JKR 20710-0006-12

JABATAN KERJA RAYA
MALAYSIA

INSPECTION AND TESTING PLAN

(VERSI 1)

2012

GARIS PANDUAN BAGI KERJA-KERJA UNTUK PROJEK JKR

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PRAKATA

Jabatan Kerja Raya (JKR) sebagai Jabatan Teknikal terunggul, sentiasa memastikan penyerahan projek yang dilaksanakan menepati kehendak pelanggan. Pelan Pemeriksaan dan Pengujian (*Inspection and Testing Plan (ITP)*) terhadap bahan dan kaedah pemasangan/pembinaan merupakan salah satu proses yang penting dalam memastikan kehendak pelanggan dapat direalisasikan melalui penghasilan produk yang berkualiti.

Sehubungan dengan itu, JKR telah menambahbaik proses kerja dengan membangunkan Dokumen Pelan Pemeriksaan dan Pengujian yang seragam untuk dijadikan sumber rujukan utama kepada staf JKR. Bahagian Pengurusan Kualiti di Cawangan Pengurusan Korporat bertindak selaku Urus Setia telah mengatur beberapa mesyuarat penyelarasan dalam proses menghasilkan dokumen ini. Sebagai permulaan, dokumen ini dijilidkan dengan judul ***INSPECTION AND TESTING PLAN (ITP) – VERSI 1***. Dokumen ini perlu ditambahbaik dari semasa ke semasa dengan versi seterusnya bagi melengkapkan lagi ITP yang terlibat dengan projek-projek JKR.

Tujuan utama penghasilan Dokumen ITP – VERSI 1 ini adalah untuk memantapkan lagi proses kerja selaras dengan kehendak Seksyen 7.1 Manual Pengurusan Sistem Bersepadu (MPSB) : Perancangan Bagi Penzahiran Produk iaitu “Keperluan verifikasi, validasi, pemantauan, pemeriksaan serta pengujian ke atas proses/aktiviti tertentu dalam penzahiran produk serta ciri-ciri produk yang diterima”. Dokumen ini juga merupakan satu garis panduan bagi membantu staf JKR untuk mendapatkan ITP yang berkenaan dan berkaitan kerja tertentu daripada pihak kontraktor dan juga untuk dijadikan rujukan kepada staf JKR semasa kerja-kerja pengawasan projek. Dokumen ITP Versi 1 ini mengandungi Pelan Pemeriksaan dan Pengujian terhadap empat (4) bidang iaitu Jalan, Arkitek, Elektrik dan Mekanikal.

Selaras dengan Objektif JKR “Menyerahkan projek yang menepati kualiti, masa dan kos yang telah ditetapkan”, diharap dokumen ini dapat menyumbang dan membantu staf JKR dalam mencapai objektif penyerahan projek yang menepati kualiti.

Disediakan oleh:
Urus Setia Sistem Pengurusan Bersepadu (SPB)
Bahagian Pengurusan Kualiti, Cawangan Pengurusan Korporat JKR Malaysia

PENGHARGAAN

Setinggi-tinggi penghargaan dan terima kasih kepada semua yang terlibat seperti berikut:

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v. En. Jaffar bin Mhd Yunus
vi. En. Mohd Khairul bin Asri

JALAN

BIL	***TRADE***
1	*EARTHWORKS*
2	*FLEXIBLE PAVEMENT*
3	*ROAD FURNITURE* - *CORRUGATED SHEET STEEL BEAM HIGHWAY GUARDRAIL* - *CONCRETE KERB* - *WIRE ROPE SAFETY FENCE* - *ROAD MARKING* - *TRAFFIC SIGNS*
4	*PILLING WORKS – DRIVEN PILE*
5	*REINFORCEMENT SOIL WALL*
6	*PRE STRESS WORK*

TRADE : EARTHWORKS

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Determine suitablility of materials on site	Atterberg Limit Test :- Liquid Limit, LL Plastic Limit, PL Plasticity Index, PI Linear Shrinkage, LS Soil Chemical Test :- pH Value Weight loss Laboratory Compaction :- Soaked CBR Test	JKR/SPJ/1988 - Cl 2.2.1.d.ii Not exceeding 80% Not exceeding 55% Not less than 3 Not more than 2.5% on ignition JKR/SPJ/1988 - Cl 2.2.4.4.b Value of CBR as shown in construction drawing	ASTM D 4318 BS 1377 : Part 4 : 1990 (4.5 kg ram method)	1. Once per 100 metre run cut or borrow or distinctly contrast material 2. One test every 1500 cu metre fill material placed Initial stage
2	Construction of earth Embankment	Trial Compaction Field Density Test	JKR/SPJ/1988 - Cl 2.2.4.4.b Minimum area of 8m x 15m - To determine number of rolling passes in relation to the loose depth to achieve desired compaction JKR/SPJ/1988 - Cl 2.2.4.4.b Not less than 90% Maximum Dry Density Guideline Testing and Inspection Road	 BS 1377 : Part 9 : 1990 (Sand Replacement method)	Initial stage and change of sources Minimum one test per 500 sq metre of each layer compacted, with maximum compacted fill shall be limited to 300 mm

TRADE : EARTHWORKS

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
3	Preparation of Road Formation level	In-situ Density Test (Top 300 mm)	JKR/SPJ/1988 - Cl 2.2.7 CBR Not less than 5% when compacted to 95% maximum dry density	BS 1377 : Part 9 : 1990	Minimum one test per 500 sq metre of each layer compacted Minimum one test per 300 sq metre of each layer compacted
4	Preparation of Subgrade Surface Finishes	Shape, Super elevation, Level, Grade	JKR/SPJ/1988 - Cl 2.2.7		

TRADE : FLEXIBLE PAVEMENT

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Approval of Sub Base Material	Material Suitability : Gradation Limits	JKR/SPJ/2008-S4 - Cl 4.2.2.2 Table 4.2.2	BS1377 : Part 2 : 1990	1. Initial stage 2. One test per 750 cu metre stockpile or laid
		Laboratory Compaction : Soaked CBR Test	JKR/SPJ/2008-S4 - Cl 4.2.2.2.i	BS1377 : Part 4 : 1990 (4.5 kg rammer method)	Initial Stage
		Mechanical Properties : Plasticity Index, Pi	JKR/SPJ/2008-S4 - Cl 4.2.2.2.ii Not more 12	BS1377 : Part 2 : 1990	1. Initial Stage 2. One test per 750 cu metre stock pile or laid
		10% Fines Value	Not less than 30 kN	MS 30 : Part 9 : 1995	
		Passing of No. 4 (4.75 mm) sieve	Not less than 45%	ASTM D2419	
2	Sub Base Construction	Thickness	JKR/SPJ/2008-S4 - Cl 4.2.2.3 & Table 4.5.1	Dipping method	Over any 100 metre length
		In Situ Compaction Test	JKR/SPJ/2008-S4 - Cl 4.2.2.3 Not less than 95% max dry density	BS1377 : Compaction Test	One test per 500 sq metre of each layer laid
		Surface Finishes - Shape, Super elevation, Level, Grade	JKR/SPJ/2008-S4 - Cl 4.2.2.3 within tolerance as Table 4.5.1	Relevant construction drawings	

TRADE : FLEXIBLE PAVEMENT

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
3	Approval of Roadbase Material	Physical & Mechanical Properties:-	JKR/SPJ/2008-S4 - Cl 4.2.3.2		1. Initial stage 2. One (1) test per 750 cu.m supplied
		Plasticity Index	Not more than 6	BS 1377 : Part 2 : 1990	
		Agreggate Crushing Value	Not more than 25%	MS 30 : Part 8 : 1995	
		Flakiness Index	Not more than 25%	MS 30 : Part 5 : 1995	
		Loss of weight in magnesium sulphate soundness tests	Not more than 18%	AASHTO Test Method T 104	
		Soaked CBR Test	Not less than 80% when compacted to 95% max dry density	BS 1377 : Part 4 : 1990 (4.5 kg rammer method)	
		Passing of the No. 4 (4.75mm) sieve	Not less than 45%	ASTM D 2419	
		Sieve Analysis	Table 4.2.3	BS 1377 : Part 2 : 1990	
4	Roadbase Construction	Thickness	JKR/SPJ/2008-S4 - Cl 4.2.3.3 within tolerance as Table 4.5.1	Dipping	Average thickness over any 100 metre length not less than the required thickness
		In-Situ Compaction Test	JKR/SPJ/2008-S4 - Cl 4.2.2.3 Not less than 95% max dry density	BS1377 : Compaction Test	One test per 500 sq metre of each layer laid
		Surface Finishes - Shape, Super elevation, Level, Grade	JKR/SPJ/2008-S4 - Cl 4.2.3.3 within tolerance as Table 4.5.1	Relevant Construction drawings	

TRADE : FLEXIBLE PAVEMENT

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
5	Approval of Prime Coat Material	Material Suitability : Cutback Emulsion	JKR/SPJ/2008-S4 - Cl 4.3.1.2 Table 4.3.1 Table 4.3.2	 MS 159 MS 161	 1. Initial Stage 2. Each delivery
	Prime Coat Construction	Spray Test : Tray Test Spraying Temperature Curing & Opening to Traffic	JKR/SPJ/2008-S4 - Cl 4.3.1.4c Between 0.5 to 1.0 litres per sq metre Between 25°C–45°C JKR/SPJ/2008-S4 - Cl 4.3.1.4d Left undisturbed for at least 24 hours after application.		One test per16,000 sq.m covered Daily Operation covered
6	Tack Coat Material	Material Suitability Emulsion	JKR/SPJ/2008-S4 - Cl 4.3.1.2 Table 4.3.2	MS161	InitialStage
	Tack Coat Construction	Spray Test : Tray Test Spraying Temperature	JKR/SPJ/2008-S4 - Cl 4.3.1.4c Between 0.25 to 0.55 litres per sq metre Between 25°C–45°C		One test per16,000 sq.m covered Daily Operation covered

TRADE : FLEXIBLE PAVEMENT

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
7	Approval of Binder Course Material (Asphaltic Concrete)	Aggregates Grading	JKR/SPJ/2008-S4 - Cl 4.3.3.2 Table 4.3.3	BS1377 : Washing and Sieving Method	i. Initial stage or any change of aggregates source ii. One (1) test per 1,000 cu.m or at least one (1) test for each plant operation session.
		Coarse Aggregate Properties:- Los Angeles Abrasion Value Magnesium sulphate soundness test Flakiness Index Water Absorption	JKR/SPJ/2008-S4 - Cl 4.3.3.2a Not more than 25% Not more than 18% Not more than 25% Not more than 2%	 ASTM C 131: 1996 AASHTO Test Method T 104 MS 30 : Part 5 : 1995 MS 30	 i. Initial stage ii. One (1) test per 200 tons produced or each plant operation
		Fine Aggregates:- Passing of the No. 4 (4.75mm) sieve Fine aggregate angularity Methylene Blue value magnesium sulphate soundness test Water Absorption	JKR/SPJ/2008-S4 - Cl 4.3.3.2 Not less than 45% Not less than 45% Not more than 10mg/g Not more than 18% Not more than 2%	 ASTM D 2419 ASTM C 1252 Ohio Department of Transportation Standard Test Method AASHTO Test Method T 104 MS 30	

TRADE : FLEXIBLE PAVEMENT

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
8	Approval of Mix Design	Job Mix Formula Marshall Properties : Bulk Specific Gravity, SG Stability, S Flow, F Stiffness, S/F Air Voids in Mix, VIM Voids in aggregate filled with bitumen, VFB	JKR/SPJ/2008-S4 - Cl 4.3.3.3a Table 4.3.5 Not less than 8000N 2.0 – 4.0mm Not less than 2000N/mm 3.0 – 7.0% 65 – 75%	 ASTM D 2726 ASTM D 1559 ASTM D 1559	 i. Initial stage ii. One (1) test per 200 tonsproducedor at least one (1) test for eachplant operation session.
		Bitumen Contents Bitumen Extraction	JKR/SPJ/2008-S4 - Cl 4.3.3.3 Table 4.3.4	ASTM D 2172	i. Initial stage ii.One (1) test per 200 tonsproducedor eachplant operation
		Plant Trial	JKR/SPJ/2008-S4 - Cl 4.3.3.b Minimum of 20 tonnes		Initial Stage
		Compliance	JKR/SPJ/2008-S4 - Cl 4.3.3.c Table 4.3.6		Initial stage

TRADE : FLEXIBLE PAVEMENT

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
9	Approval of Construction Method	Longitudinal Joints	JKR/SPJ/2008-S4 - Cl 4.3.3.5h Overlap by at least 100mm	Observation	Every completed section or daily operation.
		Traverse Joints	Overlap by at least 500mm		
		Compaction In Situ Density Test	JKR/SPJ/2008-S4 - Cl 4.3.3.5i 95 – 100% Marshall density	ASTM Test Method D 1188 or ASTM Test Method D 2726	One (1) sample per 500 sq.m of mix laid, but not less than two (2) samples for the work completed in each paving session
		Thickness	JKR/SPJ/2008-S4 - Cl 4.3.3.5j i. Average thickness over any 100 metre length ≥ required thickness ii. Minimum thickness at any point ≥ required thickness minus 5mm	Measurement	
		Surface Finishes - Shape, Super elevation, Level, Grade	JKR/SPJ/2008-S4 - Cl 4.2.3.5j	Relevant Construction drawings	
		Opening to traffic	JKR/SPJ/2008-S4 - Cl 4.2.3.5k	Observation	

TRADE : FLEXIBLE PAVEMENT

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
10	Approval of Wearing Course Material (Asphaltic Concrete)	Aggregates Grading	JKR/SPJ/2008-S4 - Cl 4.3.3.2 Table 4.3.3	BS1377 : Washing and Sieving Method	i. Initial stage or any change of aggregates source ii. One (1) test per 1,000 cu.m or at least one (1) test for each plant operation session.
		Coarse Aggregate Properties	JKR/SPJ/2008-S4 - Cl 4.3.3.2a		
		Los Angeles Abrasion Value	Not more than 25%	ASTM C 131: 1996	i. Initial stage
		Magnesium sulphate soundness test	Not more than 18%	AASHTO Test Method T 104	ii. One (1) test per 200 tons produced or each plant operation
		Flakiness Index Water Absorption	Not more than 25% Not more than 2%	MS 30 : Part 5 : 1995 MS 30	
		Fine Aggregates	JKR/SPJ/2008-S4 - Cl 4.3.3.2		
		Passing of the No. 4 (4.75mm) sieve	Not less than 45%	ASTM D 2419	
		Fine aggregate angularity	Not less than 45%	ASTM C 1252	
		Methylene Blue value	Not more than 10mg/g	Ohio Department of Transportation Standard Test Method	
		magnesium sulphate soundness test	Not more than 18%	AASHTO Test Method T 104	
		Water Absorption	Not more than 2%	MS 30	

TRADE : FLEXIBLE PAVEMENT

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
11	Approval of Mix Design	Job Mix Formula Marshall Properties : Bulk Specific Gravity, SG Stability, S Flow, F Stiffness, S/F Air Voids in Mix, VIM Voids in aggregate filled with bitumen, VFB Bitumen Contents Bitumen Extraction	JKR/SPJ/2008-S4 - Cl 4.3.3.3 Table 4.3.5 Not less than 8000N 2.0 – 4.0mm Not less than 2000N/mm 3.0 – 5.0% 70 – 80% JKR/SPJ/2008-S4 - Cl 4.3.3.3 Table 4.3.4	 ASTM D 2726 ASTM D 1559 ASTM D 1559 ASTM D 2172	 i. Initial stage ii. One (1) test per 200 tonsproducedor at least one (1) test for eachplant operation session. i. Initial stage ii.One (1) test per 200 tonsproducedor eachplant operation
12	Approval of Construction Method	Longitudinal Joints Traverse Joints Compaction In Situ Density Test	JKR/SPJ/2008-S4 - Cl 4.3.3.5h Overlap by at least 100mm Overlap by at least 500mm JKR/SPJ/2008-S4 - Cl 4.3.3.5i 95 – 100% Marshall density	Observation ASTM Test Method D 1188 or ASTM Test Method D 2726	Every completed section or daily operation. One (1) sample per 500 sq.m of mix laid, but not less than two (2) samples for the work completed in each paving session

TRADE : FLEXIBLE PAVEMENT

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
		Thickness	JKR/SPJ/2008-S4 - Cl 4.3.3.5j i. Average thickness over any 100 metre length ≥ required thickness ii. Minimum thickness at any point ≥ required thickness minus 5mm	Measurement	
		Surface Finishes - Shape, Super elevation, Level, Grade	JKR/SPJ/2008-S4 - Cl 4.3.3.5j	Relevant Construction drawings	
		Opening to traffic	JKR/SPJ/2008-S4 - Cl 4.3.3.5k	Observation	
13	Determination of Surface Regularity	International Roughness Index (IRI)	JKR/SPJ/2008-S4 - Cl 4.5.3.2 Less than 2m/km for each 100m	ARRB Walking Profiler as outlined in AUSTROAD PAT 01:2001	Before open to traffic

TRADE : ROAD FURNITURE (CORRUGATED SHEET STEEL BEAM HIGHWAY GUARDRAIL)

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Approval of Guardrail Material	Beam Element	JKR/SPJ/1988-S6-Cl 6.1.2.1, effective length 3810mm (12 feet 6 inches)	AASHTO Specification M180 for Class A Type II(galvanised)	1 sample every 200
		Steel Posts	JKR/SPJ/1988-S6-Cl-6.1.2.2(a) and drawing Block Out(Packer) shall be channel section futher test on the material supplied (if needed)	B.S. 449,Part 1 Grade 43	1 sample every 200
		Timber Posts	JKR/SPJ/1988-S6-Cl-6.1.2.2(b)	Malaysian Timber Industry Board	1 sample every 200
			Block Out(Packer) - treated timber >16kg/cu.m preservative	M.S 733	
		Medium harwood	futher test on the material supplied(if needed) M.S 733		
		Heavy Hardwood		approval of S.O	
2.	Installation of Guardrail	Setting Post (Timber/steel)	JKR/SPJ/1988-S6-Cl-6.1.3.1	relevant construction drawing	Every completion section
		Placing Beams	Post Holes backfilled- concrete grade 20/20 JKR/SPJ/1988-S6-Cl-6.1.3.2	relevant construction drawing	Every completion section
		Anchorages	JKR/SPJ/1988-S6-Cl-6.1.3.3	relevant construction drawing	Every completion section

TRADE : ROAD FURNITURE (CORRUGATED SHEET STEEL BEAM HIGHWAY GUARDRAIL)

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
3.	Determination of Marking and Storage	Marking Storage	JKR/SPJ/1988-S6-Cl-6.1.4.1 JKR logo on each beam element JKR/SPJ/1988-S6-Cl-6.1.4.2 1) stored under a cover 2) > 300mm space between lowest element and ground surface	AASHTO Specification M180 Observation	Every completion section After each delivery

TRADE : ROAD FURNITURE (CONCRETE KERB)

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Approval of Material	Concrete Kerb	Refer to JKR/SPJ/1988-S6 - Cl 6.4.2 Grade 25/20 concrete	Relevant Construction Drawing	Initial Stage
		Bedding	Grade 10/20 concrete		
2.	Installation of Kerb	Excavation	Refer to 'JKR/SPJ/1988-S6 - Cl 6.4.3.1 - Required depth and bedding thickness as shown on drawing -Suitable material refer JKR/SPJ/1988 : Section 2	Relevant Construction drawing	Every completion section or daily operation
		Cast In Situ Kerb	Refer to 'JKR/SPJ/1988-S6 - Cl 6.4.3.2 -Expension Joint performed joint filler 10mm thickness refer JKR/SPJ/1988 : Section 26 -Concreting refer JKR/SPJ/1988 : Section 9 -Formed removed after 24 hours -Minor defect repared with mortar 1:2 -Curing for a period of 7 days	Relevant Construction Drawing - -	Every completion section or daily operation

TRADE : ROAD FURNITURE (CONCRETE KERB)

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
		Precast Concrete Kerb	JKR/SPJ/1988 : Section 6 - Cl 6.4.3.3 - Steel mould as shown on drawing - Joints kerb filled with mortar 1:2 - Expansion joints shall be 20mm width	Relevant Construction Drawing	Initial Stage & Every Completion Section or Daily Operation
		Slipforming for Concrete Kerb	Refer to JKR/SPJ/1988 : S6 - Cl 6.4.3.4	Relevant Construction Drawing '-Approved automatic kerbing machine	Initial Stage & Every Complition Section or Daily Operation
		Backfilling	Refer to JKR/SPJ/1988 : S6 - Cl 6.4.3.5 -Tamped layer not more than 150mm -Finished level within ± 10mm	Relevant Construction Drawing	Every completion section or daily operation

TRADE : ROAD FURNITURE (WIRE ROPE SAFETY FENCE)

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1	Approval of Wire Rope Safety Fence Component	Galvanised mild steel posts:	REAM -GL 9/2006 -S6-Cl 6.3		
			a)OIV (Occupant Impact Velocity)-12m/s (43.2 kph) max	NCHRP 350 Test Level 3 (TL-3)	Initial Stage
			b)ORA (Occupant Ridedown Accelaration) 20g max Height of post : 690mm to 710mm		
			Shape of post refer to REAM -GL 9/2006 -S6-Cl 6.3(iii) Double Curve - form from 6mm thick mild steel		Initial Stage
		Interwoven wire ropes (Gavanised Pre-tensioned steel)	Refer to REAM -GL 9/2006 -S6-Cl 6.3(iv)	NCHRP 350 Test Level 3 (TL-3)	
			19mm diagram 3x 7 contruction breaking load: > 17.7 tonnes unfitted > 16.7 tonnes fitted		Initial stage
			Minimun modulus of elasticity: 8300kg/mm2 on the area of 283mm2 after pre-stressing		Initial stage
		Anchors	Detail end anchor refer to Appendix 6A	NCHRP 350 Test Level 3 (TL-3)	Intial Stage
2	Installation	Wire Rope	Refer to REAM - GL9/2006 : Cl 6.3(i) upper ropes 600mm±10mm from ground lower interwoven ropes 500mm±10mm from ground	Measurement	Every complition section or daily
		Post	Refer to REAM - GL9/2006 : Cl 6.3 (ii) Embedded 400mm into concrete foundation of 950mm Post spacing 2.4 m Minimum post spacing 1m	Measurement	Initial stage
		Anchors	Refer to REAM -GL 9/2006 -S6-Cl 6.3 1) length of wire rope between anchor < 627mm 2) Detail end anchor refer to Appendix 6A	NCHRP 350 Test Level 3 (TL-3)	Initial stage Intial Stage

TRADE : ROAD FURNITURE (ROAD MARKING)

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Approval of Road Marking Material		JKR/SPJ/1988-S6 - Cl 6.3.2 Standard Material	B.S 3262 Part 1 ,B.S 381C No. 356 (Golden Yellow)	-
		Thermoplastic Material : Thermoplastic	Supplied in block form (broken into pieces, each weighing not more than 4kg) or powder. Hydrocarbon resins shall be used within 6 hours Wood and gum resins shall be used within 4 hours		
		Thermoplastic Material : Glass Bead	To be incorporated in marking materials to road surface application.	CLASS A Glass beads, Table 1 of B.S 6088 (Table 6.1)	
			Additional surface reflectorisation.	CLASS B Glass beads, Table 2 of B.S 6088 (Table 6.2)	
		Road Marking Paint	Standard Material	M.S 164, B.S 381C No. 356 (Golden Yellow)	
			Stirred before application to keep the pigments in uniform suspension, Tinners or other additives not be permitted		
2.	Site Preparation	Clean and dry surface	JKR/SPJ/1988-S6 - Cl 6.3.3 Not be laid over loose detritus, mud, or extraneous matter or over old material or paint marking incompatible with the paint	-	-
		Tack coat Primer or undercoat	Refer manufacturer's instructions to avoid bleeding and discoloration , to ensure proper adhesion.		

TRADE : ROAD FURNITURE (ROAD MARKING)

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
3.	Laying Roadmarking	Center, lane & edge lines Other marking	JKR/SPJ/1988-S6 - Cl 6.3.5, 6.3.8, 6.3.9	Mechanical means Brush, spray, screed, hand-propelled or self propelled machines	-
		Thickness		BS 3262, Part 3 Appendices B and C.	
		Thickness of Thermoplastic Material : Synthetic Hydrocarbon Resin Binder	Screed lines ; 2 mm < x < 5 mm Sprayed lines other than yellow lines ; <1.5 mm Sprayed yellow edge lines (for 'No Parking', 'No Waiting' and etc.) ; < 0.8 mm		
		Thickness of Thermoplastic Material : Gum or wood resin binder	Screed lines ; 3 mm < x < 5 mm Sprayed lines other than yellow lines ; < 2.0 mm Sprayed yellow edge lines (for 'No Parking', 'No Waiting' and etc.) ; 2.0 mm < x < 3.0 mm		
		Thickness of Road Marking Paint	Shall be laied to give a wet film thickness ; 315 micron < x < 400 micron		
		Width Tolerance	Within the range of + 10% and - 0 %		
4.	Protection of Marking	Marking	JKR/SPJ/1988-S6 - Cl 6.3.6 Must be dried and protected from traffic.		
5.	Defective Material / Workmanship	Incorrect dimension and wrong location	JKR/SPJ/1988-S6 - Cl 6.3.10 Must be removed by approved chemical or mechanical means.		
6.	Clearing Up	Clean up all spatters, splashes and smirches of marking materials.	Satisfaction of the S.O		

TRADE : ROAD FURNITURE (TRAFFIC SIGNS)

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Permanent Traffic Signs - General Requirements	Luminance	JKR/SPJ/1988-S6 - Cl 6.2.5.1 Category 1 luminance	B.S. 873	Initial Stage
2.	Permanent Traffic Signs - Material				
	(i)Posts	Tubular hollow section steel	JKR/SPJ/1988-S6 - Cl 6.2.5.3 - Not less than 50mm outside diameter	B.S.1387 and B.S. 873	Initial Stage
	(ii)Sign Plates		JKR/SPJ/1988-S6 - Cl 6.2.5.4	Drawings and B.S. 873	Initial Stage
		Thickness	- Made of 10 S.W.G sheets of alluminium alloy HS 30-WP with min. thickness 3mm		
		Size	- Not exceeding 1.2m height & 2.4m width shall made from single sheet	B.S 1470	
	(iii)Sign Faces	(i) Plastic Sheeting	JKR/SPJ/1988-S6 - Cl 6.2.5.5	BS 873 / MS 1216	
		Faces	Accordance with the manufacturer's instructions Up to 1 m in size and no joint.	BS 873 / MS 1216	Initial Stage
		Joint	Lapping less than 6mm	MS 1216	Construction Stage
		Colour uniformity	Refer to addendum no.2 S 2.1.7	MS 1216	Initial Stage
			Refer to addendum no.2 S 2.1.13	MS 1216	After installation
	(iv)Backing Frames		JKR/SPJ/1988-S6 - Cl 6.2.5.6		
		Material	made from aluminium alloy HE9-TE	B.S 1474	Initial Stage
		Size	> 600mm ,<1000mm height/width stiffened by angles > 1000 mm height/width use 40mm X 40mmX3mm angles	B.S 1474	Initial Stage
			Built in section 8 mm diameter bolt at not more than 200 mm centres		

TRADE : ROAD FURNITURE (TRAFFIC SIGNS)

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
3.	Fluoresent Orange	(i) Photometric-Coefficient or Retroreflection RA Aluminium Test Panels	ASTM E 810 table 1.		Initial Stage
		ii)Daytime colour ASTM 1991	ASTM E 991, ASTM E 308 (for 2° observer) & Table 2		Initial Stage
		iii) Nigthtime Color	ASTM E 811(calculated the u') ASTM E 308 (calculated the v') & Table 3		Initial Stage
		iv) Resistance to Accelerated Weathering	ASTM G 26 Type B Method A		Initial Stage
		v) Impact Resistance	Refer Sheeting manufacturers recommendations Test Panel of alloy 601-T6 , 0.040" (o.10cm) by 3" (7.6cm) by 5"(12.7cm) and conditioned for 24 hour Shall show no cracking outside the impact area when the face of the panel is subject to an impact of 100 inch-pounds (11.3 Nm) using a weigth with a 5/8 in . (15.8 mm) diameter rounded tip dropped from a height necessary to generate an impact of 100 inch-pounds, at test temperatures of both 32° F (O° C and 72° F (22 ° C)		Initial Stage
		vi) Resistance to Heat	ASTM G 26 Type B Method A . exposed to 170 + 5° F (77 + 3°) for 24 hours minimum 70% of the original coefficient.	Air circulating oven	Initial Stage
		vii) Field Performance	Refer Sheeting manufacturers recommendations Coefficient of retroreflection is less than 100 when measured at 0.2° observation and -4° entrance at 90° rotation	Moving vehicle under normal day and night driving conditions	After installation

TRADE : ROAD FURNITURE (TRAFFIC SIGNS)

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
4.	Permanent Traffic Signs - Construction and Assembly	Traffic signs Spacing of rivets	JKR/SPJ/1988-S6 - Cl 6.2.5.7 or as shown on drawing JKR/SPJ/1988-S6 - Cl 6.2.5.7 -Not exceed 150mm around the outside edge of any sheet -Not exceed 300mm on cross braces	Construction Drawings and B.S. 873	Every completion section
5.	Permanent Traffic Signs - Location and Erection	Posts	JKR/SPJ/1988-S6 - Cl 6.2.5.8 -Distance from the centre of the post to the edge of the sign plate 300mm diameter -Erected plumb to check verticality - Grade of 20/20 concrete - Within 450mm of the ground surface		Every completion section
6.	Permanent Traffic Signs - Covering of permanent traffic signs	Covering Thickness Cover Plates	JKR/SPJ/1988-S6 - Cl 6.2.5.9 - 1.5mm (16 S.W.G) thickness JKR/SPJ/1988-S6 - Cl 6.2.5.9 - Stainless steel bolts, washers & nuts use 5mm dia bolts not more than 600mm apart. - Non-ferrous rivet use 12mm dia. bolts not more than 600mm apart - 5mm thick plastic distance pieces between the sign face & cover plate.	Observation	Every completion section
7.	Temporary Traffic Signs	Location and erection Covering	JKR/SPJ/1988-S6 - Cl 6.2.6 - Comply with JKR/SPJ/1988-S6 - Cl 6.2.5.8 JKR/SPJ/1988-S6 - Cl 6.2.6 - Comply with JKR/SPJ/1988-S6 - Cl 6.2.5.9	ARAHAN TEKNIK (JALAN) 2C/85	Every completion section

TRADE : ROAD FURNITURE (TRAFFIC SIGNS)

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
8.	Traffic Signs On Gantries	Faces of sign plates	JKR/SPJ/1988-S6 - Cl 6.2.7	B.S. 873	Initial / Construction Stage
		Steel backing frames,fitting and purlins	JKR/SPJ/1988-S6 - Cl 6.2.7	B.S. 873	
		Steel posts and post housing	JKR/SPJ/1988-S6 - Cl 6.2.7	B.S. 873	
9.	Temporary Signs for the work zone	(i) Photometric-Coefficient or Retroreflection RA	ASTM E 810 Test panel complied with Addendum No.3 Table 1		Initial Stage
		ii)Daytime color	ASTM E 991, ASTM E 308 (for 2° observer) & Test panel complied with Addendum No.3 Table II		Initial Stage
		iii) Nigthtime Color	ASTM E 811(calculated the u') ASTM E 308 (calculated the v') Test panel complied with Addendum No.3 Table III		Initial Stage
		iv) Resistance to Accelerated Weathering	ASTM G 26 Type B Method A		Initial Stage
		v) Impact Resistance	Refer Sheeting manufacturers recommendations Addendum No.3-3.1.1 (v) Test Panel of alloy 601-T6 , 0.040" (0.10cm) by 3" (7.6cm) by 5"(12.7cm) and conditioned for 24 hour		Initial Stage

TRADE : ROAD FURNITURE (TRAFFIC SIGNS)

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
		vi) Resistance to Heat	Refer Sheeting manufacturers recommendations Addendum No.3-3.1.1 (vi)	Air circulating oven	Initial Stage
		vii) Field Performance	. Refer Sheeting manufacturers recommendations Addendum No.3-3.1.1 (vi)	Moving vehicle under normal day and night driving conditions	After installation
10.	Permanent Traffic Signs - Foundations	Type and size of foundations	JKR/SPJ/1988-S6 - Cl 6.2.5.2 Single Post - Installed centrally in 300mm diameter or as shown on drawing - Grade of 20/20 concrete - Depth Within 450mm of the ground surface - Min. three (3) days after placing concrete - Backfilling at least 48 hours after placing the concrete - Pockets plan dimensions shall be 100mm larger	Relevant Construction drawings JKR/SPJ/1988-Section 9 Observation	Initial / Construction Stage

TRADE : PILING WORKS (DRIVEN PILE)

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Approval of materials delivered	Visual inspection and manufacturer records	JKR/SPJ/2010-S10 Cl 10.3	MS 1314	Every no
2	Preliminary pile	Driving records Load test	JKR/SPJ/2010-S10 & construction drawings	MS 1314	Initial Stage
3	Handling & storage	Concrete strength	JKR/SPJ/2010-S10 Cl 10.3 -achieve concrete strength of 30 N/mm2 (minimum)	MS 1314	Every batch
4	Installation	Position & alignment Driving Pile joint	JKR/SPJ/2010-S10 Cl 10.3.4.1 & construction drawings JKR/SPJ/2010-S10 Cl 10.3.4.2 JKR/SPJ/2010-S10 Cl 10.3.4.2		Every no Every no Every no
5	Pile test	Load test Calibration of testing equipments	JKR/SPJ/2010-S10 Cl 10.9.6.1 As specified in contract document and drawings		As required

TRADE : REINFORCED SOIL WALL

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1	Approval Materials:				
	i) Facing materials	Receiving of materials /	Specification for Reinforced Soil Structures and Slopes	BS 8006	Every panels/no
	ii) Reinforcing element and connections iii) Hot-dip galvanising iv) Joint filler and sealant	Visual inspection and manufacturer records			
	V) Fill material				
2	Construction	Foundation soil / bearing capacity	Specification for Reinforced Soil Structures and Slopes & Construction drawings	BS 8006	Initial stage
		Erection of elemental facing / verticality and horizontally	Specification for Reinforced Soil Structures and Slopes & Construction drawings	BS 8006	Every layer
		Fill materials	Specification for Reinforced Soil Structures and Slopes, Construction drawings & Manufacturer recommendation	BS 8006	Every layer
		Placement of reinforcing elements - tensile test / pull out test	Specification for Reinforced Soil Structures and Slopes, Construction drawings & Manufacturer recommendation	BS 8006	Every layer
		Connections	Specification for Reinforced Soil Structures and Slopes, Construction drawings & Manufacturer recommendation	BS 8006	Every layer

TRADE : PRE STRESSED WORK

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Approval of materials delivered	Visual inspection and manufacturer records	JKR/SPJ/1988 - Cl 11.4		Every no
2	Approval of equipments delivered	Calibration & manufacturer records	JKR/SPJ/1988 - Cl 11.5		Every no
		Handling & storage of equipments	JKR/SPJ/1988 - Cl 11.5		Every no
3	Installation of: i) Cable ii) Sheath iii) Tendon iv) Anchorage	Position & alignment	JKR/SPJ/1988 - Cl 11.6 & construction drawings		Every no
4	Stressing Work	Stressing/Jacking force Elongation	JKR/SPJ/1988 - Cl 11.6.9 & construction drawings		Every no

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BIL	***TRADE***
1	*CEILING WORKS*
2	*ROOF*
3	*DOOR, WINDOW AND IRONMONERY*
4	*PLASTERING WORKS*
5	*PAINTING WORKS*
6	*TILING WORKS (FLOOR/WALL TILES)*
7	*SANITARY WARE & FITTINGS*
8	*INTERIOR, SIGNAGE AND GRAPHIC*
9	*SOFT LANDSCAPE WORKS*
10	*HARD LANDSCAPE WORKS*

TRADE : CEILING WORKS

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Receive and check shop drawings from supplier. Ceiling type : - plaster ceiling - suspended ceiling Fixed ceiling	cata log / drawings / sample	Check as per contract document and take into account factors such as: <u>Plaster & suspended ceiling</u> - Check the thickness, stiffness, weight and ceiling board pattern. - Other components such as -'main T & cross T', `wall angle', `soffit cleat', `hanging C channel' and `cornice' <u>Fixed ceiling</u> - Check the thickness, stiffness, weight and ceiling board pattern. - Other component such as- `cornice' Other requirement– SIRIM Certificate and warranty, fire rated and sound insulation (acoustic ceiling).	Contract Dokumen / SPK Tools / Shop Dwg.	Ealier / months before the ceiling installation works or after roof structure works done.
2.	Receive and check sample for approval	Sample material	Check as per contract document and shop drawings.	visual	Ealier construction works or after superstructure works finish
3.	Ceiling mock-up at site.	Set Mock-up	Check the mock-up as per construction drawings & shop drawings together with the sample that have been approved and verified.	Mock up / sample Material	3 months before ceiling work.
4.	Check material that is sent to site.	Random check by batch / lab test.	Check material whether is the same as per approved sample. Store in a close area that free from dirt and moisture.	Measuring Tape / laser measure	All Stages.

TRADE : CEILING WORKS

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
5.	Ceiling Installation	Random check installation / similar to mock-up.	Check the ceiling installation as per construction drawings and for each space: - Installation technique as per approved mock-up. - Design and pattern of the ceiling shall be aligned with the roof fall. - Floor to ceiling height must be enough to cater the ceiling space for mechanical and electrical wirings. 'ceiling manhole' for fix ceiling as required.	visual	All Stages.
6.	After the installation	Check room by room / Audit before handing over	Final inspection for: - electrical & mechanical fixtures such as air-cond diffusers, lightings, ceiling fans and fire requirements are not directly fix to the ceiling boards. Finishes of the ceilings must be made good after the work is completed.	visual	All Stages.

TRADE : ROOF

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Sample	cata log / shop drawings / sample	□ Submission of shop drawing and sample for approval prior to mock-up fabrication on site 2 months before commencement on site □ As specified in contract document	shop drawing / certified material.	Once (before delivery)
2	Material Delivery	check material at random	□ Ensure only approved items are delivered at site as specified in the contract document. □ Items should be kept unexposed for long before installation process commences. □ Reject all damage items and items that does not confirm to specifications. □ Handling & storage of roofing sheets / tiles / related items shall comply to the approved Method Statement	visual	delivery stages
3	Installation	Approved installer and Certified by roof Supplier	□ Finishing - No stain marks shall be visible - Finishing shall be in good paint works □ Falls - Roof fall shall look smooth with no tool marks - Even and level especially no potential in stripping - Falls in right direction □ Physical Damage - No visible damage / defects eg. cracks, chip, etc - Joint / Sealant / Alignment shall be consistent, neat and aligned - Inspect exterior for continuity of roof covering, deterioration of fascias, gutters and soffits; and performance of flashings - Inspect interior finishes (ceilings and walls) for signs of water penetration, and structural distress □ chockage / Ponding - No sign of chockage or ponding □ Construction - No sign of leaking - Proper dressing for protrusion if any - Neat and secured installation of fixtures	visual	ALL

TRADE : ROOF

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
4.	Flat / Membrane Roof / water proofing installation.	ponding test as per audit check list.	□ Ponding shall be not more than 3mm high □ No blisters shall be on the roof (either broken or not), which may allow water to enter the roof □ Look for depressions around vent pipes where water can collect and begin leaking through cracks in the surface. □ No gap / separations of flashing by the parapet that rings the flat roof □ Surface to level to avoid tripping □ Proper dressing for any protrusion □ Openings to be sealed to prevent pest invasion □ Clean and no stain marks	spirit level	ALL
5.	Sloped Roof Installation	audit check list	□ All purlins are in the right level and none is out of line (structure tolerance shall meet roofing manufacturer recommendation) □ Final coating of paint has been applied to roof structural members □ Layers of insulation shall as specified in contract document, approved construction/shop drawings or other relevant documents. □ Thickness (BST) of metal roofing sheet shall as specified in contract document, approved construction/shop drawings or other relevant documents. □ Roof tiles in alignment □ Openings to be sealed to prevent pest invasion □ Consistent colour tone □ Proper dressing for any protrusion	visual	ALL

TRADE : ROOF

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
6	Roof Features - Fascia - Soffit - Flashing - Gutters / Drains / RWDP - Skylights - Vents - Others	Audit check list.	□ No ponding and chockage □ No cracks, chips and any other visible damage □ RWDP inlet shall be lower than the surrounding gutter invert level □ Gutter and RWDP inlet to be covered to prevent chockage where practical □ Clean and no cement stains □ No physical damage of all roof flashing and the flashing around vent stacks, roof edges, dormers, and skylights.	visual	ALL

TRADE : DOOR, WINDOW AND IRONMONGERY

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Submit sample / catalogue / shop drawing / method statement for approval and prepared mock up at site.	catalog / shop drawing / sirim cert. / sample material	• Submit within 'x' month from commencement of building works • As specified in contracts document • To ensure only specified item submitted for approval	shop drawing / certified material.	once before delivery
2.	Material delivered to site	lab material test	• As specified in contract document and as per approved proposal		ALL
3.	Contractor to measure opening provided at site for windows and doors.	random check	• To check prior to fabrication of any deviation to the specified size and report to the SO	measuring tape/laser measure.	ALL
4.	Fix Sub frame in position	Random Check.	• As specified in contract document and method statement. • To fix sub frame before plastering and check the alignment with level before fixing in position.	Spirit level	ALL
5.	Fix frame in position	Random Check.	• Check defect on the frame if any, rectify or reject.	visual	ALL
6.	Install door window panel / Install Ironmongery	Random Check.	• As specified in contract document and method statement.	visual	ALL

TRADE : PLASTERING WORKS

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Preparation for Plastering	check mock-up preparation / Random check	• at least 3 days after the completion of brickwall as specified in the contract drawing.	visual / laser equiment	once
2.	Clean Surface	random check	The surface shall be cleaned and wetted before plastering. As Specified in the contract document	visual	ALL
3.	Plaster Mix	preparation / external test	1 part of cement to 6 parts of sand by volume. As Specified in the contract document.	visual / sample	ALL
4.	Aligment	Random Check.	Set out aligments on brickwall surface before commencement of plastering works.	Measurement tools	ALL
5.	Apply the first coat	Random Check.	Averaging 10 mm thick applied to the area having greater deviation from the intended finish surface. As specified in the document.	Measurement tools	ALL

TRADE : PAINTING WORKS

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Submit sample / catalogue / colour scheme proposal	catalog / shop drawing / sirim cert. / sample material	• Submit within 'x' month from commencement of building works • As specified in contracts document • To ensure only specified or equivalent paint are submitted for approval	Colour scheme	once before delivery
2.	Material delivered to site	Random check	• As specified in contract document and as per approved proposal	visual	ALL
3.	Wall / surface preparation	Random check	• Make sure all surfaces are clear from dirt, smoothly plastered and completely dry	visual	ALL
4.	Site readiness	Random check	• Other construction works overlapped are well planned on site to avoid conflict • No other site activity to take place near painting area to disrupt painting quality	visual	ALL
5.	Apply base coat	Random check	• To make sure wall surface is free from unevenness • Make sure base coat applied is as specified in contract document	visual	ALL
6.	Applying paint	Approved applicator and Certified by Paint Supplier	• To make sure walls are coated with 2 layers of emulsion acrylic paint for internal, and weather resistance acrylic paint with anti fungus for external • Paint must be in good condition, maintenance free with good aesthetics, APEO free (alkylphpnol ethoxylate) and low VOC (volatile organic compound) with green label by SIRIM • Minimum 5 years warranty	visual / certification	ALL

TRADE : TILING WORKS (FLOOR / WALL TILES)

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Submit sample / catalogue / colour scheme proposal	catalog / shop drawing / sirim cert. / sample material	• Submit within 'x' month from commencement of building works • As specified in contracts document • To ensure only specified or equivalent paint are submitted for approval	mock-up / sample/certified material	
2.	Check quality of tiles upon delivery	Random check	• As specified in contract document and as per approved proposal, and tile installation guideline • Check on tonality, crack, chip, wasp and surface unevenness	visual	
3.	Confirm tiles dimension	Sample / Mock-up	• As specified in contract document and drawing specification • Width and length tolerance to be +/- 1%, thickness +/- 10%	measurement tools / spirit level	
4.	Wall / surface preparation	Random check	• Make sure all surfaces are clear from dirt, ready to accept tiles and completely dry	visual	
5	Floor surface preparation	Random check	• Make sure all surfaces are clear from dirt, ready to accept tiles and completely dry	visual	
6	Tiles installation	Random check and Test	• Check mortar/glue thickness as stated in tiles installation guideline • As specified in contract document	visual	
7	Site inspection	Audit check list construction	• As specified in contract document and tiles installation guideline	visual	

TRADE : SANITARY WARE & FITTINGS

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1	Submit sample / catalogue / shop drawing / method statement for approval and prepared mock up at site.	catalog / shop drawing / sirim cert. / sample material	• Submit within 'x' month from commencement of building works • As specified in contracts document • To ensure only specified item submitted for approval	shop drawing / certified material.	ONCE BEFORE DELIVERY
2	Site Readiness / Storage material	Random check	• Other construction works overlapped are well planned on site to avoid conflict • No other site activity to take place near painting area to disrupt painting quality	visual	ALL
3	Check material that is sent to site.	Random check	• To check prior to fabrication of any deviation to the specified size and report to the SO As stated in the specification	visual	ALL
4	Sanitary ware & Fittings installation	Random check	Check the sanitary installation as per construction drawings and for each space: - Installation technique as per approved mock-up.	visual	ALL
5	Sanitary after the installation	Audit check list before hand over	• As specified in contract document and method statement.	visual	ALL

TRADE : INTERIOR, SIGNAGE AND GRAPHIC

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Submit sample / catalogue / colour scheme proposal	catalog / shop drawing / sirim cert. / sample material	• Submit within '6' month before installation of works. • As specified in contracts document • To ensure only specified or equivalent materials are submitted for approval	mock-up / sample	6 months before the completion work
2.	Factory visit / Fabricate material in factory / in situ / Mock – up for Furniture and signage.	Random Check / material	• Inspection the materials used and fabricate at factory • As specified in contract document and as per approved proposal • Mock – up for Furniture, signage and others related.	visual	3 months before the completion work
3.	Site readiness	Random check	• To make sure all materials delivered in good condition/inspect the materials on site. • Make sure the site is ready / clear for major work • Measured the site area to be constructed.	visual	All Stages
4.	Material delivered to site / site preparation / confirms I.D works dimension.	Random check / Lab test	• To make sure all material approved delivered as specified and approve contract document. • Provide protection and secured storage.	lab cert / visual	All Stages

TRADE : INTERIOR, SIGNAGE AND GRAPHIC

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
5.	Site Preparation	Random check	• Make sure the site is ready / clear for major work. • Measured the site area to be constructed.	visual	All Stages
6.	Installation materials	Random check	• To make sure all materials in good condition / inspect the material on site. • Check mortar / glue / carcass thickness in ID works and related works. • As specified in contract document	visual	All Stages
7.	Site Inspection	Audit check list construction	• As specified in contract document and installations guideline.		All Stages

TRADE : SOFT LANDSCAPE WORKS

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Nursery visit	Approval of selected plant	□ Check the specifications □ Visit nursery and mark all selected plants with paint □ Only select good quality of plants	visual	Once before delivery
2.	Material Delivery	Randomly check the type, size and height of plants	□ Ensure only approved and marked plants are delivered at site as specified in the contract document □ Plants should be stored at shed or temporary covered nursery □ Plants should not be left under the sun at site more than 2 days. □ Reject all damage or unhealthy plants	visual / measurement tools	Delivery stages
3.	Planting preparation	Random check	□ Ensure all hole are excavated as per specified in the drawing and left for one week to eliminate fungus and parasites. □ Ensure soil mixture is from ratio of 3 topsoil : 1 organic compound.	visual	All
4.	Planting process	Random check	□ For palms, make sure all fronds are tied to avoid moisture loss. □ Water immediately after planting □ Ensure mulching and stakes are provided as per detail drawing provided.	visual	All
5.	Maintenance	Audit Check List	□ Ensure all plants are watered twice a day and fertilize fortnightly for first six month.	visual	All
			□ Check all dead and unhealthy plants to be replaced.	visual	All

TRADE : HARD LANDSCAPE WORKS

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Submit sample / catalogue / colour scheme proposal	catalogue/sample/color scheme/certificate	□ Check the specifications as per detail drawing. □ Inspect site to check any underground utility to be relocated □ Check soil condition suitable to cater the design load □ Prepare tools and materials to execute work	Visual	Once before delivery
2.	Material Delivery	Random check	□ Ensure only approved hardscape items are delivered at site as specified in the contract document. □ Items should be kept unexposed for long before installation process commences. □ Reject all damage items and items that does not confirm to specifications.	Visual	All
3.	Excavation/Base preparation	Random check	□ Ensure all surfaces are flexible, withstanding loads from traffic,wear & weather. □ 100mm to 300mm of soil is first removed for the area. □ Proper treatment of the underlaying soil & base as per detail drawing. □ Ensure subsoil is compacted using a vibrating plate compactor. □ Crushed rock aggregate is added & compacted thoroughly. □ Additional aggregate is added & compacted to the required level. Installation of a bed of sand & screded level.	Visual / measurement tools	All

TRADE : HARD LANDSCAPE WORKS

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
4.	Installation	Random check	Install approved hardscape paver pattern & sand swept in the joints. Joints between pavers are filled with sand. Ensure the plate compactor is used over the surface & additional sand is brushed in until all joints are completely filled Ensure a sealer is applied to the surface after cleaning.	Visual	All
5.	Maintenance	Audit Check List	Clean and treat hardscape if necessary	Maintenance checklist	All

MEKANIKAL

BIL	***TRADE***
1	*AIRCONDITIONING SYSTEM*
2	*FIRE FIGHTING SYSTEM*

TRADE : AIRCONDITIONING SYSTEM

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	**Piping**	Material Aceptance	Specification / Contract	Vernier Caliper / Visual / Delivery Order	Upon receiving material
		Installation (above ground and underground)	Malaysia Standard / British Standard / Specifcation i.e Flange, welding , screw subject to pipe size	-	Section by section
		Testing	Pressure test 1.5 working pressure for 48 hrs and pressure drop shall not below 10% from the pressure test	Dial Pressure gauge	Every section
2.	**Pump**	Material Aceptance	Specification / Contract	Delivery order/ Cataloque	Upon receiving material
		Installation	Approved JKR working drawing	-	
		Testing	Capasity test - Total head against zero flowrate	Pressure gauge/Pump performance curve	Upon completion installation
3.	**Ductwork c/w insulation**	Material Aceptance	*Specification / Contract*	Vernier Caliper / template gauge / Delivery Order	Upon receiving material
	note : Pre-fabricated duct inspection is FAT	Installation	SMACNA, Specification, approved JKR working drawing	Measuring tape,Vernier caliper,knife, torch light, thickness gauge	All various duct sizes
		Testing	Leakage test (ASHRAE), static pressure test (Specification) , condensation test (48 hrs)	Barometer	Upon completion installation

TRADE : AIRCONDITIONING SYSTEM

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
4.	**Switch Board/Wiring** **L-S1 - (Specification for Low Voltage Internal Electrical Installation)**	Material Aceptance	Specification / Contract	Delivery order / Visual	Delivery on site
		Installation	Specification (L-S1)	Visual	as per work progress
		Testing	Specification (L-S1)	Clamp, Multi meter , Test pen	Upon completion
5.	**Chiller/Compressor**	Material Aceptance	Specificaton / Contract	FAT	Upon receiving material
		Installation	Manufacturer spesification / Approved JKR Working drawing		Upon plant room completion
		Testing	MS / specification / Performance testing	Chiller Control panel, Thermometer, pressure gauge, Visual for condensation	Upon completion of system
6.	**AHU Room**	Material Aceptance	Specificaton / Contract	Visual	Delivery on site
		Installation	Specificaton / Contract / electrical and cold water requirement, Approved JKR Working Drawing	Visual, measuring tape, Vernier caliper for wall insulation thickness	50% Progress

TRADE : AIRCONDITIONING SYSTEM

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
7.	**AHU / FCU**	Material Aceptance	Specificaton / Contract	Delivery order / Visual	
		Installation	Manufacturer recommendation / Standard JKR Mechanical drawing / actual size against space provided, Approved JKR working drawing	Visual & Measuring tape	Upon 75% completion room without front wall / Before ceiling T is constructed
		Testing	MS / specification / Performance testing	Anamometer, Tachometer, ammeter/clamp meter	Upon completion installation
8.	**Cooling Tower**	Material Aceptance	Specificaton / Contract	Delivery order / Visual	Before T&C
		Installation	Manufacturer recommendation / Approved JKR working drawing / actual size against space provided	-	
		Testing	Specification / Performance testing	Tachometer, ammeter/clamp meter	Upon completion installation

TRADE : FIRE FIGHTING SYSTEM

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	**Automatic Sprinkler System**				
1.1	**Pump/jockey pump**	Material Aceptance	Specification / Contract	Visual / Delivery Order	Upon receiving material
		Installation	Manufacturer specification / Approved JKR Working drawing		
		Testing	Capacity test - Total head against zero flowrate	Dial Pressure gauge	Upon completion installation
1.2	**Electric motor**	Material Aceptance	Specification / Contract	Visual / Delivery Order	Upon receiving material
		Installation	Manufacturer specification / Standard JKR Mechanical drawing	-	
		Testing	Specification ; ampere, voltage	Clamp meter, volt meter/ multi meter	Upon completion installation and power ready
1.3	**Valves , Fittings and switches (pressure gauge, breeching inlet, sprinkler heads, isolation valves, pressure switch etc)**	Material Aceptance	Specification / Contract	Visual / Delivery Order	Upon receiving material
		Installation	Manufacturer specification / Approved working drawing	Visual	as per work progress
		Testing	Leak test for valves and fittings.	N/A (Tested once the system has completed)	Upon completion piping installation
			Functional test for switches		

TRADE : FIRE FIGHTING SYSTEM

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
2.	**Hose Reel System**	Installation	Specification (L-S1)	Visual	as per work progress
		Installation	Approved working drawing	-	when space and pipe ready
		Testing	Functional ; open and close	-	Upon installation completed
2.2.	**Pump**	Material Aceptance	Specification / Contract	Visual / Delivery Order	Upon receiving material
		Installation	Manufacturer specification / Approved working drawing		
		Testing	Capacity test - Total head against zero flowrate	Dial Pressure gauge	Upon completion installation
2.3	**Rubber Hose**	Material Aceptance	Specification / Contract	Visual / Delivery Order	Upon receiving material
		Installation	Manufacturer specification / Approved working drawing		
		Testing	Specification / Contract	Visual	Upon completion installation
2.4	**Water Tank**	Material Aceptance	Specification / Contract	Visual / Delivery Order	
		Installation	Manufacturer specification / Approved working drawing	Vernier Caliper	Upon completion installation
		Testing	Specification / Contract- Visual Leak test	-	

TRADE : FIRE FIGHTING SYSTEM

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
3.	**Wet Riser/Dry Riser System**				
3.1	**Pump**	Material Aceptance	Specification / Contract	Visual / Delivery Order	Upon receiving material
		Installation	Manufacturer specification / Approved working drawing		
		Testing	Capacity test - Total head against zero flowrate	Dial Pressure gauge	Upon completion installation
3.2	**Valves , Fittings and switches**	Material Aceptance	Specification / Contract	Visual / Delivery Order	Upon receiving material
	(pressure gauge, breeching inlet, landing valve, isolation valves, pressure switch , Alarm gong)	Installation	Manufacturer specification / Approved working drawing	Visual	
		Testing	Leak test for pipe , fittings and functional	N/A	
4.	**Fire Suppression System**	Material Aceptance	Specification / Contract	Visual / Delivery Order	Upon receiving material
	(Gas cylinder , Discharge nozzle, detector)	Installation	Manufacturer specification / Approved working drawing	Measuring tape for nozzle distance	as per work progress
		Testing	Specification / Contract- Test until intermittant alarm and fire curtain drop down	Dummy test	Once

TRADE : FIRE FIGHTING SYSTEM

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
5.	**Fire Alarm System**				
	Fire Alarm Panel , detector, alarm bell, sounder, manual call point and all accessories	Material Aceptance	Specificaton / Contract	Visual / Delivery Order	Upon receiving material
		Installation	Manufacturer specification / Approved working drawing	Visual	Upon plant room completion
		Testing	MS / specification / Performance testing	Multimeter, Test pen	
6.	**Pipeworks And Fittings**	Material Aceptance	Specificaton / Contract	Visual / Delivery Order	Upon receiving material
		Installation	Specificaton / Contract / Approved working drawing	Vernier caliper	as per work progress
		Testing	Specification- pressure test 1.5 from working pressure	Pressure gauge	Every section
7.	**Electrical Works**	Material Aceptance	Specificaton / Contract	Visual / Delivery Order	Upon receiving material
	(Control panel / switchboard, wiring)	Installation	Specification, L-S1	Visual	Upon space ready
		Testing	L-S1	Clamp meter, multi meter, Test pen	Upon completion installation

ELEKTRIK

BIL	*TRADE*
1	*LOW VOLTAGE* *-ELECTRICAL BOARDS*
2	*LOW VOLTAGE* *-WIRING SYSTEM & UNDERGROUND CABLE*
3	*LOW VOLTAGE* *-LIGHTNING PROTECTION SYSTEM*
4	*LOW VOLTAGE* *-STANTBY GENERATOR SET*
5	*EXTRA LOW VOLTAGE* *-PA SYSTEM*
6	*ICT* *-EXTERNAL INSTALLATION FOR ICT & TELEPHONE*
7	*ICT* *-EXTERNAL INSTALLATION FOR ICT: ACTIVE EQUIPMENT*
8	*MEDICAL EQUIPEMENT* *-GENERAL RADIOGRAPHY (OUTSOURCE)*
9	*MEDICAL EQUIPEMENT* *-EXAMINATION LIGHT (OUTSOURCE)*
10	*MEDICAL EQUIPEMENT* *-SURGICAL LIGHT (OUTSOURCE)*
11	*MEDICAL EQUIPEMENT* *-SURGICAL TABLE (OUTSOURCE)*

TRADE : LOW VOLTAGE : ELECTRICAL BOARDS

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	MSB / SSB / DB / AMF Board / PFC Board	1.1 Submission for material approval.	1. Shop Drawing. 2. Technical Submittal (i.e: Catalogue, Brand & Model). 3. Contract Document. 4. Specifications (L-S1, L-S2, L-S5, etc). 5. J-MAL.	N/A	Before manufacturing of the boards.
		1.2 Factory Acceptance Test (Routine Test) :			Prior of delivery to the site.
		a) Visual Inspection.	1. Approved Shop Drawing. 2. Technical Submittal (i.e: Catalogue, Brand & Model). 3. Contract Document. 4. Specifications (L-S1, L-S2, L-S5, etc). 5. J-MAL.	Measuring Devices (Caliper, Measuring Tape, etc.).	Prior of delivery to the site. Once for each board.
		b) Functional test.	1. Approved Shop Drawing. 2. Technical Submittal (i.e: Catalogue, Brand & Model). 3. Contract Document. 4. Specifications (L-S1, L-S2, L-S5, etc). 5. J-MAL.	N/A	Prior of delivery to the site. Once for each board.
		c) Pressure Test / Injection Test 2500 VAC. (*Excluded DB)	1. Approved Shop Drawing. 2. Technical Submittal (i.e: Catalogue, Brand & Model). 3. Contract Document. 4. Specifications (L-S1, L-S2, L-S5, etc). 5. J-MAL.	LV Pressure Test Set	Prior of delivery to the site. Once for each board.
		d) Insulation Resistance Test 1000 VDC. (*Excluded DB)	1. Approved Shop Drawing. 2. Technical Submittal (i.e: Catalogue, Brand & Model). 3. Contract Document. 4. Specifications (L-S1, L-S2, L-S5, etc). 5. J-MAL.	1kV Insulation Resistance Test Set.	Prior of delivery to the site. Once for each board.

TRADE : LOW VOLTAGE : ELECTRICAL BOARDS

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
		1.3 Material on site inspection	1. Design Requirement. 2. Specification (L-S1, L-S2, L-S5, etc). 3. J-MAL.	N/A	Upon delivery to the site. Once for each delivery.
		1.4 Installation of MSB / SSB / DB / AMF / PFC	1. Approved Shop Drawing. 2. Approved Method Statement. 3. Specification (L-S1, L-S2, L-S5, etc).	N/A	In-progress and upon completion of installation.
		1.5 Installation of Earthing System for LV Board.	1. Approved Shop Drawing. 2. Specification (L-S1, L-S2, L-S5, etc). 3. R < 1 Ohm	Earth Tester.	In-progress and upon completion of installation.
		1.6 Inspection of Switch Room	1. Approved Shop Drawing. 2. Specification (L-S1, L-S2, L-S5, etc).	Measuring Devices (Caliper, Measuring Tape, etc.).	In-progress and upon completion of installation.
		1.7 Setting of Protection Relay	Setting value from designer.	Secondary Relay Test Set.	Upon completion of installation for all works at the board. Once for each relay.
		1.8 Functional test during Testing & Commissioning Session.	1. Design Requirement. 2. Specification (L-S1, L-S2, L-S5, etc). 3. Functioning.	N/A	Upon completion of other test above. Once for each board.
		1.9 RCD Test	1. Design Requirement. 2. Specification (L-S1, L-S2, L-S5, etc). 3. Functioning.	RCCB Tester	Upon completion of DB, wiring and earthing installation. Once for each board.

TRADE : LOW VOLTAGE : WIRING SYSTEM & UNDERGROUND CABLE

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Light Fittings/Fan	Submission of material for approval	1. Contract. 2. J-MAL. 3. Specifications (L-S1).	Measuring devices.	Before material delivery at site. Once for each material.
		Material on site inspection.	To conform as per approved material.	Measuring devices.	Upon delivery at site. Once for each
		Installation of conduit, trunking and accessories.	Specification (L-S1).	Measuring devices.	In-progress and upon completion of installation. Once for each zone / section /
		Installation of final circuit wiring.	Specification (L-S1).	N/A	In-progress and upon completion of installation. Once for each zone / section /
		Continuity test.	R < 1 Ohms.	Insulation & Continuity Tester.	Upon completion of wiring work. Once for each circuit.
		Insulation resistance test @ 500Vdc insulation test voltage.	R > 2 Mohms.	1. Insulation & Continuity Tester. 2. Insulation Tester.	Upon completion of continuity test. Once for each circuit.
		Polarity test.	Load connected correctly.	1. Insulation & Continuity Tester.	Upon completion of wiring work. Once for each circuit.
		Installation of fittings.	1) Panduan Kaedah Penggantungan Lampu. 2) Approved method Statement 3) Specifications (L-S1)	Measuring devices.	Upon completion of fitting installations. Once for each zone / section / floor.
		Functional test.	Functional.	Measuring devices.	Upon completion of other test above. Once for each zone / section / floor.

TRADE : LOW VOLTAGE : WIRING SYSTEM & UNDERGROUND CABLE

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
2	Switch Socket Outlet (SSO)	Submission of material for approval	1. Contract. 2. J-MAL. 3. Specifications (L-S1).	Measuring devices.	Before material delivery at site. Once for each material.
		Material on site inspection.	To conform as per approved material.	Measuring devices.	Upon delivery at site. Once for each
		Installation of conduit, trunking and accessories.	Specification (L-S1).	Measuring devices.	In-progress and upon completion of installation. Once for each zone / section /
		Installation of final circuit wiring.	Specification (L-S1).	N/A	In-progress and upon completion of installation. Once for each zone / section /
		Continuity test.	R < 1 Ohms.	Insulation & Continuity Tester.	Upon completion of wiring work. Once for each circuit.
		Insulation resistance test @ 500Vdc insulation test voltage.	R > 2 Mohms.	1. Insulation & Continuity Tester. 2. Insulation Tester.	Upon completion of continuity test. Once for each circuit.
		Polarity test.	Load connected correctly.	1. Insulation & Continuity Tester.	Upon completion of wiring work. Once for each circuit.
		Installation of fittings.	1) Panduan Kaedah Penggantungan Lampu. 2) Approved method Statement 3) Specifications (L-S1)	Measuring devices.	Upon completion of fitting installations. Once for each zone / section / floor.
		Functional test.	Functional.	Measuring devices.	Upon completion of other test above. Once for each zone / section / floor.

TRADE : LOW VOLTAGE : WIRING SYSTEM & UNDERGROUND CABLE

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
3	Three Phase Point / Submain Cables	Submission of material for approval	1. Contract. 2. J-MAL. 3. Specifications (L-S1).	Measuring devices.	Before material delivery at site. Once for each material.
		Material on site inspection.	To conform as per approved material.	Measuring devices.	Upon delivery at site. Once for each
		Installation of conduit, trunking and accessories.	Specification (L-S1).	Measuring devices.	In-progress and upon completion of installation. Once for each zone / section /
		Installation of cables.	1. Specification (L-S1). 2. Approved method statement.	N/A	In-progress and upon completion of installation. Once for each zone / section /
		Continuity test.	CPC is continuous	Insulation & Continuity Tester.	Upon completion of wiring work. Once for each circuit.
		Insulation resistance test @ 500Vdc insulation test voltage.	R > 2 Mohms.	1. Insulation & Continuity Tester. 2. Insulation Tester.	Upon completion of continuity test. Once for each circuit.
		Phase sequence test.	Phase sequence terminated correctly.	Phase sequence tester.	Upon completion of cable insulation test. Once for each circuit.

TRADE : LOW VOLTAGE : WIRING SYSTEM & UNDERGROUND CABLE

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
4	Underground Cable	Submission of material for approval	1. Contract. 2. J-MAL. 3. Specifications (L-S1).	Measuring devices.	Before material delivery at site. Once for each material.
		Material on site inspection.	To conform as per approved material.	Measuring devices.	Upon delivery at site. Once for each
		Installation of cables.	1. Specification (L-S3). 2. Approved method statement.	Measuring devices.	In-progress and upon completion of installation. Once for each zone / section.
		Continuity test.	CPC is continuous and reasonable (R ~ length x cable internal resistance)	Insulation & Continuity Tester.	Upon completion of cable installation. Once for each cable.
		Insulation resistance test @ d.c voltage not less than twice (2x) the nominal voltage of the circuit concerned.	R > 2 Mohms	1. Insulation & Continuity Tester. 2. Insulation tester.	Upon completion of cable continuity test. Once for each cable
		Phase sequence test.	Phase sequence terminated correctly.	Phase sequence tester.	Upon completion of continuity test. Once for each circuit.

TRADE : LOW VOLTAGE : LIGHTNING PROTECTION SYSTEM

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Lightning Protection System	Submission of material approval	1. Contract Document 2. Construction Dwg 3. J-MAL 4. Specification L-S9	N/A	Before material delivery at site / Once for each material
		Material on site inspection	As per material approval	N/A	Upon delivery at site / Once for each
		Inspection on air termination system installation	1. Air terminals or vertical finials of annealed copper tape 25mm x 3mm or other approved material. 2. Fixing bracket intervals < 500mm (metallic / non-metallic roof). 3. Air termination rods min. 300mm (L), 16mm dia. with lock nut.	Measuring Equipment	In-progress and upon completion of installation / Once for each block
		Inspection on down conductor system installation	A. Conventional (Exposed) 1. Annealed copper tape 25mm x 3mm or other approved material. 2. Conductive fixtures at interval < 500mm. 3. Bending radii > 200mm and > 45°. B. Structural Bonding (Encased in Concrete) 1. Annealed copper tape 25mm x 3mm or other approved material. 2. Properly clamped down conductor to structural reinforcing bar at 1m intervals. C. Structural Using Natural Component (e.g. Steel Structure) 1. Vertical and horizontal bars welded over a length > 30mm.	Measuring Equipment	In-progress and upon completion of installation / Once for each down conductor

TRADE : LOW VOLTAGE : LIGHTNING PROTECTION SYSTEM

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
		Inspection on test joint installation	1. Joints and bonds by copper clamps or exothermic welding or brazing. 2. Height at 2.5m from finished floor level. 3. Copper clamp overlapping >20mm. 4. PVC casing for exposed down conductor between test joint and ground. 5. Flash counter height at 2.0m from floor finished level.	Measuring Equipment	In-progress and upon completion of installation / Once for each test joint
		Inspection on earth termination and bonding installation	1. Annealed copper tape 25mm x 3mm between earth electrode interconnection, burried > 500mm(D) and distance about 1m around external walls. 2. Exothermic weld or brazing between down conductor and earth electrode. 3. Bonding conductor of annealed copper tape 25mm x 3mm for connection between earth termination and MEB. 4. Copper jacketed earth electrode with 16mm dia. 2 nos. 1.5(L). 5. Heavy duty type earth chamber 300mm (L) x 300mm (W) x 180mm (H) with removable cover (strength $\geq$6N/mm2). 6. Permanent label "Lightning Protection Earth-Do Not Remove" fixed at every connection of down conductor to earth termination and at every earth electrodes.	Measuring Equipment	In-progress and upon completion of installation / Once for each termination and bonding

TRADE : LOW VOLTAGE : LIGHTNING PROTECTION SYSTEM

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
		Continuity test : 1. Air termination system 2. Air termination and down conductor system 3. Down conductor system and earth termination 4. Earth termination 5. Earth termination and Main Earthing Bar (MEB)	1. All conductors are continuiously connected (Resistance < 1 Ω). 2. If natural component being used as down conductor system, overall electrical resistance between uppermost part and ground level < 0.2 Ω.	Continuity Tester	Upon completion of works / Once for each block
		Resistance test : 1. Earth electrode 2. Earth termination	Entire system combine resistance < 10 Ω.	Earth Tester	Upon completion of installation / Once for each block

TRADE : LOW VOLTAGE SYSTEM : STANDBY GENERATOR SET

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Standby Generator Set.	*Before FAT. *Submission for material approval	1. Contract Document & Technical Submittal (i.e: Catalogue, Brand & Model). 2. EMAL. 3. Specification (L-S5). 4. Approved shop drawing for gen set room. 5. Certificate for country of origin.	N/A	Once for each material.
2.		*Before material delivery at site *Factory Acceptance Test (Routine Test) : a) Visual Inspection	1. Manufacturers Specification. 2. Design requirement. 3. Specification (L-5S) a) Works test. b) Fulfilling to conditioning of Engine Protective Devices. c) Sudden power increase/decrease. 4. Approved shop drawing for generator set. 5. To confirm as per material approved.	1. Inductive Load-bank at pf 0.8 lagging. 2. Measuring Equipment.	Once for each material.
3.		*Upon delivery at site.	To comform as per approved during material approval and FAT.	N/A	Each delivery.
4.		*Generator set room requirement. *By the end of construction or after generator set have been energized.	1. Specification (L-S5).	N/A	Once
5.		*Inspection on installation works. *During installation and completion of installation.	1. Manufacturers specification manual. 2. Approved Shop drawing. 3. Specification (L-S5).	N/A	Throughout the installation.

TRADE : LOW VOLTAGE SYSTEM : STANDBY GENERATOR SET

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
6.		*Insulation resistance test *Upon completion of continuity test	Ohm > 1 Mohms.	1. Insulation & Continuity Tester. 2. Insulation Tester.	Once for each circuit.
7.		* Insulation test voltage. * Upon completion of cable insulation test.	Volts (d.c).	1. Insulation & Continuity Tester. 2. Insulation Tester.	Once for each circuit.
8.		* Polarity test. * Upon completion of wiring work.	Ohm < 1 Ohms.	Insulation & Continuity Tester.	Once for each circuit.
9.		* Performance functional test. * Upon completion of installation.	1. Manufacturers specification. 2. Specification (L-S5).	N/A	During testing and commissioning.

TRADE : LOW VOLTAGE SYSTEM : STANDBY GENERATOR SET

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
10		*Cranking test. *Upon completion of load test.	1. Manufactures specification. 2. Specification (L-S5).	6 successive abortive start.	During testing and commissioning.
11		* Fuel system test. * Upon completion of installation.	1. Jabatan BOMBA & Penyelamat Malaysia. 2. Jabatan Alam Sekitar (JAS). 3. Specification (L-S5)	N/A	During testing and commissioning.
12		* Noise level measurement * Upon completion of acoustic treatment.	1. Jabatan Alam Sekitar (JAS). 2. Specification (L-S6) 3. <65 dBA Sound Pressure Level. Measured 1 metre away from the generator room.	Sound Pressure Level (SPL) Meter.	During testing and commissioning.
13		* AMF board. * Upon completion of installation.	1. Manufacturers specification. 2. Design requirement. 3. Specification (L-S5).	Insulation Tester.	During testing and commissioning.

TRADE : EXTRA LOW VOLTAGE : PA SYSTEM

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Public Address System	Material submission approval	1. Contract Document 2. PA Syste, General Specification 3. Schedule of Technical Data	N/A	Before material deliver at project site. Once for each type of material.
		Incoming material inspection	To conform with material submission approval	N/A	Upon material delivered at project site. Once for each
		Conduiting/Trunking & Cabling work	1. Specification(L-S1) 2. PA System General Specification	Measuring equipement	In-progress and upon completion of installation. Once for
		Continuity test	Resistance < 5 Ohms [Given the cable use is min. 18AWG twisted pair speaker cable with max. length of 100M]	Insulation & Continuity Tester	Upon completion of cabling work. Once for each zone/floor
		Insulation test	Resistance > 1M Ohms	Insulation & Continuity Tester.	Upon completion of cabling work. Once for each zone/floor
		Tapping wattage inspection	To confirm that the speaker tapping wattage conforms to shop drawing and schematic	N/A	Upon completion of speaker installation. Randomly chosen speakers installed.[Based in project size and/or as

TRADE : EXTRA LOW VOLTAGE : PA SYSTEM

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
		Speaker installation inspection	1. PA General Specification 2. e-PSMG	N/A	Upon completion of speaker installation. Randomly chosen speakers installed.[Based on project size and/or as
		Functional test of all equipments	All equipments shall operate as specify in the contract and manufacturer specifications.	N/A	Upon completion of PA System Installation. Once for each equipment
		Zoning test	To confirm that the zoning for each speaker installed conforms to shop drawing and schematic	N/A	Upon completion of PA System installation. Once for
		Sound pressure level test	To conform with PA System General Specification	Sound Pressure Level Meter	Upon completion of PA System installation. Once for

TRADE : ICT : EXTERNAL INSTALLATION FOR ICT & TELEPHONE

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	External Installation for ICT & Telephone	Submission of Material for approval.	1. Contract. 2. Specifications. Catalogue must be submit	N/A	Before material delivery at site. Once for each material.
		Material on site inspection.	As per approved material. Free from defect. Evidence/ photos. Catalouge	N/A	Upon delivery at site. Once for each
		Inspection of Manhole/ Telephone Pit Installation	1. Contract. 2. LS-3 Specifications.	Measuring tape.	In-progress and upon completion of installation. Once for each zone / section /
		Inspection of uPVC pipe & G.I pipe Installation	1. Contract. 2. LS-3 Specifications.	N/A	In-progress and upon completion of installation. Once for each zone /routing
		Testing & Commissioning; Clearence of ducting	1. Specification - General Practices for ICT Installation 2. TIA/ EIA standard	N/A	Upon completion of installation.. All pipe
		Inspection of Fiber Optic & Jelly Filled Cable Installation	1. Specification - General Practices for ICT Installation & LS - 16 2. Approved Shop Drawing	N/A	In-progress and upon completion of installation. Once for each zone /routing
		Testing & Commissioning; Fiber Optic cable	1. Specification - General Practices for ICT Installation 2. TIA/ EIA standard	Cable Analyzer	Upon completion of cabling work. All cable
		Testing & Commissioning; Jelly Filled cable	1. LS - 16 Specification	Continuity Tester	Upon completion of cabling work. All cable

TRADE : ICT : INTERNAL INSTALLATION FOR ICT - ACTIVE EQUIPEMENT

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Internal Installation for ICT -Active Equipment	Submission of material for approval	1. Contract. 2. Specifications. Catalogue must be submit	N/A	Before material delivery at site.Once for each material.
		Material on site inspection.	As per approved material.	N/A	Upon material are delivered at project site.Once for each material / delivery.
		Inspection & Testing of Access Switch	1. Contract. 2. Specifications.	N/A	Upon completion of installation.Once for each zone / section /
		Inspection & Testing of Distribution Switch	1. Contract. 2. Specifications.	N/A	Upon completion of installation.. All
		Inspection & Testing of Core Switch	1. Contract. 2. Specifications.	N/A	Upon completion of installation.. All

TRADE : ICT : INTERNAL INSTALLATION FOR ICT - ACTIVE EQUIPEMENT

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
		Inspection & Testing of Wireless AP	1. Contract. 2. Specifications.	N/A	Upon completion of installation.. All
		Inspection & Testing of Wireless Controller	1. Contract. 2. Specifications.	N/A	Upon completion of installation.. All
		Inspection & Testing of UPS	1. Contract. 2. Specifications.	N/A	Upon completion of installation.. All
		Inspection & Testing of Server	1. Contract. 2. Specifications.	N/A	Upon completion of installation.. All equipment
		Inspection & Testing of Firewall	1. Contract. 2. Specifications.	N/A	Upon completion of installation.. All

ELECTRICAL : MEDICAL EQUIPMENT : GENERAL RADIOGRAPHY (OUTSOURCE)

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	General Radiography System	Material approval submission	1. Contract Document 2. General Radiography Specification 3. Schedule of Technical Data Compliance 4. Approval Letter by MOH	N/A	Before materials deliver at project site Once for each system
2.		Material Inspection	To conform with material submission approval	N/A	Upon equipment delivery at project site Once for each system
3.		Pre-installation work	1. Specification (LS-1) 2. General Radiography Specification	N/A	Before equipment installation at project
4.		Functionality Test of the system	1. General Radiography specification 2. MOH requirement	N/A	After the complete installation of the equipment

ELECTRICAL : MEDICAL EQUIPMENT : EXAMINATION LIGHT (OUTSOURCE)

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Examination Light	Material approval submission	1. Contract Document 2. Examination Light Specification 3. Schedule of Technical Data Compliance	N/A	Before materials deliver at project site Once for each system
2.		Material Inspection	To conform with material submission approval	N/A	Upon equipment delivery at project site Once for each system
3.		Pre-installation work	1. Specification (LS-1) 2. Examination Light Specification	N/A	Before equipment installation at project
4.		Functionality Test of the system	1. Examination Light Specification 2. MOH requirement	Lux meter	After the complete installation of the equipment

ELECTRICAL : MEDICAL EQUIPMENT : SURGICAL LIGHT (OUTSOURCE)

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Surgical Light	Material approval submission	1. Contract Document 2. Surgical Light Specification 3. Schedule of Technical Data Compliance	N/A	Before materials deliver at project site Once for each system
2.		Material Inspection	To conform with material submission approval	N/A	Upon equipment delivery at project site Once for each system
3.		Pre-installation work	1. Specification (LS-1) 2. Surgical Light Specification	N/A	Before equipment installation at project
4.		Functionality Test of the system	1. Surgical Light Specification 2. Ministry Of Health requirement	Lux meter	After the complete installation of the equipment

ELECTRICAL : MEDICAL EQUIPMENT : SURGICAL TABLE (OUTSOURCE)

ITEM	DESCRIPTION OF WORKS	POINT OF INSPECTION / TEST	STANDARD/REQUIREMENT	TOOLS / EQUIPMENT	STAGE/ FREQUENCY
1.	Surgical Table	Material approval submission	1. Contract Document 2. Surgical Table Specification 3. Schedule of Technical Data Compliance	N/A	Before materials deliver at project site Once for each system
2.		Material Inspection	To conform with material submission approval	N/A	Upon equipment delivery at project site Once for each system
3.		Pre-installation work	1. Specification (LS-1) 2. Surgical Table Specification	N/A	Before equipment installation at project
4.		Functionality Test of the system	1. Surgical Table Specification 2. Ministry Of Health requirement	Lux meter	After the complete installation of the equipment



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