END OF DAY CHECKLIST			A-02
Project Name		Project No.	
Asset		Location	
Date		Time	

	General for all Sites	OK	N/A	S/L
1	Confirm As-built mark ups folders are on site and current	☐	☐	☐
2	Review alarms list, confirm no alarms of concern	☐	☐	☐
3	Review inhibits and remove any which do not need to be enabled, update inhibit log	☐	☐	☐
4	Brief On call staff and site controller on current status and issues	☐	☐	☐
5	Central Control room notified, and process control handed over	☐	☐	☐
6	All staff and contractors have left site and site is secure	☐	☐	☐
7	Security System is armed	☐	☐	☐
DCS or Delta V Site Specific				
1	Confirm DCS Cold start memory downloaded	☐	☐	☐
2	Download setup date to propagate graphics	☐	☐	☐
3	Alarm areas assigned to workstations and remote client session	☐	☐	☐
RTU / SCADA Site Specific				
1	Scada to RTU communication and alarming is working (test with door open / intruder alarm)	☐	☐	☐
2	Correct equipment status is being shown and trended on CCR SCADA	☐	☐	☐
3	Software backups completed	☐	☐	☐

Comments / Notes:

COMPLETED BY:	COMPANY	PRINT NAME	SIGNATURE

HV and MV CABLES			E-02B
Asset		Project No.	
Location		System	
Tag Number		Cable Size	
Termination Drawing		SLD Drawing	

		OK	N/A	S/L
1	Confirm installation is complete and ITR E02A is complete and in the completion's dossier	☐	☐	☐
2	Insulation Resistance Test (before pressure test): - 5kV Megger (Min value 100 MΩ)/ L1 – L2+L3+E _____ MΩ L2 – L1+L3+E _____ MΩ L3 – L1+L2+E _____ MΩ	☐	☐	☐
3	Pressure Test: - record leakage current mA / Test Voltage: - 15kV DC / Test Duration 15 mins L1 – L2+L3+E _____ mA L2 – L1+L3+E _____ mA L2 – L1+L3+E _____ mA	☐	☐	☐
4	Insulation Resistance Test (after pressure test): - 5kV Megger (Min value 100 MΩ) L1 – L2+L3+E _____ MΩ L2 – L1+L3+E _____ MΩ L3 – L1+L2+E _____ MΩ Ensure after completing tests 2, 3 & 4 all cores are discharged to earth for 15 mins*	☐	☐	☐
5	Reconnect cable cores and confirm correct terminations. End 'A' End 'B'	☐	☐	☐
6	Record torque settings and bolt size End 'A' _____ Nm _____ mm End 'B' _____ Nm _____ mm	☐	☐	☐
7	Gland body to earth path resistance (Max 0.1Ω)	☐	☐	☐
8	Confirm mechanical protective measures, kick plates, covers, etc are fitted correctly	☐	☐	☐
9	Replace covers and doors, and check all bolts are correct and none missing	☐	☐	☐

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

LV and HV SWITCHBOARDS			E-03B
Asset		Project No.	
Location		System	
Tag Number		Manufacturer	
Layout Drawing		Model	
SLD Drawing		Serial number	

		OK	N/A	S/L
1	Record the following rating information: **Rating:** _____Volts _____Amps **Fault Level:** _____ MVA _____Secs	☐	☐	☐
2	Confirm Vendor Test Documentation is complete and in the Completion Dossier	☐	☐	☐
3	Check correct operation of all busbar shutters	☐	☐	☐
4	Check mechanical interlocking facilities functioning correctly	☐	☐	☐
5	Confirm fuse links, MCB ratings and protection settings are as design schedule	☐	☐	☐
6	Confirm tripping, closing, and testing supplies are function check and available	☐	☐	☐
7	Energise anti-condensation heaters and confirm operation of thermostats	☐	☐	☐
8	Function check: **HV** – Main VCB's and control circuits **LV** – Main AC Breakers and check interlocks	☐	☐	☐
9	On completion of function checks, confirm any temporary links have been removed	☐	☐	☐
10	Disconnect an electronic equipment, VT's etc. & short CT's	☐	☐	☐
11	Ensure an "As Built" documentation is complete	☐	☐	☐
12	Busbar Insulation Resistance Test Results (before pressure test):- HV - 5kV Megger LV – 1KV Megger (Min value 100 MΩ) L1 – L2+L3+E _____ MΩ L2 – L1+L3+E _____ MΩL2 – L1+L3+E _____ MΩ	☐	☐	☐
13	HV only - Pressure Test: - record leakage current mA / Test Voltage: - 15kV DC / Test Duration 15 mins L1 – L2+L3+E _____ mA L2 – L1+L3+E _____ mA L2 – L1+L3+E _____ mA	☐	☐	☐
14	HV only - Insulation Resistance Test (after pressure test): - 5kV Megger (Min value 100 MΩ) L1 – L2+L3+E _____ MΩ L2 – L1+L3+E _____ MΩ L3 – L1+L2+E _____ MΩ Ensure after completing tests 12,13 & 14 all cores are discharged to earth for 15 mins*	☐	☐	☐
15	Confirm Outgoing circuits are Isolated and Energise Switchboard	☐	☐	☐
16	Confirm Voltage levels and ensure phase rotation is correct	☐	☐	☐

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

DISTRIBUTION BOARDS, CONTROL PANELS, JB			E-04B
Asset		Project No.	
Location		System	
Tag Number		Manufacturer	
SLD Drawing		Model	
Schematic Drawing		Serial number	

		OK	N/A	S/L
1	Record the following rating information: Rating _____Volts _____ Amps	☐	☐	☐
2	Confirm Vendor Test Documentation is complete and in the Completion Dossier	☐	☐	☐
3	Prove manual operation of isolators, switches, pushbuttons	☐	☐	☐
4	Confirm correct scale and operation of local ammeter if fitted	☐	☐	☐
5	Confirm local indicators operate correctly and lamps are correctly rated	☐	☐	☐
6	Confirm MCB / Fuse ratings are correct	☐	☐	☐
7	Confirm MCB / Fuse ratings at feeder source	☐	☐	☐
8	Function check feeder cubicle inclusive of local / remote functions	☐	☐	☐
9	Ensure any outgoing circuits are isolated. Energise Panel supplies and check voltage and phase sequence	☐	☐	☐
10	Carry out energised operational checks and prove that all internal logic and interlocks function as per design philosophy	☐	☐	☐
11	Energise anti-condensation heaters and confirm operation	☐	☐	☐
12	Confirm all covers are intact, gaskets are installed, locking mechanisms fully functional, all enclosure bolts installed.	☐	☐	☐
13	Ensure an “As Built” documentation is complete	☐	☐	☐

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

ELECTRIC MOTORS			E-05B
Asset		Project No.	
Location		System	
Tag Number		Manufacturer	
Fed From		Model	
Schematic Drawing		Serial number	

		OK	N/A	S/L
1	Record the following rating information: Rating: _____Volts _____ Amps _____ HZ _____ KW _____ RPM	☐	☐	☐
2	Confirm Vendor Test Documentation is complete and in the Completion Dossier	☐	☐	☐
3	Confirm MCB / Fuse rating are correct to latest design drawings	☐	☐	☐
4	Confirm motor management / protection, relays are configured correctly and settings are as per latest design schedule	☐	☐	☐
5	Test and record insulation resistance of anti-condensation heater _____MΩ	☐	☐	☐

CONDUCTOR CONTINUITY	POWER	☐ Af	☐ Bf	☐ Cf	☐ GND
	CONTROL	☐ X1	☐ X2	☐ X3	☐ X4 ☐ X5

		OK	N/A	S/L
6	Test and record motor insulation resistance – 500V Megger at 1min	☐	☐	☐

INSULATION RESISTANCE Power & Control Leads (MEGOHMS)	A - B	B - C	C - A	A - GND
	B - GND	C - GND	X1 - GND	X2 - GND
	X3 - GND	X4 - GND	X5 - GND	

		OK	N/A	S/L
7	Confirm point to point test of motor feeder	☐	☐	☐
8	For HV and MV motors, carry out PI test (min value 1.6) 1min _____MΩ, 10min _____MΩ : PI Ratio = 10min value / 1minute value = _____	☐	☐	☐
9	Where applicable check continuity of winding thermistor devices	☐	☐	☐
10	Select test position and function check starter control circuits	☐	☐	☐
11	Confirm all trip circuits operate satisfactory	☐	☐	☐
12	Confirm all remote / local control facilities operate satisfactorily	☐	☐	☐
13	Confirm anti-condensation heater operates satisfactorily: Record Current _____ A	☐	☐	☐
14	Confirm Bearings have been lubricated with the correct grease. Grease type _____	☐	☐	☐
15	Check motor shaft end play and free rotation	☐	☐	☐

MOTOR OFF LOAD RUN-IN (4 HOURS)	OPEN GREASE PLUGS AND FILL		MOTOR ROTATION
	VIBRATION	BEARING TEMP	NO LOAD CURRENT

		OK	N/A	S/L
16	Ensure an “As Built” documentation is complete	☐	☐	☐

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

BATTERIES, CHARGERS, UPS, INVERTERS			E-06B
Asset		Project No.	
Location		System	
Tag Number		Manufacturer	
Fed From		Model	
Schematic Drawing		Serial number	

BATTERIES		OK	N/A	S/L
1	Record the following information: Number of Cells_____ Capacity _____ A/Hrs Nominal Voltage _____ V	☐	☐	☐
2	Confirm Vendor Test Documentation and ITR-E-06A is complete and in the Completion Dossier.	☐	☐	☐
3	In accordance with the relevant commissioning procedure, connect load bank to bus bars of distribution board and set to rated load	☐	☐	☐
4	Demonstrate automatic discharge test and record discharge current	☐	☐	☐
5	Confirm automatic discharge period ceases after 5mins	☐	☐	☐
6	Isolate AC supply and discharge the battery bank as per vendor recommendations.	☐	☐	☐
7	Record Discharge Current _____A. Record Battery Start Voltage: _____V	☐	☐	☐
8	Record discharge current and cell voltages at regular intervals Attach Vendor battery discharge sheets showing individual cell voltages during discharge. (If vendor sheet not available, site developed sheet showing cell voltages before test, after test and at regular intervals during test. Discharge current to be recorded at each interval.)	☐	☐	☐
9	Confirm tests were conducted in accordance with design requirements and manufacturers data	☐	☐	☐
10	Confirm that cell end voltages comply with design requirements and manufacturers data. Minimum cell end volts requirement: _____V, lowest cell voltage: _____ V Minimum battery end volts requirements: _____V, Actual Battery end voltage: _____V	☐	☐	☐
11	Recharge battery bank over 12-hour period and record final open circuit terminal voltage and surface temperature. Terminal Voltage (minimum 90% nominal value): _____ V Ambient Temperature: _____ °C, Surface Temperature _____ °C	☐	☐	☐

CHARGERS / UPS / INVERTERS		OK	N/A	S/L
1	Record the following information: Input Rating: _____V _____ A _____Hz Output Rating: _____ V _____ A _____ Hz	☐	☐	☐
2	Confirm Vendor Test Documentation and ITR-E-06A is complete and in the Completion Dossier.	☐	☐	☐
3	Confirm Feeder MCB's / Fuse rating are correct to latest design drawings	☐	☐	☐
4	Function check feeder cubicle and prove remote controls / shutdowns	☐	☐	☐
5	Prove manual operation of isolators, switches, pushbuttons	☐	☐	☐
6	Confirm correct scale and operation of instruments and HMI	☐	☐	☐
7	Confirm Outgoing MCB's / Fuse rating are correct to latest design drawings	☐	☐	☐
8	Carry out IR tests on main AC circuits (*note: -disconnect electronics)	☐	☐	☐
9	Energise charger confirm output polarity and record Float Charge Values. _____ A _____V	☐	☐	☐
10	Carry out energised operational checks and prove that all internal logic and interlocks function as per design philosophy	☐	☐	☐
11	Alarms and Trips Function Test:	☐	☐	☐

	Device	Alarm Setting	Trip Setting	Comments

12	Energise charger confirm output polarity and record following values: -			
Float Charge Rate		Amps		Volts
13	Output voltage ripple within tolerance	☐	☐	☐
14	Confirm operation of current limit	☐	☐	☐
15	Confirm continuity of output voltage on failure of input AC supply	☐	☐	☐
16	Confirm operation of battery isolator on external trip signal	☐	☐	☐
17	Ensure all Vendor energised tests complete. Attach copy of vendor test report	☐	☐	☐
18	Ensure an "As Built" documentation is complete	☐	☐	☐
19	Confirm output from Inverter maintained under the following conditions: - Loss of mains input Operation of by-pass Switch	☐ ☐	☐ ☐	☐ ☐
20	Confirm battery paralleling contractor operating	☐	☐	☐
21	Energise Inverter and load test in accordance with manufacturers recommendations and record the following values: -	☐	☐	☐

		No Load	25% FLC	50% FLC	75% FLC	100% FLC
22	Load kW					
	DC Volts in					
	DC Amps in					
	AC Volts out		`			
	AC Amps out					
	Distortion (mV)					
	Output Amps Limit		`			

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

GENERATOR / ALTERNATOR			E-07B
Asset		Project No.	
Location		System	
Tag Number		Manufacturer	
Frame Size		Model	
Engine Type		Rating	
Schematic Drawing		Serial number	

		OK	N/A	S/L
1	Record the following information: Full Load _____ V _____ A _____ Hz _____ RPM	☐	☐	☐
2	Confirm Vendor Test Documentation (FAT, SAT or ITR-E-07A) is complete and in the Completion Dossier.	☐	☐	☐
3	***Note: Before tests short out the rotating diodes** Alternator Test Results (Test Voltage 5kV) *Winding IR (min 150 MΩ) MΩ Winding Resistance U – V Ω V – W Ω W – U Ω Exciter Test Results (Test Voltage 500V) *Winding IR (min 10 MΩ) MΩ *Winding Resistance Ω	☐ ☐	☐ ☐	☐ ☐
4	On completion of IR tests, discharge the windings residual charge to earth PI Test Results (min. value 2.0 MΩ) After 1 Min MΩ After 10 Min MΩ Pedestal Bearing IR MΩ Anti-Condensation Heater IR MΩ	☐	☐	☐
5	Remove shorting links and test each diode for conduction	☐	☐	☐
6	Energise anti-condensation heaters and space heaters	☐	☐	☐
7	Confirm all covers and guards have been replaced	☐	☐	☐

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

POWER TRANSFORMER			E-08B
Asset		Project No.	
Location		System	
Tag Number		Manufacturer	
Insulation Medium		Model	
IP Rating		Serial number	
Schematic Drawing		SLD Drawing	

		OK	N/A	S/L
1	Record the following information: Rating: _____ KVA AN _____ KVA AF _____ Hz Fault Level _____ MVA _____ Secs Primary Voltage: _____ V Secondary Voltage _____ V Tap Range: _____ Vector Group _____ % Impedance _____	☐	☐	☐
2	Confirm Vendor Test Documentation (FAT, SAT or ITR-E-08A) is complete and in the Completion Dossier.	☐	☐	☐
3	Confirm balanced resistance values of transformer windings. L1 – L2 Ω | L2 – L3 Ω | L3–L1 Ω	☐	☐	☐
4	Remove N – E link and perform winding insulation test (test duration:- 1min) Winding Insulation Resistance Test Results (before pressure test) MV – LV, E | MΩ | Use 5kV Megger (Min value 150 MΩ) LV – MV, E | MΩ | Use 1 kV Megger (Min value 10 MΩ)	☐	☐	☐
5	Short LV windings to earth and pressure test primary connections for 1min Test Voltage kV DC | Leakage Current mA	☐	☐	☐
6	Discharge both LV and MV windings to earth for 30mins	☐	☐	☐
7	Remove N – E link and perform winding insulation test (test duration: - 1min) Winding Insulation Resistance Test Results (after pressure test) MV – LV, E | MΩ | Use 5kV Megger (Min value 150 MΩ) LV – MV, E | MΩ | Use 1 kV Megger (Min value 10 MΩ)	☐	☐	☐
8	Confirm no deterioration of insulation resistance since pressure test	☐	☐	☐
9	Confirm operation of winding temperature monitoring system, remote indications, alarms trips and forced fan units	☐	☐	☐
10	Function check VCB/ACB control circuits and verify intertrips and protection trips	☐	☐	☐
11	Confirm tap setting is correct	☐	☐	☐
12	On completion of tests confirm transformer is left in a safe condition	☐	☐	☐

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

ELECTRIC HEATERS			E-09B
Asset		Project No.	
Location		System	
Tag Number		Manufacturer	
Model		Serial number	
Schematic Drawing		SLD Drawing	

		OK	N/A	S/L
1	Record the following information: Rating: _____ V _____ A _____ Hz _____ KW _____ Phases	☐	☐	☐
2	Confirm Vendor Test Documentation (FAT, SAT or ITR-E-09A) is complete and in the Completion Dossier.	☐	☐	☐
2	Confirm MCB / Fuse rating at Switch Board feeder cubicle are correct	☐	☐	☐
3	Confirm control equipment operating correctly	☐	☐	☐
4	Confirm correct function of high temperature alarms and trips	☐	☐	☐
5	Confirm low air flow trip functions correctly	☐	☐	☐
6	Confirm external trips function correctly (i.e.; PSD/PCS etc.)	☐	☐	☐
7	Carry out IR tests and point to point check prior to energisation checks	☐	☐	☐
8	Element resistance per phase	☐	☐	☐
9	Trip manual reset correct	☐	☐	☐
10	Energise circuit and record the following: Cold _____ Amps | Hot _____ Amps	☐	☐	☐
11	Confirm heater response is satisfactory over temperature control range	☐	☐	☐
12	For SCR controlled heaters confirm mode of operation of thyristors: - Single Cycle ☐ | Burst Firing ☐	☐	☐	☐
13	Confirm anti-condensation heater operational	☐	☐	☐
14	Check all covers and guards are installed and no bolts missing	☐	☐	☐
15	'Red Line' mark-up complete	☐	☐	☐
16	Make safe heater and lock off supply at source	☐	☐	☐

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

Watercare

SOCKET OUTLET CIRCUITS			E-10B
Asset		Project No.	
Location		System	
Schematic Drawing		SLD Drawing	

		OK	N/A	S/L
1	Record the following information: MCB Rating: _____ V _____ A _____ Phases RCD Rating _____ V _____ A _____ Trip mA _____ Type	☐	☐	☐
2	Confirm Vendor Test Documentation and ITR-E-10A is complete and in the Completion Dossier.	☐	☐	☐
3	Confirm MCB / RCD at Switch Board are correct	☐	☐	☐
4	Visually inspect circuit for external damage	☐	☐	☐
5	Perform Insulation Resistance check on circuit – minimum value 10MΩ	☐	☐	☐
6	Energise circuit and check voltage / polarity at each socket.	☐	☐	☐
7	Record Full load current of circuit at Distribution Board: Amps	☐	☐	☐
8	Confirm mechanical interlock is operational at each socket	☐	☐	☐
9	Complete earth loop impedance test	☐	☐	☐
10	'Red Line' mark-up complete	☐	☐	☐
11	For welding outlet circuits, complete the following table			

	Outlet	MCB / Fuse Rating	Earth Continuity	Circuit IR	Volts at Welding Outlet	Phase Rotation
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

LIGHTING CIRCUITS			E-11B
Asset		Project No.	
Location		System	
Schematic Drawing		SLD Drawing	

		OK	N/A	S/L
1	Record the following information: MCB Rating: _____ V _____ A _____ Phases RCD Rating _____ V _____ A _____ Trip mA _____ Type	☐	☐	☐
2	Confirm Vendor Test Documentation and ITR-E-11A is complete and in the Completion Dossier.	☐	☐	☐
3	Confirm MCB / RCD at Switch Board are correct	☐	☐	☐
4	Visually inspect circuit for external damage	☐	☐	☐
5	Perform Insulation Resistance check on circuit – minimum value 10MΩ	☐	☐	☐
6	Energise circuit and check voltage / polarity at each light, and confirm they are working correctly	☐	☐	☐
7	Record Full load current of circuit at Distribution Board: Amps	☐	☐	☐
8	Carry out live circuit earth loop impedance test from furthest luminaires (max. value 2 75Ω for 16A type 1 MCB)	☐	☐	☐
9	Confirm correct alignment of floodlights, and function of any PIR detectors	☐	☐	☐
10	For emergency luminaires, ensure batteries are fully charged and carry out discharge tests as per manufacturer's instructions or that UPS feeds are functioning	☐	☐	☐
11	Confirm discharge times comply with design requirements	☐	☐	☐
12	Re-energise circuit and confirm luminaires function correctly	☐	☐	☐
13	'Red Line' mark-up complete	☐	☐	☐

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

MISCELLANEOUS EQUIPMENT			E-12B
Asset		Project No.	
Location		System	
Tag Number		Description	
Manufacturer		Serial Number	
Schematic Drawing		SLD Drawing	

		OK	N/A	S/L
1	Record the following information: MCB Rating: _____ V _____ A _____ Phases Equipment Rating: _____ V _____ A _____ Hz	☐	☐	☐
2	Confirm Vendor Test Documentation and ITR-E-12A is complete and in the Completion Dossier.	☐	☐	☐
3	Confirm MCB / RCD at Switch Board are correct	☐	☐	☐
4	Visually inspect equipment for external damage	☐	☐	☐
5	Function check Switch Board feeder cubicle inclusive of remote / locate controls	☐	☐	☐
6	Prove manual operation of isolators, switches, pushbuttons	☐	☐	☐
7	Confirm local indicators operate correctly	☐	☐	☐
8	Energise circuit and check voltage / polarity and confirm everything is working correctly	☐	☐	☐
9	Record Full load current of circuit at Distribution Board: Amps	☐	☐	☐
10	Carry out energised operational checks and prove that all internal logic and interlocks function as per design philosophy	☐	☐	☐
11	'Red Line' mark-up complete	☐	☐	☐

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

MAIN EARTHING			E-13B
Asset		Project No.	
Location		System	
Tag Number		Description	
Schematic Drawing		Layout Drawing	

		OK	N/A	S/L
1	Confirm Vendor Test Documentation and ITR-E-13A is complete and in the Completion Dossier.	☐	☐	☐
2	Visually inspect the earth rod chamber / plant earth bus bar for internal & external damage	☐	☐	☐
3	Visually check Earth Electrode & pit / plant earth bus bar properly installed and labelled as per specification	☐	☐	☐
4	Earth conductor size correct as per site specification	☐	☐	☐
5	Carry out Earth Resistant Measurement using the Slope Method	☐	☐	☐

Earth Resistance Slope Test

The following readings are taken with potential spike location of 5m intervals from earth system:	EC Distance =

Position P Electrode	Distance of P from earth	Measured Earth Resistance
1	5m	
2	10m	
3	15m	
4	20m	
5	25m	
6	30m	

Plot results onto a graph

Calculate slope coefficient U = R3-R2/R2-R1	U=
From table obtain PT/EC for value of U	PT/EC=
Multiply the value PT/EC by EC to obtain PT	PT/ECxEC=
From graph read of resistance value for PT	Earth Electrode / Nest / Bus Bar Resistance =

6	'Red Line' mark-up complete	☐	☐	☐

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

PROTECTION RELAY / CIRCUIT			E-14B
Asset		Project No.	
Location		System	
Tag Number		Description	
Schematic Drawing		Layout Drawing	

ALL		OK	N/A	S/L
1	Confirm Vendor Test Documentation is complete (FAT and SAT) and in the Completion Dossier.	☐	☐	☐
2	Confirm all transit packing removed	☐	☐	☐
3	Visually inspect equipment for damage	☐	☐	☐
Current Transformers		**OK**	**N/A**	**S/L**
4	Confirm all connection are correct, and CT mounted correctly	☐	☐	☐
5	Confirm CT class and ratio is correct to design data	☐	☐	☐
6	Confirm CT primary polarity is correct (P1 / P2)	☐	☐	☐
7	Confirm CT secondary connections are correct (S1 / S2)	☐	☐	☐
8	Prove CT polarity (Flick Test) if applicable and carry out ratio checks to confirm CT tolerance	☐	☐	☐
9	Confirm all secondary wiring is connected and there are no open circuits	☐	☐	☐
Voltage Transformers		**OK**	**N/A**	**S/L**
10	Confirm primary and secondary fuses are correctly rated	☐	☐	☐
11	Check earthing and confirm continuity of scraping earth	☐	☐	☐
12	Carry out 1 kV IR test on VT windings (min value 10 MΩ): - [MV – LV, E _____ MΩ] [LV – MV, E _____ MΩ]	☐	☐	☐
13	Confirm winding continuity: - [MV _____ Ω] [LV _____ Ω]	☐	☐	☐
14	Energise VT and confirm VT ratio / phasing	☐	☐	☐
Protection Relays		**OK**	**N/A**	**S/L**
15	Confirm all connections are correct, secure and there are no open circuits	☐	☐	☐
16	Confirm relay identification is correct to design schedule	☐	☐	☐
17	Confirm relay type and settings are correct to latest revision of design schedule	☐	☐	☐
18	Carry out appropriate primary injection tests and confirm satisfactory operation of protection and lock-out relays (Commissioning engineer to confirm test procedures and attach results)	☐	☐	☐
19	Check withdraw type contact and CT shorting with relay base operate & undamaged	☐	☐	☐
20	Confirm all secondary wiring is connected and there are no open circuits	☐	☐	☐
ALL		**OK**	**N/A**	**S/L**
21	On completion of tests, confirm that all wiring has been re-instated, all 'frigs' and short circuits removed and relay settings re-set to design schedule	☐	☐	☐
22	Confirm all relay front covers have been re-instated and seals attached	☐	☐	☐
23	'Red Line' mark-up complete	☐	☐	☐

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

Watercare

ELECTRIC ACTUATOR FOR MOV			E-15B
Asset		Project No.	
Location		System	
Tag Number		Model	
Manufacturer		Serial Number	
Schematic Drawing		Layout Drawing	

		OK	N/A	S/L
1	Confirm Vendor Test Documentation is complete (FAT and SAT) and in the Completion Dossier.	☐	☐	☐
2	Confirm all transit packing removed	☐	☐	☐
3	Visually inspect equipment for damage	☐	☐	☐
4	Measure the Windings IR _____MΩ	☐	☐	☐
5	Measure the Windings continuity resistance _____Ω	☐	☐	☐
6	Power up the Actuator	☐	☐	☐
7	Confirm parameters are programmed to match the FD and design	☐	☐	☐
8	Operate the actuator and confirm Correct Limit and Torque switch operation and indications	☐	☐	☐
9	Confirm operation is smooth and quiet	☐	☐	☐
10	Total stroke time: - [Off Load _____ Seconds] [On Load _____ Seconds]	☐	☐	☐
11	Start Current: - [Off Load _____ Amps] [On Load _____ Amps]	☐	☐	☐
12	Running Current: - [Off Load _____ Amps] [On Load _____ Amps]	☐	☐	☐
13	'Red Line' mark-up complete	☐	☐	☐

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

CONTACTOR STARTER / FUSED SWITCH			E-16B
Asset		Project No.	
Location		System	
Tag Number		Model	
Manufacturer		Serial Number	
Schematic Drawing		Layout Drawing	

		OK	N/A	S/L
1	Record the following information: Rating: _____V _____A _____ Hz _____KW _____ Phases	☐	☐	☐
2	Confirm Vendor Test Documentation is complete (FAT and SAT) and in the Completion Dossier	☐	☐	☐
3	Confirm all transit packing removed	☐	☐	☐
4	Visually inspect equipment for damage	☐	☐	☐
5	Control circuit I.R. MΩ	☐	☐	☐
6	Main circuit I.R. MΩ	☐	☐	☐
7	Main circuit phasing is correct	☐	☐	☐
8	Protection settings verified with latest project setting schedule	☐	☐	☐
9	Check door, isolator and padlock operations are correct	☐	☐	☐
10	Over current protection testing complete	☐	☐	☐
11	Earth fault protection testing complete	☐	☐	☐
12	Indicating instrumentation testing complete	☐	☐	☐
13	Cubicle function checked and wiring correct to Schematic Dwg No.	☐	☐	☐
14	Prove operation of remote stop / start (SCADA / DCS)	☐	☐	☐
15	Remote annunciations correct (SCADA / DCS)	☐	☐	☐
16	'Red Line' mark-up complete	☐	☐	☐

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

Watercare

CIRCUIT BREAKER			E-17B
Asset		Project No.	
Location		System	
Tag Number		Model	
Manufacturer		Serial Number	
Schematic Drawing		Layout Drawing	

		OK	N/A	S/L
1	Record the following information: Rating: _____V _____A _____ Phases Fault Rating _____A	☐	☐	☐
2	Confirm Vendor Test Documentation is complete (FAT and SAT) and in the Completion Dossier	☐	☐	☐
3	Confirm all transit packing removed	☐	☐	☐
4	Insulation Resistance Test	☐	☐	☐

	Circuit Breaker Position	Test Between	MΩ
1	Closed	L1 – L2, L3, E	
2	Closed	L2 – L1, L3, E	
3	Closed	L3 – L1, L2, E	
4	Open	L1, L2, L3 – E Busbar side L1, L2, L3 – E Circuit side	
5	Test Voltage		
6	Duration		

5	Ducter Test			☐	☐	☐

	Circuit Breaker Position	Test Between	Resistance Reading Ω
1	Closed	R Phase	
2	Closed	Y Phase	
3	Closed	B Phase	

6	Prove all electrical and mechanical interlocks	☐	☐	☐
7	Check and prove all wiring are correct	☐	☐	☐
8	Check control operation of tripping / closing circuit	☐	☐	☐
9	Check lock-off (padlock) facilities on: • Isolator • Cubicle door apertures and handle • Bus bar circuit shutters	☐ ☐ ☐	☐ ☐ ☐	☐ ☐ ☐
10	Control circuit I.R. MΩ	☐	☐	☐
11	With circuit breaker in the service position check: • Manual closing • CB trips by operation of local mechanical push button • CB closes by operation of local control switch. • CB trips by manual operation, relays in shunt trip circuit and operation of remote-control switch.	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐

12	Confirm fuse sizes are correct	☐	☐	☐
13	Check all alarm indicators function correctly	☐	☐	☐
14	Remote annunciations correct (SCADA / DCS)	☐	☐	☐
15	'Red Line' mark-up complete	☐	☐	☐

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

CONTACTOR CONTROL UNIT			E-19B
Asset		Project No.	
Location		System	
Tag Number		Model	
Manufacturer		Serial Number	
Schematic Drawing		Layout Drawing	

		OK	N/A	S/L
1	Record the following information: Rating: _____V _____A _____ Phases _____KW	☐	☐	☐
2	Confirm Vendor Test Documentation is complete (FAT and SAT) and in the Completion Dossier	☐	☐	☐
2	Test position switch functions OK	☐	☐	☐
3	Auxiliary contact operates	☐	☐	☐
4	Earth fault trips unit after 0.75 seconds	☐	☐	☐
5	Over current protection functions OK	☐	☐	☐
Note: The following test will be carried out with MCC in the test position				
6	Contactor A closes	☐	☐	☐
7	Contactor A opens	☐	☐	☐
8	Contactor B closes	☐	☐	☐
9	Contactor B opens	☐	☐	☐
10	With contactor A closed check • Emergency stop operates • Plant interlock operates • Plant trip operates • Remote stop operates • Input No.1 operates • Input No.2 operates	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐
11	With contactor A or B open & manual selected check • Remote start A operates • Remote start b operates	☐ ☐	☐ ☐	☐ ☐
12	Record Starter details:			
	Starter Type:_____			

	Units	Original	1st Change	2nd Change	Final	N/A
Overload						
Star / Delta changeover time	Secs					
Star / Delta transition time	mSec					
Current transformer	OPEN or STAY					
Link fait						
Display	% or AMPS					

System	3 or 4					
Input No.1 Trip	OPEN or STAY					
Input No.2 Trip	OPEN or STAY					
Input No.1 Manual	RUN or INCH					
Reset in Monitor						
Full Load current						
Undercurrent	OFF					
Undercurrent level	%					
Undercurrent time						
Reset 3p						
Start overload	OFF / WARN / TRIP					
Start level	%					
Max. Start time	Secs					
Actual load current level	%					
Actual load current level	Secs					
Actual load current set time	%					
Inst. actual load current	OFF / WARN / TRIP					
Inst. Actual load current	%					
Earth fault	mS / INST					

13	Check all alarm indicators function correctly	☐	☐	☐
14	Remote annunciations correct (SCADA / DCS)	☐	☐	☐
15	'Red Line' mark-up complete	☐	☐	☐

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

VOLTMETER / AMMETER			E-20B
Asset		Project No.	
Location		System	
Tag Number		Model	
Manufacturer		Serial Number	
Schematic Drawing		Layout Drawing	

		OK	N/A	S/L
1	Record the following information: Rating: _____V _____A _____ VT Ratio _____CT Ratio	☐	☐	☐
2	Confirm Vendor Test Documentation is complete (FAT and SAT) and in the Completion Dossier	☐	☐	☐
3	Test Results: - Ammeter	☐	☐	☐

Meter F.S.D.	Red Phase	Yellow Phase	Blue Phase
Injected			
Indicated			

		OK	N/A	S/L
4	Phase selection switch operation checked	☐	☐	☐
5	Remote annunciations correct (SCADA / DCS)	☐	☐	☐
6	'Red Line' mark-up complete	☐	☐	☐

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

CURRENT TRANSFORMER			E-21B
Asset		Project No.	
Location		System	
Tag Number		Model	
Manufacturer		Serial Number	
Schematic Drawing		Layout Drawing	

		OK	N/A	S/L
1	Confirm Vendor Test Documentation is complete (FAT and SAT) and in the Completion Dossier	☐	☐	☐
2	Check all connections are correct, tight, star point is earthed and CT is mounted correctly	☐	☐	☐
3	If ammeter CT is fitted without meter being connected ensure CT is shorted at terminal box	☐	☐	☐
4	Confirm connection S1 and S2 are in accordance with wiring diagram	☐	☐	☐
5	Perform CT magnetisation curve and confirm it is correct to Vendor curve, protection CT's only	☐	☐	☐
6	Prove CT polarity by means of a Flick test	☐	☐	☐
7	Confirm ratio checks are within the tolerance of the CT	☐	☐	☐
8	Reconnect all wiring	☐	☐	☐
9	'Red Line' mark-up complete	☐	☐	☐

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

MINIATURE CIRCUIT BREAKER			E-22B
Asset		Project No.	
Location		System	
Tag Number		Model	
Manufacturer		Serial Number	
Schematic Drawing		Layout Drawing	

		OK	N/A	S/L
1	Record the following information: Rating: _____V _____A _____ Phases	☐	☐	☐
2	Confirm Vendor Test Documentation is complete (FAT and SAT) and in the Completion Dossier	☐	☐	☐
2	Ambient temperature oC	☐	☐	☐
3	Injected current	☐	☐	☐
4	Time taken to trip Seconds / Actual: / Curve Time:	☐	☐	☐
5	Mechanical linkage OK	☐	☐	☐
6	All poles trip	☐	☐	☐
7	'Red Line' mark-up complete	☐	☐	☐

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

Watercare

HVAC FAN & MOTOR TEST SHEET	H-04B

Asset		Project No.		System		Location	
Tag Number		Description		Termination Drawing		GA / P&ID Drawing	

Fan No.	Operation	Service	Fan Location	Special access requirements	Local stop / start	Fan curve reference

Fan performance		**Units**	**Design**	**Actual**	**Measurement Details**	**Fan data**
Volume Rate		m^3/s				Unique No:
Fan Speed		Rpm				Manufacturer:
Static Pressure	Inlet	Pa				Type:
	Outlet	Pa				Fan dia./size:
	Total	Pa				Model ref:
Motor Speed		Rpm				Duty (m^3/s @ Pa):
Running current		Amps				Serial No:

Motor Data	**Starter Data**	**Drive Data**
Unique No:	Starter location:	No. of belts
Manufacturer:	Manufacturer:	Manufacturer:
Type:	Type:	Type:
Serial No:	Overload setting:	Fan dia./size (mm):
Frame No:	Overload No. range:	Fan shaft dia. (mm):

Insulation class:		Timer setting		Motor pulley dia.:	
Power (kW)		Fuse rating:		Motor shaft dia.:	
Motor full load current	Amps	Bearing temperature:	°C	Noise level:	dBA
Motor starting current	Amps	Inlet guide vane setting:			
Comments:					

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

REVERSE CYCLE HEAT PUMP TESTING			H-05B
Asset		Project No.	
Location		System	
Tag Number		Manufacturer	
Layout Drawing		Model	
D&ID Drawing		Serial number	
Termination Drawing		Data Sheet	

		OK	N/A	S/L
1	Confirm Vendor Test Documentation and ITR-H-05A is complete and in the Completion Dossier	☐	☐	☐
2	Confirm the exterior unit is level, mounted on a solid surface and clear from debris and obstructions.	☐	☐	☐
3	Confirm the filters are installed and clean	☐	☐	☐
4	Confirm all packing and transit materials have been removed	☐	☐	☐
5	Confirm Feed MCB / RCD is suitable rating for the unit and feed source has been commissioned	☐	☐	☐
6	Energise the unit and confirm correct operation of controls and remote-control unit	☐	☐	☐
7	Confirm WiFi is configured (if applicable) and remote signals to / from SCADA (if applicable)	☐	☐	☐
8	Using a suitable instrument test device to read the room temperature and humidity, test the following functions for at least 10 mins each. Confirm set point is reached and unit operates as expected and measurement indicated by the unit compares satisfactorily with the test instrument.	☐	☐	☐
Heating		☐	☐	☐
Cooling		☐	☐	☐
Dry (humidity)		☐	☐	☐
Fan		☐	☐	☐
Auto		☐	☐	☐
Fan Speed Control		☐	☐	☐
Louvre position control and swing function		☐	☐	☐
9	Confirm Remote control is satisfactorily wall mounted and set the unit on Auto (function, fan speed and louvre control) with a set point of 21 °C or as per design.	☐	☐	☐

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

HVAC SYSTEM			H-06B
Asset		Project No.	
Tag Number		System	
Description		P&ID / GA Drawing	

			OK	N/A	P/L
1	Confirm system cleanliness and condition of the following: -				
	a)	Intake louvers	☐	☐	☐
	b)	Fan and other equipment chambers	☐	☐	☐
	c)	Floor fully and all drainage traps	☐	☐	☐
	d)	Fan internals	☐	☐	☐
	e)	Cooling coils	☐	☐	☐
	f)	Drainage trays	☐	☐	☐
	g)	Humidifiers	☐	☐	☐
	h)	Eliminators	☐	☐	☐
	i)	Dampers	☐	☐	☐
	j)	Ducting and other airways	☐	☐	☐
	k)	Sensing elements	☐	☐	☐
	l)	Terminal units	☐	☐	☐
	m)	Attenuators	☐	☐	☐
	n)	Filter coalescers	☐	☐	☐
	o)	Heater coils	☐	☐	☐
2	Test holes (with sealing covers in ducting for air flow measurements provided)		☐	☐	☐
3	Confirm that all duct grilles and access covers are in place before starting fan units		☐	☐	☐
4	Confirm all dampers for freedom of movement and effective sealing		☐	☐	☐
5	Confirm earth straps fitted		☐	☐	☐
6	Confirm all associated electrical equipment has been fully commissioned		☐	☐	☐
7	Confirm that drainage facilities have been provided for 1- e, f, g, h and n. Ensure drain water seals are filled		☐	☐	☐
8	Confirm that all control and instrumentation systems are complete and fully operational		☐	☐	☐
9	Carry out F & G system shutdown		☐	☐	☐
10	Activate smoke / gas heads at intake (where applicable)		☐	☐	☐

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

HVAC BUILDING / ROOM PRESSURISATION TEST			H-07B
Asset		Project No.	
Location		System	
Location		Description	
Termination Drawing		P&ID / GA Drawing	

Duty Supply Fan No:		Duty Extract Fan No:	
Pressure Relief Damper setpoint:		Pressure Differential Controller setpoint:	
Pressure Switch High Setting:		Pressure Switch Low Setting:	
Minimum Pressurisation Design:			

System Balanced:	OK ☐	N/A ☐	P/L ☐

	Test Preparation	OK	N/A	P/L
1	Confirm all associated instrumentation has been commissioned	☐	☐	☐
2	Pressure relief damper checklist complete	☐	☐	☐
3	Confirm that doors open and close easily and are adequately sealed	☐	☐	☐
4	Confirm adjacent areas are pressurised	☐	☐	☐
5	Deploy warning notices and clear the area of non-essential persons	☐	☐	☐

Note:

- Maximum wind speed not to exceed 24m/s during test.
- All reading taken with respect to atmosphere

Part 1 Pressurisation Results

Wind Speed (m/s):			Wind Direction:		
Reading No.	1	2	3	4	5
Time					
Pressure					
Maximum pressure attained (Pa):			Minimum pressure attained (Pa):		

Part 2 Loss of Room Pressure Test Results

Record initial room pressure (Pa)		Stand-by start @ (Pa)	
Time delay before alarm (Secs)		Pressure failure alarm (Pa)	
Set time delay (Secs)		Pressure relief damper closes fully (secs)	

Test completed satisfactory	Y	N

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

Watercare

HVAC SYSTEM PERFORMANCE TEST RECORD			H-08B		
Asset		Project No.		System	
Tag Number		Description		P&ID / GA Drawing	

		Supply Air System				Extract Air System				Module / area volume		Air change rate		Module press. With Reference to Atmos	
Area Module	Class	Fan No.	Design air m^3/s	Actual air m^3/s	% of Design	Fan No.	Design air m^3/s	Actual air m^3/s	% of Design	Gross m^3	Nett m^3	Design	Actual	Req. Pa	Actual Pa

Comments:

	COMPLETED BY (Construction):	ACCEPTED BY (Commissioning):	REVIEWED BY (Operations):
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

HVAC DUCTWORK SYSTEM LEAKAGE TEST			H-09B
Asset		Project No.	
Tag Number		System	
Description		P&ID / GA Drawing	

1	Confirm the following details:

Section under test:	
Surface area of ductwork under test	
Test static pressure	
Leakage factor	
Max Permitted leakage:	

TEST DETAILS		
Manufacturer/Type of test device:		Serial No:
Calibration Certificate No:		Date:
Range of test device:		
Duct static pressure reading:		
Flow test reading:		
Actual air flow leakage rate l/s:		
Duration of test (min of 15 mins):		Date of test:
Comments:		

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

INSTRUMENT LOOP TEST			I-01B
Asset		Project No.	
System		Description	
Tag / Loop No.		Description	
P&ID Drawing		Loop Drawing	

List Loop Components – Refer to sheet 2 for Loop Test results

Item	Tag Number	Description:	Range / Setting / Units
1			
2			
3			
4			
5			
6			
7			
8			

DATA / INSPECTION / PRE-ENERGISATION CHECKS - *Applicable for all Loops*	OK	N/A	P/L
Confirm all relevant loop components electrical and instrument Installation Completion check sheets are complete with no outstanding critical snag list items	☐	☐	☐
Confirm loop details are correct against all Project / Vendor information i.e. P & ID's, I/O schedule, Data sheet / Instrument index / Alarm & Trip schedule (including Rack / Slot / Channel location for all I/O devices)	☐	☐	☐
Confirm that all Analogue and Digital loop Configuration / Ranges and Alarm / Trip settings are correct on PCS/ESD/UCP graphics to the latest revisions of I/O schedule / Data sheets and alarm and trip schedules	☐	☐	☐
Confirm all Cabling / Earthing / Pipework conforms to project specifications and is correctly installed as per loop and Hook up diagrams	☐	☐	☐
Confirm all loop components EX and IP ratings are correct for the hazardous area installed	☐	☐	☐
Confirm "Cold Loop" check results are acceptable prior to loop energisation	☐	☐	☐
Confirm air or hydraulic supplies are set at correctly and "live" for all devices in loop. Record supply and type.....	☐	☐	☐
Confirm Loop Fuse rating is correct and with panel knife edges open and using certified test meter, confirm loop power supply falls within manufacturers accepted tolerances – Energise Loop	☐	☐	☐
LOOP FUNCTION TESTS. ***NOTE-Ensure unwanted Executive Actions are inhibited from this point.***			
With power applied check configuration of instruments are correct as per Project / Vendor data sheets	☐	☐	☐
Using certified test equipment confirm the loop supply voltages and currents are stable with no signal 'Drift". Record loop supply voltage _____	☐	☐	☐
Using Certified Test Equipment in all cases carry out Loop Test to / from VCS/PCS/ESD/UCP Systems in accordance with Project Testing Philosophy's.	☐	☐	☐
Confirm the local reset function in the field for such signals as panel Inter- trips / Shutdown / Blow down valves operates correctly	☐	☐	☐

Watercare

Carry out loop test to/ from PCS/ESD/UCP systems in accordance with manufacturer's instructions and record values below of all analogue and digital loop Input / Output display signals and alarms												
Rising %						***Falling %***				***Trip / Alarm Set point***		***Comments (record switch contacts)***
Item No.	***0***	***25***	***50***	***75***	***100***	***75***	***50***	***25***	***0***	***Rising***	***Falling***	
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												

Confirm correct controller action and functionality _____ Record controller action (Direct or Reverse) _____	☐	☐	☐
Confirm correct ESD or BDV valve fail action and timing. Record valves fail action and timing: _____ _____	☐	☐	☐
Confirm all loop components Indications /Ranges /Alarms/Fault tests are correct on Graphic /Point/ Detail display pages	☐	☐	☐
Confirm all loop components Alarms/Fault tests are correct to Printer/Data Logger or S.O.E. recorder	☐	☐	☐
Confirm all loop components remote control room indications, alarms, Inhibit /Overrides functions operates correctly (if any)	☐	☐	☐
Confirm all loop components remote reset function operates correctly	☐	☐	☐
Confirm all loop components configuration, response time and Tag / Alarm descriptors are correct – Raise any anomalies on project Snag list	☐	☐	☐

Comments

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

Watercare

CONTROL VALVE CALIBRATION / INSPECTION	I-02B

Asset		Project No.	
Location		System	
Tag Number		Manufacturer	
P&ID Drawing		Loop Drawing	
Hook Up Drawing		Termination Drawing	

Control Valve - Record Valve details.

Manufacturer: _____	Data Sheet No.: _____	Service: _____
Serial No.: _____	Model No.: _____	Rating: _____
Body Size: _____	Flange Type: _____	Lubrication: _____

	VALVE BODY	OK	N/A	P/L
1	Confirm all data correct as per project data sheet.	☐	☐	☐
2	Confirm Instrument configuration data checked against project data sheet and FD	☐	☐	☐
3	Body and Trim material correct to data sheet	☐	☐	☐
4	Leakage class correct to data sheet	☐	☐	☐
5	Valve sizing correct to data sheet	☐	☐	☐

	ACTUATOR – Where Applicable		
6	Record Actuator details.	Manufacturer: _____	Model No.: _____
	Serial No.: _____	Voltage: _____	Air / Oil Pressure: _____

7	Failure action as per data sheet (Open, Close or Last)	☐	☐	☐
8	Working pressure correct	☐	☐	☐
9	Motive Fluid type _____ If oil confirm grade: Volume:	☐	☐	☐
10	Confirm Hydraulic / Pneumatic / Electrical connections correct	☐	☐	☐
11	Confirm Torque switches and travel stops set	☐	☐	☐
12	Confirm Local /wheel (if fitted) operation correct	☐	☐	☐
13	Confirm Remote operation correct	☐	☐	☐
14	Record equipment hazardous area certifying authority and classification: _____			

	FILTER / REGULATOR – Where Applicable		
15	Record Filter/Regulator details.	Manufacturer: _____	Model No.: _____
	Serial No.: _____	Air Supply: _____	Setting: _____

	POSITIONER – Where Applicable		
16	Record Positioner details.	Tag Number: _____	Manufacturer: _____
	Model No.: _____	Serial No.: _____	Air Supply: _____
17	Record Positioner hazardous area certifying authority and classification: _____		

	I/P CONVERTER – Where applicable.			
18	Input signal as per data sheet	☐	☐	☐
19	Output range as per data sheet	☐	☐	☐

20	Record I/P converter details.	Tag Number: _____	Manufacturer: _____		
	Model No.: _____	Serial No.: _____	Air Supply: _____		
21	Record I/P converter hazardous area certifying authority and classification: _____				
22	Input signal as per data sheet			☐	☐ ☐
23	Output range as per data sheet			☐	☐ ☐
	PILOT VALVE – Where applicable.				
24	Record Pilot valve details.	Tag Number:	Manufacturer: _____		
	Model No.: _____	Serial No.: _____			
25	Pneumatic connections correct			☐	☐ ☐
26	Lock up/stay-put action correct			☐	☐ ☐
27	Operation correct as per design			☐	☐ ☐
	PROXIMITY SWITCHES / Relays – Where applicable.				
28	Record switch details.	Manufacturer: _____	Model No.: _____		
29	Record Proximity switch hazardous area certifying authority and classification:				
30	Open switch tag number:	Record Open switch serial number: _____			
31	Open switch set _____ mm / % before open				
32	Closed switch tag number:	Record Closed switch serial number: _____			
33	Closed switch set _____ mm / % before open				
34	Electrical connection correct			☐	☐ ☐
35	Open switch mode setting correct. Switch operates as per design. Record mode (NC / NO) _____			☐	☐ ☐
36	Closed switch mode setting correct. Switch operates as per design. Record mode (NC / NO) _____			☐	☐ ☐
	SOLENOID (s) – Where applicable.				
37	Record Solenoid details.	Tag No:	Manufacturer: _____		
	Serial No.: _____	Model No.: _____	Voltage: _____		
38	Equipment hazardous area certifying authority and classification:				
39	Operation correct as per design			☐	☐ ☐
40	Pneumatic and Hydraulic connections correct			☐	☐ ☐
41	Pneumatic and / or Hydraulic pressure range correct			☐	☐ ☐
	ACCUMULATOR – Where applicable.				
42	N2 charge correct			☐	☐ ☐
43	Volume tank & check valve installed correctly			☐	☐ ☐
44	PSV installed correctly			☐	☐ ☐
45	Record PSV set pressure: _____				
46	Record output pressure setting: _____				
47	Record N2 pre/charge pressure: _____				
	VALVE STROKE TEST DATA				
48	Confirm it is safe, then energise supplies and initiate bench set and calibration of valve				
49	Stroke test the valve and confirm the following				

	Input (%)	Input signal	Valve position (Actual)	Valve position (Transmitter mA)
	0			
	25			

	50			
	75			
	100			
	75			
	50			
	25			
	0			
50	Record Time Open to Closed (seconds): _____			
51	Record Time Closed to Open (seconds): _____			

Comments: - (*NOTE – list any Test equipment used during Device(s) Loop checks).*

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

Watercare

INSTRUMENT CALIBRATION			I-05B
Asset		Project No.	
Location		System	
Tag Number		Loop Drawing	
P&ID Drawing		Termination Drawing	

Record details.

Manufacturer: _____	Serial No.: _____	Model No.: _____
Operating range: _____	Calibration Range: _____	Cal Date: _____

Measured Variable (ie Temperature, Pressure etc): _____

		OK	N/A	S/L
1	Confirm all Instrument data correct as per project data sheet	☐	☐	☐
2	Instrument Checked for Damage	☐	☐	☐
3	Instrument Tag Number Attached to Instrument	☐	☐	☐
4	Confirm all Electrical and Process connections correct,	☐	☐	☐
5	Confirm motive fluid is as per manufactures specification, record (air/hydraulic) pressure: _____	☐	☐	☐
6	Carry out calibration and record “as left” results below	☐	☐	☐

Analogue Calibration

Percentage of Range		**0%**	**25%**	**50%**	**75%**	**100%**
Input (engineering value)						
Device Output	Up-Scale					
	Down Scale					
HMI / DCS Indicated Value	Up-Scale					
	Down Scale					

Digital Calibration

Switch / Relay	**Setpoint**	**Switch contact**	OK	N/A	S/L
		NO / NC	☐	☐	☐
		NO / NC	☐	☐	☐
		NO / NC	☐	☐	☐
		NO / NC	☐	☐	☐
		NO / NC	☐	☐	☐
		NO / NC	☐	☐	☐

Comments: -

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

Watercare

PCS/ESD/UCP SYSTEM LOGIC & INTERFACE TEST	I-06B

Asset		Project No.	
System		Description	
Functional Description Title		SAT Number	
Functional Description Revision		Cause and Effect No.	

DATA / INSPECTION / PRE-TEST CHECKS			
Confirm all Process Control System (PCS)/ Emergency Shutdown (ESD) / Unit Control Panel (UCP) loops associated with this test have been commissioned and are fully operational with no outstanding critical snaglist items	☐	☐	☐
Confirm all other systems associated with this test and that interface with the PCS/ESD/UCP system are commissioned and are fully operational with no outstanding critical snaglist items	☐	☐	☐
Confirm all Cause and Effect and logic drawings and Functional Design (FD) are the latest revision.	☐	☐	☐
Confirm all equipment to be Energised / De-Energised is fully commissioned and available to be tested	☐	☐	☐
Confirm type, origin and destination of data interface links corresponds to Project /Vendor data	☐	☐	☐
Confirm all necessary overrides and inhibits are in place and logged accordingly	☐	☐	☐
TEST RESULTS			
Confirm all Data interface links are Operating /Indicating correctly to the VCS/PCS/ESD/ F&G/UCP Systems	☐	☐	☐
As per Cause and Effect / Logic diagrams I/O lists initiate field device and observe correct operation of all executive Actions / Signals through to end users	☐	☐	☐
Confirm all Input / Output actions and logic operates as per Cause and Effect / Logic diagrams	☐	☐	☐
Confirm all resultant Input / Output indicate on all VCS/PCS/ESD/ F&G/UCP display pages correctly	☐	☐	☐
Confirm all resultant Input / Output signals indicate correctly at Printer/Data Logger or S.O.E. recorder	☐	☐	☐
Record and Hi-light all Input / Output actions and logic as tested as per Cause and Effect / Logic diagrams	☐	☐	☐
Confirm all logic and I/O loop configuration, PI&D controller functions, response time and tag /alarm descriptors etc are correct – Raise any anomalies on project Snaglist	☐	☐	☐

TEST RESULTS:

Hi-light all Input / Output actions tested as per Cause and Effect / Logic diagrams.

Red-line any agreed changes and attach a marked up copy with this test certificate.

Sign up all relevant sections of the System Commissioning Procedure and place this test cert. in the relevant completions dossier

Comments

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

MISC. PROCESS ANALYSERS			I-07B
Asset		Project No.	
System		Description	
Tag Number		Analyser Type	
Loop Drawing		P&ID Drawing	

List Analyser Loop Components

Item No.	*Tag Number*	*Description:*	*Range/ Setting/Units*
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Data and Inspection:	OK	N/A	P/L
Analyser checked and all data correct against project /vendor data sheet.	☐	☐	☐
Analyser installation satisfactory, complete and free from any mechanical damage.	☐	☐	☐
Analyser cabling / electrical / earthing connections are complete and installed correctly	☐	☐	☐
Analyser EX and IP ratings are correct / maintained for installed area classification	☐	☐	☐
Analyser pipe work complete and installed correctly as per Hook up drawings.	☐	☐	☐
System drains and vents discharge termination point correct as per Hook up drawings.	☐	☐	☐
Confirm all electrical and process supplies are available, correct type and rating.	☐	☐	☐
Confirm all relevant analyser loop components electrical and instrument MCR “A” check sheets are complete with no outstanding “A” punchlist items.	☐	☐	☐
Confirm “Cold Loop” check results are acceptable prior to energisation of analyser loop supplies.	☐	☐	☐
Energise			
Sampling system filters, strainers, coalesces and contaminant traps.	☐	☐	☐
External sample dryers and sample probe and system	☐	☐	☐
Sample conditioning carrier gas / co2 system	☐	☐	☐
Sample line electric heat tracing	☐	☐	☐
Sample line pump(s).	☐	☐	☐
Instrument air and Portable water supply	☐	☐	☐
Analyser Enclosure Cooling / circulation / HVAC fans	☐	☐	☐

Analyser Enclosure anti-condensation heater system and Analyser oven	☐	☐	☐
Using Certified Test Equipment and Test Medium perform Analyser Calibration Test or attach Vendor Calibration certificate to this FTC prior to Loop check.	☐	☐	☐
Using Certified Test Equipment in all cases - carry out Analyser Components Loop Test to/ from VCS/PCS/ESD/UCP Systems in accordance with Project Testing Philosophy's. Record Values below:	☐	☐	☐

	Rising %					***Falling %***				***Trip / Alarm Set point***		***Comments (Record switch contacts)***
Item No.	***0***	***25***	***50***	***75***	***100***	***75***	***50***	***25***	***0***	***Rising***	***Falling***	
1												
2												
3												
4												
5												
6												
7												

Confirm correct Controller action and functionality. Record Controller Action (Direct or Reverse) ----------	☐	☐	☐
Confirm correct Control Valve Fail Action and timing. Record Valve Fail Action and Timing: ---------- ----------	☐	☐	☐
Confirm all Analyser Loop Components Indications /Ranges /Alarms/Fault tests are Correct on Graphic / Point / Detail Display Pages	☐	☐	☐
Confirm all Analyser Loop Components Alarms/Fault tests are Correct to Printer/Data Logger or S.O.E. Recorder	☐	☐	☐
Confirm all Analyser Loop Components Remote Inhibit /Overrides Functions Operates Correctly.	☐	☐	☐
Confirm all Analyser Loop Components Remote Reset Function Operates Correctly.	☐	☐	☐
Confirm all Analyser Loop Components Configuration, Response Time and Tag and Alarm Descriptors are correct – Raise any Anomalies on the project Snag List	☐	☐	☐

Comments

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

FIRE DETECTION AND MAC DEVICE LOOP TEST			I-09B
Asset		Project No.	
Location		System	
Tag Number		Manufacturer	
Layout Drawing		Loop Drawing	
Cause and Effect Drawing		Fire Zone No	

DATA / INSPECTION / PRE-ENERGISATION CHECKS - Applicable for all Device(s) types	OK	N/A	S/L
Confirm all relevant loop components' Electrical and Instrument Installation Completion ITR's are complete with no outstanding "A" Punchlist items	☐	☐	☐
Verify Device(s) / Loop details against I/O Schedule, Project data sheet and Vendor data sheet	☐	☐	☐
Verify Device(s) location and elevation is correct as per Fire zone Layout drawing and Device(s) installation is secure and free from excess movement and vibration.	☐	☐	☐
Confirm area of vision / Sensing / Actuation is suitable for correct protection of Area / Equipment	☐	☐	☐
Also (where applicable) confirm any "dirty" Lenses / Optics are cleaned correctly by following the manufacturers instruction	☐	☐	☐
Verify all Cabling /Termination / Earthing is correct as per Loop diagram and conforms to project specifications.	☐	☐	☐
Confirm all Loop components and Termination / Earthing is suitable to correct Hazardous area classification.	☐	☐	☐
Confirm Loop diodes / Load and EOL Resistor values are correct for loop type – Record Values: Load resistor value (Ohms)..... EOL Resistor Value (Ohms)	☐	☐	☐
Confirm device(s) Addressing (if Applicable) and Loop Rack / Slot / Channel location are correct for all Device(s) in Loop.	☐	☐	☐
Confirm that any Device(s) Dip switch's settings etc are correct as per Manufacturer's instructions. Record settings:	☐	☐	☐
Verify "Cold Loop" check results are acceptable prior to loop energisation.	☐	☐	☐
Confirm Loop Fuse rating is correct and with panel knife edges open and using certified test meter, confirm loop power supply falls within manufacturers accepted tolerances – **Energise Loop**	☐	☐	☐
DEVICE(S) CALIBRATION AND LOOP FUNCTION TESTS **NOTE-Ensure unwanted Executive actions are inhibited from this point**			
MAC / Smoke / Heat Type Devices			
Apply power to Device(s) / Loop and wait for detector to stabilise in accordance with manufacturer's instructions.	☐	☐	☐
Where applicable check configuration of Device(s) (Smart Units Only) is correct as per data sheet	☐	☐	☐
Carry out Device(s) / Loop check in accordance with manufacturers' instructions and confirm the operation of all alarms at VCS/PCS/UCP.	☐	☐	☐
Where applicable Confirm / Record settings of any Field devices tested. (Use certified test equipment). _____	☐	☐	☐
Confirm correct operation of any Area visual and Audible device(s).	☐	☐	☐
Confirm the Loop Voltage / Current are stable with no Fault or Alarm indication and no Signal 'Drift".	☐	☐	☐
UV/IR Flame Type Device(s)			
Where required Align device units in accordance with manufacturers instruction	☐	☐	☐

Apply power to device(s) / Loop and carry out optimisation / Verification checks in accordance with manufacturer's instructions.	☐	☐	☐
Where applicable check configuration of device(s) (Smart Units Only) is correct as per data sheet.	☐	☐	☐
Where applicable set "Head "current in accordance with manufacturer's instructions.	☐	☐	☐
Carry out Device(s) / Loop check in accordance with manufacturer's instructions and confirm the operation of alarms at VCS / PCS / UCP	☐	☐	☐
Where applicable verify "Optical Integrity" Alarm function in accordance with manufacturer's instructions.	☐	☐	☐
Confirm correct operation of any Area visual and Audible device(s)	☐	☐	☐
Confirm the Loop voltage / Current is stable with no Fault or Alarm indication and no Signal 'Drift".	☐	☐	☐
VCS /PCS /UCP INDICATION CHECK applicable for all Device(s) / Loop types			
Confirm all device(s) / Loop operates correctly to Local panel or UCP. (Where applicable)	☐	☐	☐
Confirm all device(s) / Loop alarm and Fault tests are correct on Fire zone Overview page.	☐	☐	☐
Confirm all device(s) / Loop alarm and Fault tests are correct on Device(s) Point Fire zone Display page.	☐	☐	☐
Confirm all device(s) / Loop alarm and Fault tests are correct on Device(s) Point detail display page	☐	☐	☐
Confirm all device(s) / Loop alarm and Fault tests are correct on Alarm display page	☐	☐	☐
Confirm all device(s) / Loop alarm and Fault tests are correct to Printer / Data logger or S.O.E. recorder.	☐	☐	☐
Confirm all device(s) / Loop alarm correctly to Fire and Gas matrix / Mimic panel	☐	☐	☐
Confirm all device(s) / Loop remote inhibit function operates correctly	☐	☐	☐
Confirm all device(s) / Loop remote reset function operates correctly	☐	☐	☐
Confirm all device(s) / Loop remote lamps operate correctly.	☐	☐	☐
Confirm all device(s) / Loop alarm settings are Correct as per Cause and Effects Record alarm set point (A)…… Record alarm set point (B)……	☐	☐	☐
Confirm all device(s) / Loop configuration, Response time and Tag and alarm descriptors are correct – Raise any anomalies on snag list	☐	☐	☐
Comments: -			

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

GAS DETECTION DEVICE LOOP TEST			I-10B
Asset		Project No.	
Location		System	
Tag Number		Manufacturer	
Layout Drawing		Loop Drawing	
Cause and Effect Drawing		Fire Zone No	

DATA / INSPECTION / PRE-ENERGISATION CHECKS - Applicable for all Device(s) types	OK	N/A	S/L
Confirm all relevant loop components' Electrical and Instrument Installation Completion ITR's are complete with no outstanding critical snaglist items.	☐	☐	☐
Verify device(s) / Loop details against I/O Schedule, Project data sheet and Vendor data sheet.	☐	☐	☐
Confirm Gas detector Sensor type is correct for the Application being used and where applicable Remote testing points are accessible.	☐	☐	☐
Verify device(s) Location and Elevation is correct as per Fire zone layout drawing and Device(s) installation is secure and free from excess movement and vibration.	☐	☐	☐
Verify all Cabling /Termination / Earthing is correct as per Loop diagram and conforms to project specifications.	☐	☐	☐
Confirm all Loop components and Termination / Earthing is suitable to correct Hazardous area classification.	☐	☐	☐
Verify "Cold Loop" Check results are acceptable prior to loop energization.	☐	☐	☐
Confirm Device(s) Addressing (if applicable) and Loop Rack/Slot / Channel location are correct for all device(s) in Loop.	☐	☐	☐
Confirm Loop fuse rating is correct and with panel knife edges open and using certified test meter confirm Loop power supply falls within manufacturers accepted tolerances – Energise loop.	☐	☐	☐
DEVICE(S) CALIBRATION AND LOOP FUNCTION TESTS. ***NOTE-Ensure unwanted Executive actions are inhibited from this point***			
Open Path I.R. Gas / Oil Mist Detection Type Device(s)			
With Power applied to Device(s) / Loop wait for detector to stabilise and where applicable set "Head" current in accordance with manufacturer's instructions.	☐	☐	☐
Where applicable check configuration of Device(s) (Smart Units Only) is correct as per data sheet.	☐	☐	☐
For Point Gas detectors: In accordance with manufacturer's instructions inject Calibration gas (50% L.E.L. / 2.5% Methane in Air) At a Flow rate of …… litres/min and using a certified test meter. Confirm gas detector calibration is correct.	☐	☐	☐
Carry out Loop check and Confirm / Record test gas concentration required to achieve both LLG and HLG Alarms At VCS/PCS LLG……% L.E.L. ……% Methane in Air HLG……% L.E.L. ……% Methane in air,	☐	☐	☐
For Toxic gas detectors: In accordance with Manufacturer's instructions use Test gas sample At a Flow rate of …… litres/min and using a certified test meter confirm Gas detector calibration is correct.	☐	☐	☐
Confirm correct operation of any Area visual and Audible device(s).	☐	☐	☐
Confirm the Loop voltage / Current is stable with no Fault or Alarm indication and no Signal 'Drift".	☐	☐	☐
Where applicable Align receiver and Detector units in accordance with manufacturer's instructions.	☐	☐	☐
With Power applied to Device(s) / Loop and carry out Optimisation and Alignment verification checks in accordance with manufacturer's instructions.	☐	☐	☐
Where applicable check configuration of Device(s) (Smart Units Only) is correct as per data sheet.	☐	☐	☐
Carry out Calibration check in accordance with manufacturer's instructions and confirm the operation of	☐	☐	☐

both LLG and HLG Alarms at VCS/PCS/UCP (use Test filters where applicable).			
Where applicable verify “Beam Block” alarm function in accordance with manufacturer’s instructions.	☐	☐	☐
Confirm the Loop voltage / Current is stable with no Fault or Alarm indication and no Signal ‘Drift”.	☐	☐	☐
Confirm correct operation of any Area visual and Audible device(s).	☐	☐	☐
VCS /PCS /UCP INDICATION CHECK *applicable for all Device(s) / Loop types*			
Confirm all device(s) / Loop operates correctly to Local panel or UCP. (Where applicable).	☐	☐	☐
Confirm all device(s) / Loop alarm and Fault tests are correct on Fire zone Overview page.	☐	☐	☐
Confirm all device(s) / Loop alarm and Fault tests are correct on Device(s) Point Fire zone display page.	☐	☐	☐
Confirm all device(s) / Loop alarm and Fault tests are correct on Device(s) Point detail display page.	☐	☐	☐
Confirm all device(s) / Loop alarm and Fault tests are correct on Alarm display page.	☐	☐	☐
Confirm all device(s) / Loop alarm and Fault tests are correct to Printer / Data logger or S.O.E. recorder.	☐	☐	☐
Confirm all device(s) / Loop alarm correctly to Fire and Gas matrix / Mimic panel.	☐	☐	☐
Confirm all device(s) / Loop remote inhibit function operates correctly.	☐	☐	☐
Confirm all device(s) / Loop remote reset function operates correctly.	☐	☐	☐
Confirm all device(s) / Loop remote lamps operate correctly.	☐	☐	☐
Confirm all Gas detector Loop alarm settings are correct as per Cause and Effects Record LLG Alarm set point …… Record HLG Alarm set point …… Toxic gas level set point ……..	☐	☐	☐
Confirm all device(s) / Loop configuration, Response time and Tag and Alarm descriptors are correct – Raise any Anomalies on Snag List	☐	☐	☐
Comments: -			

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

Watercare

FIRE & GAS SYSTEM LOGIC & INTERFACE TEST			I-11B
Asset		Project No.	
Location		System	
Tag Number		Manufacturer	
Layout Drawing		Loop Drawing	
Cause and Effect Drawing		Fire Zone No	

DATA / INSPECTION / PRE-ENERGISATION CHECKS - Applicable for all Device(s) types	OK	N/A	S/L
Confirm all Fire and Gas Loops associated with this test has been commissioned and are fully operational with No outstanding critical snaglist items	☐	☐	☐
Confirm all other systems associated with this Test and that Interface with the Fire and Gas system are Commissioned and are fully operational with no outstanding critical snaglist items	☐	☐	☐
Confirm all Cause and Effect and Logic drawings are the Latest revision. This test must be performed in conjunction with the Latest revision of the project Fire and Gas Commissioning procedure	☐	☐	☐
Confirm all equipment to be energised / De-energised is Fully commissioned and available to be tested	☐	☐	☐
Confirm type, origin and destination of any F & G data interface link corresponds to Project / Vendor data.	☐	☐	☐
Confirm all necessary Overrides and Inhibits are in place and logged accordingly in the commissioning procedure.	☐	☐	☐
TEST RESULTS			
Confirm all Data interface links are Operating / Indicating correctly to the VCS / PCS / ESD / F&G / UCP Systems.	☐	☐	☐
As per Cause and Effect / Logic diagrams I/O Lists initiate Field device and observe correct operation of all Executive actions / Signals through to end users.	☐	☐	☐
Confirm all Input / Output actions and Logic operates as per Cause and Effect / Logic diagrams.	☐	☐	☐
Confirm all Resultant input / output indicate on all VCS / PCS / ESD / F&G / UCP Display pages correctly.	☐	☐	☐
Confirm all Resultant input / Output signals Indicate correctly at Printer / Data logger or S.O.E. Recorder.	☐	☐	☐
Record and Hi-light all Input / Output actions and Logic as tested as per Cause and Effect / Logic diagrams.	☐	☐	☐
Confirm All Logic and I/O Loop Configuration, Response time and Tag / Alarm descriptors etc are correct – Raise any Anomalies on the Snag List	☐	☐	☐

TEST RESULTS:

Highlight all Input / Output actions tested as per Cause and Effect / Logic diagrams – Attach to this form.

Red line any agreed changes and attach a marked up copy with this test certificate.

Sign up all relevant sections of the Fire and Gas commissioning procedure and place this Test cert. in the relevant section.

Comments:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

FIRE DAMPER LOOP TEST			I-12B
Asset		Project No.	
Location		System	
Tag Number		Manufacturer	
Layout Drawing		Loop Drawing	
Cause and Effect Drawing		Fire Zone No	

DATA / INSPECTION / PRE-ENERGISATION CHECKS - Applicable for all Fire Dampers	OK	N/A	S/L
Confirm all Relevant fire dampers components Electrical and HVAC Installation Completion ITR's are complete with No outstanding critical snaglist items.	☐	☐	☐
Verify Fire dampers loop details are correct against all Project / Vendor Information i.e. P & ID's, I/O Schedule, Data sheet, F & G / Instrument index / Alarm and Trip schedule.	☐	☐	☐
Verify Fire damper's location and Elevation is correct as per D&ID / Fire zone / Instrument / Equipment layout drawings and installation is secure and free from excess movement and vibration.	☐	☐	☐
Verify all Cabling /Termination / Earthing is correct as per Loop diagram and conforms to project specifications.	☐	☐	☐
Verify Pneumatic pipework installation at Fire dampers / Local test points / Fireman's panel are correct as per Hook up drawings and Project specifications.	☐	☐	☐
Confirm all Loop Components and Termination / Earthing is suitable to correct Hazardous area classification.	☐	☐	☐
Confirm Loop diodes / Load and EOL Resistor values are correct for Loop Type – Record Values: Load Resistor Value (Ohms) …… EOL Resistor Value (Ohms) ……..	☐	☐	☐
Verify "Cold Loop" Check results are acceptable prior to Loop energisation.	☐	☐	☐
Confirm Loop Rack / Slot / Channel location is correct for all Device(s) in loop.	☐	☐	☐
Confirm Fire dampers Air supply regulator is set as per Manufacture's details / Data sheet.	☐	☐	☐
Confirm Fire dampers frangible bulb / Fusible link is installed and undamaged and is the correct rating as per Data sheet.	☐	☐	☐
Confirm Loop Fuse rating is correct and with Panel knife edges open and using certified test meter confirm Loop Power supply falls within Manufacturers accepted tolerances – Energise loop components.	☐	☐	☐
FIRE DAMPER - LOOP FUNCTION TESTS ***NOTE-Ensure unwanted Executive actions are Inhibited from this point.***			
Apply Air supply to Fire dampers and confirm and record value is correct as per data sheet. : Air supply ……Barg.	☐	☐	☐
Using Certified test equipment confirm, and record Loop(s) Supply voltage / Current are stable with no Signal 'Drift" Loop supply voltage……	☐	☐	☐
With a healthy Fire dampers Solenoid signal confirm the Fire dampers Open and Close from the Local hand switch facility (if applicable).	☐	☐	☐
Whilst performing the Local Hand switch test previous, confirm the correct operation of the Fire dampers Open and Closed indications to the Following: VCS / PCS / UCP / Fireman's / HVAC Panels. Record the following (for this Test Only): "Open Limit" Contact settings…… 'Closed" Limit" Contact settings…….	☐	☐	☐
Observe that the correct Open / Close Position of the Fire dampers louvers coincides with the correct indications at the VCS / PCS / UCP / Fireman's / HVAC Panels.	☐	☐	☐

With a healthy Fire dampers solenoid signal confirm the Fire dampers Open and Close from the Fireman's panel (if applicable) and indicate correctly back to same.	☐	☐	☐
With a healthy Fire dampers solenoid signal confirm the Fire dampers Open and Close from the HVAC panel (if applicable) and indicate correctly back to same.	☐	☐	☐
Using Certified test equipment confirm the Fire dampers solenoid Voltage & Current are stable with no Fault or Alarm indication and no Signal 'Drift". Record the following: Solenoid supply voltage ……. / Type ……. / Output line monitored …….	☐	☐	☐
Trip and Reset Fire dampers solenoid signals from VCS / PCS / UCP Systems in accordance with Manufacturer's instructions and confirm the correct physical operation of the Fire damper.	☐	☐	☐
Confirm all Fire dampers I/O signals operate in accordance with project Cause and Effect Logic and Fire & Gas system F.D.S.	☐	☐	☐
Confirm all Solenoid valves / Fire dampers Local reset function operate correctly.	☐	☐	☐
VCS /PCS /UCP INDICATION CHECK *applicable for all Fire dampers*			
Confirm all Fire dampers Alarm and Fault tests are correct on Fire zone Overview page.	☐	☐	☐
Confirm all Fire dampers Alarm and Fault tests are correct on Fire dampers Point Fire zone Display page.	☐	☐	☐
Confirm all Fire dampers Alarm and Fault tests are correct on Fire dampers Point detail Display page.	☐	☐	☐
Confirm all Fire dampers Alarm and Fault tests are correct on Alarm display page.	☐	☐	☐
Confirm all Fire dampers Alarm and Fault tests are correct to Printer / Data logger or S.O.E. Recorder.	☐	☐	☐
Confirm all Fire dampers Alarm Correctly to Fire and Gas Matrix / Mimic Panel.	☐	☐	☐
Confirm all Fire dampers Remote inhibit function operates correctly.	☐	☐	☐
Confirm all Fire dampers Remote reset function operates correctly.	☐	☐	☐
Confirm all Fire dampers Logic, Response time and Tag and Alarm descriptors are correct – Raise any anomalies on the Snag List.	☐	☐	☐
Comments:			

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

MISCELLANEOUS FIRE AND GAS DEVICE LOOP TEST			I-13B
Asset		Project No.	
Location		System	
Tag Number		Manufacturer	
Layout Drawing		Loop Drawing	
Cause and Effect Drawing		Fire Zone No	

DATA / INSPECTION / PRE-ENERGISATION CHECKS - Applicable for all Fire Devices	OK	N/A	S/L
Confirm all relevant Loop components' Electrical and Instrument Installation Completion ITR's are complete with No outstanding critical snaglist items.	☐	☐	☐
Verify device(s) / Loop details are correct against all Project /Vendor information i.e. P & ID's, I/O Schedule, Data sheet, F & G / Instrument index/Alarm and trip schedule.	☐	☐	☐
Verify device(s) Location and Elevation is correct as per Fire zone / Instrument / Equipment layout drawing and Device(s) installation is secure and free from excess movement and vibration.	☐	☐	☐
Verify all Cabling /Termination / Earthing is correct as per Loop diagram and conforms to project specifications.	☐	☐	☐
Verify Process / Pneumatic pipework / Remote testing points (where applicable - are accessible) and correct for type of Installation as per hook up drawings and project specifications.	☐	☐	☐
Confirm all Loop components and Termination / Earthing is suitable to correct hazardous area classification.	☐	☐	☐
Confirm loop diodes / Load and EOL Resistor values are correct for Loop type – Record Values: Load resistor value (Ohms) …… EOL Resistor Value (Ohms) ……..	☐	☐	☐
Verify "Cold Loop" Check results are acceptable prior to Loop energisation.	☐	☐	☐
Confirm Loop Rack / Slot / Channel location is correct for all Device(s) in loop.	☐	☐	☐
Confirm Loop fuse rating is correct and with panel knife edges open and using certified test meter confirm Loop power supply falls within manufacturers accepted tolerances – Energise loop.	☐	☐	☐
INPUT and OUTPUT DEVICE(S) CALIBRATION AND LOOP FUNCTION TESTS *NOTE-Ensure unwanted Executive actions are Inhibited from this Point*			
Miscellaneous Input device(s) - Includes Pressure / Flow / Limit switches / Pushbuttons etc			
With power applied (where applicable) check configuration of Device(s) (Smart Units Only) is correct as per Data sheet.	☐	☐	☐
Using certified test equipment confirm the Loop voltage / Current are stable with no Signal 'Drift" Record Loop Supply Voltage..... / Type.....	☐	☐	☐
Confirm correct operation of Device(s) Input to VCS / PCS / UCP and record the following: Pressure / Flow switch setting: Rising / High…… Falling / Low…… Pressure / Flow switch "A" Contact settings..... "B" Contact settings……	☐	☐	☐
Confirm correct operation of Device(s) Input to VCS / PCS / UCP and record the following: Pushbutton: "A" Contact settings..... "B" Contact settings……	☐	☐	☐
Confirm correct operation of Device(s) Input to VCS / PCS / UCP and record the following: Limit Switch: "Open Limit" Contact settings……'Closed" Limit" Contact settings……	☐	☐	☐
Miscellaneous output device(s) - Includes Panel Inter-Trips, Solenoid valves, and Status lights & Sounders etc.			
With Power applied (where applicable) check configuration of Device(s) (Smart Units Only) is correct as per Data sheet.	☐	☐	☐

Using certified test equipment Confirm the Loop voltage / Current are stable with no Fault or Alarm Indication and no Signal 'Drift". During Function test of Device(s) / Loop - record the following: Loop supply voltage…….. / Type…….. / Output line monitored.....	☐	☐	☐
Confirm all device(s) / Loop local Auto / Inhibit Functions operates correctly.	☐	☐	☐
Confirm all device(s) / Loop local Auto / Manual Change over Device(s) operate correctly.	☐	☐	☐
Confirm all device(s) / Loop local Auto / Inhibit Device(s) operate correctly.	☐	☐	☐
Confirm all Panel inter-trips / Solenoid valves Local reset function operate correctly.	☐	☐	☐
Confirm correct operation of any Area visual and Audible device(s) i.e. Correct indication and Sounds observed.	☐	☐	☐
VCS / PCS / UCP INDICATION CHECK *applicable for all Device(s) / Loop types*			
Carry out Device(s) /Loop test from VCS/PCS/UCP Systems in accordance with manufacturer's instructions and confirm correct operation of Loop end device(s) i.e. Panel inter-trip, Solenoid valves, and Status lights & Sounders etc as shown in project Cause and Effect Logic and Fire & Gas system F.D.S.	☐	☐	☐
Confirm all device(s) / Loop alarm and Fault tests are Correct on Fire zone Overview page.	☐	☐	☐
Confirm all device(s) / Loop alarm and Fault tests are Correct on Device(s) Point Fire zone display page.	☐	☐	☐
Confirm all device(s) / Loop alarm and Fault tests are Correct on Device(s) Point detail display page.	☐	☐	☐
Confirm all device(s) / Loop alarm and Fault tests are Correct on Alarm display page.	☐	☐	☐
Confirm all device(s) / Loop alarm and Fault tests are Correct to Printer / Data logger or S.O.E. Recorder.	☐	☐	☐
Confirm all device(s) / Loop alarm correctly to Fire and Gas matrix / Mimic panel.	☐	☐	☐
Confirm all device(s) / Loop remote inhibit function operates correctly.	☐	☐	☐
Confirm all device(s) / Loop remote reset function operates correctly.	☐	☐	☐
Confirm all device(s) / Loop configuration, Response time and Tag and Alarm descriptors are correct – Raise any anomalies on Snag list.	☐	☐	☐
Comments: -			

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

WATER QUALITY COMPLIANCE INSTRUMENTATION			I-14B
Asset		Project No.	
Location		System	
Tag Number		Manufacturer	
Layout Drawing		Loop Drawing	

SET-UP	OK	N/A	S/L
Confirm all relevant Loop components' Electrical and Instrument Installation Completion ITR's are complete with No outstanding critical snaglist items.	☐	☐	☐
Verify device(s) / Loop details are correct against all Project /Vendor information i.e. P & ID's, I/O Schedule, Data sheet.	☐	☐	☐
Confirm each instrument is uniquely identified with a label or tag that includes the instrument's name, location, and duty.	☐	☐	☐
Confirm a Calibration logbook has been created for the site and that each compliance instrument is recorded in the logbook. Log sheets / books can be provided on request by the Watercare Instrument Commissioning Specialist.	☐	☐	☐
Confirm A calibration schedule is established for each instrument based on the manufacturer's recommendations and regulatory requirements and is recorded in the logbook.	☐	☐	☐
Confirm the calibration procedure for each instrument is in the Watercare WQACM and in the logbook.	☐	☐	☐
Confirm calibration kits/standards/tools are available on site and are within expiry date	☐	☐	☐
Confirm buffers are supplied and within expiry dates	☐	☐	☐
CALIBRATION			
Confirm the Personnel responsible for calibration and maintenance of instruments are trained and competent in their duties.	☐	☐	☐
Carry out a calibration of each device, using the approved calibration procedures	☐	☐	☐
Ensure the results of the calibration are recorded in the logbook as per the approved calibration sheet (calibration sheets can be provided on request by the Watercare Instrument Commissioning Specialist).	☐	☐	☐
Confirm the calibration results are verified and compared to limits from the Drinking water Standards.	☐	☐	☐
Confirm the instrument is accepted or rejected based on the calibration/verification results.	☐	☐	☐
Confirm buffers/handhelds/calibration kits serial numbers are recorded in the Calibration log	☐	☐	☐
MAINTENANCE			
Confirm a maintenance schedule is established for each instrument based on the manufacturer's recommendations and regulatory requirements	☐	☐	☐
Confirm the maintenance schedule is recorded in the logbook e.g. membrane cap changes, pH probe changes, KCL replacement etc	☐	☐	☐

	COMPLETED BY: (Commissioning)	ACCEPTED BY: (WSL Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

RADAR LEVEL TRANSMITTER			I-15B
Asset		Project No.	
Location		System	
Tag Number		Manufacturer	
Serial Number		Bluetooth Password	
Layout Drawing		Loop Drawing	
Unit of measurement		Linearization Type	
Medium Type		Failure Mode	
Application Type		Mapping Applied	Y / N / NA
Minimum (4mA)		Mapping Value	
Maximum (20mA)		Blocking Distance	

SET-UP	OK	N/A	S/L
Confirm all relevant Loop components' Electrical and Instrument Installation Completion ITR's are complete with No outstanding critical snaglist items.	☐	☐	☐
Verify device(s) / Loop details are correct against all Project /Vendor information i.e. P & ID's, I/O Schedule, Data sheet.	☐	☐	☐
Confirm factory calibration certificate is correct and in the completions dossier	☐	☐	☐

CALIBRATION

Transmitter Output		DCS/HMI Readout	
Scaled Value	Unit	Scaled Value	Unit

	COMPLETED BY: (Commissioning)	ACCEPTED BY: (WSL Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

IN-LINE STRAINER / FILTER			M-02B
Asset		Project No.	
Location		System	
Tag Number		Model	
Manufacturer		Serial Number	
Type		P&ID Drawing	

		OK	N/A	S/L
1	Confirm Vendor Test Documentation is complete (FAT and SAT or ITR M-02A) and in the Completion Dossier	☐	☐	☐
2	Confirm preservation removed	☐	☐	☐
3	Confirm correct filter element, screen or mesh has been installed	☐	☐	☐
4	Verify strainer is clean and free from contaminates	☐	☐	☐
5	Confirm all drains and vents operational	☐	☐	☐
6	Confirm changeover valves on duplex system operational	☐	☐	☐
7	'Red Line' mark-up complete	☐	☐	☐

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

HEAT EXCHANGER			M-03B
Asset		Project No.	
Location		System	
Tag Number		Model	
Manufacturer		Serial Number	
Type		P&ID Drawing	

		OK	N/A	S/L
1	Confirm Vendor Test Documentation is complete (FAT and SAT or ITR M-03A) and in the Completion Dossier	☐	☐	☐
2	Confirm preservation removed	☐	☐	☐
3	Confirm all valves associated with the exchanger are operational	☐	☐	☐
4	Confirm all Spectacle blinds are fitted and in correct orientation	☐	☐	☐
5	Confirm borescope inspection carried out	☐	☐	☐
6	'Red Line' mark-up complete	☐	☐	☐

Comments:

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

SUBMERSIBLE PUMP			M-05B
Asset		Project No.	
Location		System	
Tag Number		Model	
Manufacturer		Serial Number	
Duty		P&ID Drawing	

		OK	N/A	S/L
1	Confirm Vendor Test Documentation is complete (FAT and SAT or ITR M-05A) and in the Completion Dossier	☐	☐	☐
2	Confirm preservation removed	☐	☐	☐
3	Confirm all commissioning strainers/filters fitted are recorded in temporaries register	☐	☐	☐
4	Confirm all pump casing vent and drain lines installed correctly and valves operational	☐	☐	☐
5	Confirm pump rotates freely	☐	☐	☐
6	Check alignments and record (Attach M-06B if applicable)	☐	☐	☐
7	Reassemble coupling and associated safety guards	☐	☐	☐
Record coupling type _____ , serial number _____ , and Manufacturer _____				
8	Confirm Lineshaft lubrication if applicable.	☐	☐	☐
9	Confirm Lineshaft lubrication water supply system if applicable)	☐	☐	☐
10	Confirm pump rotor correctly aligned to pump casing if applicable	☐	☐	☐
11	Confirm gearbox check complete	☐	☐	☐
12	Confirm pump discharge valve closed	☐	☐	☐
13	Confirm pump fully primed	☐	☐	☐
14	Start pump and run up to speed against closed discharge valve. (duration to be advised by mechanical engineer: _____mins). Record discharge head pressure. _____ Barg.	☐	☐	☐
15	Fully open discharge valve start pump, Confirm operation of auto-venting facilities. (duration to be advised by mechanical engineer: _____mins).	☐	☐	☐
16	Confirm operation of non-return valve	☐	☐	☐
17	Confirm operation of pump driven cooling supplies	☐	☐	☐
18	Verify pump performance in accordance with manufacturers data and test record	☐	☐	☐
19	Complete 4 hour (or as agreed) commissioning load run & record data on attached running log	☐	☐	☐
20	'Red Line' mark-up complete	☐	☐	☐
Comments:				

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

SUBMERSIBLE PUMP	M-05B	

Tag number:	Description:

Full-load test recordings. Record Pressures, Temperatures and Vibrations

		10min	20 min	30 min	45 min	60min	1hr 20 min	1hr 40 min	2hr	2hr 20 min	2hr 40 min	3hr	3hr 20 min	3hr 40 min	4hr
Suction Pressure															
Discharge pressure															
DE bearing temp															
NDE bearing temp.															
Atmospheric temp.															
Coolant temp.	In														
	Out														
Coolant Pressure (System)															

Comments: -

	COMPLETED BY	ACCEPTED BY	REVIEWED BY
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

MECHANICAL ALIGNMENT DATA SHEET			M-06B
Asset		Project No.	
Location		System	
Tag Number		Manufacturer	
Layout Drawing		Type and Model	
P&ID Drawing		Serial number	
ISO Drawing		Data Sheet	

		OK	N/A	S/L
1	Confirm all associated pipework and supports are complete.	☐	☐	☐
2	Confirm flange/flange or flange /nozzle alignment is to correct specification with gasket in place.	☐	☐	☐
3	Confirm manufacturer figures for coupling alignment, record specified cold offsets below.	☐	☐	☐
4	Loosen off all pipework to the driven equipment.	☐	☐	☐
5	Split coupling, remove spacer (if fitted), bolts and guard. Check that coupling spacer, guards and bolts are in good condition, identified and stored in a secure place.	☐	☐	☐
6	Check flange/nozzle alignment.	☐	☐	☐
7	Carry out soft foot check.	☐	☐	☐
8	Check radial concentricity of each half coupling- ref. Fig 1. Record clock readings on sheet 3, section 1.	☐	☐	☐
9	Check axial alignments as per Fig 2. Record clock readings on sheet 3, section 2.	☐	☐	☐
10	Check radial concentricity as per Fig 3. Record clock readings on sheet 3, section 3.	☐	☐	☐
11	Tighten up all pipework and re-check items 8, 9, 10. Record results in the appropriate sections on sheet 4.	☐	☐	☐
12	Record: • Coupling spacer free length mm • Distance between Shaft ends (DBSE) mm	☐	☐	☐

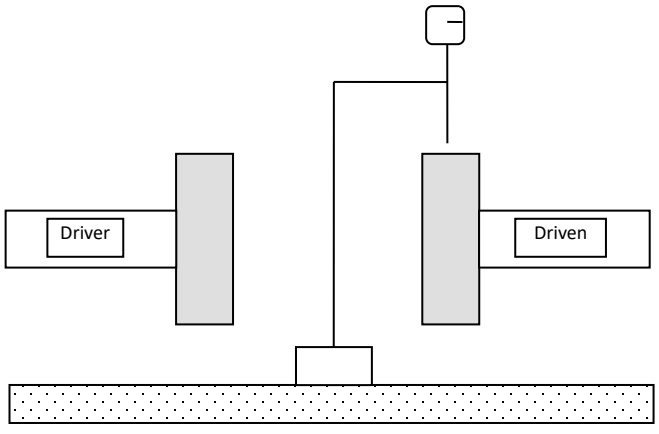


Fig. 1

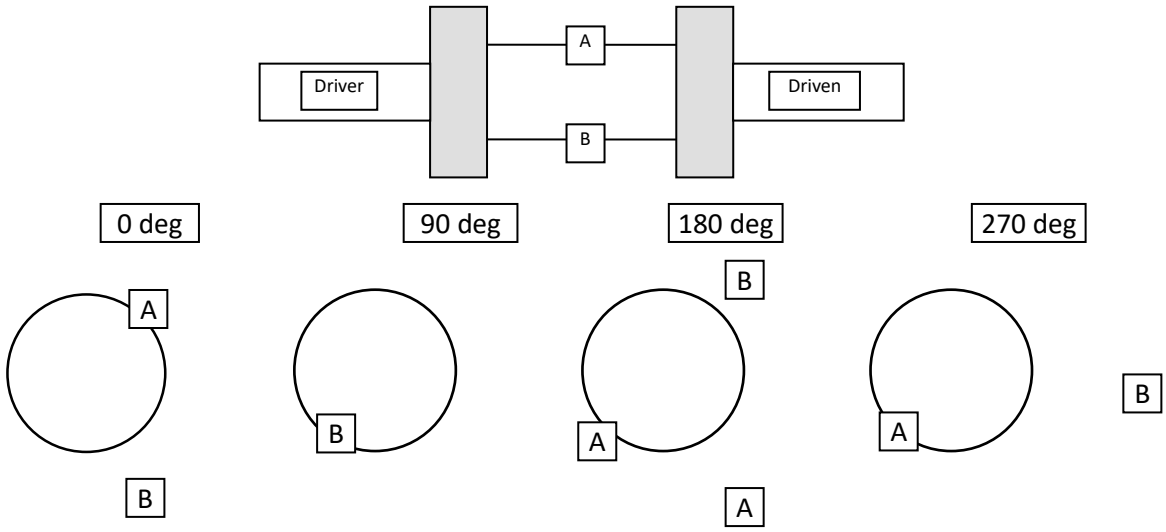


Fig. 2

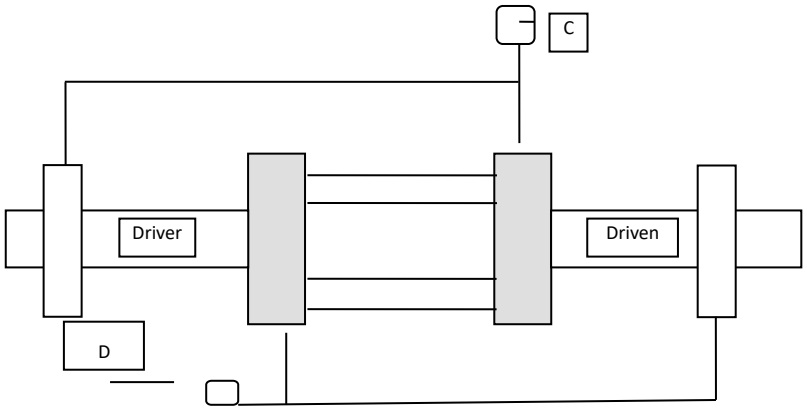
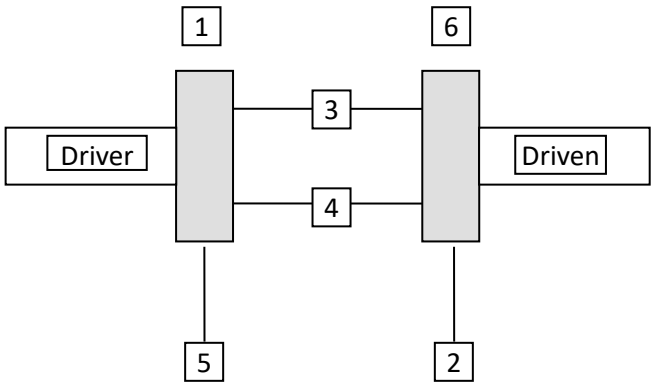
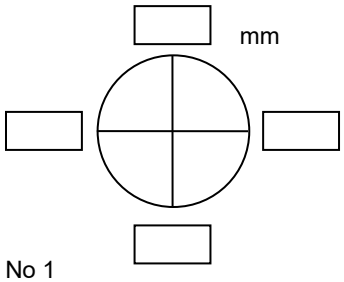
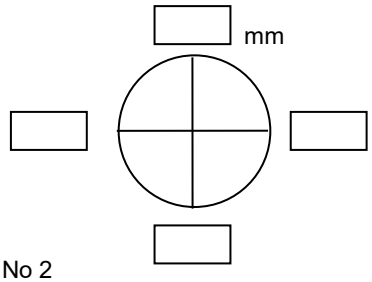
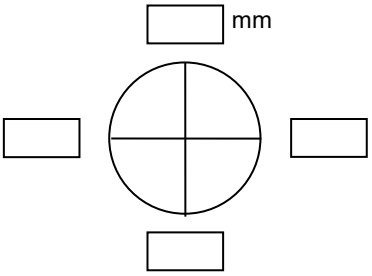
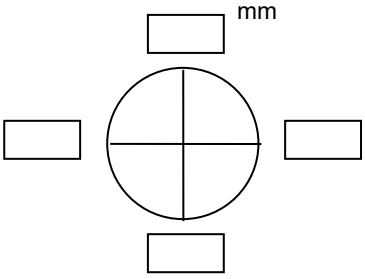
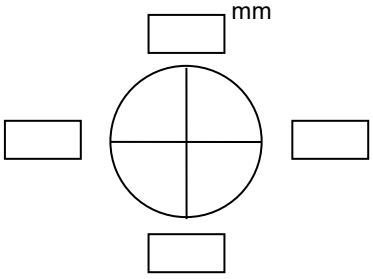


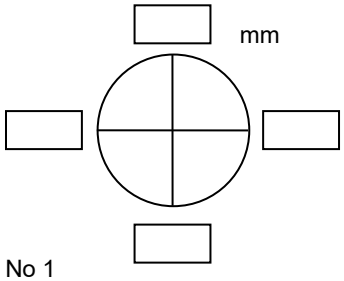
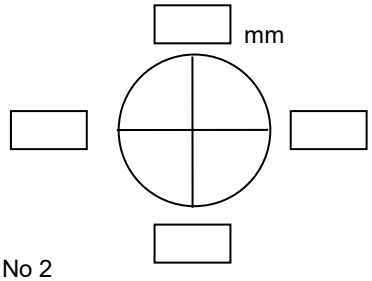
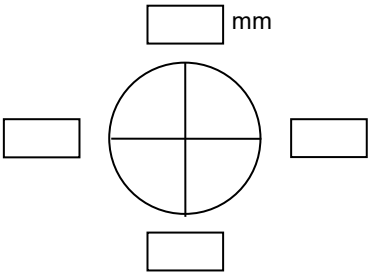
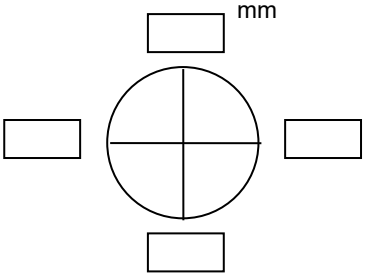
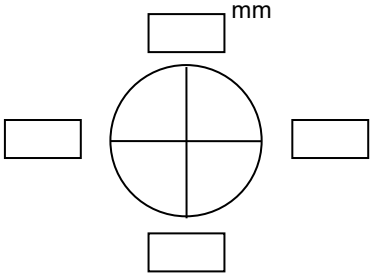
Fig. 3



Method of alignment used:

Looking in the direction of:

ALIGNMENT DATA SHEET - PIPEWORK LOOSE	
1	Radial concentricity of each half coupling to its own shaft (use for face/periphery and reverse alignment).  Driver Gauge No 1  Driver Gauge No 2
2	Coupling gap. Face to Face [axial] (use only for face/periphery method)  Clock gauges 3 & 4
3	Radial concentricity of coupling hubs to each other (use for face/periphery and reverse alignment).  Driver Gauge No 5  Driver Gauge No 6

ALIGNMENT DATA SHEET - PIPEWORK TIGHT	
1	Radial concentricity of each half coupling to its own shaft (use for face/periphery and reverse alignment).  Driver Gauge No 1  Driven Gauge No 2
2	Coupling gap. Face to Face [axial] (use only for face/periphery method)  Clock gauges 3 & 4
3	Radial concentricity of coupling hubs to each other (use for face/periphery and reverse alignment).  Driver Gauge No 5  Driven Gauge No 6
Comments:	

Test Equipment			
Make:	Model:	Serial No:	Cal Expiry Date:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

DIESEL ENGINE			M-08B
Asset		Project No.	
Location		System	
Tag Number		Model	
Manufacturer		Serial Number	
Duty		P&ID Drawing	

		OK	N/A	S/L
1	Confirm Vendor Test Documentation is complete (FAT and SAT or ITR M-08A) and in the Completion Dossier	☐	☐	☐
2	Confirm preservation and transport chocks etc are removed	☐	☐	☐
3	Confirm all commissioning strainers/filters fitted are recorded in temporaries register	☐	☐	☐
4	Carry out manufacturer's pre-start checks	☐	☐	☐
5	Confirm all electrical and instrument checks are complete	☐	☐	☐
6	Confirm fuel system is fully primed and sufficient fuel is available for commissioning activities	☐	☐	☐
7	With the engine uncoupled, dry crank engine using starting arrangements and confirm correct operation of starter motor	☐	☐	☐
8	Start engine and run up to speed, record information as per commissioning log. *Note: duration (mins) to be advised by Mechanical Engineer	☐	☐	☐
9	Confirm engine overspeed trip by overriding governor	☐	☐	☐
10	Confirm all auto start facilities operational	☐	☐	☐
11	Re-assemble coupling and associated safety guards	☐	☐	☐
12	Confirm all associated driven unit check sheets complete	☐	☐	☐
13	Start engine and run up speed, carry out full load run and record information as per Sheet 2 *Note: duration (mins) to be advised by Mechanical Engineer	☐	☐	☐
14	'Red Line' mark-up complete	☐	☐	☐
Comments:				

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

DIESEL ENGINE	M-08B	Sheet 2 of 2

Tag number:	Description:

Commissioning Log

		10min	20 min	30 min	45 min	60min	1hr 20 min	1hr 40 min	2hr	2hr 20 min	2hr 40 min	3hr	3hr 20 min	3hr 40 min	4hr
Engine Speed															
Engine jacket water temp															
Air inlet temp.															
Exhaust temp.	Left														
	Right														
Engine oil temp.															
Engine oil pressure															
Oil filter diff. pressure															
Air cleaner diff. pressure															
Fuel Pressure															
Fuel filter diff. pressure															

	COMPLETED BY	ACCEPTED BY	REVIEWED BY
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

AIR COMPRESSOR			M-09B
Asset		Project No.	
Location		System	
Tag Number		Model	
Manufacturer		Serial Number	
Duty		P&ID Drawing	

		OK	N/A	S/L
1	Confirm Vendor Test Documentation is complete (FAT and SAT or ITR M-09A) and in the Completion Dossier	☐	☐	☐
2	Confirm preservation and transport chocks etc are removed	☐	☐	☐
3	Lubrication System: • Confirm system is leak free. • Flush and fill system in accordance with manufacturer's instructions • Confirm grade / type and quantity of lubricant: - Type _____, Quantity ____ • Check condition of reclaimer	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐
4	Cooling System: - a) Flush and fill system in accordance with manufacturers recommended medium	☐	☐	☐
5	Confirm air intake filter installed and internally clean	☐	☐	☐
6	Confirm dryer towers are filled to correct level with the manufacturers recommended medium	☐	☐	☐
7	Confirm compressor rotates freely	☐	☐	☐
8	Confirm all associated electrical and instrument checks are complete	☐	☐	☐
9	Confirm all associated driver / gearbox checks are complete	☐	☐	☐
10	Re-assemble coupling, spacer hub (if fitted) and associated safety guards	☐	☐	☐
11	Carry out manufacturer's pre-start checks	☐	☐	☐
12	Run compressor as per manufacturers Commissioning procedure and complete sheet 2	☐	☐	☐
13	Check hot alignment and record (M-06A)	☐	☐	☐
14	Confirm compressor performance with manufactures design data and test record	☐	☐	☐
15	Confirm Boroscope inspection carried out	☐	☐	☐
16	'Red Line' mark-up complete	☐	☐	☐

Comments:

AIR COMPRESSOR	M-09B	

Tag number:	Description:

Commissioning log

	1st Stage In	1st Stage Out	2nd Stage In	2nd Stage Out										
Speed														
Air Pressure														
Air Temperature														
Cooling water temp in														
Cooling water temp out														
Load pressure														
Unload pressure														

	COMPLETED BY	ACCEPTED BY	REVIEWED BY
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

LIFTING EQUIPMENT-GENERAL			M-10B
Asset		Project No.	
Location		System	
Tag Number		Model	
Manufacturer		Serial Number	
Duty		P&ID Drawing	

		OK	N/A	S/L
1	Confirm Vendor Test Documentation is complete (FAT and SAT or ITR M-10A) and in the Completion Dossier	☐	☐	☐
2	Confirm preservation and transport chocks etc are removed	☐	☐	☐
3	Record the equipment ratings: SWL _____ Certifying Body _____ Proof Load _____ Proof Load Certificate Number _____	☐	☐	☐
4	Confirm load testing and inspection has been carried out by a relevant body / company and certificates issued for all lifting beams, and copies located in the completion dossier.	☐	☐	☐
5	Confirm load testing and inspection has been carried out by a relevant body / company and certificates issued for all lifting equipment including hoists, running gear, hooks, and fittings	☐	☐	☐
16	'Red Line' mark-up complete	☐	☐	☐

Comments:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

Watercare

RELIEF / SAFETY VALVE INSTALLATION			M-11B
Asset		Project No.	
Location		System	
Tag Number		Model	
Manufacturer		Serial Number	
Type		P&ID Drawing	

		OK	N/A	S/L
1	Confirm ITR M-11A is complete and in the Completion Dossier	☐	☐	☐
2	Confirm preservation removed	☐	☐	☐
3	Confirm valve correct to design data specification	☐	☐	☐
4	Confirm name plate details correct	☐	☐	☐
5	Confirm equipment installation is correct as per design drawings	☐	☐	☐
6	Visually inspect valve as being free from damage	☐	☐	☐

Balanced or Conventional:	Body material:
Bellows material:	Nozzle material:
Orifice size:	Orifice letter:
General condition:	Pilot or spring operated:
Rating	
Cold set pressure Bar g	Back pressure Bar g
Data sheet setting Bar g	Operating temperature °C
Spring Details	
Length:	Coil diameter:
No of coils:	Material:
Wire diameter:	Colour code No:
Calibration	
Cal Expiry Date:	
Test medium:	Cold set pressure: Bar g
Lifting pressure: Bar g	Re-seat pressure: Bar g
Leak Test	
Leak test pressure (90%) Bar g	Duration mins
Leak rate (bubbles per minute)	

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

TANKS AND VESSELS			M-12B
Asset		Project No.	
Location		System	
Tag Number		Manufacturer/ Model	
Serial Number		P&ID Drawing	

		OK	N/A	S/L
1	Confirm ITR M-12A is complete and in the Completion Dossier	☐	☐	☐
2	Confirm equipment is correct to design data specification	☐	☐	☐
3	Confirm tank vents and drains are complete to the P&ID, and associated spectacle blinds and spades are in the correct orientation and all flanges correctly torqued. P&ID red-lined.	☐	☐	☐
4	Visually confirm tank / vessel is clear of all debris, tools etc, arrange for cleaning if required	☐	☐	☐
5	Confirm tank / vessel internal and external wall coatings are intact and as per specification	☐	☐	☐
6	Flush, fill and drain tank / vessel in accordance with manufacturers commissioning procedures.	☐	☐	☐
7	Confirm leak or pressure test has been completed as per Watercare standards	☐	☐	☐
8	Confirm all associated electrical and instrument checks complete.	☐	☐	☐
9	If the tank / Vessel is on or feeds a water network asset, ensure sterilisation is carried out as per Watercare COP-04	☐	☐	☐
10	Confirm the tank has been installed in accordance with the Hazardous Substances and New Organisms act (HNSO). Confirm signage, spacing, bund sizing etc all meet the requirements of the Act and a Location Compliance Certificate has been issued (where required). For more information visit: www.worksafe.govt.nz//topic-and-industry/hazardous-substances/managing/storage/	☐	☐	☐
11	Confirm any dosing or transfer pumps have been installed and pre-commissioned and (where required) meet the requirements of the Hazardous Substances and New Organisms act (HNSO).	☐	☐	☐
12	Confirm: • All safety equipment and showers etc are installed and commissioned (or temporary arrangements made). • Suitable and compatible spill kits are in the vicinity. • Copies of the MSDS are current (less than 3 years old), and located at the tank, pump and control room. If HFA Confirm a tube of calcium gluconate is near the tank and dosing pumps.	☐	☐	☐

Comments:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

AUTOMATIC SPRINKLER / DELUGE SYSTEMS			M-13B
Asset		Project No.	
Location		System	
Tag Number		Model	
Manufacturer		Serial Number	
Type		P&ID Drawing	

		OK	N/A	S/L
1	Confirm ITR M-13A is complete and in the Completion Dossier	☐	☐	☐
2	Confirm preservation removed	☐	☐	☐
3	Confirm equipment is correct to design data specification	☐	☐	☐
4	Confirm all electrical and instrument checks are complete	☐	☐	☐
5	Carry out manufacturers pre-commissioning checks	☐	☐	☐
6	Confirm cover up of exposed items in and around area that may be affected by deluge water	☐	☐	☐
7	Carryout operational test of system, ensure spray patterns of each are as per design and not obstructed	☐	☐	☐
8	Confirm leaks are not observed at unexpected locations	☐	☐	☐
9	Confirm system low point and winterisation drain holes clear and adequate to remove standing water post test	☐	☐	☐
10	Confirm system is left operational	☐	☐	☐
11	'Red Line' mark-up complete	☐	☐	☐

Comments:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

PORTABLE FIRE FIGHTING / SAFETY EQUIPMENT			M-15B
Asset		Project No.	
Location		System	
Tag Number		Model	
Manufacturer		Serial Number	
Type		Location Drawing	

		OK	N/A	S/L
1	Confirm Vendor Test Documentation is complete and in the Completion Dossier	☐	☐	☐
2	Confirm preservation removed	☐	☐	☐
3	Check location and quantities of equipment are in accordance with the appropriate layout drawing and site safety plan	☐	☐	☐
4	Equipment is in good condition and undamaged	☐	☐	☐
5	Cabinet contents are as per inventory list	☐	☐	☐
6	Equipment is installed as per regulations, easily accessible and not obstructed.	☐	☐	☐
7	Extinguishers are fully charged, inspection less than 6 months old, and control signature is valid	☐	☐	☐
8	Safety signage and equipment operating instructions are clearly displayed and legible	☐	☐	☐
9	'Red Line' mark-up complete	☐	☐	☐

Comments:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

Watercare

RUNNING LOG	M-16B	Sheet 1 of 1

Tag number:	Description:

Record Pressures and Temperatures (Barg / Degrees C.)

	10min	20 min	30 min	45 min	60min	1hr 20 min	1hr 40 min	2hr	2hr 20 min	2hr 40 min	3hr	3hr 20 min	3hr 40 min	4hr
Suction Pressure														
Discharge pressure														
DE bearing temp.														
NDE bearing temp.														
Casing temp.														
Atmospheric temp.														

Record Vibrations (mm/Sec)

Drive End	X													
	Y													
	Z													
Non-Drive End	X													
	Y													
	Z													
Base Frame	X													
	Y													
	Z													

	COMPLETED BY	ACCEPTED BY	REVIEWED BY
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

SAFETY SHOWER AND EYEBATH			M-17B
Asset		Project No.	
Location		System	
Tag Number		Model	
Manufacturer		Serial Number	
Type		P&ID Drawing	
Description			

		OK	N/A	S/L
1	Confirm ITR M-17A is complete and in the Completion Dossier	☐	☐	☐
2	Confirm preservation removed	☐	☐	☐
3	Confirm equipment is correct to design data specification	☐	☐	☐
4	Confirm all electrical and instrument checks are complete	☐	☐	☐
5	Equipment is in good condition and undamaged	☐	☐	☐
6	Check location and quantities of equipment are in accordance with the appropriate layout drawing	☐	☐	☐
7	Equipment safety signage and operating instructions are clearly displayed and legible	☐	☐	☐
8	Carry out shower/eye bath test and confirm that spray pattern and coverage are correct, and operating, and control mechanism operates correctly	☐	☐	☐
9	Confirm drains are suitable	☐	☐	☐
10	Flow regulators are operable	☐	☐	☐
11	Indicator lights and remote signals (ie SCADA alarms) are functional	☐	☐	☐
12	Confirm system is left operational	☐	☐	☐
13	'Red Line' mark-up complete	☐	☐	☐

Comments:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

MISCELLANEOUS EQUIPMENT			M-18B
Asset		Project No.	
Location		System	
Tag Number		Model	
Manufacturer		Serial Number	
Type		P&ID Drawing	
Description			

		OK	N/A	S/L
1	Confirm ITR M-18A is complete and in the Completion Dossier	☐	☐	☐
2	Confirm preservation removed	☐	☐	☐
3	Confirm equipment is correct to design data specification	☐	☐	☐
4	Confirm all electrical and instrument checks are complete	☐	☐	☐
5	Carry out manufacturers pre-commissioning checks	☐	☐	☐
6	Ensure all ancillary equipment's are correct, any required certifications are in the completions dossier	☐	☐	☐
7	All lubrication requirements attended to: Grade: _____ Quantity: _____	☐	☐	☐
8	Ensure all moving / rotating equipment is correctly guarded	☐	☐	☐
9	Confirm system is left operational	☐	☐	☐
10	'Red Line' mark-up complete	☐	☐	☐

Comments:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

CENTRIFUGAL PUMP			M-041B
Asset		Project No.	
Location		System	
Tag Number		Model	
Manufacturer		Serial Number	
Duty		P&ID Drawing	

		OK	N/A	S/L
1	Confirm Vendor Test Documentation is complete (FAT and SAT or ITR M-04A) and in the Completion Dossier	☐	☐	☐
2	Confirm all pump casing vent and drain lines installed correctly and valves operational	☐	☐	☐
3	Confirm lubrication system is leak free	☐	☐	☐
4	Flush and fill lubrication system in accordance with manufacturers' instructions.	☐	☐	☐
	Record Grade/type _____ and quantity _____ of lubricant used			
5	Flush and fill cooling system in accordance with manufacturers' instructions.	☐	☐	☐
6	Complete checks for cooling system heat exchanger if fitted.	☐	☐	☐
7	Confirm seal type is as per design and correct for the pumps service, any seal fluid systems are filled to the operating level with the correct fluid type, and any external fluid liquids i.e. water are connected and commissioned and ready for operation	☐	☐	☐
8	Confirm pump rotates freely	☐	☐	☐
9	Check alignments and record (Attach M-06B)	☐	☐	☐
10	Reassemble coupling and associated safety guards.	☐	☐	☐
	Record coupling type _____ , serial number _____ , and Manufacturer _____			
11	Confirm gearbox check complete	☐	☐	☐
12	Confirm pump discharge valve is closed, or the pump recycle is lined out, in preparation for pump run	☐	☐	☐
13	Confirm pump suction valve is open in preparation for pump run	☐	☐	☐
14	Prime the pump and bleed pump casing	☐	☐	☐
15	Complete 4 hours commissioning load run & record data on attached running log	☐	☐	☐
16	Verify pump performance in accordance with manufacturers data and test record	☐	☐	☐
17	'Red Line' mark-up complete	☐	☐	☐

Comments:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

CENTRIFUGAL PUMP	M-05B	Sheet 3

Tag number:	Description:

Full-load test recordings. Record Pressures, Temperatures and Vibrations

		10min	20 min	30 min	45 min	60min	1hr 20 min	1hr 40 min	2hr	2hr 20 min	2hr 40 min	3hr	3hr 20 min	3hr 40 min	4hr
Suction Pressure															
Discharge pressure															
DE bearing temp															
NDE bearing temp.															
Casing temp.															
Atmospheric temp.															
Drive End Vibration	X														
	Y														
	Z														

POSITIVE DISPLACEMENT PUMP			M-042B
Asset		Project No.	
Location		System	
Tag Number		Model	
Manufacturer		Serial Number	
Duty		P&ID Drawing	

		OK	N/A	S/L
1	Confirm Vendor Test Documentation is complete (FAT and SAT or ITR M-04A) and in the Completion Dossier	☐	☐	☐
2	Confirm all pump casing vent and drain lines installed correctly and valves operational	☐	☐	☐
3	Inspect pulsation damper and record details (if fitted)	Type: _____		
	Pressure rating: _____	Pre-charge medium: _____	Pre-charge pressure: _____	
4	Confirm all pump casing vent and drain lines installed correctly and valves operational	☐	☐	☐
5	Confirm lubrication system is leak free	☐	☐	☐
6	Flush and fill lubrication system in accordance with manufacturers' instructions.	☐	☐	☐
7	Record Grade/type _____ and quantity _____ of lubricant used			
8	Flush and fill cooling system in accordance with manufacturers' instructions.	☐	☐	☐
9	Complete checks for cooling system heat exchanger if fitted.	☐	☐	☐
10	Confirm pump rotates freely	☐	☐	☐
11	Check alignments and record (Attach M-06B)	☐	☐	☐
12	Reassemble coupling and associated safety guards.	☐	☐	☐
	Record coupling type _____, serial number _____, and Manufacturer _____			
13	Confirm pump interlocks have been tested and are operational	☐	☐	☐
14	Confirm pump discharge valve open or the pump recycle is lined out, in preparation for pump run	☐	☐	☐
15	Confirm pump suction valve open in preparation for pump run	☐	☐	☐
16	Bleed pump casing to prime pump in preparation for pump run	☐	☐	☐
17	Complete 4-hour commissioning load run & record data on attached running log	☐	☐	☐
18	Verify pump performance in accordance with manufacturers data and test record	☐	☐	☐
19	'Red Line' mark-up complete	☐	☐	☐

Comments:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

Watercare

Tag number:	Description:

Full-load test recordings. Record Pressures, Temperatures and Vibrations

		10min	20 min	30 min	45 min	60min	1hr 20 min	1hr 40 min	2hr	2hr 20 min	2hr 40 min	3hr	3hr 20 min	3hr 40 min	4hr
Suction Pressure															
Discharge pressure															
DE bearing temp															
NDE bearing temp.															
Casing temp.															
Atmospheric temp.															
Drive End Vibration	X														
	Y														
	Z														
Non Drive End Vibration	X														
	Y														
	Z														
Base Frame Vibration	X														
	Y														
	Z														

PRESSURISED SYSTEMS LEAK TEST CHECKLIST			P-03B
Asset		Project No.	
Location		System	
Description		Location	
P&ID		Isometric	

Note: This Checklist / Procedure is aligned to WSL General Civil Construction Standard. If any doubt the standard takes precedent. Refer to "section 10 – Testing" of the standard.

This procedure is intended only for leak testing pressurised systems such as pipes and vessels.

Leakage testing is used to reveal locations of potential exfiltration due to the inclusion of damaged pipes, seals, or incorrectly made joints in the pipeline or vessels at the completion of installation.

Hydrostatic leakage testing requires selecting an appropriate configuration of method, pressure, and length of test section.

- Compressed air testing shall not be permitted for pressure pipe, due to the increased risks.

Selection of test pressure:

The hydrostatic test pressure at any point in the pipeline shall be:

a) Greater than the design operating pressure; and

b) Less than 1.25 times the rated pressure of any pipeline component.

Note – The design pressure is the maximum system pressure at a point in the pipeline, considering future developments, static pressure, dynamic pressure and an allowance for short-term surge pressure (water hammer), as determined by analysis.

Test Types:

- Constant pressure test (water loss method) – PVC, DI, GRP, and steel pipelines
- Pressure decay test for PE pipe larger than DN200 or longer than 250m
- Pressure rebound test for PE up to DN 200
- Visual test for small pressure pipelines
- Hydrostatic pressure test for PE pressure pipelines

					OK	N/A	S/L
1	Record the following:				☐	☐	☐
	Flow Medium		Operating Pressure				
	Design Pressure		Design Temperature				
	Test Pressure		Test Temperature				
	Test Medium		Duration of Test				
2	Attach test boundary P&ID or isometric drawings				☐	☐	☐
3	Ensure the system under test is isolated at the boundary's using correctly rated blinds or spades. Closed valves shall not be used for isolations at test boundary.				☐	☐	☐
4	Confirm all works on the system to be tested are complete				☐	☐	☐
5	Confirm all pipe anchors / blocks are in place and adequately cured				☐	☐	☐
6	Confirm temporary supports and blocks are installed at pipe breaks and are adequate to ensure no pipe movement under the test pressure.				☐	☐	☐
7	Confirm all test equipment including temporary hoses is certified for the test pressure and test gauges / recorders are calibrated and have valid calibration certificates				☐	☐	☐

8	Ensure the area is clear of non-essential persons, use safety signs, barriers and tape to restrict access to the area.	☐	☐	☐
9	Ensure a toolbox talk has been completed with all persons involved in the test	☐	☐	☐
10	Carry out testing as per WSL General Civil Construction Standard, section 10, attach any procedures used and test results including charts.	☐	☐	☐
	Test Type used			
	Test Result			
11	Ensure the systems are drained of test fluids and the fluids are disposed off via an approved method	☐	☐	☐
12	Remove and spades, blinds etc installed for testing, use new gaskets for any joints or blinds, and ensure the system is ready for service	☐	☐	☐
13	Remove any test equipment and replace drains and vents to meet design	☐	☐	☐
14	Remove any temporary supports, blocks, safety barriers etc.	☐	☐	☐
15	Ensure any Pipelines, tanks, and reservoirs for potable water are disinfected in accordance with Watercare's Code of Practice for water reticulation disinfection.	☐	☐	☐
16	'Red Line' mark-up P&ID's and isometrics as required	☐	☐	☐

Comments:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

WITNESS JOINT CHECKLIST			P-04B
Asset		Project No.	
Location		System	
Tag Number		Location	
P&ID		Isometric	

		OK	N/A	S/L
1	Confirm Vendor Test Documentation is complete and in the Completion Dossier	☐	☐	☐
2	Confirm preservation removed	☐	☐	☐
3	Confirm flange faces examined & seen to be clean, damage free	☐	☐	☐
4	Confirm gasket examined & seen to be clean, damage free & of correct type/size	☐	☐	☐
5	Confirm that flange faces are parallel	☐	☐	☐
6	Confirm that joints are pulled up evenly on opposing studs	☐	☐	☐
7	Confirm that all nuts and bolts are of the correct material, not counterfeit, and pulled up to correct tightness	☐	☐	☐
8	Confirm no visible damage to gasket when joint completed	☐	☐	☐
9	Confirm a minimum of two threads showing through each assembly	☐	☐	☐
10	Confirm no excessive length of stud/bolt protruding each assembly	☐	☐	☐
11	Confirm stud/bolt torque correct to specification where required and relevant certificates attached	☐	☐	☐
12	'Red Line' mark-up complete	☐	☐	☐

Comments:

	COMPLETED BY: (Construction)	ACCEPTED BY: (Commissioning)	REVIEWED BY: (Operations)
COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

Watercare

PIPING / EQUIPMENT INSULATION			P-06B
Asset		Project No.	
Location		System	
P&ID			

Sub System No.	Description	Equipment No.

Insulation Designator: -

AT	Heat Conservation with tracing	A	Heat Conservation	B	Personnel Protection
C	Acoustic Insulation	D	Frost Protection	DT	Frost Protection with heat tracing
O	No Protection				

Line No.	Isometric Drg No.	Rev	Final Paint Acceptance Certificate Complete		Insulation Designator	Insulation Thickness mm	Insulation installed in accordance with Spec.	
			Yes	No			Yes	No
			☐	☐			☐	☐
			☐	☐			☐	☐
			☐	☐			☐	☐
			☐	☐			☐	☐
			☐	☐			☐	☐
			☐	☐			☐	☐
			☐	☐			☐	☐
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Snag Items Raised / Comments:

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COMPANY			
SIGNATURE			
PRINT NAME			
DATE			

Watercare

FINAL COATING ACCEPTANCE CERTIFICATE			P-07B
Asset		Project No.	
Location		System	
P&ID			

Sub System No.	Description	Equipment No.

Line No.	Isometric Drg No.	Rev	Surface coating to design and WSL Standards		Line No.	Isometric Drg No.	Rev	Surface coating to design and WSL Standards	
			Yes	No				Yes	No
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Snag Items Raised / Comments:

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NON-PRESSURISED SERVICE LEAK TEST CHECKLIST			P-08B
Asset		Project No.	
Location		System	
P&ID		Isometric	

Note: This Checklist / Procedure is aligned to WSL General Civil Construction Standard. If any doubt the standard takes precedent. Refer to "section 10 – Testing" of the standard.

This Procedure is intended only for non-pressurised systems or as a pre-test prior to testing pressurised systems if required.

Leakage testing is used to reveal locations of potential infiltration and exfiltration due to the inclusion of damaged pipes, seals, or incorrectly made joints in the pipeline or vessels at the completion of installation.

1. Leakage testing for acceptance of non-pressure pipelines:
   - A-1) Low pressure air testing; or
   - A-2) Hydrostatic testing
2. Leakage testing for Fluid retaining structures (process tanks, reservoirs, etc.):
   - The test is to demonstrate fluid loss of less than 0.05% of the tank volume per 24 hours period.
3. Manholes and Chambers:
   - Hydrostatic testing of concrete manholes
   - Vacuum test
   - Infiltration test
   - Visual Smoke Test

					OK	N/A	S/L
1	Record the following:				☐	☐	☐
	Flow Medium		Operating Pressure				
	Design Pressure		Design Temperature				
	Test Pressure		Test Temperature				
	Test Medium		Duration of Test				
2	Attach test boundary P&ID or isometric drawings				☐	☐	☐
3	Ensure the system under test is isolated at the boundary's				☐	☐	☐
4	Confirm all works on the system to be tested are complete				☐	☐	☐
5	Ensure the area is clear of non-essential persons, use safety signs, barriers etc to restrict access				☐	☐	☐
6	Ensure a toolbox talk has been completed with all persons involved in the test				☐	☐	☐
7	Carry out testing as per WSL General Civil Construction Standard, section 10, attach any procedures used and test results.				☐	☐	☐
	Test Type used		Test Result				
8	Remove all spades, blinds etc installed for testing, use new gaskets for any joints or blinds, and ensure the system is ready for service				☐	☐	☐
9	Ensure any Pipelines, tanks, and reservoirs for potable water are disinfected in accordance with Watercare's Code of Practice for water reticulation disinfection COP-04.				☐	☐	☐
10	'Red Line' mark-up complete				☐	☐	☐

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DATE			

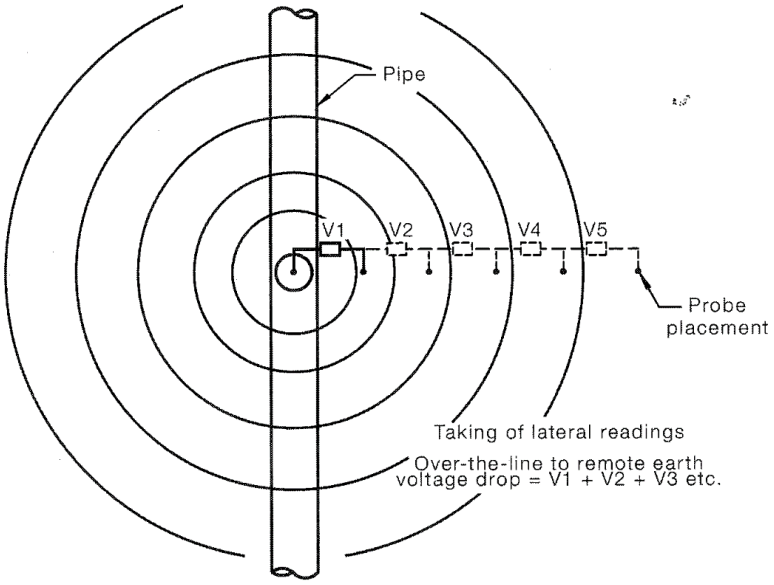
DCVG COATING DEFECT SURVEY			P-09B
Asset		Project No.	
Location		System	
P&ID			

As per the Watercare General Civil Construction Standard:

Commissioning DCVG Survey: Completed after installation and construction DCVG survey has been completed. Where the pipeline runs under a sealed surface such as concrete of bitumen, the survey shall be conducted with the probes positioned in a suitable electrolyte (such as soil) as close as practicable to the centre line of the pipe. Where the pipeline runs under a sealed surface, Watercare shall define whether the surface can be saturated with water, or holes must be drilled through the surface to provide suitable contact with the electrolyte.

Task	Minimum Level of Expertise
Field inspection and testing	Corrosion Technician with minimum 2 years' experience in corrosion testing including specific training and experience related to coating defect surveys on pipeline, under the indirect supervision of a Corrosion Technologist
Analysis and approvals	Corrosion Technologist with a minimum 10 years' experience in corrosion testing including specific experience related to coating defect surveys on pipelines or Corrosion Technician under the direct supervision and with report review and approvals of a Corrosion Technologist.

Procedure	
1.	Prior to undertaking the DCVG survey, the following inspections and tests shall be undertaken: a) Record the locations of all electrical earths in the survey report. b) Record locations of all sacrificial anode beds in the survey report. Note - Electrical safety earth beds, such as those installed for the protection of personnel and equipment and mitigation of low frequency induced (LFI) a.c. currents are not to be disconnected from the pipeline unless safe to do so.
2.	The body of Australian Standard AS4827.1 – 2008 Coating defects surveys for buried pipelines Part 1: Direct current voltage gradient (DCVG) provides "normative" advice on coating defects surveys and may be used as an additional guide to testing. However, the Watercare General Civil Construction Standard supersedes AS 4827.1 when working on Watercare's assets.
3.	Signal application
	Minimum test point swing is 1000mV. Lower strengths may only be used if it can be shown that a defect of 0.1% IR will be detected from the equivalent methodology. The DCVG survey signal may be derived from the installed CP system power supply or applied using portable transformer/ rectifier unit utilizing the system anode ground bed or temporary earth electrode. Should stray current have significant impact on the accuracy of measured defect IR signals, the sizing of defects shall be undertaken during the period when there is no stray current.
4.	Survey methodology
	Determining DCVG Signal Amplitude to Remote Earth at Test Points The procedure to determine the DCVG signal amplitude to remote earth at test point is as follows: • Place 1 reference electrode at the base of the test point or other electrical contact point with the soil, while the second electrode contacts the test point or other properly cleaned electrical point in contact with the structure. The potential swing measured by this arrangement is the DCVG signal amplitude between the pipe and the base of the test point. • Measure the voltage gradient from the base of the test point to remote earth by placing 2 probes which are separated on the ground adjacent to the test pipes (unless it was already established that there is no defect causing a voltage gradient adjacent to the test point). These 2 probes are then moved perpendicular in convenient steps at 90 degrees to the pipeline route measuring potential swings until remote earth is achieved. The sum of all potential swings of each step is then calculated from the base of the test point to the remote earth. (NOTE: Well coated pipeline may have a voltage gradient from the base of the test point to remote earth that is negligible unless a coating defect is in close proximity). In most cases, the DCVG signal measured in step (i) will adequately represent the total DCVG signal amplitude at the test point. • The total DCVG signal amplitude at a test point or other connection point is the sum of (i) and (ii)

5.	Recording of defects
	All defects located during the coating survey shall: • Be sized to remote earth and the IR drop recorded in mV. • Be marked by driving in a peg or by fluorescent paint where a peg cannot be used. • Defect information shall be recorded and includes: o GPS location recorded in NZTM (datum 2000) map coordinates, to the accuracy levels described in the Watercare Data and asset Information standard. o Description of the location with reference to the pipeline length, house number, distance from driveway, and other reference details noted to facilitate future re-location of the defect. o o Offset from pipeline if the defect could not be centred on the pipeline.
6.	Coating defect survey - % IR calculation
	Defect sizes shall be related in terms of %IR by calibrating the measured IR sizes (mV) at defects against the signal size (mV) calculated to exist at the defects' location. The signal size shall be determined from the measured signal size relative at a suitable number of "calibration" points along the pipeline, and attenuation of the signal shall be taken into account between the "calibration" points. Details of the survey and assessment, including calculated defect sizes (%IR), signal size the electrode potential survey data, shall be reported to Watercare for approval and acceptance immediately upon completion of the survey. Upon determining the epicentre of the coating defect, a series of lateral stepped potential swings shall be measured, moving from the epicentre toward remote earth. Note that lateral potential swings decay exponentially from the defect and remote earth is located when the lateral DCVG signal amplitude in subsequent steps is negligible compared to the sum of potential swings to that location. The sum of the potential swings is the IR component over the line of the coating defect to remote earth (SOL) and will be used for calculating " %IR ". Figure 10.12-1 depicts how SOL is calculated.  Hence, the series of lateral mV readings to remote earth is summed to obtain the SOL. This is defined by equation below: SOL = (V1 + V2 + V3 + V4 + V5) mV If a defect is located, the %IR is calculated as the IR drop between a point on the ground directly above the coating defect and remote earth, expressed as a percentage of the estimated signal amplitude between the coating defect and remote earth. This is shown by the equation below: %IR = (SOL x 100) / SCF Note – • Digital voltmeters (DVMs) are not sufficiently accurate to obtain the difference between the 'on and off' pipe-to-soil potentials. • The DVM's sample rate and screen update may not be synchronised with the DCVG pulse. • To reduce error, use the same DCVG instrument for all readings for a given %IR calculation, unless an accurate calibration between instruments has been established.

7.	DCVG Survey Procedures
	The Application of the DCVG survey technique is as follows: a) The surveyor should walk above the centreline of the buried pipeline and place one probe electrode in front of the other in the soil. Probes should be moist to provide good contact with the electrolyte. This may require the application of water to the electrolyte if the soil is dry or the survey is conducted over a small concrete surface. Should the pipeline run under a sealed road or large concrete surface (such as car park or building foundation), Watercare shall approve the methodology. b) The probe electrodes should be separated approximately 1.0 to 2.0 metres parallel and above the pipeline searching for voltage gradients along the pipeline. If perpendicular probes are used, one probe should always be directly above the pipeline where achievable. c) The DC offset and range selector switch is used to bring any pulse onto the meter scale. d) If a pulse is seen on the meter scale, the direction of the metre indicator deflection is observed as it points toward the electrode that is closest to the coating defect, assuming the electrode closest to the defect is connected to the negative terminal of the voltmeter. Opposite connections will cause the indicator to swing the other way. e) As the coating defect is approached, the amplitude increases and then reverses when the coating defect is passed. (If using perpendicular probes, the maximum indication will be observed when the probe above the pipeline is directly above the defect. Reversal will not occur once the defect is passed, only a reduction in amplitude). f) When a reversal of pulse direction is observed, this indicates a coating defect has been traversed. The coating defect location may be identified by retracting slowly to where no pulse is observed. The coating defect epicentre then lies midway between the 2 probe electrodes and is normally marked by a line on the ground. g) The surveyor turns 90 degrees to the pipeline and the null process is repeated. A second line is marked, and the location where the two cross is the coating defect epicentre. This location is directly above the actual coating defect. ***Note** - Max spacing between measurements of 5m in rural areas. Depending on signal strength, drilling through tar-seal may be required to achieve a suitable contact with the electrolyte if a suitable swing is not achieved on the berm of the road.* • *All defect indicators are to be precisely located and recorded. Any indication too small to be precisely located is to be recorded against the meterage range where it was identified.* • *When surveying over concrete, the concrete shall be wetted to obtain a suitable contact for the probes.* • *During construction survey (where the pipe has not been connected) all dirt shall be cleared away from bare steel (i.e. uncoated pipe ends, weld plates, AV connections).* • *In areas with low swing, closer spacing between readings shall be used in addition to greater spacing between probes.*
8.	Acceptance criteria
	The following coating performance acceptance / rejection criteria shall apply to all steel pipelines. Other criteria may be adopted by Watercare for other types of coating system subject to sufficient justification of alternative criteria. Watercare shall define the criteria to adopt for existing mains prior to beginning survey. a) All defect indications equal to or greater than 0.2% IR shall be excavated and repaired providing there is no evidence to indicate that the indications are associated with anodes, or electrical earth (defects at test leads should be excavated no matter the size, as these are likely to be shielded and have different metals). b) Defects less than 0.2% IR shall be subjected to the following assessments: a. If a defect measuring ~ 0.2%IR is excavated and shown to be a significant size, then the next largest shall be excavated to determine the actual size of the defect. This process shall be completed until Watercare determine that the defect is insignificant. b. Where two or more defect indications are separated by a pipe spool length, at least one shall be excavated, inspected and repaired. If the first indication is found to be at a pipe weld joint the other defect(s) shall be excavated. c. Should isolated defects of this size (less than 0.2%IR) be located they may not require excavation and repair subject to the following provision: If the specified over-the-line electrode potential survey indicates that a polarized protection level (free of IR component and other interference) of at least 100 mV more negative than the minimum protection criteria specified for the pipeline can be achieved at all points along the affected pipeline section with a total protection current not exceeding 50 mA per kilometre length of the pipeline. All the defects shall be recorded for future reference. d. Chambers with water, chambers without water- Where a defect is located at a chamber the Watercare

	shall advise the criteria to adopt. Tees, joints, welds, cadwelds: - All defects located at Tees, joints, welds and cadwelds must always be repaired.
9.	Re-test following defect correction
	Following rectification of coating defects, details of repairs to the coating and subsequent performance measurements indicating the success of the repair shall be recorded on the pro-forma and supplied to Watercare for retention. All repairs are to have a DCVG carried out following backfill (this may be carried out after the pipe has a minimum of 300 mm cover). It is advised that the pipe either side of the excavation be DCVG tested while the defect being inspected is exposed, to ensure that no defects exist immediately up or downstream of the excavation that may have been shielded by the defect being inspected. The table below shall be used for recording corrected defects.
10.	Report
	All test results shall be recorded and a separate report supplied to Watercare for assessment and acceptance prior to undertaking commissioning of the CP system for the pipeline. A record of defects shall be submitted to the Watercare for review following the assessment against the acceptance/ rejection criteria and a recommendation for proposed remediation where required to meet the criteria. The report shall contain the following as a minimum: a) Pipeline details including route length, diameter, fittings, off-takes, safety earths, sacrificial anodes and CP system components b) Details of equipment and methodology including method and location of signal injection points and strength of signal c) Potential survey results including output current and voltage of the direct current (CP) power source d) Listing of all coating defects located including reference points and GPS identification e) Where specified in this document, size of defects in term of lateral IR, signal size at calibration points, and calculated defect size represented as %IR f) Assessment of defect %IR sizes against the acceptance / rejection criteria in this document g) Recommendations for excavation, physical sizing and repair of defects h) Provide details of repairs undertaken and subsequent coating survey results indicating the criterion has been satisfactorily achieved. i) i) Photo record of defects during repairs

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Defect Number	Metreage (m)	GPS Coords	Description of location	IR (mv)	%IR	(I)inspected/ (R)repaired/ (N)not Repaired.	Description of defect	Likelihood of shielding (H)high (M)medium (L)low	Photo Number/ Name	Date Inspected/ Repaired	DCVG Survey