PARLIMEN MALAYSIA
BANGUNAN PARLIMEN
JALAN PARLIMEN
50680 KUALA LUMPUR

DOKUMEN SEBUT HARGA

SEBUTHARGA NO: PAR.2/367 SH.27/2025

TAJUK KERJA

KERJA-KERJA PEMBAIKAN SISTEM HOSE REEL DI DEWAN SERBAGUNA, KOMPLEKS PARLIMEN MALAYSIA, KUALA LUMPUR.

TARIKH TUTUP: 22 OGOS 2025

Nama Kontraktor :……..

Alamat:……
……..…….....
.....
.
Kelas :……Tempoh Daftar :…….

SENARAI SEMAKAN
(~~BEKALAN/PERKHIDMATAN~~/KERJA)

Sila tanda [√] bagi dokumen-dokumen yang disertakan

Bil.	Perkara/Dokumen	Untuk Ditanda Oleh Syarikat	Untuk Ditanda Oleh Jawatankuasa Pembuka Sebut harga
1.	Dokumen No. 3: Jadual Penentuan Spesifikasi Teknikal	☐	☐
2.	Dokumen No. 4: Jadual Kuantiti	☐	☐
3.	Dokumen No. 5: Ringkasan Jadual Harga	☐	☐
4.	Dokumen No. 6: Borang Sebut Harga Kerja & Surat Akuan Pembida	☐	☐
5.	Dokumen No. 7: Keterangan Mengenai Kontraktor	☐	☐
6.	Dokumen No. 8: Lukisan Pemasangan Perincian	☐	☐
7.	Dokumen Tambahan		
	(i) Profil Syarikat beserta rekod pengalaman bekerja yang lepas dan semasa semasa yang berkaitan.	☐	☐
	(ii) Salinan Penyata Bank tiga (3) bulan terkini **(Mei 2025, Jun 2025 & Julai 2025); *perlu mendapat pengesahan bank berkaitan)**	☐	☐
	(iii) Salinan Sijil Perolehan Kerja Kerajaan (SPKK)	☐	☐

Bil.	Perkara/Dokumen	Untuk Ditanda Oleh Syarikat	Untuk Ditanda Oleh Jawatankuasa Pembuka Sebut harga
	(iv) Salinan Sijil Perakuan Pendaftaran Kontraktor (PPK) – **Surat Kebenaran Khas CIDB adalah TIDAK DIBENARKAN**;	☐	☐
	(v) Salinan Sijil Taraf Bumiputera (STB) dari Pusat Khidmat Kontraktor (Kerja) – Jika Ada	☐	☐
	(vi) Salinan Sijil SSM	☐	☐
	(vii) Salinan surat pendaftaran dengan Jabatan Kastam Diraja Malaysia (JKDM) di bawah Cukai Perkhidmatan / SST (jika ada)	☐	☐

PENGESAHAN OLEH SYARIKAT	**UNTUK KEGUNAAN JABATAN**
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.	Jawatankuasa Pembuka Sebut Harga mengesahkan penerimaan dokumen bertanda kecuali bagi perkara bil. ..... (jika ada)
Tandatangan :	Tandatangan :
Nama :	Nama :
Jawatan :	Jawatan :
Tarikh :	Tarikh :
	Tandatangan :
	Nama :
	Jawatan :
	Tarikh :

KERAJAAN MALAYSIA

PARLIMEN MALAYSIA

DOKUMEN SEBUT HARGA

KERJA-KERJA PEMBAIKAN SISTEM HOSE REEL DI DEWAN SERBAGUNA, KOMPLEKS PARLIMEN MALAYSIA, KUALA LUMPUR.

– PAR.2/367 SH.27/2025

JADUAL KANDUNGAN

DOKUMEN NO. 1

ARAHAN KEPADA PENYEBUTHARGA

DOKUMEN NO. 1

ARAHAN KEPADA PENYEBUTHARGA

NO. SEBUT HARGA : PAR.2/367 SH.27/2025

KERJA-KERJA PEMBAIKAN SISTEM HOSE REEL DI DEWAN SERBAGUNA, KOMPLEKS PARLIMEN MALAYSIA, KUALA LUMPUR.

1. Tawaran adalah dipelawa kepada Kontraktor tempatan yang mempunyai Sijil Perakuan Pendaftaran Kontraktor (PPK) serta Sijil Perolehan Kerja Kerajaan (SPKK) berdaftar dengan Lembaga Pembangunan Industri Pembinaan Malaysia (LPIMPM/ CIDB) dalam Gred, Kategori, dan Pengkhususan seperti berikut :-

Gred	**G1**
Kategori	**ME**
Pengkhususan	**M02 – Sistem Pencegahan dan Pelindungan Kebakaran**

yang mana pendaftarannya masih lagi berkuatkuasa, mempunyai alamat pendaftaran di **Wilayah Persekutuan Kuala Lumpur** adalah layak membuat tawaran bagi sebutharga berikut :

KERJA-KERJA PEMBAIKAN SISTEM HOSE REEL DI DEWAN SERBAGUNA, KOMPLEKS PARLIMEN MALAYSIA, KUALA LUMPUR.

2. Penyebutharga hendaklah menyerahkan sampul tawaran sebutharga **secara manual** ke dalam peti sebutharga pada atau sebelum **22 Ogos 2025 (Jumaat),** jam **12.00 tengah hari.** Dokumen tawaran yang diterima selepas dari tarikh dan masa akan **ditolak.**

3. Sampul hendaklah dilabelkan dengan nombor sebutharga dan nombor tawaran sebutharga dan hendaklah dimasukkan ke dalam **Peti Sebut Harga No. 1 di Seksyen Kewangan dan Akaun, Aras 4, Blok Ahli Parlimen Dan Pentadbiran, Parlimen Malaysia, Jalan Parlimen, 50680 Kuala Lumpur.**

4. Tawaran sebut harga yang dikemukakan adalah **diwajibkan** mengandungi dokumen-dokumen seperti di bawah :-
   a) Jadual Penentuan Spesifikasi Teknikal — Dokumen No. 3
   b) Jadual Kuantiti — Dokumen No. 4
   c) Ringkasan Jadual Harga — Dokumen No. 5
   d) Borang Sebut Harga Kerja & Surat Akuan Pembida — Dokumen No. 6

e) Keterangan Mengenai Kontraktor Dokumen No. 7
f) Lukisan Pemasangan Perincian Dokumen No. 8

Semua borang hendaklah diisi dengan lengkap seperti yang ditentukan dan ditaip dengan kemas dan terang. Jika ruangan yang disediakan tidak mencukupi, penyebutharga dibenarkan menaip maklumat-maklumat di muka surat tambahan.

4. Senarai semak untuk penyerahan dokumen adalah seperti berikut :

Bil	Senarai Dokumen	Dokumen Wajib Yang Perlu Dikemukakan
TAWARAN KEWANGAN / TAWARAN TEKNIKAL		
a.	Dokumen No. 3: Jadual Penentuan Spesifikasi Teknikal	√
b.	Dokumen No. 4: Jadual Kuantiti	√
c.	Dokumen No. 5: Ringkasan Jadual Harga	√
d.	Dokumen No. 6: Borang Sebut Harga Kerja	√
e.	Dokumen No. 7: Keterangan Mengenai Kontraktor	√

5. Dokumen tawaran sebutharga hendaklah dikemukakan secara manual sebelum waktu dan tarikh tutup yang ditetapkan.

6. Tawaran sebutharga ini sah selama **sembilan puluh (90)** hari dari tarikh tutup bidaan.

7. Harga yang ditawarkan hendaklah harga bersih termasuk semua diskaun, kos penghantaran, servis dan cukai duti setem serta kos tambahan yang berkaitan.

8. Sebarang **tuntutan kenaikan harga** dalam jangka masa sah laku sebutharga **tidak akan dilayan.**

9. Kerajaan berhak memohon pelanjutan tempoh sah laku harga yang ditawarkan. Permohonan akan dibuat secara bertulis kepada Penyebutharga yang berjaya.

10. Sekiranya Penyebutharga bersetuju untuk melanjutkan tempoh sah laku sebutharga, Penyebutharga hendaklah menjawab secara bertulis kepada Kerajaan.

11. Penyebutharga yang enggan menandatangani kontrak yang telah disetuju terima atau yang menarik balik tawaran bidaan sebelum dipertimbangkan atau menolak tawaran setelah tawaran dibuat, akan dikenakan tindakan penggantungan pendaftaran seperti berikut:

    i) Dua (2) tahun bagi kesalahan pertama;
    ii) Lima (5) tahun bagi kesalahan kedua; dan
    iii) Pendaftaran akan dipotong terus bagi kesalahan berikutnya.

12. Penyebutharga yang tawarannya disetujuterima dikehendaki memberi perkhidmatan membekal semua barang tersebut pada tarikh yang ditetapkan oleh Kerajaan atau mana-mana tarikh lain seperti ditentukan oleh Kerajaan. Sekiranya Penyebutharga gagal berbuat demikian, tawaran yang disetujuterima akan dibatalkan dan nama Kontraktor serta nama pengarah-pengarah termasuk pemegang-pemegang saham terbesar akan disenarai hitamkan.

13. Kerajaan tidak terikat untuk menerima tawaran yang **terendah** atau mana-mana tawaran. Tiada sebarang alasan perlu diberikan oleh Kerajaan untuk sebarang penolakan tawaran. Keputusan mengenai tawaran yang diterima adalah muktamad. Sebarang surat menyurat mengenai keputusan tidak akan dilayan.

14. Tempoh siap kerja yang dicadangkan oleh pihak Kerajaan adalah tidak melebihi **enam (6) minggu** dari tarikh mula kerja termasuk laporan pengujian & pentauliahan termasuk laporan bergambar sebelum, semasa dan selepas siap kerja.

15. Penyebutharga yang berjaya akan dikehendaki mengikat kontrak dengan Kerajaan. Syarat-syarat tawaran sebutharga ini akan dijadikan sebahagian daripada kontrak. Syarat-syarat ini hendaklah diterima dan dipatuhi.

16. Sebarang pindaan yang dibuat ke atas mana-mana ruangan mestilah dipotong dan ditandatangani ringkas pada setiap perubahan yang dibuat. **Penggunaan sebarang pemadam cecair adalah tidak dibenarkan.** Kegagalan pematuhan syarat ini boleh mengakibatkan tawaran Penyebutharga ditolak.

17. Bagi Jadual Penentuan Spesifikasi Teknikal, Penyebutharga **WAJIB** mengisinya dengan betul dan jelas perkataan “YA” atau “TIDAK” pada lajur “Pematuhan (YA/TIDAK) Mandatori”. Penyebutharga juga perlu mengisi dengan betul, ringkas dan tepat pada lajur “Cadangan (Sila perincikan) Mandatori”. Penggunaan perkataan “ditto”, “seperti di atas”, “Ya”, “*Yes”* dan “*Comply”* serta “Rujuk kepada

Katalog" tidak akan diterima. Sekiranya tiada apa-apa maklumat hendak dicatat, sila gunakan perkataan "Tidak Berkenaan".

18. Parlimen Malaysia BERHAK menolak tanpa penjelasan terhadap Penyebutharga yang gagal mematuhi perenggan 17 atau jawapan yang diberikan menimbulkan keraguan.

19. **PERINGATAN MENGENAI KESALAHAN RASUAH DALAM DOKUMEN PEROLEHAN KERAJAAN**

19.1 Sebarang perubahan 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 suatu kesalahan jenayah di bawah Akta Suruhanjaya Pencegahan Rasuah Malaysia 2009 (Akta 694).

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

19.3 Tanpa prejudis kepada tindakan-tindakan lain, tindakan tatatertib terhadap anggota perkhidmatan awam dan menyenarai hitamkan kontraktor atau pembekal boleh diambil sekiranya pihak-pihak terlibat dengan kesalahan rasmi di bawah Akta Suruhanjaya Pencegahan Rasuah Malaysia 2009 (Akta 694).

19.4 Mana-mana kontraktor atau pembekal yang membuat tuntutan bayaran berkaitan perolehan ini walaupun tiada kerja-kerja dibuat atau tiada barangan dibekal mengikut spesifikasi yang ditetapkan atau tiada perkhidmatan diberi dan mana-mana anggota perkhidmatan awam yang mengesahkan tuntutan berkenaan adalah melakukan kesalahan dibawah Akta Suruhanjaya Pencegahan Rasuah Malaysia (Akta 694).

20. **PELAKSANAAN CUKAI JUALAN DAN CUKAI PERKHIDMATAN (CJCP) YANG BERKUATKUASA 1 SEPTEMBER 2018**

20.1 Semua tawaran harga oleh Pembekal hendaklah dikemukakan dengan dinyatakan harga tawaran tanpa Cukai Jualan dan Cukai Perkhidmatan (CJCP).

20.2 Senarai yang dikenakan Cukai Perkhidmatan seperti yang terdapat dalam Akta Cukai Perkhidmatan 2018. Sekiranya pembekal yang berjaya berdaftar CJCP dan perkhidmatan tersebut adalah termasuk dalam senarai yang dikenakan Cukai Perkhidmatan, Kerajaan akan menawarkan nilai perolehan termasuk kenaan Cukai Perkhidmatan.

20.3 Pembekal hendaklah memaklumkan pada bila-bila masa setelah berdaftar dengan JKDM kepada Kerajaan supaya Cukai Perkhidmatan boleh dibayar. Kegagalan atau kelewatan syarikat untuk memaklumkan kepada Kerajaan mengenai status pendaftraan dengan JKDM akan menyebabkan syarikat perlu menanggung CJCP dan tidak layak menuntut apa-apa bayaran daripada Kerajaan.

21. **PELAKSANAAN PROGRAM *PROFESSIONAL TRAINING AND EDUCATION FOR GROWING ENTREPRENEURS* (PROTEGE) DALAM PEROLEHAN KERAJAAN (1PP/PK1.2)**

21.1 Penyebut harga adalah dikehendaki melaksanakan program PROTEGE dalam perolehan kerajaan mengikut had nilai ambang (threshold value) dan sektor seperti berikut :

Bil	Sektor	Nilai Ambang (RM)
1	Pembinaan	10 juta
2	Perkhidmatan / Penyelenggaraan Bangunan / Infrastruktur / Jalan	5 juta
3	Teknologi Informasi dan Komunikasi	10 juta
4	Perkhidmatan Perunding	5 juta
5	Perubatan dan Farmasi	10 juta
6	Perkhidmatan Sokongan Kesihatan	10 juta

Bil	Sektor	Nilai Ambang (RM)
7	Perkhidmatan Penyenggaraan, Pembaikan dan Baik Pulih	10 juta
8	Pengangkutan dan Logistik	10 juta
9	Pertahanan Strategik	10 Juta
10	Perkhidmatan Kawalan Keselamatan	4 juta
11	Sektor Lain	10 juta

21.2 Syarikat hendaklah memperuntukkan sekurang-kurangnya 1% daripada keseluruhan kos projek bagi melaksanakan program PROTEGE.

21.3 Syarikat yang mendapat kontrak Kerajaan di bawah nilai ambang digalakkan untuk melaksanakan program PROTEGE, namun tidak tertakluk kepada penetapan 1% daripada nilai kontrak keseluruhan.

21.4 Penetapan bilangan minimum peserta PROTEGE-RTW bagi sesuatu kontrak dikira berdasarkan formula berikut :

$$\frac{\text{1\% X Kos Keseluruhan Projek / Prolehan}}{\text{RM24,000*}}$$

* Elaun PROTEGE (RM2,000 seorang X 12 bulan)

21.5 Syarikat yang mengemukakan sijil atau surat pengesahan daripada Sekretariat PROTEGE, akan diberi **keutamaan** tidak kira sama ada program PROTEGE dilaksanakan bagi perolehan Kerajaan atau program PROTEGE dilaksanakan oleh inisiatif syarikat sendiri.

22. BON PELAKSANAAN

(a) Bagi kontrak kerja yang bernilai melebihi RM200,000.00, Kontraktor hendaklah mengemukakan bersama-sama dengan Surat Setuju Terima, Bon pelaksanaan sebanyak 5% daripada jumlah harga kontrak.

(b) Kontraktor yang dilantik hendaklah mengemukakan Bon Pelaksanaan dalam Ringgit Malaysia dalam bentuk :

i) Jaminan Bank/Syarikat Kewangan yang dikeluarkan oleh bank/syarikat kewangan berlesen di bawah Akta Perkhidmatan Kewangan 2013 [Akta 758] yang beroperasi di Malaysia;

1) jaminan Bank Islam yang dikeluarkan oleh bank berlesen di bawah Akta Perkhidmatan Kewangan Islam 2013 [Akta 759] yang beroperasi di Malaysia;

2) jaminan Insurans yang dikeluarkan oleh syarikat insurans yang berlesen di bawah Akta Perkhidmatan Kewangan 2013 [Akta 758] yang beroperasi di Malaysia;

3) jaminan Takaful yang dikeluarkan oleh Syarikat Takaful yang berlesen di bawah Akta Perkhidmatan Kewangan Islam [Akta 759] yang beroperasi di Malaysia; atau

4) jaminan yang dikeluarkan oleh Bank Pembangunan Malaysia Berhad (BPMB) dan Bank Perusahaan Kecil & Sederhana (SME Bank).

Bon Pelaksanaan dalam bentuk yang tidak dilesenkan di bawah akta seperti di Perkara (b) di atas termasuk di bank pesisir pantai dan bank luar negara adalah tidak dibenarkan.

(c) Kontraktor boleh memilih kaedah Wang Jaminan Pelaksanaan. Wang Jaminan Pelaksanaan ialah satu kemudahan bagi memenuhi keperluan Bon Pelaksanaan. Wang Jaminan Pelaksanaan bermaksud sejumlah wang yang dipegang oleh Kerajaan bagi memastikan kontraktor mematuhi dan melaksanakan obligasinya di bawah kontrak yang ditandatangan.

1) Jumlah Wang Jaminan Pelaksanaan adalah 5% daripada harga keseluruhan kontrak. Kemudahan ini hanya dibenarkan kepada kontraktor kerja tempatan sahaja. Walau bagaimanapun, Wang Jaminan Pelaksanaan tidak dibenarkan untuk Sub Kontraktor Dinamakan bagi Kerja.

2) Kontraktor yang memilih / dikenakan kaedah Wang Jaminan Pelaksanaan akan dikenakan potongan sebanyak 10% daripada bayaran kemajuan pertama dan seterusnya sehingga ia mencapai jumlah 5% peratus daripada nilai keseluruhan kontrak.

(d) Tempoh sah laku Bon Pelaksanaan bagi perolehan kerja adalah berdasarkan nilai projek seperti berikut:

Nilai Projek	Tempoh Sah Laku Bon Pelaksanaan
Kos Projek sehingga RM10 juta	• Dari tarikh kuat kuasa kontrak sehingga 12 bulan selepas tamat tempoh Tanggungan Kecacatan (DLP)
Kos Projek melebihi RM10 juta	• Dari tarikh kuat kuasa kontrak sehingga 24 bulan selepas Tempoh Tanggungan Kecacatan (DLP)

23. ***LIQUIDATED & ASCERTAINED DAMAGES* (LAD)**

23.1 Sebaik sahaja arahan dikeluarkan untuk memulakan perkhidmatan, syarikat dikehendaki melaksanakan perkhidmatan tersebut mengikut jadual dan spesifikasi yang telah ditetapkan.

23.2 Sebarang kegagalan syarikat dalam mematuhi perkara tersebut (lewat/gagal/kurang kualiti atau lain-lain) boleh mengakibatkan tindakan diambil ke atas syarikat dengan pengenaan LAD, Denda atau Tolakan mengikut formula berikut :

(PR / 365 hari) x nilai kontrak

23.3 Sekiranya syarikat gagal menyempurnakan perkhidmatan yang telah ditetapkan dalam tempoh kontrak yang dipersetujui, maka syarikat dikehendaki membayar denda dalam tempoh 30 hari setelah menerima notis denda daripada Kerajaan dengan menggunakan formula di atas.

24. HARGA INDIKATIF JABATAN

24.1 Harga Indikatif Jabatan bagi sebut harga ini adalah Ringgit Malaysia: **Dua Ratus Ribu Sahaja (RM200,000.00).**

24.2 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.

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

25. PERTANYAAN

Penyebutharga yang memerlukan sebarang penjelasan mengenai dokumen sebutharga dan pertanyaan berkaitan sebutharga boleh merujuk kepada:

(a) Hal-hal Berkaitan Perolehan

1. Nama : Encik Muhamad Syafiq Bin Abu Jamil
   No. Tel : 03-2603 6850
   E-mel : muhamad.syafiq@parlimen.my

2. Nama : Puan Faridatul Citra Bt. Md. Isa
   No. Tel : 03-2603 6862
   E-mel : faridatul@parlimen.my

(b) Hal-hal Berkaitan Spesifikasi Teknikal

1. Nama : Encik Azaham bin Mohamed Razali
   No. Tel : 03-2603 6832
   E-mel : azaham@parlimen.my

2. Nama : Encik Muhammad Khalil bin Mohd Nor
   No. Tel : 03-2603 6821
   E-mel : khalil@parlimen.my

DOKUMEN NO. 2

1. SYARAT-SYARAT SEBUTHARGA UNTUK KERJA

2. SYARAT-SYARAT AM

DOKUMEN NO. 2

SYARAT-SYARAT SEBUTHARGA UNTUK KERJA

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 Kerajaan dan Kontraktor mengambil Insurans Liabiliti Awam dan Insurans Kerja* (sekiranya dinyatakan di dalam Butir-butir Ringkasan Sebutharga) bagi tempoh pelaksanaan Kerja ini. Kontraktor hendaklah juga mengemukakan Nombor Kod Pendaftaran dengan PERKESO.

2.2 Kontraktor hendaklah mengemukakan kepada Pegawai Kerja semua polisi insurans dan Nombor Kod Pendaftaran dengan PERKESO yang tersebut di atas sebelum memulakan Kerja. Bagaimana pun 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 Kerja berhak mengambil tindakan seperti di bawah fasal 9(d).

3. PERATURAN PELAKSANAAN KERJA

3.1 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 arahan Pegawai Kerja atau Wakilnya.

*3.2 Kerja-kerja elektrik yang dilaksanakan di samping mematuhi kehendak diperenggan 3.1 di atas, hendaklah juga mematuhi semua peraturan dan pekeliling, undang-undang dan undang-undang kecil yang diluluskan oleh:

(i) Suruhanjaya Tenaga
(ii) Jabatan Keselamatan Pekerjaan dan Kesihatan
(iii) Pemegang Lesen dan Pihak Berkuasa Bekalan Elektrik
(iv) Jabatan Bomba dan Penyelamat
(v) Pihak Berkuasa Tempatan

4. KEGAGALAN KONTRAKTOR MEMULAKAN KERJA

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

5. SUB-SEWA DAN MENYERAHHAK KERJA

Kontraktor tidak dibenarkan mengsub-sewakan Kerja kepada Kontraktor-kontraktor lain. Kontraktor tidak boleh menyerahhak apa-apa faedah dibawah kontrak ini tanpa terlebih dahulu mendapat persetujuan bertulis daripada Pegawai Kerja.

6. PENOLAKAN BAHAN, BARANG DAN MUTU HASIL KERJA OLEH PEGAWAI KERJA

6.1 Pegawai Kerja 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 Kerja, 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.

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

6.3 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 Kerja secara bertulis.

7. RINGKASAN SEBUT HARGA

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

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

7.3 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.

7.4 Harga-harga dalam Ringkasan Sebut Harga yang dikemukakan oleh Kontraktor hendaklah tertakluk kepada persetujuan sebelumnya daripada Pegawai Kerja tentang kemunasabahannya. Persetujuan sebelumnya itu dan apa-apa pelarasan kemudiannya kepada harga-harga dalam Ringkasan Sebut Harga hendaklah dibuat sebelum Dokumen Kontrak ditandatangani.

7.5 Apa-apa pelarasan harga dalam Ringkasan Sebut Harga menurut perenggan 7.4 tersebut di atas dan apa-apa kesilapan hisab dalam Ringkasan Sebut Harga hendaklah dilaras dan diperbetulkan sebelum Dokumen Kontrak ditandatangani. Jumlah amaun yang dilaraskan

hendaklah sama dengan amaun jumlah harga pukal dalam Borang Sebut Harga. Amaun jumlah harga pukal dalam Borang Sebut Harga hendaklah tetap tidak berubah.

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

8. PERCANGGAHAN DAN KECUKUPAN DOKUMEN SEBUT HARGA

8.1 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 ada ditunjuk atau diperihalkan secara khusus, dengan syarat bahawa tujuan, maksud itu hendaklah difahamkan dengan munasabahnya dari Dokumen Sebut Harga itu.

8.2 Jika Kontraktor mendapati apa-apa pencanggahan dalam Dokumen Sebut Harga dia hendaklah merujuk kepada Pegawai Kerja untuk mendapatkan keputusan.

9. KEGAGALAN KONTRAKTOR MENYIAPKAN KERJA DAN PENAMATAN PERLANTIKAN KONTRAKTOR

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

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

(b) Kemajuan Kerja terlalu lembab tanpa apa-apa sebab munasabah;

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

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

(e) Apabila Kontraktor diisytiharkan bankrap oleh pihak yang sah.

10. BAYARAN KEMAJUAN

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

11. KERJA PERUBAHAN

11.1 Pegawai Kerja boleh menurut budi bicaranya mengeluarkan arahan-arahan yang berkehendakkan sesuatu perubahan kerja dengan secara bertulis. Tiada apa-apa perubahan yang dikeluarkan oleh Pegawai Kerja atau yang disahkan kemudian oleh Pegawai Kerja boleh membatalkan sebut harga ini.

11.2 Semua kerja perubahan dan/atau tambahan yang diluluskan oleh Pegawai Kerja 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 Kerja dan Kontraktor hendaklah digunakan.

12. TEMPOH TANGGUNGAN KECACATAN (DLP)

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

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

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

13. PERATURAN MEMBAYAR SELEPAS SIAP

Bayaran sepenuhnya hanya akan dibayar setelah Kontraktor menyiapkan kerja dengan sempurnanya dan Perakuan Siap Kerja dikeluarkan.

14. PERAKUAN SIAP KERJA

Pegawai Kerja hendaklah mengeluarkan Perakuan Siap Kerja sebaik sahaja kerja disiapkan dengan sempurna dan memuaskan. Tarikh siap kerja ini adalah bermulanya Tempoh Tanggungan Kecacatan.

15. PERAKUAN SIAP MEMPERBAIKI KECACATAN

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

16. PEMATUHAN KEPADA UNDANG-UNDANG OLEH KONTRAKTOR

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

DOKUMEN NO. 3

SPESIFIKASI TEKNIKAL

DOKUMEN NO. 3

SPESIFIKASI TEKNIKAL

SEBUT HARGA BAGI KERJA-KERJA PEMBAIKAN SISTEM HOSE REEL DI DEWAN SERBAGUNA, KOMPLEKS PARLIMEN MALAYSIA, KUALA LUMPUR - PAR.2/367 SH.27/2025

1. SKOP KERJA

Skop kerja merangkumi kerja-kerja berikut:-

i) Kerja-kerja membekal, memasang, menguji dan mengujiterima sistem hose reel di Dewan Serbaguna, Kompleks Parlimen Malaysia

ii) Kerja – kerja pendawaian dan lain-lain kerja yang berkaitan.

2. TEMPOH SIAP KERJA

Keseluruhan skop kerja di atas perlulah siap dan diserahkan kepada Parlimen Malaysia dengan sempurna selewat-lewatnya dimana tempoh kerja maksimum adalah enam (6) minggu.

3. PERATURAN, SYARAT DAN PIAWAIAN

a) Semua kerja yang dilakukan termasuk petugas yang menjalankan kerja, bahan-bahan dan peralatan mesti mematuhi keperluan, peraturan dan syarat yang ditetapkan oleh:

i. Jabatan Bomba dan Penyelamat (BOMBA)
ii. Suruhanjaya Tenaga
iii. Tenaga Nasional Berhad (TNB)/ Pelesenan Bekalan
iv. Jabatan Keselamatan dan Kesihatan pekerja
v. Jabatan Alam Sekitar (DOE)
vi. Jabatan Kerja Raya (JKR)
vii. Perbadanan Urus Air Selangor

viii. Jabatan kerajaan, pihak utiliti/pihak berkuasa tempatan, pelesenan dan Syarikat yang mempunyai kuasa ke atas perkhidmatan dan kemudahan.

b) Peraturan / piawaian tambahan yang berikut hendaklah turut dipatuhi:

i. Akta Bekalan Elektrik 1990,
ii. Peraturan Elektrik 1994,
iii. MS.IEC 364:1996 atau BS 7671:1992 (IEE Peraturan Pendawaian),
iv. MS 2616
v. Undang – undang Kecil Bangunan 1984,
vi. Akta Kilang dan Jentera 1967,
vii. Akta Keselamatan dan Kesihatan Kerja 514 :1994,
viii. Piawaian Malaysia dan /atau Piawaian IEC yang Terbaru,
ix. Spesifikasi Piawaian JKR,
x. Menurut dan tertakluk kepada kelulusan wakil kerajaan

c) Segala denda atau surcaj yang dikenakan oleh pihak berkuasa utiliti/pelesen/syarikat dan/atau pihak berkuasa tempatan disebabkan oleh:

i) Kegagalan mematuhi keperluan yang ditetapkan oleh pihak berkuasa utility/syarikat dan/atau pihak berkuasa tempatan;

dan / atau

ii) Keadaan kekurangan kuasa dan/atau tidak mematuhi kualiti kuasa yang diperlukan akan ditanggung oleh kontraktor.

4. KEMAHIRAN KERJA

a) Pihak kontraktor mestilah menyediakan tenaga kerja yang mahir dan kompeten dalam bidang mereka untuk menjalankan kerja di bawah kontrak ini mengikut amalan kejuruteraan yang baik. Semua kerja yang dijalankan mestilah di bawah penyeliaan petugas yang berkelayakan kompeten dan mahir selaras dengan keperluan pihak berkuasa yang berkenaan.

5. PERALATAN DAN BAHAN

a) Semua bahan gantian dan peralatan yang dibekalkan dan dipasangkan kepada Kerajaan mestilah yang baru dan belum digunakan dan bermutu tinggi dari segi reka bentuk, pembuatan dan prestasi.

6. MENGUJI DAN MENGUJTERIMA SISTEM

a) Pihak kontraktor dikehendaki menguji dan mengujiterima sistem sehingga berfungsi dengan baik setelah kerja-kerja pemasangan sistem hose reel siap dipasang dan perlu dibuat dengan kehadiran Pegawai Kerja atau wakilnya.

b) Semua data pengujian perlu direkodkan dan perlu diserahkan kepada Pegawai Kerja untuk tujuan pengesahan.

7. SPESIFIKASI TEKNIKAL SISTEM HOSE REEL – RUJUK LAMPIRAN B

PENGESAHAN BAGI JADUAL PENENTUAN SPESIFIKASI TEKNIKAL

SEBUT HARGA BAGI KERJA-KERJA PEMBAIKAN SISTEM HOSE REEL DI DEWAN SERBAGUNA, KOMPLEKS PARLIMEN MALAYSIA, KUALA LUMPUR-PAR.2/367 SH.27/2025

Saya mengesahkan bahawa saya telah menyemak perkara-perkara di atas dan memperakui bahawa saya **bersetuju / tidak bersetuju *** dengan perkara-perkara yang telah dinyatakan di atas .

.....	.....
Tandatangan Kontraktor	Tandatangan Saksi
Nama Penuh:.....	Nama Penuh:.....
Atas Sifat :.....	Atas Sifat:.....
No. Kad Pengenalan:.....	No. Kad Pengenalan:.....
Alamat :.....	Alamat :.....
.....	.....
Tarikh :.....	Tarikh :.....

Nota

1. **Sila pastikan semua keterangan dalam jadual penentuan spesifikasi teknikal dinyatakan YA atau TIDAK atau dicatat dalam ruang lain-lain kenyataan.**
2. ***Sila potong yang berkenaan.**

DOKUMEN NO. 4

JADUAL KUANTITI

DOKUMEN NO. 4

JADUAL KUANTITI

SEBUT HARGA BAGI KERJA-KERJA PEMBAIKAN SISTEM HOSE REEL DI DEWAN SERBAGUNA, KOMPLEKS PARLIMEN MALAYSIA, KUALA LUMPUR-PAR.2/367 SH.27/2025

1. SCHEDULE OF PRICES

The tenderer must complete this Schedule of Price at the same time of tender. The Government is under no obligation to accept the lowest tender and reserves the right to accept any tenders in part of full and to vary quantities stated with no variation to the rates.

The prices entered in this Schedule shall be for the dismantle, supply, installation, testing and commissioning of the complete system and other ancillary equipment in accordance with the requirements of the specifications and drawings together with (1) year maintenance and guarantee as specified.

Where work is specified or incidental to the contract and to corresponding item has been allowed for, the cost of such work shall be deemed to be included under the relevant item of work listed in the summary below.

1.0 *PRELIMINARIES & GENERAL ITEM*

No.	*Description*	*Price/Unit (RM)*	*Price (RM)*
a.	*Preliminaries including:* *(a) Insurance of works and Public Liability Policy* *(b) Prepare shop drawings, catalogue and sampel material*		
b.	*Preparation of (3) nos hard cover document for this project inclusive other related document*		
c.	*Submit proposal drawing endorsed by Professional Engineer*		
d.	*New hose reel system must integrate with existing system*		
e.	*Site clearing and cleaning after installation works completed.*		

f.	*Painting of complete system, identification, name plates, etc. as per drawing and specification*		
g.	*As Built Drawing endorsed by Professional Engineer*		
h.	*Testing and commissioning of the above equipment c/w test record and Operational Manual*		
i.	*One year service and comprehensive maintenance during warranty period including all spare parts.*		
j.	*Any other work item not specifically mentioned above but implied and or necessary to complete the air conditioning installation (give details).* *i.* *ii.* *iii.*		
Total to be carried to SUMMARY OF PRICES of Section 4			

2.0 ***HOSE REEL SYSTEM***

No.	***Description***	***Qty.***	***Price/Unit (RM)***	***Amount (RM)***
1.	*Heavy duty electric motor pump set c/w starter, couplings, base plate, neoprene pads, concrete plinth, etc. as per drawings and technical specifications. (Duty Pump)* *- Must comply to MS2616 and comply to latest BOMBA approval*	*1 set*		
2.	*Heavy duty diesel engine pump set c/w diesel tank, base plate, neoprene pads, concrete plinth, insulated exhausted pipe and all other accessories as per drawings and specifications. (Standby pump)* *- Must comply to MS2616 and comply to latest BOMBA approval*	*1 set*		
3.	*Fuel tank for diesel pump* *Capacity (30 Litres)*	*1 set*		

4.	*Maintenance free sealed lead acid rechargeable type battery and metal box as per drawing and specification*	*1 set*		
5.	*Electrical works c/w trunking, conduit and all other accessories as per drawing and specification. (The contractor shall include cost for electrical cable from Distribution Board to Pump Panel)*			
a.	*Above ground cable (PVC Cable in G.I conduit)*	*1 lot*		
b.	*Underground cable (PVC Armoured Cable) including underground cable with road crossing requirement*	*1 lot*		
6.	*Pump switchboard c/w cablings, conduits, control wiring between switchboard and various equipment, automatic controls, alarms, single line schematic circuit diagram, overvoltage protector, earthling, voltmeter, ammeter, etc. as per drawing and specification.* *- Must comply to MS2616 and comply to latest BOMBA approval*	*1 lot*		
7.	*Lightning surge protector as per drawing and specification.*	*1 lot*		
8.	*Alarm for hose reel system (outside pump room) as per drawing and specification / to be determined by S.O*	*1 lot*		
9.	*Under ground including road crossing requirement and above ground pipe works c/w valves, fittings, supports and hangers, pressure gauges, pressure switches, automatic air release valves etc. as per drawing and specification*			
a.	*Under ground (G.I Pipe Class 'C' c/w pre insulated factory wrapped externally with bituminous compound)*			
i.	*ø50mm*	*1 lot*		
b.	*Above ground (G.I Pipe Class 'C')*			
i.	*ø50mm*	*1 lot*		
ii.	*ø25mm*	*1 lot*		

10.	*Excavation, laying and filling buried piping.*	*1 lot*		
11.	*Hot-dipped galvanised pressed steel water tank c/w water level indicator (stainless steel wire rope), electrodes c/w holder and spacer, ball valve, cover, ladder, overflow pipe, scour pipe, etc. as per drawing and specification.*	*1 lot*		
12.	*All civil works necessary for complete installation of the above system include aluminium louvres for tank and pump house, concrete plinth for tanks, coring, cutting, digging, drilling, cart away debris, etc. and making good to S.O satisfaction.*	*1 lot*		
13.	*Item not included above, but shown in the drawings, described in the drawing or specifications, required by the legislation or obviuously necessary for the successful completion and efficient operation of the entire installation. If none is required please write 'NIL' otherwise full details of items are to be given. (Please Give Details):* *a.* *b.*			
Total to be carried to SUMMARY OF PRICES of Section 4.0				

3.0 ***PORTABLE FIRE EXTINGUISHERS***

No.	***Description***	***Qty.***	***Price/Unit (RM)***	***Amount (RM)***
1.	*Fire Extinguishers ABC (9.0 kg)*	*1 no.*		
2.	*Fire Extinguishers CO2 (5.0 kg)*	*1 no.*		
Total to be carried to SUMMARY OF PRICES of Section 4				

DOKUMEN NO. 5

RINGKASAN JADUAL HARGA

DOKUMEN NO. 5

RINGKASAN JADUAL HARGA

SEBUT HARGA BAGI KERJA-KERJA PEMBAIKAN SISTEM HOSE REEL DI DEWAN SERBAGUNA, KOMPLEKS PARLIMEN MALAYSIA, KUALA LUMPUR - PAR.2/367 SH.27/2025

NO.	***DESCRIPTIONS***	***PRICE (RM)***
1.	*PRELIMINARIES & GENERAL ITEM*	
2.	*HOSE REEL SYSTEM*	
3.	*PORTABLE FIRE EXTINGUISHERS*	
TOTAL TO BE CARRIED FORWARD TO FORM OF TENDER		

Ringgit Malaysia: .....

.....

NILAI INI HENDAKLAH SAMA DENGAN NILAI YANG DITAWARKAN, JIKA TIDAK SEBUTHARGA YANG DIKEMUKAKAN TIDAK AKAN DIPERTIMBANGKAN.

Tempoh kerja yang ditawarkan : ..... **hari**

.....	.....
Tandatangan Kontraktor	Tandatangan Saksi
Nama Penuh:.....	Nama Penuh:.....
Atas Sifat :.....	Atas Sifat:.....
No. Kad Pengenalan:.....	No. Kad Pengenalan:.....
Alamat :.....	Alamat :.....
.....	.....
Tarikh :.....	Tarikh :.....

DOKUMEN NO. 6

BORANG SEBUT HARGA KERJA & SURAT AKUAN PEMBIDA

DOKUMEN NO. 6

BORANG SEBUT HARGA KERJA

Ketua Pentadbir
Parlimen Malaysia
Bangunan Parlimen
Jalan Parlimen
50680 Kuala Lumpur.

Tuan,

SEBUTHARGA NO. PAR.2/367 SH.27/2025

KERJA-KERJA PEMBAIKAN SISTEM HOSE REEL DI DEWAN SERBAGUNA, KOMPLEKS PARLIMEN MALAYSIA, KUALA LUMPUR.

Di bawah dan tertakluk kepada Arahan Kepada Penyebut Harga, Syarat-syarat Sebut Harga, Spesifikasi Kerja dan pelan-pelan, 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 …….. hari/bulan/tahun dari tarikh akhir tempoh mula kerja seperti yang diarahkan oleh Pegawai Inden. Bertarikh pada …….. Haribulan ……..... 2025.

……	……
Tandatangan Kontraktor	Tandatangan Saksi
Nama Penuh: …….	Nama Penuh: …….....……
No. K/P: ……..	No. K/P: ……....……
Alamat: …….	Alamat: .....……..
……	..……..
……...	..……..
Atas sifat: …….	

……
Meterai atau Cap Kontraktor

LAMPIRAN 6

Pekeliling Perbendaharaan Malaysia
PK 1.6

SURAT AKUAN PEMBIDA

KERJA-KERJA PEMBAIKAN SISTEM HOSE REEL DI DEWAN SERBAGUNA, KOMPLEKS PARLIMEN MALAYSIA, KUALA LUMPUR.

– NO. SEBUTHARGA : PAR.2/367 SH.27/2025

Saya, ……..…… No. Kad Pengenalan ……. yang mewakili …..... nombor Pendaftaran …… dengan ini mengisytiharkan bahawa saya atau mana-mana orang yang mewakili syarikat ini:

i. tidak akan menawarkan, menjanjikan atau memberikan apa-apa suapan kepada mana- mana orang dalam mana-mana Kementerian/Agensi atau mana-mana orang lain, sebagai suapan untuk dipilih dalam mana-mana perolehan; dan
ii. tidak akan melakukan atau terlibat dengan tipuan bida dalam mana-mana perolehan.

Bersama 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 terlibat dalam pakatan tipuan bida dengan syarikat lain berkenaan perolehan di atas atau menawarkan, menjanjikan atau memberikan apa-apa suapan kepada mana-mana orang dalam PARLIMEN MALAYSIA atau mana-mana orang lain sebagai dorongan untuk dipilih dalam perolehan seperti di atas, maka saya sebagai wakil syarikat bersetuju tindakan-tindakan berikut boleh diambil:

2.1 Hilang kelayakan untuk dinilai dan dilantik bagi perolehan di atas; dan

2.2 Lain-lain tindakan undang-undang/tatatertib mengikut undang-undang/peraturan perolehan Kerajaan yang berkuat-kuasa.

3. Saya sesungguhnya faham bahawa—

3.1 saya atau mana-mana orang yang berkaitan dengan syarikat boleh didakwa bagi kesalahan* di bawah Akta Suruhanjaya Pencegahan Rasuah Malaysia 2009 *[Akta 694]* dan Kanun Keseksaan [Akta 574] serta boleh dihukum di bawah undang-undang masing-masing atas kegagalan saya atau mana-mana orang yang mewakili syarikat ini untuk mematuhi perkara (i) dalam surat akuan ini; atau

3.2 tindakan boleh dikenakan ke atas syarikat di bawah Akta Persaingan 2010 *[Akta 712]* atas kegagalan saya atau mana-mana orang yang mewakili syarikat ini untuk mematuhi perkara (ii) dalam surat akuan ini. Sekiranya syarikat didapati melanggar peruntukan seksyen 4(2)(d) Akta 712, syarikat boleh didenda tidak melebihi sepuluh peratus (10%) daripada pusing ganti (*turn over)* seluruh dunia sepanjang tempoh suatu pelanggaran itu berlaku.

4. Sekiranya terdapat mana-mana orang cuba memperolehi atau meminta apa-apa suapan daripada saya atau mana-mana orang yang berkaitan dengan syarikat ini sebagai dorongan untuk dipilih dalam perolehan seperti di atas, maka saya berjanji akan dengan segera melaporkan perbuatan tersebut kepada pejabat Suruhanjaya Pencegahan Rasuah Malaysia (SPRM) atau balai polis yang berhampiran. Saya sedar bahawa kegagalan saya berbuat demikian adalah merupakan suatu kesalahan di bawah seksyen 25 (1) Akta Suruhanjaya Pencegahan Rasuah Malaysia 2009 *[Akta 694]* dan boleh dihukum di bawah seksyen 25 (2) akta yang sama, apabila disabitkan boleh didenda tidak melebihi RM100,000 atau penjara selama tempoh tidak melebihi sepuluh tahun atau kedua-duanya.

5. Saya sesungguhnya faham bahawa syarikat melakukan kesalahan jika seseorang yang bersekutu dengan syarikat** memberikan, menjanjikan atau menawarkan suapan untuk memperoleh atau mengekalkan perniagaan atau faedah dalam menjalankan perniagaan di bawah Seksyen 17A, Akta Suruhanjaya Pencegahan Rasuah Malaysia 2009 *[Akta 694],* apabila disabitkan kesalahan boleh didenda tidak kurang daripada sepuluh kali ganda jumlah atau nilai suapan, atau RM1 juta, atau dipenjarakan selama tempoh tidak melebihi dua puluh tahun atau kedua-duanya.

Yang benar,

Tandatangan :.....
Nama :.....
No. KP :.....
Tarikh :.....
Cop Syarikat :.....

Catatan:

(i)*termasuk kesalahan ditetapkan dalam Jadual (Perenggan 3 (a), takrif "kesalahan ditetapkan") Akta Suruhanjaya Pencegahan Rasuah Malaysia 2009 [*Akta 694*] yang boleh dihukum di bawah Kanun Keseksaan [*Akta 574*].

(ii) **seseorang yang bersekutu dengan syarikat merujuk kepada seksyen 17A (6) Akta Suruhanjaya Pencegahan Rasuah Malaysia 2009 [*Akta 694*], iaitu seseorang itu bersekutu dengan organisasi komersial jika dia seorang pengarah, pekongsi atau pekerja organisasi komersial itu atau dia ialah orang yang melaksanakan perkhidmatan untuk atau bagi pihak organisasi komersial itu.

(iii) Surat Akuan ini hendaklah dikemukakan bersama surat perwakilan kuasa.

(iv) Takrifan perusahaan di bawah Akta 712 merangkumi syarikat yang terlibat dengan perolehan Kerajaan.

DOKUMEN NO. 7

KETERANGAN MENGENAI KONTRAKTOR

DOKUMEN NO. 7

KETERANGAN MENGENAI PENYEBUTHARGA

1. Nama Syarikat Penyebutharga : ……

1.1 Alamat Pejabat : ……

……

……

1.2 No.Telefon : ……

1.3 No. Pendaftaran Syarikat : ……

1.4 No. Pendaftaran Kementerian Kewangan (sertakan salinan sijil) : ……

1.5 No. Pendaftran GST : ……

1.6 Kelas : .....

1.7 Tajuk/Tajuk Kecil : .....

1.8 Jika bertaraf Bumiputera, nyatakan :
Tarikh Berkuatkuasa : .....

Tarikh Tamat : .....

2. Modal Dibenar : ……

Modal Berbayar : ……

3. Ahli-ahli Syarikat :

(i) Ahli-ahli Lembaga Pengarah

NAMA	JAWATAN	SAHAM DIPEGANG

(ii) Ahli-ahli Pengurusan

NAMA	JAWATAN

REKOD PENGALAMAN

(Senarai semua rekod pengalaman dalam 5 tahun lepas)

BIL.	NAMA KONTRAK	PELANGGAN (KEMENTERIAN/ AGENSI)	NILAI KONTRAK (RM)	TEMPOH KONTRAK

Nota:

1. Pihak Penyebutharga perlu mengemukakan bukti salinan surat tawaran kerja, Salinan Perakuan/Pengesahan Siap Kontrak daripada Pelanggan bagi setiap kontrak yang disenaraikan hendaklah disertakan.

2. Sekiranya lampiran tidak mencukupi pihak Penyebutharga boleh menggunakan lampiran tambahan sendiri.

SENARAI KONTRAK SEMASA

(Senarai semua kontrak di dalam tangan/sedang berjalan dan belum selesai termasuk kontrak yang baru ditawarkan)

BIL.	NAMA KONTRAK	PELANGGAN (KEMENTERIAN/ AGENSI)	NILAI KONTRAK (RM)	TEMPOH KONTRAK

Nota:

1. ***Pihak Penyebutharga perlu mengemukakan bukti salinan surat tawaran kerja.***
2. ***Laporan Pelanggan atas prestasi kontrak semasa hendaklah disertakan. Sekiranya tiada rekod pengalaman, sila isikan 'TIADA'. (Tempoh kontrak hendaklah termasuk lanjutan masa yang diluluskan)***
3. ***Sekiranya lampiran tidak mencukupi pihak Penyebutharga boleh menggunakan lampiran tambahan sendiri.***

Saya perakui bahawa segala keterangan di atas adalah benar.

Tandatangan :……..…….…..

Nama :……..……..…..

No. K/P :…….……

Jawatan :…….

Tarikh :…….

Cop Firma/
Syarikat :…….

Tandatangan Saksi : ……..……

Nama Saksi :……..……

No. K/P :……..……..

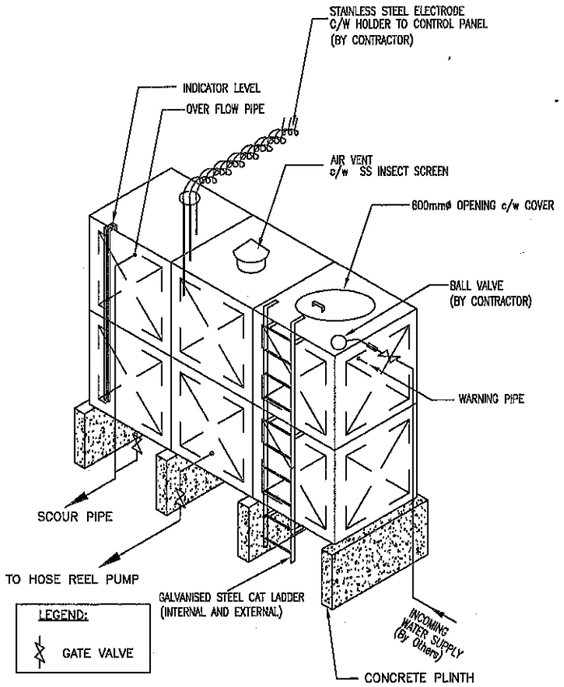
Jawatan :……..…….

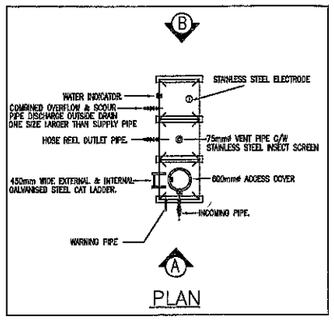
Tarikh :……..

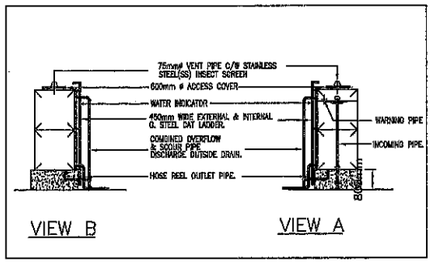
Cop Firma/
Syarikat :……..……..

Nota : Jika didapati keterangan/maklumat di atas adalah tidak benar, pihak Kerajaan berhak menolak/membatalkan tawaran syarikat tuan.

DOKUMEN NO. 8:
LUKISAN PEMASANGAN PERINCIAN

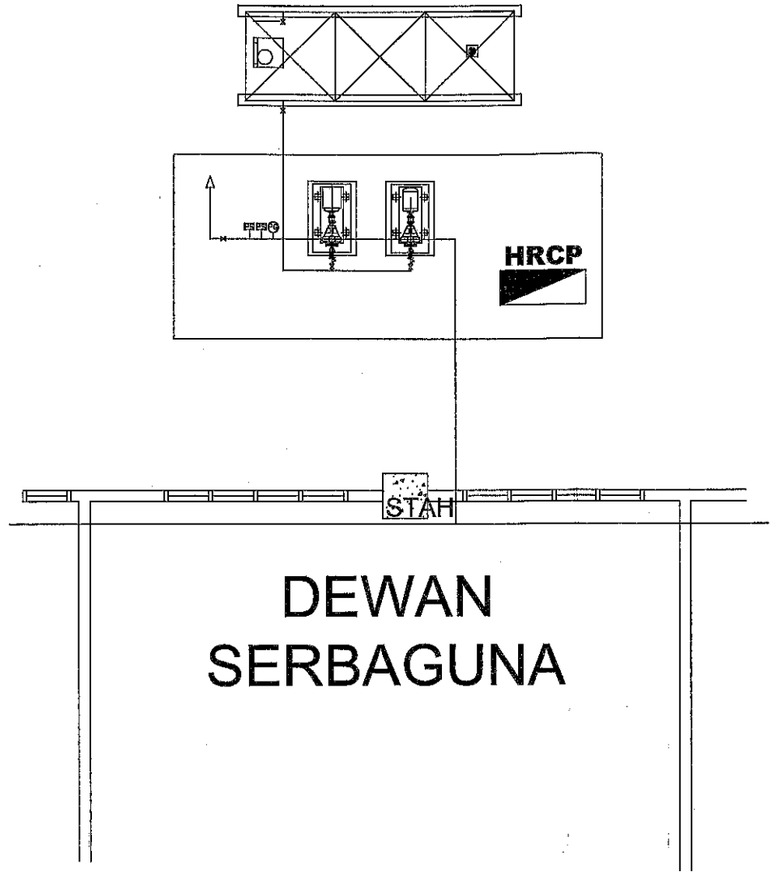






NOTE:
PLEASE REFER TO THE SCHEMATIC FOR THE EXACT TANK SIZE

DETAIL OF HOSE REEL TANK INSTALLATION



TENDER DRAWING

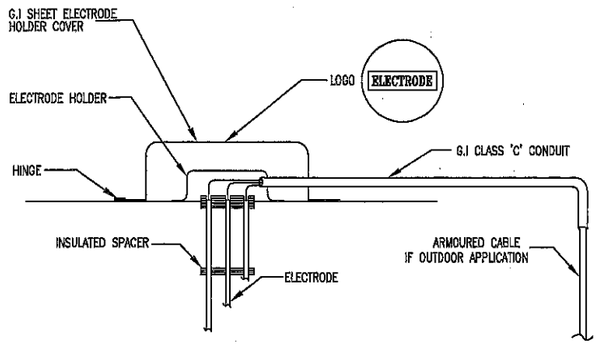
LEGEND :-

PELANGGAN

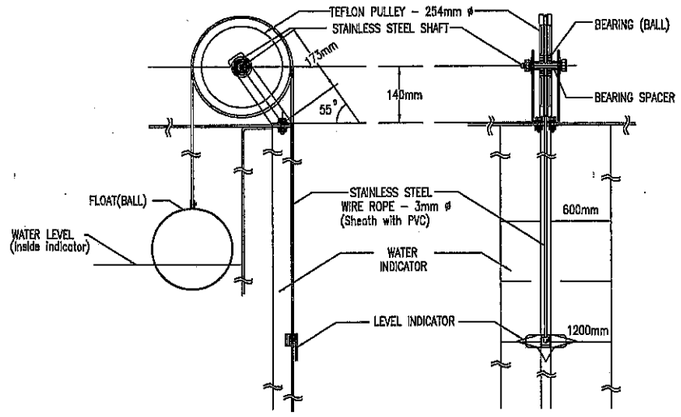
PARLIMEN MALAYSIA

PROJEK

TAMBAHAN SISTEM HOSE REEL DI BLOK DEWAN SERBAGUNA PARLIMEN MALAYSIA



TYPICAL DETAIL OF ELECTRODE INSTALLATION



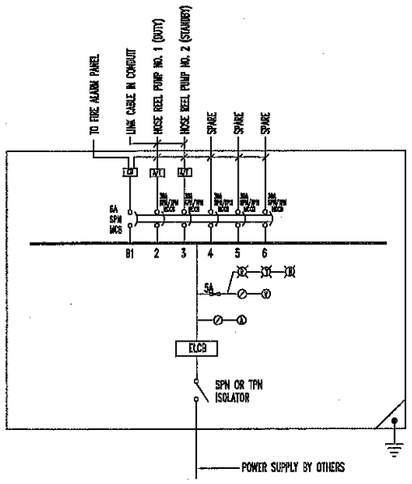
TYPICAL DETAIL OF LEVEL INDICATOR INSTALLATION

SISTEM PENCEGAH KEBAKARAN

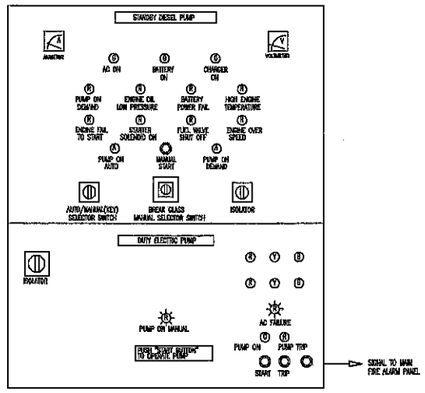
DEWAN SERBAGUNA

- PERINCIAN PEMASANGAN 1

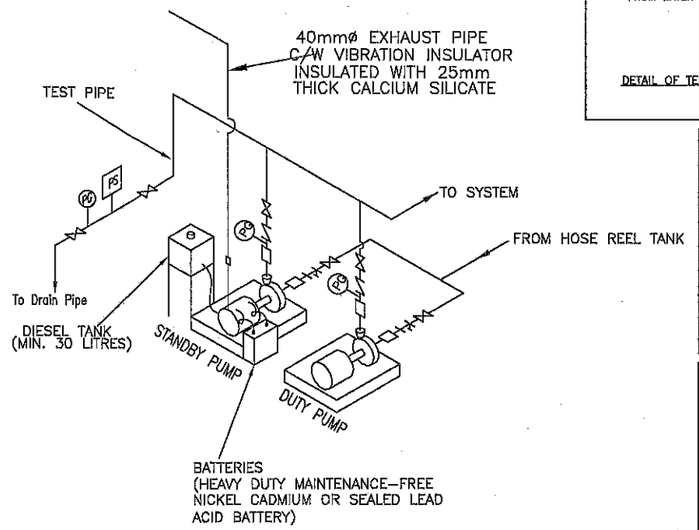
SKALA	NTS	DILUKIS OLEH	KHALIL
TARIKH	MEI 2025	DISEMAK OLEH	AZAHAM
NO. LUKISAN			REVISION
BSFL/2025/M/FF/01			



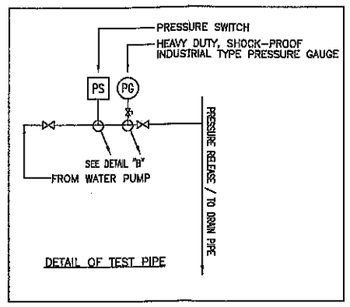
TYPICAL SINGLE LINE DIAGRAM
FOR HOSE REEL PUMP SWITCHBOARD

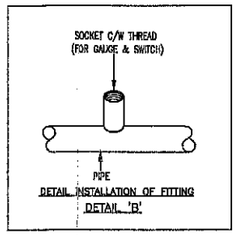


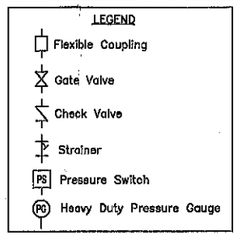
TYPICAL HOSE REEL STARTER
PUMP SWITCHBOARD

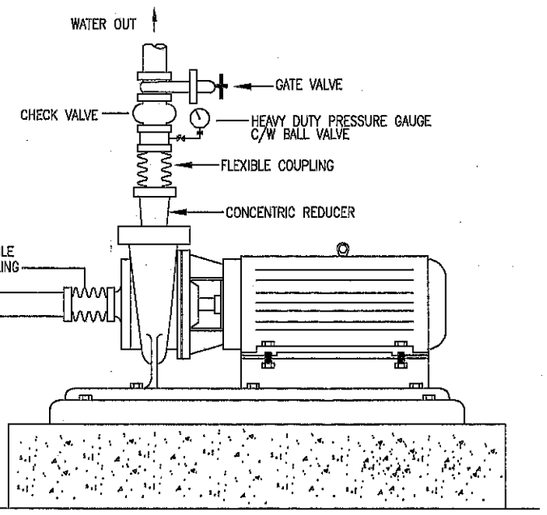


DETAIL OF HOSE REEL PUMP

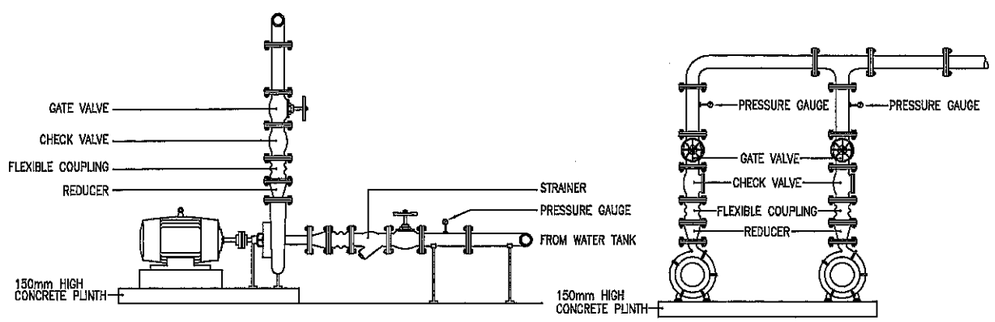




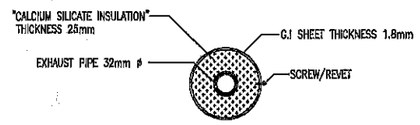




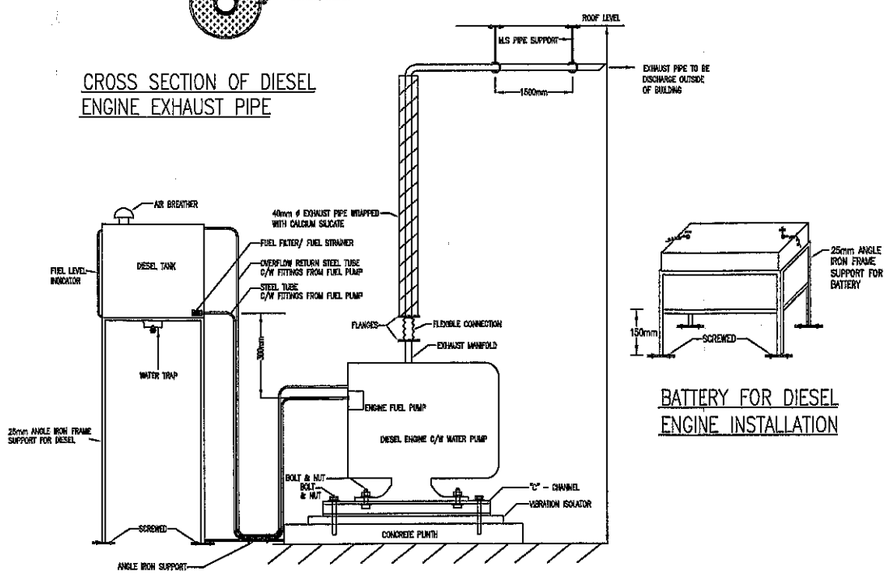
TYPICAL VALVES ARRANGEMENT FOR END SUCTION PUMP



TYPICAL PUMP INSTALLATION (HOSE REEL SYSTEM)



CROSS SECTION OF DIESEL
ENGINE EXHAUST PIPE



DETAIL OF DIESEL ENGINE

BATTERY FOR DIESEL
ENGINE INSTALLATION

TENDER DRAWING

LEGEND :-

PELANGGAN

PARLIMEN MALAYSIA

PROJEK

TAMBAHAN SISTEM HOSE REEL DI BLOK DEWAN SERBAGUNA PARLIMEN MALAYSIA

SISTEM PENCEGAH KEBAKARAN

DEWAN SERBAGUNA

- PERINCIAN PEMASANGAN 2

SKALA	NTS	DILUKIS OLEH	KHALIL
TARIKH	MEI 2025	DISEMAK OLEH	AZAHAM
NO. LUKISAN			REVISION
BSFL/2025/M/FF/02			

LAMPIRAN A1 : SURAT AKUAN PEMBIDA

LAMPIRAN A2 : SURAT AKUAN PEMBIDA BERJAYA

LAMPIRAN A1
(PK 4.2)

SURAT AKUAN PEMBIDA
Bagi

SEBUT HARGA BAGI KERJA-KERJA PEMBAIKAN SISTEM HOSE REEL DI DEWAN SERBAGUNA, KOMPLEKS PARLIMEN MALAYSIA, KUALA LUMPUR.

No. Sebutharga : .....

Saya..... Nombor K.P.....yang mewakili syarikat ..... Nombor Pendaftaran (*MOF/CIDB/SSM).....dengan ini mengisytiharkan bahawa saya atau mana-mana individu yang mewakili syarikat ini tidak akan menawar atau memberi rasuah kepada mana-mana individu dalam **PARLIMEN MALAYSIA** atau mana-mana individu lain, sebagai ganjaran mendapatkan sebutharga 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 **PARLIMEN MALAYSIA** atau mana-mana individu lain sebagai sogokan untuk dipilih dalam sebutharga seperti di atas, maka saya sebagai wakil syarikat bersetuju tindakan-tindakan berikut diambil:

2.1 penarikan balik tawaran kontrak bagi sebutharga di atas;atau

2.2 penamatan kontrak sebutharga di atas; dan

2.3 lain-lain tindakan tatatertib 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 sebutharga 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: i) * Potong mana yang tidak berkenaan
ii) Surat akuan ini hendaklah dikemukakan bersama Surat Perwakilan Kuasa

LAMPIRAN A2
(PK 4.2)

SURAT AKUAN PEMBIDA BERJAYA
Bagi

SEBUT HARGA BAGI KERJA-KERJA PEMBAIKAN SISTEM HOSE REEL DI DEWAN SERBAGUNA, KOMPLEKS PARLIMEN MALAYSIA, KUALA LUMPUR.

No. Sebutharga : .....

Saya..... Nombor K.P..... yang mewakili syarikat ..... Nombor Pendaftaran (*MOF/CIDB/SSM) .....dengan ini mengisytiharkan bahawa saya atau mana-mana individu yang mewakili syarikat ini tidak akan menawar atau memberi rasuah kepada mana-mana individu dalam **PARLIMEN MALAYSIA** atau mana-mana individu lain, sebagai ganjaran mendapatkan sebutharga 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 **PARLIMEN MALAYSIA** atau mana-mana individu lain sebagai ganjaran mendapatkan sebutharga seperti di atas, maka saya sebagai wakil syarikat bersetuju tindakan-tindakan berikut diambil:

2.1 penarikan balik tawaran kontrak bagi sebutharga di atas;atau
2.2 penamatan kontrak sebutharga di atas; dan
2.3 lain-lain tindakan tatatertib 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 ganjaran mendapatkan sebutharga 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: i) * Potong mana yang tidak berkenaan
ii) Surat akuan ini hendaklah dikemukakan bersama Surat Perwakilan Kuasa

7. SPESIFIKASI TEKNIKAL SISTEM HOSE REEL

RUJUK LAMPIRAN B1-
SPESIFIKASI
SISTEM HOSE REEL

8. SCHEDULE OF DESIGN REQUIREMENTS

HOSE REEL SYSTEM

Item	Description of Equipment	Quantity
1.	Heavy duty **electric motor pump** set c/w starter, couplings, concrete plinth for pump, base plate, neoprene pads, etc. as per specification (Fire Pump with BOMBA Approval). Tenderer shall submit together with this tender, a full set of design drawing and calculation to justify system capacity and literature.	1 Set
2.	Heavy duty **standby diesel engine** pump set c/w diesel tank, concrete plinth for pump, base plate, neoprene pads, insulated exhaust pipe, etc. as per specification (Fire Pump with BOMBA Approval). Tenderer shall submit together with this tender, a full set of design drawing and calculation to justify system capacity and literature.	1 Set
3.	Heavy duty maintenance free nickel cadmium / sealed lead acid rechargeable type battery and metal box as per drawing and specification	1 Set
4.	Fuel tank as per drawings and specification	Min. 30Liter
5.	Minimum flow rate of each pump	To stated by tenderer
6.	Total head of each pump	To stated by tenderer
7.	Nominal rpm of each motor	≤ 2900 rpm
8.	Minimum efficiency of each pump	To stated by tenderer
9.	Minimum motor horse power	To stated by tenderer
10.	Minimum diesel engine horse power	To stated by tenderer
11.	Power factor	To stated by tenderer
12.	Pump switchboard c/w cablings, conduits, control wiring between switchboard and various equipment, automatic controls, alarms, single line schematic circuit diagram, overvoltage protector, earthling, voltmeter, ammeter, etc. as per specification. (Tenderer shall submit together with this tender, a full set of design drawing and calculation to justify system capacity and literature.)	1 Lot
13.	Lightning surge protector as per drawing and specification	10 kA
14.	Alarm for hose reel system (outside pump room) as per drawing and specification / to be determined by S.O	1 Lot
15.	Underground including road crossing requirement and above ground pipe works c/w valves, fittings, supports and hangers, pressure gauges, pressure switches, automatic air release valves etc. as per drawing and specification	1 Lot

16.	Type of pipe jointing: a. 50mm diameter and below b. 65 mm diameter and above	 Screw Joints Mechanical Joints
17.	Capacity of **hot- dipped galvanised pressed steel** water tank c/w water level indicator (stainless steel wire rope), electrodes c/w holder and spacer, ball valve, cover, ladder, overflow pipe, scour pipe, etc. as per drawing and specification -including tapping from external water reticulation	2,400 iGallons

PORTABLE FIRE EXTINGUISHERS

Item	Description of Equipment	Quantity
1.	5kg. carbon dioxide fire extinguishers c/w mounting brackets and etc. (Tenderer shall submit together with this tender, a full set of design drawing and calculation to justify system capacity and literature.)	To stated by tenderer
2.	9kg. dry powder portable fire extinguishers c/w mounting brackets and etc. (Tenderer shall submit together with this tender, a full set of design drawing and calculation to justify system capacity and literature.)	To stated by tenderer

SCHEDULE OF TESTING, ADJUSTING, BALANCING AND COMMISSIONING REQUIREMENT

HOSE REEL SYSTEM

Pre Delivery Stage			
No.	**Inspection / Test Name**	**Scope**	**Responsibility**
1	Pump Performance Test and Inspection	All pump	Contractor and results endorsed by manufacturer
2	Switchboard Test and Inspection	category 1: I ≤ 600A by Suruhanjaya Tenaga	Contractor and Suruhanjaya Tenaga Certified Switchboard's manufacturer. All results must be certified by Competent Person as in Electricity Regulations 1994.

Delivery Stage			
Bil.	**Inspection / Test Name**	**Scope**	**Responsibility**
3	Visual Inspection	All delivered material and equipment to site inspected against technical specification, approved materials and good physical conditions.	Contractor
4	Documentation	All delivered material and equipment to site inspected against technical specification, approved materials and good physical conditions.	Contractor
5	Measurement	All delivered material and equipment to site inspected against technical specification, approved materials and good physical conditions.	Contractor

Installation Stage			
Bil.	**Inspection / Test Name**	**Scope**	**Responsibility**
	Visual Inspection		
6	Visual Inspection	All installation subjected to technical specifications and drawings.	Contractor

	Testing		
7	Hydrostatic Pressure Test	All piping. 1.5 times the normal working pressure of the system for period of 48 hours any leaks or deformations for the entire piping system.	Contractor
8	Pipe Flushing and Leak Test	All piping	Contractor
9	Cable Continuity Test	All power cabling	Contractor
10	Pump Start Test Pipe	All piping	Contractor

Functional Performance Stage			
Bil.	**Inspection / Test Name**	**Scope**	**Responsibility**
11	Pump Operating Test	All pumps	Contractor
12	Vibration and Noise Level Test	All Hose reel system	Contractor
13	Testing of Electrical Wiring	All power cabling	Contractor
14	Essential Power Supply for Electric Pump Inspection	Essential power	Contractor
15	Battery for Diesel Pump Inspection	Battery	Contractor
16	Fuel Storage for Diesel Pump Inspection	Fuel storage	Contractor
17	Automatic Operation of Pumps (Duty and Standby Electric/Diesel)	All pumps	Contractor
18	The Furthest and Highest Hose Reel Unit Head Performance Test	All hose reel system	Contractor
19	Automatic Air Release Valve (AARV) Test	All Automatic Air Release Valve	Contractor
	Switchboard and Power Supply		
20	Switchboard General Inspection	All switchboard	Contractor and results verified by electrical competent person.
21	Power Supply Test	All switchboard	Contractor and results verified by electrical competent person.
22	Overcurrent and Earth Fault Protection	All switchboard	Contractor and results verified by electrical competent person.

FIRE ALARM SYSTEM

Delivery Stage			
No.	**Inspection / Test Name**	**Scope**	**Responsibility**
1	Visual Inspection	All delivered material and equipment to site inspected against technical specification, approved materials and good physical conditions.	Contractor
2	Documentation	All delivered material and equipment to site inspected against technical specification, approved materials and good physical conditions.	Contractor
3	Measurement	All delivered material and equipment to site inspected against technical specification, approved materials and good physical conditions.	Contractor

Installation Stage			
Bil.	**Inspection / Test Name**	**Scope**	**Responsibility**
4	Cabling Insulation Test	All cabling	Contractor
5	Cable Continuity Test	All power cabling	Contractor

Functional Performance Stage			
Bil.	**Inspection / Test Name**	**Scope**	**Responsibility**
6	Fire Alarm Panel Operational Test	All switchboard.	Contractor
7	Batteries Test	All switchboard	Contractor
8	Devices and Signalling Operational Test	All switchboard	Contractor
9	Alarm/Sounder/Flashing Light Test	All switchboard	Contractor

9. SCHEDULE OF EQUIPMENT OFFERED

HOSE REEL SYSTEM

NO.	ITEMS	JKR REQUIREMENT	CONTRACTOR'S OFFER
1.0	**Electrical Pumpset**		
	No. of pump offered	1 Set	
	Manufacturer	To state by tenderer	
	Country of origin	To state by tenderer	
	Model	To state by tenderer	
	Type	End Suction	
	Material of impeller	Bronze/Stainless Steel	
	Material of shaft	Stainless Steel	
	Type of seal	Mechanical	
	Motor power rating	To state by tenderer	
	Flow rate of pump (igpm)	To state by tenderer	
	Total head of pump (ft)	To state by tenderer	
	Efficiency of pump (%)	To state by tenderer	
	Manufacturer of electric motor	To state by tenderer	
	Model no. of electric motor	To state by tenderer	
	Power rating (kW)	To state by tenderer	
	Rpm of motor	≤2900	
	Electrical characteristics (volts/frequency/phase)	415V/50Hz/3Ph	
	Class of insulation	F	
	Type of starter	To state by tenderer	
	Brand name of starter	To state by tenderer	
	Set starting pressure	To state by tenderer	
	Set shut off pressure	To state by tenderer	
	Note: (Must attached design drawing proposal and calculation and endorsed by Professional Engineer to justify capacity and system selected)	To state by tenderer	
	Attached pump test certification (MS2616) - Must comply to MS2616 and comply to latest BOMBA approval	Yes (MS2616)	
2.0	**Diesel Engine Pumpset**		
	No. of pump offered	1 Set	
	Manufacturer	To state by tenderer	
	Country of origin	To state by tenderer	
	Model no.	To state by tenderer	
	Type	End Suction	
	Material of impeller	Bronze/Stainless Steel	
	Material of shaft	Stainless Steel	
	Type of seal	Mechanical	
	Max. pumping power base on total head@ 30 igpm flow	To state by tenderer	
	Flow rate of pump (igpm)	To state by tenderer	
	Total head of pump (ft)	To state by tenderer	
	Efficiency of pump (%)	To state by tenderer	
	Rpm of motor	≤2900	
	No. of cylinder	To state by tenderer	
	Piston displacement	To state by tenderer	
	Mode of cooling	To state by tenderer	
	Automatic start provided	Yes	
	Manual start/stop provided	Yes	
	Capacity ofdiesel tank (litre)	Min. 30 Litre (8 gal.)	
	Specific fuel consumption at max. torque	To state by tenderer	
	Exhaust pipe material	To state by tenderer	
	Type of insulation exhaust pipe	Calcium Silicate	
	Note: (Must attached design drawing proposal and calculation and endorsed by Professional Engineer to justify capacity and system selected)	To state by tenderer	

NO.	ITEMS	JKR REQUIREMENT	CONTRACTOR'S OFFER
	Attached pump test certification (MS2616) - Must comply to MS2616 and comply to latest BOMBA approval	Yes (MS2616)	
3.0	**Battery c/w cabinet (Diesel Engine)**		
	Louvers cabinet lockable	Yes	
	Manufacturer of battery	To state by tenderer	
	Country of origin	To state by tenderer	
	Model no. of battery	To state by tenderer	
	Ampere hour	To state by tenderer	
	Rated voltage	To state by tenderer	
	Number of batteries	To state by tenderer	
	Type of batteries	Maintenance free sealed lead acid rechargeable type	
	Overall dimension	To state by tenderer	
	Conforming standard (attach certificate)	Yes	
4.0	~~Hose Reel Drum~~		
	~~No. of hose reel offered~~	~~To state by tenderer~~	N/A
	~~Manufacturer of reel~~	~~To state by tenderer~~	N/A
	~~Type of reel~~	~~Swing Universal~~	N/A
	~~Diameter of reel~~	~~Max 560 mm~~	N/A
	~~Manufacturer of hose~~	~~To state by tenderer~~	N/A
	~~Internal diameter of hose~~	~~25 mm~~	N/A
	~~Length of each hose~~	~~30 m~~	N/A
	~~Working pressure of hose~~	~~10 bar~~	N/A
	~~Bursting pressure of hose~~	~~42 bar~~	N/A
	~~Make of stop valve~~	~~To state by tenderer~~	N/A
	~~Type of stop valve~~	~~To state by tenderer~~	N/A
	~~Make of nozzle~~	~~To state by tenderer~~	N/A
	~~Type of nozzle~~	~~Shut-off (brass type)~~	N/A
	~~Dimension cabinet~~	~~Not Applicable~~	N/A
	~~Conforming standard (attach certificate)~~	~~Yes~~	N/A
5.0	**Conventional Audible Alarm Bell**		
	No. of alarm bell offered	1 Set	
	Make/model	To state by tenderer	
	Type/Size	To state by tenderer	
	Country of origin	To state by tenderer	
	Conforming standard (attach certificate)	Yes	
6.0	**Hose Reel Water Tank**		
	No. of hose reel tank offered	1 Set	
	Manufacturer	To state by tenderer	
	Brand/model	To state by tenderer	
	Material of tank	Hot Dipped Galvanized Pressed Steel	
	Capacity of tank	2400 igallons (minimum)	
	Size of tank	3.6m (W) x 1.2m (L) x 2.4m (H)	
	Size of plate	1.22m x 1.22m	
	Thickness of plate/tank	5mm	
	Type of joint	Bolting, Plates and Stiffeners	
	Mechanical level indicator of float type c/w pulley:		
	1. Material of wire rope	Stainless Steel	
	2. Diameter of wire rope	3mm	
	3. Material of scale indicator arrow	To state by tenderer	
	Material of external access ladder	Hot Dipped Galvanized Steel	

NO.	ITEMS	JKR REQUIREMENT	CONTRACTOR'S OFFER
	Note: (Must attached design drawing proposal and calculation to justify capacity and system selected)	To state by tenderer	
	Conforming standard (attach certificate)	Yes	
7.0	**Stainless Steel Electrode (non-float) c/w holder and spacer**		
	No unit of offered	1 Set	
	Manufacturer's name	To state by tenderer	
	Brand/model	To state by tenderer	
	County of origin	To state by tenderer	
	Supply voltage(V)	To state by tenderer	
	Power consumption (A)	To state by tenderer	
	Type of cable	To state by tenderer	
	Size of cable (mm)	To state by tenderer	
	Type cable use outdoor application	Armoured Cable	
8.0	**Piping**		
	1. **Above ground**		
	Manufacturer of pipes	To state by tenderer	
	Class of pipe	C	
	Material of pipe	Galvanised steel	
	Conforming standard (attach certificate)	Yes	
	2. **Underground**	Pre Insulated factory wrapping externally with Bituminous	
	Manufacturer of Bituminous	To state by tenderer	
	Thickness of wrapping material	To state by tenderer	
	Manufacturer of pipes	To state by tenderer	
	Class of pipe	C	
	Material of pipe	Galvanised steel	
	Conforming standard (attach certificate)	Yes	
9.0	**Type of Pipe Jointing**		
	a **65 mm diameter and above**		
	Manufacturer's name	To state by tenderer	
	Make and model no.	To state by tenderer	
	Type	To state by tenderer	
	Diameter	To state by tenderer	
	Material of body	To state by tenderer	
	Material of jointing	To state by tenderer	
	Rated working pressure	To state by tenderer	
	Conforming standard (attach certificate)	Yes	
	b **50 mm diameter and below**		
	Manufacturer's name	To state by tenderer	
	Material	To state by tenderer	
	Make and model no.	To state by tenderer	
10.0	**Fittings**		
	Gate Valve (Make and Type)	To state by tenderer	
	Conforming standard (attach certificate)	Yes	
	Check Valve (Make and Type)	To state by tenderer	
	Conforming standard (attach certificate)	Yes	
	Strainer (Make and Type)	Bronze body type	
	Conforming standard (attach certificate)	Yes	
	Ball valve (Make and Type)	To state by tenderer	
	Conforming standard (attach certificate)	Yes	
	Pressure gauge (Make and Type)	150 mm dia. Dial Face Type	
	Conforming standard (attach certificate)	Yes	
	Pressure switch (Make and Type)	To state by tenderer	
	Conforming standard (attach certificate)	Yes	

NO.	ITEMS	JKR REQUIREMENT	CONTRACTOR'S OFFER
	Flexible coupling (Make and Type)	Wire and fibre moulded high pressure rubber	
	Conforming standard (attach certificate)	Yes	
	Air release valve (Make and Type)	To state by tenderer	
	Conforming standard (attach certificate)	Yes	
	Vibration isolator (Make and Type)	Neoprene pad	
	Conforming standard (attach certificate)	Yes	
11.0	**Pump Switchboard**		
	No. of pump switchboard offered	1 Set	
	Make and manufacturer	To state by tenderer	
	Material/gauge of switchboard	To state by tenderer	
	Size of cubicle (mm)	To state by tenderer	
	Thickness of metal sheet (mm)	To state by tenderer	
	Catalogues and circuit diagram enclosed	Yes	
	Current consumption (A)	To state by tenderer	
	Operating Voltage(V)	To state by tenderer	
	Timer model	To state by tenderer	
	Relay model	To state by tenderer	
	Alarm bell sounding when pump is running	Yes	
	Bell silence switch provided	Yes	
	Note: (Must attached design drawing proposal and calculation to justify wiring diagram and system selected)	To state by tenderer	
	Attached pump switchboard test certification - Must comply to MS2616 and comply to latest BOMBA approval	Yes	
12.0	**Lighting Surge Arrestor (Data/power)**		
	Manufacturer	To state by tenderer	
	Model	To state by tenderer	
	Test Standard (attach certificate)	Yes	
	Peak discharge current to Earth	To state by tenderer	
	Peak leak through voltage	To state by tenderer	
	Maximum working voltage	To state by tenderer	
	Maximum working current	To state by tenderer	
	Full modes protection	To state by tenderer	
	Advance voltage free contact	To state by tenderer	
	Response time	To state by tenderer	
	Visual LED status indication	To state by tenderer	
13.0	**Circuit Breaker**		
	Make	To state by tenderer	
	Range capability	To state by tenderer	
	Model	To state by tenderer	
14.0	**Starters**		
	Make	To state by tenderer	
	Range capability	To state by tenderer	
	Model	To state by tenderer	
15.0	**Contactors**		
	Make	To state by tenderer	
	Range capability	To state by tenderer	
	Model	To state by tenderer	
16.0	**Ammeters**		
	Make	To state by tenderer	
	Range capability	To state by tenderer	
	Model	To state by tenderer	
17.0	**Voltmeter**		
	Make	To state by tenderer	
	Range capability	To state by tenderer	
	Model	To state by tenderer	

NO.	ITEMS	JKR REQUIREMENT	CONTRACTOR'S OFFER
18.0	**Power Factor Meter**		
	Make	To state by tenderer	
	Range capability	To state by tenderer	
	Model	To state by tenderer	
19.0	**Earth Fault Relay**		
	Make	To state by tenderer	
	Range capability	To state by tenderer	
	Model	To state by tenderer	
20.0	**Fuses**		
	Make	To state by tenderer	
	Range capability	To state by tenderer	
	Model	To state by tenderer	
21.0	**Isolator**		
	Make	To state by tenderer	
	Range capability	To state by tenderer	
	Model	To state by tenderer	
22.0	**Indicator Lights**		
	Make	To state by tenderer	
	Range capability	To state by tenderer	
	Model	To state by tenderer	
23.0	**Push Buttons**		
	Make	To state by tenderer	
	Range capability	To state by tenderer	
	Model	To state by tenderer	
24.0	**Spare Isolator**		
	Make	To state by tenderer	
	Range capability	To state by tenderer	
	Model	To state by tenderer	
25.0	**Selector Switch**		
	Make	To state by tenderer	
	Type	To state by tenderer	
	Size	To state by tenderer	
26.0	**Signal cables**		
	Make	To state by tenderer	
	Type	To state by tenderer	
	Size	To state by tenderer	
27.0	**Other Items (Please specified)**		

NO.	ITEMS	JKR REQUIREMENT	CONTRACTOR'S OFFER

PORTABLE FIRE EXTINGUISHER

NO.	ITEMS	JKR REQUIREMENT	CONTRACTOR'S OFFER
1.0	**Carbon Dioxide (CO_2)**		
	Capacity/weight (kg)	5 kg	
	Quantity provided	To state by tenderer	
	Make	To state by tenderer	
	Model	To state by tenderer	
	Country of origin	To state by tenderer	
	Type of agent extinguishing	To state by tenderer	
	Overall height (mm)	To state by tenderer	
	Overall diameter (mm)	To state by tenderer	
	Material of cylinder	To state by tenderer	
	Working pressure (Bar)	To state by tenderer	
	Test pressure (Bar)	To state by tenderer	
	Discharge time (sec)	To state by tenderer	
	Effective period of agent	1 Year	
	Class of fire	B,C + electrical	
	Locked cabinet provided	To state by tenderer	
	Size of cabinet (mm)	To state by tenderer	
	Conforming standard (attach certificate)	Yes	
2.0	**Dry Powder**		
	Capacity/weight (kg)	9 kg	
	Quantity provided	To state by tenderer	
	Make	To state by tenderer	
	Model	To state by tenderer	
	Country of origin	To state by tenderer	
	Type of agent extinguishing	To state by tenderer	
	Overall height (mm)	To state by tenderer	
	Overall diameter (mm)	To state by tenderer	
	Material of cylinder	To state by tenderer	
	Working pressure (Bar)	To state by tenderer	
	Test pressure (Bar)	To state by tenderer	
	Discharge time (sec)	To state by tenderer	
	Effective period of agent	1 Year	
	Class of fire	A, B, C	
	Locked cabinet provided	To state by tenderer	
	Conforming standard (attach certificate)	Yes	

LAMPIRAN B2

SPESIFIKASI
SISTEM HOSE REEL

SECTION 3.0 TECHNICAL SPECIFICATION

3.1 HOSE REEL SYSTEM

Table of Contents

SECTION 3.1 TECHNICAL SPECIFICATION FOR HOSE REEL SYSTEM

1.0 GENERAL

All major equipment offered shall be supported by copies of the current test certificates from SIRIM or recognised laboratory Such as Factory and Machinery Act (FMA), National Fire Protection Association (NFPA), Underwriters Laboratories (UL) or Loss Prevention Certification Board (LPCB).

1 WATER STORAGE TANK

1.1 Hot Dipped Galvanized Pressed Steel

The storage tank shall be minimum 5 mm thick hot dipped galvanized pressed steel. The tank shall be sectional compartmented with hydraulically pressed flanges comply to BS 1564:1975 and treated with two protective coats of paint, including bolting sections together, jointing with approved plates and stiffeners, 5 mm chamfered pressed steel covers and mosquito-proof framed access door.

1.2 Tank Accessories

The tank shall be supplied complete with:

1.2.1 Water level indicator of the float type and scales graduated in metres c/w metal indicator arrow, stainless steel wire rope, etc. as shown in the drawing.

1.2.2 External and internal access ladders shall be of hot dipped galvanized steel

1.2.3 Overflow pipe (one size larger than the inlet pipe).

1.2.4 Scour pipe complete with drain valve and drain pipe.

1.2.5 Inlet pipe c/w float ball (brass) valve (BS 1968:1953) and gate valve.

1.2.6 Outlet pipe connections to pumps and sized according to the drawings.

1.2.7 Galvanized vent pipe of 75 mm diameter in the form of swan neck and covered with stainless steel insect screen.

1.2.8 One number of 600 mm diameter manholes with hinged cover situated near the water inlet pipes.

1.2.9 Warning pipe.

1.2.10 Stainless steel electrodes shall be provided in the storage water tank for sensing low level condition and shall stop the pumps when the storage tank at low level.

The storage tank shall be installed on concrete plinths. The capacity and location of the storage tank shall be as indicated in the Tender Drawings.

All offers of storage tank shall be supported by copies of the most current test certificates from SIRIM, or other authorities having jurisdiction.

2 PUMPING EQUIPMENT

The total number and the duty of each Fire Hose Reel Pump to be provided are as indicated in the Schedule of Design Requirements and/or Tender Drawings. The Hose Reel Pump System comprises a duplicate set of pumps, one known as the 'Duty Pump' to operate on normal electric power supply and the other a 'Standby Pump' arranged to operate either on emergency power supply or by a diesel engine, in case of mains failure, as indicated in Schedule of Design Requirements and/or Tender Drawings.

Duty and standby pumps shall comply of Malaysia standard heavy duty end suction pump MS 2616:2015 Fixed Fire Fighting System - Fire pumps, as per schedule of design requirement and shall have a smoothly cast volute, machined and balanced impeller fitted to stainless steel shaft and sleeves, turning in heavy duty ball thrust and roller bearings, with leak proof mechanical seals. The material of the impeller shall be high grade bronze/stainless steel as indicated in Schedule of Design Requirements. All electric driven pumps shall be direct-coupled to its driving motor by flexible type steel couplings and the whole unit shall be mounted on a common rugged steel base plate.

All pump units shall be mounted on raised concrete plinth and the overall height of the plinth shall be as indicated in Schedule of Design Requirements and/or Tender Drawings. The Contractor shall supply and install the concrete plinth and shall be responsible to ensure smooth running, quiet operation with noise effectively reduced.

Each pump shall be fitted with suction strainer, suction valve, anti-vibration flexible coupling, discharge 'non-slam' check valve, discharge valve, pressure gauges, renewable casing wearing rings, renewable bronze shaft sleeves at the mechanical seal and a priming cock as indicated in the drawings.

All pumps shall be specifically chosen for their particular operation as regards water quantity, operating speed and working head.

All pumps shall be carefully selected and operate on a suitable flow characteristic curve as denoted by the pump characteristics i.e., at operating condition for a given flow rate and head as indicated in Schedule of Design Requirements.
All pumps and motors shall have full load speed not exceeding 2900 rpm.

2.1 Mechanical Seal

The pump seal shall be integral with the casing and shall be of the mechanical seal type. The mechanical seal material shall be of either silicon carbide, carbon or ceramic type and suitable for fluid media operation.

2.2 Pump Operation

The pumps shall be arranged such that the Duty Pump starts automatically when a fall in pressure occurs in the rising or distribution mains exceeding 5%-10% of the setting pressure. The Standby Pump (Diesel Engine) operational should be automatically ON in the event of further pressure drop 20% of the setting pressure, and should be manually OFF. The duty pump shall stop automatically when the normal static pressure in the riser or distribution mains has been re-established.

2.3 Diesel Engine

The diesel engine shall be for driving the standby Fire Hose Reel Pump and shall be of cold starting, direct injection type, naturally aspirated single cylinder, air-cooled with variable speed governor, fuel and lubricating oil filters and exhaust silencer. The engine shall be of the industrial type suited for continuous heavy duty performance and shall be rated at not more than 2900 rpm under standard atmospheric conditions. The power output shall be as specified in the Schedule of Design Requirements, with all engine accessories driven, or not less than 120 % of power required to drive the pump at design condition.

The engine is to be started directly by an extra heavy duty 12 Volts or 24 Volts electric starter motor, from a bank of batteries. Automatic and manual starting of the engine shall be provided. Manual starting switch shall be placed on the engine instrument panel.

The battery shall be heavy duty maintenance-free nickel cadmium or sealed lead acid rechargeable type of sufficient capacity a minimum of not less than as indicated in Schedule of Design Requirements for Hose Reel System in 5 hour rate of discharge, to provide six (6) successive abortive starts of the engine without recharging, and housed in metal box located beside the engine set. The box shall be lockable c/w lock set and have louvers for sufficient ventilation.

A trickle charger shall be supplied with the battery and of the automatic type with two charging rates. Charger instrumentation shall consists of ammeters, voltmeters, indicating lights for "Main On", "Trickle Charge", "Booster Charge" to be incorporated in the pump control panel in the pump room.

The engine and pump set shall be mounted on raised concrete plinth. The overall height of the plinth shall be as indicated in Schedule of Design Requirements and/or Tender Drawings.

The exhaust pipe shall be insulated with 25mm thick calcium silicate, complete with 1.8mm metal cladding and discharge outside of plant room as shown in the Tender Drawings.

2.4 Fuel Tank

The fuel tank must be of welded steel conforming to BS EN 210:2000 for mild steel drums. The tank must be mounted above the inlet to the Engine Fuel Pump to provide a gravity feed.

The tank must be fitted with an indicator showing the level of the fuel in the tank. The tank capacity is indicated in Schedule of Design Requirements (Minimum 30 litres (8 gals.).

Any valve in the fuel feed pipe between the fuel tank and the engine, must be placed adjacent to the tank and it shall be locked in the open position. Pipe joints must be soldered and the plastic tubing must not be used.

The following auxiliary equipment must be provided:

2.4.1 A sludge and a sediment trap.

2.4.2 An inspection and a cleaning hole.

2.4.3 A filter between the fuel tank and fuel pump mounted in an accessible position for cleaning.

2.4.4 Means to enable the entire fuel system to be bled of air.

2.4.5 Screwed plugs for air relief.

3 PIPEWORK

3.1 General

The work involved includes but shall not be limited to the supply and installation of all necessary pipe, valves, fittings, anchors, supports, brackets, insulation etc. unless specifically excluded elsewhere in this Specification.

The pipework shall be carried out by competent person certified by authorize body in accordance with the best engineering practice and to conform with the diagrams and layouts shown in the Tender Drawings.

3.2 Regulations

All pipelines shall be installed in accordance with the relevant Regulations and Standard such as Factory and Machinery Act (FMA), National Fire Protection Association (NFPA), Underwriters Laboratories (UL) or Loss Prevention Certification Board (LPCB).

3.3 Piping Installation

All piping material shall be galvanized steel to BS EN 10255:2004 Class 'C'.

Square tees, square elbows & cross tee shall not be used. All changes of direction of the pipe run shall be made with standard bends or long turn fittings.

All piping shall be cut with pipe cutters, accurately to dimensions determined on site and worked into position without springing or forcing. Pipe thread shall be cut with threaded dies and ends reamed before assembly. All screwed and socketed pipe joints shall be made using Teflon or an approved propriety jointing compound and fine hemp. Any threaded tubing exposed after jointing shall be painted to prevent corrosion.

A suitable automatic air release valve shall be fitted to each stack of risers or as indicated in the Tender Drawings.

The contractor shall ensure that all joints are tight and drip-proof.

3.4 Underground Piping

All underground pipes shall be galvanized steel to BS EN 10255:2004 Class 'C', pre-insulated factory wrapped externally with bituminous comply to BS EN 10224:2002 and BS EN 10311:2005 or tape Coating Systems to protect pipelines against damaging corrosion and shall be complete with pipe marker at 20' interval.

Pipes run underground shall be laid at least 900 mm below the surface and adequate provision for protection against vehicle movements and corrosion shall be taken. The insulated pipe shall be carefully laid on a sand bed completely free of stones, back-filled with sand around and over the pipe to a minimum depth of 80 mm. The next layer of backfill shall then be 300 mm deep of material free of stones; etc. The trench shall then be filled with available material.

*** For road crossing, please refer to detail drawing.**

All excavation, backfill of underground pipework shall be done properly by the Contractor. The work shall be supervised for alignment, levels and protection to the piping.

Piping shall be installed in accordance with good commercial practice. Care should be taken to avoid possible restrictions due to foreign matter, faulty fabrication or improper installation.

3.5 Pipe Jointing

3.5.1 Screwed Joint Connections

Pipe joints up to and including 50 mm (2") diameter on galvanized steel piping shall be made by means of screwed connections.

For screwed joints, the sealing compound to be used shall be litharge or glycerin. Plumber's rope or paint will not be allowed for such purpose. Standard reducing pieces shall be used throughout the whole installation.

3.5.2 Selection of pipe jointing type for 65 mm (2½") diameter and above to suit the operational requirements of the specific installation shall be as per Schedule of Design Requirements and specification below:

3.5.2.1 Mechanical Joint Coupling

For joints 65 mm (2½") and above, on galvanized steel piping shall be made by means of mechanical joint coupling.

All joint couplings, fittings, valves, and accessories shall be the products of a single manufacturer.

All castings used for coupling housings, fittings, valve bodies, etc., shall be traceable for quality assurance.

Detail of mechanical joint couplings and fittings shall be shown as per drawing.

All mechanical joint couplings shall conform to ASTM A-536 Grade 65-45-12.

Installation of mechanical joint coupling shall be in accordance with the manufacturer's installation instructions. The Contractor shall remove and replace any joints deemed improperly installed.

Where mechanical joints coupling are impractical, or flanges are required for erection purposes, or at connections to fittings and at all flanged valves, flanges shall be fitted and welded onto pipes to approval.

All flanged joints shall be flushed and aligned and shall be made with corrugated joining rings, coated on both sides with the recommended joining compound. All bolts and nuts shall be of galvanized steel of approved manufacturer.

All welded joints shall comply with BS EN 10253-2. Pipe ends shall be prepared by machining, grinding or machine gas cutting or hand flame cutting with subsequent grinding.

Prior to commencement of welding work, the contractor shall submit a copy of a competent welder certificate for approval.

3.6 Pipe Supports

All vertical runs of pipe shall be adequately supported with suitable steel clamps. All horizontal runs of pipe shall be hung from ceiling slab or walls with suitable steel hangers. At the lowest point of a vertical riser pipe, proper additional support shall be used to support from the floor level.

In the case of pipe support is allowed to be hang at roof structural steel, drilling and punching of hole are not allowed for roof structural steel. Steel bracket/ clamps or proper fixing shall be provided.

All pipes shall be adequately supported by approved type steel hangers. The spacing of these supports shall be as follows:-

Schedule 1: Pipe Spacing

Nominal pipe diameter	**Maximum spacing**	
	Horizontal spacing	**Vertical spacing**
Up to and including 50 mm (2" diameter) bore	3 m	3.5 m
65 mm (2½") bore up to and including 150 mm (6") bore	4 m	4 m

SCHEDULE 2: Anchoring

Pipe sizes (Diameter)	Rod Size	Anchor Size	Hole Diameter	Anchor Length	Hole depth
20 mm – 40 mm	6 mm	10 mm	10 mm	25 mm	25 mm
50 mm – 150 mm	9 mm	13 mm	13 mm	40 mm	40 mm

3.7 Pipe Sleeves

Pipe sleeves shall be fitted for pipes passing through concrete floors and walls (concrete/brick). Pipe sleeves shall be one (1) nominal diameter larger than the service pipe concerned.

Sleeves for galvanized steel pipe shall be of galvanized pipe off-cuts, and sleeves for copper pipe shall be similar but of brass or copper. Pipe sleeves of 100 mm diameter and above maybe constructed from not less than 3 mm galvanized sheet steel.

Pipe sleeves fitted in floors shall generally end 25 mm above the finished floor level, except in plant rooms and other areas where "wet floors" are expected in these cases, the sleeves shall end 50 mm above the finished floor level.

3.7.1 Fire Resistance Sealant or Non-Combustible Fire Stop Material

Any opening or clearances on floor, wall or partition through which pipe and pipe sleeves passes through shall be tightly caulked with fire resistance sealant or non-combustible fire stop material compliance to BS EN 14187-7:2003 with minimum 2 hours fire protection to form acoustic and fire barrier.

The method of installation for the fire resistance sealant or non-combustible fire stop material through any floors, walls or partitions shall in accordance with manufacturer's instruction.

3.8 Pipework Accessories and Fittings

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

Each valve shall be of the same nominal size as the line in which it is installed, Except for control, pressure reducing and similar valves which shall be correctly sized for the duty concerned. Connection between each valve and adjacent piping or equipment shall be made either flange or treaded joints may be applicable.

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

3.8.1 Flexible Couplings shall be of wire and fibre moulded high-pressure rubber type. The flange shall be integral with the fittings and shall be clamped in place using split steel flanges for sizes 50 mm diameter and above. For sizes below 50 mm diameter, a similar hose shall be used except that hose clips sealed with mastic shall be used for connection.

3.8.2 Strainers shall be installed upstream of all pumps. For 50 mm diameter and below, the strainers shall be bronze body type. All strainers shall be fitted with permanent magnets and removable bronze screens.

3.8.3 Pressure gauges shall be minimum 100 mm diameter dial face type and having ranges suitable for the service pressure encountered. The maximum range of the gauge should be double the operating pressure.

The gauges shall be industrial type shock proof, oil filled, stainless steel casing and IP 65 Ingress Protection Rating (Able to protect against water jets).

3.8.4 All valves supplied and installed shall conform to the following standards:

3.8.4.1 Gates Valve

All gate valves shall be of approved full bore type.

All gate valves up to 50 mm (2") shall be of the screw end bronze body with internal spindle and shall comply with BS EN 12288:2003.

All gate valves above 50 mm (2") shall be of the flange end cast iron body with internal spindle and shall comply with BS 5163-1:2004.

3.8.4.2 Check Valve

All check valves, horizontal or vertical up to 50 mm (2") shall be screw end bronze type spring loader type and shall comply with BS EN 13709:2010.

All check valves above 50mm (2") shall be wafer type cast iron with stainless steel disc and shall comply with BS EN 13709:2010.

3.8.4.3 Ball Valve

All ball valves shall be screw end brass type and shall comply with BS EN 13828

3.8.5 Pressure switches shall have an operating pressure range of 0 – 1 bar or 0.3 bar – 3.5 bar depending on the line pressure of the system, and shall have stainless steel diaphragm, a mercury switch and to operate on 240 volt, 50 Hertz A.C. supply.

3.8.6 All pipe fittings up to and including 50 mm (2") diameter, shall be of malleable cast iron conforming to BS143 and BS1256.

All pipe fittings having 65 mm (21/2") diameter and above, shall be of galvanized steel type conforming to JIS B2311:2117 or equivalent approved standard within the specifications of the relevant piping circuit and shall be of best quality manufactured. Each pipe fittings shall have appropriate identification mark embossed or engraved on it and approved by S.O prior to installation.

Any non-standard fittings shall not be permitted unless otherwise approve by S.O

3.8.7 All flange fittings shall be factory welded and no welding shall be carried out at the site. All flange connections shall have their mating faces machined to a true surface square with the centre line pipe axis $\pm$ 3° deflection from the cross-sectional axis of the pipe. Factory fabricated gaskets shall be used for leak proof connections.

3.8.8 On-site welding operations should be avoided as far as possible, but if unavoidable they shall be carried out in accordance with BS 2971:1991 and should be carried out by qualified welders.

3.8.9 All bends used shall have radius of not less than five (5) times the diameter. If radius is not obtainable, alternative bends of approved type may be used.

3.8.10 Tees in pipes shall be slipped on or other approved leveled end. All tees shall be of approved manufacturer.

3.8.11 Reduction in diameter for through flow pipes shall be made by means of reducing sockets. Eccentric reducing sockets shall be used on horizontal pipes and concentric reducing sockets for vertical pipes only.

3.8.12 Unions 50 mm and under shall be screwed with ground brass seats. Unions 65 mm and above shall be standard galvanized steel companion flanges. Where the pipe is galvanized , the union and flanges shall be galvanized . Unions of flanged connections shall be provided where necessary, to permit dismantling of piping or removal of valves and equipment.

3.9 Pipe Arrangement

Typical arrangement of pipe shall be as shown in tender drawing.

4 HOSE REEL

The hose reel system shall be of the swing universal type and shall consist of but not limited to the a stop valve, reel, hose, shut-off nozzle assembly, nozzle box/steel cabinet and shall be designed as to facilitate swift withdrawal of the hose in any directions with the reel axis horizontal.

4.1 Rubber Hose

The rubber hose shall have 25 mm internal diameter and a working pressure of 10 bars. The minimum bursting pressure shall be 42 bars.

The rubber hose shall be manufactured with an inner rubber tube lining, a reinforcement of single rayon braid of cotton conforming to BS EN 694:2001 and an abrasion resistant rubber cover.

The length of the rubber hose shall not be less than 30 meter as indicated in the Schedule of Design Requirements. There shall be no joints in the length of the hose.

4.2 Stop Valve

The stop valve shall be complying with Malaysia Standard MS 1447 and BS EN 671-1:2001, 25 mm diameter and threaded 25 mm B.S.P. (British Standard Pipe) parallel. Any indication of the open or shut position shall be fixed or marked on the wheel of the valve, and the body of the valve shall be marked with directional arrow indicating the direction of flow through the valve.

The hose reel waterways connecting the water supply to the hose excluding the stop valve and that part between the stop valve and the hose reel shall be constructed of non-ferrous material or stainless steel.

4.3 Shut-Off Nozzle

The hose shall terminate in a shut-off nozzle which shall give the following control settings: Shut and Spray and/or Jet
The material of shut off nozzle shall be brass and comply to Malaysia Standard MS 1447.

Note: When both spray and jet are provided, it is recommended that the sequence should be as above with the spray setting between the shut setting and the jet setting.

Any spray discharge shall be in the form of either a sheet of spray or a conical spray.

4.3.1 Marking of control conditions

Rotary operated nozzles shall be marked to show the direction of closing and opening.
Lever operated nozzles shall be marked to show the settings for:

Shut and Spray and/or Jet.

4.4 Hose Reel

The hose reel shall extend not more than 350 mm from the mounting surface and shall have an overall diameter not greater than 750 mm. The side plate of the hose reel shall have a continuous outer rim and shall be rigid in construction. The diameter of the inner core on which the hose is wound shall not be less than 200 mm. When the full length of the hose is coiled on the hose reel without the use of abnormal tensions, the rims of the side plates of the hose reel shall project at least 15 mm beyond the external diameter of the coiled hose reel. It shall be arranged in such a way that the hose is not restricted or flattened by the application of additional layers.

Every hose reel shall be marked with the following information:

4.4.1 The manufacturer's name, trade name or mark, or the name, trade name or mark of the responsible vendor.

4.4.2 Instructions for operating and use, which shall include the following:

4.4.2.1 Turn on stop valve to release nozzle.

4.4.2.2 Run out hose.

4.4.2.3 Turn on water at nozzle.

4.4.2.4 The hose shall be fully charged before winding it on to the reel.

4.4.2.5 Test pressure in bar (lbf/in^2).

4.5 Hose Reel Cabinet

The cabinets if required shall be fitted with a door and fitted with a lock. Lockable cabinets shall be provided with an emergency opening device, which may be protected only by transparent frangible material. The hose reel cabinet shall be unlocked with a key, to provide access for inspection and maintenance. The emergency opening device shall not leave jagged or sharp edges when broken. Proper Label/Sticker shall be fix on the outside of Hose Reel Cabinet.

5 NOISE AND VIBRATION CONTROL

This section of specification specifies the basic requirement that the noise and vibration isolation control for the mechanical equipment which must be satisfied in order to be considered for the installation.

All mechanical plant and services shall be installed in accordance with the methods of installation and precautions stated herein, and such additional precautions as may be necessary to ensure that the operation of the plant does not result in noise levels or vibration amplitudes beyond the specified limits.

5.1 Pumping Equipment

The 9.0 mm minimum thick neoprene pads / natural rubber shall be installed for all pumps shall have a minimum deflection as follow;

(a) When equipment on stable ground, the minimum deflection is 19 mm.

(b) When equipment on concrete slab above floor level, the minimum deflection is 38mm.

6 ELECTRICAL INSTALLATION WORK

6.1 General

The Contractor shall carry out all electrical work necessary for the efficient, safe and satisfactory operation of the plant detailed elsewhere in the specification and shall supply, install and connect all motors, switchboards, switchgears and all necessary equipment and materials except where it is stated in the specification that materials are to be supplied or work is to be carried out by others.

All electrical equipment supplied shall be of the first grade as regards design and fully competent electrician of appropriate grades shall only carry out manufacture and installation.

All the electrical work shall use JKR approved product listed on J-MAL / Electrical Material Approval List.

The Contractor shall provide the following electrical equipments and services: -

6.1.1 All electric motors, starters, cable boxes and isolating switches for the fire protection services.

6.1.2 Conduit, cable tray, cabling and control wiring from the electrical isolator in the sub-switchboards to the fire protection switchboards (control panels).

6.1.3 Conduit, cable tray, cabling and control wiring from the fire protection switchboards (control panels) to the various items of fire protection and ventilation equipments.

6.1.4 All control equipments, control wiring and associated works.

6.1.5 Conduit and wiring including control switches and fused spare outlets as indicated in the tender drawings.

The Contractor shall be required on completion of the electrical installation to provide in a glazed frame a complete "as installed" wiring diagram identifying all the control circuit and the various colour-coding.

The following works shall be carried out under other specialist work: -

6.1.5.1 Supply, installation and connection of the sub-mains to main fire protection plant switchboard and to the isolators in the sub-switchboards fire protection.

6.1.5.2 Lighting and power socket outlets in the plant rooms.

Unless specified elsewhere, all equipment, apparatus, appliances and accessories for low voltage electrical installation shall be rated for operation on a 240/415 V within the tolerance as defined in MS IEC 60038 : 230/400V (+10%, -6%), 3 phase, 50 Hz. system with solidly earthed neutral.

All standard shall conform to the latest MS, MS IEC, IEC, BS EN, BS and/or EN standard.

6.2 Fire Fighting Switchboards

6.2.1 Types of Fire Fighting Switchboard

The types of switchboard shall be as specified in the Drawings and/or and Schedule of Design Requirements shall be of the following types: -

6.2.1.1 Self-contained, floor mounted, flush fronted, metalclad cubicle type suitable for front and rear access.

6.2.1.2 Self-contained, floor mounted, flush fronted, metalclad cubicle type suitable for front access.

6.2.1.3 Wall mounted metalclad type suitable for front access.

The switchboards shall house their air circuit breakers, moulded case circuit breakers, fuse switches, switch fuses, isolators, contactors, busbars, meters, protective relays, selector switches, indicating lamps, current transformers, cable terminating boxes, cable glands, anti-condensation heaters complete with automatic thermostats and isolators and all other necessary items of equipment whether specified hereinafter or in the drawings or not, suitable for operation on a 400/240 V (+10%, -6%), 3 phase, 50 Hz. system with solidly earthed neutral.

Unless otherwise specified elsewhere, the switchboards shall be capable of withstanding fault condition of not less than 50 kA at 415 V for 1 s as defined in IEC 60439-1.

The switchboards shall comply with IEC 60439-1 and the degree of protection shall be IP41 in accordance to MS IEC 60529. Outdoor switchboard shall also comply with MS IEC 60439-5 with protection degree of IP54 in accordance to MS IEC 60529.

Type testing for switchboard:-

Table 2A: Type testing for switchboard as per categorization

Category	Current Rating	Registration & Type Test Report
i	I ≤ 600A	Suruhanjaya Tenaga
ii	600A < I ≤ 2000A	Suruhanjaya Tenaga & Partial Type Test accordance with MS IEC 60439-1 (i) Short Circuit Test (Clause:80203) (ii) Temperature Rise Test (Clause:8.2.1)
iii	I > 2000A	Suruhanjaya Tenaga & Full Type Test accordance with MS IEC 60439-1

Routine tests on the switchboard shall be carried out before delivery to site. The main circuits and the auxiliary circuits shall be tested to verify dielectric properties with power-frequency test voltage of 2500 Vac for 1 minute and insulation resistance under test voltage of 1000 V.

Routine tests shall include inspection and checking of wiring, electrical continuity of the protective circuits, connections and effectiveness of mechanical actuating elements and interlock. **Test Results or Certificate duly certified by Competent Person as in Electricity Regulations 1994 shall be issued for every switchboard supplied and installed.**

6.2.2 Enclosures

6.2.3 General

Switch operating handles shall be interlocked with the compartment door so that the door may not be opened until the switch is off.

Light shall be clearly visible at a distance on clear day. The following shall be incorporated in Switchboard:

6.2.3.1 Duty & Standby Electric Pump:

(a) Red, Yellow and Blue lights for phase indication in duplicate.

(b) Red flashing light for A/C FAIL and PUMP ON MANUAL.

(c) Green light for PUMP RUN.

(d) Yellow light for PUMP TRIP.

(e) START and STOP push button.

(f) Switch off for A/C isolate and AUTO MANUAL selector switch.

(g) An ammeter and voltmeter shall be provided.

(h) MANUAL START push button.

(i) Amber light for AUTO ON, AUTO CRANK ON, MANUAL ON, and AUTO CRANK FAIL.

(j) Green light signals shall be provided on single horizontal alignment spaced adequately to show that the supply is normal. They are A.C ON, CHARGER ON, D.C ON.

6.2.3.2 A relay shall be provided to sound the alarm bell at the ground floor near the pump room, and also to the Master Alarm Bell at the Main Fire Alarm Panel and at the Repeater Panel on the starting of any pump.

6.2.3.3 A relay shall be provided in the switchboard to stop the pump when the water level in the water tank is at low water level and prevent from being switch on again until the water level reach start level.

6.2.4 Self-Contained Floor Mounted Cubicle Switchboards

The framework of the switchboard shall be fabricated from rolled steel sections of thickness not less than 2.5 mm and shall be self-supporting when assembled, uniform in height and depth from front to back. The rigid construction shall be designed to withstand without any sag, deformation or warping, the loads likely to be experienced during normal operating, maintenance or maximum fault condition.

The front shall be provided with covers/doors of box formation. The rear shall be provided with hinged removable doors of box formation. The rear doors shall be of double-leaf type with rebated edges and each leaf should preferably not be wider than 450 mm. Each leaf of door shall have 2 pairs of approved hinges. The door shall be fitted with approved type of surface-mounted espagnolette or cremone bolts complete with approved locking device operated by a satin chrome lever handle at the centre fixing. The top and sides shall be of removable panels. Cover plates with openings for cable entry shall be provided at the base of the switchboard. All panels, covers and doors shall be fabricated from sheet steel of thickness not less than 2.0 mm and so constructed as to provide a clear, flush and pleasing appearance. The panels, covers and front doors shall be secured to the enclosure by means of chromed type of screws with cylindrical knurled head complete with retaining clips. Welded cross struts shall not be used.

The switchboard shall be dust and vermin proof. All covers and doors shall be provided with grommets and dust seals to exclude dust and dirt. Louvers or ventilation vent with filter shall be provided at the sides and back for adequate ventilation. Precaution shall be taken to prevent overheating due to hysteresis and eddy current using non-ferrous plate (for single core cable). All edges shall be rounded. Serrated star washers shall be fitted to ensure satisfactory earthing of the front cover.

All indicating instrument which need to be read by the operator shall not be located higher than 2 m above the base of the switchboard. All operating devices such as handle, push buttons, etc., shall be located at such a height that they can easily be operated, and in general, the centreline shall not be higher than 2 m above the base of the switchboard. In the case where building automation devices, transducers and relays are provided, they shall be separately housed in a compartment of the section of the switchboard. All wiring from the devices, transducers and relays shall be neatly arranged and connected to the terminal blocks with removal links mounted on rail. Terminals shall be identified and labelled in accordance with IEC 60445.

A lockable tool compartment with keys and opening handle shall be provided at the lowest subsection of the switchboard. The switchboard shall undergo de-rusting treatment, anti-rust treatment with the exterior finished with epoxy dry-powder and oven baked semi-gloss beige colour and interior finished matt white. The switchboard shall be bolted to mild steel channel base or over concrete trench. The channel shall be anti-rusted and painted with a primer. There shall be a readily installed cable tray on the interior at both side panels for outgoing cable. All cables shall be rigidly secured using cable support bracket of non rotting material, before termination.

6.2.5 Wall Mounted Switchboards

The switchboard shall be fabricated from sheet steel of thickness not less than 2.0 mm. The enclosure shall be of all welded construction with sheets bent where possible so as to minimise the number of welded joints. The four sides of the enclosure shall be returned at the front to facilitate fixing of front cover plates. The front cover plates or doors shall be of box formation and flanged to facilitate fixing to the enclosure.

The front cover of the switchboard shall be provided with grummets and dust seal to exclude dust and dirt. Meshed louver or ventilation vent with filter shall be provided at both sides for ventilation. All edges shall be rounded.

Serrated star washers shall be fitted to ensure satisfactory earthing of the front cover. The switchboard shall undergo de-rusting treatment, anti-rust treatment and be finished with epoxy dry-powder and oven baked semi-gloss beige colour.

The switchboard shall not be mounted directly to the wall structure. It shall be firmly bolted/ welded on to galvanized C-channel brackets which in turn shall be bolted to the wall or structure by means of bolts and nuts. The top of the switchboard shall not be higher than 2100mm and the bottom shall not be lower than 900mm from the floor.

6.2.6 Associated Components

Busbars shall be of hard drawn high conductivity copper of adequate rectangular cross section to carry continuously the specified current without overheating and also coloured in accordance with the latest applicable British Standards. An earthen busbars of suitable cross section shall be run the full length at the base of the main switchboard.

Connections from busbars to the circuit breakers, switchfuses and fuseswitches shall be effected by means of copper bars or rods securely clamped to the busbars and identified by means of coloured plastic sleeving to indicate the phase colours.

All relays provided shall be heavy-duty pattern, unaffected by external vibration and capable of operation in any position. All meters and relays shall be fully tropicalised.

Earth fault/over current relays with the delay characteristics shall be provided to trip circuit breakers as specified. Earth fault relay shall incorporate drop flag indicator with hand-reset contacts.

All contactors and starters, relays and controllers shall be fitted on insulated panels. All incoming and outgoing circuit and in ring shall be brought to the contactors, starters, relays and controllers, via insulated terminal strips mounted within the metal cubicles, and all wiring between terminal strip and electrical equipment inside the control panel shall be neatly run and taped in accordance with the requirements of the Suruhanjaya Tenaga (ST).

6.2.7 Air Circuit Breakers (ACB)

ACB shall be of withdrawable metalclad, flush mounted, horizontal draw out isolation and air break type suitable for installing on cubicle type of switchboard. They shall be three or four poles type as specified and shall comply fully with IEC 60947-1 and 60947-2. They shall be ASTA or KEMA or other accredited laboratories certified for minimum rupturing capacity, rated short time withstand current, (Icw) of 50 kA at 415 V for 1 second or otherwise specified.

They shall consist of quick-make, quick-break, mechanically and electrically trip free mechanism arranged to give double break in all poles simultaneously. The closing mechanism shall be of stored energy type, either manually or electrically charged. Mechanical `ON' and `OFF' or '|' and '0' indicators shall be provided. The tripping mechanism shall be equipped with push button for independent manual tripping and shall be stable and not being opened by shocks.

Each pole of the circuit breaker shall be provided with an arc chute to extinguish the arc drawn between the breaker contacts each time a breaker interrupts current, and interpole barriers to reduce arcing time for rapid deionization of the arc and guard against flash over. The contacts shall be renewable type.

The operating mechanism and carriage shall have the following positions: -

6.2.7.1 Service - In this position the main and control contacts are engaged.

6.2.7.2 Test - In this position the main contacts are isolated but the control contacts are still engaged. It shall be possible to check the correct operation of the control circuits without energising the main circuit.

6.2.7.3 Isolated - Both main and control contacts are isolated.

They shall be provided with marking to show the breaker positions with facility for padlocking the carriage in the Test and Isolated positions.

They shall be equipped with the following interlock devices: -

(a) Prevent withdrawal of breaker while the breaker is in closed position.

(b) Prevent closure of breaker while the carriage is in any position between `fully isolated' and `fully home'.

The arrangement of the busbar connections shall be such that with the circuit breaker withdrawn, the life parts shall be protected, either by suitable shrouding or lockable shutters.

Minimum four numbers (2-Normally-Open, 2-Normally-Close) double break type auxiliary contacts shall be provided.

Mechanical interlocks and/or electrical interlocks, where specified, shall be provided. Mechanical interlock shall be of code key type, arranged to mechanically operate the trip mechanism latch so that the breaker can only be closed when the key is trapped in the lock.

Electrical interlock shall be controlled by means of operation of auxiliary switches of another breaker designed to cut out the closing coils and mechanism of the parent breaker.

Where used as bus-coupler, they shall be of 4 pole type and provided with electrical and/or mechanical interlocks as required so that it is not possible for the coupler to close with its associated main incoming supply breakers closed.

Where used as incoming feeder from supply source (either from transformer, generator set or coupler), they shall be of 4 pole type.

The neutral of the 4 pole type ACB terminals shall be of the same size as the phase.

The frame of ACB shall be bonded to the switchboard eathing bar using of 3 mm x 25 mm tinned copper tape.

6.2.8 *Moulded Case Circuit Breakers (MCCB)*

MCCB shall comply with MS IEC 60947-2. They shall be fully tropicalised and suitable to be used up to an ambient temperature of 40 °C, enclosed in glass-reinforced polyester moulded case and suitable for use on 240/415 V, 50 Hz. A.C. supply system.

They shall be of the quick-make, quick-break type having manually operable toggle type handle. Permanent position indicators shall be provided to show status of the breaker. When tripping occurs, the handle shall be in the trip position midway between the 'ON' and 'OFF' or 'I' and 'O' position so as to provide positive indication of automatic interruption. The operating mechanism shall be non-tamperable.

The MCCB shall have trip-free feature to prevent the breaker from being closed against fault conditions. Multipole MCCB shall have common-trip operating mechanism for simultaneous operation of all poles.

The tripping units shall be one of the following types: -

6.2.8.1 Thermal-magnetic types with bimetallic elements for inverse time-delay overload protection and magnetic elements for short circuit protection.

6.2.8.2 Solid state trip unit with adjustable overload protection and adjustable short circuit protection with or without adjustable time-delay.

An arc extinguisher shall be incorporated to confine, divide and extinguish the arc drawn between the breaker contacts each time a breaker interrupts current. The contacts shall be of non-welding type.

If current limiting types of MCCB are used, they shall be equipped with current limiting device of either permanent self-resetting power fuse type or magnetic repulsion moving contact type.

The current limiting device shall coordinate with the normal trip mechanism so that all fault and overload currents occurring within the safe capability of the MCCB shall cause the MCCB to open, and all currents occurring beyond the capability of the MCCB shall cause the current limiting devices to operate.

If required, the MCCB shall have facilities for shunt trip, under-voltage/no-volt trip, externally connected earth fault protection, externally connected over current protection etc. They shall also have auxiliary contacts, accessories etc. for indication, alarm and interlocking purposes if necessary.

In area where is specified, and door interlocking facilities to prevent the panel door from being opened to access to the MCCB in closed position, shall be provided.

6.2.9 *Miniature Circuit Breakers (MCB)*

MCB shall be of type approved by Suruhanjaya Tenaga and JKR.

Unless otherwise indicated in the Drawings and/or Schedule of Design Requirements, MCB shall have breaking capacity not less than 6kA (rms) and of C-type with class 3 energy limiting characteristics. They shall comply with MS IEC 60898-1 and/or MS IEC 60898-2, fully tropicalised and suitable for use on a 240/415 V, 50Hz. A.C. system and up to an ambient temperature of 40°C.

They shall be quick-make, quick-break and trip free type complete with de-ion arc interrupters.

The tripping elements shall be of thermal magnetic type with inverse time delay over current and instantaneous short circuit characteristic. The respond to overload shall be independent of variations in ambient temperature.

They shall be manually operated by means of toggle type handles having visual indication of whether the breaker is opened, closed or tripped.

Multipole MCB shall be of all pole protected type and provided with common-trip mechanism for simultaneous operation of all the poles.

6.2.10 *Isolating Switches*

Isolating switches or switch-disconnector shall be of metalclad or high impact insulating material (e.g. polycarbonate) type. They shall fully comply with MS IEC 60947-1 and MS IEC 60947-3. The degree of protection shall be IP54 for indoor installation and IP65 for outdoor installation.

They shall be able to operate continuously at full current rating without de-rating, capable of making and breaking currents under normal condition and when in open position, providing isolation from source of electrical energy for reasons of safety.

They shall be quick-make, quick-break type suitable for use on 240/415 V, 50Hz. a.c. system. They shall be provided with removable top and bottom end plates or knockouts for cable entry.

The enclosure, the isolating mechanism and all other accessories shall be from the same manufacturer.

The enclosure for metalclad type shall comprise of heavy gouge steel plates rust protected and finished grey stove enamel. Front access doors for metalclad type, which is detachable, shall be fitted with dust-excluding gasket and shall be interlocked to prevent opening when the switch is 'On'.

However this interlock shall be able to be defeated by competent person for maintenance purpose. It shall be provided with, if required, facilities for lock-on and lock-off the operating handle.

6.2.11 Contactors

Contactors shall comply with IEC 60947-1 and 60947-4-1. They shall be fully tropicalised, suitable to be used up to an ambient temperature of 40°C and suitable for use on 240/415V (+10%, -6%) 50Hz. A.C. supply system.

The contacts shall be of quick-make and quick-brake type, dust-proof and rust protected. They shall be utilisation category as per Table 4A.

Table 4A – IEC Utilization Categories

Current	Utilization Category	Typical Applications
AC	AC-1	Non Inductive or slightly inductive loads, resistance furnaces, heaters.
	AC-2	Slip-ring motors : switching off
	AC-3	Squirrel-cage motors: starting, switching off motors during running Most typical industrial application
	AC-4	Squirrel-cage motors: starting, plugging[1], inching[2]
	AC-5a	Switching of electric discharge lamps
	AC-5b	Switching of incandescent lamps
	AC-6a	Switching of transformers
	AC-6b	Switching of capacitor banks
	AC-7a	Slightly inductive loads in household appliances: mixes, blenders
	AC-7b	Motor-loads for household applications: fans, central vacuum
	AC-8a	Hermetic refrigerant compressor motor control with manual resetting overloads
	AC-8c	Hermetic refrigerant compressor motor control with automatic resetting overloads

6.2.11.1 Plugging – Stopping a motor rapidly by reversing the primary power connection.

6.2.11.2 Inching – Energizing a motor repeatedly for short periods to obtain small incremental movements.

The contactor shall have multiple contacts and unless otherwise specified shall be normally-open.

6.3 Protection Relays

The protection device shall be of the type acceptable to the Supply Authority or Licensee and JKR. The protection relays shall be of panel flush mounting type. All relays shall comply with relevant parts of IEC 60255.

Over current and earth fault protection shall be provided by externally connected current transformers.

Unless specified in the Drawing and/or Schedule of Design Requirements, electromechanical over current and earth fault relay shall be of Inverse Definite Minimum Time (IDMT) type.

For over current relay of IDMT induction disc type, current settings shall be from 50% to 200% adjustable in seven equal steps and time multiplier settings from 0.1 to 1.0 seconds adjustable continuously.

Earth fault relay of IDMT induction disc type shall have current settings from 10% to 40% or rated current adjustable in seven equal steps time multiplier settings ranging from 0.1 to 1.0 adjustable continuously.

Earth leakage relay (ELR) shall be of the type suitable for use on a 240/415 V,50 Hz. A.C. system and up to ambient temperature of 40°C ELR shall be provided with test button for simulation of a fault, earth leakage LED indicator a reset button, protection against nuisance tripping due to transient voltage and D.C. sensitive. Unless otherwise specified in the Drawings and/or Schedule of Design Requirements, ELR shall be of adjustable current sensitivity and adjustable time delay type.

The selectivity range for current sensitivity shall be 0.03A to 10A and the time delay selectivity range of 0 second to 1 second. ELR shall incorporate with matching balanced core current transformer and shunt trip coil for the circuit breaker to which it controls the tripping shall also be provided.

Unless specified in the Drawings and/or Schedule of Design Requirements, the microprocessor based protection relays shall be rated at 240V/415V and operating voltage shall be in a range from 90V to 250V. The relays shall be housed in robust panel flush mounting case to IP 54 and shall be fully tropicalised and suitable to be used up to an ambient temperature of 50°C and relative humidity of 95%.

Unless otherwise specified, the microprocessor based protection relays shall be of combined three phase over-current and earth-fault protection with instantaneous, definite time and inverse-time characteristics. Time / current characteristic of IDMT over current and earth fault relays shall be of standard inverse curve (3/10).

The microprocessor based protection relays shall give numerical digital readout of set values, actual measured values and recorded values. The relays shall include a serial communication port for external connection to facilitate external reading, setting and recording of relay data and parameters by a personal computer (PC). PC connecting cable and parameter reading/setting/recording PC program shall be provided.

The microprocessor based protection relays shall incorporate with built-in self-supervision system with auto-diagnosis. The self-supervision system shall continuously monitor the relay microprocessor programs. If a permanent fault is detected, an alarm indication shall be given. A 240V/5A alarm contact for connection to external alarm shall be provided.

If current and voltage measurements are specified, the microprocessor based protection relays shall make available these measurements for local display. The measurements shall include three phase currents, phase-to-phase voltages and three phase-to neutral voltages.

The microprocessor based protection relays shall comply with relevant parts IEC 60255 and shall also comply with relevant parts of IEC 61000 on electromagnetic compatibility.

6.4 Measuring Instrument and Accessories

Measuring instrument and accessories shall comply with the relevant IEC Standards. They shall meet the requirement as specified in the Drawings and/or Schedule of Design Requirements.

6.4.1 Measuring Instrument

Measuring instrument shall be of panel flush mounting type with square escutcheon plate finished matt black and pressed steel case.

They shall be of industrial grade type adequately shielded against stray magnetic fields, conform to the measuring scales and arrangements as shown in the Drawings and calibrated for correct readings.

They shall comply with MS 925 and relevant parts of IEC 60051. External zero adjustment shall be provided for ammeters and voltmeters.

Ammeters, unless otherwise specified, shall be of moving iron type having continuous overload capacity of 120% of rated value and full scale value accuracy of ± 2%. They shall be provided with maximum demand indicator, if specified.

Voltmeters shall be of moving iron type having overload capacity of 200% of rated value and full scale value accuracy of ± 1.5%.

Kilowatt-hour meter shall be of 6 numbers wheel cyclometer aluminium type with both the current and voltage coils on laminated cover fabricated from high quality silicon steel strip.

They shall have overload capacity of 200% of rated value and accuracy of ± 0.5% at the supply voltage and frequency characteristic.

Power factor meters shall be of balanced type using ferrodynamic, cross-coiled mechanism with measuring range from 0.5 lagging to 0.5 leading. Full scale value accuracy shall be ± 1.5%.

Frequency meters shall be of reed type with frequency range from 45 Hz. to 55Hz. and accuracy of ± 5%.If specified in the Drawings and/or Schedule of Design Requirements, the microprocessor based power meter shall be rated at 240V/415V and operating voltage shall be in a range from 90V to 265V.

The meters shall be housed in robust panel flush mounting case to IP 54 and shall be fully tropicalised and suitable to be used up to an ambient temperature of 50 0C and relative humidity of 95%.

The meters shall give direct numerical digital readout of actual measured values and recorded values. The meters shall include one serial communication port for external connection to facilitate external reading and recording of meter data and parameters.

The measurements and their accuracy of the microprocessor-based meters shall be:

Parameters / measurements	Accuracy
Volts (V): line-line / line-neutral	0.5% of reading ± 2 digit
Currents (A): per phase	0.5% of reading ± 2 digit
Frequency (Hz)	0.1 Hz ± 1 digit
Power Factor: total	1% of reading ± 2 digit
Active Power (kW): total	1% of reading ± 2 digit
Reactive Power (kVAr): total	1% of reading ± 2 digit
Apparent Power (kVA): total	1% of reading ± 2 digit
Active Energy (kWh): total	1% of reading
Reactive Energy (kVArh): total	1% of reading
Maximum Demands (A, W, VA): total	1% of reading ± 2 digit

If harmonics content measurement is specified, individual and total harmonics distortion on the current and voltage up to 30th harmonic shall be measured with the accuracy of 1% of reading.

There shall be a custom display screen, which can be programmed to display customised specific parameter requirements.

All data shall be continuously and concurrently logged, recorded and stored in internal non-volatile memory. All time base logged-in data can be retrieved and downloaded to a personal computer (PC) using serial communication port. PC connecting cable and data retrieving PC program shall be provided

The meters shall comply with IEC 60359 and IEC 60688. The meters shall also comply with relevant parts of IEC 61000 on electromagnetic compatibility.

6.4.2 Current Transformers

Current transformers shall comply fully with MS 1202 and IEC 60044-1 and shall have short time rating not less than that of the switchboard in which they are incorporated. The secondary shall be rated for 5A. They shall be adequately rated in VA to carry the summation of all VA burdens of the connected loads but in any case, the rating shall not be less than 15VA. They shall be capable of withstanding, without damage, on open circuit secondary with full primary current.

They shall be constructed from high quality silicon steel or resin encapsulated steel core. They shall be installed inside the switchboard in such a way that it is easily accessible for maintenance purpose. Identification labels shall be fitted giving type, ratio, rating, output and serial numbers.

Unless otherwise specified, current transformers used for measuring and metering shall be of Class 1.0 accuracy and those used for protection shall be of Class 10P10 accuracy.

6.5 Surge Protection Device

The surge protective devices (SPDs) shall be one-port type compatible with the 240/415V (+10%, -6%), 3 phases, 4 wires, 50Hz with solidly earthed neutral supply system it is protecting. The SPDs shall be of the type complying with MS IEC 61643-1, MS IEC 61643-12 and IEE Std C62.41.2 and in accordance with recommendations of MS IEC 62305 and the relevant parts and section of MS IEC 60364.

If the specifications conflict in any way, with any or all of the above/ standards, the specification shall have precedence and shall govern.

The SPDs shall be designed for the average isokeraunic level of approximately 200 thunder-days per year.

The SPDs modes of protection shall be each phase-to-neutral (L-N), each phase-to-earth (L-E) and neutral-to-earth (N-E) for either single phase or three phase supply system.

The SPDs shall be of voltage limiting type with metal oxide varistors (MOVs), or voltage switching type with gas discharge tube (GDT)/spark gap, or combination type with MOVs and GDT/spark gap. MOVs and GDT shall comply with MS IEC 61643-331 and MS IEC 61643-311 respectively.

The maximum continuous operating voltage (Uc) of SPDs shall be minimum 175V for SPDs connected between L-N and (L-E). When SPDs connected between (N-E), the rating of Uc shall be minimum 240V. The continuous operating current (Ic) for each mode of protection shall not exceed 3mA. In the case where the MOVs are used, the SPDs shall be provided with integrated thermal protection to avoid thermal runaway due to degradation.

The SPDs to be installed with respect to the location of category shall be as in Table 7A. The maximum discharge current (Imax) of SPDs shall be declared by the SPD manufacturer by submitting the V-I characteristic of a MOVs / GDT / spark gap.

The SPDs shall be equipped with visual indicator showing the protection status of the SPDs. Unless otherwise specified, SPDs shall be provided with auxiliary contact for connection to remote monitoring of SPDs protection status. A durable label with red lettering on a white background with words as stated below shall be fastened externally on the front cover of the SPDs compartment.

AMARAN

1. Pemasangan ini dilindungi oleh *Surge Protective Device* (SPD).
2. SPD tidak lagi berfungsi apabila 'petunjuk' bertukar warna/ tidak menyala.
3. Slia buat pemeriksaan pada SPD secara bulanan.
4. Sila hubungi 'orang kompeten' untuk penggantian SPD.
5. Pastikan juga 'circuit breaker' ke SPD sentiasa berada dalam keadaan ON (I).

The size of connecting conductors shall be as recommended by the SPD manufacturer. The connecting conductors shall be as short as possible (preferably not exceeding 0.5m for the total length) and shall be tightly bound together throughout the whole length with cable-ties or other approved means. Either a or a fuse of rating as recommended by the SPD manufacturer shall be provided for disconnecting the SPDs from the system in the event of SPDs failure or for maintenance. In the case where an MCCB is used, the breaking capacity of the MCCB shall comply with the rated ultimate short circuit breaking capacity (Icu) for the switchboards and DB respectively. The Ics shall be 50% of the Icu.

Location Category	1.2/50µs (U_{oc}) Voltage Generator	8/20 µs (I_{sc}) Current Generator	Voltage Protection Level (Up)	Maximum Discharge Current, Imax (8/20 µs) per mode
Main Switchboard (MSB)	≥ 20 kV	≥ 10 kA	≥ 1800 V	≥ 65 kA
Sub-Switchboard (SSB) receiving energy from MSB located in the same building	≥ 10 kV	≥ 5 kA	≥ 1500 V	≥ 40 kA
SSB receiving energy from MSB located in other building	≥ 20 kV	≥ 10 kA	≥ 1800 V	≥ 65 kA
Distribution Board (DB) receiving energy from SSB located in the same building (*for cases where the SSB located in other building with MSB)*	≥ 6 kV	≥ 3 kA	≥ 1200 V	≥ 20 kA
Distribution Board (DB) receiving energy from SSB located in the same building (*for cases where the SSB located in other building with MSB)*	≥ 10 kV	≥ 5 kA	≥ 1500 V	≥ 40 kA
DB receiving energy from the licensee or MSB/SSB located in other building	≥ 20 kV	≥ 10kA	≥ 1500 V	≥ 40 kA
Socket Outlet or Terminal Equipment	≥ 2 kV	≥ 1 kA	≥ 500 V	≥ 10 kA

6.6 System of Wiring

The system of wiring shall be surface wiring, concealed wiring, surface conduit wiring or concealed conduit wiring as indicated in the Drawings and/or Schedule of Design Requirements. The wiring systems shall comply with MS IEC 60364-5-52.

All wiring shall be run neatly and in an orderly manner. They shall be routed parallel to building wall and column lines in a coordinated manner with other services. The wiring throughout shall be on the 'looping-in system' and no 'tee' or other types of joints are allowed. No reductions of the strands forming the conductors are allowed at all terminals. All strands shall be effectively secured by approved means.

Wiring which are not embedded in concrete or concealed behind plaster shall be run in an accessible manner on the beams, underside of slabs or below pipes, ducts, and down drops shall be run on the surface of columns or walls. Concealed wiring shall be installed in such a way that plaster can be applied over their thickness without being subjected to spalling or cracking. Cables serving different operating voltages and functions shall be segregated.

All cables shall be legibly marked on the external surface with at least the following elements; Manufacturer's identification, Voltage designation, Nominal area of conductor and Standard Numbers. Standard colour coded cable shall be used for three phase circuit to identify the phase conductors, neutral conductor and protective conductor respectively.

Opening on floor, wall or partition through which cable, trunking, conduit or other wiring passes through shall be sealed according to the appropriate degree of fire resistance after the installation.

Chipping and cutting of concrete are not allowed unless otherwise approved by the S.O.'s Representative. The Contractor is required to work in conjunction with the building contractor for the provision of openings, trenches, core-holes, chases etc. as the building concreting work progresses.

In steel frame structures, the wiring system shall be rigidly and securely supported and fastened in place onto the structural steel beams, purlins and columns by fasteners such as clamps, clips, anchors, straps, hangers, supports or similar fittings. The fasteners shall be designed and installed as not to damage either to steel structures or wiring system.

The fasteners shall be installed at intervals not exceeding 1000 mm, and within 300 mm of every outlet box, junction box, device box, cabinet or fitting. Fasteners shall be of spring steel and/or galvanized steel, and where wires, rods or threaded rods are used with fasteners, they shall be of rolled carbon steel. The fasteners shall be finished with zinc coatings to resist rusting. Samples for the fasteners used shall be submitted to S.O.'s Representative for approval before they are used.

Unless otherwise approved by S.O.'s Representative, no welding on and/or drilling holes into any members or components of the steel frame structures for the installation of fasteners are allowed.

6.6.1 *Types of Cable*

6.6.1.1 PVC Insulated PVC Sheathed Cable

PVC insulated PVC sheathed cables of300/500 V grade to MS 136 and 600/1000 V grade to MS 274. The conductors shall be of stranded plain annealed copper to MS 69 and MS 280.The insulation shall be suitable for continuous operation at a maximum cable temperature of 70oC and comply with MS 138.

6.6.1.2 PVC Insulated Cable

PVC insulated cable of 450/750 V grade to MS 136 and 600/1000 V grade to MS 274. The conductors shall be of stranded plain annealed copper to MS 69 and MS 280. The insulation shall be suitable for continuous operation at a maximum cable temperature of 70^0C and comply with MS 138.

6.6.1.3 XLPE/PVC Cable

Cable shall be manufactured and tested in accordance to BS 5467 or IEC 60502 and shall have high conductivity plain copper stranded conductors, insulated with cross-linked polyethylene (XLPE), suitable for a voltage of 600/1000V laid together and bedded with extruded PVC and sheathed with PVC.

6.6.1.4 Armoured Cable

(a) PVC/SWA/PVC Cable – Cable shall be manufactured and tested in accordance with MS 274 or BS 6346 and shall have high conductivity plain copper stranded conductors insulated with PVC suitable for a voltage of 600/1000V laid together and bedded with PVC, armoured with galvanized steel wires and sheathed with PVC.

(b) XLPE/SWA/PVC Cable – Cable shall be manufactured and tested in accordance to BS 5467 or IEC 60502 and shall have high conductivity plain copper stranded conductors, insulated with cross-linked polyethylene (XLPE), suitable for a voltage of 600/1000V laid together and bedded with extruded PVC, armoured with galvanized steel wires and sheathed with PVC.

(c) XLPE/AWA/PVC Cable – Cable shall be manufactured and tested in accordance to BS 5467 or IEC 60502 and shall have high conductivity plain copper stranded conductors, insulated with cross-linked polyethylene (XLPE), suitable for a voltage of 600/1000V laid together and bedded with extruded PVC, armoured with aluminium wires and sheathed with PVC.

6.6.1.5 Mineral-Insulated Cables

Mineral-insulated cables shall be manufactured complying with IEC 60702, IEC 60331 and BS 6387 Category C, W and Z for electrical circuit integrity in case of fire. The cables shall have been tested to comply with IEC 60332-1 and 60332-3 for flame retardance, and IEC 61034 for smoke obscuration. The cables shall be halogen free with low organic content and do not release any corrosive emission when subject to fire conforming to IEC 60754-2. The cables shall be able to withstand a short circuit temperature of 280°C for 5 seconds. For general lighting and power points final circuits, unless otherwise specified, cables of 600V insulation grade may be used.

For main circuits and major power points, the cables used shall be of 1000 volt insulation grade. They shall be installed strictly in accordance with the manufacturer's recommendation and instruction. The mineral-insulated cables shall be as specified:

(a) Mineral-insulated copper sheathed copper conductor (MICC) cables comprise of pressure packed magnesium oxide insulation contained within a solid drawn ductile seamless copper sheath with solid high conductivity copper conductors; or

(b) Mineral-insulated mineral sheathed copper conductor (MIMS) cables comprise of multi stranded high conductivity copper conductors wrapped with layers of glass mica composite tape flame barrier and be insulated with a non-melt cross linked mineral insulation and mineral sheathed.

Cables installed on walls shall be fixed by means of copper clips or copper saddles at appropriate spacing. The clips or saddles shall be secured by means of brass screws. Where cables are installed on cable trays, they shall be clipped at appropriate spacing by means of copper saddles. The saddles shall be secured by means of brass bolts and nuts. Where single core cables are used on multi-phase distribution work, the cables shall be laid on their phase groups whether flat or trefoil.

Where single core cables pass through ferrous or other magnetic materials, the area surrounding the cables shall be replaced with non-ferrous plate of appropriate dimensions. Adequate bonding shall be provided where cables break formation to enter terminating positions. Minimum bending radius shall be not less than six times the cable diameter and saddle spacing not more than 60 times the cable diameter or 500 mm whichever is less.

Connection to motors, generators, transformers and other similar equipment shall be by one of the two methods listed below: -

(a) The cable shall be clipped at the appropriate spacing up to a point adjacent to the equipment and an unsupported anti-vibration loop shall be left in the cable.

(b) The cable shall be glanded into a suitable terminal box adjacent to the equipment and connection to the equipment being effected by means of mechanically protected flexible cable of adequate cross sectional area.

For mineral-insulated copper sheathed copper conductor (MICC) cables, termination shall be of cold seal type. Silicon rubber sleeve insulation shall be used to replace copper sheath stripped off near the termination for temperature not exceeding 150oC. For temperature exceeding 150oC, varnished glass sleeve insulation shall be used. Insulation and continuity tests shall be carried out before and after the cable is terminated. The insulation test reading shall be 'infinity'. A blow lamp may be used for drying out cable ends.

If it is impracticable to cut to waste, in which event the cable should be brought to cherry red heat at about 600 mm from the end and moisture driven carefully towards the cut end. It is absolutely essential that great care shall be taken to maintain earth continuity when terminating the cables.

Dirt and metallic particles in the compound and any loose traces of dielectric left at face of the sheath after stripping shall be removed prior to sealing. Cold sealing compound shall be forced down one side of the pot only until slightly overfilling in order to avoid trapping of air at the base of the pot and to ensure that when the sealing disc is entered before crimping a completely solid insulation barrier is affected.

All other necessary accessories such as tap-off units, joint boxes, brass compress ring glands, screw-on brass pots, earth tail seals, coloured sleeving for phase identification, cone shape beads, fibre disc, brass locknuts etc. required for the proper installation work, unless otherwise approved by the S.O.'s Representative, shall be of the type manufactured by the cable manufacturer.

For mineral-insulated mineral sheathed copper conductor (MIMS) cables, termination shall be metal gland or close fitting metal bush of crimping type. All other necessary accessories such as tap-off units, joint boxes including termination kits etc. required for the proper installation work, unless otherwise approved by the S.O.'s Representative, shall be of the type manufactured by the cable manufacturer.

6.6.2 *Wiring in Conduit/Trunking (Surface or Concealed)*

The cables used in conduit wiring, unless otherwise specified shall be similar to that described above. Unless otherwise specified in the Drawings and/or Schedule of Design Requirements, the conduits shall be of galvanized steel and conduit fittings shall be of galvanized steel or alloy materials. Cables above false ceiling shall be run in conduit or trunking.

The conduit shall generally be run on the underside of the floor slabs by mild steel brackets or suspenders. The trunking shall be suspended from the floor slabs or mounted against the wall by mild steel brackets. The mild steel brackets shall be anti-rust treated, painted with a primer and finished in orange enamel. The suspension structure shall be robust in constructions and adequately installed such that the conduit/trunking will not sag.

Flexible conduit shall be used for termination to equipment, which is subjected to movement or vibration. However, the length of this flexible conduit shall not exceed 400mm unless approved by the S.O.'s representative.

6.6.3 *Metallic Conduits*

Steel conduits shall be of galvanized, heavy gauge, screwed type complying with MS 275-1, MS 1534:PT.1, MS 1534:PT.2:Sec1, IEC 60423, IEC 61386-1 and IEC 61386-21. All steel conduit fittings shall comply with MS 275-2, MS 1534:PT.1, MS 1534:PT.2:Sec1, IEC 61035-1, IEC61035-2-1, IEC 61386-1 and IEC 61386-21. The steel conduits shall be fitted with brass bushes at the free ends and expansion devices at appropriate intervals.

The ends of each length of steel conduit shall be properly reamed. The termination to the distribution boards, consumer units, switchgears and outlet boxes shall be effected by brass type smooth-bore bushes. All steel conduits shall be effectively earthed.

For laying underground steel conduit shall be used and buried at a minimum depth of 450 mm below ground level or 100 mm below floor slab or hard standing. Junction boxes, outlet boxes etc. shall be of galvanized sheet steel or alloy material or malleable cast iron. The covers shall be galvanized sheet steel or alloy material with thickness not less than 1.2 mm. Accessories such as junction boxes down dropping to luminaries shall have die-cast cone-shaped metal cover.

6.6.4 Cable Trunking

Cable trunkings shall comply with IEC 61084. They shall be fabricated from galvanized sheet steel and finished with two coats of standard enamel paint. They shall be equipped with removable covers at suitable intervals. They shall be supplied in lengths to suit the installation and shall have the following minimum wall thickness: -

NOMINAL SIZE (mm x mm)	MINIMUM WALL THICKNESS (mm)
50 x 50 and below	1.0
75 x 50 to 100 x 100	1.2
150 x 50 to 300 x 150	1.6
Above 300 x 150	2.0

All trunking elbows, offset and combination elbows, adaptors and tees shall be of same thickness as the straight trunking and shall be the type manufactured and supplied by the same trunking manufacturer.

The trunking shall be supported by fixing brackets so that the trunking will not be in contact with the walls or floor slabs. The brackets shall be installed at intervals not greater than 1500 mm for vertical runs and not greater than 1000 mm for horizontal runs. The brackets shall be derusted, finished in a primer and coated with standard enamel paint.

Wherever the trunking passes through a floor or a fire resistant wall, fire-resisting barrier shall be provided. At these positions the cables shall be sealed with non-hygroscopic fire resisting material of minimum 2-hour fire rating. In addition, the floor openings and wall openings shall be sealed with similar type of compound.

Cables running in the trunking shall carry conductor identification colours and shall be supported by split hard wood racks securely fixed at the base of the trunking and spaced not more than 600 mm apart.

Cables for each final circuit shall be properly bunched together and labelled. Where conduit is tapped off from the trunking, suitable brass type smoothbore bushes shall be fitted at all conduit termination. Unless otherwise specified, all trunkings shall have either tinned copper tape of dimension not less than 25 mm x 3 mm as circuit protective conductor or earth cable of appropriate size. In the latter case, all trunking joints shall be bridged by means of tinned copper tape of dimension not less than 25 mm x 3 mm.

6.6.5 Cable Trays

Cable trays system shall comply with MS IEC 61537 and shall be fabricated from perforated galvanized sheet steel complete with all necessary bends, tee pieces, adaptors and other accessories. The minimum thickness of the sheet steel shall be 1.5 mm for cable trays with widths up to and including 300 mm and 2.0 mm for cable trays with width exceeding 300 mm. However minimum thickness for the sheet steel of the perforated hot dipped galvanized cable trays shall be 2.0 mm. Cable trays may either be suspended from floor slabs by hangers or mounted on walls or vertical structure by brackets at 600 mm intervals.

However where the above methods of installation are not feasible or practical, suitable floor mounted mild steel structures shall be provided. All supports, hangers and structures shall be robust in construction and adequately installed to cater for the weights of the cables and trays supported on them so that cable trays and cables will not sag. All supports, hangers, bracket and structures shall be anti-rusted, finished in primer and coated with standard enamel paint.

All supports, hangers, bracket and structure for the perforated hot dipped galvanized cable trays shall also be of hot dipped galvanized type. Fixing clips and cleats for cables on trays shall be installed by means of bolts, washers and nuts.

All tees, intersection units, adaptor units etc. shall be the type manufactured by the cable tray manufacturer unless otherwise approved by the S.O.'s Representative. Wherever cable tray pass through a floor or a fire resistant wall, fire-resisting barrier as mentioned above shall be provided.

6.6.6 Cable Ladder

Cable ladder system shall comply with MS IEC 61537 and fabricated from mild steel and finished in hot-dipped galvanized or epoxy powder coat complete with all necessary horizontal elbow, horizontal tee, horizontal cross, reducer straight, outside riser, inside riser, reducer left, reducer right, cable clamp, cantilever arm, hold down clip/clamp, hanger bar, vertical splice plate and horizontal splice plate for welded type and screwed type. The minimum thickness of the sheet steel shall be 2.0 mm.

Cable ladder may either be suspended from floor slabs by hangers or mounted on walls or vertical structure by cantilever arm. Cable ladder shall be supported rigidly and adequately by external spring hangers mounted on channel base.

The cable ladder shall be supported at maximum intervals of 3000mm for in contact with the wall or floor slab surfaces. The spring hangers shall be supplied by the cable ladder manufacturer.

All supports, hangers, and structures shall be robust in construction and adequately installed to cater for the weights of the cables and ladder supported on them so that cable ladder and cables will not sag.

Rungs shall be spaced at 300mm nominal centres, welded to the rail sections by approved welding procedures. All rungs shall be perforated in accordance to the manufacturer's design.

The cable ladders shall be supplied fully assembled with preparations for connections to straight sections or accessories using splice plates mechanically bolted together. Allowance shall be provided for longitudinal adjustments and expansion. The cable ladders when completed shall be smooth, free from all sharp edges and shall be capable of discharging any water that may be retained due to normal weathering.

All accessories shah be the type manufactured by the cable ladder manufacturer unless otherwise approved by the S.O.'s representative. Wherever cable ladder pass through a floor or a fire resistant wall, fire-resisting barrier as mentioned above shall be provided.

6.6.7 Mounting Heights

Mounting heights listed below shall be measured from the underside of the fitting to the finished floor level. Unless otherwise specified or directed on site by the S.O.'s Representative, heights of fixing shall be as follows: -

Type of Fitting	Mounting Height (mm)
Suspended ceiling luminaries and ceiling fans	2400
Wall mounted luminaries and wall bracket fans	2050
Switches, and fan and regulators	1450
Socket outlets (for surface wiring), and those in the kitchen and washing areas (for concealed wiring)	1450
Socket outlets (for concealed wiring)	300
Isolator points	1450
Window unit air conditioner switches and starters	1450
Cooker points	1450
Water heater outlet points.	1450
Distribution boards (in service duct)	1450
Distribution boards (other than in service duct)	2050

6.7 Earthing

All motors and equipment earthing shall comply with Electricity Regulations 1994 and relevant parts of MS IEC 60364.

All protective conductors, copper tapes and earth electrode shall comply with BS EN 13601.

6.8 Labelling

Labels shall be fitted on the outside of all switchboards by means of non-corrodable screws or rivet or any other method approved by the S.O.'s Representative. The labels shall be of laminated plastic with engraved lettering with details such as type of equipment, rating, setting, to/from where it is connected etc.

The exact wording of the labels shall be agreed with the S.O.'s Representative. Single line mimic schematic circuit diagram shall be provided at the facial of the switchboards showing the relevant connection. The single line diagram shall be encased in perspex sheet and riveted on the outside front cover of the switchboard.

6.9 Starters

The starters for each motor shall comply with regulation of ST or Local Authority. Unless otherwise specified or indicated, the Contractor shall provide the following type of starters: -

Fractional hp motors shall squirrel cage type with split phase starting:-

kW	PHASE	CONSTRUCTION	STARTER
Below 0.75	1	-	Capacitor start induction run
0.75 to 2.2	3	Squirrel Cage	Direct on Line
3 to 7.5	3	Squirrel Cage	Star Delta/Auto Transformer
Above 7.5	3	Wound Rotor	Primary & Secondary Resistance/Soft starter

All soft starters shall be of reliable brand instead of conventional star-delta or auto-transformer starter and designed only for building services application and the power factor shall remain unity at any condition. Soft starter designed for general purpose shall not be used.

6.10 Electric Motors

All electric motors shall be totally enclosed fan-cooled and fully tropicalised, and shall be furnished with Class 'F' insulation to BS EN 60085:2008 and shall be specifically designed for 50 Hz, 400V (+10%, -6%), 3 phase power supply and to comply with the Electricity Supply Act 1990 (Act 447) and Electricity Regulations 1994 regulations. Motors shall be continuously rated and shall have torque characteristics as required by their respective duties.

6.11 Power Factor Requirement

The monthly average power factor of all the equipment supplied shall be not less than 0.85.

The above condition is to be achieved by power factor improvement equipment or devices. However, if the power factor correction is done other than at the load, than the cabling, electrical switching protection devices between the load and the point of correction shall be rated according to the worst power factor condition that they may be subjected to.

Power factor improvement used shall conform to IEC 70/70 standards and shall be suitable for continuous operation at a nominal voltage of 400V (+10%, -6%)/50 Hz/3 phase.

Capacitors used shall be dry type with self-healing properties and discharge devices. Loss shall not exceed 0.5W/kVar.

When automatic power factor correction bank is used, the regulator with the required number of steps should also incorporate no-volt protection relay, anti-hunting relay and a manual and automatic control switch. The regulator should be set to respond to kVar need of the system with no hunting. The regulator shall have LED display to show the number of steps switched on at any one time and settings for the sensitivity value and the desired power factor.

Current transformer to suitable ratio shall be rated at 15VA and minimum accuracy of Class 1. The Contractor shall be liable to pay any surcharge, or part thereof, levied by the TNB as a consequence of low power factor of the installed equipment.

7 CLEANING, PAINTING AND IDENTIFICATION

The painting works shall include all equipment, piping, fittings, valves, hangers, conduits, framework, switchboard, etc. and all other works exposed to view.

All paints used shall be of approved brand of best quality, low Volatile Organic Compound (VOC) content and ready mixed paint brought to site in unopened containers. No painting shall be done in unsuitable weather. Each coat of painting shall only be applied when the previous coat is completely dry.

The Contractor shall provide all tarpaulins, sheets and covering to protect the floors, walls and other works belonging to other trades. All equipment and piping shall be thoroughly cleaned and degreased upon completion on his work before any painting is carried out.

All metal works shall be cleaned and scale shall be free from grease. The surface shall then be prepared with an approved rust inhibitive primer and two (2) high gloss-finishing coats to approved colors and to the approval of the S.O.

All pipelines shall be painted to approved colors in general to match the surroundings. In addition, 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 50 mm (2") diameter, 150 mm (6") long for pipes over 50 mm (2") diameter. All items to be painted shall be first cleaned and prime coated. Over this the final colour shall be applied in two coats. The paint shall be gloss-finish type.

The Schedule of Colours shall be as follows unless otherwise decided by the Superintending Officer.

ITEM	COLOUR
Water Tank	Red
Pipes	Red
Landing Valves	Red
Inlet Connections	Red
All Valves	Red
Items exposed to weather	Two coats of aluminium paint
Directional arrows	White

All Fire Fighting System equipment should be as per UBBL clause 248 or as other colours approved by Jabatan Bomba dan Penyelamat Malaysia.

8 VALVE TAGS

All valves shall be provided with Brass tags, 25 mm (1") min. dia. with stamped identification numbers, secured by chains to each valve handles. Upon completion of the work, a drawing showing the location and purpose of each valve shall be prepared and two (2) copies supplied where one (1) copy shall be placed in the suitable glass frame, and the other copy to the Owner. The drawing shall be complete with all valve numbers and shall enable each piping system to be traced by means of the valve tags. (wet riser, sprinkler, dry riser)

9 NAME PLATES

Supply and install on each of the following, identification nameplates engraved lettering. The plate size and lettering shall be subject to the approval of the S.O. but no limited: -

9.1 Fire fighting switchboard and sub switchboard.

All control components nameplates shall bear the system number and the identification of the control function.

9.2 All duty and standby pump.

9.3 Pressure indication 'Cut In' and 'Cut Off' of pressure switch.

10 SAMPLE OF MATERIAL FOR SUBMISSION AND APPROVAL

The Contractor shall prepare sample board of typical material proposed to use in the work and/or samples of workmanship (mock up) to the approval of the S.O, prior to commencement of the installation work. The sample board and/or samples of workmanship (mock up) shall comprise of pipes, pipe fittings, pipe hanger and support, shut-off nozzle, automatic air release valve and cables.

The cost of the sample board or samples of workmanship (mock up) is deemed to be included in the Contract.

---------- **END OF SECTION 3.1** ----------

Table of Contents

List of Tables

1.0 TESTING, ADJUSTING, BALANCING AND COMMISSIONING REQUIREMENTS

1.1 GENERAL

This section specifies the requirements for all testing, adjusting, balancing and commissioning (TABC) of the mechanical works to be carried out under the contract. The objectives of TABC are;

i. To verify the delivered materials are as per approved specification and good physical condition.

ii. To verify the installation works are carried out in accordance to specification and good engineering practises.

iii. To verify the performance in terms of functionality, safety, maintainability and operational ability of the installed equipment/systems meet the specified design intention through a series of tests and adjustments.

iv. To ensure all test result are systematically recorded and verified prior to system commissioning.

TABC works are divided into four stages as the following;

i. Final Acceptance Test

ii. Delivery stage.

iii. Installation stage.

iv. Functional Performance Test stage.

Contractor shall submit Inspection and Testing Plan (ITP) of TABC works to be carried out in accordance to with this specification to Superintending Officer (S.O) for review and approval.

1.2 INSPECTION AND TESTING PLAN (ITP)

ITP shall consist of;

i. List of All TABC Requirement

All TABC works with specific scope and boundaries shall be clearly stated at every stage of TABC works and comply with the regulation of Jabatan Bomba dan Penyelamat Malaysia and document contract. Sample of Inspection and Testing Plan as per Table1.

ii. TABC Work Schedules

TABC work schedules shall be integrated into main project schedules.

iii. Method Statements

TABC method statements shall consists of TABC procedures, responsibilities, necessary tools, measuring equipment and accuracy, consumables and acceptance criteria. Type of test required is listed in Schedule of Inspection and Testing.

Method statements and acceptance criteria for all equipment installation stage inspection and functional performance testing shall be endorsed by manufacturer or manufacturer's valid representative.

Acceptance criteria shall be stated as per Schedule of Design Requirements, technical specification or any applicable standards.

ITP shall be updated for any changes and resubmitted to the S.O/S.O's representative for approval.

Prior to the commencement of the TABC works as per approved ITP, contractor shall issue Request for Inspection and Testing (RFIT) to the S.O. During the TABC, contractor shall have his supervising foreman and mechanics available to aid the testing and to perform any adjustments as directed. The TABC works shall be carried out under the direction of experienced personnel and witnessed by S.O or S.O's representatives. No subsequent installation works shall proceed without S.O's approval of the test result.

Depending on the specific demands of individual installation, S.O's Representative may require additional or substitute testing works in regard to any elements in the installation other than those indicated in this specification.

Table 1: Sample of Inspection and Testing Plan

Stage	Inspection and Test Name	Scope and Boundaries	Responsibility	Method Statement	Test Form No	Expected Date
Final Acceptance Test	Pump Performance Test	Hose Reel Pump	Manufacturer	HR-ITP-001	HR-01	17 Jan
	Switchboard Test	Switchboard	Manufacturer	HR-ITP-002	HR-02	19 Jan
Delivery Stage	Visual Inspection	Hose Reel duty & standby/diesel engine pumps	Contractor	HR-ITP-003	HR-03	10 Feb
	Measurement (size, capacity)		Contractor	HR-ITP-004	HR-04	17 Feb
	Documentation-(DO, QA etc.)		Contractor	HR-ITP-005	HR-05	20 Feb
Installation Stage	Flushing Test	Hose Reel Pipe	Contractor	HR-ITP-006	HR-06	17 Mac
	Leak Test	Pipe and fittings	Contractor	HR-ITP-007	HR-07	18 Mac
	Support and hanger load test	Equipment & pipe work	Contractor	HR-ITP-008	HR-08	20 Mac
	Cable continuity and Insulation Test	Power cable from incoming and outgoing	Contractor	HR-ITP-009	HR-09	27 Mac
	Water Tank Inspection	Leveling leaking, ladder, electrode sensor	Contractor	HR-ITP-010	HR-010	29 Mac
	Orientation of Equipment	Hose Reel duty, standby/diesel engine pump	Contractor	HR-ITP-011	HR-011	10 Apr
Functional Performance Stage	Pump start-up Test	Pumps, Switchboard, all switches and sensors, valves & fittings	Contractor	HR-ITP-012	HR-012	17 May
	Hose Reel pump Functional Performance Test			HR-ITP-013	HR-013	20 May

1.2.1 Final Acceptance Test

Final Acceptance Test shall be conducted as per Schedule of Inspection & Testing Requirements and Schedule of Price of this tender document. The equipment shall be witness-tested at Original Equipment Manufacturer (OEM) premises before being delivered to site by not more than three (3) government's representative nominated by the Pengarah Kanan Cawangan Kejuruteraan Mekanikal, Ibu Pejabat JKR Malaysia, Kuala Lumpur.

The Contractor shall include in the tender all costs that will be incurred for the Final Acceptance Test at Original Equipment Manufacturer (OEM) premises including food, travelling (air fare, inland transport, airport taxes, etc) and hotel accommodation not lower than the current Malaysian Government rates for a period of not more than seven (7) working days not inclusive travelling days.

A factory test shall be defining as any test of equipment required as stated in the contract, conducted at manufacturer's plant or at an independent and accredited test facility approved by the S.O.

Performance test method statement, test standard and acceptance criteria shall be submitted to S.O for approval prior to such testing. The manufacturer shall conduct the test, passes judgement of acceptance and produces a signed test report. All test report shall be submitted to S.O for approval. Manufacturer shall be responsible for any reworks and adjustment of the equipment if the test results fail to comply with the approved acceptance criteria.

1.2.1.1 Pump Performance Test and Inspection

Performance rating tests for the hose Reel pumps shall be performed by the manufacturer to verify equipment performance against design specifications and compliance with the specification.

Performance rating test of duty and standby pumps shall comply of Malaysia standard heavy duty end suction pump MS2616:2015 Fixed Fire Fighting System -Fire pumps, as per schedule of design requirement.

1.2.1.2 Switchboard Test and Inspection

Routine tests on the switchboard (category 1: I ≤ 600A by Suruhanjaya Tenaga) shall be carried out before delivery to site. Routine tests shall include inspection and checking of wiring, electrical continuity of the protective circuits, connections and effectiveness of mechanical actuating elements and interlock. Test Results or Certificate duly certified by Competent Person as in Electricity Regulations 1994 shall be issued for every switchboard supplied and installed.

1.2.2 Delivery Stage

All incoming material and equipment to site shall be verify by visual inspection, documentation and measurement that delivered items are comply with technical specification, as per approved materials and good physical conditions. Materials delivered to site shall be free from defects and adequately protected against site conditions.

List of verify and inspection during delivery stage as per Table 2:-

Table 2: Verify and Inspection

Inspection / Test Name	Description
Visual Inspection	• Good physical conditions • Free from defects • Adequately protected
Documentation	• Delivery Order • Quality Assurance • Technical Data
Measurement	• Size and dimension • Orientation of equipment and plant layout

1.2.3 Installation Stage

1.2.3.1 Visual Inspection

List of visual inspection and testing during installation as per Table 3: -

Table 3: Visual Inspection of Hose Reel System

Inspection / Test Name	System/Component	Objectives
Visual inspection	Pumps House/Room	Verify that all Hose Reel pumps house/room components are installed as per approved shop drawings approved material list installation method statement and free from installation effects.
	Water tank	Verify inlet pipe, capacity and tank compartment.
	Pump Set	Verify the alignment of shaft, mounting, Inertia block & spring isolator.
	Piping	Verify types of pipe, protection and colour coding.
	Incoming pipe	Verify inhibitors
	Flow meter	Verify for pump dry running protection
	Flow switch	Verify the numbers and functionality
	Hose Reel compartment / Riser	Physical condition and working space of drum and hose.
	Hanger and supports	Verify hanger and supports as per drawing and technical specification.
	Pipe sleeves	Verify all the pipe sleeves with the right size.
	Fire seal	Verify seal thru any floor, wall or partitions using non-combustible or fire resistant sealant material

1.2.3.2 Testing

List of inspection and testing works during installation as per Table 4:-

Table 4: Test List in Installation Stage

Inspection / Test Name	System/Component	Objectives
Hydrostatic Pressure Test	Pumps and piping	Verify integrity of all pipe joints and fittings.
Pipe Flushing and Leak Test	Pumps and piping	Verify integrity of all pipe joints and fittings, pipe internally clean and water quality are acceptable
Cable Continuity Test	Electrical cabling	Verify cable continuity effectiveness
Pump Start Test Pipe	Test pipe in pump house/rooms	Verify the functionality and pump cut in/cut off.

a. Hydrostatic Pressure Test

All pipes, valves, fittings, etc. shall be tested to operation of not less than 2 bars for any four hose Reels operating at the same time or 1.5 times the working pressure whichever is higher for period of 48 hours. All tests shall be done in accordance to ASME B31.9.

During the pressure test, all welding joints, bends, fitting and valves shall be visual checked for any leaks or deformations for the entire piping system.

Pressure drop allowable not more than 5% from the tested value for the period of testing

b. Pipe Flushing And Leak Test

All pipes shall be flushed before pressure test. Flushing will be done by a fresh potable water or dry compressed air wherever water flushing is not desirable to clean the pipe of all dirt, debris or loose foreign materials. No leakage of any kind will be permissible during testing. Flushing will be continued till the inside of the pipe is fully cleaned to the satisfaction of the S.O. Test reports shall be submitted to S.O after completion of flushing procedures. As a minimum, the test records shall contain detail of testing and the results.

c. Cable Continuity Test

Cable continuity test shall be performed on each power cable by ohmmeter method. Perform an acceptance test on cables, including terminations and joints, after cable system installation and before the cable system is placed into service. In accordance with ANSI/IEEE 400, by means of direct voltage (dc) and recorded in the relevant testing form.

d. Pump Start Test Pipe

Test pipe in pump house/rooms shall be used to verify the functionality and pump setting.

1.2.4 Functional Performance Test

All Functional Performance Test shall commence after all inspection and testing during installation stage has been completed. List of functional performance test are as the following:

Table 5: Hose Reel Inspection and Test List

Inspection / Test Name	Objectives
Pump Operating Test	Verify the pump functionality and performance as per published performance data included pump cut in/cut off using flow switch setting pressure, flow rate, RPM, current and voltage.
Vibration and Noise Level Test	Verify the noise level is within permissible range
Testing of electrical wiring	Verify the continuity of power supply
Essential power supply for electric pump Inspection	Verify the continuity of power supply in the event of power failure.
Battery for diesel pump Inspection	Verify battery capacity as per design
Fuel storage for diesel pump Inspection	Verify the storage capacity as per design
Automatic Operation of Pumps (Duty and standby electric/diesel)	Verify the operation of the system as per design
The furthest and highest Hose Reel unit head performance test	Verify the operating pressure of pump as per design
Automatic Air Release Valve (AARV) Test	Verify no air pocket in the pipe line

Detail method statement for testing shall be submitted conforming to the test requirements in this specification. All components shall be installed as per approved working/shop drawings, approved material list and free from defects.

1.2.4.1 Switchboard And Power Supply

List of Switchboard and power supply inspection and test name are listed in Table 6. Detail method statement for testing shall be submitted conforming to the test requirements in this specification. Only competent person as in Electricity regulations 1994 shall conduct the Switchboard testing.

Table 6: Switchboard and Power Supply Inspection and Test Requirements

Inspection / Test Name	Description
Switchboard General Inspection	• Verify physical switchboard components are as per specification. • Check for tripping setting and system trip • Check for wiring, motor insulation and record data. • Check for cable terminal tightness. • Check for equipment and panel grounding connection. • Check for any sign for cable heating. Cable temperature shall be measured and verify against IEEE standards for temperature rise during full load. • Check for voltmeter and ammeter function and accuracy record running voltage and ampere. • Check for control circuit function as intended. • Check for contractors, relays, ACB, MCCB, MCB, type, size and ratings as per specification.
Power Supply Test	• Verify that power supply parameters are within permissible range, safety protections are in place and physical condition of switch board and cabling works are acceptable as per specification and approved shop drawings. • Verify rotation of equipment/phase sequencing according to manufacturer recommendation • Verify phase protection relay installation and function. • Switching from normal electrical to essential supply
Overcurrent and Earth Fault Protection	• Circuit breaker and Earth Fault Protection calibration and discrimination shall be conducted and coordinated between electrical contactors. • Circuit breaker and Earth Fault Protection shall be tested against simulated leakage current. • Inverse definite minimum time (IDMT) tripping delay shall be selected/programmed suitable for equipment starting overloading preventing nuisance tripping during starting.

1.3 COMMISSIONING

Commissioning includes achieving, verifying, and documenting that the performance of facilities, systems, and assemblies meets defined objectives and criteria.

All completed test forms and test summary shall be submitted to S.O/S.O's representative for final review and approval. Having satisfied that all appropriate tests have been conducted and the performance of the installation meet the design objectives; S.O's representative will issue or recommends to the S.O for the issuance of Certificate of Practical Completion (CPC).

1.3.1 Handing Over Documents

After the issuance of Certificate of Practical Completion, contractor shall submit all related project handing over documents as the following;

a) Test Report complete with fully verified Inspection checklist and Test Forms.
b) Defects List
c) Operation and Maintenance Manual which includes
   - *Manual/Standard Operating Procedures*
   - *Preventive Maintenance Schedule and Manual*
   - *Equipment/Product Engineering Data.*
   - *Operation set point (cut in/ cut off pressure, flow rate etc)*
   - *Switchboard overload setting and set points*
   - *Contractor and manufacturer contact details*
   - *Circuit Diagrams*
   - *Inventory List*
d) As-Built drawings
e) Schedule of System Familiarization Program to end users.

1.3.2 System Familiarization Program

In-class and practical System Familiarization Program shall be conducted to the personnel nominated by S.O within one (1) month of issuance of Certificate of Practical Completion. Program shall focus on:

- Overview of design concept and objectives
- Operation instruction & competency requirement
- Maintenance procedures
- Critical operating parameters monitoring
- Emergency response & safety procedures and
- Jabatan Bomba dan Penyelamat Malaysia requirement and procedures.

Contractor shall submit program modules and materials to S.O for approval prior to commencement of training. Particulars of trainee shall be recorded and send to S.O for records.

2.0 TESTING INSTRUMENTS AND ACCESSORIES

All permanent sensors and gauges use for measurement of temperature, pressure and flow shall be factory calibrated and all calibration certificates shall be submitted to S.O prior to testing works.

The contractor shall provide all necessary testing, calibrating instruments and labour required for the testing, adjusting, balancing and commissioning of the complete fire fighting system installed under the contract.

The contractor shall also allow for any necessary replacement of parts in order to achieve the conditions specified in the drawings and specification.

Testing instruments specification shall be but not limited to as per *Table 77*.

Table 7: Testing Instruments

Measurement	Type	Accuracy
Ampere	Clamp meter (instantaneous)	2.0% ± 5 digits (45-65Hz)
Voltage	Clamp meter (instantaneous),	1.5% ± 5 digits
Combined power, ampere, voltage, power factor and Energy	Power/Energy logger (continuous)	Active Power: ±(1.2% of reading + 0.005% of range) (For PF≥0.99); ±(1.2% of reading + 7 x (1-PF) + 0.005% of range) (from 0.6 PF to 0.98PF)
Noise (Average)	Sound Level Meter Class 2	*Class 1 as per IEC 61672-1:2002*
Vibration	Vibration Analyses	*± 5% of reading (from 0.01 g to 50 g); where "g" in meter per second square.*
RPM Motor tester	Tachometer	0.05% ± 1 digits

Table of Contents

List of Tables

1.0 TESTING, ADJUSTING, BALANCING AND COMMISSIONING REQUIREMENTS

1.1 GENERAL

This section specifies the requirements for all testing, adjusting, balancing and commissioning (TABC) the mechanical works to be carried out under the contract. The objectives of TABC are;

i. To verify the delivered materials are as per approved specification and good physical condition.

ii. To verify the installation works are carried out in accordance with specification and good engineering practises.

iii. To verify the performance in terms of functionality, safety, maintainability and operation ability of the installed equipment/systems meet the specified design intent through a series of tests and adjustments.

iv. To ensure all test result is systematically recorded and verified prior to system commissioning.

TABC works are divided into three stages as the following;

i. Delivery stage.

ii. Installation stage.

iii. Functional Performance Test stage.

Contractor shall submit Inspection and Testing Plan (ITP) of TABC works to be carried out in accordance with this specification to Superintending Officer (S.O) for review and approval.

1.2 INSPECTION AND TESTING PLAN (ITP)

ITP shall consist of;

i. List of All TABC Requirement

All TABC works with specific scope and boundaries shall be clearly stated at every stage of TABC works and comply with the regulation of Jabatan Bomba dan Penyelamat Malaysia and document contract. Sample of Inspection and Testing Plan as per Table1.

ii. TABC Work Schedules

TABC work schedules shall be integrated into main project schedules.

iii. Method Statements

TABC method statements shall consists of TABC procedures, responsibility, necessary tools, measuring equipment and accuracy, consumables and acceptance criteria. Type of test required is listed in Schedule of Inspection and Testing.

Method statements and acceptance criteria for all equipment installation stage inspection and functional performance testing shall be endorsed by manufacturer or manufacturer's valid representative.

Acceptance criteria shall be stated as per Schedule of Design Requirements, technical specification or any applicable standards.

ITP shall be updated for any changes and resubmitted to S.O/S.O's representative for approval.

Prior to the commencement of the TABC works as per approved ITP, contractor shall issue Request for Inspection and Testing (RFIT) to the S.O. During the TABC, contractor shall have his supervising foreman and mechanics available to aid in testing and to perform any adjustments as directed. The TABC works shall be carried out under the direction of experienced personnel and witnessed by S.O or S.O's representatives. No subsequent installation works shall proceed without S.O approval of the test result.

Depending on the specific demands of individual installation, S.O's representative may require additional or substitute testing works in regard to any elements in the installation other than those indicated in this specification.

Table 1 : Sample of Inspection and Testing Plan

Stage	Inspection / Test Name	Scope and Boundaries	Responsibility	Method Statement	Test Form No	Expected Date
Delivery Stage	Equipment Verification and Physical Inspection	Equipment	Contractor	CFA-ITP-01	CFA-01	01 Jan
Installation Stage	Cable Continuity and Insulation Test	All LV cable	Contractor	CFA-ITP-02	CFA-02	05 Jan
Functional Performance Stage	Fire Alarm Panel Physical Test	Fire Alarm Panel	Contractor	CFA-ITP-03	CFA-03	07 Feb
	Batteries Test	Batteries	Contractor	CFA-ITP-04	CFA-04	15 Mac
	Devices and Signaling Test	Devices and Cable	Contractor	CFA-ITP-05	CFA-05	18 Apr
	Sound Level /Flashing Light Test	Alarm/Sounder/ Flashing Light	Contractor	CFA-ITP-06	CFA-06	22 Apr

1.2.1 Delivery Stage

All incoming material and equipment to site shall be verify by visual inspection, documentation and measurement that delivered items are comply with technical specification, as per approved materials and good physical conditions. Materials delivered to site shall be free from defects and adequately protected against site conditions.

1.2.2 Installation Stage

List of inspection and testing works during installation as per Table 2;

Table 2 : Test List in Installation Stage

Inspection / Test Name	System / Component	Objectives
Cabling Insulation Test	Cabling	Verify insulation effectiveness
Cable Continuity Test	Electrical Cabling	Verify cable continuity effectiveness

1.2.2.1 Cabling Insulation Test

Insulation resistance test shall be performed via a megohmmeter with an acceptable voltage output that recommended by cable manufacturer. Each conductor shall be individually test with all other conductors and shields grounded. Test duration shall be one minute and the resistance value shall be recorded until a steady reading is obtained.

1.2.2.2 Cable Continuity Test

Cable continuity test shall be performed on each power cable by ohmmeter method. Perform an acceptance test on cables, including terminations and joints, after cable system installation and before the cable system is placed into service. In accordance with ANSI/IEEE 400, by means of direct voltage (dc) and recorded in the relevant testing form.

1.2.3 Functional Performance Test

List of functional performance test are as the following. All Functional Performance Test shall commence after all inspection and testing during installation stage has been completed.

1.2.3.1 Fire Alarm Panel Operational Test

Before the testing, mains power shall be supplied and backup battery shall be properly connected to the fire alarm panel. When the fire alarm panel switched on, all relevant indicators shall be illuminated such as "Supply on", etc. and fault indicator shall not be illuminated such as "Power failure", etc. The printer shall be tested to print any status/fault occurred or recorded by the fire alarm panel.

The panel shall be able to integrated and sending signal to Control Monitoring System (CMS) and link to Jabatan Bomba dan Penyelamat Malaysia, sub Fire Alarm Panel and all relay (e.g. AHU, Lift and Pump).

1.2.3.2 Batteries Test

The batteries shall be tested as follows:

i. Charger test: With the batteries fully charged and connected to the charger, the voltage across the batteries shall be measured with a voltmeter. The voltage reading shall be as per specified in the specification.

ii. Load voltage test: With battery charger disconnected, the terminal voltage shall be measured while supplying the maximum load required by its application. The voltage level shall not fall below the levels specified in the specification.

Turn Off mains power supply to the fire alarm panel and ensure that the batteries supply shall be able to sustain the load as per specification.

Turn On the mains power supply and ensure that the duration to recharge the batteries to full charge shall be in accordance to the specification.

1.2.3.3 Devices and Signalling Operational Test

Detectors and main fire alarm panel shall be tested at different zone and the result shall be as follow:

i. Signal shall be relayed back to the corresponding zone through each respective indication on the fire alarm panel and mimic diagram.

For all tests conducted which involve an alarm signal or fault signal:

i. Master alarm sounder/bell shall be activated for the initialization of alarm signal; or

ii. Buzzer in the fire alarm panel shall be activated for the fault signal.

Manual call point shall be tested using testing key and alarm/sounder/flashing light shall be response within 3 seconds.

1.2.3.4 Alarm/Sounder/Flashing Light Test

Alarm/sounder/flashing light shall be tested for the function. The result of the test shall be in accordance to the specification.

1.3 COMMISSIONING

Commissioning includes achieving, verifying, and documenting that the performance of facilities, systems, and assemblies meets defined objectives and criteria.

All completed test forms and test summary shall be submitted to S.O's representative for final review and approval. Having satisfied that all appropriate tests have been conducted and the performance of the installation meet the design objectives; S.O's representative will issue or recommends to the S.O for the issuance of Certificate of Practical Completion (CPC).

1.3.1 Handing Over Documents

After the issuance of Certificate of Practical Completion, contractor shall submit all related project handing over documents as the following;

a) Test Report complete with fully verified Inspection checklist and Test Forms.
b) Defects List
c) Operation and Maintenance Manual which includes
    - *Manual/Standard Operating Procedures*
    - *Preventive Maintenance Schedule and Manual*
    - *Equipment/Product Engineering Data.*
    - *Contractor and manufacturer contact details*
    - *Circuit Diagrams*
    - *Inventory List*
d) As-Built drawings
e) Schedule of System Familiarization Program to end users

1.3.2 System Familiarization Program

In-class and practical System Familiarization Program shall be conducted to the personnel nominated by S.O within one (1) month of issuance of Certificate of Practical Completion. Program shall focus on:

- Overview of design concept and objectives
- Operation instruction & competency requirement
- Maintenance procedures
- Critical operating parameters monitoring and
- Emergency response & safety procedures.

Contractor shall submit program modules and materials to S.O for approval prior to commencement of training. Particulars of trainee shall be recorded and send to S.O for records.

2.0 TESTING INSTRUMENTS AND ACCESSORIES

The contractor shall provide all necessary testing, calibrating instruments and labour required for the testing, adjusting, balancing and commissioning of the conventional fire alarm system installed under the contract.

The contractor shall also allow for any necessary replacement of parts in order to achieve the conditions specified in the drawings and specification. Provisional sum for that purpose is provided in Schedule of Price.

Testing instruments specification shall be but not limited to as per Table 3.

Table 3 : Testing Instruments

Measurement	Type	Accuracy
Noise Level	Sound Level Meter Class 1	*Class 1 as per IEC 61672-1:2002*
Ampere	Clampmeter (instantaneous)	*2.0% ± 5 digits (45-65Hz)*
Voltage	Clampmeter (instantaneous)	*1.5% ± 5 digits*
Electrical Resistance of Insulator	Megohmmeter	-
Cable Continuity	Ohmmeter	-
Functional of Manual Call Point	Testing Key	-
Functional of Optical Beam/Aspirating /Smoke Detector	Aerosol spray	-
Functional of Heat Detector	Heat Gun, Hair dryer, Heat Lamp	-
Functional of Flashing Light	Flashlight, Test Lamp	-

SECTION 5.1 SPECIFICATION FOR COMPREHENSIVE SERVICE AND MAINTENANCE OF THE HOSE REEL SYSTEM AND ANCILLARY EQUIPMENT

1 GENERAL

The work covered by this Specification is for the supply of all materials, appliances, labour and necessary incidentals for the service and maintenance of the Fire Fighting System and Ancillary Equipment.

All work to be performed under this Specification shall be in accordance with the commercial practice, and must be in strict accordance with this Specification.

2 WORKMANSHIP AND MATERIALS

The work described in this Specification shall be performed by workmen skilled in the service, maintenance and repair of Fire Fighting System and Ancillary Equipment of all types, and shall be executed in accordance with the best commercial practice.

All materials to be supplied in connection with work under this Specification shall be new and unused, and shall generally be of the best quality as regard manufacture and performance.

3 SUPERVISION

The Contractor shall have a Foreman in charge of the service, maintenance and repair work to be carried out under this Specification. This Foreman must be thoroughly competent in supervising the service, maintenance and repair of the Fire Fighting System and Ancillary Equipment of all types and shall be in the direct employ of the Contractor, and acceptable to the Superintending Officer.

The Contractor shall have in his direct employ, workmen who are especially skilled in the service, maintenance and repair of Hose Reel System and Ancillary Equipment of all types.

4 SCOPE OF WORK

All machinery and equipment comprising the complete Hose Reel System and Ancillary Equipment shall be serviced and maintained.

The service and maintenance of the complete Hose Reel System and Ancillary Equipment shall be in strict accordance with the Servicing and Maintenance Schedule as set out in clause 5.10 below.

The Contractor shall advise the Superintending Officer of any defects in any part or parts of the complete Hose Reel System and Ancillary Equipment observed during routine inspection and service, and shall repair such defects if required to do so by the Superintending Officer.

The Contractor shall also provide emergency repair service during normal working hours and also during overtime hours if required to do so by the Superintending Officer.

5 CONSUMABLE MATERIALS

The Fire Fighting Contractor shall supply the following consumable materials as and when required:-

1. All pump gland packing.

2. All carbon brushes required to replace worn brushes in electric motors.

3. All electric contact points required to replace worn electric contact points in switch gears, motor starter gears, electric control gears and electric relays.

4. All cotton waste, soap detergent and other cleaning materials required for cleaning purposes.

The costs of these consumable materials shall not be charged for separately by the Contractor, but shall be included in the fixed monthly rate quoted by the Contractor for the Service and Maintenance of the Complete Hose Reel System and Ancillary Equipment.

6 REPAIRS

The Contractor shall repair defects in the complete Hose Reel System and Ancillary Equipment on the instructions of the Superintending Officer. The costs of such repair shall not be included in the fixed monthly rate quoted by the Contractor for the Service and Maintenance of the complete Hose Reel System and Ancillary Equipment but shall be charged for separately by the Contractor.

All repairs on the complete Hose Reel System and Ancillary Equipment 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 repairs. During the guarantee period the Contractor shall rectify defects in repairs carried out by him with no additional charge to the Government.

7 SERVICE AND MAINTENANCE RECORDS

1. The Contractor shall provide a service and maintenance record book for the complete Hose Reel System and Ancillary Equipment being serviced and maintained by him. This record book shall be kept in the plant room of the Hose Reel System and Ancillary Equipment being serviced and maintained, and brief details of all service, maintenance and repairs carried out on the complete Hose Reel System and Ancillary Equipment shall be entered by the Contractor into this book for checking purposes. The address and telephone number of the Contractor's service station shall also be entered into this record book to facilitate emergency service calls.

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 Hose Reel System and Ancillary Equipment. This record shall be in the form of a Maintenance/Repair Sheet, and shall be countersigned by the Superintending Officer each time the Hose Reel System and Ancillary Equipment is attended to by the Contractor.

8 RATES FOR SERVICE AND MAINTENANCE

The rates for the Service and Maintenance of the complete Hose Reel System and Ancillary Equipment shall be as shown in the Schedule of Prices for this Contract.

These rates shall be quoted for by the Contractor at the time he submits his tender, and shall hold good for the period of **THREE years** commencing from the end of the warranty period. The Contractor may be required to enter into a contract for the above period with the Government on the Standard Form of Contract for Service and Maintenance of Hose Reel System and Ancillary Equipment (a copy of this Standard Form may be inspected at the Office of the Pengarah Kanan, Cawangan Kejuruteraan Mekanikal, Ibu Pejabat J.K.R. Malaysia, Kuala Lumpur.

9 PAYMENTS

Payments shall be made in accordance with Clause 24 of the Conditions Of Contract, but bills presented for payments must be accompanied by a full statement and substantiated by one copy of the individual maintenance/repair records required under paragraph 7(2) of this specification.

10 SERVICING AND MAINTENANCE SCHEDULES

The Contractor shall inspect and service the machinery and equipment comprising the complete Hose Reel System and Ancillary Equipment at the above premises periodically as scheduled in the check list except where otherwise directed by the Superintending Officer.

The check list is in no way exhaustive and shall not in any way relieve the Contractor from executing any other work necessary to ensure the efficient functioning of the Hose Reel System and Ancillary Equipment.

The Contractor shall report in writing to the Superintending Officer any defect/s observed in any part or parts of the complete Hose Reel System and Ancillary Equipment. The report shall state the cause/s of the defect/s observed, and shall include an estimate of the cost of repairs required.

No	Item	Frequency		
1	**WATER PUMPS**	Monthly	Quarterly	Yearly
a	Check all seals, glands and pipe lines for leaks & rectify as necessary	√		
b	Check pump rotation manually	√		
c	Check and adjust pump glands as necessary		√	
d	Check all pump bearings and lubricate with oil or grease as necessary	√		
e	Check the alignment and condition of all rubber couplings between pumps and driving motors, and rectify as necessary	√		
f	Check the tension of all belt drives, and adjust as necessary	√		
g	Check all bolts and nuts for tightness, and tighten as necessary	√		

No	Item	Frequency		
2	**ELECTRIC MOTOR**			
a	Check all motor bearings, lubricate with grease as necessary	√		
b	Check carbon brushes and slip rings of all motors, and clean as necessary. Renew carbon brushes as necessary		√	
c	Check safety devices fitted to all motors, and clean, adjust and lubricate as necessary	√		
3	**SWITCHBOARD**			
a	Inspect and check the routine operation of all electrical starters, electrical control gears, automatic switchover control gears, battery charging, relays and ancillary electrical apparatus	√		
b	Clean or renew electric contactors as necessary		√	
c	Renew electric fuses, LED, push button, ammeter, voltmeter and etc. as necessary.		√	
d	Inspect and check all cable and wiring connections		√	
4	**WATER TANK**			
a	Check tanks for leaks & operation of ball valves & rectify if necessary	√		
b	Check all accessories (e.g. water level indicator & wire rope, ladder, cover, electrode, etc.)	√		
5	**PIPING AND FITTINGS**			
a	Check all water piping, valve, fitting, hose, etc. for leaks	√		
b	Flush out system of all dirt			√
c	Check for air lock in the system & rectify accordingly	√		
d	Check all bolts and nuts for tightness, and tighten as necessary		√	
e	Reprime the hose reel system			√
6	**HOSE REEL**			
a	Check all hoses fully charged with water	√		
b	Check operation of swivel joint	√		
c	Clean and adjust nozzles of hoses			√
7	**DIESEL ENGINE**			
a	Inspect and test automatic & manual starting and also for manual stopping of the engine	√		
b	Check all bolts and nuts for tightness,	√		

No	Item	Frequency		
	and tighten as necessary			
c	Check all engine foundation for cracks and rectify as necessary		√	
d	Check the tension of all belt drives, and adjust as necessary	√		
e	Check all engine bearings and lubricate with oil grease as necessary.	√		
f	Check the alignment and condition of all rubber couplings between diesel engine and water pump and rectify as necessary.	√		
g	Check the level of the fuel, steel tube & fitting, any sludge and sediment at the diesel tank	√		
h	Inspect and check condition of battery, fittings and connection as necessary			√
8	**BASEPLATE**			
a	Check all bolts and nuts for tightness, and tighten as necessary	√		
9	**SUPPORT AND HANGER**			
a	Check all support and hanger as necessary			√
10	**SIMULATION TEST**			
a	Test run all pump for automatic and manual starting and switchover operation for a minimum running period of an hour	√		
11	**PAINTING**			
a	Check overall painting and repaint if necessary			√

11 SCHEDULE OF RATES FOR THE COMPREHENSIVE SERVICE AND MAINTENANCE

The tenderer is to note that the cost quoted for this shall not be included in the tender price but quoted separately in the table below and it will be binding in the event that the Government decides to accept them immediately after the guarantee period.

These rates should not be subjected to variation for the period of 3 years after the free maintenance period.

The tenderer shall quote the rate in Section 8.5

---------- END OF SECTION 5.1 ----------

