



**ELSINORE
VALLEY**

MUNICIPAL WATER DISTRICT

**Startup and Closeout Plan
for the
Booster Facility**

March 2022

Note: This sample Startup and Closeout Plan provides a sample for level of detail expected. Refer to the project Plans and Specifications for actual testing parameters and testing documents required.

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Introduction

Water Booster Facility

Introduction

Start-up and Testing Plan Objectives

The purpose of this Plan is to identify all tasks associated with the Mechanical, Electrical and Instrumentation/Control project startup and testing of the #### Water Booster Facility. The plan will describe each of the systems to be tested and contains the required sign-off sheets to document the testing activities.

In general, the procedures and sign-off sheet for the first required phase, “Planning and Pre-Commissioning Testing Procedures” are included in Section 2. All items identified in Section 2 must be signed-off prior to beginning the “Commissioning Phase I Testing Procedures” located in Section 3. All items in Section 3 must be completed and signed off before Section 4 testing can be started. Section 4 “Commissioning Phase II Testing and Closeout Items Checklist” includes but is not limited to the Reliability Acceptance Test (RAT) and the 30-Day Continuous Operation.

A brief explanation of the information included in each Section and Appendices of this Plan is provided below.

Section 1 – Overall Signoff Sheet

The entire Plan must be completed in order to ensure that all project requirements and specifications are satisfied. Section 1 is an Overall Section Sign-off Sheet. The purpose of Section 1 is to easily track “milestone” testing and close-out tasks. Once the requirements of the individual testing or close-out sections have all been signed off throughout the plan, the appropriate overall box will be signed acknowledging completion. Once all of the boxes on this sheet have been signed, the Pre-Commissioning, Commissioning and Closeout project tasks will be completed.

Section 2 – Planning and Pre-Commissioning Testing Procedures

The items identified within Section 2 are required to be complete and signed-off prior to energizing the electrical system and advancing to Commissioning Phase I. Pre-Commissioning tasks include but are not limited to FAT-1, FAT-2, SAT-1 Part 1, and SAT-1 Part 2. Many of these items can be completed and tested during the normal course of construction activity to ensure that all systems are ready for Commissioning Phase I. The Contractor is responsible to notify the District’s representative prior to testing, with advance notice as specified. Note that it is at the Owners, or their representative’s discretion as to if various testing requires witnessing. Certain items, such as point to point wire checks, may only be partially witnessed. It is however imperative that the Contractor pre-checks everything required to avoid failures and costly delays during the Commissioning phases of the project.

Section 3 – Commissioning Phase I Testing Procedures

The Section 3 checklist provides tasks and procedures in a chronological order to demonstrate functional operation of the station system(s). Commissioning Phase I tasks include but are not limited to SAT-2. The combined hardware/software system is tested from this point forward. At the satisfactory conclusion of this testing the Contractor will proceed to Commissioning Phase II. Procedures in this section must be witnessed by the Owner or Owner's representative.

Section 4 – Commissioning Phase II Testing and Closeout Items Checklist

This section documents the functional operation of the station during the required Reliability Acceptance Test (RAT) and the 30-Day Continuous Operation & tracks Closeout items.

Appendix A – Piping, Valve and Equipment Configurations for Testing Exhibit

This appendix is a placeholder to insert drawings showing locations and configurations of valves and piping that are to be used during and after various phases of testing. The Contractor is to insert drawings and descriptions of piping, valve and equipment configurations & any temporary and/or by-pass piping to be used during testing.

Appendix B – TCP Input/Output Signals Checklist

This appendix provides a list of the TCP Input and Output signals that are to be tested and proven during Pre-Commissioning and Commissioning Phase I activities. The appendix provides check boxes to verify various aspects of each signal's testing.

Appendix C – Spare Parts Checklist

Spare Parts requirements are called out in various specification sections and are identified in Plan Appendix C. Each identified requirement contains a check box to track when the spare parts have been delivered and accepted.

Appendix D – O&M Checklist

Required O&M Manuals are identified and tracked via this section. Each identified requirement contains a check box to track when the required document has been delivered and approved.

Appendix E – Special Warranty Checklist

The project specifications require all equipment to be covered by a (1) year warranty. This appendix identifies warranties with different requirements only. Each warranty listed contains a check box to track when the warranty paperwork has been delivered so that the warranty period can be determined.

Section 1:

Start-up and Testing Overall Section Sign-off

START-UP AND TESTING FINAL SIGN-OFF SHEET				
SYSTEM DESCRIPTION	SECTION 1 FINAL SIGN-OFF OF PROJECT - OWNERS SIGNATURE CONSTITUTES FACILITY ACCEPTANCE PER SPEC. SEC. ##### Signature / Date	SECTION 2 PLANNING AND PRE-COMMISSIONING TESTING FOR ALL EQUIPMENT HAS BEEN COMPLETED AND APPROVED Signature / Date	SECTION 3 COMMISSIONING PHASE I TESTING HAS BEEN COMPLETED AND APPROVED Signature / Date	SECTION 4 COMMISSIONING PHASE II TESTING HAS BEEN SATISFACTORILY COMPLETED AND PROJECT CLOSEOUT TASKS AND ITEMS HAVE BEEN COMPLETED AND ACCEPTED Signature / Date
### Water Booster Facility				

Section 2:

Planning and Pre-Commissioning Testing Procedures Sign-off

PLANNING AND PRE-COMMISSIONING CHECKOUT SIGN-OFF SHEET

	TEST PROCEDURE OR COORDINATION	NOTES/COMMENTS	DWG REF	CONTRACTOR SIGN-OFF	DATE	OWNER SIGN-OFF	DATE
1	Confirm Owner has been notified (##-days in advance) of Startup intentions and have been provided with a Start-up and Training Schedule.						
2	Confirm Factory Acceptance Test Part 1 (FAT-1) is complete.	This is un-witnessed testing.					
3	Confirm Factory Acceptance Test Part 2 (FAT-2) is complete.	This is witnessed testing.					
4	Confirm current as-built drawings are available on site for reference during start-up and testing.	All as-built documentation is to be the latest to date. Redlines will be made during the startup process. A final as-built set of documents will be provided at the end of the project.					
5	Confirm approved Loop Diagrams are onsite.	Specification Section #####					
6	Confirm approved Operations and Maintenance Manuals are onsite.						
7	Confirm all Spare Parts are onsite and have been accepted.	Various Sections					
8	Confirm Short Circuit , Coordination & Arc Flash Study has been completed and accepted and all arc flash labels are affixed to gear.	Specification Section #####					
9	Confirm NETA Third Party Lab has been approved for testing.	Specification Section #####					
10	Confirm NETA Ground System Test is acceptable at 5 ohms or less.	Specification Section ##### All NETA testing of the Electrical System must be completed and approved prior to energizing the system.					
11	Confirm NETA tests on electrical gear and motors is complete and acceptable. This includes setting the circuit breakers per the settings identified in the Power Study.	Specification Section ##### Some of the motor testing such as vibration and rotation, will need to take place after the motor is energized. The motor tests addressed in this section include insulation resistance and continuity.					

	TEST PROCEDURE OR COORDINATION	NOTES/COMMENTS	DWG REF	CONTRACTOR SIGN-OFF	DATE	OWNER SIGN-OFF	DATE
12	Confirm that all Valves have been setup, tested and are operating correctly.	Specification Section #####					
13	Confirm the piping system has been pressure tested and disinfected.	Specification Section #####					
14	Confirm Sluice Gates have been setup, tested and are operating correctly.	Specification Section #####					
15	Ensure that after testing and disinfection, all piping and valves are left in the proper position and are ready for dynamic testing of the system.						
16	Confirm all electrical equipment and devices are installed correctly, have been tested for short circuits, are in the open position, have LOTO in place and are ready to be energized.						
17	Confirm Pump Manufacturer's representative(s) have certified their equipment is ready to be placed into operation.	1) Certification of factory testing. 2) Installation approval.					
18	Confirm the flow meter has been configured.	Specification Section #####					
19	Confirm field instruments have been pre-tested and calibrated. Copies of field calibration reports have been submitted.	Specification Section #####					
20	Confirm Owner furnished RTU is ready for initial testing/startup.	1) Program installed. 2) IP addresses for network equipment.					
21	Confirm the ISS has been notified and scheduled for startup activities and Operational Testing.						
22	Confirm equipment and wiring identification is complete. All nameplates, tags and labeling is in place						
23	Confirm Seismic Anchorage Calculations for electrical equipment have been approved and electrical equipment is secured according to the approved submittal.	Various Specification Sections					

	TEST PROCEDURE OR COORDINATION	NOTES/COMMENTS	DWG REF	CONTRACTOR SIGN-OFF	DATE	OWNER SIGN-OFF	DATE
24	Confirm Generator Manufacturer's representative(s) have certified their equipment is ready to be placed into operation.	1) Vendor's pre-startup and testing complete. 2) Generator fueled.					
25	Confirm ATS is ready to be placed into operation.	1) Controller parameters confirmed by Yuima WD. 2) ATS/Genset coordination checked.					
26	Confirm MCC Manufacturer's representative(s) have certified their equipment is ready to be placed into operation.	1) VFD parameters set. 2) IP address assigned for network equipment. 3) Power Monitor programmed and IP address set.					
27	Confirm the Electrical Contractor has performed insulation testing on all wires prior to tagging and terminating.	This is un-witnessed testing.					
28	Confirm the Electrical Contractor has conducted point-to-point wire "ring-out" checks while referencing approved loop drawings. The point-to-point ring-out checks to include continuity wire tests, verification of correct wire numbers, and verify correct wire termination points. The Electrical Contractor is to provide a certification of 100% accuracy upon completion of the wire ring-out test.	SAT-1 Part 1 This is unwitnessed testing. Refer to PLC I/O Checklist in Appendix B for tracking checklist.					
29	Confirm SAT-1 Part 2 testing is complete.	SAT-1 Part 2 This is witnessed testing. Refer to PLC I/O Checklist in Appendix B for tracking checklist.					

Section 3:

Commissioning Phase 1 Testing Procedures Sign-off

COMMISSIONING PHASE I TESTING PROCEDURES SIGN-OFF SHEET							
	TEST PROCEDURE OR COORDINATION	NOTES/COMMENTS	DWG REF	CONTRACTOR SIGN-OFF	DATE	OWNER SIGN-OFF	DATE
GENERAL							
1	Confirm that Section 2 Planning and Pre-Commissioning Checkout Testing is complete and has also been signed off in Section 1.	See Section 1 and Section 2: Planning and Pre-Commissioning Testing Procedures Sign-off.					
2	Confirm all equipment has been aligned and is ready for operation.						
3	Confirm all applicable equipment has been provided with the proper lubrication.						
4	Confirm District hydraulic system is in the correct configuration to provide/receive water from the pump station.	See Appendix A: Piping Exhibit.					
5	Confirm the ATS is in the NORMAL position.		E-3				
6	Energize the Main Switchboard (SE), test voltage on Line side of 300A Main Circuit Breaker (MCB) and verify the surge protection device at SE is operating correctly.		E-3				
7	Close 3000A MCB and confirm the voltage through ATS in the NORMAL position and confirm voltage to ATS/Switchboard.		E-3				
8	Verify correct operation of the Power Monitor at the ATS/Switchboard.		E-3				
9	Close the Lighting Transformer Primary Circuit Breaker to energize the transformer. Verify proper voltage at Panel "LPA"		E-3				
10	Confirm operation and Panel Schedule for all circuit breakers in Panel "A". Energize corresponding loads and verify correct operation.	Include receptacle GFI testing.	E-7				
11	Yuima representative to energize PLC and confirm operation of System Ethernet.		I-2, I-3				
12	VFD Manufacturers representative configure VFD's and provide certification and ok to operate.						
13	Pump Manufacturers representative to perform tests on motors and provide certification and ok to operate.						
14	Complete SAT-2 I/O testing per check list.	See Appendix B: PLC I/O Checklist, SAT-2.					

	TEST PROCEDURE OR COORDINATION	NOTES/COMMENTS	DWG REF	CONTRACTOR SIGN-OFF	DATE	OWNER SIGN-OFF	DATE
PUMP 1 STARTUP PROCEDURE							
15	During the course of the pump testing, sign-off on all I/O identified in Appendix B, SAT-2. Along with the devices called out in these Pump procedures the appendix also includes pump commands and status's, etc. A signature on this line acknowledges that all items have been confirmed.	See Appendix B: PLC I/O Checklist, SAT-2.					
16	Confirm the LOS at the motor is in the locked out or open position.						
17	Close the 900A circuit breaker for the Pump 1 VFD.						
18	Confirm the compartment fans operate by adjusting the thermostat to force their operation. Return the thermostat to the specified setting after testing.						
19	With Pump Manufacturers Representative present bump the motor and verify rotation. Representative to complete all testing and provide acknowledgement of proper operation prior to further operation of pump. Representative to provide Certification document.						
20	Turn the VFD to Hand. Confirm the pump does not run. Momentarily release the LOS at the motor and confirm the pump begins to run. Engage the LOS again and confirm the pump shuts down.						
21	Place the HOA switch in the HAND position. Confirm the pump starts and HMI/SCADA indicate Pump 1 is running . Confirm manual speed operation from VFD HMI. Turn switch back to OFF and confirm pump shuts down.						
22	With the HOA in the OFF position, confirm the motor heater is energized and operating by checking the amperage on the heater circuit.						
23	Start the motor in HAND and confirm the motor heater turns off.						
24	With the motor running in HAND, simulate a MOTOR HIGH TEMP condition by removing the High Temp (CR4) relay, and confirm the motor shuts down and MOTOR HIGH TEMP is indicated at the PLC/HMI/SCADA.						
25	Start the Pump in HAND and simulate a Low Low Level condition in Forebay 1 by tipping the LSL-101 float. Confirm the motor shuts down and the fault is indicated at the PLC/HIM/SCADA.						

	TEST PROCEDURE OR COORDINATION	NOTES/COMMENTS	DWG REF	CONTRACTOR SIGN-OFF	DATE	OWNER SIGN-OFF	DATE
26	Adjust Pressure Switch PSH-102 so it is set to trip slightly lower than operating pressure for testing. With Pump 1 running in AUTO, simulate a HIGH DISCHARGE PRESSURE condition by pinching down the discharge valve while the pump is running. Confirm the pump shuts down and a HIGH DISCHARGE PRESSURE alarm is indicated at the PLC/HMI/SCADA. Adjust to final setting after testing						
27	Start the Pump in HAND and simulate a motor overload fault through the VFD. Confirm the motor shuts down and the fault is indicated at the PLC/HIM/SCADA.						
28	Place the HOA switch in the AUTO position. Initiate a start call from SCADA and confirm pump starts. Confirm pump shuts off when the call is removed. Turn switch back to off and confirm pump stays OFF when pump is called.						
29	Start the pump in AUTO, adjust the pump speed command from SCADA. Confirm the motor speed changes per command, and the speed displayed on the door mounted HMI matches the speed reference received by SCADA. Return the speed command to its normal setting.						
PUMP 2 STARTUP PROCEDURE							
30	During the course of the pump testing, sign-off on all I/O identified in Appendix B, SAT-2. Along with the devices called out in these Pump procedures the appendix also includes pump commands and status's, etc. A signature on this line acknowledges that all items have been confirmed.	See Appendix B: PLC I/O Checklist, SAT-2.					
31	Confirm the LOS at the motor is in the locked out or open position.						
32	Close the 900A circuit breaker for the Pump 2 VFD.						
33	Confirm the compartment fans operate by adjusting the thermostat to force their operation. Return the thermostat to the specified setting after testing.						
34	With Pump Manufacturers Representative present bump the motor and verify rotation. Representative to complete all testing and provide acknowledgement of proper operation prior to further operation of pump. Representative to provide Certification document.						
35	Turn the VFD to Hand. Confirm the pump does not run. Momentarily release the LOS at the motor and confirm the pump begins to run. Engage the LOS again and confirm the pump shuts down.						

	TEST PROCEDURE OR COORDINATION	NOTES/COMMENTS	DWG REF	CONTRACTOR SIGN-OFF	DATE	OWNER SIGN-OFF	DATE
36	Place the HOA switch in the HAND position. Confirm the pump starts and HMI/SCADA indicate Pump 2 is running . Confirm manual speed operation from VFD HMI. Turn switch back to OFF and confirm pump shuts down.						
37	With the HOA in the OFF position, confirm the motor heater is energized and operating by checking the amperage on the heater circuit.						
38	Start the motor in HAND and confirm the motor heater turns off.						
39	With the motor running in HAND, simulate a MOTOR HIGH TEMP condition by removing the High Temp (CR4) relay, and confirm the motor shuts down and MOTOR HIGH TEMP is indicated at the PLC/HMI/SCADA.						
40	Start the Pump in HAND and simulate a Low Low Level condition in Forebay 1 by tipping the LSL-101 float. Confirm the motor shuts down and the fault is indicated at the PLC/HIM/SCADA.						
41	Adjust Pressure Switch PSH-102 so it is set to trip slightly lower than operating pressure for testing. With Pump 2 running in AUTO, simulate a HIGH DISCHARGE PRESSURE condition by pinching down the discharge valve while the pump is running. Confirm the pump shuts down and a HIGH DISCHARGE PRESSURE alarm is indicated at the PLC/HMI/SCADA. Adjust to final setting after testing						
42	Start the Pump in HAND and simulate a motor overload fault through the VFD. Confirm the motor shuts down and the fault is indicated at the PLC/HIM/SCADA.						
43	Place the HOA switch in the AUTO position. Initiate a start call from SCADA and confirm pump starts. Confirm pump shuts off when the call is removed. Turn switch back to off and confirm pump stays OFF when pump is called.						
44	Start the pump in AUTO, adjust the pump speed command from SCADA. Confirm the motor speed changes per command, and the speed displayed on the door mounted HMI matches the speed reference received by SCADA. Return the speed command to its normal setting.						

	TEST PROCEDURE OR COORDINATION	NOTES/COMMENTS	DWG REF	CONTRACTOR SIGN-OFF	DATE	OWNER SIGN-OFF	DATE
PUMP 3 STARTUP PROCEDURE							
45	During the course of the pump testing, sign-off on all I/O identified in Appendix B, SAT-2. Along with the devices called out in these Pump procedures the appendix also includes pump commands and status's, etc. A signature on this line acknowledges that all items have been confirmed.	See Appendix B: PLC I/O Checklist, SAT-2.					
46	Confirm the LOS at the motor is in the locked out or open position.						
47	Close the 900A circuit breaker for the Pump 3 VFD.						
48	Confirm the compartment fans operate by adjusting the thermostat to force their operation. Return the thermostat to the specified setting after testing.						
49	With Pump Manufacturers Representative present bump the motor and verify rotation. Representative to complete all testing and provide acknowledgement of proper operation prior to further operation of pump. Representative to provide Certification document.						
50	Turn the VFD to Hand. Confirm the pump does not run. Momentarily release the LOS at the motor and confirm the pump begins to run. Engage the LOS again and confirm the pump shuts down.						
51	Place the HOA switch in the HAND position. Confirm the pump starts and HMI/SCADA indicate Pump 3 is running . Confirm manual speed operation from VFD HMI. Turn switch back to OFF and confirm pump shuts down.						
52	With the HOA in the OFF position, confirm the motor heater is energized and operating by checking the amperage on the heater circuit.						
53	Start the motor in HAND and confirm the motor heater turns off.						
54	With the motor running in HAND, simulate a MOTOR HIGH TEMP condition by removing the High Temp (CR4) relay, and confirm the motor shuts down and MOTOR HIGH TEMP is indicated at the PLC/HMI/SCADA.						
55	Start the Pump in HAND and simulate a Low Low Level condition in Forebay 2 by tipping the LSL-201 float. Confirm the motor shuts down and the fault is indicated at the PLC/HIM/SCADA.						

	TEST PROCEDURE OR COORDINATION	NOTES/COMMENTS	DWG REF	CONTRACTOR SIGN-OFF	DATE	OWNER SIGN-OFF	DATE
56	Adjust Pressure Switch PSH-202 so it is set to trip slightly lower than operating pressure for testing. With Pump 3 running in AUTO, simulate a HIGH DISCHARGE PRESSURE condition by pinching down the discharge valve while the pump is running. Confirm the pump shuts down and a HIGH DISCHARGE PRESSURE alarm is indicated at the PLC/HMI/SCADA. Adjust to final setting after testing						
57	Start the Pump in HAND and simulate a motor overload fault through the VFD. Confirm the motor shuts down and the fault is indicated at the PLC/HIM/SCADA.						
58	Place the HOA switch in the AUTO position. Initiate a start call from SCADA and confirm pump starts. Confirm pump shuts off when the call is removed. Turn switch back to off and confirm pump stays OFF when pump is called.						
59	Start the pump in AUTO, adjust the pump speed command from SCADA. Confirm the motor speed changes per command, and the speed displayed on the door mounted HMI matches the speed reference received by SCADA. Return the speed command to its normal setting.						
PUMP 4 STARTUP PROCEDURE							
60	During the course of the pump testing, sign-off on all I/O identified in Appendix B, SAT-2. Along with the devices called out in these Pump procedures the appendix also includes pump commands and status's, etc. A signature on this line acknowledges that all items have been confirmed.	See Appendix B: PLC I/O Checklist, SAT-2.					
61	Confirm the LOS at the motor is in the locked out or open position.						
62	Close the 900A circuit breaker for the Pump 4 VFD.						
63	Confirm the compartment fans operate by adjusting the thermostat to force their operation. Return the thermostat to the specified setting after testing.						
64	With Pump Manufacturers Representative present bump the motor and verify rotation. Representative to complete all testing and provide acknowledgement of proper operation prior to further operation of pump. Representative to provide Certification document.						
65	Turn the VFD to Hand. Confirm the pump does not run. Momentarily release the LOS at the motor and confirm the pump begins to run. Engage the LOS again and confirm the pump shuts down.						

	TEST PROCEDURE OR COORDINATION	NOTES/COMMENTS	DWG REF	CONTRACTOR SIGN-OFF	DATE	OWNER SIGN-OFF	DATE
66	Place the HOA switch in the HAND position. Confirm the pump starts and HMI/SCADA indicate Pump 4 is running . Confirm manual speed operation from VFD HMI. Turn switch back to OFF and confirm pump shuts down.						
67	With the HOA in the OFF position, confirm the motor heater is energized and operating by checking the amperage on the heater circuit.						
68	Start the motor in HAND and confirm the motor heater turns off.						
69	With the motor running in HAND, simulate a MOTOR HIGH TEMP condition by removing the High Temp (CR4) relay, and confirm the motor shuts down and MOTOR HIGH TEMP is indicated at the PLC/HMI/SCADA.						
70	Start the Pump in HAND and simulate a Low Low Level condition in Forebay 2 by tipping the LSL-201 float. Confirm the motor shuts down and the fault is indicated at the PLC/HIM/SCADA.						
71	Adjust Pressure Switch PSH-202 so it is set to trip slightly lower than operating pressure for testing. With Pump 4 running in AUTO, simulate a HIGH DISCHARGE PRESSURE condition by pinching down the discharge valve while the pump is running. Confirm the pump shuts down and a HIGH DISCHARGE PRESSURE alarm is indicated at the PLC/HMI/SCADA. Adjust to final setting after testing.						
72	Start the Pump in HAND and simulate a motor overload fault through the VFD. Confirm the motor shuts down and the fault is indicated at the PLC/HIM/SCADA.						
73	Place the HOA switch in the AUTO position. Initiate a start call from SCADA and confirm pump starts. Confirm pump shuts off when the call is removed. Turn switch back to off and confirm pump stays OFF when pump is called.						
74	Start the pump in AUTO, adjust the pump speed command from SCADA. Confirm the motor speed changes per command, and the speed displayed on the door mounted HMI matches the speed reference received by SCADA. Return the speed command to its normal setting.						

	TEST PROCEDURE OR COORDINATION	NOTES/COMMENTS	DWG REF	CONTRACTOR SIGN-OFF	DATE	OWNER SIGN-OFF	DATE
FOREBAY WATER BOOSTER FACILITY - PUMP SYSTEM CONTROL STRATEGY TESTING							
75	At the HMI/PLC Lead/Lag Selector, select Pump 1 (P1) as Lead and Pump 2 (P2) as Lag. With the Hand /Off/Auto switches located on the VFD's in Auto on both pumps simulate a Low Forebay 1 level through SCADA and confirm Pump 1 comes on first followed by Pump 2. Swap the Lead/Lag selector and confirm Pump 2 operates first followed by Pump 1. Run this scenario twice in each setting to confirm the chosen lead pump starts first each time. Place HMI selector switch in Auto and the VFD switch in Auto and confirm pump alternation through SCADA with each new pump call.	NOTE: The pumps described in this portion of the plan (PUMP SYSTEM CONTROL STRATEGY TESTING) are described as P1, P2, P3 and P4. This is a description used to reference pump sequencing only and does not reflect the actual Pump Tag Names. In this case P1 would be the "Lead" pump but it may actually be Pump #4 if that is where it fell into the alternation scheme.					
76	With the HMI selector switch in Auto and the VFD's for P1 and P2 switches in Auto and no pumps running, start filling the wet well with water. Verify the lead pump comes on and ramps up to a minimum speed of 75% when the water level reaches (El. 1136.50). With a continued influx of water verify the pump attempts to maintain a set point elevation of (1135.00) by operating at a speed of between 75% and 100%.						
77	If the lead pump is able to maintain the set point level at 75% and the tank level drops to (El. 1133.00) confirm the pump shuts off and remains off until the start set point of (El.1136.50) is reached again.						
78	If P1 is running at 100% speed and the tank level rises to the P2 "On" level of (El.1137.00) confirm P2 ramps up to a minimum speed of 75%. Confirm both pumps operate at 75% to 100% while trying to maintain the (El. 1135) set point.						
79	Confirm that when P1 and P2 are both running at 75% and the level reaches the P2 off level of (El.1133.50), P2 shuts down and P1 continues to run at 75% to 100% trying to maintain the set point.						
80	If P1 and P2 are running at 100% speed and the tank level rises to the P3 "On" level of (El.1137.50). Confirm P3 comes on and ramps up to speed and continues to run at 75 % to 100% along with P1 and P2 while maintaining set point of (El.1135.00)						
81	If pumps 1, 2 and 3 are running at a speed of 75% and the tank level drops to the P3 "Off" level of (El.1134.00), confirm P3 shuts down and P1 and P2 continue to run at varying speeds between 75% and 100% to maintain the setpoint.						
82	Simulate a pump fail. Confirm that an alarm is sent and the P4 standby pump comes on and takes the place of the failed pump.						

	TEST PROCEDURE OR COORDINATION	NOTES/COMMENTS	DWG REF	CONTRACTOR SIGN-OFF	DATE	OWNER SIGN-OFF	DATE
83	Stagger start all four pumps to confirm all pumps will run together in the manual mode.						
84	Confirm "Hardwired Interlock Testing" per Note 4 on I-2. "If the level in the Forebay falls below the Low Low Level as measured by LSLL-101, all pumps shall stop regardless of the PID level controller's output and a Forebay Low Low Level alarm shall be Generated. The Low Low Level alarm shall remain on until the operator turns it off. Normal level control of the pumps shall not resume until the level in the Forebay has risen back above the Low Low Float Setpoint.		I-2				
85	Confirm "Hardwired Interlock Testing" per Note 4 on I-2. "If the level in the Forebay falls below the Low Low Level as measured by LSLL-201, all pumps shall stop regardless of the PID level controller's output and a Forebay Low Low Level alarm shall be Generated. The Low Low Level alarm shall remain on until the operator turns it off. Normal level control of the pumps shall not resume until the level in the Forebay has risen back above the Low Low Float Setpoint.		I-3				
STAND-BY GENERATOR/ AUTOMATIC TRANSFER SWITCH							
86	Confirm SDAPCD "Permit to Operate" is onsite and attached to the Generator prior to fueling .		I-4				
87	Confirm Manufacturerers Technician has performed pre-operational startup and testing and has stated the Generator is ready to operate.		I-4				
88	Confirm the required "Load Bank Test" has been satisfactorily completed.		I-4				
89	Run the Generator and confirm "RUN" signal at PLC/HMI/ SCADA.		I-4				
90	Start the Generator and create a "FAIL" alarm by hitting the E-stop. Confirm signal at PLC/HMI/SCADA .		I-4				
91	Simulate "BATTERY LOW VOLTAGE" lifting the signal lead at the Generator Control Panel. Simulate signal and confirm at PLC/HMI/SCADA.		I-4				
92	Simulate "FUEL LEAK" signal by placing a jumper across the switch input terminals at the Generator Control Panel. Confirm FUEL LEAK alarm at PLC/HMI/SCADA.		I-4				

	TEST PROCEDURE OR COORDINATION	NOTES/COMMENTS	DWG REF	CONTRACTOR SIGN-OFF	DATE	OWNER SIGN-OFF	DATE
93	Simulate "LOW FUEL" signal by connecting a 4-20 signal simulator at the input terminals from the fuel tank sensor at the Generator Control Panel. Simulate signal and confirm matching readings at HMI/SCADA.		I-4				
94	With minimum load on the station place GenSet in the Automatic position and open the main circuit breaker at SE. Confirm the Generator starts and transfers power to the Switchboard through the ATS. Test generator output power with meter and record results. Confirm phase rotation.						
95	Set time delay to re-transfer per District requirements. Close the main CB at SE and confirm ATS transfers back to Utility and auto restart of the PLC and VFDs, and resumption of normal PS operation.	Time delay settings to be determined by District.	I-4				
96	Confirm generator cool down timing.	Time delay settings to be determined by District.					
97	Confirm Generator has been re-fueled after testing.						
SERVICE ENTRANCE SWITCHBOARD SURGE PROTECTION DEVICE							
98	Simulate and confirm SPD alarm is shown at PLC / HMI / SCADA.		I-4				
ATS / SWITCHBOARD/GENERATOR							
99	Confirm Power Monitor information is accessible from SCADA network.		I-4				
100	With the Generator running, confirm the ATS is shown in EMERGENCY MODE" at PLC / HMI / SCADA.		I-4				
101	Perform "Emergency Generator / Step Sequence" testing as described in Spec. Section 17050-2.03		N/A				
MISCELLANEOUS							
102	Remove power source from UPS and confirm "120V POWER FAIL" alarm at PLC/HMI/SCADA.	See Appendix B: PLC I/O Checklist, SAT-2.	I-4				
103	Simulate a "UPS LOW BATTERY" condition and confirm alarm at PLC/HMI/SCADA.	See Appendix B: PLC I/O Checklist, SAT-2.	I-4				
104	Confirm "RTU INTRUSION" (ZS-304) alarm at PLC/HMI/SCADA when opening RTU door.	See Appendix B: PLC I/O Checklist, SAT-2.	I-4				
105	Confirm "ELECTRICAL ROOM INTRUSION" (ZS-305A & B) alarms at PLC/HMI/SCADA when opening Electrical Room door.	See Appendix B: PLC I/O Checklist, SAT-2.	I-4				
106	Confirm "FOREBAY HATCH #1 INTRUSION" (ZS-105) alarm at PLC/HMI/SCADA when opening Forebay 1 hatch door.	See Appendix B: PLC I/O Checklist, SAT-2.	I-2				

	TEST PROCEDURE OR COORDINATION	NOTES/COMMENTS	DWG REF	CONTRACTOR SIGN-OFF	DATE	OWNER SIGN-OFF	DATE
107	Confirm "FOREBAY HATCH #2 INTRUSION" (ZS-207) alarm at PLC/HMI/SCADA when opening Forebay 2 hatch door.	See Appendix B: PLC I/O Checklist, SAT-2.	I-3				
108	Confirm Flow Meter (FE/FIT-206) operation by observing flow and comparing to pump curve for accuracy. Confirm "TOTAL FLOW" and "FLOW INDICATION" at PLC/HMI/SCADA.	See Appendix B: PLC I/O Checklist, SAT-2.	I-3				
109	Confirm Pressure Regulating Valve (ZSC-104) operation. Confirm report back to at PLC/HMI/SCADA.	See Appendix B: PLC I/O Checklist, SAT-2.	I-2				
110	Confirm Pressure Regulating Valve (ZSC-205) operation. Confirm report back to at PLC/HMI/SCADA.	See Appendix B: PLC I/O Checklist, SAT-2.	I-3				
111	Confirm the operation of the Station Lighting.		E-5				
112	Confirm operation of all building receptacles.		E-5				
113	Confirm operation of Air Conditioning		E-5				

Section 4:

Commissioning Phase II Testing and Closeout Items Sign-off

COMMISSIONING PHASE II TESTING AND CLOSEOUT ITEMS SIGN-OFF SHEET

	TEST PROCEDURE OR COORDINATION	NOTES/COMMENTS	DWG	CONTRACTOR SIGN-OFF	DATE	OWNER SIGN-OFF	DATE
1	Training for District personnel has been completed.	Contractor to coordinate with District 30 days prior to commencement of Commissioning Phase II					
2	Reliability Acceptance Test (RAT) - Confirm CONTRACTOR has demonstrated that all systems are capable of operating continuously in the intended manner for an extended period without failing. During the RAT, the system under test will be operated within design parameters reflecting the day-to-day operation of the facilities for an uninterrupted period of 20 calendar days						
3	30-Day Continuous Operation - Confirm completion of 30-Day Continuous Plant Operation with Corrections made as appropriate.						
4	Confirm final O&M's (including any corrections discovered during testing) are complete and copies delivered to owner.						
5	Confirm warranties checklist is complete and warranty start dates are correct.						
6	Final copies of updated AQMD Permit have been delivered to owner and posted on site.						
7	Final As-built construction drawings have been submitted and approved.						
8	Final As-built loop drawings have been submitted and approved.						
9	Confirm any Spare Parts used during start-up have been replenished and all spare parts have been delivered to the District.						
10	Final site clean up is complete and accepted.						

Appendix A:

Piping Exhibit

Contractor to insert drawings and descriptions of piping, valve and equipment configurations & any temporary and/or by-pass piping to be used during testing.

Appendix B:
TCP Input/Output Signal Checklist

ELSINORE VALLEY MUNICIPAL WATER DISTRICT
BOOSTER PUMP STATION
APPENDIX B



TCP Input/Output Signal Checklist

Item No.	I/O Type	I/O Tag No.	Description	Event	Alarm	Hard-Wired	SOFT I/O	DWG	Range / Value	Engineer Units	Analog 0%	Analog 25%	Analog 50%	Analog 75%	Analog 100%	PLC	OIT	SCADA	Unwitnessed SAT-1 Part 1 Contractor (Initials)	Date	Witnessed Tested SAT-1 Part 2 (Initials)	Date	Witness Tested SAT-2 (Initials)	Date	Comments
Blue Highlight = Does not apply to signal.																									
FOREBAY TANK 1 DRAWING I-2 DEVICE / SIGNAL / FUNCTIONAL CHECKLIST																									
1	DI	LALL-101A	Forebay Tank 1 Low Low Level		X	X		I-2								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							LSSL-101 Float
2	AI	LI-201A	Forebay Tank 1 Level	X	X	X		I-2	0-32	FT	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							LT-101 Level Transducer
3	DI	YA-105	Forebay Hatch Intrusion		X	X		I-2								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
4	DI	ZSC-104	PRV Closed Tank 1	X	X	X		I-2								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							PSH-103
5	DO	HS-102B & C	P1 Start / Stop	X		X		I-2								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
6	DI	YL-102B	P1 Run	X		X		I-2								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
7	DI	PSH-102	P1 High Discharge Pressure		X	X		I-2								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							PSH-102
8	DI	YA-102B	P1 VFD Fail		X	X		I-2								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
9	DI	YA-102D	P1 High Temperature		X	X		I-2								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
10	DI	ZL-102B	P1 In Remote	X		X		I-2								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
11	AI	SI-102B	P1 Speed Indication	X	X	X		I-2	0-100	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
12	AO	N/A	P1 Speed Command	X	X	X		I-2	0-100	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
13	DO	HS-103B & C	P2 Start / Stop	X		X		I-2								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
14	DI	YL-103B	P2 Run	X		X		I-2								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
15	DI	PSH-103	P2 High Discharge Pressure		X	X		I-2								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							PSH-102
16	DI	YA-103B	P2 VFD Fail		X	X		I-2								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
17	DI	YA-103D	P2 High Temperature		X	X		I-2								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
18	DI	ZL-103B	P2 In Remote	X		X		I-2								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
19	AI	SI-103B	P1 Speed Indication	X	X	X		I-2	0-100	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
20	AO	N/A	P1 Speed Command	X	X	X		I-2	0-100	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
FOREBAY TANK 2 DRAWING I-3 DEVICE / SIGNAL / FUNCTIONAL CHECKLIST																									
1	DI	LALL-201A	Forebay Tank 2 Low Low Level		X	X		I-3								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							LSSL-101 Float
2	AI	LI-201A	Forebay Tank 2 Level	X	X	X		I-3	0-32	FT	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							LT-101 Level Transducer
3	DI	YA-207	Forebay Hatch Intrusion		X	X		I-3								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
4	AI	PI-204A	Station Pressure	X	X	X		I-3	0-200	PSI	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
5	DI	ZSC-205A	PRV Closed Tank 1	X	X	X		I-3								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							PSH-103
6	DO	HS-202B & C	P3 Start / Stop	X		X		I-3								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							

ELSINORE VALLEY MUNICIPAL WATER DISTRICT
BOOSTER PUMP STATION
APPENDIX B



TCP Input/Output Signal Checklist

Item No.	I/O Type	I/O Tag No.	Description	Event	Alarm	Hard-Wired	SOFT I/O	DWG	Range / Value	Engineer Units	Analog 0%	Analog 25%	Analog 50%	Analog 75%	Analog 100%	PLC	OIT	SCADA	Unwitnessed SAT-1 Part 1 Contractor (Initials)	Date	Witnessed Tested SAT-1 Part 2 (Initials)	Date	Witness Tested SAT-2 (Initials)	Date	Comments
Blue Highlight = Does not apply to signal.																									
7	DI	YL-202B	P3 Run	X		X		I-3								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
8	DI	PSH-202	P3 High Discharge Pressure		X	X		I-3								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							PSH-102
9	DI	YA-202B	P3 VFD Fail		X	X		I-3								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
10	DI	YA-202D	P3 High Temperature		X	X		I-3								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
11	DI	ZL-202B	P3 In Remote	X		X		I-3								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
12	AI	SI-202B	P3 Speed Indication	X	X	X		I-3	0-100	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
13	AO	N/A	P3 Speed Command	X	X	X		I-3	0-100	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
14	DO	HS-203B & C	P4 Start / Stop	X		X		I-3								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
15	DI	YL-203B	P4 Run	X		X		I-3								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
16	DI	PSH-203	P4 High Discharge Pressure		X	X		I-3								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							PSH-102
17	DI	YA-203B	P4 VFD Fail		X	X		I-3								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
18	DI	YA-103D	P4 High Temperature		X	X		I-3								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
19	DI	ZL-103B	P4 In Remote	X		X		I-3								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
20	AI	SI-103B	P4 Speed Indication	X	X	X		I-3	0-100	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
21	AO	N/A	P4 Speed Command	X	X	X		I-3	0-100	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
22	AI	Fi-206A	Flow Meter "Total Flow"	x	x	X		I-3		Gallons						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							

POWER MONITORING SYSTEM DRAWING I-4
DEVICE / SIGNAL / FUNCTIONAL CHECKLIST

1	DI	YA-301A	SPD Alarm		X	X		I-4								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
2	DI	JA-304A	AC Power Fail		X	X		I-4								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
3	DI	JA-304C	UPS Low Battery		X	X		I-4								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
4	DI	YA-304A	RTU Intrusion		X	X		I-4								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
5	DI	YA-305	Electrical Room Intrusion		X	X		I-4								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
6	DI	YL-302A	Generator Running	X	X	X		I-4								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
7	DI	YA-302A	Generator Fail		X	X		I-4								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
8	DI	YA-302C	Generator Low Battery		X	X		I-4																	Not used.
9	DI	YA-302E	Generator Fuel Leak		X	X		I-4								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
10	DI	LAL-302A	Generator Low Fuel		X	X		I-4																	Not used.
11	DI	ZL-303A	ATS In Emergency	X	X	X		I-4								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
12	Data Link	N/A	Power Monitor Status	X	X		X	I-4								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							

Appendix C:

Spare Parts Checklist

APPENDIX C SPARE PARTS CHECKLIST				
Item No.	Specification Section	Item Name	Description	Complete (Checkbox)
1		General	Spare parts shall be delivered in manufacturer's original containers, labeled to completely describe contents and equipment for which it is furnished.	<input type="checkbox"/>
1	11315	Vertical Turbine Pumps	(4) Complete mechanical seal (4) Complete set of gaskets and "O" rings (1) Set of special tools	<input type="checkbox"/>
2	16483	Variable Frequency Drives	1. (3) spare fuses of each type and amp rating installed. 2. (2) of each type converter power semi-conductor. 3. (2) of each type of inverter power semi-conductor. 4. (5) of each type of panel lamps. 5. (1) of each type of control printed circuit board and gate firing board. Spare parts to be packaged per specification requirements.	<input type="checkbox"/>
4	16620	Stand-by Engine Generator	1. (3) Filters of each type for all services. 2. (3) Fuses of each type and rating used. 3. (3) Indicator light bulbs of each type and rating used	<input type="checkbox"/>
5	17010-1.04.E	Instrumentation and Controls	Provide Spare Parts List and \$1,000.00 worth of spare parts.	<input type="checkbox"/>

Appendix D:

O&M Manuals Checklist

APPENDIX D				
O&M MANUALS AND INFORMATION CHECKLIST				
Item No.	Specification Section	Item Name	Description	Complete (Checkbox)
1	11315	Vertical Turbine Pumps	Provide operation and maintenance manual for the Vertical Turbine Pumps	
2	11400	Magnetic Flow Meter	Provide operation and maintenance manual for the Magnetic Flow Meter	
3	15100	Valves and Appurtenances	Provide operation and maintenance manual for the Valves and Appurtenances	
4	15110	Sluice Gates	Provide operation and maintenance manual for the Sluice Gates	
5	15120	Diaphragm-Actuated Control Valves	Provide operation and maintenance manual for the Diaphragm-Actuated Control Valves	
6	15130	Gauges	Provide operation and maintenance manual for the Gauges	
7	16010	General Electric	Provide operation and maintenance manual for general electrical products used on this project	
8	16400	Switchboards	Provide operation and maintenance manual for the Switchboards	
9	16441	Panelboards	Provide operation and maintenance manual for the Panelboard	
10	16443	Surge Suppresion Device	Provide operation and maintenance manual for the Surge Suppression Device	
11	16460	Transformers	Provide operation and maintenance manual for the Lighting Panel Transformer.	
12	16483	Variable Frequency Drives	Provide operation and maintenance manual for the VFD's.	
13	16620	Diesel Generator	Provide (4) sets of operation and maintenance manuasl for diesel generator and all components.	
14	17010	Instrumentation and Controls	Provide operation and maintenance manual for the items provided in this spec. section.	
15	238126	Split System Air Conditioners	Provide operation and maintenance manual for the A/C unit.	

Appendix E:

Special Warranty Checklist

APPENDIX E				
SPECIAL WARRANTY CHECKLIST - Per Spec. Sec. 01660 and 230000, Standard Warranty on all equipment is (1) year. Only warranties with different requirements are listed here.				
Item No.	Specification Section	Item Name	Description	Complete (Checkbox)
1	05120	Structural Steel	Warranty to cover replacement or repair all defective material and workmanship within 18 months of shipment, or 12 months after plant startup, whichever occurs first.	<input type="checkbox"/>
2	07920	Sealants and Caulking	Provide a 5 year warranty.	<input type="checkbox"/>
3	09962	Concrete Lining	Schedule warranty inspection (11) months after completion of coating work.	<input type="checkbox"/>
4	13123	Sunshade Structure	Provide a minimum 20 year warranty for roof panels.	<input type="checkbox"/>
5	16443	Surge Suppression Device	Provide a 10 year warranty from date of shipment against any SPD part failure.	<input type="checkbox"/>
6	15100	Surge Anticipator/Surge Relief Valve	Provide a minimum 12 month warranty for the Pressure Relief Valve.	<input type="checkbox"/>
7	16620	Diesel Generator	Provide a (5) year warranty	<input type="checkbox"/>
8	238126	Split-System Air Conditioners	Provide a (5) year warranty for the Compressor	<input type="checkbox"/>