panduan Kerja Pertukangan Atenden Enjin Bekalan Air;
- v) Perintah-Perintah Tetap Pihak Berkuasa Bekalan Air JKR;
- vi) Other operation manuals for the pumps and equipment.

### **3.4 Refresher/Induction Training**

During the commissioning of the plant, the Jurutera Air Bahagian (DWE) and Penolong Jurutera/ Pembantu Teknik/Juruteknik and attendants allocated to assist the teams, will undergo “hands on” training in preparation for accepting responsibility for operation of the plant. This training role will be a significant aspect of the duties of the commissioning team.

### **3.5 Handing Over and Documentation**

3.5.1 When the plant is operating satisfactorily and treated water has been supplied into the existing reticulation system, it will be handed over to the JBALB Bahagian staff.

3.5.2 The commissioning team will prepare four (4) copies of the commissioning report, (1) one copy to the Regional Manager, (1) one copy to the Jurutera Bahagian and (2) two copies to JBALB Headquarters.

3.5.3 The report shall contain as a separate section, the recommended procedure for operating the various items of the plant including the following:

- i) valve on-off schedules,
- ii) switchboard operation and use of control panels and monitors.
- iii) observed rate of desludging of clarifiers and backwashing of filters
- iv) operation of the raw water pumps and clear well pumps to integrate the plant into the existing system and optimize its operation.

3.5.6 An assessment of the induction training of operator staff shall be given.

**METHOD STATEMENT  
BOOSTER PUMP STATION PRE & POST COMMISSIONING**



## METHOD STATEMENT

### Booster Pump Station Pre & Post Commissioning

#### Background Information

Project Name	
Contract No.	

#### Pre & Post Commissioning Implementation

Divisional Involvement	<ol style="list-style-type: none"> <li>1. Divisional Office representative shall be present during pre-commissioning and commissioning stage to witness and to comment any dissatisfaction /query through Project Management Team / Commissioning Team representative.</li> <li>2. Representative from Divisional Office shall be at least Penolong Jurutera (PJ29) of Mechanical or Electrical to be involved during pre-commissioning and commissioning stage (especially M&amp;E equipment testing).</li> <li>3. Water treatment plant operator (PRAK) shall be involved during system operational testing for the purpose of familiarisation of new treatment plant.</li> <li>4. Certificate of Practical Completion (CPC) shall be to the satisfaction of JBALB Commissioning Team and JBALB Divisional Office SO/SOR/OIC. This is to ensure proper handing over and operational needs are met and achieved as per design in the Contract.</li> </ol>
New Pipe interconnection to existing piping system	<ol style="list-style-type: none"> <li>1. JBALB Project Management Team concerned shall notify any pipe interconnection and submit method statement for interconnection work to JBALB Divisional Office prior to the commencement of actual work.</li> <li>2. Method statement must be agreed between Project Management Team and Respective JBALB Divisional Office before any work can proceed.</li> <li>3. Upon agreement on the interconnection Method Statement, the affected Divisional Office (DWE/OIC) shall issue notice of water supply interruption to the public prior to the execution of interconnection work either via Corporate Communication or Information Department (which ever) is more efficient and cost effective within a weeks notice.</li> <li>4. Any actual shutdown to the existing system shall be done by JBALB Project Management Team or representative from JBALB Divisional Office assisted by the Contractor involved.</li> <li>5. The interconnection work and any reinstatement work which is affected by the interconnection process shall be done by the contractor involved to the satisfaction of representative of both PMT and Divisional Office.</li> </ol>
Consumables Requirement	<ol style="list-style-type: none"> <li>1. After every successful Testing and Commissioning, it is crucial that the Appointed Contractor/Consultant prepare and advice on the usage and quantity of consumable required like chlorine, aluminum sulphate, polymer and soda ash shall be made available as stock for at least 3 to 6 months (subject to availability &amp; plant</li> </ol>

	<p>locality) for operational use after project completion (CPC).</p> <ol style="list-style-type: none"> <li>2. It is recommended that the information on where and how to acquire these required consumable shall be made known to the JBALB Divisional Office for reference of their planning and procurement process by the users.</li> <li>3. Material acquisition inclusive of M&amp;E parts shall be identified and JBALB Divisional Office is recommended to acquire major parts for major pumps and dosing pump for stock in advance for the ease of maintenance after the end of Defect Liability Period (DLP).</li> </ol>
<p>Recommendation on Operational and/Or Overall Maintenance Plan</p>	<ol style="list-style-type: none"> <li>1. Operation and maintenance manual for the water treatment plant shall be provided by the contractor to the JBALB Divisional Office and JBALB Headquarters for references on Operational matters.</li> <li>2. JBALB Divisional Office shall produce the Maintenance Plan which include periodic and preventive/predictive maintenance of all major equipment i.e. Treated water pump, submersible water intake pump and control panels. It is recommended that all major equipment is checked and inspected at a regular interval of three (3) months (minimum) by Audit or representatives from JBALB Headquarters.</li> <li>3. Divisional Office shall coordinate with JBALB Headquarters regarding procedure, schedule and costing for maintenance of all equipment. It is advisable that this coordination is initiated prior to the end of project's DLP.</li> </ol>
<p>Recommendation on manpower requirement of new Water Treatment Plant (WTP) and Booster Pump Station (BPS)</p>	<ol style="list-style-type: none"> <li>1. It is recommended that DWE/OIC's to review their current operation setup and manpower requirement to suit the new WTP prior to the completion of the project. It would be best that proper proposal on operation of new WTP to be worked out at the commissioning stage since forecast on actual manpower required can be identified clearly with the involvement of Divisional Office at this stage.</li> <li>2. For the operation of BPS, additional manpower should be allocated sufficiently to oversee the operation of isolated BPS. This would help to avoid or reduce the occurrence of vandalism especially to this isolated BPS. Any failure at this BPS will jeopardize the reliability of water supply to which the BPS cater.</li> </ol>

**GUIDELINES AND CHECKLIST FOR FULL TESTING & COMMISSIONING  
OF BOOSTER PUMP STATION**

***General Notes for Pre-commissioning,  
Commissioning and Acceptance Test  
Booster Pump Stations***

**GENERAL NOTES FOR  
PRE-COMMISSIONING, COMMISSIONING AND ACCEPTANCE TESTING  
OF BOOSTER PUMP STATIONS**

The following notes are intended as a guide to the completion of Pre-Commissioning and Commissioning Works in a manner which will be consistent throughout all new Booster Pump Stations.

**Guidelines and Checklist for Pre-commissioning (Appendix A)**

These are checks which are required to be undertaken by the Mechanical/Electrical Sub-Contractor and are supervised by Contractor's staff. They are intended as a virtual 'check list' to ensure that all items of equipment have been installed correctly and have been prepared for commissioning/operation.

**Guidelines and Checklist for Commissioning**

These are checks which are required to be undertaken by Contractor's staff in the presence of JBALB staff.

It is essential that JBALB staffs are present in order to witness measurements, readings, and observations made during these checks. For this reason, sufficient notice should be given by Contractor to JBALB (UPT). The contractual requirement is for 21 days' notice. It is possible however, to advise late changes to programme by facsimile/telephone when absolutely necessary.

Guidelines and Checklist for Commissioning are intended to be applicable to ALL Booster Stations. It is unavoidable, therefore, that certain sections will not be applicable to a particular scheme. Inapplicable sections will normally have been crossed out or struck through before the time of commissioning. If this is not the case, then a comment should be made by the signatories at the bottom of sheet 3 indicating which sections have not been undertaken or witnessed.

It is absolutely essential that Mechanically/Electrically competent personnel are delegated to witness the commissioning of Mechanical and Electrical equipment in order to avoid protracted discussions and arguments on methods/techniques employed to generate the data.

## Specific Guidance: Pre-Commissioning /Commissioning

### 1. *Check pumps stop when reservoir full.....*

If the reservoir is greater than 1 km-from the Booster Station, pumps are stopped by a differential pressure switch which is operated on a decrease in flow. It may not be convenient to wait for what could amount to several hours in order to demonstrate the correct operation of this cut-out. All that is necessary in this case is to slowly close the pump discharge valve and note the flow at which the pump trips.

For reservoirs less than 1 km from the Booster Station, pumps are stopped by level electrodes which respond to the conduction of an electric current between them (when both are immersed in water). Again, correct operation can be demonstrated by lowering the High Level electrode into the water, or by shorting the Reference and High Electrodes momentarily.

### 2. *Check pumps restart automatically.....*

If a low flow trip, then re-start is by an adjustable timer. All that is necessary in this case to demonstrate correct operation, without having to wait for an excessive time, is to temporarily adjust the timer to a value of a few minutes.

Where trip is by electrode, re-start is also by electrodes, in this case by a break in the flow of electric current between them. (When the water level falls below the Low Level Electrode) Correct operation can be demonstrated in this case by raising the Low Level Electrode clear of the water surface, or by momentarily disconnecting the connection to the Low Level Electrode.

### 3. *Check pumps stop when suction tank is at low level.*

*Check pumps re-start automatically.....*

In the case of a suction tank, trip and re-set are both by electrode and the same comments made above apply here. In some situations, however, where there is uncertainty as to the precise details of existing water reservoirs, it will be necessary to check correct tripping by draining or drawing down the feed reservoir.

### 4. *Motor rated speed + measured speed*

This is determined by either an optical or a contact tachometer.

5. *Travelling Crane*

The JKPP Certificate for the crane should be issued and available for record.

6. *Surge Suppression Equipment.*

After the surge suppression equipment is commissioned, all that is required under this section is to observe the maximum and minimum pressures indicated on the surge arrestor pressure gauge on starting and stopping the pump from a position of pressure equilibrium. The JKPP Certificate for the Surge Suppression Equipment should be issued and available for record

7. *Generating Sets*

Department of Environment (DOE) Approval Certificate for installation of Generating Set should be issued and available for record.

8. *Fire Protection System*

Bomba Approval on all Fire Protection System should be issued and available for record.

9. *Chlorination System*

To check whether chlorination system synchronizes with booster pump or not.

Table A - Pump Bearings/Vibration

Correct operation of pumps can only be assessed by mechanically competent and experienced personnel. Manufacturers' literature states that bearing temperature should be checked by hand: If a normal person can hold a bearing cover without feeling pain, then it is highly probable that the temperature is below 60 degree C and that the bearing is running normally.

If the bearing is running hot, this does not necessarily mean that it is defective, in nine cases out of ten it is usually found that it has been over packed with grease, and that cleaning and repacking the bearing will reduce its operating temperature.

'Abnormal' noise and vibration is a very subjective assessment and again, should be left to experienced personnel.

Table B - Pump Test Sheet

Readings are taken over the operating range of the pumps. Data are calculated and graphs drawn SUBSEQUENT to the commissioning of the booster stations. JBALB personnel/representative should witness the readings taken. There will be one TABLE A, and one TABLE B for each pump set.

**Guidelines for Acceptance Test**

Most of the data entered onto the Acceptance Test Guidelines will be abstracted from the Pre-Commissioning and Commissioning Guidelines. The main purpose of the acceptance test is to demonstrate the system as a whole will function satisfactorily over a period of 14 days (or less depending upon the operational requirements of JBALB).

All that is required is for JBALB representatives to acknowledge the period of operation defined as the 'Acceptance Test'.

N.B. JBALB representatives are not being asked to 'accept' or takeover schemes. All that is required of them is to witness the proceedings and if necessary, to draw up a 'snag list' of items considered incomplete or defective. This snag list, together with any comments considered appropriate, should be referred to JBALB Divisional who are the agency responsible for accepting schemes.



**COMMISSIONING CHECKLIST FOR BOOSTER PUMP STATION**

**COMMISSIONING CHECKLIST FOR BOOSTER STATION**

COMMISSIONING CHECKLIST FOR BOOSTER PUMP STATION

Project Name .....	Pump Type .....	
Work Contract No. ....	Serial Nos.	PUMP .....
Booster Stations .....		PUMP .....
Name & Location .....		PUMP .....
		PUMP .....
<b>1. REFERENCE DOCUMENTS</b>	<b>Compliance checked by Consultant</b>	
Location Plan		
Scheme Specific		
Pipeline Profiles		
Booster Station Assembly drawings		
Manufacturers Pump set test cert. (attached)		
O&M manual (draft)		
<b>2. PUMPS</b>	<b>Checked by Consultant</b>	<b>Witnessed by JBALB Representative</b>
a) Refer to Operation & Maintenance Manual (2.2.5 Operating Procedure - Booster Pump. Station)		
b) Run each pump for 2 hours or until Bearing temperature is constant. Check Bearing temperature in motor and pump, noise, vibration and gland leakage (see table. A, Data Sheet)		
c) Take readings at approximately 25%, 50% and 100% Discharge valves open condition (see table B, Data Sheet)		
d) Check pumps stop when reservoir-full		
	Actual level: m	
e) Check pump re-starts automatically		
	Actual level: m	

COMMISSIONING CHECKLIST FOR BOOSTER PUMP STATION

f) Check pumps stop when suction tank is at low level				
	Actual level:		m	
g) Check pumps re-start automatically after 1 hour (if water is available)				
	Actual level:		m	
3. MOTORS	PUMP	PUMP	PUMP	PUMP
a) Rate speed (rpm)				
Measured speed.(rpm)				
b) (full load)				
4. OVERHEAD TRAVELLING CRANE			Yes	No
a) Alignment check complete				
b) Manufacturers test certificate attached				
Vertical Deflection test of crane bridge caused by hoist plus SWL in central Position	Span	Def		
Permitted max. def. (Span - 750)		Def		
d) Load hook through full travel				
e) Crane travelled full length with SWL				
f) JKPP type approval				
g) JKPP installation approval & Certificate (See Attached Certificate)				
5. DIESEL GENERATOR SET				
a) Manufacturers Test Certificate attached				
b) D.O.E. Application				
c) Oil pressure switch operation	Rated	Actual		
	kPA	kPA		
d) Water temperature switch operation	°C	°C		
e) Engine overspeed switch operation	rpm	rpm		

COMMISSIONING CHECKLIST FOR BOOSTER PUMP STATION

f) Trip-on control circuit voltage failure						
g) Noise measurement (dBA) Measured 3 m from exhaust Measured 3 m from outer wall		North	South	East	West	
h) Test generator over six consecutive starts				Yes	No	
<b>6. SURGE SUPPRESSION EQUIPMENT</b>						
(Where Surge Suppression Equipment fitted, commissioning will be carried out under section 2)						
a) Pump start up:	Observed pressure	Max.		Min.		
	Pump shut down:	Observed pressure	Max.		Min.	
		Pressure Set Point:		Bar		
		Level Set Point:		M		
<b>7. CHLORINE DOSING SYSTEM</b>						
Check all gas pipework joints for leaks using ammonia vapor.						
Manufacturers pre-start up checks complete				Yes	No	
Satisfactory				Unit	Yes	No
				Chlorine Dosing		
				Chlorine Dosing		
				Chlorine Dosing		
Check operation changeover panel.						
Commissioning complete, system ready for use.				<b>Yes</b>	<b>No</b>	
Commissioning completed	Checked By Contractor	Certified by Consultant		Witnessed by JBALB Representative		
Name						
Signature						
Designation						
Date						

COMMISSIONING CHECKLIST FOR BOOSTER PUMP STATION

Project Name :	Capacity : m3/hr			
Work Contract No. :	Operation : hr/d			
<b>TELEMETRY SYSTEM</b>				
Station Name: .....				
<p>1. I/O Check</p> <p><u>PROCEDURE</u></p> <ul style="list-style-type: none"> <li>- For input/Output signal to/from the PLC DI Card. Use signal simulator or wire to simulate at the respective terminal block, simulate the selector switch, push button and equipment.</li> <li>- Verify Correct input/output status at PLC DI Card and indicating light/alarm annunciator and Graphic Scada System.</li> </ul> <p><u>TEST CRITERIA</u></p> <ul style="list-style-type: none"> <li>- The PLC DI and Scada System shall receive the signal.</li> <li>- The LED status at the PLC DI module and equipment status at Scada shall turn off when the simulated signal is disabled.</li> </ul>				
DESCRIPTION	DIGITAL INPUT/ OUTPUT ADDRESS	SCADA GRAPHIC		REMARKS
		YES	NO	
	Checked by Contractor	Certified by Consultant	Witnessed by JBALB Representative	
Name				
Signature				
Designation				
Date				

COMMISSIONING CHECKLIST FOR BOOSTER PUMP STATION

Project Name :		Capacity :	m3/hr	
Work Contract No. :		Operation :	hr/d	
<p>2. ANALOG INPUT/OUTPUT SIGNAL TO/FROM SCADA ( PLC LOGIC TEST )</p> <p><u>PROCEDURE</u></p> <ol style="list-style-type: none"> <li>Determine the loop is internally powered or externally powered from the schematic diagram.</li> <li>Connect the + and – wires of the signal injector to the 4-20mA inputb terminals at...(Station Name).....Panel and set the signal injector according to the loop power condition.</li> <li>Simulate the signal to 0%, 25%, 50%, 75%, 100% of the instrument range.</li> </ol> <p><u>TEST CRITERIA</u></p> <p>- The Scada shall give the output signal according to signal simulated.</p>				
<p>Equip. Description :</p> <p>Simulated Range : 4 – 20 mA</p> <p>Input Range :</p>				
	Simulated Range (mA)	Desired Value	Displayed Value	Remarks
	4			
	8			
	12			
	16			
	20			
Commissioning complete systems ready for use.				
	Checked by Contractor	Certified by Consultant	Witnessed by JBALB Representative	
Name				
Signature				
Designation				
Date				

ACCEPTANCE TEST FOR BOOSTER PUMP STATION

**ACCEPTANCE TEST FOR BOOSTER PUMP STATION**

ACCEPTANCE TEST FOR BOOSTER PUMP STATION

Project Name .....

Work Contract No. ....

1. Design Assumption: (See attached sheet)

2. Start Date for Test:

3. JBALB Required From:

4. JBALB State Representative Required for JBALB Valve/Filling

Operation From: ..... to .....

5. Disinfection successfully completed:	Pipelines	
	Surge Vessels	
	Suction Tank	
	Reservoirs	

6. Equipment used for measurement	Pipelines	Tanks
Flow		
Range of flowmeter		
Head loss through flowmeter		
Comments		
Pressure		
Range of instrument		
Comments		
Level		
Comments		



ACCEPTANCE TEST FOR BOOSTER PUMP STATION

<b>7. CRITERIA FOR PASSING TEST</b>				
Booster Station Name:				
Operating hours:	hr/day			
Start pumping:				
Stop pumping:				
<p>* These are shift times. The pump will stop and start during this period if the Storage Reservoir fills.</p> <p>Required output: 1.1 times Average Daily Year 2000 Flow            = 1.1 x _____ = _____</p>				
<b>8. Pipelines</b>	Year 2000 Flow*	Flow Measured	Required Pressure	Recorded Pressure
* or highest available flow (see attached graph)				
<b>9. Reservoir Name</b>				
Overflow measured at full pump output (outlet valve closed, inlet valve held open)				
Bypass flow (if applicable)				
Required year 2000 inflow				
Actual max. pumped inflow				
Peak outflow measured				

ACCEPTANCE TEST FOR BOOSTER PUMP STATION

10. Test conducted for 14 days/ ..... (OR as agreed with JBALB)			
11. OVERHEAD CRANE			
		Yes	No
JKKP Approval Required			
If Yes, JKKP Certificate			
If No, JBALB Approval At Commissioning			
12. DIESEL GENERATOR SET			
		Yes	No
D.O.E Approval			
13. SURGE SUPPRESSION EQUIPMENT			
		Yes	No
JKKP Type Approval			
JKKP Installation Approval			
14 CHLORINE DOSING SYSTEM		Yes	No
Functioning in line with booster pump			
15.	Checked By Contractor	Certified by Consultant	Witnessed by JBALB Representative
Signature			
Name			
Designation			
Date			

**TABLE A**

Time (Every Hour)	Bearing Check 40 -60 C				Abnormal Noise and/or vibration	Any leaks visible
	Motor		Pump			
	Inner	Outer	Inner	Outer		

	<b>Checked By Contractor</b>	<b>Certified by Consultant</b>	<b>Witnessed by JBALB Representative</b>
<b>Name</b>			
<b>Signature</b>			
<b>Designation</b>			
<b>Date</b>			

TABLE B:  
PUMP TEST CERTIFICATE

Unless otherwise specified Tests carried out in accordance  
with BS5316 Part 1, Class C

CUSTOMER/PROJECT:				PUMP TESTED: PUMP SIZE:										
DRIVER: TYPE: MAKE: MODEL:                      RPM: POWER:                      AMP: VOLTAGE:                      PHASE:				IMPELLER DIA:                      MM ORIFICE PLATE DIA:                      MM FLOW RATE:                      m <sup>3</sup> /h TOTAL HEAD:                      M				SERIAL NO: INLET/OUTLET DIA:    MM						
SUCTION PRESSURE GAUGE LEVEL:                      M														
DISCHARGE PRESSURE GAUGE LEVEL:                      M														
TEST NO.	FLOW m3/h	DISCHARGE PRESSURE M	SUCTION PRESSURE M	V <sup>2</sup> /2g M	TDH M	VOLT	AMP	P.F.	MOTOR		PUMP			RPM
									INPUT POWER kW	EFF %	BHP kW	WHP kW	EFF %	
				Checked By Contractor				Certified by Consultant				Witnessed by JBALB Representative		
Name														
Signature														
Designation														
Date														

**LIST OF EQUIPMENTS**

<b>1.</b>	<b>Treated Water Pump</b>					
	Pump Brand/Make					
	Pump Model					
	Pump Serial No.					
	Pump Head	m				
	Design Flow Rate	m <sup>3</sup> /hr				
	HP					
	Power	kW				
	Rated current	A				
	Voltage/Phase	V/Phase				
	Motor Brand/Make					
	Motor Model					
	Motor Serial No.					
	Motor Speed	rpm				
	Motor Frequency	Hz				
	Class					

<b>2.</b>	<b>Chlorination System</b>					
2.1	<i>Vacuum Regulator</i>					
	Brand/Make					
	Type					
	Model					
	Heater Make					
	Heater Type					
	Power Rating	V/A/W				
2.2	<i>Chlorinator</i>					
	Brand/Make					
	Type					
	Model					
	Max Capacity	kg/hr				
	Motor Make					
	Motor Type					
	Power Rating	V/Hz				
2.3	<i>Changeover Manifold</i>					
	Brand/Make					
	Type					
	Serial No.					
	Range					
2.4	<i>Injector</i>					
	Brand/Make					
	Type					
	Serial No.					
	Max Capacity	kg/hr				

<b>3.</b>	<b>Pressure Transmitter</b>					
	Instrument Brand/Make					
	Instrument Model					
	Instrument Serial No.					
	Measure (ie Ph, NTU,mg/l)					
	Output	mA				
	Rated current	A				
	Voltage/Phase	V/Phase				
	Rated Frequency	Hz				
	Class					
<b>4</b>	<b>Crane</b>					
	Brand/Make					
	Type					
	Model					
	Country					
	Year					
	Equipment Serial No.					
	Hoist Serial No.					
	PMA Registration No.					
	Hoisting Capacity	Ton				

5.	<b>Surge Vessel (If Applicable)</b>					
	5.1	<i>Compressor</i>				
		Brand/Make				
		Model				
		Serial No.				
		Piston Displacement				
		Max Discharge Pressure	Bar			
		Design Duty Pressure	Bar			
		Free Air				
		Noise Level	dB			
5.2	<i>Motor</i>					
		Brand/Make				
		Type				
		Model				
		Serial No				
		Power	kW			
		Voltage/Phase	Phase			
		Rated Current	A			
		Speed	Rpm			
		Class				



## APPENDIX

PRE-COMMISSIONING CHECKLIST FOR BOOSTER PUMP STATION

**Appendix (A)**

**PRE-COMMISSIONING CHECKLIST FOR BOOSTER PUMP STATION**

PRE-COMMISSIONING CHECKLIST FOR BOOSTER PUMP STATION

Project Name .....	Pump Type .....
Work Contract No. ....	Serial Nos. Pump .....
Booster Stations .....	Pump .....
Name & Location .....	Pump .....
	Pump .....

1. VALVES

Function Checks	Direction	Open	Seats
a) Washdown/Priming Valves			
b) Suction Valves			
c) Discharge Valves			
d) Non-Return Valves			
e) Air Release Valves			

2. PUMPS

i) Manufacturers Pre-Start Up Checks (see attached sheets) completed	PUMP	PUMP	PUMP	PUMP

ii) Alignment Checks

See manual for procedure	No.	Parallel (mm)				Angular (mm)			
		PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP
Reading with pipework uncoupled	1								
	2								
	3								
	4								
Reading with pipework coupled	1								
	2								
	3								
	4								

Manufacturers tolerance: Parallel ..... mm  
 Angular ..... mm

PRE-COMMISSIONING CHECKLIST FOR BOOSTER PUMP STATION

<b>3. ELECTRICAL</b>					
i) Earthing Protection Check	S.B	PUMP	PUMP	PUMP	PUMP
a) Earth Resistance on Electrical Systems (must be 1 ohm or less)					
b) Insulation Resistance Cables .....	See attached data sheet D (i) A				
c) Polarity check					
d) Earth Resistance of Lighting Protection System =					ohms
(must be less than 10 ohms)					
ii) Switchgear Protection	Setting		Checked by		
a) Over current protection					
b) Earth leakage setting					
iii) Pump Motor Insulation Resistance	R	Y	B		
PUMP					
PUMP					
PUMP					
PUMP					
<b>4. INSTRUMENTATION</b>					
			Yes	No	
a) Installation/Assembly complete and in accordance with drawing					
b) Control cables insulation check (see attached sheet D(i))					
c) Isolation and Balancing Valves, bleed screws checked for operation over full strokes					
	Instrument				
	Instrument				
	Instrument				
	Instrument				

PRE-COMMISSIONING CHECKLIST FOR BOOSTER PUMP STATION

d) Instrument lines clear of obstruction, flushed through and checked for leaks

Instrument  
Instrument  
Instrument  
Instrument

Yes	No

e) Check Zero Calibration of Primary Loop Element:

With balancing valves on DP transmitter open, energise supply to instruments and measure loop current after 10 minutes

	Expected	Actual
Instrument	4,00 mA	mA
Instrument	4,00 mA	mA
Instrument	4,00 mA	mA
Instrument	4,00 mA	mA

If a value differs from that expected by more than 0.01 mA, reconfirm sensor range with D.P. range stamped on D all Tube/Orifice Plate, and then refer to manufacturers operating instructions for procedure to set zero and coarse span.

N.B. The fine span is pre-set at the factory and should not be adjusted unless there is reason to suspect an unexpected change in calibration. A precision pressure source is required before adjusting the fine span potentiometer.

PRE-COMMISSIONING CHECKLIST FOR BOOSTER PUMP STATION

f) Check Integrator/Analogue Converter Calibration:

Confirm that the Meter Factor (written on the inside of the connection compartment) matches the settings of " switches S1, S2, S3 and S4 and link LI.

(Details of the calibration necessary to determine the Meter Factor are contained in Appendix A of the Manufacturers' Instruction Manual).

Refer to 'Analogue Converter Scaling' a page 10 of the Manufacturers' Instruction Manual for the procedure to check the calibration.

	Zero		Proportion or FS	
	Expected	Actual	Expected	Actual
Instrument	0,00 mA	mA	mA	mA
Instrument	0,00 mA	mA	mA	mA
Instrument	0,00 mA	mA	mA	mA
Instrument	0,00 mA	mA	mA	mA

5. PUMP PROTECTION

a) Low Level Probe in suction tank	m
b) High Level Probe in suction tank	m
c) High Level Probe in receiving reservoir	m
d) D.P. switch in discharge pipeline	m <sup>3</sup> /h

6. MOTORS

a) Check motor insulation resistance	R	B	Y
PUMP			
PUMP			
PUMP			
PUMP			

PRE-COMMISSIONING CHECKLIST FOR BOOSTER PUMP STATION

b) Check rotation correct	P	Yes	No
	PUMP		
	PUMP		
	PUMP		
	PUMP		
c) Check thermister trip for motor over 37 kW (by shorting thermister)	P	Yes	No
	PUMP		
	PUMP		
	PUMP		
	PUMP		
<b>7. OVERHEAD TRAVELLING CRANE</b>			
a) Tapes over breather holes removed	Yes		No
b) All damaged paintwork repaired			
c) Alignment check (NA to monorail hoists)	Drawing Dimension	Measured Dimension	Permitted Tolerances
	i) Crane span at each end of carriages		±6 mm
	ii) Diagonal centres of crane wheels		±6 mm
	iii) Crane span at crane rail level		±6 mm
d) Safe work load _____tonnes painted on frame			Yes

PRE-COMMISSIONING CHECKLIST FOR BOOSTER PUMP STATION

8. GENERATORS			
a) Manufacturers pre-start checks completed (see attached sheets) Completed	Generator Unit		
b) Insulation Tests (Resistance in M ohms) (see attached data sheet D(i)C)	Measured	Required	
		>50 MΩ	
i) Between load terminals and plant structure		>50 MΩ	
ii) Between generator terminals and structure		>50 MΩ	
iii) Between generator phases	R.Y.	>50 MΩ	
	R.B.	>50 MΩ	
	B.Y.	>50 MΩ	
iv) Ancillary equipment: Heaters		>1 MΩ	
c) Continuity tests: Phase and circuit connections checked	Yes	No	
d) Earthing protection check	Measured	Required	
		< 1 ohm	
i) Earth resistance on electrical system			
		Yes	No
ii) Polarity verified		Yes	No
iii) Generator neutral earthing		Yes	No
e) Battery Checks	Measured		
	i) Standing voltage measured		Volts
	ii) Starting voltage measured		Volts
	iii) Specific gravity		
	iv) Level of electrolyte		
	v) Trickle charger checked for correct operation		Amps



PRE-COMMISSIONING CHECKLIST FOR BOOSTER PUMP STATION

f) Fuel system	Yes	No
i) Fuel tank level sensors checked for correct operation of pump and alarms		
ii) Fuel lines purged of air		
g) Before starting	Yes	No
i) All lubrication systems checked as correct		
ii) Ambient temperature of area		
iii) Cooling water gauge reading		
h) Fire/safety	Yes	No
i) Fire extinguishers installed and fully charged		
ii) Fire fuel shut-off valve checked (remove fusible link)		
<b>9. SURGE SUPPRESSION EQUIPMENT</b>		
a) Compressors: Manufacturers pre-start up checks complete (see attached sheets)	Compressor A	Compressor B
b) Pipeline length	m	
c) Double orifice vented NRV's: No.		
d) Double orifice inflow check NRV's: No.		
e) Vessel size	m <sup>3</sup>	
f) Outlet size	mm	
g) Outlet NRV	Yes/No	
h) Normal operating pressure	kPA	
i) PRV setting	kPA	
j) Maximum surge pressure	kPA	
k) Minimum Surge pressure	kPA	

PRE-COMMISSIONING CHECKLIST FOR BOOSTER PUMP STATION

l) Alarm setting high/low  m) Compressor settings start/stop n) JKKP type approval o) JKKP installation approval          Above checks satisfactorily completed.	High		Low	
	Rated	Actual	Rated	Actual
	mm	mm	mm	mm
	Stop		Start	
	Rated	Actual	Rated	Actual
	mm	mm	mm	mm
	Yes/No			
	Yes/No/NA			

	Checked By Contractor	Supervised by Consultant	Witnessed by JBALB Representative
Name			
Signature			
Designation			
Date			

PRE-COMMISSIONING CHECKLIST FOR BOOSTER PUMP STATION

CABLE CHECK SHEET							
Project Name: .....				Capacity: .....		m <sup>3</sup> /hr	
Work Contract No.: .....				Operation: .....		hr/d	
Site Location: .....				Resistance (M ohms)			
Power/Control Cables							
Cable Name	From:	Cable Type	1-E	2-E	3-E	4-E	5-E
	To:						
Values should exceed 1 MΩ							
The above checks have been completed satisfactorily.							
	Checked By Contractor		Certified by Consultant		Witnessed by JBALB Representative		
Name							
Signature							
Designation							
Date							