Appendix A:
Inspection Test Plan

A1 – Earthworks

A2 – Concrete Works

A3 – Piling Works

A4 – Pipeworks

A5 – Mechanical Works

A6 – Electrical Works

Appendix A1- Earthworks

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD / REQUIREMENT	TOOLS / EQUIPMENT	STAGE / FREQUENCY	RESPONSIBILITY	EVIDENCE	REMARKS
EARTH WORKS								
1	Site clearing	Area to be cleared Depth of grubbing Removal of topsoil	- Refer to construction drawings - Approved method statement	Survey equipment Tools to measure depth	Entire site	Contractor	Setting out plan Survey plan	
2	Excavation	Dimensional tolerance (depth)	Width < 300mm than the dimensions shown on the drawings	Tools to measure depth	When required	Contractor/ Project Manager	Survey plan	
		Unsuitable material (If any)	JKR/SPJ/2013-S2: Clause 2.2.1 (d) or JKR 20800-0183-14 Section B Cl. 5.2.3	Trial pit	When required		Material laboratory test	
		Grading of replacement materials	JKR/SPJ/2013-S2: Table 2.1 or JKR 20800-0183-14 Section B Cl. 5.7, Table B1	Particle Size Distribution (Gradation analysis)	When required		Material laboratory test	
		Excavation of hard materials/ rock	JKR/SPJ/2013-S2: Clause 2.2.1 (f) and (g) or JKR 20800-0183-14 Section B Cl. 5.2.5,	Trial excavation	When required		Trial excavation record	
		Rock blasting	JKR/SPJ/2013-S2: Clause 2.2.3.8 or JKR 20800-0183-14 Section B Cl. 5.1.2	Trial blasting	When required		Trial blasting record	
3	Fill materials	Suitability of materials	JKR/SPJ/2013 - Cl. 2.2.4.1 and 2.2.4.2 or JKR 20800-0183-14 Section B Cl. 5.2.4 or Federal Aviation Administration (FAA) AC 150/5320-6E CI 205	Atterberg limit test	One test/ 1500 m3 of the material to be used	Contractor/ Project Manager	Material laboratory test	
				Gradation analysis				
				Compaction test (MS 1056)				
				Soaked CBR test				
			Federal Aviation Administration (FAA) AC 150/5320-6E CI 205 & ICAO A. Manual Part	Plate Bearing Test				
4	Slope Cutting	Area to be cut and trim	Refer to construction drawing	Survey equipment Measuring tape	Before slope cutting	Surveyor / Contractor	Setting out plan Surveyor peg point	
		Safety Precaution	JKR specification for occupational safety & Health in engineering construction	Visual checking	Before slope cutting	Contractor		Ensure nobody or property at the downstream of slope cutting
		Excavation - Dimension - Level - Line - Profile	Refer to construction drawing	Survey equipment Measuring devices	Once slope cutting completed	Contrator / Surveyor Consultant	Request for Inspection Form	
		Compaction	Refer to construction drawing Visual inspection	Excavator	Once after work completed	Contractor / Consultant	Request for Inspection Form Compaction record	

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD / REQUIREMENT	TOOLS / EQUIPMENT	STAGE / FREQUENCY	RESPONSIBILITY	EVIDENCE	REMARKS
			EARTH WORKS					
5	Drainage	Drainage route Drain excavation and Slope alignment	Refer to construction drawing Refer to construction drawing	survey equipment Measuring tape	Before start work	Surveyor / Contractor	Setting our plan	
		Drain invet level	Refer to construction drawing Site Layout plan	Survey equipment Level measuring devices			Request for Inspection Form	
		Belian pile	Refer to construction drawing	Excavator Measuring tape	once during piling work	Contractor Consultant	Pile Material inspection form Request for Inspection Form for piling work	
		Cutting and bending of steel reinforcement	Refer to construction drawing BS4449		Before fixing concreting	Contractor		
		Fixing of steel reinforcement to formwork	Refer to construction drawing Comply design concrete cover Comply design drain width and depth	Measuring tape		Contractor / Consultant	Request for Inspection Form	
6	Slope Protection	Preparation of site Compaction	Refer to construction drawing MS1056 SO approval	Compaction and CBR test equipment	once upon work done		Request for inspection form	
		Placement of Gabions Material	BS1052:1980 JKR/SPJ/1988 sub-Section 3.6.2.1			Contractor / Consultant	Material inspection form	
		Installation of Gabion Stone	refer to construction drawing refer to construction drawing			Contractor / Consultant Consultant	Request for inspection form	

Appendix A2- Concrete Works

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION/TEST	STANDARD/REQUIREMENT	TOOLS/ EQUIPMENT	STAGE/ FREQUENCY	RESPONSIBILITY	EVIDENCE	REMARKS
CONCRETE WORKS								
1	CONCRETE MATERIALS	Manufacturers certificate of test. (types & composition of cement)	SIRIM approved cement		Before mixing concrete and at change of supplier	Contractors/ Supplier	certificate	
	Cement	Storage	Protected againt water					
	Aggregates (Fine and Course)	Approved Source., Aggregate test results	- Granite for water retaining structure - Limestone for non water retaining structure		Before mixing concrete and at change of source/ supplier	Contractors/ Supplier	Aggregates test report	
		Aggregates test results	Elongation, flakiness, clay slit content, soundness etc.					
		Grading or Sieve Anaysis test results	Within Grading envelope					
	Water	Source of water.	Approved source -clean, free chloride and sulphate		Before mixing concrete and at change of soured/ producer/ supplier	Contractors/ Supplier	Sampling test	
2	STEEL REINFORCEMENT	Steel characteristic strength fy N/mm2	As design for use in the construction drawings		Before delivery to site / Initial, Ramdom testing	Contractors/ Supplier	Mill certificates, tensile test results	
			MS 146, BS 4461, MS 144, MS 145					
		Storage	In clean and dry conditions		Initial stage/ throughout.	Contractors/ Supplier		
		Condition of steel reinforcement	Clean , free from rust, scalling, oil, grease, paint, dirt etc		Before fixing and concreting.	Contractors/ Consultant	Request for inspection form	
		Cutting and bending of steel reinforcement	As per construction drawings. and BS 4449		Before fixing and concreting.	Contractors		
		Fixing of steel reinforcement to formwork	As per construction drawings		Before concreting	Contractors/ consultant	Request for inspection form	
			Comply design concrete cover					
			BS 1052					
		Welding of reinforcement	Welding carried out by certified welder			Contractors		
			BS EN 1011 and BS EN 60974					
3	APPROVAL AND PRODUCTION OF CONCRETE MISTURE (Prescribed or designed concrete)	Concrete grade /strength or mixture	As required in construction drawing or Approved by consultant		Initial stage or Regularly on production	Contractors/ supplier	- Consultant approval - Concrete testing from - Initial test results or comformity test or identity test, and /or Delivery order	
		Cement content	JKR Building Specs					
		Consistency / watercement ratio	Slump test / compacting test/ Vebe test/ flow test					
		Admixtures	Prescribed concrete : CEM 1 only . No admixture					
			Designed concrete : All cement type + Admixture					
4	APPROVAL OF READY MIXED.	Supplier Information / Manufacturer certificate	Supplier name, Plant location, transportation duration, Plant's capacity production		Initial Stage	Consultant	Manufacturers certificates and licencing.	
		Mixing	All concrete materials mixed at plant (NO extra water/ admixtures added after leaving the plant)		Regularly on production	Supplier		
		Delivery	Delivery ticket and manufacturer's batching record					
			Check for grade, slump, temperature, Time < 2 hrs.					

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION/TEST	STANDARD/REQUIREMENT	TOOLS/ EQUIPMENT	STAGE/ FREQUENCY	RESPONSIBILITY	EVIDENCE	REMARKS
CONCRETE WORKS								
5	CONCRETE TESTING (Compressive Strength : CUBES OR CYLINDER)	Initial test results	Samples: At least 3 specimens from each of 3 batches. (Average strength is used) Average Compressive strength > fck of Table D8, D9 by adequate margin (2 x SD): (At least 6-12 N/mm2) Historical data of batching plant can be used (exceed target mean strength at 28 days)		Initial stage /change in material or specified requirement	Contractor/ Supplier	Record form	1. EN 12390-2 (Curing) 2. Test result - average of 2 or more specimens made from 1 sample tested at same age. 3. Cube strength at 7 days 28-days compressive strength.
		Conformity test results	Rate of sampling for accessing comformity : (Table D10), 35 test results for initial roduction or 35 test results (within 12 months) for continuous production. Test result from individual specimen or; average of 2 or more specimens made from 1 sample tested at 28 days. Criteria Acceptance : Table D11		Initial stage /change in material or specified requirement	Contractor		
		Identity test	Rate of sampling and testing to EN 12350-1 · critical structure : 1 sample per 10m3 or 10 batches · slab/beam :1sample per $20m^3$ or 20 batches · raft foundation/ mass concrete :1 sample per $50m^3$ or 50 batches · minimum 2 samples each concreting day per grade/structure · for designed mix : 4 samples (12 cubes) on first concreting day per grade and subsequently minimum 1 sample per source per day per grade	JKR/QC/B05/04	Random on production.	Contractor		
		Identity test for Slump and Flow test	Sampling and testing plan to comply with MS 26-1-1 (sampling),MS 26-1-2 (slump measurement),MS 26-1-5 (flow measurement) Slump measurement - Table D14, D15 , and MS 523:Part 1 Flow measurement - Annex B of MS 523-2	JKR/QC/B05/04	Initial stage / ramdom on production.	Contractor	Record form	

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION/TEST	STANDARD/REQUIREMENT	TOOLS/ EQUIPMENT	STAGE/ FREQUENCY	RESPONSIBILITY	EVIDENCE	REMARKS
CONCRETE WORKS								
6	PLACEMENT OF CONCRETE	Site condition	Dry condition. No concreting in flowing water and underwater.		Throughout	Contractor	Record form	
		Placement and compaction	Time mixing and placement within 2 hrs., Temperature not exceed 36 deg C					
			Concrete dropped no exceed 1.5m high.					
			Compacting in layer 300 mm to 450 mm.only.					
7	FORMWORK AND SCALFOLDING	Design Drawings and method statement	Certified by Professional Engineer. If scaffolding is necessary, appoint competent scaffolder	Design/shop drawings	Before installation.	Contractor/ Consultant	Drawings, calculation certificate	
		Construction stage	Formwork and scalfolding in correct position, shape, profile and dimension (verticality, alignment and level), rigid and tight, clean.	visual	Before and during concreting	Contractor		
			Finishes: Formed and unformed surface finish to various classes.					
		Removal of formworks	When approval by consultant granted		After min strength achieved.	Contractor		
8	SUPPORTING AND SPACER BLOCKS	size	NOT more than 50mm x50mm		Throughout	Contractor		
		strength	At least the same strength and material source's as the concrete to be poured (with nominal aggregates size = 10 mm)		Throughout	Contractor		
9	CONSTRUCTION JOINTS	Location	As per drawings; or if not indicated in the drawings, Contractor may proposed with consultant approval		Throughout	Contractor		
			NOT allowed at toilet/wet area		Throughout	Contractor		
		Horizontal constructions joint	Placed 25mm gauge strip inside the forms along all exposed surface to ensure straight joint		Throughout	Contractor		
		Constructions joint for wall/column	Construct 75mm height of kicker (starter stub) monolithically with the base concrete		Throughout	Contractor		

Appendix A3- Piling Works

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD / REQUIREMENT	TOOLS / EQUIPMENT	STAGE / FREQUENCY	RESPONSIBILITY	EVIDENCE	REMARKS
PILING WORKS - PRE CAST (DRIVEN/ JACKED - IN PILE)								
1	Piling equipments (Type/ hammer weight/ pressure requirement)	- Approval of piling equipments - Approved method statement	Refer to construction drawings & Method statement	Visual inspection	Prior to pile installation	Contractor/ Consultant	Equipment specification & calibration records	
2	Set criteria (End bearing piles)	Set criteria calculation submitted by contractor and approval from consultant	Refer approved set criteria calculation	Hiley's formulae (Driven pile) or equivalent approved by consultant/ Correlation chart (Jacked-in)	Prior to pile installation	Contractor/ Consultantr	Approved Set calculation	Hiley set calculation
3	Piles	Physical condition of piles (Type/dimension/ shoes/ defects)	Refer to construction drawings & approved pile catalogue/drawing	Visual inspection	3 specimens for each batch of delivery or every 40 piles whichever is larger	Contractor/ Consultant	Record and defects marking	To submit pile concrete cube test result
4	Installation of piles	Number of preliminary pile	Refer to construction drawings	Contract document	Prior to installation of preliminary pile	Contractor/ surveyor/ Consultant	As built drawing & piling records	
		Pile deviation	< 75mm	Survey equipments	Every pile		As built drawing/Survey record/ pins/ pegs/ markers	
		Verticality of pile	< 1:75	Survey equipments/plumb bob			As built drawing	
		Pile extension		Visual inspection	Every extension of pile		Welding records	
		Termination of pile	Set criteria (end bearing pile)/penetration depth as specified in the drawings (friction pile)	Visual inspection	Every pile		Pile driving record	
5	Pile testing (Static load test)	Test method	Refer to construction drawings, Method Statement	Document review	Prior to commencement of testing	Contractor/ Consultant	Method statement	
		Number of test	Refer to construction drawings	Contract document & Method Statement	Prior to commencement of testing		Load test report	
		Testing procedures	Approved method statements	Document review	Every test pile		Method statement	
		Allowable capacity of pile (Acceptance of piles)	Residual settlement after removal of test load < (D/120+4)mm or 6.5mm, whichever the lowest - Refer calculation method	Load Settlement Graph	Every test pipe		Load test report	
			Total settlement under design load < 12.5mm - Refer calculation method					
			Total settlement under 2xWL < 38mm Or 10% x pile diameter; whichever is the lower value. - Refer calculation method					

Appendix A4- Pipe Works

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY	RESPONSIBILITY	EVIDENCE	REMARKS
Pipeworks/Waterworks								
1.	HDPE Pipe Laying Work	Material & Production Acceptance Test	Manufacturer standard / MS1058 Malaysia Standard for portable water HDPE pipes	Factory QC test ort / Production certificate	Before product dispatch out from factory	Contractor	Certificate of Approval from SWA	
		Material Delivery Acceptance	Specification / Contract construction drawing	Delivery order/ Catalogue	Upon receiving material	Consultant Contractor	Delivery order	
		Storage	General in clean, flat and away from Heat / Flaming	Physical inspection	Upon each bath of material receiveing	Contractor	Material Inspection Form Deivery order	
		Pipe Laying work	Contract construction drawing / Pipeline profile drawing	Measuring tape / Vernier Caliper	Before pipe Jointing	Consultant Contractor	Request for Inspection Form, Delivery order, surveyor indentified route	
		Pipe Jointing and Laying	Specificaton / Manufacturer recomendation / Approved Method statement / Pipeline profile drawing	Automatic / Semi auto HDPE butt welding machine	Every joint	Consultant Contractor	Welding / pipe layer certificate	
		Trenching and backfilling	Constract construction drawing / JKR General specification for water main construction	Visual Visual, measuring tape	Every 200-300 meter interval	Consultant Contractor	Request for Inspection Form	
		Isolation Valve, Washour and Air valve installation	Contract construction drawing / Pipeline profile drawing	Visual, measuring tape	Before installation	Contractor	Request for Inspection Form	
		Sectional Pressure Test	Specificaton / Contract requirement / Approved Mehod statement - 1.5 x working pressure	pressure pump, pressure gauge, timer	Sectional / Test once upon pipework completed	Consultant Contractor	Form-CS-W-3 (water main pressure and leakage test form)	
		General System Test for Water Work	General in clean / Manufacturer Specification (Control valve setting)	Physical inspection, pressure gauge	Overall test prior water supply to WTP	Contractor	Request for Inspection Form and Approval Chit	

Appendix A5- Mechanical Works

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY	RESPONSIBILITY	EVIDENCE	REMARKS
HORIZONTAL SPLIT CASING PUMP / VERTICAL MULTI STAGE PUMP INSTALLATION								
1	Horizontal Split Casing / Vertical Multistage Pump	Submission of material for approval	1. Shop Drawing. 2. Technical Submittal (i.e: Catalogue, Brand & Model). 3. Contract Document.		Before manufacturing	Consultant/ Contractor/ S.O	Material approval	
		Factory acceptance test	Refer contract specification		Prior of delivery to the site.	Consultant/ Manufacturer/ S.O	Testing report	For motor >100kW
		Material on site inspection.	To conform as per approved material.	Visual	Upon delivery at site. Once for each delivery.	Consultant / Contractor	Material Inspection Form	
		Pump installation	1. Manufacturer installation manual 2. Approved method statement / Shop drawing	- Measuring tape & spirit level - visual	Upon installation	Consultant/ Contractor	Request for inspection form	
		Non-shrink grouting	Manufacturer specification	spirit level	Upon installation of QDC	Contractor		Stud-bolt with lock nut
		Pump allignment	Manufacturer specification	Feeler gauge, Dial gauge and shim plate	Upon base frame grouting	Contractor	- M&E pump allignment form - To be done by skilled personnel	
		Discharge pipe & bracket installation	Approved method statement / Shop drawing	Plumb bob/ spirit level	Upon installation	Consultant/ Contractor	Request for inspection form	
		LCP installation	Approved method statement / Shop drawing		Upon installation	Consultant/ Contractor	Request for inspection form	
		Pump cable insulation resistance test		Insulation Tester	Upon completion of cable laying	Contractor / consultant	M&E Cable Insulation Test Form	
		Setting of pump protection parameters and value	Manufacturer recommendation	Computer / Instrument manual	Upon energized of control panle	contractor	M&E testing and commissioning form	
		Functioning test during testing & commissioning	1. Design Requirement. 2. Specification 3. Functioning.		Upon completion of other test above. Once for each board.	Contractor / Consultant / S.O'R	M&E pre-Commissioning & T&C Test Form	

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY	RESPONSIBILITY	EVIDENCE	REMARKS
PIPE AND FITTINGS INSTALLATION								
1.	Piping	Material Aceptance	Specification / Approved shop drawing/ Malaysia Standard / British Standard / Specifcation: i.e Flange, welding & joint method subject to pipe size.	Delivery Order	Upon receiving material	Consultant/ Contractor/ S.O	- Material approval -Delivery Order	
		Installation (above ground and underground)	Approved shop drawing	Visual, measuring tape		Consultant/ Contractor		i. Above ground application - Pipe coated with zinc chromate coating ii. Underground application - Pipe coated with bituminous with lime coating
		Pressure Testing	Pressure test 1.5 working pressure for 48 hrs and pressure drop shall not below 10% from the pressure test	Pressure gauge & pressure pump	Section by section Every section	Consultant/ Contractor		
2.	Valve and fittings	Material Aceptance Installation	Specification / Approved shop drawing/ Malaysia Standard / British Standard / Specifcation: i.e Pressure rating	Visual	Before manufacturing	Consultant/ Contractor/ S.O		
		Material on site inspection.	To conform as per approved material.	Visual	Upon delivery at site. Once for each delivery.	Consultant / Contractor	Material Inspection Form	
		Installation	Approved shop drawing		Upon installation	Consultant/ Contractor	Request for inspection form	to check all bolt and nuts shall be HDG high
3.	Pipe Collar weld / Spigot weld	Welding joint inspection	- Approved method statement / Shop drawing - Welding to be performed by skilled welder	Visual	Randomly check for every 10 welding joints	Contractor/ Consultant	Request for inspection form	Physical chek on welding joint
		Pressure test	- Approved method statement - Pressure test for > 16 bars for 15 minutes	Pressure gauge & Nitrogen gas	every joint	Contractor/ Consultant	M&E pressure testing form	

Appendix A6- Electrical Works

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD / REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY	RESPONSIBILITY	EVIDENCE	REMARKS
LOW VOLTAGE : ELECTRICAL BOARDS								
1.	MSB / SSB / DB / AMF Board / LCP/CP	Submission for Circuit diagram for approval.	1. Shop Drawing. 2. Technical Submittal (i.e: Catalogue, Brand & Model). 3. Contract Document.		Before manufacturing of the boards.	Contractor/ Consultant	Panel approval from consultant	
		Factory Acceptance Test a) Functional test.	Refer contract specification 1. Approved Shop Drawing. 2. Technical Submittal (i.e: Catalogue, Brand & Model).		Prior of delivery to the site. After completion of installation work	Contractor/ Consultant / S.O'R	 Manufacturer Test Report	For MSB only
		b) Pressure Test / Injection Test - Exclude control panel, DB	1. Approved Shop Drawing. 2. Technical Submittal (i.e: Catalogue, Brand & Model). 3. Contract Document.	LV Pressure Test Set	Prior of delivery to the site.		Manufacturer Test Report	For MSB and Sub-switchboard
		c) Insulation Resistance Test 1000 VDC. - Exclude control panel, DB	1. Approved Shop Drawing. 2. Technical Submittal (i.e: Catalogue, Brand & Model). 3. Contract Document.	Insulation Resistance Test	Prior of delivery to the site. Once for each board.		Manufacturer Test Report	For MSB and Sub-switchboard
		Material on site inspection	1. Approved Shop Drawing. 2. Technical Submittal (i.e: Catalogue, Brand & Model). 3. Contract Document.	Measuring Devices (Caliper, Measuring Tape, etc.).	Every Panel delivered to site	Contractor/ Consultant	Material Inspection Form	
		Installation of MSB / SSB / DB / AMF / PFC	1. Approved Shop Drawing. 2. Approved Method Statement.		In-progress and upon completion of installation. Once for each board.	Contractor/ Consultant	Request for Inspection Form	
		Installation of Earthing System for LV Board.	1. Approved Shop Drawing. 2. Specification	Earth Tester.	Upon completion of installation. Once for each installation.	Contractor/ Consultant	M&E Pre-Commissioning Test	
		Setting of Protection Relay - For MSB, AMF and SSB only	Setting value from designer for O/C, E/F	Secondary Relay Test Set.	Upon completion of installation for all works at the board. Once for each relay.	Contractor/ Tester/ SESCO	TEST REPORT	Done by third party tester
		Functional test during Testing & Commissioning Session.	1. Design Requirement. 2. Specification 3. Functioning.		Upon completion of other test above. Once for each board.	Contractor/ Consultant / S.O'R	M&E pre-Commissioning & T&C Test Form	

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD / REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY	RESPONSIBILITY	EVIDENCE	REMARKS
2	Variable Speed Drive (VFD)	Submission for material approval	1. Technical specification 2. Contract documents		Before manufacturing/ Once for each material.	Contractor/ Consultant/ S.O		
		Material on site inspection.	To conform as per approved material.	Visual	Upon delivery at site. Once for each delivery.	Consultant/ Contractor	Material Inspection Form	
		VFD installation - Mounting method - Air ventilation - accessible for trouble shooting	1. Manufacturer installation manual 2. Approved method statement / Shop drawing	Visual, measuring tape, spirit level	During and after installation	Contractor	Request for inspection Form	
		Cable termination and insulation resistance test	Manufacturer installation manual	Insulation & Continuity Tester	Upon completion of cable Termination	Contractor/ Consultant	M&E Cable Insulation Test Form	
		Motor ID & information and drive parameters setting - To be done by trained and competant personnel	Manufacturer recommendation	Computer /Drive firmware manual	Upon energized of control panle	Contractor		Including Pump ID run
		Functioning test during testing & commissioning session	1. Design Requirement. 2. Specification 3. Functioning.		Upon completion of other test above. Once for each board.	Contractor/ Consultant / S.O'R	M&E pre-Commissioning & T&C Test Form	

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD / REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY	RESPONSIBILITY	EVIDENCE	REMARKS
LOW VOLTAGE : WIRING SYSTEM & UNDERGROUND CABLE								
1.	Light Fittings/Fan	Submission of material for approval	Technical specification		Before material delivery at site. Once for each material.	Contractor/ Consultant		
		Material on site inspection.	To conform as per approved material.		Upon delivery at site. Once for each delivery.	Contractor/ Consultant	Material Inspection Form	
		Installation of conduit, trunking and accessories.	Approved Shop Drawing		- In-progress and upon completion of installation. - Once for each zone/ section/	Contractor/ Consultant	Request for Inspection Form	
		Installation of final circuit wiring.	Specification (L-S1).		In-progress and upon completion of installation. Once for each zone / section / floor.	Contractor/ Consultant	Request for Inspeciton Form	
		Insulation resistance test		Insulation Tester	Upon completion of cable laying	Contractor/ Consultant	M&E Cable Insulation Test Form	
		Polarity test.	Load connected correctly.	Insulation & Continuity Tester, polarity tester	Upon completion of wiring work. Once for each circuit.	Contractor/ Consultant		
		Installation of fittings.	- Approved method Statement - Specifications (L-S1)	Measuring devices.	Upon completion of fitting installations. Once for each building	Contractor/ Consultant	Request for Inspection Form	
		Functional test.	Functional.	Measuring devices.	Upon completion of other test above.	Contractor/ Consultant	M&E T&C Form	
2	Switch Socket Outlet (SSO)	Submission of material for approval	Technical specification	Measuring devices.	Before material delivery at site. Once for each material.	Contractor/ Consultant		
		Material on site inspection	To conform as per approved material	Measuring devices.	Upon delivery at site. Once for each delivery.	Contractor/ Consultant	Material Inspection Form	
		Installation of conduit, trunking and accessories.	- Approved shop drawing - Specification (L-S1).	Measuring devices.	In-progress and upon completion of installation. Once for each zone / section / floor.	Contractor/ Consultant	Request for Inspection Form	
		Installation of final circuit wiring.	Specification (L-S1).	continuity meter	In-progress and upon completion of installation. Once for each zone / section / floor.	Contractor/ Consultant	Request for Inspection Form	
		Insulation resistance test		Insulation Tester	Upon completion of cable laying	Contractor/ Consultant	M&E Cable Insulation Test Form	
		Polarity test.	Load connected correctly.	Insulation,Continuity Tester, polarity	Upon completion of wiring work. Once for each circuit.	Contractor/ Consultant		
		Installation of fittings.	- Approved method Statement - Specifications	Measuring devices.	Upon completion of fitting installations. Once for each zone / section / floor.	Contractor/ Consultant	Request for Inspection Form	
		Functional test.	Functional.	Measuring devices.	Upon completion of other test above. Once for each zone / section / floor.	Contractor/ Consultant	M&E testing & commissioning Form	
3	Three Phase Point / Submain Cables	Submission of material for approval	Technical specification	Measuring devices.	Before material delivery at site. Once for each material.	Contractor/ Consultant	Material Approval	

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD / REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY	RESPONSIBILITY	EVIDENCE	REMARKS
		Material on site inspection.	To conform as per approved material.	Measuring devices.	Upon delivery at site. Once for each delivery.	Contractor/ Consultant	Material Inspection Form	
		Installation of conduit, trunking and accessories.	As per approve shop drawings	Measuring devices.	In-progress and upon completion of installation. Once for each zone / section / floor.	Contractor/ Consultant	Request for Inspection Form	
		Installation of cables.	- Specification (L-S1). - Approved method statement.	Visual	In-progress and upon completion of installation. Once for each zone / section / floor.	Contractor/ Consultant	Request for Inspection Form	
		Insulation resistance test		- Insulation & Continuity Tester. - Insulation Tester.	Upon completion of continuity test. Once for each circuit.	Contractor/ Consultant	M&E Cable Insulation Test Form	
		Phase sequence test.	Check phase sequence terminated correctly.	Phase sequence tester, continuity tester	Upon completion of cable insulation test. Once for each circuit.	Contractor/ Consultant		Marking on cable to identify each cable identity
4	Underground Cable	Submission of material for approval	Technical specification	Measuring devices.	Before material delivery at site. Once for each material.	Contractor/ Consultant	Material Approval	
		Material on site inspection.	To conform as per approved material.	Measuring devices.	Upon delivery at site. Once for each delivery.	Contractor/ Consultant	Request for Inspection Form	
		Installation of cables.	- Specification (L-S3). - Approved method statement.	Visual	In-progress and upon completion of installation. Once for each zone / section.	Contractor/ Consultant	Request for Inspection Form	
		Continuity test.		Insulation & Continuity Tester.	Upon completion of cable installation. Once for each cable.	Contractor/ Consultant		
		Insulation resistance test		Insulation & Continuity Tester.	Upon completion of cable continuity test. Once for each	Contractor/ Consultant	M&E Cable Insulation Test Form	
		Phase sequence test.	Check phase sequence terminated correctly.	Phase sequence tester / Continuity test	Upon completion of continuity test. Once for each circuit.	Contractor/ Consultant		Marking on cable to identify each cable identity

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD / REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY	RESPONSIBILITY	EVIDENCE	REMARKS
LOW VOLTAGE : LIGHTNING PROTECTION SYSTEM								
1.	Lightning Protection System	Submission of material approval	- Technical specification - M&E drawing		Before material delivery at site / Once for each material	Contractor/ Consultant	Material Approval	
		Material on site inspection	As per material approval		Upon delivery at site / Once for each delivery	Contractor/ Consultant	Material Inspection Form	
		Inspection on air termination system installation	- Air terminals or vertical finials of annealed copper tape 25mm x 3mm or other approved material. - Fixing bracket intervals < 500mm (metallic / non-metallic roof). - Air termination rods min. 300mm (L), 16mm dia. with	Measuring Equipment	In-progress and upon completion of installation / Once for each block	Contractor/ Consultant	Request for Inspection Form	
		Inspection on down conductor system installation	- Annealed copper tape 25mm x 3mm or other approved material. - Properly clamped down conductor to structural reinforcing bar at 1m intervals.	Measuring Equipment	In-progress and upon completion of installation / Once for each down conductor	Contractor/ Consultant	Request for Inspection Form	
		Inspection on test joint installation	- Joints and bonds by copper clamps or exothermic welding or brazing. - Height at 2.5m from finished floor level. - Copper clamp overlapping >20mm. - PVC casing for exposed down conductor between test joint and ground. - Flash counter height at 2.0m from floor finished level.	Measuring Equipment	In-progress and upon completion of installation / Once for each test joint	Contractor/ Consultant	Request for Inspection Form	
		Resistance test : 1. Earth Electrode 2. Earth Termination	Entire system combine resistance < 5 Ω	Earth Tester	Upon completion of installation / Once for each block	Contractor/ Consultant	- M&E Pre-Commissioning Test Form - T&C Test Form	

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD / REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY	RESPONSIBILITY	EVIDENCE	REMARKS
LOW VOLTAGE : STANDBY GENERATOR SET								
1.	Standby Generator Set.	Submission for material approval	Technical specification		Before manufacturing/ Once for each material.	Contractor/ Consultant/ S.O	Material Approval	
		Factory Acceptance Test (Routine Test) : a) Visual Inspection b) Cranking Test	- Manufacturers Specification. - Design requirement. a) Works test. b) Fulfilling to conditioning of Engine Protective Devices. c) Sudden power increase/decrease. - Approved shop drawing for generator set. - To confirm as per material approved.	- Inductive Load-bank at pf 0.8 lagging.	Before material delivery at site / Once for each material. During testing and commissioning.	Contractor/ Consultant/ S.O'R/ Manufacturer	Manufacturer Test Report	For generator >100kW
		Material on site inspection	To comform as per approved material	Visual Inspection	Upon delivery at site. Each delivery.	Contractor/ Consultant	Material Inspection Form	
		Generator set room requirement.	1. Shop drawing 2. Specification		By the end of construction or after generator installation	Contractor/ Consultant	- Subject to consultant approval - Shop drawing approval	
		Inspection on installation works.	1. Manufacturers specification manual. 2. Approved Shop drawing. 3. Specification (L-S5).	measuring tape , spirit level	- During installation and completion of installation. - Throughout the installation.	Contractor/ Consultant	Request for Inspection Form	
		Noise level measurement	- Jabatan Alam Sekitar (JAS). - <80 dBA Sound Pressure Level. Measured 1 meter away from the generator room.	Sound Meter.	Upon completion of acoustic treatment. During testing and commissioning.	Contractor/ Consultant	M&E pre-Commissioning & T&C Test Form	
		Battery installation and connection	1. Manufacturer installation manual 2. Connection shall done by competent personnel	Ampere meter / DC volt etre	Upon installation	Contractor/ Consultant	Request for inspection form	
		Setting of Generator set's protection parameters and value	Manufacturer recommendation	Computer / Equipment manual	Upon energized of control panel	Contractor/ Consultant	Manufacturer service/ test report	
		Generator start up	1. Design Requirement. 2. Specification 3. Manufacturer guidline	Voltmeter, sound meter and ampere meter	Upon parameter setting done	Contractor/ Manufacturer	Manufacturer service/ test report	
		Functioning test during testing & commissioning session	1. Design Requirement. 2. Specification 3. Functioning.	Voltmeter, sound meter and ampere meter	- Upon completion of other test above. - Once for each board.	Contractor/ Consultant / S.O'R	M&E pre-Commissioning & T&C Test Form	

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD / REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY	RESPONSIBILITY	EVIDENCE	REMARKS
2.	Acoustic	Acoustic treatment system installation	1. Manufacturer installation manual 2. Approved method statement / Shop drawing	Measuring tape & spirit level	Upon installation	Contractor	Request for inspection form	To check air inlet and outlet arrow / rotation
3.	LV Cabling	Material submission approval	- Contract Document. - Technical Submittal (i.e : catalogue, brand & model).		Prior to delivery to site. / Once for each type of material	Contractor/ Consultant	Material approval	
		Material on site inspection	- Manufacturer's Specification. - Design Requirement. - Technical Specification		Upon delivery at site. / Once for each material / delivery	Contractor/Consultant	Material Inspection Form	
		Cable installation	- Approved Method Statement - Approve shop drawing - Technical Specification		In-progress and upon completion of installation. / Once for each installation	Contractor/Consultant	Request for Inspection Form	
		Continuity Test	- Approved Method Statement - Specification		Upon Completion of cable installation / Once for each cable	Contractor/Consultant	M&E Cable Insulation Test Form	
		Insulation Resistance Test	Ohm > 5 M ohms.	1. Insulation & Continuity Tester. 2. Insulation	Upon Completion of continuity test / Once for each cable	Contractor	M&E Cable Insulation Test Form	