KERAJAAN MALAYSIA

MAJLIS SUKAN NEGARA

DOKUMEN SEBUT HARGA

KERJA-KERJA MENAIKTARAF TANDAS DAN BILIK PERSALINAN SERTA YANG BERKAITAN DI GIMNASIUM 1 MSN BUKIT JALIL, KUALA LUMPUR UNTUK MAJLIS SUKAN NEGARA MALAYSIA

NO. SEBUT HARGA :.....

KETUA PENGARAH
MAJLIS SUKAN NEGARA MALAYSIA
KOMPLEKS SUKAN NEGARA
BUKIT JALIL, SRI PETALING
57000 KUALA LUMPUR

KERJA-KERJA MENAIKTARAF TANDAS DAN BILIK PERSALINAN SERTA YANG BERKAITAN DI GIMNASIUM 1 MSN BUKIT JALIL, KUALA LUMPUR UNTUK MAJLIS SUKAN NEGARA MALAYSIA

ISI KANDUNGAN

SENARAI SEMAKAN

SENARAI SEMAK

Sila Tandakan [√] bagi Dokumen-dokumen yang disertakan.

Bil	Perkara/ Dokumen	Untuk di tanda oleh Syarikat	Untuk di tanda oleh Jawatankuasa Pembuka Sebut Harga
1	Salinan Sijil Perolehan Kerja Kerajaan (SPKK)		
2	Salinan Perakuan Pendaftaran Kontraktor (PPK)		
3	Salinan Sijil Taraf Bumiputera (STB) - PKK		
4	Salinan Penyata Akaun Bank (3 Bulan) Terkini Yang Disahkan Oleh Pihak Bank		
5	Borang Sebut Harga telah diisi dengan lengkap (termasuk nilai tawaran dan tempoh siap) dan ditandatangani oleh Penama seperti tertera dalam Sijil Pendaftaran dari CIDB/PKK (BSH/1)		
6	Ringkasan Sebut Harga telah diisi dengan lengkap (RSH/1)		
7	Senarai Kerja 5 tahun yang telah disiapkan (BRG-D/1)		
8	Senarai Kakitangan Teknikal (BRG-E/1)		
9	Senarai Keempunyaan Loji dan Peralatan Utama (BRG-F/1)		
10	Prestasi Kerja Semasa (BRG-G/GA/GA1)		
11	Senarai Sub-Kontraktor Pakar (BRG-H/1-2)		
12	Profil Syarikat (Lengkap dan Sempurna)		
13	Surat Akuan Pembida (Lampiran A1)		
14	Addenda Sebutharga (jika berkaitan)		
15	Lain-lain sekiranya ada:		

PENGESAHAN OLEH SYARIKAT	UNTUK KEGUNAAN MAJLIS SUKAN NEGARA
Dengan ini saya mengesahkan bahawa saya telah membaca dan memahami semua syarat-syarat dan terma yang dinyatakan di dalam dokumen sebut harga. Semua maklumat yang dikemukakan adalah benar. Tandatangan: Nama: Jawatan: Tarikh:	Jawatankuasa Pembuka Sebut Harga mengesahkan penerimaan dokumen bertanda kecuali bagi perkara bil.....(jika ada). Tandatangan: Nama: Jawatan: Tarikh: Tandatangan: Nama: Jawatan: Tarikh:

ARAHAN KEPADA PENYEBUTHARGA

ARAHAN KEPADA PENYEBUT HARGA

1. HAK KERAJAAN UNTUK MENERIMA / MENOLAK SEBUT HARGA

Kerajaan adalah tidak terikat untuk menerima sebut harga yang terendah atau mana-mana sebut harga atau memberi apa-apa sebab di atas penolakan sesuatu sebut harga. Keputusan Jawatankuasa Sebut Harga adalah muktamad.

2. CARA-CARA MELENGKAPKAN DOKUMEN SEBUT HARGA

2.1. Penyediaan Sebut Harga

Kontraktor adalah dikehendaki mengisi dengan dakwat segala maklumat berikut dengan sepenuhnya:-

(a) Harga dan tandatangan Kontraktor di Ringkasan Sebut Harga,
(b) Harga, tempoh dan tandatangan dalam Borang Sebut Harga,
(c) Senarai Kerja Dalam Tangan,
(d) Senarai Kerja Pengalaman 5 Tahun,
(e) Senarai Kakitangan Teknikal,
(f) Senarai Loji dan Peralatan Utama,
(g) Jadual Kadar Harga (jika ada),
(h) Butir-butir Spesifikasi (jika ada),
(i) Surat Akuan Pembida.
(j) Jika berlaku kesilapan dalam mengisi maklumat-maklumat di atas Penyebut Harga hendaklah menandatangani ringkas semua pembetulan.
(k) Kegagalan mengisi/menandatangani Borang Sebut Harga akan mengakibatkan Sebut Harga ditolak.
(l) Sekiranya terdapat percanggahan di antara maklumat yang dinyatakan dalam Ringkasan Sebut Harga dan Borang Sebut Harga, maklumat di dalam Borang Sebut Harga diberi keutamaan.
(m) Sekiranya Penyebut Harga didapati memberikan maklumat palsu atau sengaja menyorok atau tidak memberikan mana-mana maklumat yang memberikan kesan negatif terhadap keupayaannya, Sebut Harganya akan ditolak dan tindakan tatatertib akan diperakukan terhadapnya.

2.2. Dokumen-dokumen lain yang mesti dikemukakan **(Dokumen Wajib/Sokongan)**

(a) Salinan Sijil Perolehan Kerja Kerajaan (SPKK)

(b) Salinan Sijil Perakuan Pendaftaran Kontraktor (PPK)

(c) Salinan Sijil Taraf Bumiputera (PKK)

(d) Senarai sub-kontraktor pakar (jika berkaitan)

2.3. Penyerahan Dokumen Sebut Harga

(a) Dokumen Sebut Harga yang telah diisi dengan lengkap hendaklah dimasukkan ke dalam sampul surat berlakri yang dicatatkan dengan bilangan Sebut Harga ..... serta tajuk sebut harga dan hendaklah dimasukkan ke dalam peti sebut harga pada masa dan tempat yang ditetapkan dalam Notis Sebut Harga.

(b) Jika Dokumen Sebut Harga tidak diserahkan dengan tangan, Penyebut Harga hendaklah menghantar Dokumen tersebut secara pos berdaftar supaya tiba pada atau sebelum masa dan di tempat yang ditetapkan seperti berikut :

Lobi (Aras Bawah),
Majlis Sukan Negara Malaysia,
Kompleks Sukan Bukit Jalil,
Seri Petaling,
57000 Kuala Lumpur

sebelum jam 12.00 tengahari

(c) Sebut Harga yang diserahkan selepas masa yang ditetapkan, berbangkit atas sebarang sebab, tidak akan dipertimbangkan.

2.4. Penjelasan Lanjut

Sekiranya terdapat maklumat dalam Dokumen Sebut Harga yang tidak jelas atau bercanggah, Penyebut Harga boleh menghubungi pejabat yang menjual/mengeluarkan Dokumen Sebut Harga untuk penjelasan lanjut.

2.5. Tandatangan Oleh Penyebutharga

Sebutharga hendaklah ditandatangan oleh pegawai yang ditauliahkan oleh syarikat seperti penama yang dinyatakan dalam Sijil Perolehan Kerja Kerajaan (SPKK) yang dikeluarkan oleh CIDB, Pusat Khidmat Kontraktor (PKK) atau PUKONSA/ UPKJ yang mana berkenaan.

3. TEMPOH SIAP KERJA

Kerja ini hendaklah disiapkan dalam tempoh tidak melebihi **12 Minggu.** Mana penyebut harga yang menawarkan tempoh siap kerja melebihi temph siap kerja maksimum yang ditetapkan tidak akan dipertimbangkan.

4. BAYARAN DOKUMEN SEBUT HARGA

* Dokumen Sebut Harga ini adalah **PERCUMA** atau;

~~* Dokumen Sebut Harga ini dijual dengan harga RM..... (Ringgit Malaysia : ..... sahaja)~~

Note

* Potong tidak berkenaan

5. PERBELANJAAN PENYEDIAAN SEBUT HARGA

Semua Perbelanjaan bagi penyediaan sebut harga ini hendaklah ditanggung oleh Penyebut Harga sendiri.

6. TEMPOH SAH SEBUT HARGA

Sebut Harga ini sah selama sembilan puluh (90) hari dari tarikh tutup sebut harga. Penyebut harga tidak boleh menarik balik sebut harganya sebelum tamat tempoh sah sebut harga. Tindakan tatatertib akan diambil sekiranya penyebut harga menarik balik sebut harganya sebelum tamat sah sebut harga. Laporan mengenai penarikan balik Sebut Harga oleh penyebut harga akan dikemukakan kepada CIDB/BPKU untuk tindakan.

7. PELAKSANAAN INTEGRITY PACT DALAM PEROLEHAN KERAJAAN

Penyebut harga wajib mengemukakan **Surat Akuan Pembida** bersama-sama dengan Dokumen Sebutharga di mana penyebut harga berwaad untuk tidak akan menawarkan atau memberi rasuah kepada mana-mana individu lain sebagai sogokan untuk dipilih dalam sebut harga tersebut. Surat Akuan Pembida ini hendaklah dilengkapkan dan ditandatangani oleh Pegawai Syarikat yang ditauliahkan.

Surat Akuan Pembida tersebut adalah menjadi salah satu dokumen mandatori dalam penilaian sebut harga peringkat pertama. Sekiranya penyebut harga gagal mengemukakan **Surat Akuan Pembida** yang telah dilengkapkan dan ditandatangani, penyebut harga tersebut akan dinilai sebagai gagal dalam penilaian peringkat pertama (gagal kriteria mandatori sebut harga) dan penilaian seterusnya tidak akan dilaksanakan.

Penyebut harga yang berjaya wajib mengemukakan **Surat Akuan Pembida Berjaya** beserta dengan Borang Perjanjian Inden Kerja/Surat Setuju Terima yang telah ditandatangani di mana ia berwaad tidak akan memberi rasuah sebagai ganjaran kerana mendapatkan kontrak. Surat Akuan ini akan menjadi sebahagian daripada Kontrak.

Pemalsuan maklumat dokumen dan rekod untuk mengaburi penilaian perolehan adalah kesalahan jenayah dan boleh disabitkan di bawah Kanun Keseksaan (Akta 574).

8. DASAR CUKAI JUALAN DAN CUKAI PERKHIDMATAN (CJCP)

Kerajaan memutuskan untuk melaksanakan Cukai Jualan dan Cukai Perkhidmatan (CJCP) bagi menggantikan Cukai Barang dan Perkhidmatan (GST) mulai 1 September 2018 berdasarkan Akta Cukai Jualan 2018 [Akta 806] dan Akta Cukai Perkhidmatan 2018 [Akta 807].

Akta Cukai Jualan 2018 [Akta 806] dan Akta Cukai Perkhidmatan 2018 [Akta 807] telah berkuat kuasa mulai 1 September 2018. Selaras dengan peruntukan dalam Akta tersebut, perolehan kerja pembinaan tidak dikenakan Cukai Perkhidmatan. Bagi perolehan kerja lain antaranya pengurusan fasiliti dan lain-lain, Agensi Kerajaan hendaklah merujuk kepada Jadual Pertama di bawah Peraturan Cukai Perkhidmatan 2018 dan peraturan semasa yang berkuat kuasa.

Agensi Kerajaan hendaklah menggunakan anggaran jabatan tanpa kenaan CJCP untuk menentukan kaedah perolehan.

Bagi pengeluaran Surat Setuju Terima (SST), Agensi hendaklah merujuk kepada 1PP/PK4.2 atau pekeliling berkaitan SST yang berkuat kuasa.

Bagi memastikan urusan perolehan dan pembayaran dapat dilaksanakan dengan lancar selaras dengan perkembangan dan peraturan terkini, satu panduan perlu disediakan.

9. PERINGATAN MENGENAI KESALAHAN RASUAH

Semua Penyebut Harga adalah diingatkan supaya tidak terlibat dalam aktiviti jenayah rasuah berkaitan dengan perolehan ini. Sehubungan dengan itu, para Penyebut Harga diberi peringatan berikut:

9.1 Sebarang perbuatan atau percubaan rasuah untuk menawar atau memberi, meminta atau menerima apa-apa suapan secara rasuah kepada dan daripada mana-mana orang berkaitan perolehan ini merupakan satu kesalahan jenayah di bawah Akta Suruhanjaya Pencegahan Rasuah Malaysia 2009 (Akta 694).

9.2 Sekiranya mana-mana pihak ada menawar atau memberi apa-apa suapan kepada mana-mana anggota perkhidmatan awam, maka pihak yang ditawar atau diberi suapan dikehendaki membuat aduan dengan segera ke pejabat Suruhanjaya Pencegahan Rasuah atau balai polis yang berhampiran. Kegagalan berbuat demikian adalah merupakan suatu kesalahan di bawah Akta Suruhanjaya Pencegahan Rasuah Malaysia 2009 (Akta 694).

9.3 Tanpa prejudis kepada tindakan-tindakan lain, tindakan tatatertib terhadap anggota perkhidmatan awam dan menyenaraihitamkan Kontraktor boleh diambil sekiranya pihak-pihak terlibat dengan kesalahan rasuah di bawah Akta Suruhanjaya Pencegahan Rasuah Malaysia 2009 (Akta 694).

9.4 Mana-mana Kontraktor yang membuat tuntutan bayaran berkaitan perolehan ini walaupun tiada kerja dibuat mengikut spesifikasi yang ditetapkan dan mana-mana anggota perkhidmatan awam yang mengesahkan tuntutan berkenaan adalah melakukan kesalahan di bawah Akta Suruhanjaya Pencegahan Rasuah Malaysia 2009 (Akta 694).

10. PEMATUHAN AKTA 342 DAN NORMA BAHARU DALAM SEKTOR PEMBINAAN DAN DALAM MENANGANI EPIDEMIK DAN PANDEMIK COVID 19

10.1 Penyebutharga yang berjaya dikehendaki mematuhi Akta Pencegahan dan Pengawalan Penyakit Berjangkit 1988 (Akta 342) dan semua Garis Panduan dan Prosedur Operasi Piawai yang berkaitan dalam menangani Epidemik dan Pandemik seperti wabak Covid 19 yang dikeluarkan oleh Kementerian Kesihatan Malaysia, CIDB dan Jabatan Kerja Raya Malaysia.

10.2 Penyebutharga dikehendaki mengambilkira dalam harga tawaran untuk pematuhan perkara 60.1.

10.3 Kegagalan mematuhi Akta, Garis Panduan dan Prosedur Operasi Piawai yang telah ditetapkan menyebabkan tindakan boleh di ambil oleh agensi agensi yang berkenaan dan sebarang tuntutan akibat tindakan ini tidak akan dipertimbangkan

11. ADDENDA SEBUTHARGA

11.1 Sebelum tarikh akhir bagi penyerahan sebutharga, Jabatan/Agensi boleh mengeluarkan Addenda Sebutharga untuk menerangkan, membetulkan, mengurangkan atau membuat tambahan mana-mana bahagian Kandungan dokumen sebutharga. Semua Addenda Sebutharga akan dikeluarkan secara rasmi kepada semua penyebutharga melalui Jabatan/Agensi yang memanggil sebutharga.

11.2 Setiap Addenda Sebutharga yang dikeluarkan akan diedarkan kepada semua penyebutharga dan akan menjadi sebahagian daripada dokumen sebutharga. Penerimaan setiap Addenda Sebutharga hendaklah diakui melalui Borang Bukti Penerimaan yang disertakan bersama-sama Addenda Sebutharga. Borang Bukti Penerimaan bagi Addenda Sebutharga yang terlibat hendaklah dikembalikan bersama-sama dengan dokumen sebutharga bagi tujuan penilaian dan tindakan selanjutnya. Ianya menjadi sebahagian daripada syarat wajib dalam proses penilaian sebutharga yang dilakukan. Kegagalan berbuat demikian boleh menyebabkan sebutharga berkenaan ditolak.

11.3 Penyebutharga hendaklah juga mengesahkan penerimaan semua Addenda Sebutharga yang dikeluarkan dalam Senarai Semakan Mengemukakan Sebutharga. Kegagalan berbuat demikian boleh menyebabkan sebutharga berkenaan ditolak. Semua Addenda Sebutharga yang dikeluarkan adalah menjadi sebahagian dari Kontrak.

11.4 Penyebutharga hendaklah mengambil tindakan sewajarnya terhadap apa-apa maklumat atau arahan yang dinyatakan dalam Addenda Sebutharga.

12. HARGA INDIKATIF JABATAN

12.1 Harga Indikatif Jabatan bagi sebutharga ini adalah Ringgit Malaysia : **(LIMA RATUS RIBU SAHAJA (RM500,000.00)**

12.2 Harga Indikatif Jabatan ini merupakan suatu anggaran sahaja dan amaun tersebut tidak mengikat Kerajaan atau mana-mana pihak lain juga bagi maksud mengelakkan kekeliruan yang mungkin berbangkit.

12.3 Pihak Kerajaan tidak menjamin bahawa syarikat akan dipilih atau boleh menyiapkan kerja dengan bersandarkan Harga Indikatif Jabatan.

SURAT AKUAN PEMBIDA

LAMPIRAN A1
(SAP bertarikh 1 April 2010)

SURAT AKUAN PEMBIDA

Bagi

KERJA-KERJA MENAIKTARAF TANDAS DAN BILIK PERSALINAN SERTA YANG BERKAITAN DI GIMNASIUM 1 MSN BUKIT JALIL, KUALA LUMPUR UNTUK MAJLIS SUKAN NEGARA MALAYSIA

NO SEBUTHARGA :.....

Saya, ... nombor K.P.....yang mewakili .....nombor Pendaftaran.....atau mana-mana individu yang mewakili syarikat ini tidak akan menawar atau memberi rasuah kepada mana-mana individu dalam **MAJLIS SUKAN NEGARA** atau mana-mana individu lain, sebagai sokongan untuk dipilih dalam Sebut Harga seperti di atas. Bersama-sama ini dilampirkan Surat Perwakilan Kuasa bagi saya mewakili syarikat seperti tercatat di atas untuk membuat pengisytiharan ini.

2. Sekiranya saya atau mana-mana individu yang mewakili syarikat ini didapati bersalah menawar atau memberi rasuah kepada mana-mana individu dalam **MAJLIS SUKAN NEGARA** atau mana-mana individu lain sebagai sogokan untuk dipilih dalam Sebut Harga seperti di atas, maka saya sebagai wakil syarikat bersetuju tindakan-tindakan berikut diambil:

2.1 Penarikan balik tawaran kontrak bagi Sebut Harga di atas ; atau
2.2 Penamatan kontrak bagi Sebut Harga di atas;
2.3 Disabitkan dibawah Kanun Keseksaan (Akta 574); dan
2.4 Tindakan tatatertib lain mengikut peraturan perolehan Kerajaan.

3. Sekiranya terdapat mana-mana individu cuba meminta rasuah daripada saya atau mana-mana individu yang berkaitan dengan syarikat ini sebagai sogokan untuk dipilih dalam Sebut Harga seperti di atas, maka saya berjanji akan dengan segera melaporkan perbuatan tersebut kepada pejabat Suruhanjaya Pencegahan Rasuah Malaysia (SPRM) atau balai polis yang berhampiran.

Yang Benar,

.....

Nama : .....

No.K.P : .....

Cop Syarikat :

Catatan: * Potong mana yang tidak berkaitan

SYARAT^2 SEBUT HARGA

SYARAT-SYARAT SEBUT HARGA

1. PEMERIKSAAN TAPAK BINA

Kontraktor disifatkan telah memeriksa dan meneliti tapak bina dan sekitarnya, bentuk dan jenis tapak bina, takat dan jenis kerja, bahan dan barang yang perlu bagi menyiapkan kerja, cara-cara perhubungan dan laluan masuk ke tapak bina dan hendaklah mendapatkan sendiri segala maklumat yang perlu tentang risiko, luar jangkaan dan segala hal-keadaan yang mempengaruhi dan menjejas sebut harganya. Sebarang tuntutan yang timbul akibat daripada kegagalan Kontraktor mematuhi kehendak ini tidak akan dipertimbangkan.

2. INSURANS

2.1. Kontraktor hendaklah atas nama bersama Kerajaan dan Kontraktor mengambil Insurans Liabiliti Awam dan Insurans Kerja (sekiranya dinyatakan di dalam Butir-butir Ringkasan Sebut Harga) bagi tempoh pelaksanaan Kerja termasuk tempoh kecacatan dan ditambah tiga (3) bulan dan empat belas (14) hari. Kontraktor hendaklah juga mengemukakan Nombor Kod Pendaftaran dengan PERKESO.

2.2. Kontraktor hendaklah mengemukakan kepada Pegawai Inden semua polisi insurans dan Nombor Kod Pendaftaran dengan PERKESO yang tersebut di atas sebelum memulakan Kerja. Bagaimanapun untuk tujuan memulakan Kerja sahaja Nota-nota Perlindungan dan resit-resit bayaran premium adalah mencukupi. Sekiranya Kontraktor gagal mengemukakan semua polisi insurans selepas tempoh sah nota-nota perlindungan, tanpa sebarang sebab yang munasabah, Pegawai Inden berhak mengambil tindakan.

3. BON PELAKSANAAN

Bon Pelaksanaan dikecualikan bagi perolehan yang bernilai sehingga **RM200,000.00.**

4. PERATURAN PERLAKSANAAN KERJA

4.1. Kerja-kerja yang dilaksanakan hendaklah mematuhi Spesifikasi, pelan-pelan, butir-butir kerja dalam Ringkasan Sebut Harga dan Syarat-syarat yang dinyatakan dalam Dokumen Sebut Harga ini dan Pegawai Inden atau Wakilnya.

4.2. Kerja-kerja elektrik yang dilaksanakan di samping mematuhi kehendak di perenggan 4.1 di atas, hendaklah juga mematuhi semua peraturan dan pekeliling, undang-undang dan undang-undang kecil yang diluluskan oleh:

4.2.1. Suruhanjaya Tenaga
4.2.2. Jabatan Keselamatan Pekerjaan dan Kesihatan (JKKP)
4.2.3. Pemegang Lesen dan Pihak Berkuasa Bekalan Elektrik
4.2.4. Jabatan Bomba dan Penyelamat
4.2.5. Pihak Berkuasa Tempatan
4.2.6. Suruhanjaya Pengurusan Air Negara (SPAN)

5. KEGAGALAN KONTRAKTOR MEMULAKAN KERJA

Sekiranya Kontraktor gagal memulakan kerja selepas tujuh (7) hari dari tarikh akhir tempoh mula kerja yang dinyatakan dalam Inden, tanpa sebab-sebab yang munasabah, Inden akan dibatalkan oleh Pegawai Inden dan tindakan tatatertib akan diambil terhadap kontraktor.

6. SUB-SEWA DAN MENYERAH HAK KERJA

Kontraktor tidak dibenarkan mengsub-sewakan Kerja kepada Kontraktor-kontraktor lain. Kontraktor tidak boleh menyerah hak apa-apa faedah di bawah Inden ini tanpa terlebih dahulu mendapatkan persetujuan bertulis daripada Pegawai Inden.

7. PENOLAKAN BAHAN, BARANG DAN MUTU HASIL KERJA OLEH PEGAWAI INDEN

7.1. Pegawai Inden atau Wakilnya berhak menolak bahan, barang dan mutu hasil kerja dari jenis piawaian yang tidak menepati seperti diperihalkan dalam spesifikasi. Kontraktor hendaklah, apabila diminta oleh Pegawai Inden, memberi kepadanya baucar-baucar dan/ atau perakuan ujian pengilang untuk membuktikan bahawa bahan-bahan dan barang-barang itu mematuhi spesifikasi. Bahan, barang dan kerja-kerja yang ditolak hendaklah diganti dan sebarang kos tambahan yang terlibat hendaklah ditanggung oleh Kontraktor sendiri.

7.2. Kontraktor hendaklah dengan sepenuhnya atas perbelanjaan sendiri menyediakan sampel bahan dan barang-barang untuk ujian.

7.3. Tiada penggantian untuk peralatan, bahan dan cara kerja yang telah ditentukan di dalam spesifikasi atau ditawarkan dan telah diterima, dibenarkan kecuali mendapat persetujuan daripada Pegawai Inden secara bertulis.

8. RINGKASAN SEBUT HARGA

8.1. Ringkasan Sebut Harga hendaklah menjadi sebahagian daripada Borang Sebut Harga ini dan hendaklah menjadi asas Jumlah Harga Sebut Harga.

8.2. Harga-harga dalam Ringkasan Sebut Harga hendaklah mengambil kira semua kos termasuk kos pengangkutan, cukai, duti, levi, bayaran dan caj-caj lain yang perlu dan berkaitan bagi penyiapan Kerja dengan sempurnanya.

8.3. Tiada sebarang tuntutan akan dilayan bagi pelarasan harga akibat daripada perubahan kos buruh, bahan-bahan dan semua duti dan cukai kerajaan, sama ada dalam tempoh sah sebut harga atau dalam tempoh Kerja.

8.4. Harga-harga dalam ringkasan Sebut Harga yang dikemukakan oleh Kontraktor hendaklah tertakluk kepada persetujuan sebelumnya Itu daripada Pegawai Inden tentang kemunasabahannya. Persetujuan sebelumnya itu dan apa-apa pelarasan kemudiannya kepada harga-harga dalam Ringkasan Sebut Harga hendaklah dibuat sebelum Inden Kerajaan dikeluarkan.

8.5. Apa-apa pelarasan harga dalam Ringkasan Sebut Harga menurut perenggan 8.4 tersebut di atas dan apa-apa kesilapan hisab dalam Ringkasan Sebut Harga hendaklah dilaraskan dan diperbetulkan sebelum Inden Kerajaan dikeluarkan. Jumlah amaun yang dilaraskan hendaklah sama dengan amaun jumlah harga pukal dalam Borang Sebut Harga. Amaun jumlah harga pukal dalam Borang Sebut Harga hendaklah tidak berubah.

8.6. Sekiranya sebut harga berasaskan senarai kuantiti sementara, pengukuran semula hendaklah dibuat dan harga sebut harga diselaraskan.

9. PERCANGGAHAN DAN KECUKUPAN DOKUMEN SEBUT HARGA

9.1. Borang Perjanjian Inden Kerja, Surat Akuan Pembida Berjaya yang ditandatangani oleh Kontraktor dan Dokumen Sebut Harga hendaklah disifatkan menjadi dan dibaca serta ditafsirkan sebagai sebahagian daripada Kontrak ini.

9.2. Dokumen Sebut Harga adalah dikira sebagai saling jelas-menjelas antara satu sama lain. Kontraktor hendaklah mengadakan segala yang perlu untuk melaksanakan kerja dengan sewajarnya sehinggalah siap mengikut tujuan dan maksud sebenar. Dokumen Sebut Harga pada keseluruhannya sama ada atau tidak tujuan dan maksud itu hendaklah difahamkan dengan munasabahnya dari Dokumen Sebut Harga itu.

9.3. Jika Kontraktor mendapati apa-apa percanggahan dalam Dokumen Sebut Harga dia hendaklah merujuk kepada Pegawai Inden untuk mendapatkan keputusan.

10. KEGAGALAN KONTRAKTOR MENYIAPKAN KERJA DAN PENAMATAN PERLANTIKAN KONTRAKTOR

Pegawai inden berhak membatalkan Inden sekiranya Kontraktor berada dalam keadaan berikut dan setelah menerima surat amaran daripada Pegawai Inden:

(a) Kontraktor masih gagal menyiapkan Kerja dalam tempoh masa yang telah ditetapkan;

(b) Kemajuan Kerja terlalu lembap di mana Kontraktor didapati gagal menjalankan kerja dengan tekun dan teratur tanpa apa-apa sebab yang munasabah

(c) Penggantungan pelaksanaan seluruh atau sebahagian Kerja, tanpa apa-apa sebab yang munasabah;

(d) Tidak mematuhi arahan Pegawai Inden tanpa apa-apa alasan yang munasabah;

(e) Pegawai Inden berhak membatalkan Inden sekiranya Kontraktor diisytiharkan bankrap oleh pihak yang sah.

~~11. BAYARAN PENDAHULUAN~~

~~Bayaran pendahuluan dibenarkan bagi kontrak yang bernilai melebihi RM 200,000.00 hingga RM 500,000.00~~

12. BAYARAN INTERIM/ KEMAJUAN

Pegawai Inden dibenarkan membuat bayaran interim sehingga kerja-kerja siap dilaksanakan.

13. KERJA PERUBAHAN

13.1. Pegawai Inden boleh menurut budi bicaranya mengeluarkan arahan-arahan yang berkehendakkan sesuatu perubahan kerja dengan secara bertulis. Tiada apa-apa perubahan yang dikeluarkan oleh Pegawai Inden atau yang disahkan kemudian oleh Pegawai Inden boleh membatalkan Sebut Harga ini.

13.2. Semua kerja perubahan dan/ atau tambahan yang diluluskan oleh Pegawai Inden akan diukur atau dinilai dengan menggunakan kadar harga yang ada dalam Senarai Kuantiti/ Ringkasan Sebut Harga. Jika tidak terdapat sebarang kadar harga yang bersesuaian, kadar harga yang dipersetujui oleh Pegawai Inden dan Kontraktor hendaklah digunakan.

14. PENGUKURAN KUANTITI SEMENTARA

Setelah kerja-kerja yang melibatkan Kuantiti Sementara disiapkan di tapak, pengukuran semula kuantiti hendaklah dibuat secara bersama.

15. LANJUTAN MASA

Pelanjutan masa adalah tertakluk kepada Jawatankuasa Sebut Harga terlebih dahulu.

16. TEMPOH TANGGUNGAN KECACATAN (DLP)

16.1. Tempoh Tanggungan Kecacatan bagi sebut harga hendaklah sekurang-kurangnya enam (6) bulan dari tarikh kerja diperakukan siap. Bagi kerja-kerja mekanikal dan elektrikal di mana tempoh waranti ke atas alat-alat dan loji-loji adalah dua belas (12) bulan dan dalam kes-kes tertentu oleh sebab jenis dan kerumitan kerja, tempoh tanggungan kecacatan yang lebih lama daripada enam bulan (6) boleh dikenakan.

16.2. Kontraktor dipertanggungjawabkan untuk membaiki kecacatan, ketidaksempurnaan, kekecutan atau apa-apa jua kerosakan lain seperti yang mungkin kelihatan dan yang disebabkan oleh bahan atau barang atau mutu hasil kerja yang tidak menepati sebut harga ini apabila diarahkan oleh Pegawai Inden dan dalam masa yang berpatutan. Kontraktor hendaklah membaiki kecacatan, ketidaksempurnaan, kekecutan atau apa-apa jua kerosakan lain atas Kos Kontraktor sendiri.

16.3. Sekiranya Kontraktor gagal membaiki kecacatan, ketidaksempurnaan, kekecutan atau apa-apa jua kerosakan lain seperti yang diarahkan, Pegawai Inden berhak memotong kos membaiki dari baki wang yang akan dibayar kepada kontraktor atau, jika baki itu tiada mencukupi, mengeluarkan surat pengesyoran kepada Lembaga Pembangunan Industri Pembinaan Malaysia (CIDB) dan Pusat Khidmat Kontraktor (PKK) untuk menggantungkan pendaftaran Kontraktor, dan menghantar salinan-salinan tersebut kepada Pengarah Kerja Raya Negeri/ Ketua Jabatan, Bahagian Pembangunan Bumiputera, Kementerian Kerja Raya dan Lembaga Pembangunan Industri Pembinaan. Bagi Kerja-kerja elektrik/ mekanikal, salinan surat hendaklah dihantar kepada Pengarah Cawangan Kerja Elektrikal/ Pengarah Cawangan Kerja Mekanikal.

16.4. Tempoh tanggungan liabiliti kecacatan (DLP) sepertimana yang dinyatakan pada Surat Iringan Kepada Inden Kerajaan/Surat Setuju Terima iaitu bermula dari tarikh diambil milik dan penyerahan projek.

17. PERATURAN MEMBAYAR SELEPAS SIAP

Bayaran sepenuhnya hanya akan dibayar setelah kontraktor menyiapkan kerja dengan sempurnanya dan Perakuan Siap Kerja dikeluarkan. Walaubagaimanapun Pegawai Inden hendaklah membuat potongan atau menahan sejumlah amaun dari wang yang akan dibayar kepada Kontraktor sebagai kos untuk membaiki apa-apa kecacatan yang tidak dapat dibaiki oleh Kontraktor di dalam tempoh tanggungan kecacatan. Kontraktor hendaklah mengembalikan Inden Kerajaan (Pelaksanaan Kerja) dan Inden Kerajaan (Penyiapan Kerja) sepertimana yang telah ditetapkan dalam Pekeliling Perbendaharaan Malaysia (PK 4.2) kepada Pegawai Inden.

18. PERAKUAN SIAP KERJA

Pegawai Inden hendaklah mengeluarkan Perakuan Siap Kerja sebaik sahaja kerja disiapkan dengan sempurna dan memuaskan sejajar dengan syarat-syarat Dalam Dokumen Sebut Harga. Tempoh Tanggungan Kecacatan bermula daripada tarikh siap kerja.

19. PERAKUAN SIAP MEMPERBAIKI KECACATAN

Pegawai Inden hendaklah mengeluarkan Perakuan Siap Membaiki Kecacatan sebaik sahaja kontraktor telah membaiki kecacatan, ketidaksempurnaan, kekecutan atau apa-apa jua kerosakan lain.

20. PEMATUHAN KEPADA UNDANG-UNDANG OLEH KONTRAKTOR

Kontraktor hendaklah mematuhi segala kehendak Undang-undang Kecil dan Undang-undang Berkanun dalam Malaysia semasa pelaksanaan Kerja. Kontraktor tidak berhak menuntut sebarang kos dan bayaran tambahan kerana pematuhannya dengan syarat-syarat ini.

21. PENAMATAN BERSABIT RASUAH, AKTIVITI MENYALAHI UNDANG-UNDANG ATAU AKTIVITI HARAM

Tanpa menjejaskan apa-apa hak Kerajaan yang lain, jika kontraktor, personel, kakitangan atau pekerjanya disabitkan bersalah oleh mahkamah kerana rasuah atau aktiviti menyalahi undang-undang atau aktiviti haram yang berkait dengan Perjanjian/ Kontrak ini atau mana-mana perjanjian lain yang Kontraktor mungkin ada dengan Kerajaan, Kerajaan berhak untuk menamatkan Perjanjian / Kontrak ini pada bila-bila masa, dengan memberi notis bertulis dengan segera yang membawa maksud sedemikian kepada Kontraktor.

Setelah penamatan tersebut, Kerajaan berhak terhadap semua kerugian, kos, ganti rugi dan perbelanjaan (termasuk apa-apa kos dan perbelanjaan sampingan) yang ditanggung oleh Kerajaan yang timbul daripada penamatan tersebut.

Bagi mengelakkan keraguan, kedua-dua pihak Kerajaan dan Kontraktor bersetuju bahawa Kontraktor tidak layak terhadap sebarang bentuk kerugian termasuk kehilangan keuntungan, ganti rugi, tuntutan atau apa sekalipun setelah penamatan Kontrak ini.

22. PERAKUAN KERJA TIDAK SIAP

Pegawai Inden hendaklah mengeluarkan Perakuan Kerja Tidak Siap apabila penyiapan Kerja didapati telah terlambat dan sebab kelambatan tidak melayakkan Kontraktor mendapat lanjutan masa, maka kerugian atau ganti rugi yang dialami oleh Kerajaan akibat daripada kelambatan tersebut adalah ditanggung oleh Kontraktor. Kerugian atau ganti rugi yang dialami oleh Kerajaan akan diperolehi semula daripada Kontraktor melalui Ganti Rugi Tertentu dan Ditetapkan.

23. **KENAAN DENDA/TOLAKAN/ *LIQUIDATED AND ASCERTAINED DAMAGE* (LAD) BAGI SEBUT HARGA KERJA**

Kelewatan dalam menyiapkan projek boleh menyebabkan peningkatan kos projek. Jika syarikat gagal memenuhi obligasi kontrak, denda/ganti rugi hendaklah dituntut daripada syarikat. Jika syarikat gagal membayarnya, denda/ganti rugi hendaklah dituntut daripada bayaran kemajuan atau daripada sebarang baki bayaran yang syarikat berhak menerima.

*** Pengenalan LAD boleh ditetapkan berdasarkan formula seperti berikut :**

$$\text{LAD} = \frac{\textit{Base Landing Rate}\ (\text{BLR})}{100} \times \frac{\text{Harga Kontrak}}{365\ (\text{hari})}$$

* '*Prime Rate*' yang dikeluarkan oleh mana-mana bank perdagangan

BORANG SEBUT HARGA

BORANG SEBUTHARGA

Sebutharga Bil :.....

BAHAGIAN KEWANGAN
MAJLIS SUKAN NEGARA
KOMPLEKS SUKAN BUKIT JALIL
SERI PETALING
57000 KUALA LUMPUR
MALAYSIA

Tuan,

Sebut Harga untuk :-

KERJA-KERJA MENAIKTARAF TANDAS DAN BILIK PERSALINAN SERTA YANG BERKAITAN DI GIMNASIUM 1 MSN BUKIT JALIL, KUALA LUMPUR UNTUK MAJLIS SUKAN NEGARA MALAYSIA.

Di bawah dan tertakluk kepada Arahan Kepada Penyebut Harga, Syarat-syarat Sebutharga untuk kerja, Spesifikasi Kerja dan Lukisan, saya yang bertandatangan di bawah ini adalah dengan ini menawarkan untuk melaksanakan dan menyiapkan kerja-kerja tersebut bagi jumlah harga pukal sebanyak Ringgit Malaysia: .....
.....(RM .....)

2. Saya bersetuju menyiapkan kerja-kerja ini dalam masa ..... **minggu** dari tarikh mula kerja seperti yang ditetapkan di bawah Perenggan 2 Borang Perjanjian Inden Kerajaan.

Bertarikh pada ..... haribulan ..... 20.....

.....
(Tandatangan Kontraktor)

Nama Penuh : .....
No. K/P : .....
Alamat : .....
.....
.....
Atas sifat : .....

.....
Meteri atau Cap Kontraktor

.....
(Tandatangan Saksi)

Nama Penuh :.....
No. K/P : .....
Alamat : .....
.....
.....

SENARAI KUANTITI

RINGKASAN SEBUTHARGA

BIL	SPESIFIKASI KERJA	JUMLAH	
		RM	SEN
1.	**KERJA-KERJA MENAIKTARAF TANDAS DAN BILIK PERSALINAN SERTA YANG BERKAITAN DI GIMNASIUM 1 MSN BUKIT JALIL, KUALA LUMPUR UNTUK MAJLIS SUKAN NEGARA MALAYSIA**		
	1.KERJA-KERJA AWALAN		
	2. TANDAS LELAKI & WANITA / (2 UNIT)		
	3. MENAIKTARAF 4 UNIT BILIK URUT MENJADI PEJABAT		
	4. BILIK PERSALINAN 1 MENJADI BILIK SEMINAR		
	5. DUA (2) TANDAS LELAKI DAN WANITA DIUBAHSUAI MENJADI DUA (2) UNIT TANDAS OKU		
	6. KERJA-KERJA BAIKPULIH BILIK PERSALINAN 2, BILIK PERSALINAN 3, BILIK PERSALINAN 4 DAN BILIK PERSALINAN 5		
	7. TANDAS LELAKI (LUAR)		
	8. TANDAS PEREMPUAN (LUAR)		
	9. LALUAN ARAS BAWAH GIMNASIUM 1		
	10.KERJA-KERJA MENGECAT 24 UNIT PINTU DAN BINGKAI ARAS BAWAH GIMNASIUM 1		
	JUMLAH		
Ringgit Malaysia :			

Tandatangan Penyebutharga

Nama Penyebutharga

No. K/P Penyebutharga

Jawatan

Cop Syarikat

Alamat:

Telephone :
Facsimile :
E-Mail :
Tarikh :

Tandatangan Saksi

Nama Saksi

No. K/P Saksi

Jawatan

Alamat:

Telephone :
Facsimile :
E-Mail :
Tarikh :

PERHATIAN :

Sebarang pertanyaan boleh dimajukan kepada ;

MUHAMAD FAEZAL MD NOH
(Bahagian Fasiliti Sukan)
Tel : 03-89929600/89929837
Fax : 03-90583380

Nota :

1. Kontraktor dinasihatkan melihat sendiri tapak cadangan untuk mengetahui selok-belok kerja.

2. Harga tawaran sah selama 3 bulan dari tarikh tutup panggilan sebutharga dibuat.

3. Bersama-sama ini juga sila lampirkan profile syarikat untuk rujukan.

4. Majlis tidak terikat dengan mana-mana sebutharga yang terendah.

.....
(Tandatangan Kontraktor)

Nama :_____
Cop/Alamat :_____
_____
_____
_____
No. Tel. :_____
No. Fax. :_____

KERJA-KERJA MENAIKTARAF TANDAS DAN BILIK PERSALINAN SERTA YANG BERKAITAN DI GIMNASIUM 1 MSN BUKIT JALIL, KUALA LUMPUR UNTUK MAJLIS SUKAN NEGARA MALAYSIA

BIL	BUTIRAN KERJA	UNIT	KUANTITI	KADAR HARGA (RM) / KUANTITI	JUMLAH (RM)
1.	**KERJA-KERJA AWALAN**				
i.	Kerja-kerja permulaan *(Preliminaries)* mengikut spesifikasi am, spesifikasi tambahan termasuk Insurans Tanggungan Awam, Insurans Kerja, Insurans Pampasan Kerja dengan membayar premium atau nombor pendaftaran PERKESO bagi semua pekerja.	Pukal	Pukal		
ii.	Menyediakan pekerja, peralatan keselamatan dan kebersihan semasa kerja-kerja sedang dijalankan seperti tali-tali halangan, kon, tanda amaran dan tali merah-putih sehingga kerja-kerja disiapkan mengikut arahan Pegawai Penguasa.	Pukal	Pukal		
iii.	Menyediakan laporan foto kemajuan kerja (sebelum, semasa dan selepas) sebanyak dua (2) set bewarna pada setiap tuntutan bayaran (*Hard copy & soft copy* – dalam thumb drive).	Pukal	Pukal		
iv.	Mengadakan dan menyediakan tong sampah mudah alih menggunakan lori mengikut kesesuaian tapak bagi menampung kapasiti sampah agar kebersihan tapak adalah sentiasa terjamin . Sampah sarap ini perlu dibawa keluar daripada tapak bina yang diluluskan oleh pihak berkuasa tempatan apabila penuh atau di atas arahan Pegawai Penguasa.	Pukal	Pukal		
v.	Pihak kontraktor mestilah memindahkan segala peralatan sedia ada ke kawasan yang sesuai dan memindahkan semula termasuk kemasan ke tempat yang diarahkan oleh pihak MSNM	Pukal	Pukal		
				JUMLAH	

BIL	BUTIRAN KERJA	UNIT	KUANTITI	KADAR HARGA (RM) / KUANTITI	JUMLAH (RM)
2.	**TANDAS LELAKI & WANITA / (2 UNIT)**				
i.	Kerja-kerja mengetuk, memecah dan membuang jubin dinding dan lantai yang lama.	M^2	41		
ii.	Kerja-kerja memecahkan plaster dan menyodok semua sambungan atau menggaris permukaan sebagai kekunci *'Key'* untuk permukaan dinding dan lantai.	M^2	41		
iii.	16mm skrid simen dan pasir untuk menjubin dinding dan lantai.	M^2	41		
iv.	Kerja-kerja membekal dan memasang baru jubin dinding ukuran 1'x2' *'Heavy duty'* lengkap kekemasan.	M^2	41		
v.	Kerja-kerja membekal dan memasang baru jubin lantai jenis hemogenous ukuran 1'x2' *'Heavy duty'* lengkap kekemasan.	M^2	45		
vi.	Kerja-kerja membuang paip lama dan membekal serta memasnag baru paip pvc kelabu ½" tebal class 7, lengkap *'Fitting'* penyambungan dan kekemasan.	M	12		
vii.	Kerja-kerja membekal dan memasang *'Stopcock* brass heavy duty' saiz 3/4' lengkap kekemasan.	No	1		
viii.	Kerja-kerja menanggal peralatan lama membuka, membekal serta memasang baru wc duduk lengkap tangki peralatan *'Saifon, angle valve'* serta kekemasan.	No	2		
ix.	Kerja-kerja menanggal, membuka peralatan lama serta membekal dan memasang baru *'Wall hung' basin*' lengkap pemasangan *'Waze sink, 'Angle valve', 'Bottle trap'* serta kekemasan.	No	2		
x.	Kerja-kerja membekal dan memasang baru kepala paip basin tap lengkap kekemasan.	No	2		
xi.	Kerja-kerja menanggal peralatan lama serta membekal dan memasang baru *'Hand bidet spray', 'Flexible hose', 'Angle valve'* dan *'Hook'*	No	2		
xii.	Kerja-kerja membuka, menanggal, membuang kerangka dan siling lama.	M^2	4.5		
xiii.	Kerja-kerja membekal, memasang baru siling gantung saiz 2'x4' lengkap kerangka siling serta *'Main track', 'Cross track', 'Centre track', 'Wall angle'* dan dawai penyangkut.	M^2	4.5		
xiv.	Membekal dan memasang papan tanda *'Signage'* dari jenis *'Acrylic' berukuran 300mm x 200mm* **'TANDAS LELAKI', 'TANDAS WANITA'** mengikut spesifikasi yang ditetapkan serta berkaitan	No	2		

xv.	Membekal dan memasang cermin muka berukuran 800mm x 800mm mengikut spesifikasi yang ditetapkan	No	2		
2.1	**Elektrikal**				
i.	Kerja-kerja membekal dan memasang baru lampu LED putih (20 watt) berbingkai 2'x4' lengkap pendawaian dan suis	No	2		
				JUMLAH	

BIL	BUTIRAN KERJA	UNIT	KUANTITI	KADAR HARGA (RM) / KUANTITI	JUMLAH (RM)
3.	**MENAIKTARAF 4 UNIT BILIK URUT MENJADI PEJABAT**				
i.	Kerja-kerja mengetuk, memecah dan membuang jubin dinding dan lantai yang lama.	M^2	184		
ii.	Kerja-kerja membekal dan menyimen render baru pada permukaan lantai.	M^2	21		
iii.	Kerja-kerja membekal dan melepa 16mm *'Skrid'* simen menggunakan plaster jenis *(MI White Finish No.128)* pada permukaan dinding lengkap kekemasan.	M^2	184		
iv.	Kerja-kerja membekal serta menyediakan permukaan dan sapu satu lapisan *'Wall sealer'* pada permukaan dinding.	M^2	184		
v.	Kerja-kerja membekal serta menyediakan permukaan dan sapu dua lapisan cat kemasan pada permukaan dinding lengkap kekemasan.	M^2	184		
vi.	Kerja-kerja membuka, menanggal, membuang kerangka dan siling lama.	M^2	21		
vii.	Kerja-kerja membekal, memasang baru siling gantung saiz 2'x4', lengkap kerangka siling serta *'Main track', 'Cross track', 'Center track', 'Wall angle'* dan dawai penyangkut.	M^2	21		
viii.	Kerja-kerja membekal dan memasang baru pintu kaca *'Tempered glass'* 12mm tebal termasuk aksesori, saiz 7'x3', lengkap kekemasan.	No	2		
ix.	Kerja-kerja membekal dan memasang baru lantai jenis *'Vinyl heavy duty'* tebal 2mm termasuk segala bahan dan peralatan yang diperlukan semasa kerja-kerja pemasangan dijalankan lengkap kekemasan.	M^2	21		
x.	Membekal dan memasang papan tanda *'Signage'* dari jenis *'Acrylic' berukuran 300mm x 200mm* **'PEJABAT'** mengikut spesifikasi yang ditetapkan serta berkaitan	No	4		
3.1	**Elektrikal Dan Mekanikal**				
i.	Kerja-kerja membekal dan memasang baru lampu LED putih (20 watt) berbingkai 2'x4' lengkap pendawaian dan suis	No	16		
ii.	Kerja-kerja membekal dan memasang penghawa dingin jenis siling *(Cassette type)* 2Hp lengkap pendawaian dan suis termasuk kerja-kerja yang berkaitan dengannya	No	4		
				JUMLAH	

BIL	BUTIRAN KERJA	UNIT	KUANTITI	KADAR HARGA (RM) / KUANTITI	JUMLAH (RM)
4.	**BILIK PERSALINAN 1 MENJADI BILIK SEMINAR.**				
i.	Kerja-kerja mengetuk, memecah dan membuang jubin dinding dan lantai yang lama.	M^2	722		
ii.	Kerja-kerja membekal dan menyimen render baru pada permukaan lantai.	M^2	81		
iii.	Kerja-kerja mengetuk, memecah dan membuang dinding konkrit/ batu.	M^2	76		
iv.	Kerja-kerja membuka, menanggal, membuang keluar kerangka dan siling lama.	M^2	81		
v.	Kerja-kerja membekal, memasang baru siling gantung saiz 2'x4', lengkap kerangka siling serta *'Main track', 'Cross track', 'Center track', 'wall angle'* dan dawai penyangkut.	M^2	81		
vi.	Kerja-kerja membekal dan memasang baru pintu kaca *'Tempered glass'* 12mm tebal termasuk aksesori, saiz 7'x4' lengkap kekemasan.	No	2		
vii.	Kerja-kerja membekal dan memasang *'Portable Full Fabric Partition'* termasuk aksesori dan kerja-kerja yang berkaitan, ukuran 27' panjang x 9' tinggi.	M^2	23		
viii.	Kerja-kerja membekal dan memasang baru lantai jenis *'Vinyl heavy duty'* tebal 2mm termasuk segala bahan dan peralatan yang diperlukan semasa kerja-kerja pemasangan dijalankan lengkap kekemasan.	M^2	81		
ix.	Membekal dan memasang papan tanda *'Signage'* dari jenis *'Acrylic' berukuran 300mm x 200mm* **'BILIK SEMINAR'** mengikut spesifikasi yang ditetapkan serta berkaitan	No	1		
4.1	**Kerja-kerja Elektrikal Dan Mekanikal**				
i.	Kerja-kerja membekal dan memasang baru lampu LED putih (20 watt) berbingkai 2'x4' lengkap pendawaian dan suis	No	12		
ii.	Kerja-kerja membekal dan memasang penghawa dingin jenis siling *(Cassette type)* 3.0hp lengkap pendawaian dan suis termasuk kerja-kerja yang berkaitan dengannya.	No	3		
				JUMLAH	

BIL	BUTIRAN KERJA	UNIT	KUANTITI	KADAR HARGA (RM) / KUANTITI	JUMLAH (RM)
5.	**DUA (2) TANDAS LELAKI DAN WANITA DIUBAHSUAI MENJADI DUA (2) UNIT TANDAS OKU**				
i.	Kerja-kerja mengetuk, memecah dan membuang jubin dinding dan lantai yang lama.	M^2	80		
ii.	Kerja-kerja mengetuk, memecah dan membuang dinding konkrit/batu.	M^2	19.5		
iii.	Kerja-kerja memecahkan plaster dan menyodok semua sambungan atau menggaris permukaan sebagai kekunci *'Key'* untuk permukaan dinding dan lantai.	M^2	80		
iv.	16mm skrid simen dan pasir untuk menjubin dinding dan lantai.	M^2	80		
v.	Kerja-kerja membekal dan memasang baru jubin dinding ukuran 1'x2' *'Heavy duty'* lengkap kekemasan.	M^2	19.5		
vi.	Kerja-kerja membekal dan memasang baru jubin lantai jenis *'Homogenous'* ukuran 1'x2' heavy duty lengkap kekemasan.	M^2	61		
vii.	Kerja-kerja membuang paip lama dan membekal serta memasang baru paip pvc kelabu ½" tebal class 7, lengkap *'Fitting'* penyambungan dan kekemasan.	M	12		
viii.	Kerja-kerja membekal dan memasang *'Stopcock brass heavy duty'* saiz 3/4' lengkap kekemasan.	No	1		
ix.	Kerja-kerja menggal peralatan lama membuka, membekal serta memasang baru wc duduk lengkap tangki peralatan *'Saifon', 'Angle valve'* serta kekemasan.	No	2		
x.	Kerja-kerja menanggal, membuka peralatan lama serta membekal dan memasang baru *"Wall Hung Basin'* lengkap pemasangan *'Waze sink', 'Angle valve', 'Bottle trap'* serta kekemasan.	No	2		
xi.	Kerja-kerja membekal dan memasang *'Handle bar stainless steel'* untuk OKU lengkap kekemasan.	No	2		
xii.	Kerja-kerja menanggal peralatan lama, membekal dan memasang baru kepala paip paip jenis *'Pillar tap'* bersalut krom	No	2		
xiii.	Kerja-kerja menanggal peralatan lama serta membekal dan memasang baru *'Hand bidet spray', 'Flexible hose', 'Angle valve'* dan *'Hook'*	No	2		
xiv.	Kerja-kerja membina ramp dari jubin lantai jenis *'Homogenous'* saiz 1'x2' lengkap kekemasan.	M^2	2.7		

xv.	Kerja-kerja membekal dan memasang baru pintu *'Compact laminated' (Toilet cubicle system)* tebal 12mm termasuk engsel, *'Door lock', 'Door knob', 'Coat hook'*, ukuran 7'x3' dan lengkap kekemasan.	No	2		
xvi.	Membekal dan memasang papan tanda *'Signage'* dari jenis *'Acrylic' berukuran 300mm x 200mm* **'TANDAS OKU LELAKI', 'TANDAS OKU WANITA'** mengikut spesifikasi yang ditetapkan serta berkaitan	No	2		
xvii.	Membekal dan memasang cermin muka berukuran 800mm x 800mm mengikut spesifikasi yang ditetapkan	No	2		
5.1	**Elektrikal**				
i.	Kerja-kerja membekal dan memasang baru lampu LED putih (20 watt) berbingkai 2'x4' lengkap pendawaian dan suis	No	2		
ii.	Membekal Dan Memasang *'Wired disable toilet' Lengkap Dengan 'Ceiling pullcard', 'Reset panel', 'Overdoor indicator', 'Lamp and sounder', 'Main control panel'* termasuk kerja-kerja yang berkaitan dengannya	No	2		
				JUMLAH	

BIL	BUTIRAN KERJA	UNIT	KUANTITI	KADAR HARGA (RM) / KUANTITI	JUMLAH (RM)
6.	**KERJA-KERJA BAIKPULIH BILIK PERSALINAN 2, BILIK PERSALINAN 3, BILIK PERSALINAN 4 DAN BILIK PERSALINAN 5**				
i.	Kerja-kerja mengetuk, memecah dan membuang jubin dinding dan lantai yang lama.	M^2	1270		
ii.	Kerja-kerja membekal dan menyimen *'Render'* baru pada permukaan lantai.	M^2	78		
iii.	Kerja-kerja memecahkan plaster dan menyodok semua sambungan atau menggaris permukaan sebagai kekunci *'Key'* untuk permukaan dinding dan lantai.	M^2	570		
iv.	16mm skrid simen dan pasir untuk menjubin dinding dan lantai.	M^2	570		
v.	Kerja-kerja membekal dan memasang baru jubin dinding ukuran 1'x2' *'Heavy duty'* lengkap kekemasan.	M^2	570		
vi.	Kerja-kerja membekal dan memasang baru jubin lantai jenis *'Homogenous'* ukuran 1'x2' *'Heavy duty'* lengkap kekemasan.	M^2	60		
vii.	Kerja-kerja membuang paip lama dan membekal serta memasnag baru paip pvc kelabu ½" tebal class 7, lengkap *'Fitting'* penyambungan dan kekemasan.	M	122		
viii.	Kerja-kerja membekal dan memasang *'Stopcock brass heavy duty'* saiz 3/4' lengkap kekemasan.	No	4		
ix.	Kerja-kerja menanggal peralatan lama membuka, membekal serta memasang baru wc duduk lengkap tangki peralatan *'Saifon', 'Angle valve'* serta kekemasan.	No	4		
x.	Kerja-kerja menanggal, membuka peralatan lama serta membekal dan memasang baru *'Wall Hung Basin'* lengkap pemasangan *'Waze sink', 'Angle valve', 'Bottle trap'* serta kekemasan.	No	8		
xi.	Kerja-kerja menanggal, membuka peralatan lama serta membekal dan memasang baru pancuran mandi *(Shower head)* jenis *'Crome'*.	No	24		
xii.	Kerja-kerja membuka, menanggal, membuang rangka dan pintu lama.	No	28		
xiii.	Kerja-kerja membekal dan memasang baru pintu *'Compact laminated' (Toilet cubicle system)* tebal 12mm termasuk engsel, *'Door lock', 'Door knob', 'Coat hook',* ukuran 7'x3' dan lengkap kekemasan.	No	28		
xiv.	Kerja-kerja membekal dan melepa 16mm skrid simen menggunakan plaster jenis *(MI White Finish No.128)* pada permukaan dinding lengkap kekemasan.	M2	700		

xv.	Kerja-kerja membekal serta menyediakan permukaan dan sapu satu lapisan *'Wall sealer'* pada permukaan dinding.	M2	700		
xvi.	Kerja-kerja membekal serta menyediakan permukaan dan sapu dua lapisan cat kemasan dalam pada permukaan dinding lengkap kekemasan.	M2	700		
xvii.	Kerja-kerja membuka, menanggal, membuang kerangka dan siling lama.	M2	138		
xviii.	Kerja-kerja melepa 16mm ketebalan *'Skrid'* simen menggunakan *'Plaster'* pada permukaan dinding lengkap kekemasan, membekal serta menyediakan permukaan dan sapu dua lapisan cat kemasan dalam pada permukaan dinding lengkap kekemasan.	M2	180		
xix.	Kerja-kerja membekal dan memasang baru lantai jenis *'Vinyl heavy duty'* tebal 2mm termasuk segala bahan dan peralatan yang diperlukan semasa kerja-kerja pemasangan dijalankan lengkap kekemasan.	M2	78		
xx.	Kerja-kerja menanggal peralalatan lama dan membekal serta memasang baru kepala paip jenis *'Pillar tap'* bersalut *'Crome'*.	No	8		
xxi.	Kerja-kerja menanggal peralatan lama serta membekal dan memasang baru *'Hand bidet spray', 'Flexible hose', 'Angle valve'* dan *'Hook'*	No	4		
xxii.	Membekal dan memasang papan tanda *'Signage'* dari jenis *'Acrylic' berukuran 300mm x 200mm* **'BILIK PERSALINAN 1', 'BILIK PERSALINAN 2', 'BILIK PERSALINAN 3' dan 'BILIK PERSALINAN 4'** mengikut spesifikasi yang ditetapkan serta berkaitan	No	4		
xxiii.	Membekal dan memasang cermin muka berukuran 800mm x 800mm mengikut spesifikasi yang ditetapkan	No	8		
6.1	**Elektrikal**				
i.	Kerja-kerja membekal dan memasang baru lampu LED putih (20 watt) berbingkai 2'x4' lengkap pendawaian dan suis	No	32		
ii.	Memindahkan papan agihan (DB) sediada ke lokasi baru termasuk kerja-kerja yang berkaitan dengannya	No	2		
				JUMLAH	

BIL	BUTIRAN KERJA	UNIT	KUANTITI	KADAR HARGA (RM) / KUANTITI	JUMLAH (RM)
7.	**TANDAS LELAKI (LUAR)**				
i.	Kerja-kerja mengetuk, memecah dan membuang jubin dinding dan lantai yang lama.	M^2	127		
ii.	Kerja-kerja memecahkan plaster dan menyodok semua sambungan atau menggaris permukaan sebagai kekunci *'Key'* untuk permukaan dinding dan lantai.	M^2	127		
iii.	16mm skrid simen dan pasir untuk menjubin dinding dan lantai.	M^2	127		
iv.	Kerja-kerja membekal dan memasang baru jubin dinding ukuran 1'x2' *'Heavy duty'* lengkap kekemasan.	M^2	117		
v.	Kerja-kerja membekal dan memasang baru jubin lantai jenis *'Homogenous'* ukuran 1'x2' *'Heavy duty'* lengkap kekemasan.	M^2	13		
vi.	Kerja-kerja menanggal peralatan lama, membekal dan memasang baru mangkuk buang air kecil bentuk segiempat dari jenis tembikar bersilau dipasang dipermukaan dinding (330Lx290Wx525mm) putih.	No	3		
vii.	Kerja-kerja menanggal peralatan lama dan membekal serta memasang baru *'Exposed manual urinal flush valve/w integral stop cum check valve and straight/bed pipe'*	No	3		
viii.	Kerja-kerja menanggal peralatan lama serta membekal dan memasang baru *'Hand bidet spray', 'Flexible hose', 'Angle valve'* dan *'Hook'*	No	2		
ix.	Kerja-kerja menanggal peralatan lama, membekal dan memasang baru kepala paip paip jenis *'Pillar tap'* bersalut krom	No	2		
x.	Kerja-kerja menanggal peralatan lama membuka, membekal serta memasang baru wc duduk lengkap tangki peralatan *'Saifon, Angle valve'* serta kekemasan.	No	2		
xi.	Kerja-kerja menanggal, membuka peralatan lama serta membekal dan memasang baru *'Wall hung basin'* lengkap pemasangan *'Waze sink', 'Angle valve', 'Bottle trap'* serta kekemasan.	No	2		
xii.	Kerja-kerja membuang paip lama dan membekal serta memasang baru paip pvc kelabu ½" tebal class 7, lengkap fitting penyambungan dan kekemasan.	M	30		
xiii.	Kerja-kerja membuka, menanggal, membuang keluar kerangka dan siling lama.	M^2	13		

xiv.	Kerja-kerja membekal, memasang baru suspended siling saiz 2'x4', lengkap kerangka siling serta *'Main track', 'Cross track', 'Center track', 'wall angle'* dan dawai penyangkut.	M^2	13		
xv.	Kerja-kerja membekal dan memasang baru pintu *'Compart laminated' (Toilet cubicle sytem)* tebal 12mm termasuk engsel , *'Door lock', 'Door knob', 'Coat hook'* ukuran 7'x3' dan lengkap kekemasan.	No	3		
xvi.	Membekal dan memasang cermin muka berukuran 800mm x 800mm mengikut spesifikasi yang ditetapkan	No	3		
xvii.	Membekal dan memasang papan tanda *'Signage'* dari jenis *'Acrylic' berukuran 300mm x 200mm* '**TANDAS LELAKI'** mengikut spesifikasi yang ditetapkan serta berkaitan	No	1		
7.1	**Elektrikal**				
i.	Kerja-kerja membekal dan memasang baru lampu LED putih (20 watt) berbingkai 2'x4' lengkap pendawaian dan suis	No	3		
ii.	Kerja-kerja membekal dan memasang *'Ekzos fan'* lengkap pendawaian serta yang berkaitan dengannya	No	1		
				JUMLAH	

BIL	BUTIRAN KERJA	UNIT	KUANTITI	KADAR HARGA (RM) / KUANTITI	JUMLAH (RM)
8.	**TANDAS PEREMPUAN (LUAR)**				
i.	Kerja-kerja mengetuk, memecah dan membuang jubin dinding dan lantai yang lama.	M^2	150		
ii.	Kerja-kerja memecahkan plaster dan menyodok semua sambungan atau menggaris permukaan sebagai kekunci 'key' untuk permukaan dinding dan lantai.	M^2	150		
iii.	16mm skrid simen dan pasir untuk menjubin dinding dan lantai.	M^2	150		
iv.	Kerja-kerja membekal dan memasang baru jubin dinding jenama ukuran 1'x2' *'Heavy duty'* lengkap kekemasan.	M^2	150		
v.	Kerja-kerja membekal dan memasang baru jubin lantai jenis 'Hemogenous' ukuran 1'x2' *'Heavy duty'* lengkap kekemasan.	M^2	17		
vi.	Kerja-kerja menggal peralatan lama membuka, membekal serta memasang baru wc duduk lengkap tangki peralatan *'Saifon'*, *'Angle valve'* serta kekemasan.	No	2		
vii.	Kerja-kerja menanggal peralatan lama serta membekal dan memasang baru *'Hand bidet spray', 'Flexible hose', 'Angle valve' dan 'Hook'*	No	2		
viii.	Kerja-kerja menanggal, membuka peralatan lama serta membekal dan memasang baru *'Wall hung basin'* lengkap pemasangan waze sink, angle valve, bottle trap serta kekemasan.	No	1		
ix.	Kerja-kerja menanggal peralatan lama, membekal dan memasang baru kepala paip paip jenis *'Pillar Tap'* bersalut krom	No	1		
x.	Kerja-kerja membuang paip lama dan membekal serta memasang baru paip pvc kelabu ½" tebal class 7, lengkap fitting penyambungan dan kekemasan.	M	31		
xi.	Kerja-kerja membuka, menanggal, membuang keluar kerangka dan siling lama.	M^2	17		
xii.	Kerja-kerja membekal, memasang baru suspended siling saiz 2'x4', lengkap kerangka siling serta main track, cross track, center track, wall angle dan dawai penyangkut.	M^2	17		
xiii.	Kerja-kerja membekal dan memasang baru pintu compart laminated *(Toilet cubicle system)* tebal 12mm termasuk engsel, *'Door lock', 'Door knob', 'Coat hook'*, ukuran 7'x3' dan lengkap kekemasan.	No	3		

xiv.	Membekal dan memasang cermin muka berukuran 800mm x 800mm mengikut spesifikasi yang ditetapkan	No	1		
xv.	Membekal dan memasang papan tanda *'Signage'* dari jenis *'Acrylic' berukuran 300mm x 200mm* '**TANDAS WANITA'** mengikut spesifikasi yang ditetapkan serta berkaitan	No	1		
8.1	**Elektrikal**				
i.	Kerja-kerja membekal dan memasang baru lampu LED putih (20 watt) berbingkai 2'x4' lengkap pendawaian dan suis	No	3		
ii.	Kerja-kerja membekal dan memasang *'Ekzos fan'* lengkap pendawaian serta yang berkaitan dengannya	No	1		
				JUMLAH	

BIL	BUTIRAN KERJA	UNIT	KUANTITI	KADAR HARGA (RM) / KUANTITI	JUMLAH (RM)
8.	**LALUAN ARAS BAWAH GIMNASIUM 1.**				
i.	Kerja-kerja menanggal dan membuang keluar *'Aluminium strip'* siling yang lama.	M^2	197		
ii.	Kerja-kerja membekal dan memasang baru siling gantung saiz 2'x4', lengkap kerangka siling serta *'Main track', 'Cross track', 'Center track', 'Wall angle'* dan dawai penyangkut lengkap kekemasan.	M^2	197		
iii.	Kerja-kerja mengikis cat lama dari permukaan yang berlepa, baiki semua retak dan juga permukaan lain yang cacat dengan *'Putty'*.	M^2	197		
iv.	Kerja-kerja membekal serta menyediakan permukaan dan sapu satu lapisan *'Wall sealer'* pada permukaan dinding.	M^2	197		
v.	Kerja-kerja membekal serta menyediakan permukaan dan sapu dua lapisan cat kemasan dalam pada permukaan dinding lengkap kekemasan.	M^2	1,766		
vi.	Kerja-kerja mengetuk, memecah dan membuang jubin lantai yang lama.	M^2	1,766		
vii.	Kerja-kerja membekal dan menyimen *'Render'* baru pada permukaan lantai.	M^2	1,766		
viii.	Kerja-kerja membekal dan memasang baru lantai jenis *'Vinyl Heavy duty'* tebal 2mm termasuk segala bahan dan peralatan yang diperlukan semasa kerja-kerja pemasangan dijalankan lengkap kekemasan.	M^2	197		
8.1	**Elektrikal**				
i.	Kerja-kerja membekal dan memasang baru lampu LED putih (20 watt) berbingkai 2'x4' lengkap pendawaian dan suis	No	24		
				JUMLAH	

BIL	BUTIRAN KERJA	UNIT	KUANTITI	KADAR HARGA (RM) / KUANTITI	JUMLAH (RM)
9.	**KERJA-KERJA MENGECAT 24 UNIT PINTU DAN BINGKAI ARAS BAWAH GIMNASIUM 1.**				
i.	Kerja-kerja mengikis cat lama dari permukaan kayu dan tampal semua retak dengan dempul *(Putty)* serta menggosok dengan kertas pasir.	No	24		
ii.	Kerja-kerja membekal serta menyediakan permukaan dan sapu satu lapisan *'Primer oxide'* atau *'Speed undercoat'*.	No	24		
iii.	Kerja-kerja membekal serta menyediakan permukaan dan sapu dua lapisan cat kilat *'Gloss finish'* pada permukaan pintu lengkap kekemasan.	No	24		
iv.	Kerja-kerja membuka, membekal dan memasang kunci *'Level handle'* jenis *'Crome'* lengkap kekemasan.	No	24		
				JUMLAH KESELURUHAN	

Notis makluman :-

*Kadar Kuantiti Yang Dinyatakan Dalam Sebutharga Ini ***HANYALAH ANGGARAN UKURAN KUANTITI SEMENTARA.*** Pihak Penyebutharga Dinasihatkan Membuat Ukuran Sendiri Di Tapak*

SPESIFIKASI

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1. General

1.1. Unless otherwise specified or shown on the Drawings, all ceilings shall be of gypsum plasterboards or as approved by the S.O. with class 'O' fire rating and all ceiling installation shall comply with the classification of fire spread as stipulated in the 8th Schedule Uniform Building By-Law 1984.

1.2. All conceal ceilings shall be provided with service access to the ceiling void for maintenance of services above the ceiling space in accordance to the Drawings and approval of the S.O..

1.3. All sprinkler heads (drops) shall have 12.5mm diameter oversize ring, sleeve or adaptor through the ceiling tile to allow for free movement of the sprinkler pipes. It shall also comply with the local fire regulations and to the S.O.'s approval.

1.4. The Contractor shall not commence the ceiling installation works until the building is effectively weather-tight and the work area of wet trades has been completed and dried.

2. Submittals

2.1. Unless otherwise specified, the Contractor shall submit manufacturer's shop drawings and design calculations for the complete proprietary ceiling system showing compliance to all specifications including the method of installation of the ceiling board/panels, hangers, fittings and all accessories duly certified by an Architect registered with the Board of Architects or a P.E. with practising certificate registered with the Board of Engineers Malaysia.

2.2. The contractor shall submit method statement from the proprietary ceiling system supplier/manufacturer of the installation works to the S.O. for approval prior to the commencement of the works at site. No installation of ceiling works shall commence until approval is given in writing by the S.O..

3. Setting Out

3.1. The ceiling layout shall be planned prior to installation to determine the grid configuration, direction et cetera to ensure that all fixings points are compatible with the structural members or other services, or both.

3.2. Mechanical and electrical services shall be completed before installation of the suspension systems. Mechanical services and electrical wiring systems, including cable trays, conduits, junction boxes, down-lights and other appurtenances shall be independently supported and independently braced from the ceiling support system. Suspension hangers may be installed before or during installation of services with the approval of the S.O..

3.3. The shop drawings used for the ceiling installation shall contain sufficient information to allow the installer to set out the ceiling grid. The finished height of the ceiling shall be shown clearly on the drawings.

3.4. Sufficient information should be clearly indicated on the drawings to enable the ceiling module and setting out points in each ceiling area applicable to all relevant trades to be established early. All trades shall work to the same setting out points and data.

3.5. The ceiling height in each area shall be marked in relation to the elevation benchmarks and then transferred by means of a water level, rotating laser or other

approved devices. Setting out lines should be in both directions and squared accurately at the outset.

4. Acoustic Requirements

4.1. Acoustic requirements specified or shown on the Drawings, such as sound absorption, sound insulation and impact sound insulation shall be tested in accordance with BS EN 13964, BS EN ISO 140 or other acceptable standards.

4.2. A full test report shall be submitted to the S.O. as proof of compliance. It shall relate to the entire specified system. Any variations shall be endorsed by the test laboratory or field testing. Test reports, comments and the testing authority shall be stated in the manufacturer's trade literature or be made available upon request or both.

4.3. All acoustic ceilings shall be of proprietary system using mineral fibre boards or spray applied cellulose on ceiling and/or soffit of slab as approved by the S.O. and conforms to class 'O' fire rating classification comply with BS 476 Part 6 & Part 7.

5. Materials and Ceiling Components

5.1. Zinc-Coated and Aluminium/Zinc Coated Steel

Zinc-coated and aluminum/zinc-coated steel used for the construction of suspended ceiling components shall comply with MS 1196 or other equivalent Standards. The Contractor shall provide proof of compliance to the approval of the S.O.. Where sections have been cut from zinc-coated or aluminium/zinc-coated sheets, the cut edges shall be treated with protective anti-rust paint to prevent corrosion. All pre-painted finish for ceilings shall be as specified under SECTION G: ROOFING.

5.2. Linear Strip Ceiling

Unless otherwise specified or shown on the Drawings, linear strip ceiling shall be aluminium pre-painted anodized comprising of 150mm width x 12.5mm deep x 0.6mm thick panel fixed in accordance to manufacturer's recommendation and to S.O.'s approval.

5.3. Plasterboard

5.3.1. All plasterboards dimensions, its tolerances and flexural breaking load shall comply with BS EN 520. The board shall carry class 'O' approval from DGFR.

5.3.2. Unless otherwise specified in the Drawings the size for plasterboard ceiling shall be 600mm x 1200mm x 9mm thick minimum and shall be suspended from the soffit with adjustable hanger rods in accordance to manufacturer's recommendation and S.O.'s approval.

5.4. Plasterboard with improved core adhesion at high temperature (Type F)

The type of board and test requirements shall be in accordance with BS EN 520, and to the approval of the S.O.. The board shall carry Class 'O' approval from DGFR.

5.5. Plasterboard with reduced water absorption (Type H)

The types of moisture resistance board to receive paint finish shall be in accordance with BS EN 520 and to the approval of the S.O.. The board shall carry Class 'O' approval from DGFR.

5.6. Mineral Fibre Boards

5.6.1. Unless otherwise specified, the board size shall be 600mm x 1200mm x 15mm thick square edges. The board shall carry Class 'O' approval from the DGFR and the minimum sag resistance shall be of RH 99.

5.6.2. Surface coating of the board shall be applied with vinyl latex paint in white colour at factory and the surface design/texture of the board shall be to S.O.'s approval.

5.7. Fibre Cement Ceiling Panel

Fibre cement ceiling panel shall be asbestos free and shall be an autoclaved cellulose fibre cement flat board. The basic composition consists of cement, refined sand and cellulose fibre. The material shall be classified as Class 'O' and shall be 'Fire- Listed' under SIRIM QAS Fire Listing Scheme.

5.8. Acoustic Glass Wool Ceiling Panel

Acoustic glass wool ceiling panel shall be lightweight fibre glass wool material with high acoustical sound absorption of NRC: 0.90-1.00 (ASTMC 423). Unless otherwise specified the size of the panel shall be 600mm x 1200mm x 20mm thick, square edge fixed to aluminium tee exposed grid systems, suspended from the soffit with adjustable hanger rods in accordance to manufacturer's recommendation and S.O.'s approval.

5.9. Glass Fibre Reinforced Gypsum (GRG)

5.9.1. GRG Boards are manufactured by glass fibre reinforced gypsum and comprise of non-combustible high-grade gypsum casting plaster with glass fibre membranes. Unless otherwise specified shall be in sizes of 1200mm X 900mm x 9mm thick. The board shall conform to the following:

Fire performance : GRG Boards are rated non-combustible as defined in BS 476: Part 4.
Dry Density : Approx. 1660kg/m²

5.9.2. GRG boards shall be installed in accordance to the manufacturer's recommendation and to S.O.'s approval.

5.10. Cornice

5.10.1. Unless otherwise specified, cornice shall be provided of the same ceiling material for all plaster ceiling materials.

5.10.2. Cornice shall be fixed to the walls and ceiling using proprietary adhesive or as recommended by the manufacturer and approved by the S.O..

5.10.3. Large cornices shall be fixed using screws together with cornice adhesive as recommended by the cornice manufacturer and to S.O.'s approval.

5.10.4. Cornice should be carried and handled carefully to avoid cracking the core or wrinkling the paper liner. Where possible, the contractor shall use full lengths of cornice and mitre all joints.

5.10.5. The Contractor shall ensure accurate and level placement by marking ceilings and walls with a line at the cornice edge.

5.10.6. Cornice with shorter length shall be installed first followed by the longer lengths by bowing out to spring mitres fit into place.

5.11. Reinforcing/Jointing tape

The tape shall not be less than 50mm width paper tape in accordance with ASTM C475 from an approved manufacturer, and to the approval of the S.O..

5.12. Jointing compound

Jointing compound shall setting type or pre-mixed multi-purpose gypsum based air drying type compound, in accordance with BS EN 13963 and to the approval of the S.O..

5.13. Sealants

The application of fire sealant for plasterboard with improved core adhesion at high temperature (Type F) and wet area sealant for plasterboard with reduced water absorption (Type H) shall be in accordance with BS 8212 and to the approval of the S.O.. The appropriate type of sealant shall be used for the required type of plasterboard. Elastomeric sealants can be used at the perimeter of the dry lining or partitioning to provide an airtight construction and to the approval of the S.O..

5.14. Control joint

Unless otherwise specified, control joints shall be provided in a long continuous run of ceiling, spaced at not more than 12 meters centres maximum and recommended by the manufacturer and to the approval of the S.O..

5.15. Anchors and Fasteners

5.15.1. The Contractor shall submit the details of the proposed proprietary anchor to the S.O. for approval.

5.15.2. Notwithstanding the above, the alternative anchor proposed shall be made of carbon steel galvanized to minimum thickness of 5 μm or stainless steel in accordance to European Technical Approval Guideline ETAG 001 Metal Anchors for Use in Concrete.

5.15.3. The size of the anchor fixing shall not be less than 6mm diameter (M6) with effective anchorage depth of not less than 30mm measured from the soffit of the floor slab. The hole for the anchor shall be drilled using drill bit of corresponding size to the proprietary anchor. The design resistance in all load directions shall not be less than 1.10kN.

5.15.4. Shot-fired alternative anchors shall not be allowed. Shot-fired (hybrid-pin) alternative anchors shall not be used to install the suspended ceiling hangers to the concrete soffit. Screws with nylon wing plugs shall not be used as ceiling anchors to install the suspended ceilings.

5.15.5. Fasteners shall have a corrosion-resistant finish and be appropriate for intended use, in accordance with BS EN 14566. The heads of fasteners shall be shaped so that they can be driven slightly below the surface of the plasterboard without punching through the paper liner.

5.16. Acoustical Cellulose Insulation

5.16.1. Spray Applied Acoustical Cellulose Insulation on ceiling and/or soffit of slab shall be:

5.16.1.1. Thickness – minimum 30mm

5.16.1.2. Thermal conductivity (k-value) = 0.0029 W/mK tested to ASTM C-177.

5.16.1.3. Fire retardant Class "O" complying with BS476 Part 6 & 7 and endorsed by Jabatan Bomba Dan Penyelamat Malaysia.

5.16.1.4. Average moisture absorption of not more than 15% as per ASTM C739.

5.16.1.5. Tested Noise Reduction Coefficient of NRC 0.75 at 30mm thickness.

5.16.1.6. Tested to be non-toxic and asbestos free, contain no carcinogenic materials and shall not cause any skin irritation to humans

5.16.2. Where required, appropriate surface preparation and treatment should be done on the surface of the substrate according to manufacturer's recommendation.

5.16.3. The application of cellulose insulation shall be applied strictly to manufacturer's method statement and to S.O.'s approval

6. Ceiling Suspension System

6.1. General

6.1.1. Batten system (furring channels) as vertical ceiling hangers shall not be allowed for the installation of proprietary ceiling system.

6.1.2. Where grid ceiling suspension system are installed exposed to wind condition (outside building), all lay-in ceiling panels/boards shall be secured to the suspension system with minimum two proprietary `hold-down clip' for each tile as recommended by the manufacturer and approved by the S.O..

6.1.3. Only proprietary adjustable butterfly type locking clips (rod joiner) shall be used with a minimum thickness of 0.48mm and galvanize coating mass of minimum 80g/sq.m. The locking clips shall be of minimum steel grade SK-5 or approved equivalent with a minimum pull off strength of 110kgs.

6.2. Fixed Ceiling System

6.2.1. Timber framing or metal framing system shall be designed and installed to support the fixed ceiling panels/boards on the external or outside space of the building as shown on the Drawings.

6.2.2. All timber materials used shall be treated and as specified under SECTION H: TIMBER, JOINERY AND IRONMONGERY. Unless otherwise specified, ceiling boards fixed to the timber frames shall be with butt 'V' joint using nails or screws as recommended by the ceiling manufacturer and to S.O.'s approval.

6.2.3. Where conceal ceiling are used, all ceiling panels/boards fixed to the metal frames shall be screwed permanently to the metal framing system as recommended by the ceiling manufacturer and to S.O.'s approval.

6.2.4. All screw fixings of the ceiling panel/boards to the framing system shall be completely sealed to match with the ceiling surface. All external ceiling shall be painted with weather resistant paint as specified under SECTION O: PAINTING.

6.3. Grid Ceiling Suspension System

6.3.1. Vertical suspension members

6.3.1.1. Ceiling hangers shall be galvanized mild steel machine straightened hanger rods of minimum 4mm diameter consisting of 2 pieces length with a galvanization thickness of minimum 80g/sq.m and tensile strength of minimum 350MPa., held together by a galvanized rod joiner (adjustable type galvanized locking clips). Only proprietary adjustable locking clips (butterfly type) shall be used as a rod joiner.

6.3.1.2. Proprietary anchor fixing shall not be less than 6mm diameter (M6) with effective anchorage depth of not less than 30mm measured from the soffit of the floor slab. The hole for the anchor shall be drilled using drill bit of corresponding size to the anchor. The proprietary anchor is fixed to the structural soffit at a distance 200mm away from the wall and then spaced equal to or not more than 1200mm centre to centre (c/c) to form the grid of the ceiling hanger

6.3.1.3. One end of the hanger shall be attached to a pre-drilled galvanized mild steel L-shaped soffit cleat 25mm x 25mm x 50mm (width) and minimum base metal thickness of 2mm with a galvanization thickness of mimimum 80g/sq.m for suspending the pre-straightened hanger rod. The other end of the hanger shall be secured using proprietary locking clips to the primary T-section. The T-sections shall be fixed accordingly to the required ceiling level by adjusting the length of the ceiling hanger through the rod joiner.

6.3.1.4. One end of the pre-straightened hanger rod shall be hooked to the pre-drilled soffit cleat and the other end of the hanger shall be secured to the primary T-section using proprietary locking clips. The T-sections shall be fixed accordingly to the required ceiling level by adjusting the length of the ceiling hanger through the rod joiner

6.3.1.5. The proprietary adjustable locking clips (butterfly type rod joiner) shall be 0.5mm minimum thickness with galvanize coating mass of minimum 80g/sq.m. The locking clips shall be of minimum steel grade SK-5 and with a minimum pull off strength of 110kgs.

6.3.2. Horizontal suspension members

6.3.2.1. The T-grid system shall be manufactured to a minimum 24mm width x 30mm height T-section rigidized (rotary stitching) on all T-sections and with a load carrying capacity of minimum 20kgs/m² per ASTM C635. All T-sections shall be in powder coated colour white. Installation shall refer to manufacturer's method statement.

6.3.2.2. Perimeter wall angles shall be securely fixed to the adjacent perimeter walls using appropriate fixings forming part of the grid ceiling system as recommended by the manufacturer and approved by the S.O..

6.4. Concealed Ceiling Suspension System (Soffit-ceiling distance < 1800mm)

Unless otherwise shown on the Drawings and when the distance between the concrete soffit and the suspended ceiling board is less than 1800mm in vertical height, the concealed ceiling suspension system shall be as follows:

6.4.1. Vertical suspension members

6.4.1.1. Ceiling hangers shall be rigidized galvanize mild steel 25mm x 25mm angle section with 0.5mm base metal thickness OR galvanized mild steel machine straightened hanger rods of minimum 4mm diameter with a galvanization thickness of minimum 80g/sq.m and tensile strength of minimum 350MPa. The rod shall be in 2 pieces and should be used in conjunction with the adjustable suspension (butterfly type) clip/rod joiner. Levelling of the ceiling shall be executed in accordance with manufacturer's method statement.

6.4.1.2. Proprietary anchor fixing shall not be less than 6mm diameter (M6 or ¼") with effective anchorage depth of not less than 30mm measured from the soffit of the floor slab. The hole for the anchor shall be drilled using drill bit of corresponding size to the anchor. The proprietary anchor shall be fixed to the structural soffit at a distance 200mm away from the wall and then spaced equal to or not more than 1000mm centre to centre (c/c) to form the grid of the ceiling hanger

6.4.1.3. Where hanger rods are used, one end of the hanger rod shall be attached to a pre-drilled galvanized mild steel L-shaped soffit cleat 25mm x 25mm x 50mm (width) with minimum base metal thickness of 2mm. The other end of the hanger shall be secured using proprietary locking clips to the primary channel (main runners).

6.4.1.4. Where mild steel angle sections are used as ceiling hangers, one end of the ceiling hanger shall be connected to the pre-drilled proprietary anchor fastener to the soffit slab. The other end of the hanger shall be secured using proprietary locking

clips or suspension brackets to the primary channel (main runners).

6.4.2. Horizontal members

6.4.2.1. Primary rigidized galvanised steel channel (main runners) shall be 34mm x 12mm x 0.4mm minimum BMT at a distance of 100mm away from the wall and spaced equal to or not more than 1000mm c/c (the minimum thickness may varies according to the profile with larger cross section values with appropriate justification from manufacturer). Installation shall refer to manufacturer's method statement.

6.4.2.2. Secondary rigidized galvanize steel channel 34mm x 12mm x 0.4mm minimum BMT shall be secured using proprietary locking clips or suspension brackets to the primary channel.

6.4.2.3. The primary and secondary channels shall be connected using galvanized proprietary locking clips or suspension brackets with minimum thickness of 0.5mm (the minimum thickness may varies according to the profile with larger cross section values with appropriate justification from manufacturer) and screwed as recommended by the manufacturer. And no tilting movement are allowed on Primary channel once secured with locking clips.

6.4.2.4. Unless otherwise specified, a single layer 9mm thick gypsum plasterboard ceiling shall be screwed using galvanized wafer head dry wall screw Ø 4mm x 25mm length fixed at maximum distance of 200mm c/c to the secondary channel as recommended by the manufacturer.

6.5. Concealed Ceiling Suspension System (Floor-ceiling distance > 1800mm)

Unless otherwise shown on the Drawings or when the distance between the concrete soffit and the suspended ceiling board exceeds 1800mm in vertical height, the concealed ceiling suspension system shall be as follows:

6.5.1. Vertical suspension members

6.5.1.1. Ceiling hanger system shall be galvanized mild steel threaded rods of not less than 6mm diameter.

6.5.1.2. Fixing of vertical suspension hangers to soffit slab shall be by using threaded rod and proprietary anchor (drop in anchor or equivalent). Identify the actual location of suspended point on site, mark the position for drilling, the position should no more than 100mm away from the perimeter wall, drilling at least 28mm depth. Insert corresponding diameter drop-in anchor or equivalent, for best result hammer the "pin" slightly inside the drop-in-anchor. Cut threaded rod to require suspension length and screw fix the threaded rod into the corresponding diameter drop-in-anchor or equivalent. Slightly pull the threaded rod to check the fixing.

6.5.1.3. One end of the threaded ceiling hanger rod shall be connected to the pre-drilled anchor fastener (drop-in anchors or equivalent) and the other end of the threaded rod shall be secured to the proprietary locking clips or suspension

brackets with two M6 nuts and locked to the primary channel (main runners).

6.5.2. Horizontal members

6.5.2.1. Primary channel shall be galvanised steel 38mm x 12mm x 1mm thick minimum placed at a distance of 100mm away from the wall and spaced equal to or not more than 1000mm c/c. The primary channel shall have the characteristic strength of at least 250N/mm². Installation shall refer to manufacturer's method statement

6.5.2.2. The dimension of the secondary channel shall be at not less than 50mm x 20mm x 0.5mm thick minimum place at 450mm c/c minimum for 9mm thickness board and 600mm c/c minimum for 12mm thickness board. The secondary channel shall have the characteristic strength of at least 250N/mm².

6.5.2.3. The primary and secondary channel shall be connected using galvanize proprietary locking clip with minimum thickness of 0.5mm (the thickness may vary according to the profile with larger cross section values with appropriate justification from manufacturer) and screw as recommended by the manufacturer.

6.5.2.4. Unless otherwise specified, a single layer 9mm thick minimum plasterboard ceiling shall be screwed using galvanized dry wall screw Ø4mm x 25mm length at maximum 200mm c/c to the secondary channel as recommended by the manufacturer.

6.6. Performance and Installation Requirements

6.6.1. Suspended ceiling systems are not designed for and shall not be regarded as structural elements. Electrical wiring systems, including cable trays, conduits, junction boxes, lighting fixtures, air-conditioning ducts, air diffusers and other appurtenances shall not be placed directly on the ceiling and shall be independently supported and independently braced from the structure.

6.6.2. Suspended ceilings shall be designed to ensure that detrimental levels of water and condensation are not formed within or on the surfaces of the ceiling and related components and the ceilings shall be designed according to Class C conditions of BS EN 13964.

6.6.3. Other steel components of the substructure such as supporting member, perimeter trim, et cetera shall have a characteristic strength of at least 250N/mm² and their tolerances shall comply with BS EN 13964. No bends or notches or drilling or other alterations from its original state are allowed on steel components unless allowed by the manufacturer.

6.6.4. Where not specified, tolerances for the ceiling shall comply with BS EN 13964. The maximum deflection between two suspension points shall not exceed L/500 where L is the suspension distance between the two points.

6.6.5. The top fixing of all suspension components shall be made to the primary structural framing element, unless specifically designed otherwise. The contractor shall ensure the fixings are of a corrosion-

resistant material suitable for the intended application, and fixings shall be compatible with the material of the structure to which they are to be fitted.

6.7. Structural steel fixing

6.7.1. Self-drilling screws are not allowed for structural steel, unless specifically designed otherwise. These screws shall not be placed in tension unless specifically designed for that purpose.

6.7.2. Penetrations made into the structural steel by drilling shall be duly approved by the S.O..

6.7.3. Clips shall be installed strictly in accordance with the manufacturer's recommendations.

6.8. Cold formed truss/timber truss fixing

6.8.1. Suspended ceiling system fixings to cold formed trusses shall only be allowed by using steel plate straps. For the case of proprietary truss systems, the Contractor shall obtain written approval from the Truss System Provider and the S.O..

6.8.2. Fixings to timber joists shall be made into the side of the timber, with five times the diameter of the fastener clear edge distances.

6.9. Glued laminated timber fixing

Top fixing to glued laminated timber members shall only be allowed with the approval of a P.E. The glued laminated timber shall be fabricated as specified under SECTION H: TIMBER, JOINERY AND IRONMONGERY.

6.10. Concrete fixing

6.10.1. Shot-fired fasteners are not allowed to be installed directly to a concrete flat roof slab. Separate structural framing element for ceiling fixing shall be specifically designed if required, and it shall be approved by the S.O..

6.10.2. Fixing to aerated/lightweight concrete shall only be made in accordance with the manufacturer's recommendations.

6.11. Purlin fixing

6.11.1. Fixings shall be made of steel plate straps. No connections requiring drillings to the web/lip of the purlins are allowed, unless specifically designed otherwise.

6.11.2. Where flange connections are necessary, they should be made as close as possible to the web of the purlin, and design calculations shall be provided to ensure the structural capacity of the purlin is not compromised.

6.11.3. Fixings shall be selected and installed in accordance with the manufacturer's specification and approved by the S.O..

6.12. All concrete expansion bolts shall be installed in accordance with the manufacturer's recommendations taking due care to maintain minimum edge distances, spacing and embedment depth.

6.13. Ceiling hangers shall be installed in accordance to the ceiling system manufacturer's recommendation. Bends as means of levelling the ceiling or to avoid plenum services, shall not be made in the ceiling hangers. Where ceiling hangers cannot be secured at the specified spacing, secondary members shall be installed to manufacturer's recommendation.

6.14. In areas where the suspended ceiling is adjacent to rooms or areas with twenty four (24) hours air-conditioning and the concrete soffits are applied with PU foam, the ceiling suspension hanger shall be secured to the concrete soffit using M6 x 30mm A4 stainless steel (DIN17440) anchor bolts as specified or shown on the Drawings.

6.15. Unless otherwise shown on the Drawings, plasterboard partitions shall be fixed to the primary framing members of the ceiling suspension system in accordance with of BS 8212.

6.16. Suspended Ceiling Exposed to Wind (Outside Building).

6.16.1. Wind Load

6.16.1.1. The minimum basic wind speed shall be 35 m/s. However, the minimum basic wind speed shall be increased to 41m/s for lightweight covering.

6.16.1.2. The requirement of wind load shall be as stated in the MS 1553 – Code of Practice on Wind Loading for Building Structures. The minimum basic wind speed shall be as specified above or as per the value stated in MS 1553 whichever higher.

6.16.1.3. Load combinations shall be clearly identified (as per MS EN 1993 Part 1 to Part 3 or other equivalent standards recognised internationally) and itemised to enable design checking to be carried out upon the most adverse conditions or the effect (e.g. effect of uplift) under consideration.

6.16.1.4. Where grid ceilings system is installed to areas exposed to wind condition (outside buildings), all lay-in ceiling panels/boards shall be secured to the suspension system with minimum two proprietary `hold-down clip' for each tile as recommended by the manufacturer and approved by the S.O.. Installation shall refer to manufacturer's method statement.

6.17. Testing and Inspection

6.17.1. The Contractor shall carry out in-situ Pull-Out Test for the complete ceiling suspension (hanger) system inclusive of the rod joiner and the anchors. The sampling rate shall be 5 samples for every 200 number of hangers installed and the points of testing shall be carried out subject to S.O.'s approval.

6.17.2. The minimum load for the pull-out test shall be 0.5 kN applied to each complete ceiling suspension sample inclusive of rod joiner where applicable. The test sample shall be left for the duration of 8 hours and the observation shall be recorded and submitted to the S.O. for approval.

6.17.3. The Contractor shall inform the S.O. in writing to request for inspection and approval prior to closing up of the ceiling suspension system with ceiling panels.

6.18. Warranty

6.18.1. When a proprietary ceiling system is used, the Contractor shall submit to the S.O. a warranty from the manufacturer with the following provisions:

6.18.1.1. The products used are genuine and free from manufacturing defects;

6.18.1.2. The complete ceiling suspension (hanger) system are installed in accordance with the manufacturer's method statement, recommendation, guidance and specifications that will deliver the specified level of performance;

6.18.1.3. The warranty certificate shall cover a period of ten (10) years from the date of Certificate of Practical Completion against any defect or failure due to the installation and workmanship by the manufacturer's registered panel installer.

TABLE OF CONTENT

1. General

1.1. Cement

1.1.1. The cement, unless otherwise described shall be Ordinary Portland Cement, complying with MS EN 197-1 as specified in SECTION D: CONCRETING or Masonry Cement complying with MS EN 413-1.

1.1.2. White and coloured cement shall be of approved manufacture.

1.2. Plasticiser

The plasticizer shall be of approved manufacture and used strictly in accordance with the manufacturer's recommendation.

1.3. Plasterlime

The plasterlime shall be of approved manufacture and shall comply with BS 890 and shall be applied strictly in accordance with the manufacturer's recommendation.

1.4. Sand

The sand for external rendering, internal plastering and floor screeding shall comply with MS 30 for fine aggregates. Sand for plastering using gypsum shall comply with MS 701.

1.5. Water

Water for mixing shall be clear and free from harmful matter as specified in SECTION D: CONCRETING.

1.6. Mixing

1.6.1. All mixing of mortar for plaster and screed shall be done by machine. Hand mixing shall only be allowed for small quantities and with the approval of the S.O.. Hand mixing shall be done on a clean platform. The water content of the mix shall be only the minimum required to give a workable mix.

1.6.2. Mortar for plaster and screed shall be used up within forty five (45) minutes after mixing.

1.6.3. For gypsum plaster, mixes shall be used up within one (1) hour after mixing.

1.6.4. No remaking of the mix shall be permitted thereafter.

1.7. Surface Preparation

1.7.1. Where possible cement paving, screeding and rendering on concrete surface shall be laid while the concrete is still green that is after the final set but not later than twenty-four (24) hours of laying concrete. The concrete surfaces shall be brushed with a stiff broom before it has hardened to remove laitance and give a roughened surface. Hardened concrete surfaces shall be thoroughly hacked to form a key to the approval of the S.O..

1.7.2. Before any paving, screeding or rendering is applied, all surfaces shall be thoroughly cleaned and wetted and be in damp state at the time the paving, screeding or rendering is applied.

1.7.3. Where plastering and rendering are to be applied in several coats, the surface of each preceding coat shall be scratched while still green to form key for the subsequent coat.

1.8. Bay

Paving and screeding shall be laid in alternate bays. On hardened concrete bases, each bay shall not exceed $15m^2$. On the surface where the concrete is still green, each bay shall not exceed $30m^2$. Where bays are not square, the ratio of the length between adjacent sides of each bay shall be approximately 1:1.5. The joints in paving screed shall coincide as nearly as possible with joints in the base.

1.9. Curing and Protection

Unless otherwise specified hereinafter, the screeds shall be cured for three (3) to seven (7) days after laying, and protected from rapid drying by covering with polyethylene sheets or tarpaulins and shall also be protected from any damage.

1.10. Making Good

1.10.1. Defective screeds shall be cut out and made good with fresh screed and sufficient time shall be allowed for the screed to dry prior to the laying of the floor finish.

1.10.2. Defective plastering and rendering shall be made good by cutting out the defective part to a rectangular shape, and the edges shall be undercut to form dovetail-key and finished flush with the surrounding work.

1.11. Samples

The Contractor shall supply the S.O. with samples of materials and/or sample of finished work for approval. Approved samples shall be kept at site for reference.

1.12. Tools

Proper tools shall be used for all scribing, scoring, splicing, smoothing edges, making angles et cetera of tiles, bricks and others so as to produce neat and fit joints.

1.13. Types of Finishes

The appropriate type of finishes to be used in the various locations of the works shall be as shown on the Drawings or as tabulated in the schedule of finishes. Unless otherwise shown on the Drawings or described in the B.Q., the finishes and their dimensions shall be as specified hereinafter.

1.14. Cornices and Angles

1.14.1. The cornices and moulded work shall be clean and accurately formed to the section shown on the Drawings. All mitres, stops and enrichments and moulding shall follow the details as shown on the Drawings, all to the approval of the S.O..

1.14.2. All rounded and moulded angles shall be of the same material mix as the adjacent finish. For narrow reveal, splays and returns under 30mm wide, Class D plaster to BS 1991 shall be used.

2. Plaster Work

2.1. Plain Plaster

2.1.1. Plain plaster shall consist of one (1) part masonry cement to six (6) parts sand by volume. Where CEM 1 is used, plasticizer or plasterlime shall be added to the mix in accordance with the manufacturer's instruction.

2.1.2. The plaster shall be applied in two coats generally to a total thickness of 20mm to brickwall and 12mm to soffits, beams, columns, brick-walls and other smooth surfaces.

2.1.3. The first coat shall consist of rough plastering to a thickness of 10mm for 20mm plainface, and 6mm for 12mm plainface. The second coat shall be finished with a steel trowel for internal surfaces and with a straight-edged wood float for external surfaces.

2.1.4. All external walls, unless otherwise specified shall be finished with rough surface cement plastering.

2.1.5. All internal walls, unless otherwise specified shall be finished with smooth skimmed surface cement plastering.

2.2. Granolithic Plaster

2.2.1. Granolithic plaster shall consist of by volume, two (2) parts cement, one (1) part sand, five (5) parts granite chipping passing 6mm mesh and retaining upon 3mm mesh, applied in two (2) coats to a total thickness of 10mm to a backing coat, finished smooth with wood float.

2.2.2. The backing coat shall consist of 12mm thick plain plaster as described herein before. The finished surface shall be brushed lightly to achieve the required texture after it has reach initial set.

2.2.3. Shanghai plaster shall consist of two (2) parts approved coloured cement, one (1) part sand and five (5) parts of selected lime-stone chipping passing 6mm mesh and retaining upon 3mm mesh by volume applied in two (2) coats to a total thickness of 10mm to the backing coat, finished smooth with wood float.

2.2.4. The backing coat shall consist of 12mm thick plain plaster as described hereinbefore. The finished surface shall be brushed lightly to achieve the required texture after it has reached initial set.

2.3. Shanghai Plaster

2.3.1. Shanghai plaster shall consist of two (2) parts approved coloured cement, one (1) part sand and five (5) parts of selected lime-stone chipping passing 6mm mesh and retaining upon 3mm mesh by volume applied in two (2) coats to a total thickness of 10mm to the backing coat, finished smooth with wood float.

2.3.2. The backing coat shall consist of 12mm thick plain plaster as described hereinbefore. The finished surface shall be brushed lightly to achieve the required texture after it has reached initial set.

2.4. Textured Finish Plaster

2.4.1. Textured finish plaster shall consist of a 20mm thick backing coat of plain plaster as described hereinbefore ruled into a plain and even surface and a finishing coat as on the Drawings and described hereinafter.

2.4.2. For rough cast finish, the mix shall consist of selected cement, sand and aggregate in the proportion to give the required finish to the approval of the S.O..

2.4.3. For Tyrolean finish, the mix shall consist of one (1) part selected coloured cement, and two (2) parts sand by volume applied to the backing coat by means of a Tyrolean machine in accordance with the manufacturer's recommendation. The finish shall be built up in three (3) layers to a total thickness of not exceeding 6mm. Each coat shall be allowed to dry before the application of a subsequent coat.

2.4.4. For pebble-dash finish, the dry pebble for the finish shall be thrown onto the backing coat while the latter is still wet. The pebbles to be used shall be clean and of size and quality approved by the S.O..

2.4.5. For pebble-wash finish, the selection of pebbles shall be clean and of size, colour and quality approved by the S.O.. The selected pebbles shall be mixed with plain plaster and applied while it is still wet in a single coat generally to a total thickness of 12mm to a backing coat. The applied surface is tapped to set the pebbles in position. The pebbles shall be brushed and washed lightly to achieve the required texture after it has reached the initial set. Loose pebbles shall be placed back in position and by tapping the surface to set.

2.5. Gypsum Plaster

2.5.1. Gypsum plaster, or plaster of Paris, is produced as a proprietary dry plaster powder and when it is mixed with water, it re-forms into gypsum. The ratio of the gypsum powder mix to the amount of water shall be as recommended by the manufacturer.

2.5.2. The setting of unmodified plaster starts about ten (10) minutes after mixing and is complete in about forty-five (45) minutes; but not fully set for seventy two (72) hours. The total gypsum plaster thickness for vertical and horizontal masonry and concrete surfaces shall be 16mm.

2.5.3. The resulting paste hardens as it cools, forming a relatively soft, pliable finished product. Unlike mortar or cement, which dries much harder, gypsum plaster can be sanded or otherwise manipulated once cured, making it a good option for aesthetic, non-load bearing purposes.

2.5.4. Gypsum plaster is renowned for its use as an art medium and is often use in conservation works especially for decorative embellishment. It is also used to simulate the appearance of surfaces of wood, stone or metal.

2.6. Lime Plaster

2.6.1. Typical lime plaster mix shall consist of one (1) part lime putty to three (3) parts of washed, well graded sand. The lime putty is mixed at one (1) to three (3) ratios, creates a compact plaster.

2.6.2. Water is added to produce slaked lime (calcium hydroxide), which is sold as a wet putty or white powder. Water is added to the white powder mix as per the manufacturer's recommendation.

2.6.3. Water is added to the proprietary lime plaster mix as per the manufacturer's recommendation to form a workable paste prior to use. Lime plaster is used as an alternative to or in combination with ordinary Portland cement. It is commonly used for decorative works such as mural paintings on walls, ceilings or any type of flat surface.

2.6.4. Once the water is mixed it shall be stored in an air-tight container. Once exposed to the atmosphere, the calcium hydroxide turns back into calcium carbonate, causing the plaster to set.

2.7. Barium Plaster

The plastering of internal surfaces of X-Ray room walls shall be of barium plaster consisting of one (1) part cement, one (1) part barytes (barium sulphate) fines and three (3) parts barytes sand by volume.

2.8. Plaster to Sides of Manholes, Inspection Chambers and Septic Tanks

Plastering to sides of manholes, inspection chambers and septic tanks shall be as specified under SECTION F: SEWERAGE.

3. Paving Work

3.1. Cement Paving

3.1.1. Unless otherwise shown on the Drawings or described in the B.Q., cement paving shall be 20mm thick consisting of one part cement to three parts sand by volume. The paving shall be thoroughly rammed within 30 minutes of laying and trowelled smooth after it has stiffened sufficiently to prevent laitance being brought to the surface. Paving to apron shall finish to a slight fall towards surface drains.

3.1.2. Unless otherwise shown on the Drawings or described in the B.Q., skirtings shall be formed to a height of 150mm and thickness of 20mm, coved at bottom and rounded at top.

3.2. Granolithic Paving

3.2.1. Granolithic paving shall be 20mm thick, consisting of two (2) parts cement and five (5) parts granite chipping passing 6mm mesh and retained upon 3mm mesh by volume.

3.2.2. The chipping shall be washed and free from dust. The paving shall be trowelled smooth to proper level or fall where appropriate. After initial set the surface shall be brushed lightly to achieve the required textured finish.

3.2.3. Unless otherwise shown on the Drawings, granolithic skirting shall be 100mm high and 20mm thick, coved at bottom and slightly rounded at top.

3.2.4. Unless otherwise shown on the Drawings or described in the B.Q., the edge of threshold and treads of concrete stairs shall be finished with 150mm x 75mm x 12mm thick vitreous non-slip nosing tiles laid lengthwise bedded and pointed in 1:3 cement and sand mortar. The sides of open stringers shall be finished with granolithic plaster worked to profile of treads and risers to the approval of the S.O..

3.3. In-situ Terrazzo

3.3.1. In-situ terrazzo shall consist of one (1) part approved coloured cement and three (3) parts selected limestone chipping passing through 12mm mesh and retained upon 3mm mesh by volume.

3.3.2. The terrazzo topping shall be 20mm thick laid on 20mm thick cement and sand (1:3) screed. The concrete base to receive the screed shall be thoroughly cleaned and wetted.

3.3.3. While laying the screed, aluminium or brass strips of size 32mm wide x 3mm thick shall be set in vertically on edge into the screed to form panels. Each panel shall not exceed $4m^2$ with top edges of the strips standing sufficiently high to finish flush with the finished terrazzo floor level. The terrazzo shall be trowelled to a dense even finish.

3.3.4. When sufficiently hard but not less than two (2) days after being laid it shall be rubbed down to a smooth surface by means of carborundum stone.

3.3.5. Tile impregnator then shall be applied strictly in accordance to the manufacturer's recommendation onto the terrazzo surface to prevent future staining.

3.3.6. Unless otherwise shown on the Drawings or described in the B.Q., the edge of the threshold and treads of concrete stairs shall be finished with 150mm x 76mm x 12mm vitreous non-slip nosing tiles of approved colour laid lengthwise bedded and pointed. The sides of open stringers shall be finished with in-situ terrazzo working to profile of treads and risers to the approval of the S.O..

3.4. Waterproof Paving to Roof Slabs

Waterproof paving to roof slabs shall be as specified under SECTION D: CONCRETING.

3.5. Precast Concrete Paving

3.5.1. Unless otherwise shown on the Drawings or described in the B.Q., precast concrete paving slabs shall be of size 600mm x 600mm x 50mm thick each and made of 1:2:4-20mm concrete reinforced with `A6' fabric reinforcement to MS 145. The top surfaces of slab shall be brushed with stiff broom or wire brush after the initial set to give a rough finish.

3.5.2. Paving slabs shall be laid to the pattern as shown on the Drawings or approved by the S.O.. The slabs shall be bedded on 25mm thick semi-dry cement and sand (1:3) screed laid on 100mm thick properly compacted and blinded hardcore.

3.5.3. The joints between the paving slabs shall be 20mm wide filled with cement mortar (1:3) and raked to a depth of 6mm.

3.6. Interlocking Concrete Paving

3.6.1. Taking the existing sub-grade/soil conditions and the anticipated traffic loading into consideration, an adequate thickness of well compacted base course must be provided to ensure good pavement performance. Unless otherwise specified, existing bitumen or concrete surfaces need not be removed and can act as good sub-grade.

3.6.2. Interlocking concrete paving blocks shall comprise of segmental interlocking concrete paving units laid on minimum 30mm thick sand bedding course.

3.6.3. A layer of sand should be loosely spread and screed to a uniform thickness such that its compacted thickness would be approximately 30mm thick. It is important that the sand layer remains undisturbed prior to the laying of blocks.

3.6.4. The grade of the concrete and thickness of the paving blocks shall be as detailed in the Drawings.

3.6.5. Concrete edge restraints shall be provided at the perimeter of the pavement to ensure the paving blocks are tightly abutted and to separate areas of different laying pattern.

3.6.6. The paving blocks are placed side by side on the sand bed with gaps of approximately 2mm between adjoining blocks. The gap between the paving blocks shall be filled with fine sand of different grading to that required for the bedding sand.

3.6.7. The paving blocks can be cut to fit edges and awkward corners. The pavement which has been laid shall be compacted with a hand-guided plate vibrator until it is firmly embedded in the sand layer.

3.6.8. The general specification of the precast concrete paving blocks shall comply with MS 1380.

3.7. In-situ Concrete Paving Footpath

3.7.1. In-situ concrete paving shall consist of 75mm thick concrete of 1:3:6-20mm mix by volume as specified in Section D: CONCRETING, laid on 100mm thick properly compacted and blinded hardcore to panels as shown on the Drawings or as approved by the S.O..

3.7.2. The concrete shall be well compacted and floated with a wooden float to smooth and even finish. After the concrete has achieved the initial set, the surface shall be brushed with stiff broom or wire brush to give a rough finish.

3.7.3. The joints between the panels shall be filled with approved cold-poured polyurethane joint filler.

3.8. Brick Paving

3.8.1. Bricks for paving shall be of semi-vitreous bricks 225mm x 75mm x 50mm thick of approved quality and colour.

3.8.2. The bricks shall be soaked as specified in SECTION E: WALL SYSTEM before laying and shall be laid flat on 25mm semi-dry cement and sand (1:3) screed with 6mm spacing to the pattern as shown on the Drawings or as approved by the S.O..

3.8.3. The screed shall be laid on 75mm thick concrete (1:3:6-19mm) base founded on properly compacted and blinded 100mm thick hardcore. The joints shall be filled with cement mortar (1:2) and finish flush.

4. Tiling Work

4.1. Ceramic Tile

4.1.1. In general, all ceramic tiles manufactured locally are using the `dry-pressed' manufacturing process and the ceramic tiles are categorized based on their water absorption rate as defined in the MS 1294, MS ISO 13006 or the International Standard Organization (ISO) Standards (ISO 13006).

4.1.2. The methods and materials used in the installation of ceramic tiles under normal internal conditions shall comply with MS 1294-1 and the installation of ceramic tiles under normal external conditions shall comply with MS 1294-2.

4.1.3. The installation of tiling works requires skilled operatives working safely using protective clothing and equipment where appropriate; workmanship shall comply with BS 8000-11 for ceramic tiles.

4.1.4. Unless otherwise shown on the Drawings, ceramic tiles to internal and external floor for heavy duty areas shall be vitrified with water absorption less than 0.5% [Classification Group BIa] also referred to as heavy duty tiles shall comply with MS ISO 13006 and the size shall be tiles 300mm x 300mm.

4.1.5. Unless otherwise shown on the Drawings, ceramic tiles to internal floor areas under normal condition shall be vitrified with water absorption less than 3% [Classification Group BIa or, BIb] shall be vitreous hard wearing non-slip glazed complying with MS ISO 13006 and the tile size shall be 300mm x 300mm.

4.1.6. Unless otherwise specified in the Drawings or described in the B.Q., ceramic tile skirting shall match the flooring tiles and shall be 300mm x 100mm laid lengthwise on cement and sand (1:3) screed as described. All angles to skirting shall be neatly cut to fit all abutments.

4.1.7. Unless otherwise specified in the Drawings, accessories such as skirting (bull nose or cove base), step tiles, step nosing, edging strips, angle tiles (internal and external), etc. shall be of an approved type standard manufacture from the same material to match flooring. Unless otherwise shown on the Drawings, skirting shall be 100mm high, stair nosing shall be minimum 20mm wide laid full length of the treads and of bull nose profile, and edging strips 25mm wide.

4.1.8. Unless otherwise shown on the Drawings, ceramic tiles for internal walls shall be scuff-resistant glazed vitrified tiles with water absorption less than 6% [Classification Group BIb or BIIa] shall comply with MS ISO 13006. Unless otherwise specified, the minimum tile size shall be of 300mm x 300mm.

4.1.9. Unless otherwise shown on the Drawings, ceramic tiles for external walls up to first floor height shall be scuff-resistant glazed vitrified tiles with water absorption less than 3% [Classification Group BIa or BIb] and shall comply with MS ISO 13006. The tiles maximum size shall be of 300mm x 300mm.

4.1.10. Unless otherwise shown on the Drawings, ceramic tiles for external walls used above first floor height shall be scuff-resistant glazed vitrified tiles with water absorption less than 0.5% [Classification Group BIa] shall comply with MS ISO 13006. The tiles maximum size shall be of 300mm x 300mm.

4.1.11. Unless otherwise specified in the Drawings, all ceramic tiles for walls and floors shall be of 1st Grade or Grade A with approved surface finish & texture, colour and manufacture.

4.1.12. Ceramic tiles used for walls which have high water absorption characteristics shall be bedded with approved tile adhesive to the manufacturer's specification on 20mm thick cement and sand (1:3) render which has sufficiently cured. The tiles shall be laid with 2mm to 3mm gap and all joints shall be filled with approved tile proprietary grout to match. Exposed edges of tiling shall be finished with rounded on edge tiles. Ceramic tiles of Classification Group BIII with water absorption >10% shall not be used under any conditions.

4.1.13. Porous tiles shall be soaked before fixing to prevent rapid suction and subsequent failure in bonding with the mortar bed. Tiles should be removed from their cartons and completely immersed in clean water for at least thirty (30) minutes. After soaking, they should be stacked tightly together, with the end tiles face outwards, on a clean surface and allowed to drain. Tiles classified in MS ISO 13006 in Groups BIIb and BIII require this saturation treatment; soaking of tiles of Group BIa, BIb and BIIa is unnecessary, refer to MS 1294-1.

4.1.14. Unless otherwise instructed by the manufacturer, the tiles should be fixed dry. All tile installation shall use approved type cementitious adhesives. The selection and application of ceramic tile adhesives for internal and external tile installations on walls and floors shall comply with MS ISO 13007-1 and MS 1294.

4.1.15. Grouts used shall be of proprietary grout with good working characteristics, low shrinkage and good adhesion to edges of the tiles complying with MS ISO 13007-3. The selection of the type of grout shall be to the manufacturer's recommendation. Sanded grout shall be used for tile joint width of 4mm or more. Non-sanded grouts shall be used for installation in joints of 4mm width or less. The application of ceramic tile grouts for internal and external tile installations on walls and floors shall comply with MS 1294.

4.1.16. Tiles shall be laid with joints not exceeding 3mm wide to be filled with coloured grout. Admixtures shall be used in accordance with the manufacturer's recommendation and they shall not be added to the proprietary grout unless approved by the grout manufacturer. Admixtures

are added for improving the resilience and reducing the water permeability of the hardened grout mortar.

4.1.17. Unless otherwise shown on the Drawings, movement joints should be located in the tiles installation to coincide and be continuous with all existing structural movement joints, although they are actually formed as separate joints isolated by suitable thickness of back-up material.

4.1.18. Unless otherwise shown on the Drawings, the movement joints with consultation with the designers shall be positioned at the following locations:

4.1.18.1. Over existing and/or structural movement joints;

4.1.18.2. Where tiling abuts other materials;

4.1.18.3. Where tiling is continuous across junctions of different background materials;

4.1.18.4. In large tile areas, at internal vertical corners and at 3m to 4.5m centers horizontally and vertically; and

4.1.18.5. Where stresses are likely to be concentrated, for example at changes of alignment.

4.1.19. Unless otherwise specified in the Drawings, joint sealant materials for movement joints shall be selected and applied in accordance with the guidance given BS 6213.

4.1.20. Where large format ceramic tiles are required for walls and to be fixed above first floor height, they shall be secured by mechanical means. When the thickness of tile exceeds 12.5mm and the weight of tile is more than 32kg/m^2, mechanical fixing is recommended. All mechanical fixing methods shall be certified by a competent Professional Engineer and to the approval of the S.O..

4.1.21. Pull-out test shall be carried out after twenty-eight (28) days installation for every maximum area 500m^2 or on the tiles that are suspected of hollowness, at the instruction of the S.O..

4.1.22. Adhesion strength of the pull-out test shall exceed 0.5 N/mm^2 for walls with cement: sand mortar bedding or 1.0N/mm^2 with adhesive bedding. Pull-out test shall be carried out in accordance to MS ISO 13007-2 and as recommended by the tile adhesive manufacturer. Location and number of test point for the pull-out test shall be as requested by the S.O..

4.2. Precast Terrazzo Tiles

4.2.1. Unless otherwise shown on the Drawings, precast terrazzo tiles of an approved manufacture shall be 100mm x 300mm x 20mm thick machine-pressed tiles comprising of 6mm limestone aggregate and coloured cement.

4.2.2. The tiles shall be soaked prior to laying and shall be laid butt jointed on 20mm thick semi-dry cement and sand screed. The laying shall be done while the screed is still green. All joints between the tiles shall be grouted with coloured cement to match.

4.2.3. The tiles shall be rubbed down to a smooth surface after a minimum of two days or laying by means of Carborundum stone. Tile impregnator shall then be applied strictly in accordance with the manufacturer's recommendation on to the terrazzo surface to prevent future staining.

4.2.4. Unless otherwise stated in the Drawings, nosing and edging tiles to edges of flooring and treads of concrete stairs shall be of an approved type and to match with the flooring accessories such as skirting (bull nose or cove base), step tiles, step nosing, edging strips, angle tiles (internal and external), etc. shall be of an approved type from the same material to match flooring.

4.2.5. Unless otherwise shown on the Drawings, skirting shall be 100mm high, stair nosing shall be minimum 20mm wide laid full length of the treads and of bull nose profile, and edging strips 25mm wide.

4.3. Mosaic

4.3.1. Unless otherwise shown on the Drawings, mosaic tiling to floors shall be semi-glazed tiles and shall be of an approved colour and manufacture.

4.3.2. Unless otherwise shown on the Drawings, mosaic tiling to walls shall be fully glazed tile and shall be of approved colour and manufacture.

4.3.3. Unless otherwise shown on the Drawings or described in the B.Q., all skirting shall be 100mm high to match floor tiling. The tiles at the bottom of the skirting shall be set at 45^0 to the horizontal and the top finished with cove tiles or edging strips to manufacturer's recommendation. The tiles required to form angles to skirting shall be neatly cut and fit to all abutments.

4.3.4. Mosaic tiling to floors shall be bedded on 20mm thick semi-dry cement and sand (1:3) screed, laid on the concrete base which has been thoroughly cleaned and wetted.

4.3.5. Mosaic tiling to walls shall be evenly buttered with cement:sand mortar before bedding on 20mm thick cement and sand (1:3) screed which has sufficiently cured. Alternatively the tiling shall be bedded with approved proprietary adhesive to manufacturer's recommendation onto the cement screed.

4.3.6. During bedding, the surface of the mosaic shall be checked and any unevenness shall be made good. Any misaligned or defective tiles shall be adjusted or replaced. All joints shall be grouted with approved proprietary grout or coloured cement and sand grout to match. The tiling shall be allowed to mature under damp condition for at least four (4) days before cleaning down.

4.3.7. The selection and application of tile adhesives for internal and external mosaic installations on walls and floors shall comply with MS ISO 13007-1. The selection and application of tile grouts for mosaic installations on walls and floors shall comply with MS ISO 13007-3.

4.4. Quarry Tiles

4.4.1. Quarry tiles shall be of non-slip type 150mm x 150mm x 12mm thick complying with MS 1091. The tiles shall be bedded on 20mm thick semi-dry cement and sand (1:3) screed with joints about 2mm wide, laid on the

concrete base which has been thoroughly cleaned and wetted. All tiles shall be soaked overnight before laying.

4.4.2. All skirting shall be 100mm high with rounded top edge to match the tiles flooring. The tiles required to form angles to skirting shall be neatly cut and fit to all abutments.

4.5. PVC Tiles/Sheets

4.5.1. PVC tiles or sheets shall be of approved type, pattern and colour. PVC tiles or sheets are to be of non-slip type and shall comply with MS 602. Tiles shall be 250mm x 250mm x 2mm thick minimum. Sheets shall be 2 m roll width x 2mm thick minimum.

4.5.2. Accessories such as skirting, stair nosing, edging strips etc. shall be of the same manufacture from similar material to match flooring. Unless otherwise described skirting shall be 100mm high; stair nosing shall be 60mm wide laid full length of the treads and of bullnose profiles; and edging strips shall be 25mm wide.

4.5.3. The final appearance and performance of the floor covering will be determined and affected, in part, by the condition of the subfloor. It is essential that all subfloors are solid, smooth, flat, even, permanently dry, clean and free from all foreign materials such as dust, paint, grease, oils, solvents, curing and hardening compounds, sealers, asphalt and old adhesive residue. The dryness of the subfloor is of the utmost importance and it must be determined by testing the moisture level in the subfloor. Enough drying time must be allowed in the building program to achieve a relative humidity (RH) reading of below 75% or in compliance to the manufacturer's RH recommendation.

4.5.4. Installation area for the flooring must be clean, fully enclosed, weathertight and maintained at uniform temperature at least forty-eight (48) hours prior to, during and after the installation is completed.

4.5.5. The tiles or sheet shall be laid and jointed on 20mm thick cement and sand (1:3) screed subfloor with an approved proprietary waterproof adhesive strictly in accordance with manufacturer's recommendation. The screed shall be finished smooth with a steel trowel to an even surface and shall be dry, clean and free from dust and sand before laying the tiles and sheets. A self-leveling sub-floor smoothing compound shall be applied on uneven surfaces to provide a quality finish to receive the floor coverings or as recommended by the manufacturer.

4.5.6. For ground floor or basement areas, an approved damp proof membrane shall be installed prior to the application of sand/cement screeds.

4.5.7. Adhesive; when not specified otherwise, type to be as recommended and approved by the PVC tile/sheet covering manufacturer. Use acrylic adhesive/solvent based adhesive on dry, dustless sub floors in areas not subjected to spillages. Use two parts polyurethane adhesive on the sub-floors in areas subject to excessive spillage of water. Floors must be kept free of traffic until the PU adhesive is fully set, recommended minimum eight (8) hours.

4.5.8. The floor coverings should be adhered in acrylic adhesive or approved equivalent. All joints on the floor must be cut in, grooved and hot welded. Cove up skirting shall be 100mm height, to enable the self-coving of the floor covering. In areas that are not subjected to spillages of water onto

the wall surfaces, the top of the covering is to be finished with PVC capping seal. This should be adhered to the wall surface approximately 100mm-150mm high prior to self-coving floor covering. The material is than cut and fitted into the capping seal, capping seal should be adhered with contact adhesive.

4.5.9. In areas that are subjected to spillages of water onto the wall surfaces, the top of the covering is finished with aluminium trimming, a specially designed section for forming water-tight joint in conjuction with the surface of the wall finishes. It is recommended that the aluminium trim to be screwed on the wall surface.

4.5.10. Where area of excessive spillages of water, it is important that a watertight joint be achieved at junction of drains, gratings, access covers etc.

4.5.11. On completion, the flooring shall be well-cleaned and treated or polished in accordance with the manufacturer's recommendation.

4.6. Timber Strip Flooring

4.6.1. Unless otherwise shown on the Drawings, timber strip flooring shall be ready-made, laminated three (3) ply timber strips or floorboards of approved manufacture. The timber species for use in timber strip flooring shall be as specified in SECTION H: TIMBER, JOINERY AND IRONMONGERY.

4.6.2. The flooring shall be laid to the pattern as approved by the S.O., on 20mm thick cement and sand (1:3) screed with an approved waterproof adhesive applied in accordance with manufacturer's recommendation. The screed shall be finished smooth with a steel trowel to an even surface and it shall be dry, clean and dust free before laying the timber strip flooring. After the adhesive has set, the timber strip flooring shall be sanded to a true smooth and even surface using suitable sanding machine. Any misaligned or defective timber strip shall be adjusted or replaced.

4.6.3. Unless otherwise shown on the Drawings or described in the B.Q., skirting to timber strip flooring shall consist of 100mm x 12mm thick wrot timber skirting rounded at the top, and fixed to the wall or column using 38mm masonry nails spaced approximately at 600mm centres in two (2) rows 26mm away from the top and bottom edges. The nails shall be punched below the surface and the holes filled with approved putty. Any jointing of the skirting shall use splayed butt joints.

4.6.4. The face edges of the flooring shall be lined with wrot timber edging to match. The edging strips shall be 38mm wide approximately x 12mm thick fixed to the base using adhesive as specified hereinbefore, projecting 12mm from the finished sides of floor slabs. Edging strips shall be jointed using glued splayed butt joints.

4.6.5. After sanding the flooring shall be cleaned, any gap sealed with approved sealer, stained and finished with three (3) coats of approved polyurethane paint. Each coat shall be applied strictly in accordance with the manufacturer's recommendation.

4.7. Parquet Tile Flooring

4.7.1. Unless otherwise shown on the Drawings, parquet tiles shall be ready-made 120mm x 120mm x 10mm thick consisting of 120mm x 25mm x 10mm pressure treated kempas, keruing or other approved medium hardwood timber battens. The timber species for use in parquet flooring shall be as specified in SECTION H: TIMBER, JOINERY AND IRONMONGERY WORKS.

4.7.2. The flooring shall be laid to the pattern as approved by the S.O., on 20mm thick cement and sand (1:3) screed with an approved waterproof adhesive applied in accordance with manufacturer's recommendation. The screed shall be finished smooth with a steel trowel to an even surface and it shall be dry, clean and dust free before laying the parquet flooring. After the adhesive has set, the parquet flooring shall be sanded to a true smooth and even surface using suitable sanding machine. Any misaligned or defective parquet shall be adjusted or replaced.

4.7.3. Unless otherwise shown on the Drawings or described in the B.Q., skirting to parquet flooring shall consist of 100mm x 12mm thick wrot timber skirting rounded at the top, and fixed to the wall or column using 38mm masonry nails spaced approximately at 600mm centres in two (2) rows 26mm away from the top and bottom edges. The nails shall be punched below the surface and the holes filled with approved putty. Any jointing of the skirting shall use splayed butt joints.

4.7.4. The face edges of the flooring shall be lined with wrot timber edging to match. The edging strips shall be 38mm wide approximately x 12mm thick fixed to the base using adhesive as specified hereinbefore, projecting 12mm from the finished sides of floor slabs. Any edging strips shall be jointed using glued splayed butt joints.

4.7.5. After sanding the flooring shall be cleaned, any gap sealed with approved sealer, stained and finished with three (3) coats of approved polyurethane paint and sanding between coats. Each coat shall be applied strictly in accordance with the manufacturer's recommendation. The required type of flooring finish shall be to S.O.'s approval.

4.8. Granite Slabs

4.8.1. Unless otherwise shown on the Drawings, granite slabs for flooring shall be 600mm x 600mm x 25mm thick shall be bedded with cement: sand mortar or alternatively with 9mm thick approved proprietary tile adhesive onto 25mm thick cement and sand (1:3) screed as described hereinbefore. The slabs shall be laid butt-joint. Any gap shall be filled with approved mixture of adhesive and grout powder. After grouting, the surface then shall be polished, buffered and finished with a layer of impregnator.

4.8.2. If used in wet or exposed areas, or on ground floor, waterproofing system shall be installed prior to the laying of granite slabs. The floors or the exposed wet areas shall be applied with two coats of approved waterproof coating.

4.8.3. The reverse side of granite slabs in contact with the ground floor or exposed wet wall surface shall be applied with approved waterproof coating.

4.9. Marble Slab

4.9.1. Unless otherwise shown on the Drawings, marble slabs for flooring shall be 600mm x 600mm x 25mm thick shall be bedded with cement: sand mortar or alternatively with 9mm thick approved tile adhesive onto 25mm thick cement and sand (1:3) screed. The slabs shall be laid butt-joint. Any gap shall be filled with approved mixture of the adhesive and grout powder. After grouting, the surface then shall be polished, buffered and finished with a layer of impregnator.

4.9.2. If used in wet or exposed areas, or ground floor, waterproofing system shall be installed prior to the laying of marble slabs. The floors or the exposed wet areas shall be applied with two coats of approved waterproofing coating.

4.9.3. The reverse side of marble slabs in contact with the ground floor or exposed wet wall surface areas shall be applied with approved waterproof coating.

4.10. Vinyl

4.10.1. Vinyl sheet or vinyl tile flooring shall be high performance homogenous-heterogeneous type and specified in accordance to the following type and performances:

4.10.1.1. Vinyl Type 1: Heavy duty to withstand heavy traffic of trolleys.

4.10.1.2. Vinyl Type 2: Anti-static to cater for aseptic and dust free environment.

4.10.1.3. Vinyl Type 3: Anti-slip to cater for wet areas as well as slippery areas.

4.10.1.4. Vinyl Type 4: Heavy duty, fully flexible and resilient for sports flooring and children play areas (Designed specially that combines tough wear layer with a resilient backing for comforts and under floor sound deadening properties and attractive good looks).

4.10.1.5. Vinyl Type 5: High Resistant to Chemical.

4.10.2. All joints to be hot welded and matching coloured. The skirting to the vinyl floor must be of the same vinyl to 150mm high with approved cove former and finished with matching coloured UPVC capping strips with approved recommended acrylic adhesive strictly to manufacturer's method of installation.

4.10.3. Vinyl sheet shall have Polyurethane Reinforced (PUR) surface treatment for easy maintenance.

4.10.4. Colours and patterns of vinyl flooring shall be to the PD's concurrence. Approved metal dividing clips shall be installed when vinyl flooring meets with other floor finishes.

4.10.5. Prior to the application of vinyl floor covering, the contractor shall ensure that the floor substrate has a perfectly even surface, dry and free from. Vinyl sheets shall be installed onto floor flatness tolerance of not more than $\pm$ 3mm for every 3 m length floor area ready to receive vinyl flooring. Self-levelling compound of approved quality to be installed before

finishing with vinyl flooring. The flatness tolerance shall strictly adhere to manufacturer's method of installation.

4.10.6. Types of adhesive with low VOC shall be used strictly in accordance with the recommendation of the manufacturer of the proposed type of vinyl flooring.

4.10.7. Laying of all type's vinyl flooring shall only be carried out by specialists from the approved supplier of the material.

4.10.8. The contractor shall incorporate damp proof treatment before laying the vinyl flooring to ensure that the floor slab/ or base screed is free from rising damp.

4.10.9. For waiting areas, corridors and other specific areas, the vinyl floors shall be completed with designed motifs, graphics and interplay of colours to the P.D.'s concurrence.

4.10.10. Stainless steel floor trap and gratings provided in vinyl flooring area shall be of special approved type that is suitable for vinyl flooring and shall be installed to manufacturer's specification and instructions.

4.10.11. Approved anti-slip nosing strips shall be used wherever vinyl is being laid on steps or staircases. Special approved type of metal grating suitable for vinyl flooring shall be used.

4.11. Indoor Sport Floors - Cushion PVC Sport Flooring

4.11.1. Unless otherwise specified on the Drawings, multi purposed game court surfaces shall be finished with Cushion PVC Sport Flooring sheets endorsed and recommended surfacing systems with excellent shock absorption, elasticity, flexibility, strong protective membrane, waterproof, resilience and slip resistance to ensure great sports performance.

4.11.2. Cushion PVC Sport Flooring sheets shall be minimum overall thickness of 7.5mm comprising of surface layer with protecsol treated, calendered and grained 100% PVC sheet.

4.11.3. Its reinforced by double layer of non-woven fiberglass grid and double density closed cell foam. Shall undergone Sanosol treatment for fungistatic and bacteriostatic, surface treated with Protecsol cross-linked dirt protection treatment.

Weight: 4.7kg/m2,
Shock Absoprtion (EN 14808): P1
Impact Protection Index (IPI) (AC-P90-205) =76%,
Vertical Deformation (EN 14809): < 2mm,
Energy Return (pr EN WI 217): 0.4 m/s,
Abrasion Resistance (EN ISO 5470-1):<350mg,
Sliding Coefficient (EN 13036-4): 80-100,
Indentation Resistance (EN1516) : < 0.5mm,
Abrasion resistance EN ISO 5470-1) < 350mg.
Ball bounce (EN12235) >90%
Fire (EN13501-1): Cfl-S1
Complied to GREEN Label/ Certificate
Low VOC

4.11.4. Cushion PVC flooring sheets shall comply with approved or accredited by major sport federations, namely BWF, FIBA, ITTF, AFC, FIVB, IFF.

4.11.5. The final appearance and performance of the floor covering will be determined and affected, in part, by the condition of the subfloor. The general requirement for the subfloor must be absolutely hard, smooth finished level, dry, structurally sound, free from cracks and other irregularities, free from contaminated with paint, plaster, oil, grease or any substances that could affect the adhesion. A damp proof membrane must be laid under the concrete to act as a barrier against underlting hydrostatic pressure and moisture (for ground floor only). Cracks or hollowness must be repaired and filled with an appropriate material. The subfloor must be level with a tolerance of 3mm over 2 meter straight edge.

4.11.6. The floor covering should be underlayment 5mm self levelling compound (eg. CL 11 or NC146) with Primer and applied in accordance with manufacturer's instruction. The tensile Bending strength after 28 days is 6N/mm2 and Compressive Strenght after 28 days is 30N/mm2. Self levelling compound shall complied with green label certification.

4.11.7. The top of the covering is finished with Damp Proof Membrane (For Ground floor only) (eg. HydroEpoxy 300 or PE146), a 2 component water based epoxy polyamide membrane/barrier coating. The cured membrane shall withstand 250kPa hydrostatic pressure which is equivalent to a 25m head of water. Application is in accordance with manufacturer's instruction.

4.11.8. Cushion PVC Sport Flooring sheets installation shall only use low VOC adhesives.

5. Carpet

5.1. Carpet Tiles

5.1.1. Unless otherwise specified on the Drawings, all carpets shall be of high quality, durable, loop pile type of 100% Nylon type 6 fibre (ASTM D 629-72/ANSI), 1/12 gauge, minimum 7mm overall thickness of pile height and cushion backing, 16 oz per sq yard pile weight (normal traffic area), 24 oz per sq yard pile weight (heavy traffic area).

5.1.2. Carpets shall be coated with protective coating (eg. 3M Scotchgard™) for stain resistant and easier cleaning.

5.1.3. All ground floor areas, which are specified using carpet tiles, shall have approved damp-proof membrane on the ground floor slabs.

5.1.4. Unless otherwise specified on the Drawings, wall edges shall be with approved minimum 100mm height timber skirting.

5.1.5. The contractor shall be required to submit samples of the various colours/patterns and SIRIM Eco-Label certification.

5.1.6. Aluminium dividing strips or other suitable rust proof metal gripper strips shall be laid at junctions of different floor finishes and finishing flushed with flooring.

5.1.7. Carpet tiles can be laid over any smooth, hard floor like parquet, laminated flooring and stone. Ensure the surface is clean, level and dry before installation.

5.1.8. All floor areas, which are specified using carpets, must be dry, level, and free from dirt, grease, oil, paint, sealer, old adhesives, and other residues.

5.1.9. Carpet tiles installation shall only use low formaldehyde water-based adhesive.

5.1.10. Carpet tiles used shall be laid with close butt joints, stretched and balanced so that all seams are parallel with minimum bows with suitable rustproof metal gripper strips securely installed. The carpets shall be installed in largest practical pieces and salvage shall be trimmed as required to assure color uniformity and pattern match at seams. All carpet shall have its edges trimmed and neatly fitted around all perimeters, openings and obstructions.

5.1.11. The carpets shall be installed in largest practical pieces and salvage shall be trimmed as required to assure color uniformity and pattern match at seams. All carpet shall have its edges trimmed and neatly fitted around all perimeters, openings and obstructions.

5.1.12. Warranty minimum 2 years on manufacturing defect. Supply and install by approved installer by manufacturer.

5.2. Broadloom Carpet (Roll Carpet / wall to wall carpet)

5.2.1. Machine Tufted Carpet

5.2.1.1. Unless otherwise specified on the Drawings, the machine tufted carpet shall be of high quality, durable, loop pile type or cut pile type or combination of both of 100% Nylon type 6 fibre (ASTM D 629-72/ANSI), 1/12 gauges, minimum 7mm overall thickness of pile height and PVC backing underlay, minimum 18 oz per sq yard pile weight (normal traffic area), minimum 24 oz per sq yard pile weight (heavy traffic area).

5.2.1.2. Broadloom carpets shall be coated with protective coating (eg. 3M Scotchgard™) for stain resistant and easier cleaning.

5.2.1.3. All ground floor areas, which are specified using carpets, shall have approved damp-proof membrane applied on the floor slabs. Unless otherwise specified on the Drawings, all carpets shall be laid with 6mm thick rubber-crumb underlay.

5.2.1.4. Unless otherwise specified on the Drawings, wall edges shall be with approved minimum 100mm height timber skirting.

5.2.1.5. All floor areas, which are specified using carpets, must be dry, level, and free from dirt, grease, oil, paint, sealer, old adhesives, and other residues.

5.2.1.6. The contractor shall be required to submit samples of the various colours/patterns and SIRIM Eco-Label certification.

5.2.1.7. Aluminium dividing strips or other suitable rust proof metal gripper strips shall be laid at junctions of different floor finishes and finishing flushed with flooring.

5.2.1.8. Broadloom carpets used shall be laid with close butt joints with underlay, stretched and balanced so that all seams are parallel with minimum bows with suitable rustproof metal/ wood gripper gripper strips securely installed. The carpets shall be installed in largest practical pieces and salvage shall be trimmed as required to assure color uniformity and pattern match at seams. All carpet shall have its edges trimmed and neatly fitted around all perimeters, openings and obstructions.

5.2.1.9. The carpets shall be installed in largest practical pieces and salvage shall be trimmed as required to assure colour uniformity and pattern match at seams. All carpet shall have its edges trimmed and neatly fitted around all perimeters, openings and obstructions.

5.2.1.10. Warranty minimum 2 years on manufacturing defect. Supply and install by approved installer by manufacturer.

5.2.2. Axminster Carpet

5.2.2.1. Unless otherwise specified on the Drawings, the axminster carpet shall be of high quality, durable, cut pile type of 80% Wool 20% Nylon type 6 fibre (ASTM D 629-72/ANSI), 1/12 gauges 7/7 rows and pitch, minimum 7mm overall thickness of pile height and jute backing, minimum 32 oz per sq yard pile weight (normal traffic area), minimum 42 oz per sq yard pile weight (heavy traffic area).

5.2.2.2. Broadloom carpets shall be coated with protective coating (eg. 3M Scotchgard™) for stain resistant and easier cleaning.

5.2.2.3. All ground floor areas, which are specified using carpets, shall have approved damp-proof membrane applied on the floor slabs. Unless otherwise specified on the Drawings, all carpets shall be laid with 6mm thick rubber-crumb underlay.

5.2.2.4. Unless otherwise specified on the Drawings, wall edges shall be with approved minimum 100mm height timber skirting.

5.2.2.5. All floor areas, which are specified using carpets, must be dry, level, and free from dirt, grease, oil, paint, sealer, old adhesives, and other residues.

5.2.2.6. The contractor shall be required to submit samples of the various colours/patterns and SIRIM Eco-Label certification.

5.2.2.7. Aluminium dividing strips or other suitable rust proof metal gripper strips shall be laid at junctions of different floor finishes and finishing flushed with flooring.

5.2.2.8. Broadloom carpets used shall be laid with close butt joints with underlay, stretched and balanced so that all seams are parallel with minimum bows with suitable rustproof metal/ wood gripper gripper strips securely installed. The carpets shall be installed in largest practical pieces and salvage shall be trimmed as required to assure color uniformity and pattern match at seams. All carpet shall have its edges trimmed and neatly fitted around all perimeters, openings and obstructions.

5.2.2.9. The carpets shall be installed in largest practical pieces and salvage shall be trimmed as required to assure colour uniformity and pattern match at seams. All carpet shall have its edges trimmed and neatly fitted around all perimeters, openings and obstructions.

5.2.2.10. Warranty minimum 5 years on manufacturing defect. Supply and install by approved installer by manufacturer.

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1. General

1.1. All paints to be used shall be those supplied by approved manufacturers. The quality of paints shall comply with MS 125 in respect of oil/enamel paints and MS 134 in respect of emulsion paints/acrylic paint.

1.2. Prior to commencing painting work, the Contractor shall submit the following to the S.O.:

1.2.1. Name of the paint manufacturer and the manufacturer's certification that the paint conform to the relevant standard as specified in sub-section 1.1 hereof together with the proof that such certification have been verified by tests carried out by SIRIM or ISO in the last three (3) years.

1.2.2. The performance warranty by the manufacturer to the Government on the performance of the paint against any peeling, cracking, fungus/ algae growth and discoloration which may arise during a period of five (5) years or more from the date of practical completion due to insufficiency in material or workmanship. The terms of the performance warranty shall be as stipulated in APPENDIX O/1 and as approved by the S.O..

1.2.3. Name of the painting applicator as approved by the paint manufacturer including written evidence of the current approval.

1.2.4. A copy of the method statement including procedure for the painting works in accordance with these specification and manufacturer's instructions.

1.3. All paints shall be delivered to the Site in the manufacturer's original sealed containers unopened and shall be used strictly in accordance with the manufacturer's instructions.

1.4. Paints shall not be adulterated and any paint that has deteriorated shall not be used and shall be removed from the Site forthwith.

1.5. Unless otherwise specified in the Drawings, the types of paints to be sued for the work on exposed surfaces shall be as stated in the `Schedule of Paint Finish' attached hereinafter.

1.6. The colours and tints of paints shall be selected by the S.O. and the priming, undercoats and finishing coats shall be of approved differing tints and shall be obtained from the same manufacturer.

1.7. No painting shall be done under conditions which may jeopardize the quality of finish paintwork.

1.8. During painting, care shall be taken to prevent stain or damage to other works.

1.9. Surfaces to be painted shall be dry, free from dirt, oil, grease, old loose paint and other deleterious matter. All cracks shall be raked out and stopped and all holes and dents shall be filled.

1.10. Unless otherwise specified in the manufacturer's instructions, each coat of paint applied on timber or metal surfaces shall be allowed to dry and subsequently rubbed down lightly with sandpaper before the next coat is applied. Any dirt or dust shall be removed from preceding coats immediately before proceeding with application of the next coat.

1.11. All priming to shop fabricated components shall be done at shop.

1.12. All prime surfaces shall be inspected and approved by the S.O. before commencement of painting works.

1.13. Finish surfaces shall be uniform in finish and colour and be free from brush marks or other defects.

1.14. Sample areas showing all tints of paints to be used shall be prepared by the Contractor as and when required by the S.O..

2. Painting to Timber Work

2.1. Painting to New Timber Work

2.1.1. Unless otherwise as shown on the Drawings, all exposed wrot surfaces of timber shall be painted as specified hereinafter.

2.1.2. Before painting to new timber work, all knots shall be covered with knotting and all nail holes, cracks, et cetera shall be stopped with white lead and putty (1:3) and shall be primed with aluminium wood primer well brushed in.

2.1.3. Unless otherwise specified, the prepared surface shall be painted with one undercoat (alkyd undercoat) and shall be finished with two coats of premium semi-gloss fungus resisting alkyd paint or three (3) coats UV protection, low odour alkyd wood finish.

2.1.4. Timber decks shall be applied with three coats of scratch resistant, UV protection, fast drying urethane alkyd wood finish. Each preceding coat shall be allowed to dry thoroughly and rubbed down lightly with fine sand paper and thoroughly cleaned before applying the next coat.

2.1.5. All timber surfaces abutting concrete or brickwork shall be primed before fixing or assembling.

2.1.6. All ironmongeries except hinges shall be removed before painting begins and shall be carefully re-fixed.

2.2. Repainting Existing Timber Work

Where repainting to existing timber work is specified, the following procedure shall be adhered to. If the surface is intact, it shall be rubbed down with fine sand paper to the approval of the S.O.. Then one coat of undercoat shall be applied followed by two (2) coats of gloss enamel paint unless otherwise specified. Where cracking and flaking have occurred, the entire existing paint shall be removed by burning off or by use of paint remover as approved by the S.O.. The surfaces shall then be thoroughly cleaned and shall be applied with minimum one coat aluminum wood primer followed by one (1) undercoat and unless otherwise specified in the Drawings, shall be finished with two (2) coats of gloss enamel paint.

3. Painting to Metal Work

3.1. Painting New Steel and Ironwork

The areas to be painted shall be cleaned down and be free from rust, scale, oil, grease, dirt and dust. One (1) coat of approved metallic primer shall be applied followed by one (1) coat of premium alkyd undercoat unless specified and shall be finished with two (2) finishing coats of gloss/semi-gloss fungus resisting alkyd paint.

Soil and vent pipes shall be primed as above and given two (2) coats of approved bituminous paint.

3.2. Repainting Existing Steel and Ironwork

3.2.1. Where repainting to existing steel or ironwork is stated in the Drawings, the following procedure shall be adhered to. Where a firm surface exists, it shall be scuffed with fine sand paper to the approval of the S.O. and spot primed if necessary, before the application of by one (1) coat of premium alkyd undercoat unless specified and shall be finished with two (2) finishing coats of gloss/semi-gloss fungus resisting alkyd or gloss enamel paint.

3.2.2. If the old paint is in a bad, deteriorated condition the whole paint shall be removed by the use of approved paint remover or by scraping as approved by the S.O.. The surface shall be thoroughly cleaned and shall be applied with one coat approved metallic primer, by one (1) coat of premium alkyd undercoat unless specified and shall be finished with two (2) finishing coats of gloss/semi-gloss fungus resisting alkyd or gloss enamel paint.

3.3. Painting New Galvanized Ironwork

Where painting to new galvanized ironwork is specified, the surfaces shall be applied with one coat of approved self-etching quick drying metallic primer unless otherwise specified and shall be finished with two finishing coats of gloss/semi-gloss fungus resisting alkyd paint or gloss enamel paint.

3.4. Repainting Existing Galvanized Ironwork

3.4.1. Where repainting to existing galvanized ironwork is specified, the following procedure shall be adhered to. If the surface is not corroded, it shall be slightly sanded and all dirt's, oil, and grease removed by washing with an approved solvent and applied with one (1) coat of approved metallic primer unless otherwise specified, shall be finished with two (2) finishing coats of gloss/semi-gloss fungus resisting alkyd paint or gloss enamel paint. If the surface has corroded, the whole paint shall be removed by the use of approved paint remover or by scraping as approved by S.O..

3.4.2. When the surface is completely clean, it shall be applied with one coat approved metallic primer, unless otherwise specified, shall be finished with two finishing coats of gloss/semi-gloss fungus resisting alkyd paint or gloss enamel paint.

4. Painting to Masonry Work

4.1. Painting New Plastered/Masonry Surfaces

4.1.1. The new plastered or masonry surfaces shall be allowed to dry completely and shall be cleaned down to remove dust, dirt, plaster splashes, and the like. In case of old unpainted walls, all fungus, mosses, lichens and vegetative growth shall also be removed.

4.1.2. The cleaned surfaces of the external walls shall be applied with one coat of approved alkaline resisting primer and unless otherwise specified in the Drawings, followed with two (2) coats of ultra-violet (UV) weather resistant emulsion paint.

4.1.3. The external wall surfaces shall be applied with one (1) coat of approved alkaline resisting primer, unless otherwise stated in the Drawings, followed with two (2) coats of 100% acrylic with heat reflective and UV protected, and temperature reduction weather resistant acrylic emulsion paint for Green Ratings Certification as approved by the S.O..

4.1.4. The internal wall surfaces shall be applied with one (1) coat of approved modified acrylic sealer, and unless otherwise as shown on the Drawings, followed with two (2) coats of low VOC acrylic paint.

4.2. Repainting Existing Plastered or Masonry Surfaces

4.2.1. Where repainting to existing plastered or the masonry surface is specified, the following procedure shall be adhered to. All existing paint shall be removed by scraping and the surface shall be washed with high pressure water jet (for Non-Conservation Projects). All cracks and other imperfections shall be made good and the surface should be allowed to dry completely.

4.2.2. The surface shall then be applied with two (2) coats of any other type of water base emulsion paint as described hereinbefore for Painting New Plastered/Masonry Surfaces and as approved by the S.O..

4.2.3. However, for buildings which fall under heritage status, repainting works shall refer to *Garis panduan Pemuliharaan Bangunan Warisan 2016* (or latest version).

4.3. Textured Wall

4.3.1. Natural Spray Granite textured wall shall be applied with one (1) coat of approved alkaline resisting acrylic primer, unless otherwise stated in the Drawings, followed with two (2) layers natural fine stone and ceramic chips texture with high build acrylic resin and two (2) clear finish coats.

4.3.2. Spray Tile textured wall shall be applied with one (1) coat of approved alkaline resisting acrylic primer, unless otherwise specified in the Drawings, followed with one (1) coat of spray tiles texture and two (2) coats of pure acrylic based premium weather paint.

5. Treatment to Fair Face Surfaces

Surfaces that are to be left bare such as fair-face brickwork, fair-face concrete or stones and the like shall be thoroughly clean, dry and free from grease, dust and loose or flaking

materials. The surfaces shall then be treated with an approved colourless silicon-based water repellent liquid applied in accordance with the manufacturer's instructions. The solution shall be applied in two (2) coats over the entire area and crevices by brushing.

6. Epoxy Coatings

Epoxy coatings shall be applied with one (1) coat of approved penetrative epoxy sealer, followed with two (2) coats epoxy topcoat.

7. Silicone Paint

Silicone paint for external walls and ceiling shall be applied with one (1) coat of Pigmented Water Base Penetration Water Repellent and two (2) finishing coats of Breathable Silicone Paint of approved colour applied strictly in accordance with manufacturer's instruction.

8. Painting on Floor Surfaces

8.1. Painting on concrete drive way shall be applied with one (1) coat of floor primer at 100 µm DFT, followed by one (1) coat of floor glass flake at 300 µm DFT or floor non-slip aggregate (fine/medium) and followed with two (2) coats of floor polyurethane (PU) topcoat at 50 µm DFT per coat.

8.2. Painting on car park parking bay floors shall be applied with one (1) coat of floor primer at 100 µm DFT, then followed with two (2) coats of floor polyurethane (PU) topcoat at 50 µm DFT per coat.

8.3. Painting on TNB sub-station internal floors shall be applied with one (1) coat of approved two-pack epoxy sealer, followed with two (2) coats of two pack epoxy floor coating at 50 µm DFT per coat, unless otherwise stated in the drawings.

9. Painting to Timber-based Products

9.1. Chipboard Surfaces

9.1.1. Before painting, all nail holes, crevices and the like shall be stopped with white lead and putty (1:3). The surface shall then be smoothened by rubbing down with fine sand paper and finally cleaned to remove dust. Where the board is to be finished with enamel paint, one (1) undercoat and two (2) finishing coats of gloss enamel paint shall be applied. If the board is to be finished with emulsion paint, one (1) undercoat and two (2) coats of emulsion paint shall be applied.

9.1.2. Where repainting to existing enamel paint finished chipboard is required, the following procedure shall be adhered to. If the paintwork is still intact, it shall be rubbed down with fine sand paper to the approval of the S.O.. Then one (1) coat of undercoat shall be applied followed by one (1) coat of gloss enamel paint.

9.1.3. Where cracking and flaking has occurred, the entire existing paint shall be removed by burning off, as approved by the S.O.. The surfaces shall then thoroughly clean and shall be applied with one (1) undercoat and finished with two (2) coats of gloss enamel paint.

9.1.4. Where repainting to existing emulsion paint finished chipboard is required, the surface shall then be thoroughly cleaned and applied with two (2) coats of emulsion paint.

9.2. Hardboard Surfaces

Before painting to hardboard, all nail holes, crevices and the like shall be filled with approved putty. The surface shall then be applied with one (1) undercoat and two (2) coats of emulsion paint unless otherwise specified.

9.3. Wood Cement Board Surfaces

Before painting to wood cement board, all nail holes, crevices and the like shall be filled with approved filling compound of alkali resistant type. The surface shall then be lightly sanded, and any dust should be removed from the surface with a piece of clean, coarse cloth. The surface shall then be applied with one (1) undercoat and two (2) coats of emulsion paint unless otherwise specified.

10. Painting to Gypsum Board and The Like

10.1. Before painting the surfaces shall be clean and free from dirt. The surfaces shall then be applied with one (1) undercoat and two (2) coats of emulsion paint. Similar procedure shall be followed where repainting to existing painted surfaces is required.

11. Painting to Laboratory Bench Tops

11.1. Timber tops of benches in laboratories that are required to be painted shall be prepared as described hereinbefore for timber work. The surfaces shall then be applied with one (1) coat aluminum wood primer followed by one (1) coat approved chemical resistant primer and finished with two (2) coats of approved chemical resistant gloss enamel paint in accordance with manufacturer's instructions.

11.2. Where repainting to existing timber tops laboratory benches is required, the surfaces shall be rubbed down lightly with fine sand paper. The surfaces shall then be thoroughly cleaned and shall be applied with one (1) coat of approved chemical resistant primer followed by one (1) coat of approved chemical resistant gloss enamel paint.

12. Varnishing

12.1. Varnishing to New Timberwork

12.1.1. The surfaces to be varnished shall be smoothened with fine sand paper and all crevices, holes and the like, if any, shall be filled with approved whiting. It shall be clean, dry, free from dust, dirt and wax before the application of varnish. Unless otherwise approved by the S.O., the surfaces shall be applied with three (3) coats of approved UV protection, low odour alkyd wood finish or varnishing mixture used strictly in accordance with the manufacturer's instructions.

12.1.2. Where non patented products are allowed to be used, the varnishing mixture shall consist of methylated spirit, shellac and approved stain

forming the first coat followed by one (1) coat of an approved mixture consisting of thinner and lacquer. The mixtures shall be of uniform consistency throughout. Unless otherwise specified in the Drawings, the finish shall be gloss and as approved by the S.O..

12.1.3. Timber deck surfaces shall be applied with three (3) coats of approved scratch resistant, UV protection, fast drying low odour urethane alkyd wood finish.

12.2. Re-varnishing To Existing Timberwork

Where re-varnishing to timberwork is specified in the Drawings or described in the B.Q., the surface shall first be thoroughly scuffed to remove the existing varnish. The surface shall then be smoothened with fine sand paper, cleaned, dried and free from dust, dirt and wax. It shall then be varnished as described hereinbefore for new timberwork.

13. Painting Works for Buildings in Coastal Areas.

13.1. External walls shall be applied with one (1) coat of approved pliolite based alkaline resisting primer sealer, unless otherwise specified in the Drawings, followed with two (2) coats of elastomeric weather resistant paint of approved colour applied strictly in accordance to manufacturer's instruction.

13.2. Unless otherwise specified in the Drawings, the internal walls shall be applied with one (1) coat of approved water based alkaline resisting acrylic wall sealer, followed with two (2) coats of low volatile organic compounds (VOCs), alkylphenolethoxylate (APEO) free, formaldehyde free acrylic premium emulsion paint of approved colour applied strictly in accordance to manufacturer's instruction.

13.3. Mild steel shall be applied with one (1) coat of zinc rich epoxy, one (1) coat of surface tolerance epoxy mastic and followed with two (2) coats of polyurethane topcoat.

13.4. Galvanized steel shall be applied with one (1) coat of surface tolerance epoxy mastic and followed with two (2) coats of polyurethane topcoat.

13.5. Roofing sheet coatings for marine environment shall refer to SECTION G: ROOFING.

13.6. Coatings of fasteners used shall comply with AS 3566 Class 4 and be certified as such by the supplier of fasteners and as approved by the S.O..

14. Painting Works to Clinical Areas (Hygienic Areas)

14.1. All external walls shall be applied with one (1) coat of approved siloxane primer sealer, unless otherwise stated in the Drawings, followed with two (2) coats of silicone emulsion water repellent paint applied strictly in accordance to manufacturer's instruction.

14.2. Internal walls shall be applied with one (1) coat of approved ultra-low VOCs alkaline resisting primer sealer, followed with two (2) coats of anti-bacteria, anti-fungus, low VOCs, 100% APEO free, formaldehyde free acrylic premium emulsion paint.

14.3. Internal walls (clinical areas) shall be applied with one (1) coat of approved ultra-low VOCs epoxy primer sealer, followed with two (2) coats of anti-bacteria, anti-fungus, low VOCs, 100% APEO free, formaldehyde free epoxy paint.

14.4. Internal walls (clinical areas with 24 Hours Air-Conditioning) shall be applied with one (1) coat of approved ultra-low VOCs acrylic water-based primer sealer, followed with two (2) coats of anti-bacteria, anti-fungus, low VOCs, 100% APEO free, formaldehyde free Polyurethane paint.

14.5. Painting to Health Facility (Ministry of Health) Buildings shall also adhere to *Garis Panduan Skema Warna Luaran Bangunan Fasiliti Kesihatan* KKM.

15. Completion of Painting Works

On completion of paintwork, all paint marks inadvertently left on glass, floors, tiles and other surfaces shall be removed. Any stain or marking on finished paintwork shall be removed and touched up to the approval of the S.O..

APPENDIX O/1

PAINT PERFORMANCE WARRANTY (SPECIMEN)

1. Coverage of Performance Warranty

We ..... the paint Manufacturer hereby warrants that for a period of **five (5) years** from the date of Practical Completion, the paint system shall not be affected by the following defects:

(i) Peeling
This condition is manifested when the paint film peels away or detaches from the substrate.

(ii) Cracking
This condition is manifested by any visible cracking on the paint film other than that caused by plastering cracks and structural defects.

(iii) Fungus/Algae Growth
This condition is established when there is a growth of micro-organisms on the surface of the paint films which would result in the marring of the appearance of the paint film through discoloration.

(iv) Discoloration
This condition occurs when the coating loses its original colour in patches and excessive discoloration appears.

2. Procedure for Claims

(i) Any defect claims shall be made in writing and delivered by post or by hand to the Manufacturer.

(ii) A technical team from the Manufacturer will be dispatched to evaluate the nature of the claim. Should our findings conclude the defects as within the scope of warranty, then the Manufacturer shall make good such defects.

(iii) Should the Manufacturer's technical team conclude that the defects falls outside the scope of the warranty, the Manufacturer shall not be held responsible for the claim.

(iv) Should the Government disagree with the conclusion of the technical team pertaining to the defects in particular, then an independent third party competent in such technical evaluation shall be appointed to investigate the disputed defects.

(v) The appointment of independent third party competent in such technical evaluation shall only be appointed upon the mutual agreement between the Government and the Manufacturer.

(vi) The findings of the third party shall be conclusive and mutually accepted by the Government and the Manufacturer.

(vii) If the findings of the independent third party are within the coverage of this performance warranty, all cost shall be borne by the Manufacturer or otherwise such cost shall be borne by the Contractor.

(viii) All claims for the defects must be received by the Manufacturer not later than fourteen (14) days from the expiry of the warranty period.

MANUFACTURER

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Company Stamp

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.....

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Signature

Name:
Date:

WITNESS

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Company Stamp

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Signature

Name:
Date:

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1. General

1.1. All interior architectural signage shall be of acrylic plastic as approved by the S.O. unless otherwise specified in the Drawings. All panel sign surfaces shall be flat and smooth, constructed to remain flat under installed conditions within tolerance of plus or minus 1mm measured diagonally.

1.2. All external architectural signage shall be aluminium panel fabricate as approved by the S.O. unless otherwise specified in the Drawings. All panel sign shall be off corrosion free material.

1.3. All road signage shall be well coordinated and in accordance with *Arahan Teknik (Cawangan Jalan JKR)* latest edition.

1.4. All fire signages shall be complied to the *requirements of Jabatan Bomba dan Penyelamat Malaysia.*

1.5. All signage works shall comply with the regulatory requirements currently enforced and shall comply with MS 1184: *Universal Design and Accessibility in The Built Environment - CP* and *Government Immoveable Asset Code System* (*Sistem Kod Aset Tak Alih - SKATA*) as referred to sub-section 10.

1.6. Unless otherwise stated in the Drawings, the panel and lettering size, profiles and dimensional requirements of interior panel signage shall be as follows:

1.6.1. The standard thickness of cast-acrylic matt clear sheets shall be not less than 4mm.

1.6.2. Raised lettering and graphic symbols shall be of 0.8mm thickness obtained by using acrylic applique and chemically welded to sign panels.

1.6.3. The type of panel material and size of letterings shall be as indicated in the Schedule of Signage prepared by the manufacturer to the S.O.'s approval.

1.7. Graphic content and style of signage shall be in accordance with the Schedule of Signage, Shop Drawings and comply with the requirements indicated below:

1.7.1. Panel material shall be acrylic with machine-routed raised copy applied to surface of panel, along with "raster-method" Grade 2 braille beads, or pictograms and other artwork to be reverse applied vinyl or silk-screened process in colours as indicated.

1.7.2. For background colours, provide Pantone Matching System (PMS) coloured coatings, including inks and paints, that are recommended by acrylic manufacturer for optimum adherence to surface, and that are non-fading for application intended.

1.7.3. Raised copy shall be machine routed copy, provide manufacturer's full range of solid to applique colours to the S.O.'s approval.

1.8. Pictogram/Symbol shall be provided where required with S.O.'s approval.

1.9. Visual scale shall apply to the signages based on distances, colours used and font types. Consideration shall be given to legibility and vividness to aid the visually impaired visitors.

1.10. Location, accessories and mounting positions of signs shall comply with MS 1184, manufacturer's recommendations and as approved by the S.O..

1.11. Wall mounted panel signs shall be mounted to wall surfaces using methods indicated below:

1.11.1. Vinyl-tape mounting: use double-sided very high bond (VHB) tape to adhere signs to smooth, non-porous surfaces.

1.11.2. Silicone-adhesive mounting: Use liquid-silicone adhesive recommended by manufacturer to attach signs to porous, irregular, or vinyl-coated surfaces. Use double-sided foam tape to hold sign in position until silicone adhesive has fully cured.

1.11.3. Mechanical fasteners: Use non-removable mechanical fasteners placed through pre-drilled holes in sign face, or through shim plate. Use proper anchors at masonry walls as recommended by manufacturer. Attach sign panel to shim plate using vinyl-tape method as described above.

1.11.4. Where signs are scheduled or indicated to be mounted on glass, to provide matching acrylic back plate at reverse-side of glass to conceal mounting materials.

1.11.5. After installation, soiled sign surfaces shall be cleaned and protected from damage.

1.12. All suspended signages shall be 2-sided with metal frame of 5mm clear acrylic and spray-painted with silkscreen finish or equivalent. The size of the panel signage shall be not less than 120mm (height) x 600mm (width) unless otherwise specified in the Drawings. Suspended panel signs shall be hung to soffit of slab or others approved structure using stainless steel rod or cable.

1.13. During the Contractor's drawings preparation phase, the Contractor shall provide full size mock-up samples of each type as required for inspection and subsequent approval by the S.O..

2. Copper Plating

2.1. Surface preparation of the copper plate is to be done before plating process. Cleaning process should include, degreasing, spray washing, immersion washing, stripping and or coating removal. Copper plate is to be pre-treated to receive plating treatment. Thickness of copper plating is to be of minimum 3-5µm. All copper plating should be a thick film coating with excellent levelling to cover all surface irregularities to improve the general aesthetics.

2.2. Where grainy texture is required, the copper plate should be allowed to run in copper sulphate bath or copper cyanide-based solution bath for a longer period.

3. Aluminium

3.1. Aluminium sign panels shall be preferably supported by extruded aluminium extrusions for both internal and external signs complying with the requirements of MS 2289: Aluminium and Aluminium Alloy - Extruded Shapes.

3.2. Aluminium sheets where otherwise stated for construction shall be of minimum 3mm thick with welded angles for support. The sub-contractor is to ensure that no tin-canning or deflection effect on the sign-face. Where tin-canning effect appears on the sign face, the nominated sub-contractor is to remove and replace the sign panel.

3.3. Aluminium sheets used shall comply with the requirements of MS 2040: Aluminium and Aluminium Alloys - Sheets and Coiled Sheets - Specification. The alloy selected will be of a temper suitable for cutting.

3.4. Where signs required more than one standard size aluminium panel, the jointing shall be performed in accordance to BS 1473 by using rivets or screws with welded angles to the main panels. The joint shall than be fine sand, smoothen to be flushed to be seen as one and no butt-line joint, division or separation is to be seen.

3.5. All aluminium sections shall be fabricated from aluminium alloy B6063-T5 complying with the requirements of MS 2289: Aluminium and Aluminium Alloy-Extruded Shapes.

3.6. The aluminium shall be electronically anodized in matte finish for etched aluminium required for the fire door sign.

4. Paint Finish

Unless otherwise specified, all painting works shall be carried out as specified in SECTION O: PAINTING.

5. Screen Printing Works

5.1. Applications of screen-printing works shall be in accordance with the Drawings. The Contractor shall ensure high accuracy in printing registration and workmanship.

5.2. Silkscreen ink shall be of two (2) pack-serical poly-screen with Ultra Violet protective agents against colour fading. All finished screen-printed text or graphics shall be coated with a layer of 2-pack polyurethane clear coat matte finish.

6. Vinyl Graphic Stickers

6.1. Unless otherwise specified in the Drawings, vinyl graphic stickers shall be used as recommended by the manufacturer and approved by the S.O..

6.2. Unless otherwise specified in the Drawings, all illuminated graphics shall be of translucent graphic films and non-illuminated signs shall be translucent opaque graphic films as approved by the S.O..

6.3. All vinyl graphics shall be precision cut by computers with no jagged edge. Minimum performance of vinyl stickers shall be to the approval of the S.O..

7. Stainless Steel

7.1. Stainless steel shall be austenitic, non-magnetic, using grade 304 or 316 to BS EN 10088 and BS 1449 Part 2 for plate, sheet and strip and BS 970 where relevant. Stainless steel plate and component with hairline finish for all internal signs shall be of grade 304 4B.

7.2. Stainless steel plate and component for all external signs shall be of marine grade 316 with alloy addition of molybdenum to prevent specific forms of corrosion.

7.3. Stainless steel fasteners, bolts, screws, bolts, washers and other fixing components shall be of Grade A2 or Grade A4 to BS EN ISO 3506.

8. Acrylic

Acrylic used for the external signage shall be of high impact acrylic. Extruded acrylic shall not be acceptable. The Contractor shall comply with the required thickness of the acrylic as shown on the Drawings.

9. Installation and Fixing Works

9.1. The Contractor shall submit a works programme and method statements for the installation of all internal and external signs. The Contractor is to include in their method statement on safety processes, measures to be taken and procedures while erecting the external signs.

9.2. Unless otherwise shown on the Drawings, all base plates for external signs shall be galvanized steel plates with drawings and calculation certified by P.E.

10. Labeling For Registration of Immoveable Asset Components

10.1. The code and format for labelling of components shall be as stipulated in the Government's:

10.1.1. Asset Code System (*Sistem Kod Aset Tak Alih – SKATA*) and

10.1.2. Asset Data Collection Guidelines *(Garis Panduan Pengumpulan Data Aset Tak Alih – PeDATA).*

10.2. All labels for the registration of the asset components shall comply with the regulatory requirements currently enforced and shall comply with the relevant International and/or Malaysian Standards.

10.3. Labels for the assets must be durable and withstand exposure to extreme conditions such as chemicals, temperature, weather, oils and detergents. The labels must also be able to withstand the rigour of cleaning schedule, maintenance and repairs.

10.4. Unless otherwise stated in the Drawings, minimum requirements for asset component labels shall be as follows:

10.4.1. Normal Condition – vinyl stickers.

10.4.2. Extreme Condition - steel / aluminium plate.

10.5. Asset component labels shall be affixed to the asset in a position that is easily accessible for readability while the asset is in normal operating position (*Refer to PeDATA).*

10.6. Labels shall be located on clean, smooth, flat surfaces where possible, and on surfaces that provide direct visual access to a label scanner and its operator.

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1. Scope of Work

1.1. The work to be performed under this contract shall comprise, but not limited to the supply, delivery, installation, testing, adjusting, balancing, commissioning and maintenance of the following principal services and the associated works and items:

1.2. Internal Cold Water Plumbing System

1.2.1. Internal Piping system complete with all bends, tees, sockets, valves, plugs, reducers, brackets, supports and other necessary accessories to complete the installation.

1.2.2. Water Tank (Suction and Storage Tank)

1.3. Internal Sanitary Plumbing System

1.3.1. Internal piping complete with all necessary bends, tees, sockets, branches, offsets, and other necessary accessories to complete the installation.

1.3.2. Internal inspection chamber, gully trap and grease trap.

1.4. The contractor shall at his own cost be responsible to appoint Suruhanjaya Perkhidmatan Air Negara (SPAN) certified personnel for the submission, supervision, construction, testing and certification of the completed works.

1.5. The Contractor shall prepare and submit working drawings to the Superintending Officer (S.O.) for approval within thirty (30) days from the date of acceptance of tender. In preparing these working drawings, the Contractor shall coordinate with the building layout and constructional details of the architectural, structural and electrical drawings.

1.6. The drawing shall be fully dimensioned and show all the precise locations, arrangement and loading of the equipment. The drawings shall also indicate location and details of all foundation, supports, chases, core holes, opening in partition wall, floors and roof and any other information required for works or services to be provided by others.

1.7. The drawings submitted shall be modified as necessary and, if requested by S.O., re-submitted for final approval. Six (6) sets of drawings shall then be submitted for distribution to all parties concerned.

1.8. The contractor shall submit method statement (upon S.O. request), samples of materials or execute samples of workmanship (mock-up) for S.O.'s approval, and for further samples as required until the samples submitted or executed are, in accordance with this specification.

1.9. Samples, after approval, shall indicate the standard of materials and workmanship to be maintained in the execution of the works.

1.10. After connection work is done, the Contractor shall ensure that all system to be operational as required.

1.11. The Contractor shall service and maintain the above-mentioned cold water and sanitary plumbing system during Defect Liability Period (DLP) from the date of Certificate of Practical Completion (CPC) in good operating condition until Certificate of Making Good Defect (CMGD).

1.12. The Contractor shall submit the as-built drawing, Operation and Maintenance Manual (OMM) complete with Schedule of Maintenance before handing over subject to S.O.'s approval.

Exclusion:

The boundary of scope of work between mechanical works and civil works can be referred from Figure 1 to Figure 4 in the Appendix.

2. Internal Cold Water Plumbing System

2.1. General

All water supply plumbing and installation shall be executed in accordance with the latest edition of the following:

2.1.1 *Act 655 - Water Services Industry Act 2006*

2.1.2. *Water Services Industry (Water Reticulation and Plumbing) Rules 2014*

2.1.3. *BS 8558:2011 – Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages – Complementary guidance to BS EN 806.*

The Contractor shall submit method statement of installation if required by the S.O..

2.2 Pipework (Material Pipes Standards)

2.2.1 General

Pipework for water supply plumbing shall be to the dimensions shown in the drawings or as specified hereinafter and shall be complete with all bends, tees, sockets, plugs, reducers, brackets, supports and other accessories to complete the installation.

2.2.2 Standards

2.2.2.1. All pipes, fittings and equipment used for water supply plumbing and installation shall be of the type and make approved by SPAN and as mentioned in the drawings.

2.2.2.2. The standards stated in this specification shall comply with their latest edition issued or relevant standards approved by SPAN.

The details of the internal piping shall be referred to **Table X1.**

Table X1. List of Internal Piping

Type of pipe	Minimum wall thickness & pressure rating	Standard	Fitting
High Density Polyethylene (HDPE)	PN 12.5 at 20°C (equivalent to 10 bar derated working pressure at 30°C)	MS 1058 or BS EN 12201 and marked with SIRIM certification numbers	Moulded integrally dezincified brass with BSP threads of BS EN 12420:2014 or BS EN 12165:2016. Nickel and Chromium plated to BS 1224 service condition NO. 2.
Acrylonitrile Butadiene Styrene (ABS)	PN 12 to MS 1419: Part 1: 2007	MS 1419: Part 1: 2007	MS 1419: Part 2: 2007 - Fitting MS 1419: Part 3: 2007 - Solvent cement. All ABS pipes, fittings and solvent cement shall be supplied by the same manufacturers.
Polybutylene (PB)	PN 15 at 20°C (equivalent to 15 bar derated working pressure at 30°C)	MS ISO 15876 or AS/NZS 2642	Moulded integrally dezincified brass with BSP threads of BS EN 12420:2014 or BS EN 12165:2016. Nickel and Chromium plated to BS 1224 service condition NO. 2.
Polypropylene random co-polymer (PP-R)	PN 14 at 70°C	MS 2286 or BS EN ISO 15874	Moulded integrally dezincified brass with BSP threads of BS EN 12420:2014 or BS EN 12165:2016. Nickel and Chromium plated to BS 1224 service condition NO. 2.
Stainless Steel (SS)	BS EN 10312: <Ø 12mm → Series 1 ≥Ø 12mm → Series 1 or Series 2 or ASTM A312/A312M: Ø ½" – Ø 2" → Schedule 40S (Threaded) Ø 2½" – Ø 8" → Schedule 10S (Welded)	MS 1841: 2010, BS EN 10312 ASTM A312/A312M or JIS G 3448	Stainless steel compression fittings to BS 4368 or SAS 322: 2003 Ø ½" – Ø 2" → (Schedule 40S) Threaded & screw fittings according to ISO 4144:2003 Ø 2½" – Ø 8" → (Schedule 10S) Butt weld fittings according to ASTM A 403 / A 403M
Copper Tubing	Type K	BS EN 1057 BS 2871	Brazing according to BS EN 1254: Part 1 or Compression joint according to BS EN 1254: Part 2 or Accelerated 'push fit' according to BS EN 1254: Part 2
Crosslinked Polyethylene (PE-X)	PN 12 at 70°C	MS 1736: Part 2	MS 1736: Part 3 - Fitting Moulded integrally dezincified brass with BSP threads of BS EN 12420:2014 or BS EN 12165:2016. Nickel and Chromium plated to BS 1224 service condition NO. 2.

2.3 Pipe Installation

2.3.1. Pipes and fittings shall be cleaned and free from manufacturing burrs and site debris.

2.3.2. The pipes shall be adequately protected against damage during transit. Each delivery of pipes shall be accompanied by the manufacturer's testing certificate.

2.3.3. Internal Piping

2.3.3.1. All installation shall be done according to the approved drawings and pipe manufacturer's recommendation. Plumber shall be competent in various types of installation. Special care shall be taken in the arrangement of piping to ensure a neat finishing and alignment.

2.3.3.2. Services pipes and distribution pipes except those buried under ground level shall be concealed in wall, ceilings, boxed up or laid within the common trench, services shaft, etc provided where possible. All work shall be executed in such a manner to avoid cutting into finished work in walls, aprons, beam, etc. where practicable as the work proceeds. Pipe work to be buried or concealed shall not be covered or plastered before they are examined, tested and approved by the S.O..

2.3.3.3. Installation of valves and fittings shall be grouped where this will not affect their operation, to reduce the number of joints to a minimum.

2.3.3.4. All necessary isolating valves, check valves and other fittings as required are as shown in the approved drawings. Every section of major branch supply piping shall be installed a gate valve at the point of connection to the supply.

2.3.3.5. Minimum diameter for internal cold water plumbing system shall be 20mm (3/4") except for flush valve system where minimum diameter shall be 25mm (1"). Final branches to fittings shall be 20mm diameters and the sizes of feeders from which these branches are taken shall be as in **Table X2**:

TABLE X2. Diameter of Feeders to Number of Fitting Served

No of Fittings Served	Diameter of Feeders
1	20mm
2	20mm
3, 4	25mm
5, 6 ,7	32mm
8, 9, 10, 11, 12	40mm
13, 14, 15, 16, 17, 18	50mm

2.3.4. Threaded Joints

2.3.4.1. Threaded end connections for plastic (ABS/PE/PB) pipes shall have tapered thread forms complying with **AS ISO 7.1-2008 and AS ISO 7.2-2008** or equivalent approved standard in accordance with manufacturer's instruction.

2.3.4.2. Where threaded joint is to be made between plastic (ABS/PE/PB) pipes and metal, the plastic (ABS/PE/PB) pipes should be the male component of the joint.

2.3.4.3. All screwed joints shall be made by using Teflon tape or approved jointing compound.

2.3.5. Flanged Joints

Flanged joints or other suitable methods can be used for pipe more than 50mm and working pressure more than 10 bar (PN10).

2.3.6. Bends

Bends of all piping shall have a radius of not less than 5 times the diameter and shall be of standard type.

2.4. Pipe Supports

2.4.1. Pipe supports, hangers, anchors, guides etc. shall be supplied and installed for proper support.

2.4.2. Vertical riser shall be supported at each floor with galvanized iron (G.I) riser clamps or other material subject to S.O.'s approval.

2.4.3. Horizontal pipe runs shall be supported on hangers of split ring adjustable type or clevis type. Where pipelines run along walls, columns or ceilings, brackets or clamps may be used.

2.4.4. Piping at all equipment, valve positions and at main junctions, shall be adequately supported to prevent any distortion or transmission of strain to connect equipment or valves.

2.4.5. Where pipe lines run in a common group, they shall be supported from a common hanger bar as indicated in the approved drawings.

2.4.6. Pipe supports and hangers shall be spaced at intervals as shown in **Table X3** and **Table X4**:

TABLE X3. Recommended Maximum Spacing of Support for Horizontal Cold Water Pipe

Pipe Size (mm)	Recommended Maximum Spacing of Support (m)	
	Non-metal	Metal
20	0.8	1.5
25	0.85	1.8
32	1.0	2.4
40	1.1	2.4
50	1.25	2.4

80	1.65	3.0
100	1.9	3.0

Source: *British Standards Institude. (2010). BS EN 806-4: Specifications for installations inside buildings conveying water for human consumption. Installation*

TABLE X4. Recommended Maximum Spacing of Support for Vertical Cold Water Pipe

Pipe Size (mm)	Recommended Maximum Spacing of Support (m)	
	Non-metal	Metal
20	1.0	2.4
25	1.1	2.4
32	1.3	3.0
40	1.3	3.0
50	1.6	3.6
80	2.1	3.6
100	2.5	3.6

Source: *British Standards Institude. (2010). BS EN 806-4: Specifications for installations inside buildings conveying water for human consumption. Installation*

2.4.7. Vertical pipes shall be supported at least at the top and bottom of each riser, at each floor level, and at each isolating valve. In addition, a further support shall be provided between floor levels for pipes smaller than 32mm.

2.5. Pipe Sleeve and Cover Plate

2.5.1. Where pipes are required to be laid through structural beams or slabs, G.I/uPVC pipe sleeves shall be provided. All pipes shall be properly secured in place with brackets.

2.5.2. All exposed piping within occupied rooms shall be boxed up to S.O.'s approval.

2.5.3. Where pipe past through fire break walls or other partitions, clearance between pipes and sleeves shall be tightly pegged with suitable fire rated material to form a sound and fire barrier.

2.6. Valves and Fitting

2.6.1. All valves shall be of SPAN approved, manufactured and generally constructed in accordance with relevant standard. All valves shall be suitable for system operating pressure.

2.6.2. All valves and fittings necessary for the correct control, operation and maintenance of all services shall be provided and installed to the satisfaction of the S.O.. Samples shall be submitted for S.O.'s approval before installation. Valves shall be installed where they are easily accessible for maintenance and operating purposes.

2.6.3. Each valve shall be of the same nominal size as the pipeline in which it is installed, except for control, pressure reducing and similar valves which shall be correctly sized as per specific duty and functionality.

Connection between each valve and adjacent piping or equipment shall be made either flange or threaded joints may be applicable.

2.6.4. Before installation, every valve shall be blown out with air to remove any foreign matter lodged in the valve.

2.6.5. Stop Valves / Gate Valves

2.6.5.1. Stop valves / gate valves are generally used as isolation valves.

2.6.5.2. Full bore copper alloy screw-down stop valves / gate valves of the same diameter as the pipe shall be provided and fixed for control in the following positions:

2.6.5.3. On the service pipe before it enters the building.

(i) On each branch of the service pipe.

(ii) On the inlet to each storage or feed cistern.

(iii) On the inlet to each flushing cistern.

(iv) On the outlet of each storage tank or feeder cistern.

(v) In other position on the pipe as shown or indicated, other than on overflow/warning pipe.

(vi) For system with pressure reducing valve (PRV), location of the gate valves shall be as indicated in the approved drawings.

2.6.5.4. Stop valve of 50mm and below shall be complied with *MS 1022* and stop valve of 50mm and above shall be complied with *BS EN 1213*.

2.6.5.5. Gate valve of various sizes shall be complied with *BS EN 12288* (copper alloy valves) and *BS EN 1171* (cast iron valves) (PN12 above).

2.6.5.6. Gate valve sized from 65mm to 100mm shall be either screwed or flanged end complied with above mentioned standards.

2.6.5.7. Valves with reduced flow areas shall not be used for water closet flush valves and flushing cistern.

2.6.5.8. All valves shall have hand-wheel with externally screwed bronze or stainless steel spindle.

2.6.6. Pressure Gauges

2.6.6.1. Dial type with 3-way gauge cock shall be supplied and installed where indicated in the approved drawings.

2.6.6.2. A pressure gauge shall be installed at every suction pipe, every delivery pipe and at the common header pipe.

2.6.6.3. Pressure gauges shall be minimum 100mm diameter dial face type and having ranges suitable for the service pressure

encountered. The measuring range of the gauge should be 125% of the maximum pressure.

2.6.6.4. The gauges shall be industrial type shock proof, liquid filled, stainless steel casing and IP 65 Ingress Protection Rating.

2.6.6.5. The construction of pressure gauges shall comply with *BS EN 837-1*.

2.6.7. Pressure Reducing Valve (PRV)

2.6.7.1. Air vent and pressure reducing valve shall be installed at 30 meter intervals along downpipes to restrict the pressure sustained by the fittings to prevent water hammer and other effect.

2.6.8. Check Valves

2.6.8.1. Where shown in the drawings, non-slam-type check valves shall be supplied and fitted.

2.6.8.2. Valves shall be selected in relation to the velocity of the water in the pipe. In all cases, the valve is required to operate silently on reversal of water flow and if necessary, valves of the double or articulated clack type or the spring assisted type shall be fitted.

2.6.9. Water Meter

2.6.9.1. Suitable water meter approved by SPAN shall be supplied and installed as required.

2.7. Water Tank

2.7.1. Water Tank Material

2.7.1.1. All water tanks for water supply shall be of the type and capacity shown or stated in the drawings. The water tanks shall be watertight and properly supported.

2.7.2. Fibreglass Reinforced Plastic (FRP) Water Tank

2.7.2.1. The tanks shall be scribbled down and flushed out with clean water and sterilized with chemical containing chlorine before being put into use.

2.7.2.2. Water tank design shall comply with the following standards:

(i) MS 1241 - FRP Water Tank

(ii) MS 1390 – FRP Sectional Water Tank

(iii) Any other standards approved by SPAN

2.7.2.3. Materials for the construction of panels shall conform to MS 1241. The surface of FRP panels shall be manufactured with built-in stabilizer against embrittlement due to ultra-violet radiation.

2.7.2.4. The panel shall be of hot press moulded and fabricated from fiberglass reinforced plastic (FRP) of dimension 1meter x 1meter square with maximum tolerance of 1.5mm. Each FRP panel will be manufactured with flanges at a right angle of 90° to all sides of each panel. The thickness of the flange for the side wall and base plates will not be less than 10mm and the landed width of each flange will not be less than 70mm for base and side panels.

2.7.2.5. Water storage tank of 10,000 litres or more shall have internal compartments to facilitate maintenance of the water tank. Alternatively, multiple tank may be employed. An equalizing pipe shall be provided between each compartment or between each separate storage tank supplying water to the same distribution pipe.

2.7.2.6. Physical Properties of the FRP Panel is as shown in **Table X5**:

TABLE X5. Physical Properties of FRP Panel

Parameter	Results
Tensile strength	>70 MN/m²
Bending strength	>100 MN/m²
Elastic modulus in bend	>6,000 MN/m²
Hardness	30% or 90% of the resin manufacturer specification whichever is higher
Glass content	>25%
Water absorption	1.0%

Source: *Malaysian Standard. (2010). MS 1390: Glass-Fibre Reinforced Polyester Panels and Panel Water Tanks – Specification (First Revision)*

2.7.2.7. Jointing Material

(i) The jointing material shall be synthetic rubber as sealant with stainless steel washer, nuts and bolts.

(ii) The holes for the bolts will be 12mm ± 1.5 to 2.0mm in diameter, suitable for M12 bolts and nuts.

2.7.2.8. Connections

(i) All holes and pipe connection made in wall, top and bottom of tanks shall be factory fabricated before delivery of tank to site. The positions and type pipe connections shall be carried out strictly in accordance with the manufacturer's recommendations.

2.7.2.9. Painting

(i) The internal face of the water tank shall be given two coats of non-toxic, non-corrosive paint and external one coat primer and two coats of non-corrosive paint to S.O. approval.

2.7.3. High Density Polyethylene (HDPE) Tank

2.7.3.1. The HDPE tanks shall be constructed of physiologically safe, non-toxic, inert, visor-elastic, UV-resistant high density polyethylene of one-piece moulded seamless construction to *BS 4213* or *MS 1225* and *SIRIM* certified without welding or joint. The tanks shall be manufactured from 100% virgin food grade resins without the additional recycled or reworked material. The resin used must be certified by the resin manufacturer to be food grade compliance and suited for the potable water.

2.7.3.2. The tanks and all piping connections shall be installed strictly in accordance to manufacturer's instructions and specification and the installation shall be supervised and verified by the manufacturer.

2.7.3.3. The tanks shall come with a minimum 10 years warranty against defect in materials, manufacture and workmanship by the tank manufacturer. The warranty certificate shall be submitted to S.O. before handing over.

2.7.4. Stainless Steel Tank

2.7.4.1. Stainless steel tank design shall comply with the following standards shown in **Table X6**:

TABLE X6. Standard for The Respective Steel Tank

Type of water tank	Standard
Stainless steel storage tank	JKR 20200-0041-99
Pressed steel sectional rectangular tank panel	BS 1564

2.7.5. Stainless Steel Storage Tank

2.7.5.1. Material used in the fabrication of this tank shall be of Grade 304 stainless steel ASTM Designation: A240/A240M-94a or equivalent standards and supported by the respective mill certificates.

2.7.5.2. The finished surface of the materials used shall be of bright annealed (BA) and/or non-shining (2B) finished.

2.7.5.3. The tank shall be manufactured inclusive of the following components:

(i) Top cap

(ii) Top cover

(iii) Tank body

(iv) Bottom cover

(v) Stand (for round bottom & spherical types only)

2.7.5.4. The stands (except for flat bottom type), fittings and accessories such as internal and external ladder, tank cover, screw nut, etc. of the tank shall be made of similar stainless steel materials of the above grade.

2.7.5.5. Each tank shall be marked / labeled on the external upper part of the tank body according to the following information:

(i) Manufacturer's name and/or trade mark

(ii) Date of manufacture

(iii) Serial number and model

(iv) Capacity

2.7.6. Pressed Steel Sectional Rectangular Tank Panel Water Tank

2.7.6.1. Material for the pressed steel sectional water tank shall be manufactured from 0.8mm thickness Grade 304 stainless steel plate inner surface composite with minimum of 5mm external surface of mild steel plate.

2.7.6.2. The reinforcement for pressed steel sectional water tank shall be reinforced using suitable support. Detail calculation for internal / external reinforcement design shall be submitted to S.O. for record.

2.7.6.3. All bolts, nuts and washers in contact with water shall be of stainless steel Grade 304. All external bolts, nuts and washers in contact with water shall be of hot dipped galvanized mild steel.

2.7.6.4. The cover for pressed steel sectional water tank shall be constructed 1.2m x 1.2m / 1m x 1m from 1.2mm thickness Grade 316 stainless steel plate.

2.7.6.5. Non-toxic PVC foam shall be used for jointing between flanges.

2.7.7. Tank Components and Accessories

2.7.7.1. The installation of storage / domestic tanks shall include but not limited to the following accessories and fitting to the tanks:

(i) Overflow / warning pipe, outlet tapping and scour pipes shall discharge outside the building or to a point shown or stated in the approved drawing.

(ii) Access manholes with cover, the number, locations and details of which shall be approved by S.O..

(iii) Mosquito-proof air vents to the tank cover at the positions and as per details approved by S.O..

(iv) Water tanks of two (2) metres depth or more shall be provided with internal and external ladders. The internal ladder and external ladder shall be made of stainless steel grade 304 unless otherwise specified. The ladder width shall not be less than 300mm and the length shall

be suitable for the tank specified. The maximum height from floor finish level to the first ladder step shall be 300mm.

(v) Water level indicators and scales graduated in meters to suit the depth of the tank as shown in the approved drawings.

(vi) Float Operated / Ball Valves

a) Float operated valve shall comply with BS 1212. The combination of body pattern, seat number and size of float to suit the required pressure zone shall be as per standard.

b) All ball valves shall be supplied and fitted complete with back nuts, ball float, arm, etc. Ball floats may be of soldered copper or brass or alternatively polyethylene and PVC.

(vii) Pilot Operated Valve

a) Pilot-operated valve shall comply with AWWA C530-07. The configuration and material of main valve, vertical float rod and float shall be as per standard and specification.

(viii) Drain Cocks

a) Gunmetal drain cocks shall be provided as necessary to ensure that all sections of the pipework and plant can be effectively drained. The sizes of drain cocks shall be as follows: -

i. Tanks, plant and pipes above 6" diameter - ≥ 1" diameter

ii. Pipes 3" to 5" diameter - 0.75" diameter

iii. Pipes up to 2.5" diameter - 0.5" diameter

2.7.8. Water Tank Foundation

2.7.8.1. Panel Tank

(i) Unless otherwise shown in the approved drawings, the foundations shall be constructed to provide continuous support to all base panel joints in one direction at 1000mm nominal centres according to panel sizes. The concrete foundation shall have a width of at least 300mm and height of at least 600mm. All foundations shall be constructed according to JKR standard specifications.

(ii) If concrete slab is used, dwarf walls or steel beams shall be placed between the tank and the base level to allow a minimum clearance of 500mm to enable ease of tank

installation and subsequent bolts tighten and adjustments after installation.

(iii) Whenever recommended by the tank manufacturer, the steel skid base shall be designed and constructed in accordance with manufacturer's instructions, and details. In such cases, the continuous support can be spaced at greater than 1000mm nominal centers as recommended by the manufacturer.

2.7.8.2. Round Tank

(i) The concrete plinth shall have minimum of 100mm height complete with 5mm mild steel base plate as per tank size.

2.7.9. Flange Joint (Nozzle)

2.7.9.1. Flange joint used for the inlet, outlet and scour of storage tanks shall be made of stainless steel grade 304 externally and internally. Joint gaskets shall be of 5mm thick, medium rubber reinforced with two-ply flexible fabric and complying with BS 6956, or approved silica sealant used in the FRP tanks. All bolts, nuts and washer used for flange nozzles shall be made of stainless steel grade 304.

2.8. Cleaning, Painting and Identification

2.8.1. Cleaning of Pipework

2.8.1.1. All pipes, fittings, etc., shall be kept closed against moisture and foreign matters when stored on site.

2.8.1.2. All pipes, fittings, valves and accessories shall be thoroughly cleaned internally and externally before their installation and again where necessary before closing up.

2.8.1.3. After installation and before putting into service, all pipework including fittings, valves shall be thoroughly cleaned internally.

2.8.2. Painting and Identification

2.8.2.1. All pumping equipment shall be factory painted according to the manufacturer's recommendations.

2.8.2.2. All thermoplastic pipes, fittings, valves, etc., exposed directly to sunlight shall be painted with water based exterior-grade latex paint.

2.8.2.3. All surfaces to be painted shall be first thoroughly cleaned to remove dirt, scales, grease spots etc. Surface shall be completely dry before painting.

2.8.2.4. All surfaces shall have minimum one coat primer and two coats finish subject to S.O.'s approval.

2.8.3. Pipework Identification

2.8.3.1. All pipes installed shall be identified in accordance with their relevant standards.

2.8.3.2. Directional arrows shall be painted on the pipework in the plant rooms, tank room and vertical risers. Lettering and the direction of flow must be indicated by painting a black / white arrow on to the pipelines at appropriate intervals. These arrows shall be 3" long on pipes up to 50mm (2") diameter, 150mm (6") long for pipes over 50mm (2") diameter.

2.8.4. Labels for Valves and Controls

2.8.4.1. All control valves, relays, switches and instrumentation shall be identified by black or white engraved laminated plastic labels, securely attached to the item by means of non-corrodible screws or rivet or any other method approved by the S.O., or when such item is installed on or within panels or cubicle, the labels shall be located immediately below the item.

3. Sanitary Plumbing System

3.1. Rules and Regulation By Law

3.1.1. All the workmanship and material for the supply, installation, testing, adjusting, balancing & commissioning of all system and accessories shall comply with the following rules and regulation requirements:

3.1.1.1. Drainage, Sanitation and Sanitary Plumbing By-Laws of the Street, Drainage and Building Act. 1974;

3.1.1.2. Gravity Drainage Systems Inside Buildings - Sanitary Pipework, Layout and Calculation, BS EN 12056 Part 1, Part 2 & Part 5;

3.1.1.3. Code of Practice for Sanitary System in Buildings, MS 1402:2006;

3.1.1.4. Local Authority By-Laws in force at time of installation; and

3.1.1.5. Other relevant rules and regulations.

3.2. Material Standard

3.2.1. Pipework for sanitary plumbing shall be to the dimensions shown in the drawings or as specified hereinafter and shall be complete with all fittings, brackets, supports and other accessories to complete the installation.

3.2.2. All pipes, fittings and equipment used for sanitary plumbing and installation shall be of the type and make approved by SPAN and as mentioned in the drawings.

3.2.3. The standards stated in this specification shall comply with their latest edition issued or relevant standards approved by SIRIM.

3.2.4. The following standards in their latest edition as shown in **Table X7** shall apply:

TABLE X7. Standard for Different Types of Sanitary Pipe

Item	Standard
Unplasticized polyvynil chloride (uPVC)	MS 1063, BS EN 1329-1, BS 4514, MS 628, BS EN ISO 1452-2:2009
Unplasticized polyvynil chloride (uPVC) (Underground)	MS 979: Part 1 (∅100mm & ∅155mm) MS 979: Part 2 (∅200mm and above) or BS EN 1401-1, MS 1085
Poly propylene (PP)	MS ISO 7671:2012
Cast Iron Pipes	BS 416 for heavy grade pipes BS 437 for spigot / socket drain
Galvanized Iron	BS EN 10255 "Heavy"

3.3. Definition of Sanitary Pipe

3.3.1. Soil (Black Water) Pipe

3.3.1.1. Pipes attached to a building and designed to convey sewage or waste matter from any water closet (W.C) or urinal.

3.3.2. Waste (Grey Water) Pipe

3.3.2.1. A separate waste pipe shall be provided for the following:

(i) Dirty water from baths, basins, wash troughs, ablution, floor trap and other waste containing a small proportion of soap and /or dirt; and

(ii) Greasy water from kitchen sinks and equipment where grease traps or interceptors are required.

3.4. Sanitary Discharge System

3.4.1. All main stacks shall be minimum 100mm diameter or subject to S.O.'s approval.

3.4.2. The discharge system can be classified as follows:

3.4.2.1. Single Stack System

(i) In this system, all appliances discharge separately into a single discharge stack. All traps are unventilated and those on pipes 50mm and below must have 75mm water seals (trap). The stack is directly connected to the manhole.

3.4.2.2. Fully Ventilated System

(i) All appliances are directly discharged to a common stack and essential features of this system are the provision of 75mm deep seal traps on baths, basins and sinks as well as the provision of a ventilating pipe to which every appliance connected.

3.4.2.3. The Modified Single Stack System

(i) The modified single stack system basically similar to the single stack system, with the exception that the W.C.'s only are ventilated direct to the main ventilating pipe.

(ii) The depth of the water seal to all appliances, except W.C.'s shall 75mm.

(iii) The depth of the water seal to W.C.'s shall be 50mm to the main discharge stack.

3.4.2.4. Ventilated System

(i) The discharge from W.C.'s, urinal and other soil appliances are conveyed via a main discharge soil (soil pipe) and finally to the sewer line.

(ii) A separate waste pipe conveys the discharge from waste basins, baths, sinks to the waste water drain through a trapped gully.

3.5. Pipework Material

3.5.1. UPVC Soil, Waste and Vent Pipes

3.5.1.1. All pipes shall run in accordance with layout sizes shown in the approved drawings. The pipes shall be provided, fixed and connected to fittings and sanitary installation complete with all necessary bends, tees, sockets, branches, offsets, inspection pieces, etc. Pipes shall be joined with approved solvent in accordance with the manufacturer's instructions.

3.5.1.2. Pipes, fittings and the system of unplasticised polyvinyl chloride (uPVC) in the field of soil, ventilation and waste discharge (low and high temperature) inside buildings, for soil and waste discharge systems buried in ground within the building structure and for soil, ventilation and waste discharge for both inside buildings and buried in building structure shall complied to MS 1063 or BS EN 1329 Part 1 or BS 4514 (size ∅82mm only).

3.5.1.3. Pipes, fittings and the system of unplasticized polyvinyl chloride (uPVC) piping systems shall comply to MS 1063; or BS EN 1329: Part 1; or BS 4514 (size ∅82mm only)

(i) For soil, ventilation and waste discharge (low and high temperature) inside buildings (marked with "B").

(ii) For soil and waste discharge systems buried in ground within the building structure (marked with "D").

(iii) For soil, ventilation and waste discharge for both inside buildings and buried in building structure (marked with "BD").

3.5.1.4. The pipes and the fittings shall be coloured through the wall. The colour of pipes and fittings shall be as follows:

(i) "B" code – white

(i) "D" code – brown

(i) "BD" code - white

3.5.1.5. All underground sewerage pipe and fittings of ∅ 4" (100mm) diameter and ∅ 6" (150mm) diameter shall be of uPVC Brown complied to MS 979: Part 1; and for size ∅ 200mm and above complied to MS 979: Part 2 or BS EN 1401 Part 1 or BS 4660 (fitting of nominal size 110mm and 160mm only).

3.5.1.6. Main soil, waste and vent pipes shall be carried up to the roof level and protected by vent cowl and weather apron as per approved drawing.

3.5.1.7. All pipes shall be fixed in straight runs and all horizontal runs shall be laid to gradients in accordance with BS EN 12056 Part 2 and in any event not less than 18mm/m unless otherwise instructed.

3.5.1.8. UPVC Waste, Vent and Soil System (Inside building, buried in building structure and buried in ground within building structure)

(i) The uPVC pipes, fittings and system shall comply in all respects with the requirements of MS 1063 or other relevant standard certified by SIRIM / SPAN.

(ii) Pipes shall be supplied in plain-ended lengths and the minimum acceptable with thickness of pipe and fittings as shown in **Table X8**:

TABLE X8. Minimum Acceptable Thickness of UPVC Waste Pipe and Fittings

Nominal Sizes (mm)	Wall Thickness (mm)		
	Pipes (mm)	Fittings (mm)	Sockets (mm)
32	3.0	3.0	2.0
40	3.0	3.0	2.0
50	3.0	3.0	2.0
63	3.0	3.0	2.0
75	3.0	3.0	2.0
80	3.0	3.0	2.3
82	3.0	3.0	2.3
90	3.0	3.0	2.3
100	3.0	3.0	2.3
110	3.2	3.2	2.4
125	3.2	3.2	2.4
140	3.2	3.2 / 3.5*	2.4 / 2.6*

160	3.2	3.2 / 4.0*	2.4 / 3.0*
180	3.6 / 4.4*	3.6 / 4.4*	2.7 / 3.3*
200	3.9 / 4.9*	3.9 / 4.9*	2.9 / 3.7*
250	4.9 / 6.2*	4.9 / 6.2*	3.7 / 4.7*
315	6.2 / 7.7*	6.2 / 7.7*	4.7 / 5.8*

Note * For soil and waste discharge systems buried in ground within the building structure and for soil, ventilation and waste discharge for both inside buildings and buried in building structure.

(iii) The method of jointing to be employed shall be that solvent welding using the manufacturer's approved cement. Seal ring fittings shall be used where necessary to accommodate thermal movement or the sockets of standard fittings shall be converted to seal ring adaptor.

(iv) Access shall be provided where necessary either by means of an integrally moulded door in an access fitting with an externally fitted rubber seal and secured with two-piece clamp type door fitted into the pipe run.

3.5.1.9. Underground uPVC Sewerage Pipes and Fittings

(i) The underground uPVC sewerage pipes and fittings shall comply in all respects with the requirement of MS 979: Part 1 (∅100mm and ∅155mm) and MS 979: Part 2 (∅200mm and above) or other relevant standard certified by SIRIM / SPAN.

(ii) Pipes shall be supplied in plain-ended lengths.

(iii) The minimum acceptable wall thickness of pipes and fittings shall be as shown in **Table X9**:

TABLE X9. Minimum Acceptable Thickness of Underground UPVC Pipe and Fittings

Nominal Sizes (mm)	Wall Thickness (mm)		
	Pipes	Fittings	Junctions
100	3.2	3.4	3.4
155	4.1	4.1	4.1
200	4.9	4.9	4.9
250	6.1	6.1	6.1

(iv) The method of jointing to be employed shall be strictly to manufacturer's recommendation.

3.5.1.10. Expansion Joints (Expansion Coupling for uPVC Pipes)

(i) Where pipework is constructed using solvent welded joints, expansion joints for uPVC pipes shall be carried out in accordance with the manufacturer's recommendations.

(ii) Expansion joints shall be provided at a maximum of 4 meter centre for soil, 2 meter centre for waste and between fixed points over 1 meter centre.

3.5.1.11. Cast Iron/Galvanized Iron Pipe

(i) Where shown or stated in the drawing, 100mm diameter cast iron soil and vent pipes internally coated with anti-corrosive bituminous coating shall be provided, fixed and connected to the fittings and sanitary system.

(ii) All main and branch soil pipe and fittings shall be cast iron to BS 416 Heavy grade coated with an approved tar-based composition.

(iii) Main and branch vent pipe and fittings shall be cast iron to BS 416 Heavy grade factory coated with an approved certificate tar-based composition.

(iv) Branch vent pipe of 2" (50mm) diameter and below shall be galvanized to BS 10255: Heavy grade.

(v) Cast iron pipes shall be jointed with an approved certificate resin with molten lead and well-sealed. All necessary bends, tees, sockets, branches, offsets, inspection pieces, shall be provided where necessary.

3.5.1.12. Other Material

(i) All material not specifically mentioned above shall conform to the latest edition of their respective British Standard and/or Malaysian Standard or equivalent specification and shall be to the approval of SIRIM / SPAN.

3.6. Workmanship & Pipe Support

3.6.1. The installation, method of jointing and fixing shall comply in all respects to the manufacturer's recommendation and comply with latest relevant standards.

3.6.2. All soil, waste and vent pipes, pipe hooks clamps and clips shall be placed tight up against the head or underside of the collar. Extension clips shall be used where it is necessary to run the pipe clear of the wall.

3.6.3. Use only fixings that are compatible with the materials and system of pipework. Do not exceed the maximum spacing between fixings for sanitary pipes given below.

3.6.4. Maximum intervals between pipe supports shall be:

3.6.4.1. Horizontal Position

TABLE X10. Recommended Maximum Spacing of Support for Horizontal Sanitary Pipe

Pipe Size (mm)	Recommended Maximum Spacing of Support (m)	
	Non-metal	Metal
32	0.5	2.1
40	0.5	2.4
50	0.6	2.7
80	1.0	3.0
100	1.0	3.0
150	1.2	NA

Source: British Standards Institude. (2000). BS EN 12056-2: Gravity drainage systems inside buildings. Sanitary pipework, layout and calculation

3.6.4.2. Vertical Position

3.7. Ventilating Pipe

3.7.1. Main ventilating stack pipe shall be discharge to the open air or connected to the discharge stack above the spillover level of the highest appliance on the stack. (Soil pipe or single stack system shall in all cases be vented by upward extension of the soil or combined pipe).

3.7.2. The upward vent pipe shall be straight and free from any bends or angles except where unavoidable. It shall be extended through the roof to the required height with the open end protected by means of copper wire globe or approved cowl. The distance of outlet is not less than 900mm above the head of any window or other opening into a building and within a horizontal distance of 3m.

3.7.3. All vent and branch vent pipes shall be graded 18mm/m (minimum 1°) to drip back to the soil or waste pipe by gravity. A branch vent must rise vertically or at an angle of not more than 45° from the vertical to a point 150mm above the fixture it is venting before running horizontally.

3.7.4. Main ventilating pipe shall not be less than 50mm dia. or 2/3 of the diameter of the main soil/waste pipe whichever the larger diameter is.

3.8. Anti-Syphonage

3.8.1. An anti-syphonage pipe shall be carried up from each fixture to the branch or main vent pipe above the level of the fixture to prevent the loss of the water seal in traps.

3.8.2. No fixture shall be connected to the soil, waste or combined pipe at any point between the trap and the anti-syphonage pipe, which it serves.

3.8.3. In special cases, anti-syphonage vent pipe could be connected to the waste, combined pipe or soil pipe on the opposite side of the water seal to the fixture at a point, which should be between 75mm to 300mm from the crown of the trap. In the case of bath and closet pan, the vent pipe shall not exceed 1.2m from the crown of the trap.

3.8.4. Before connecting to the main vent pipe all anti-syphonage pipework shall rise above the floor level of the sanitary appliances.

3.8.5. Anti-syphonage pipework shall not be less than 32mm diameter.

3.9. Traps

3.9.1. Each sanitary appliance shall be fitted with a trap either as an integral part of the appliance or attached to and immediately beneath its outlet. All traps shall be accessible and provided with adequate facility for cleaning. The internal surface of the trap shall be smooth throughout. Generally, the trap shall be of the same material as the soil/waste pipe.

3.10. Floor Traps

3.10.1. Floor trap in all areas, unless otherwise specified, shall be 100mm diameter similar materials to the pipe traps complete with grating and self-tapping screw.

3.11. Testing Tees

3.11.1. Testing tees shall be located on the vertical stacks between floors to enable each floor to be tested independently as specified hereafter. Upon completion of testing, the tees shall be sealed up with lead joint or solvent joint where uPVC pipe is specified.

3.12. Grease Interceptors/Waste Drain Trap (Where Specified)

3.12.1. The body of the interceptor and baffles shall be made of Stainless Steel Grade 316. The baffles shall be of removable type.

3.12.2. Grease interceptors shall be certified by relevant authority. It shall be of floor mounted or fully recessed manual type complete with extension collar or extension piece to suit the structural requirement where required.

3.13. Reducing Fitting

3.13.1. Wherever reduction in pipe sizes takes place, reducing fitting shall be used.

3.14. Cleaning Eyes and Inspection Opening

3.14.1. To provide access for the proper inspection, cleaning and testing of the entire length of pipe, inspection openings and cleaning eyes shall be provided on all soil, waste and combined pipes at:

3.14.1.1. Each change of direction of piping; and

3.14.1.2. Based on each soil, waste or vent stack.

3.15. Temporary Closing of Pipeworks (Ingress of Contaminants)

3.15.1. As soon as pipes have been installed, all openings shall be capped or plugged to prevent the entrance of materials that would obstruct or choke the pipes. It is the responsibility of the Contractor to ensure that caps and plugs are left in place until removal is necessary for completion of installation.

3.16. Inspection Chamber / Gully Trap

3.16.1. The works shall include the construction of all inspection chambers / gully trap generally as shown in the civil/tender/working drawings and specification. Inspection chamber and gully trap shall not be located in clinical areas, clean areas or any other areas that will affect the cleanliness, functionality and operability of the spaces.

3.17. Underground/Buried Pipe (For Sanitary)

3.17.1. All underground/buried pipes shall be carefully laid on beddings free from rocks, stones and other broken materials. Unless otherwise stated, all direct buried pipework shall be installed in open trench.

3.17.2. Excavation and Trenching for Piping

3.17.2.1. The Contractor shall perform all excavation to the depths indicated in the drawings or as specified in conformance with local authority requirements.

3.17.2.2. All excess excavation materials shall be removed from the site. The contractor shall prevent surface water from flowing into trenches or the excavations by using sheeting and shoring method thus ensuring the safety of personnel. Any water accumulating therein shall be removed.

3.17.3. Trench Excavation

3.17.3.1. Trenches shall be of necessary width for the proper laying of the pipe, and the banks shall be as nearly vertical as practicable. The bottoms of the trenches shall be accurately graded to provide uniform bearing and supports for each section of the pipe on undisturbed soil at every point along its entire length, or may be over excavated 100mm below depth indicated and filled with well tamped salt free coarse sand or other approved materials. Layers or brick, concrete base and angle blocks shall be used support for the laying of piping.

TABLE X12. Trenches Width for Different Pipe Diameter

Pipe Diameter Inches	Trenches Width Inches
3 and under	15 - 24
4 - 6	18 - 28
8	20- 30

3.17.4. Depth of Trench's Cover

3.17.4.1. The minimum depth of trenches covered with concrete slab shall be 450mm from top of pipe to finished ground level and trenches without concrete slab shall be 750mm.

3.17.5. Protection of Existing Utilities

3.17.5.1. Existing utility lines or other completed utility lines if damaged by the Contractor shall be repaired at his own expense.

3.17.5.2. When connecting to existing utility lines, no section of the existing piping shall be abandoned unless it is specifically indicated on the drawings.

3.17.6. Backfilling of Trenches

3.17.6.1. Trenches shall not be backfilled until all required pressure and other tests have been performed. Backfill and compaction shall comply to Civil & Structural Engineer's requirements.

4. Testing, Adjusting, Balancing and Commisionning (TABC)

4.1. General

4.1.1. All work to be performed shall be in accordance with this specification and the commercial practice.

4.2. Internal Cold Water Plumbing System

4.2.1. The Contractor shall allow for the cost of all tests to the plumbing system to the satisfaction of the S.O.. The completed plumbing system shall be tested for hydraulic performance.

4.2.2. The cost for providing all testing, adjusting, balancing and commissioning as well as calibrated measuring equipment, all materials and consumables such as fuel, electricity, water etc. shall be borne by the Contractor.

4.2.3. All pipework which is to be encased or concealed shall be tested, approved and recorded before it is finally enclosed.

4.2.4. The Contractor shall give the S.O. a minimum of full seven (7) days notice of his readiness to carry out acceptance tests, completed testing sheet and schedule for S.O.'s approval.

4.2.5. Before the commencement of acceptance tests, the Contractor shall have completed all of his preliminary testing and adjusted the equipment to its proper running order.

4.2.6. During the testing period, no modification, adjustment or other work on the installation shall be carried out without the permission of the S.O.. Should there be any contravention of this requirement, the results of all tests completed may be rejected and a retest shall be carried out.

4.2.7. No acceptance test shall be carried out except in the presence of the S.O., the State Water Authority's representative (if required) and the Contractor or their respective representative appointed for the purpose.

4.2.8. If the installation fails to perform during testing in accordance with the requirements of the Specification or acceptance criteria, the S.O. may reject the whole or any part of it. The Contractor shall bear all costs and expenses for all retests and remedial works.

4.2.9. Testing of Internal Pipework

4.2.9.1. Pressure Test

(i) Internal reticulation and main distribution pipes shall be slowly and carefully charged with water in order that all air is expelled from the system. The system shall be allowed to stand full for 24 hours. An air relief valve should be provided at the highest point in the system to bleed off any air that is present.

(ii) A test pressure of 1.5 times the maximum working pressure shall be applied for 24 hours.

(iii) No pipework shall be covered or concealed until it has been tested to the satisfaction of the S.O. or his representatives. Where arrangement of work makes necessary, the piping system shall be tested by sections to prove joints between sections.

(iv) The completed system shall be inspected for leaks during the test. Should any signs of leakage occur in the tanks or pipework, their positions shall be marked and the Contractor shall carry out remedial measures. The pressure tests procedure shall be repeated until the whole water system passes. The pipe installation is considered to have passed the pressure test if no visible leak and no drop in the pressure reading are observed during the test.

(v) All equipment not designed to withstand test pressure shall be disconnected during test, but shall be reconnected and tested under actual working pressure.

(vi) The permanently installed pumps shall not be used for pressure testing of the water system.

4.2.9.2. Flow Test

(i) During the flow test, all pumps shall be run with all valves fully open and the following data shall be recorded:

a) Flow at pump outlet into storage tank

b) Head at pump discharge outlet

c) Current consumed

d) Voltage

4.2.9.3. Flushing of Cold Water System

(i) After completion of the pressure tests to the satisfaction of the S.O., the whole piping and water storage system shall be thoroughly flushed with potable water before they are put into use.

(ii) The Contractor shall ensure the system is fit for purpose and the water in the pipeline is safe for consumption after flushing.

(iii) The Contractor, at his own expense, shall use water supply for cleaning and flushing out of all the plumbing system that he had installed as per Contract.

(iv) Control valves and all equipment liable to damage, shall be disconnected before cleaning out. All strainers shall be thoroughly cleaned out during and at the completion of the clean out operation.

4.2.9.4. Balancing

(i) Prior to balancing, all isolation/gate valves shall be checked to be in the fully open position for the pumping system.

4.2.9.5. Records

(i) All pressure, flow and balancing tests shall be recorded by Contractor and certified by S.O. or S.O.'s representatives.

(ii) The S.O. reserves the rights to order a re-test if the Contractor fail to produce authentic test record.

4.2.10. Testing of Storage Water Tank

4.2.10.1. After flushing, the tank shall be filled with water to maximum operating capacity level and the level of water surface shall be carefully recorded. The tank shall be accepted as satisfactory if after a period of 48 hours there is:

(i) No measured reduction in water level, due allowance being made for evaporation from the surface of water;

(ii) No visible sign of leakage from any part of tank;

(iii) No deformation of any part of the surface.

4.2.10.2. If the test results do not satisfy the above conditions of test, the Contractor shall locate and rectify all defects and leakages and the test shall be repeated. The Contractor shall bear all costs and expenses for all tests and remedial works.

4.2.11. Testing of Pump (If Applicable)

4.2.11.1. All pumps and motors shall be checked for flow rates, pressures and RPM. The input signal device sensors and controllers shall be checked to ensure the pumps cut-in and cut-out at predetermined water levels.

4.2.12. Post Occupancy Testing, Adjusting, Balancing and Commissioning

4.2.12.1. Further adjustments to the system controls such as re-balancing, re-tuning, re-checking and re-adjustment etc. shall be made whilst the building is occupied and the installation is in

use during the defects liability period. The cost of the adjustment shall be included in the tender.

4.3. Sanitary Plumbing System

4.3.1. The S.O. reserves the right to request for water, air or smoke tests as well as for hydraulic performance to be performed by the Contractor at his expense including the furnishing of the necessary equipment. The testing procedure shall be in accordance with MS 1402: Part 3.

4.3.2. Water Test

4.3.2.1. There is no justification for a water flood test to be applied to the whole of the plumbing system. The part of the system mainly at risk is that below the lowest sanitary appliances and this may be tested by inserting a test plug in the lower end of the pipe and filling the pipe with water up to the flood level of the lowest sanitary appliances, provided that the static head does not exceed 6m. This is a visual inspection.

4.3.3. Air Test

4.3.3.1. Air test may be performed by inserting expanding rubber testing plugs in the lower and upper ends of the main soil pipe and main ventilating pipes and sealing the plugs with water necessary. The water seals of all sanitary appliances shall be fully charged.

4.3.3.2. The testing plug at the upper end of the ventilation pipe should be fitted with a tee-piece with cock on each branch. A flexible tube manometer should be fixed to one branch while air pressure is being introduced into the system through the other branch until the desired pressure is indicated on the manometer scale.

4.3.3.3. The air test applied shall be 3.8 mbar (38mm water gauge) in period not less than 3 minutes without loss.

4.3.4. Smoke Test

4.3.4.1. Smoke can be introduced into the system by a small machine under the source pressure as for the air test. The whole system shall be filled with smoke before the openings are sealed with plugs.

4.3.4.2. The pressure on the smoke shall be maintained for three (3) minutes after the last opening has been sealed.

4.3.4.3. Smoke test is not recommended if UPVC pipe material is adopted. Rubber jointing components can also be adversely affected.

4.3.4.4. Smoke testing shall normally only be used instead of air test when an undetectable leak in the system occurs.

4.3.5. Hydraulic Performance

4.3.5.1. Hydraulic performance discharge tests shall be made from all appliances singly and correctively. Obstruction in any of the

pipe lines shall be traced and the whole system examined for proper hydraulic performance including the retention of an adequate water seal in each trap.

5. Comprehensive Service and Maintenance for Internal Cold Water and Sanitary Plumbing System

5.1. General

All work to be performed shall be in accordance with this specification and the commercial practice.

5.2. Workmanship and Materials

5.2.1. The work described in this specification shall be performed by skilful workmen in the service, maintenance and repair of the internal cold water and sanitary plumbing system and shall be executed in accordance with the good engineering practice.

5.2.2. All materials to be supplied in connection with work under this Specification shall be new, unused, genuine, and shall generally be the best quality in manufacturing and performance.

5.3. Supervision

5.3.1. The Contractor shall have a competent Plumber in charge of the service, maintenance and repair work to be carried out under this Specification and shall be in the direct employ of the Contractor, and acceptable to the S.O..

5.3.2. The Contractor shall have in his direct employ workmen who are skilled in the service, maintenance and repair of internal cold water and sanitary plumbing system.

5.4. Scope of Work

5.4.1. The work covered under this Specification is to service and maintain all equipment comprising the complete internal cold water and sanitary plumbing system strictly accordance with the servicing and maintenance schedule as set out in sub-section 5.6..

5.4.2. The Contractor shall rectify any defects in any parts of the complete internal cold water and sanitary plumbing system observed during routine inspection and service, and shall repair such defects if required to do so by the S.O..

5.4.3. The Contractor shall also provide emergency repair service at any time if required to do so by the S.O..

5.5. Consumable Materials

5.5.1. The Contractor shall include in his service and maintenance contract for the supply of the following consumable materials as and when required.

5.5.1.1. All oils and greases required for the lubrication of motor bearing, packing, pivots and other moving parts.

5.5.1.2. All cotton waste, soap detergent and other cleaning materials required for cleaning purpose.

5.5.1.3. All consumable filter elements.

5.5.1.4. All tap washers.

5.5.1.5. All electric contact points required to replace worn electric contact points in switchgears, electric control gears and electric relays.

5.5.1.6. All electric fuses required to replace blown or defective fuses.

5.5.1.7. All indicator lamps required to replace blown lamps.

5.5.2. The cost of these consumable materials shall not be charged for separately, but shall be included in the schedule quoted by the Contractor for the service and maintenance of the complete internal cold water and sanitary plumbing system.

5.6. Servicing and Maintenance Schedule

5.6.1. The Contractor shall inspect and service all equipment comprising the complete internal cold water and sanitary plumbing system periodically as scheduled in the approved check list except where otherwise directed by the S.O..

5.6.2. The Contractor shall report in writing to the S.O. any defect/s observed in any part or parts of the complete internal cold water and sanitary plumbing system. The technical report shall state the causes of the defects observed, and shall include the estimate of repairs required for non-consumable material or any part or equipment damaged by catastrophic event or vandalism.

5.7. Check List (Monthly Report)

5.7.1. Pumps (If Applicable)

5.7.1.1. Check all seals, glands and pipe line for leakage.

5.7.1.2. Check all pump bearing and lubricate with oil or grease.

5.7.1.3. Check the alignment and condition of coupling.

5.7.1.4. Check all bolt and nut for tightness.

5.7.1.5. Clean pumps casing and shaft.

5.7.1.6. Check and record pump running pressure.

5.7.2. Electric Motor Pumps (If Applicable)

5.7.2.1. Check motor bearing and rewinding.

5.7.2.2. Check carbon brush and slip rings and clean as necessary.

5.7.2.3. Check and record motor running amperes, voltages and resistance of cable.

5.7.3. All Electrical Starters, Electrical Control Gears, and Ancillary Electrical Apparatus (If Applicable)

5.7.3.1. Clean and adjust all bearings, pivots and other moving parts as necessary.

5.7.3.2. Clean or renew electric contactors as necessary.

5.7.3.3. Renew electric fuse as necessary.

5.7.3.4. Check the performance of the complete pumping and associated equipment as necessary.

5.7.4. Cold Water Piping

5.7.4.1. Check water leakages in piping and rectify accordingly.

5.7.4.2. Check water leakages in valve and rectify accordingly.

5.7.4.3. Check excessive vibration of piping during pumping.

5.7.4.4. Clean strainer baskets.

5.7.4.5. Check all water taps for leakages and replace rubber washer as necessary.

5.7.4.6. Check ball float valves and adjust as necessary.

5.7.4.7. Check water level control indicator.

5.7.4.8. Check water leakage at any part of jointing of panel water tank.

5.7.5. Internal Sanitary Plumbing System

5.7.5.1. Check access covers, caps and cleaning eyes.

5.7.5.2. Check any water leakage at any part of jointing of internal sanitary pipe system.

5.7.5.3. Check discharge pipe systems:

(i) It shall be kept in a clean and sound condition.

(ii) Any blockages shall be removed by using hand operated rods and capable passing through the system without damaging the internal surfaces of pipes and fittings.

5.8. Inspection and Records

5.8.1. Inspect and check all other equipment under this Contract, whether or not these are specifically mentioned in the check list.

5.8.2. The Contractor is responsible for the operation of the plant and equipment on correct methods of operating the plant and equipment and on the maintenance points to be watched.

5.8.3. Report in writing to the S.O. any defects observed in any part or parts of the complete internal cold water and sanitary plumbing system. The report shall state the cause/s of the defect/s observed and shall include an estimate of the cost of repairs required.

5.8.4. Service and maintenance records shall be properly updated and kept by Contractor or as instructed by S.O..

5.9. Sampling of Storage Water

5.9.1. The Contractor shall have deemed to have included the sampling and testing of water in storage tanks.

5.9.2. The Contractor shall be responsible for ensuring that water quality testing is regularly done on the cold or domestic water supply network to monitor the water quality provided to the end user against the most current revision of the State Water Authority guidelines for domestic and drinking water.

5.9.3. Samples for testing to be performed every six months shall include:

5.9.3.1. Chemical Analysis

5.9.3.2. Bacteriological Analysis

5.9.4. In the event the cold or domestic water quality does not meet the most recent revision of the State Water Authority guidelines for domestic and drinking water (the most current revision at the time of sampling), the Contractor shall immediately notify the S.O. and recommend appropriate action for approval.

5.9.5. The above mentioned tests shall be performed again until the approval of S.O. is obtained.

5.10. Repairs

5.10.1. The Contractor shall repair any defects in the complete internal cold water and sanitary plumbing system on the instruction of the S.O..

5.10.2. All repairs on the complete internal cold water and sanitary plumbing system shall be guaranteed by the Contractor against defects in workmanship and materials for a period of one year to take effect from date of completion of the repairs. During the guarantee period, the Contractor shall rectify defects in repairs carried out by him with no additional charge to the government.

5.11. Service and Maintenance Records

5.11.1. The Contractor shall provide a service and maintenance record book for the complete internal cold water and sanitary plumbing system being serviced and maintained by the Contractor. This record book shall be kept in the plant or maintenance room of internal cold water and sanitary plumbing system being serviced and maintained, and brief details of all services, maintenance and repairs carried out The address and telephone number of the Contractor's personnel and person in charge shall also be recorded into this record book to facilitate emergency service call.

5.11.2. The Contractor shall also keep an accurate detailed record in duplicate of all service, maintenance and repair work carried out by him on the complete internal cold water and sanitary plumbing system as well as ancillary equipment. This record shall be in the form of a Maintenance/Repair Sheet, and shall be countersigned by the S.O. each

time the internal cold water and sanitary plumbing system as well as ancillary equipment is attended to by the Contractor.

APPENDIX X1

Limit of Mechanical Scope of Design (Civil and Mechanical)

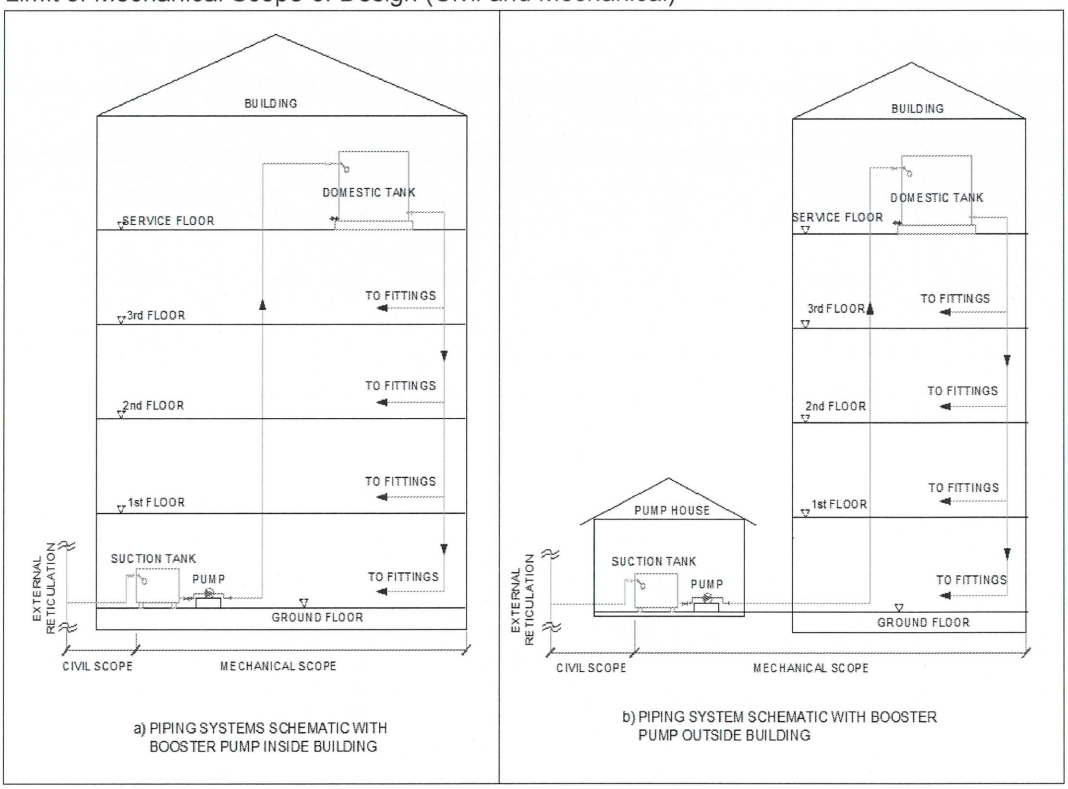

Figure X1. Indirect Feed System

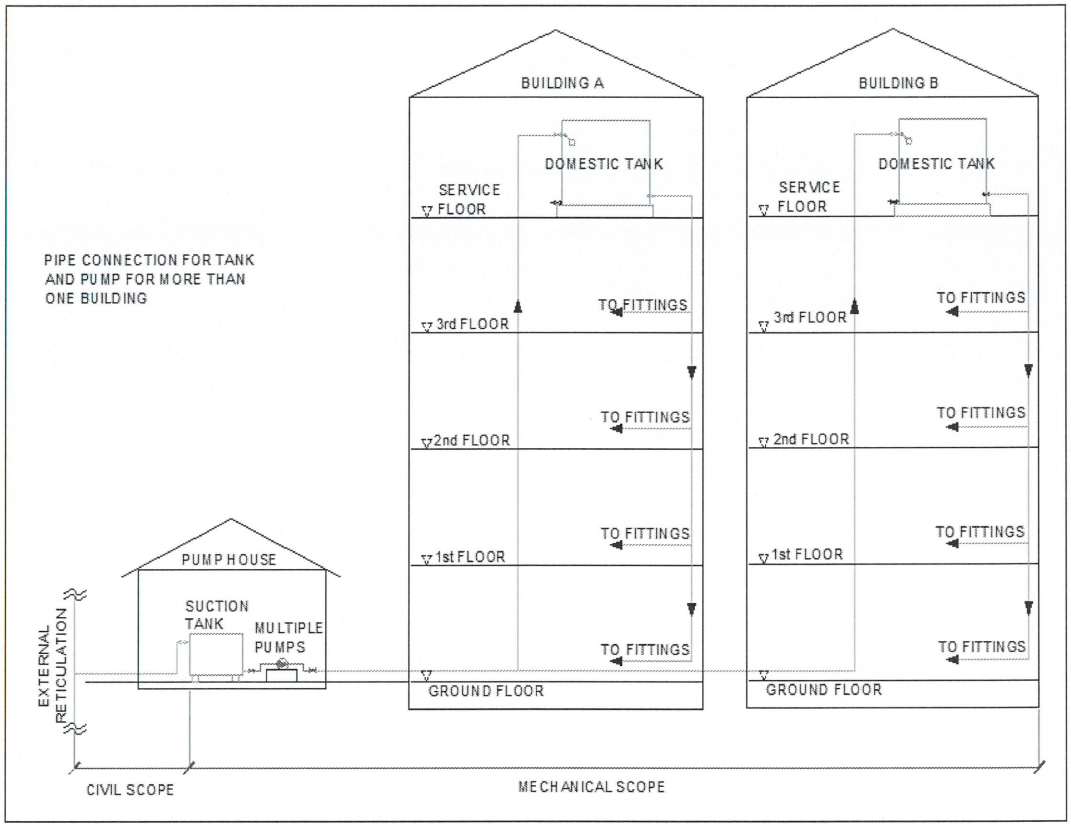

Figure X2. Pumping to Multiple Building Blocks

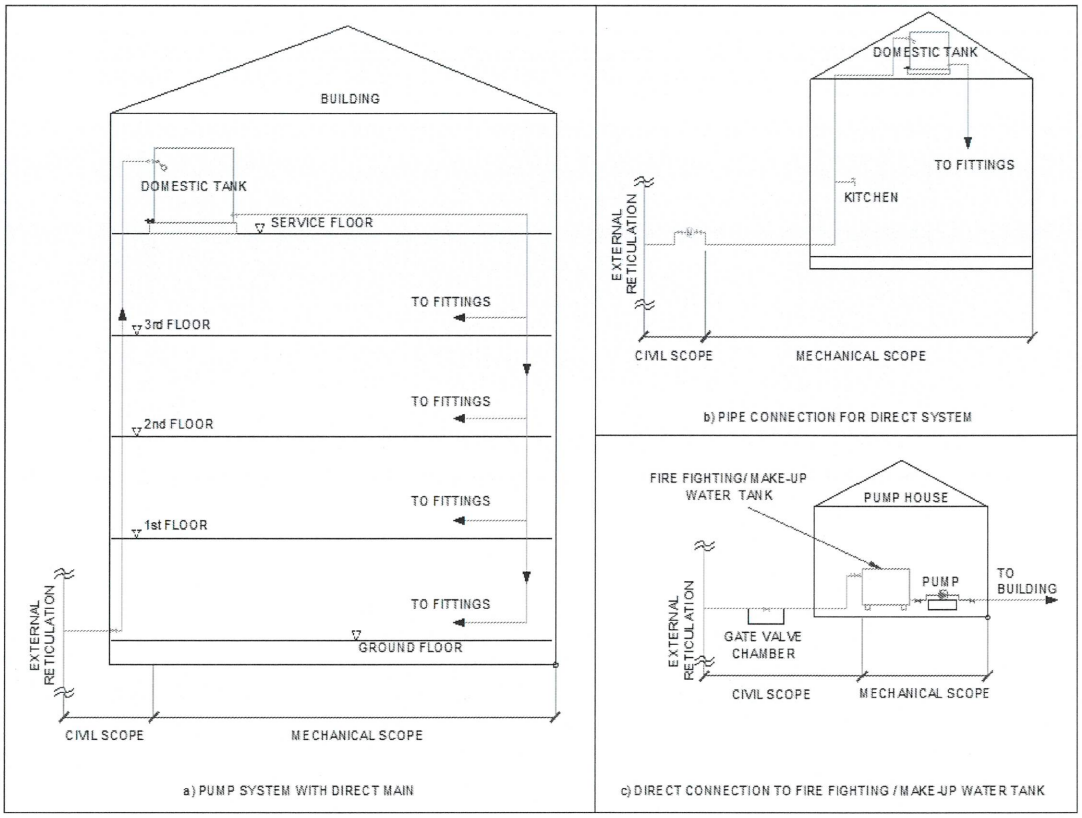

Figure X3. Direct Feed from Main Water Pipe

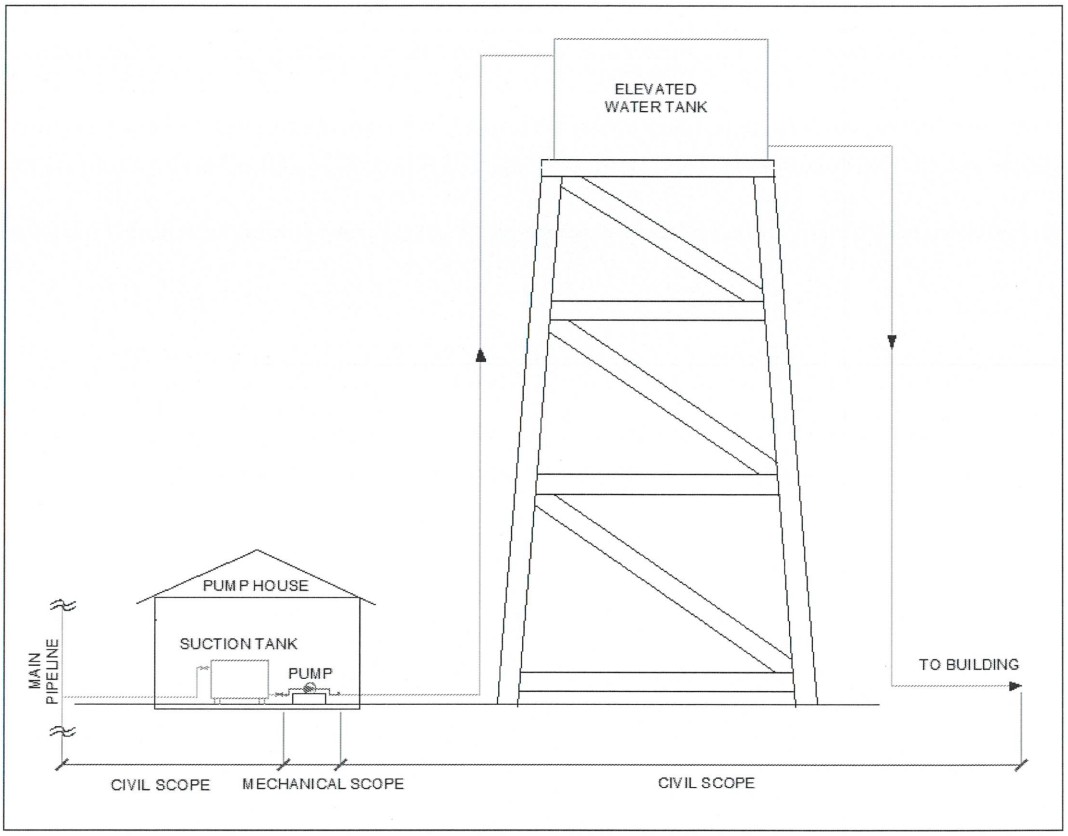

Figure X4. Pumping to Elevated Water Tank

TABLE OF CONTENTS

1. General

The sanitary fitting works shall be executed by personnel with valid permits issued by SPAN as stipulated under *Water Service Industry Act 2006*. The Contractor shall be responsible for employing such personnel and all the work performed by them.

2. Products and Materials

2.1. All products and materials to be incorporated in the work shall be new and unused. Materials to be used within the scope of work shall be those approved by SPAN. When the quality of a material or process is not specifically set forth in the approved products and materials list, the Drawings, or the Specifications, the best available quality of the material or process shall be provided, subject to the approval of the S.O..

2.2. All products and materials shall be supplied by suppliers registered with SPAN. The Contractor shall provide proof to the S.O. in the form of a valid Confirmation Letter or Certificate of Registration issued by SPAN to the supplier. The products and materials shall also be subjected to other terms and conditions mentioned in these specifications.

2.3. All products and materials shall be of the makes and models tested and approved for use. It is the Contractor's responsibility to verify that products and materials received for the job conform to the current approved products and materials supplied by SPAN registered suppliers.

2.4. All products and materials furnished shall be subject to inspection for compliance with these specifications and all other appropriate specifications. The Contractor shall make application to the S.O. for inspection at least five (5) days in advance of starting any work.

3. Sanitary Fittings

3.1. Fittings

3.1.1. Unless otherwise shown on the Drawings, all fittings including all necessary brackets and accessories shall be as scheduled in **TABLE Y/1** hereinafter. The Contractor shall be responsible for determining the type of trap required for each fitting. All necessary concrete backing shall be provided to fittings secured to floors.

3.1.2. Unless otherwise shown on the Drawings, the colour of sanitary ware shall be in white.

3.2. Vanity tops

3.2.1. Unless otherwise shown on the Drawings, a minimum thickness of 12mm vanity tops of approved manufacture and colour shall be installed in accordance with the manufacturer's instructions. It shall be moulded as one solid piece with it's top sloping gently towards the wash hand basin and having a slight upturn or kerb as its outer edges including backsplash to prevent water damage to wall and vanity back.

3.2.2. It shall be manufactured from non-porous composite product composed of polyester resin and calcium carbonate marble dust with the permanence

of stone and an aesthetic appeal of natural marble or granite. The slab surface shall have a glossy finish and protected by suitable polymer to ensure durability and impermeability. It shall be stain- and chemical-resistant, and UV stabilised.

3.3. Type of Sanitary Fittings and Description

3.3.1. Unless otherwise shown or/and specified in the Drawings, the sanitary fittings shall be of the following:

3.3.1.1. All sanitary fittings shall be of white in colour, from an approved manufacturer, generally ensuite and complete with all necessary fittings.

3.3.1.2. Waste and bath overflow, chains and stays, shall be chromium plated brass to BS EN 274 Part 1-3.

3.3.1.3. Taps and combination tap assemblies shall be chromium plated brass to BS EN 200.

3.3.1.4. All sanitary fittings shall comply with Water Services Industry Act 2006 and Water Services Industry (Water Reticulation and Plumbing) Rules 2014.

3.4. Wash Basin

3.4.1. Unless otherwise specified, wash basin for public buildings shall be 600mm x 410mm x 200mm earthenware plain edge sink in white fireclay complete with chromium plated tap, blank tap hole stopper, 30mm 'p' trap with 40mm seal, waste fittings, plug with chain and painted bracket supports to S.O.'s approval.

3.4.2. Where shown wash basins shall be to MS 147 of the following types as specified:

3.4.2.1. Under counter basin with overflow.

3.4.2.2. Wall hung basin with or without pedestal as specified.

3.4.2.3. Semi-recessed basin with or without overflow as specified.

3.4.2.4. Counter top basin with or without overflow as specified.

3.4.2.5. Handicap basin.

TABLE Y1: Sanitary Fittings

No.	Item	Description
1	Wash Basin	Wash basin for domestic purposes shall be 560mm x 410mm in approved colour vitreous china complete with chromium plated tap, blank tap hole stopper, 30mm 'p' trap with 40mm seal, waste fittings with chrome-plated brass pop up waste and painted bracket supports. Clinical wash hand basins shall be wall hung vitreous type and not less than 600mm in width complete with a wall mounted 175mm long elbow action lever mixer with premix function. Clinical wash hand basins shall not have any overflow outlet, soap recess nor basin plug.
2	Vanity tops	Vanity top as specified, with integrated sink as shown in the Drawings, complete with chromium-plated tap, blank tap hole stopper, 30mm 'p' trap with 40mm seal, waste fittings with chrome-plated brass pop up waste. Vanity top as specified, but with holes pre-punched to receive an under-counter vanity basin and tap respectively, as shown in the Drawings, complete with 555mm x 415mm under-counter vanity basin in vitreous china, complete with chromium-plated tap, 30mm 'p' trap with 40mm seal, waste fittings with chrome-plated brass pop up waste and painted bracket supports.
3	Sinks	915mm x 460mm, single bowl single drainer stainless steel sinks shall be to BS 1244, stainless steel grade 304 (0.8 to 0.9mm) minimum thick, with satin finish to the size and configuration shown on the drawings with overflow and sound deadening pads under the sink and drainers. Metal sinks in stainless steel to size and shape as shown in the Drawings, complete with chromium plated tap as required, 40mm waste water outlet, chrome-plated brass pop up waste and painted mild steel frames support.
4	Water closet	Unless otherwise specified, water closet shall be pedestal closet in white vitreous china conforming to MS 1522 complete with pedestal pan, 'p' trap and ventilation outlet, plastic hinged seat and rubber buffers. Squatting closet in white vitreous china conforming to MS 1522 complete with pair of raised foot treads in white fire clay with 'p' trap and 40mm diameter uPVC flush pipe.
5	Urinal	Single urinal bowl in white vitreous china conforming to MS 1799 and MS 147 complete with back inlets, hangers and steadying brackets, 40mm outlet with hinged gratings and 50mm uPVC waste pipe, chromium plated flush pipes and spreaders to suit the number of appliances. Urinal range of 2 or more bowls as (a) but with white vitreous china division between bowls.

		Urinal shall give a single flush of not exceeding 2.5 litres per stall or per 600 millimetres width of slab and not exceeding 2.5 litres for wall hung urinals in compliance with Water Services Industry Act 2006 and Water Services Industry (Water Reticulation and Plumbing) Rules 2014.
6	Cistern for Water Closet	Dual-flush cistern with a nominal volume of a full and partial flush not exceeding 6 and 3 litres respectively in compliance with Water Services Industry Act 2006 and Water Services Industry (Water Reticulation and Plumbing) Rules 2014. WC Cistern shall conform to MS 795 with 40mm flush pipe, water inlet valve, 20mm diameter overflow for discharge externally and chrome flushing lever handle. WC shall be of vitreous china cistern conforming to MS 795 with 40mm flush pipe, water inlet valve, 20mm diameter overflow for discharge externally and chromed lever handle. Each flush cistern for w/c shall be tested as stipulated in the requirements of MS 795.
7	Cistern for urinal	Single flush 2.5 litre urinal flushing cistern in white vitreous china conforming to MS 795 complete with chromium plated flushing inlet pipe, 20mm diameter overflow for discharge externally and chrome lever handle in compliance with Water Services Industry Act 2006 and Water Services Industry (Water Reticulation and Plumbing) Rules 2014.
8	Flush valve for Water Closet	Unless specified, W/C flush valve shall be low pressure single flush 6 litres gravity flush water closet valve. It shall have a non-hold-open feature or an automatic shut-off system in compliance with Water Services Industry Act 2006 and Water Services Industry (Water Reticulation and Plumbing) Rules 2014. Vacuum Breaker is optional, only applicable to w/c flush valves intended to be connected to direct potable water mains. Its performance requires proper match of valve and w/c pan conforming to MS 1522. Each flush valve shall be made of metal (preferably copper alloy) and corrosion resistant. All exposed surfaces to the users shall be chromed plated or made of stainless steel.
9	Flush valve for urinal	Urinal flush valve shall be Single flush 2.5 litres gravity flush valve. It shall have a non-hold-open feature or an automatic shut-off system in compliance with Water Services Industry Act 2006 and Water Services Industry (Water Reticulation and Plumbing) Rules 2014. Each urinal flush valve shall be made of metal (preferably copper alloy) and corrosion resistant. All exposed surfaces to the users shall be chromed plated or made of stainless steel.

10	Shower fittings	Shower fittings shall be approved chromium plated brass easy clean valve, with 3" diameter shower face and Chromium plated stainless steel grade 304 arm.
11	All types of taps	Unless otherwise specified, taps shall be approved chromium plated brass/ ABS chrome plated taps conforming to BS EN 200 - testing method and have SIRIM certification with minimum 5 years warranty. All taps shall be fitted with aerator in compliance with Water Services Industry Act 2006 and Water Services Industry (Water Reticulation and Plumbing) Rules 2014.
12	Hand Bidet	Unless otherwise specified, bidet shall be chromium plated copper alloy nozzle, 1.2 m heavy duty double interlock stainless steel grade 304 flexible hose, chromium plated ABS plastic wall hanger and quarter turn angle valve. OR Bidet shall be chromium plated ABS nozzle with 1.2 m heavy duty ABS flexible hose, chromium plated ABS plastic wall hanger and quarter turn angle valve.
13	Sanitary appliances	Unless otherwise specified or shown on the Drawings, the sanitary appliances shall be: Floor trap, Robe Hook, Towel Rail, Safety Grab Bar and Handicap Safety Grab Bar shall be in stainless steel grade 304 chrome plated. Soap Dispenser shall be in uPVC (LEAD-FREE). Soap holder and toilet roll holder shall be in white earthenware (ceramic).

STANDARD SPECIFICATIONS FOR BUILDING WORKS 2020

Designed by :
Maizali & Massrol

REKOD PENGALAMAN KERJA DALAM 5 TAHUN LEPAS – BORANG D

BORANG D – REKOD PENGALAMAN KERJA PENYEBUTHARGA

(Senarai semua kerja yang disiapkan dalam 5 tahun lepas +)

Bil.	Nama	Nilai Kontrak (RM)	Nilai Penyebutharga* Bertanggungjawab	Tempoh Kontrak **	Tarikh Milik Tapak	Tarikh Siap		Nama dan Alamat Penguasa/ Jurutera Perunding	Nama Alamat Majikan
						Kontrak	Sebenar		

\+ Salinan Perakuan/Pengesahan Siap Kerja bagi setiap kerja yang disenaraikan hendaklah disertakan.

* Hanya perlu diisi sekiranya penyebutharga melaksanakan kerja sebagai ahli syarikat gabungan.

** Tempoh kontrak hendaklah termasuk lanjutan masa yang diluluskan.

SENARAI KAKITANGAN TEKNIKAL - BORANG E

BORANG E – KAKITANGAN TEKNIKAL
(Butir-butir Kakitangan Teknikal Yang Ada Dalam Penggajian Penyebutharga Masa Kini)

*Nama dan No. K/P	Umur	Kelulusan Professional/ Pendidikan**	Tahun Kelulusan	Tarikh Diambil Bekerja	Jawatan yang Disandang/ Tugas-Tugas semasa	Pengalaman Lepas (Jawatan disandang, Nama projek dan majikan dan tempoh Bekerja dan sebagainya
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

* Salinan Borang KWSP `A' setiap pekerja bagi bulan caruman terakhir dan salinan perjanjian perkhidmatan ahli professional yang diambil khidmat secara kontrak hendaklah disertakan.

** Sila sertakan salinan Sijil Kelulusan atau Sijil Keahlian Badan-badan Professional

BORANG E – KAKITANGAN TEKNIKAL

(Butir-butir Kakitangan Teknikal Yang Ada Dalam Penggajian Penyebutharga Masa Kini)

*Nama dan No. K/P	Umur	Kelulusan Professional/ Pendidikan**	Tahun Kelulusan	Tarikh Diambil Bekerja	Jawatan yang Disandang/ Tugas-Tugas semasa	Pengalaman Lepas (Jawatan disandang, Nama projek dan majikan dan tempoh Bekerja dan sebagainya
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

* Salinan Borang KWSP `A' setiap pekerja bagi bulan caruman terakhir dan salinan perjanjian perkhidmatan ahli professional yang diambil khidmat secara kontrak hendaklah disertakan.

** Sila sertakan salinan Sijil Kelulusan atau Sijil Keahlian Badan-badan Professional

SENARAI KEEMPUNYAAN LOJI DAN PERALATAN UTAMA - BORANG F

BORANG F – KEEMPUNYAAN LOJI DAN PERALATAN PEMBINAAN UTAMA
(Senarai Loji dan Peralatan Pembinaan Utama kepunyaan penyebutharga yang sesuai yang boleh digunakan untuk projek)

Bil.	Butiran (Jenis, model, buatan dan keupayaan/ saiz)	Dimiliki, Disewa-beli Atau Disewapajak*	Bilangan Setiap satu	Nilai Semasa (RM)	Umur (dari tarikh belian asal)	Tempat simpanan/ digunakan sekarang	Catatan
A.	Loji dan Peralatan Asas ** : i) Lorry / Tipper / Dumper / 4x4 ii) Sky lift						
B.	Loji dan Peralatan lain : i) Drill and Cutter ii) Welding Machine iii) Pneumatic Jackhammers						

* Salinan kad pendaftaran dan/ atau dokumen-dokumen lain bukti keempunyaan hakmilik penyebutharga atau perjanjian sewabeli/ sewapajak atas setiap Loji dan Peralatan yang disenaraikan hendaklah disertakan.

** Pegawai yang menyediakan Dokumen Sebutharga hendaklah menyenaraikan butiran-butiran Loji dan Peralatan Asas bagi projek berkenaan (tanpa bilangan AKM).

PRESTASI KERJA SEMASA

BORANG G

BORANG G - SENARAI KERJA/ KONTRAK SEMASA PENYEBUTHARGA

(Senarai semua kerja di dalam tangan/sedang berjalan dan belum siap termasuk kontrak yang baru diawadkan)

Bil	Nama Kontrak/Projek+	Nilai Kontrak (RM)	Nilai Penyebutharga* Bertanggung jawab	Tempoh Kontrak **	Tarikh Milik Tapak	Tarikh Siap Kontrak	Kemajuan Kerja+		Nama dan Alamat Jurutera Projek	Nama dan Alamat Majikan
							Ikut Jadual (%)	Sebenar Dicapai (%)		

* Hanya perlu diisi sekiranya penyebutharga melaksanakan kerja sebagai ahli syarikat gabungan

** Tempoh Kontrak hendaklah termasuk lanjutan masa yang diluluskan.

\+ Peringatan Penting

Bagi setiap kerja semasa dalam tangan yang disenaraikan, penyebutharga wajib mengemukakan Laporan Penyelia Projek seperti format di Borang GA/GA1.

SULIT

BORANG GA – LAPORAN PENYELIA PROJEK ATAS PRESTASI KERJA (BUKAN PROJEK MSN) SEMASA PENYEBUTHARGA

(Borang ini hendaklah dilengkapkan oleh Penyelia Projek atau Pembantu Kanannya yang mengawasi projek dan diserahkan kepada Kontraktor dalam satu sampul berlakri untuk disertakan bersama-sama sebutharganya)

Kepada: Pengarah.....
.....
.....
(u/p:.....)

Nama Kontraktor: .....
Nama Projek Yang Dilaksanakan .....
.....

No. Kontrak :

Harga Kontrak (termasuk anggaran nilai kerja perubahan) : RM .....
Wang Kos Prima dan Peruntukan Sementara : RM .....
Nilai Kerja Pembina : RM .....

Tarikh Milik Tapak : ..... Tempoh Kontrak: ..... Minggu
Tarikh Penyiapan Asal : .....

Lanjutan Masa Yang Telah Diluluskan : ..... hari

Lanjutan Masa Seterusnya:
Yang difikir/ dijangka layak diperakukan : ..... hari
Atas Sebab-sebab : (i) .....
(ii) .....

Kemajuan Kerja (berdasarkan nilaian kerja yang telah dilaksanakan):
Pencapaian sebenar: ..... % Mengikut Jadual: ..... %
Tarikh Kerja dijangka akan dapat disiapkan: .....

Nilai Bahagian Kerja Yang Telah Siap : RM .....
Nilai Baki Kerja Yang Belum Siap : RM .....

Ulasan-ulasan mengenai Prestasi Kontraktor:
(Nyatakan apa-apa kepujian dan/ atau kelemahan kontraktor dan juga apa-apa tindakan/ perakuan yang diambil/ dipertimbang berhubung dengan prestasi Kontraktor melaksanakan Kontrak)

Tandatangan Penyelia Projek : .....

Nama : .....
Jawatan : ..... Tarikh: .....

SULIT

BORANG GA1 – LAPORAN JURUTERA PROJEK ATAS PRESTASI KERJA SEMASA PENYEBUTHARGA

(Borang ini hendaklah dilengkapkan oleh Jurutera Projek atau Pembantu Kanannya yang mengawasi projek apabila diminta berbuat demikian oleh Pegawai Penilaian dan hendaklah dihantar segera dengan menggunakan mesin Fax/Email)

Kepada: Pengarah.....
.....
.....
(u/p:.....)

Nama Kontraktor: .....
Nama Projek Yang Dilaksanakan .....
.....

No. Kontrak :

Harga Kontrak (termasuk anggaran nilai kerja perubahan) : RM .....
Wang Kos Prima dan Peruntukan Sementara : RM .....
Nilai Kerja Pembina : RM .....

Tarikh Milik Tapak : ..... Tempoh Kontrak: ..... minggu
Tarikh Penyiapan Asal : .....

Lanjutan Masa Yang Telah Diluluskan : ..... hari

Lanjutan Masa Seterusnya:
Yang difikir/ dijangka layak diperakukan : ..... hari
Atas Sebab-sebab : (i) .....
(ii) .....

Kemajuan Kerja (berdasarkan nilaian kerja yang telah dilaksanakan):
Pencapaian sebenar: ..... % Mengikut Jadual: ..... %
Tarikh Kerja dijangka akan dapat disiapkan: .....

Nilai Bahagian Kerja Yang Telah Siap : RM .....
Nilai Baki Kerja Yang Belum Siap : RM .....

Ulasan-ulasan mengenai Prestasi Kontraktor:
(Nyatakan apa-apa kepujian dan/ atau kelemahan kontraktor dan juga apa-apa tindakan/ perakuan yang diambil/ dipertimbang berhubung dengan prestasi Kontraktor melaksanakan Kontrak)

Tandatangan Pegawai Penguasa/
Jurutera Projek/ Wakilnya : .....

Nama : .....
Jawatan : ..... Tarikh: .....

SENARAI SUB-KONTRAKTOR PAKAR - BORANG H

BORANG H

SENARAI SUB KONTRAKTOR UNTUK KERJA PAKAR
(PEMBUAT / PEMBEKAL)

SUB KONTRAKTOR DAN PEMBEKAL YANG DINIATKAN UNTUK KONTAK INI			
Penyebutharga hendaklah menyenaraikan nama-nama sub-kontraktor yang dicadangkan.			
No.	Bidang Kerja dan Maklumat Am Kontraktor Pakar	Pendaftaran Dengan CIDB (Gred / Kategori / Pengkhususan)	Pendaftaran Dengan Lain-Lain Jabatan Berkaitan / MOF
1	**Skop Pembekalan** a) Jenis Skop : b) Nama Pembekal : c) Alamat Pembekal :		
2	**Pembuat Pakar** a) Jenis Skop Kerja : b) Nama Pembuat : c) Alamat Pembuat :		
3	d) Profit Produk : e) Profit Projek Dilaksanakan : f) Sample : (wajib dikemukakan bersama dengan dokumen sebutharga)		
3	Pengesahan daripada sub-kontraktor pakar. Kami dengan ini mengesahkan bahawa penyebutharga telah mendapat maklumat kos dan kaedah pembinaan produk kami dan kami bersetuju untuk melaksanakan kerja ini untuk pihak Kerajaan. _____ (Tandatangan) Nama : No. KP : Jawatan : Tarikh : Cop Syarikat :		

Nota :

1 Sekiranya kontraktor gagal mengemukan pengesahan daripada pembekal / pembuat pakar. Sebutharga kontraktor boleh tidak dipertimbangkan oleh Jawatankuasa berkaitan

2 Sekiranya sub-kontraktor pakar gagal untuk meyakinkan pihak Kerajaan tentang kualiti daya tahan dan pematuhan kepada syarat yang ditetapkan, kontraktor hendaklah bersetuju untuk menggunapakai produk dan perkhidmatan sub-kontraktor pakar yang lain dengan tiada tambahan kos kepada kontrak

LIST OF SPECIALIST SUB-CONTRACTORS TO BE ENGAGED IN THIS PROJECT

NAME AND ADDRESS OF SUB-CONTRACTORS	REGISTRATION WITH CIDB / MOF (Submit copies of relevent registration)	TYPE OF WORK UNDERTAKEN	YEARS OF EXPERIENCE

LUKISAN