



**JABATAN KETUA PENGARAH TANAH DAN GALIAN PERSEKUTUAN,  
KEMENTERIAN AIR, TANAH DAN SUMBER ASLI.**

## **DOKUMEN SEBUT HARGA**

**TAJUK : SEBUT HARGA MEMBEKAL, MENUKARGANTI DAN MENYELENGGARA SISTEM PENYAMAN UDARA JENIS *WATER COOLED PACKAGE* KEPADA JENIS *AIR COOLED PACKAGE C/W INDOOR AND OUTDOOR UNIT, WIRING, PANEL ELECTRIC, BRACKETS, CORING, HACKING, PUNCHING OF HOLES IN FLOOR/WALL, MAKING GOOD, PAINTING, PLINTH, PVC CONDUIT & CABLE TRAY* DI BANGUNAN JABATAN KETUA PENGARAH TANAH DAN GALIAN PERSEKUTUAN NEGERI KELANTAN, KEMENTERIAN AIR, TANAH DAN SUMBER ASLI TERMASUK KERJA-KERJA BERKAITAN.**

**KOD BIDANG**

**NO. SEBUT HARGA**

**JKPTG SH16/2018**

**TARIKH  
DIIKLAN**

**TAWARAN**

**11 Oktober 2018 (Khamis)**

**TAKLIMAT/  
TAPAK**

**LAWATAN**

**14 Oktober 2018 (Ahad), Jam 9.30 pagi**

**TARIKH  
DITUTUP**

**TAWARAN**

**22 Oktober 2018 (Isnin) Jam 12.00 Tengah Hari**

**NOTA: SEBUTHARGA INI HANYA TERBUKA KEPADA PEMBEKAL TEMPATAN YANG BERSIJIL DAFTAR KEMENTERIAN KEWANGAN DI NEGERI KELANTAN SAHAJA.**

**SEBUT HARGA MEMBEKAL, MENUKARGANTI DAN MENYELENGGARA SISTEM  
PENYAMAN UDARA JENIS WATER COOLED PACKAGE KEPADA JENIS AIR COOLED  
PACKAGE C/W INDOOR AND OUTDOOR UNIT, WIRING, PANEL ELECTRIC,  
BRACKETS, CORING, HACKING, PUNCHING OF HOLES IN FLOOR/WALL, MAKING  
GOOD, PAINTING, PLINTH, PVC CONDUIT & CABLE TRAY DI BANGUNAN JABATAN  
KETUA PENGARAH TANAH DAN GALIAN PERSEKUTUAN NEGERI KELANTAN,  
KEMENTERIAN AIR, TANAH DAN SUMBER ASLI TERMASUK KERJA-KERJA  
BERKAITAN.**

**KANDUNGAN**

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|           | <i>Section 2 .....</i>                   | <i>General Specification .....</i>                        |
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|           | <i>Schedule A .....</i>                  | <i>Schedule Of Technical Requirement .....</i>            |
|           | <i>Schedule B .....</i>                  | <i>Schedule Of Technical Data Of Equipment Offer.....</i> |
|           | <i>Schedule C .....</i>                  | <i>Schedule Of Price .....</i>                            |
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|           | Lampiran C .....                         | Senarai Kerja-Kerja Yang Sedang Disiapkan .               |
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|           | Lampiran I .....                         | Jadual Kerja Dalam Tangan Syarikat                        |

## SENARAI SEMAKAN (BEKALAN/ PERKHIDMATAN/ KERJA)

Sila tandakan ☐ / ☐ Bagi Dokumen-dokumen Yang Disertakan.

| <b>TAJUK JKPTG SH 16/2018:</b><br><br><b>SEBUT HARGA MEMBEKAL, MENUKARGANTI DAN MENYELENGGARA SISTEM PENYAMAN UDARA JENIS WATER COOLED PACKAGE KEPADA JENIS AIR COOLED PACKAGE C/W INDOOR AND OUTDOOR UNIT, WIRING, PANEL ELECTRIC, BRACKETS, CORING, HACKING, PUNCHING OF HOLES IN FLOOR/WALL, MAKING GOOD, PAINTING, PLINTH, PVC CONDUIT &amp; CABLE TRAY DI BANGUNAN JABATAN KETUA PENGARAH TANAH DAN GALIAN PERSEKUTUAN NEGERI KELANTAN, KEMENTERIAN AIR, TANAH DAN SUMBER ASLI TERMASUK KERJA-KERJA BERKAITAN.</b> |                                                                                                                  |                                            |                                                                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------------------------------------------------------------|
| <b>BIL</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>PERKARA/ DOKUMEN</b>                                                                                          | <b>UNTUK<br/>DITANDA OLEH<br/>SYARIKAT</b> | <b>UNTUK DITANDA<br/>OLEH<br/>JAWATANKUASA<br/>PEMBUKA SEBUT<br/>HARGA</b> |
| <b>DOKUMEN CADANGAN KEWANGAN</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                  |                                            |                                                                            |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Salinan Sijil Akuan Pendaftaran dari Kementerian Kewangan (Bekalan/ Perkhidmatan)                                | <input type="checkbox"/>                   | <input type="checkbox"/>                                                   |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Salinan Sijil Akuan Bumiputera dari Kementerian Kewangan (Bekalan/ Perkhidmatan)                                 | <input type="checkbox"/>                   | <input type="checkbox"/>                                                   |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Salinan Sijil Akuan Pembuat dari Kementerian Kewangan (Bekalan/ Perkhidmatan)                                    | <input type="checkbox"/>                   | <input type="checkbox"/>                                                   |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Salinan Sijil Pendaftaran dari Pusat Khidmat Kontraktor (Kerja)                                                  | <input type="checkbox"/>                   | <input type="checkbox"/>                                                   |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Salinan Sijil Pendaftaran CIDB<br><b>Kod Bidang : G1 / ME / M01</b>                                              | <input type="checkbox"/>                   | <input type="checkbox"/>                                                   |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Salinan Sijil Taraf Bumiputera dari CIDB                                                                         | <input type="checkbox"/>                   | <input type="checkbox"/>                                                   |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Borang Sebut Harga</b> telah diisi dengan lengkap (Termasuk nilai tawaran dan tempoh siap) dan ditandatangani | <input type="checkbox"/>                   | <input type="checkbox"/>                                                   |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <i>Schedule Of Price</i>                                                                                         | <input type="checkbox"/>                   | <input type="checkbox"/>                                                   |
| 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Surat Akuan Penyebut Harga (lengkap diisi)                                                                       | <input type="checkbox"/>                   | <input type="checkbox"/>                                                   |

**TAJUK JKPTG SH 16/2018:**

**SEBUT HARGA MEMBEKAL, MENUKARGANTI DAN MENYELENGGARA SISTEM PENYAMAN UDARA JENIS WATER COOLED PACKAGE KEPADA JENIS AIR COOLED PACKAGE C/W INDOOR AND OUTDOOR UNIT, WIRING, PANEL ELECTRIC, BRACKETS, CORING, HACKING, PUNCHING OF HOLES IN FLOOR/WALL, MAKING GOOD, PAINTING, PLINTH, PVC CONDUIT & CABLE TRAY DI BANGUNAN JABATAN KETUA PENGARAH TANAH DAN GALIAN PERSEKUTUAN NEGERI KELANTAN, KEMENTERIAN AIR, TANAH DAN SUMBER ASLI TERMASUK KERJA-KERJA BERKAITAN.**

| <b>BIL</b> | <b>PERKARA/ DOKUMEN</b>                                        | <b>UNTUK<br/>DITANDA OLEH<br/>SYARIKAT</b> | <b>UNTUK DITANDA<br/>OLEH<br/>JAWATANKUASA<br/>PEMBUKA SEBUT<br/>HARGA</b> |
|------------|----------------------------------------------------------------|--------------------------------------------|----------------------------------------------------------------------------|
|            | <b>DOKUMEN CADANGAN KEWANGAN</b>                               |                                            |                                                                            |
| 10         | Surat Akuan Penyebut Harga Yang Berjaya (lengkap diisi)        | <input type="text"/>                       | <input type="text"/>                                                       |
| 11         | Maklumat Am & Latar Belakang Penyebut Harga                    | <input type="text"/>                       | <input type="text"/>                                                       |
| 12         | Laporan sulit bank / institusi kewangan                        | <input type="text"/>                       | <input type="text"/>                                                       |
| 13         | Jadual pengalaman kerja                                        | <input type="text"/>                       | <input type="text"/>                                                       |
| 14         | Jadual kerja dalam tangan                                      | <input type="text"/>                       | <input type="text"/>                                                       |
| 15         | Salinan Penyata Bulanan Akaun Bank bagi tiga (3) bulan terkini | <input type="text"/>                       | <input type="text"/>                                                       |
|            | <b>DOKUMEN CADANGAN TEKNIKAL</b>                               |                                            |                                                                            |
| 16         | Jadual Spesifikasi Teknikal                                    | <input type="text"/>                       | <input type="text"/>                                                       |
| 17         | Borang penyerahan Contoh dan Katalog (jika berkaitan)          | <input type="text"/>                       | <input type="text"/>                                                       |
| 18         | Cadangan Penyelenggaraan (jika perlu)                          | <input type="text"/>                       | <input type="text"/>                                                       |
| 19         | Senarai Kakitangan Teknikal (jika berkaitan)                   | <input type="text"/>                       | <input type="text"/>                                                       |
| 20         | Laporan Keempunyaan Loji Peralatan Penyebut Harga              | <input type="text"/>                       | <input type="text"/>                                                       |
| 21         | Lain –lain sekiranya perlu                                     | <input type="text"/>                       | <input type="text"/>                                                       |

|                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>PENGESAHAN OLEH PENYEBUTHARGA</b></p> <p>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.</p> <p>Tandatangan:</p> <p>Nama:</p> <p>Jawatan:</p> <p>Tarikh:</p> | <p><b>UNTUK KEGUNAAN JABATAN</b></p> <p>Jawatankuasa Pembuka Sebut Harga mengesahkan penerimaan dokumen bertanda kecuali bagi perkara bil. .... (jika ada).</p> <p>Tandatangan:</p> <p>Nama:</p> <p>Jawatan:</p> <p>Tarikh:</p> <p>Tandatangan:</p> <p>Nama:</p> <p>Jawatan:</p> <p>Tarikh:</p> <p>Tandatangan:</p> <p>Nama:</p> <p>Jawatan:</p> <p>Tarikh:</p> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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**1.**

**ARAHAN KEPADA PENYEBUTHARGA**

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## **ARAHAN KEPADA PENYEBUTHARGA**

### **C.I.D.B**

|                          |   |                 |
|--------------------------|---|-----------------|
| Gred                     | : | G1              |
| Kategori                 | : | M01             |
| NO. SEBUT HARGA          | : | JKPTG SH16/2018 |
| Pusat Khidmat Kontraktor | : | Semua           |

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**SEBUT HARGA MEMBEKAL, MENUKARGANTI DAN MENYELENGGARA SISTEM PENYAMAN UDARA JENIS WATER COOLED PACKAGE KEPADA JENIS AIR COOLED PACKAGE C/W INDOOR AND OUTDOOR UNIT, WIRING, PANEL ELECTRIC, BRACKETS, CORING, HACKING, PUNCHING OF HOLES IN FLOOR/WALL, MAKING GOOD, PAINTING, PLINTH, PVC CONDUIT & CABLE TRAY DI BANGUNAN JABATAN KETUA PENGARAH TANAH DAN GALIAN PERSEKUTUAN NEGERI KELANTAN, KEMENTERIAN AIR, TANAH DAN SUMBER ASLI TERMASUK KERJA-KERJA BERKAITAN.**

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1. **AM**

Kerajaan adalah dengan ini mempelawa Penyebutharga-penyebutharga yang berdaftar dengan C.I.D.B dalam Gred dan Kategori seperti yang dinyatakan di atas menyertai sebut harga ini.

Arahan Kepada Penyebutharga ini adalah menjadi sebahagian daripada kontrak.

2. **HAK KERAJAAN UNTUK MENERIMA / MENOLAK SEBUT HARGA**

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

3. **DOKUMEN SEBUT HARGA**

3.1. **Penyediaan Sebut Harga**

Kontraktor adalah dikehendaki mengisi segala maklumat berikut dengan sepenuhnya, kegagalan mengisi/ memberi maklumat yang diperlukan boleh menyebabkan sebut harga tersebut akan ditolak, iaitu:-

- i. Harga dan tandatangan Penyebutharga
  - a. Borang Sebut Harga
  - b. *Schedule Of Prices*
- ii. Maklumat-maklumat peralatan yang ditawarkan
- iii. Katalog-katalog peralatan
- iv. Perancangan pelaksanaan (CPM) (jika Perlu)
- v. Salinan Kedudukan Kewangan
- vi. Senarai Lampiran (Lampiran A - Lampiran F)

Jika berlaku kesilapan dalam mengisi maklumat-maklumat di atas Kontraktor hendaklah menandatangani ringkas semua pembetulan.

3.2. **Penyerahan Dokumen Sebut Harga**

- i. Dokumen Sebut Harga yang telah diisi dengan lengkap hendaklah dimasukkan ke dalam sampul surat berlakri yang dicatatkan dengan Bilangan Sebut Harga **JKPTG SH16/2018** serta Tajuk Sebut Harga dan hendaklah dimasukkan ke dalam peti sebutharga yang disediakan di **Jabatan Ketua Pengarah Tanah dan Galian Persekutuan,**

**Kementerian Air, Tanah dan Sumber Asli, Bahagian Khidmat Pengurusan, Aras 1, Podium 1, Wisma Sumber Asli, No. 25, Persiaran Perdana, Presint 4, 62574 PUTRAJAYA** sebelum tarikh dan waktu tutup sebutharga.

- ii. Sebut Harga yang diserahkan selepas masa yang ditetapkan, berbangkit dari sebarang sebab, tidak akan dipertimbangkan.

Kegagalan Kontraktor mengembalikan Dokumen Sebut Harga pada tarikh yang ditetapkan membolehkan Sebut Harga tersebut akan ditolak.

### 3.3. Penjelasan Lanjut

Sekiranya terdapat maklumat dalam Dokumen Sebut Harga yang tidak jelas atau bercanggah, Kontraktor boleh menghubungi pejabat ini untuk penjelasan lanjut.

## 4. MAKLUMAT DAN LATARBELAKANG PENYEBUTHARGA

- 4.1 Di samping mengemukakan dokumen-dokumen yang tersebut di atas Penyebutharga-penyebutharga dikehendaki melengkapkan borang-borang berikut yang disertakan bersama Dokumen Sebut Harga ini, dengan sempurna dan mengembalikannya bersama-sama dengan Sebut Harga masing-masing:
  - i. LAMPIRAN A MAKLUMAT AM DAN LATAR BELAKANG PENYEBUT HARGA
  - ii. LAMPIRAN B KEDUDUKAN KEWANGAN PENYEBUT HARGA
  - iii. LAMPIRAN C PENGAKUAN PENYEBUT HARGA
  - iv. LAMPIRAN D LAPORAN SULIT DARIPADA BANK / INSTITUSI KEWANGAN MENGENAI KEDUDUKAN KEWANGAN PENYEBUT HARGA
  - v. LAMPIRAN E SURAT AKUAN PENYEBUT HARGA BERJAYA
  - vi. LAMPIRAN F LAPORAN KEPUNYAAN LOJI DAN PERALATAN PETENDER
  - vii. LAMPIRAN G JADUAL PENGALAMAN SYARIKAT
  - viii. LAMPIRAN H JADUAL KERJA DALAM TANGAN
- 4.2 Borang-borang ini hendaklah diisi dengan maklumat-maklumat yang benar dan data-data yang tepat. Semua butiran perlu diisi dan jawapan yang jelas hendaklah diberikan terhadap semua pertanyaan di dalam borang-borang di atas. Jika perlu helaian tambahan boleh dilampirkan. Setiap helaian tambahan yang dilampirkan kepada borang-borang lain hendaklah ditandatangani oleh Penyebutharga.
- 4.3 Semua maklumat dan dokumen yang tersebut di atas hendaklah dikemukakan oleh Penyebutharga bersama-sama sebut harganya semasa menghantar dokumennya sebelum tarikh tutup sebut harga. Sebarang

maklumat atau mana-mana dokumen tersebut yang diterima selepas sebut harga ditutup tidak akan diambil kira dalam penilaian keupayaan Penyebutharga.

- 4.4 Sekiranya Penyebutharga didapati memberi maklumat palsu atau sengaja menyorok (*withhold*) atau tidak memberikan mana-mana maklumat yang memberikan kesan negatif terhadap keupayaannya, sebut harganya akan ditolak dan tindakan tatatertib akan diperakukan terhadapnya.

5. PERBELANJAAN PENYEDIAAN DOKUMEN SEBUT HARGA

Semua perbelanjaan bagi penyediaan Sebutharga ini hendaklah ditanggung oleh Penyebutharga sendiri.

6. TEMPOH SAH SEBUT HARGA

Sebut Harga ini sah selama 90 hari dari tarikh tutup Sebut Harga. Kontraktor tidak boleh menarik balik sebut harganya sebelum tamat tempoh sah Sebut Harga. Pengesyoran tindakan tatatertib akan diambil sekiranya Kontraktor menarik balik Sebutharganya sebelum tamat tempoh sah Sebut Harga.

7. SESI TAKLIMAT

Penyebutharga **DIWAJIBKAN** untuk menghadiri satu taklimat yang akan diadakan pada **14 Oktober 2018 (Ahad) jam 9.30 pagi di Bilik Mesyuarat, Jabatan Ketua Pengarah Tanah dan Galian Persekutuan Negeri Kelantan, Bandar Baru Tunjong, 15100 Kota Bharu, Kelantan Darul Naim**

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## **2. BORANG SEBUT HARGA**

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**BORANG SEBUT HARGA**  
**NO. SEBUT HARGA : JKPTG SH16/2018**

Ketua Pengarah,  
Jabatan Ketua Pengarah Tanah dan Galian Persekutuan,  
Kementerian Air, Tanah dan Sumber Asli,  
Bahagian Khidmat Pengurusan  
Aras 1, Podium 1, Wisma Sumber Asli  
No. 25, Persiaran Perdana, Presint 4  
62574 PUTRAJAYA

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**SEBUT HARGA MEMBEKAL, MENUKARGANTI DAN MENYELENGGARA SISTEM  
PENYAMAN UDARA JENIS WATER COOLED PACKAGE KEPADA JENIS AIR  
COOLED PACKAGE C/W INDOOR AND OUTDOOR UNIT, WIRING, PANEL ELECTRIC,  
BRACKETS, CORING, HACKING, PUNCHING OF HOLES IN FLOOR/WALL, MAKING  
GOOD, PAINTING, PLINTH, PVC CONDUIT & CABLE TRAY DI BANGUNAN JABATAN  
KETUA PENGARAH TANAH DAN GALIAN PERSEKUTUAN NEGERI KELANTAN,  
KEMENTERIAN AIR, TANAH DAN SUMBER ASLI TERMASUK KERJA-KERJA  
BERKAITAN.**

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1. Di bawah dan tertakluk kepada Arahan Kepada Penyebutharga, Syarat-syarat Am Sebut Harga, Spesifikasi Kerja dan Pelan-pelan, saya yang menandatangani di bawah ini adalah dengan ini menawarkan untuk melaksanakan dan menyiapkan kerja tersebut bagi jumlah ..... wang ..... pukal ..... sebanyak ..... Ringgit Malaysia: ..... (RM..... )

2. Saya bersetuju menyiapkan kerja-kerja ini dalam masa ..... minggu dari tarikh tempoh mula kerja seperti yang ditetapkan oleh Pegawai Inden.

Bertarikh pada ..... haribulan ..... 2018

.....  
(Tandatangan Kontraktor)

Nama Penuh:

No. K/P:

Alamat:

.....  
(Tandatangan Saksi)

Nama Penuh:

No. K/P:

Alamat:

.....  
(Meteri atau Cop Kontraktor)

Tarikh :

## **SYARAT-SYARAT SEBUT HARGA UNTUK KERJA**

### **1. Pemeriksaan Tapak Bina**

Kontraktor adalah dinasihatkan untuk 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 menjejaskan sebut harganya. Sebarang tuntutan yang timbul akibat daripada kegagalan Kontraktor mematuhi kehendak ini tidak akan dipertimbangkan.

### **2. Insurans/ Bon Pelaksanaan**

Kontraktor yang berjaya hendaklah atas nama bersama Kerajaan Malaysia dan Kontraktor mengambil perkara-perkara seperti berikut:-

- i. Bon Pelaksanaan sebanyak 5% daripada jumlah nilai Sebut Harga, jika nilai yang ditawarkan melebihi RM50,000.00. (Kontraktor dibenarkan membuat pilihan untuk mengemukakan Jaminan Bank atau Jaminan Insurans.);
- ii. Polisi Insuran Tanggungan Awam (iaitu insurans terhadap bencana kepada orang dan kerosakan kepada harta); dan
- iii. Nombor-nombor pendaftaran di bawah Skim Keselamatan Sosial Pekerja (PERKESO) bagi tempoh pelaksanaan kerja inden ini.

Kontraktor hendaklah mengemukakan kepada Pegawai Inden semua polisi insurans, Bon Pelaksanaan dan Nombor Kod Pendaftaran dengan PERKESO yang tersebut di atas sebelum memulakan kerja. Bagaimanapun untuk tujuan memulakan kerja sahaja Nota-nota Perlindungan dan resit-resit bayaran premium adalah mencukupi. Sekiranya Kontraktor gagal mengemukakan semua Polisi Insurans selepas tempoh sah Nota-nota Perlindungan, tanpa sebarang sebab yang munasabah, Pegawai Inden berhak mengambil tindakan seperti di bawah Fasal 10 (d).

### **3. Peraturan Pelaksanaan Kerja**

Kerja-kerja yang dilaksanakan hendaklah mematuhi spesifikasi, pelan-pelan, butir-butir kerja dalam Ringkasan Sebut Harga (*Shedule Of Price*) dan Syarat-syarat yang dinyatakan dalam Dokumen Sebut Harga ini dan arahan Pegawai Inden atau Wakilnya.

### **4. Kegagalan Kontraktor Memulakan Kerja**

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

### **5. Sub-Sewa Dan Menyerahak Kerja**

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

**6. Penolakan Bahan, Barang Dan Kerja Oleh Pegawai Inden**

Pegawai Inden atau Wakilnya berhak menolak bahan, barang dan kerja-kerja yang tidak menepati spesifikasi, bahan, barang dan kerja-kerja yang ditolak hendaklah diganti dan sebarang kos tambahan yang terlibat hendaklah ditanggung oleh Kontraktor sendiri.

**7. Ringkasan Sebut Harga**

- i. Jadual Harga Sebut Harga (*Schedule Of Prices*) hendaklah menjadi sebahagian daripada Borang Sebut Harga ini dan hendaklah menjadi asas Jumlah Harga Sebut Harga.
- ii. 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 menyiapkan Kerja dengan sempurna.
- iii. 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.
- iv. Harga-harga dalam Ringkasan Sebut Harga yang dikemukakan oleh Kontraktor hendaklah tertakluk kepada persetujuan sebelumnya daripada Pegawai Inden tentang kemunasabahannya. Persetujuan sebelumnya itu dan apa-apa pelarasan kemudiannya kepada harga-harga dalam Ringkasan Sebut Harga hendaklah dibuat sebelum Inden Kerja dikeluarkan.
- v. Apa-apa pelarasan harga dalam Ringkasan Sebut Harga menurut perenggan (iv) tersebut di atas dan apa-apa kesilapan hisab dalam Ringkasan Sebut Harga hendaklah dilaraskan dan diperbetulkan sebelum Inden Kerja dikeluarkan. Jumlah amaun yang dilaraskan hendaklah sama dengan amaun jumlah harga pukal dalam Borang Sebut Harga. Amaun jumlah harga pukal dalam Borang Sebut Harga hendaklah tetap tidak berubah.

**8. Percanggahan Dalam Dokumen Sebut Harga**

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

**9. Bayaran Berperingkat**

Bagi Kerja yang bernilai melebihi RM25,000.00, satu kali bayaran berperingkat dibenarkan setelah nilai Kerja-kerja yang disiapkan melebihi 50% dari nilai Sebut Harga tersebut.

**10. Kegagalan Kontraktor Menyiapkan Kerja Dan Penamatan Perlantikan Kontraktor**

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

- i. Sekiranya Kontraktor masih gagal menyiapkan Kerja dalam tempoh masa yang telah ditetapkan;
- ii. Kemajuan Kerja terlalu lembab tanpa apa-apa sebab yang munasabah;

- iii. Penggantungan pelaksanaan seluruh atau sebahagian Kerja, tanpa apa-apa sebab yang munasabah;
- iv. Tidak mematuhi arahan Pegawai Inden tanpa apa-apa alasan yang munasabah; dan
- v. Apabila Kontraktor diisytiharkan bankrap oleh pihak yang sah.

#### **11. Kerja Perubahan**

- i. Pegawai Inden boleh menurut budi bicaranya mengeluarkan arahan-arahan yang berkehendakkan sesuatu perubahan kerja dengan secara bertulis. Tiada apa-apa perubahan yang dikeluarkan oleh Pegawai Inden atau yang disahkan kemudian oleh Pegawai Inden boleh membatalkan Sebut Harga ini.
- ii. Semua kerja perubahan dan/ atau tambahan yang diluluskan oleh Pegawai Inden akan diukur atau dinilai menggunakan kadar harga yang ada dalam Senarai Kuantiti/ Ringkasan Sebut Harga. Jika tidak terdapat sebarang kadar harga yang bersesuaian kadar harga yang dipersetujui oleh Pegawai Inden dan kontraktor hendaklah digunakan.

#### **12. Pematuhan Kepada Undang-Undang Oleh Kontraktor**

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

#### **13. Peraturan Membayar Selepas Siap**

Bayaran sepenuhnya hanya akan dibayar setelah Kontraktor menyiapkan Kerja dengan sempurna dan mengembalikan Inden Kerja Asal.

#### **14. Tempoh Tanggungan Kecacatan**

Tempoh Tanggungan Kecacatan bagi Kerja yang bernilai di antara RM50,000.00 hingga RM500,000.00 adalah selama Dua Belas (12) Bulan dari tarikh Kerja diperakukan siap.

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## **3. SPECIFICATION**

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## SECTION 1

### Scope Of Work :-

1. Kerja-kerja membekal, menukarganti & menyelenggara sistem penyaman udara jenis **water cooled package** kepada jenis **air cooled package** c/w indoor and outdoor unit, wiring, panel electric, brackets, coring, hacking, punching of holes in floor/wall, making good, painting, plinth, PVC conduit & cable tray serta kerja-kerja berkaitan sehingga sistem dapat beroperasi dengan keupayaan sebenar di bangunan Jabatan Ketua Pengarah Tanah Dan Galian (Persekutuan) Negeri Kelantan sebagaimana berikut :-

#### 1.1 AHU No. 1 ( 200,000 Btuh ) – Ducted Blower

- i. Kerja-kerja mencabut 1 set peralatan sediada termasuk peralatan berkaitan. Peralatan tersebut hendaklah di simpan ditempat yang diarahkan sebagaimana oleh pegawai inden.
- ii. Kerja memasang 1 unit ducted blower berkapasiti 200,000 Btuh termasuk kerja berkaitan sehingga sistem berfungsi dengan sempurna.
- iii. Kerja-kerja memeriksa paip sediada serta memasang fitting, filter / strainer sehingga system dapat berfungsi dengan sempurna.
- iv. Kerja-kerja memasang / membuat supply duct untuk unit ducted blower baharu termasuk kerja berkaitan sehingga sistem berfungsi dengan sempurna.
- v. Kerja-kerja menaiktaraf panel kawalan sehingga system dapat berfungsi dengan sempurna.

#### 1.2 AHU No. 2 ( 250,000 Btuh ) – Ducted Blower.

- a. Kerja-kerja mencabut 1 set peralatan sediada termasuk peralatan berkaitan. Peralatan tersebut hendaklah di simpan ditempat yang diarahkan sebagaimana oleh pegawai inden.
- b. Kerja memasang 1 unit ducted blower berkapasiti 250,000 Btuh termasuk kerja berkaitan sehingga sistem berfungsi dengan sempurna.
- c. Kerja-kerja memeriksa paip sediada serta memasang fitting, filter / strainer sehingga system dapat berfungsi dengan sempurna.
- d. Kerja-kerja memasang / membuat supply duct untuk unit ducted blower baharu termasuk kerja berkaitan sehingga sistem berfungsi dengan sempurna.
- e. Kerja-kerja menaiktaraf panel kawalan sehingga system dapat berfungsi dengan sempurna.

#### 1.3 AHU No. 3 ( 300,000 Btuh ) – Ducted Blower

- a. Kerja-kerja mencabut 1 set peralatan sediaada termasuk peralatan berkaitan. Peralatan tersebut hendaklah di simpan ditempat yang diarahkan sebagaimana oleh pegawai inden.
- b. Kerja memasang 1 unit ducted blower berkapasiti 300,000 Btuh termasuk kerja berkaitan sehingga sistem berfungsi dengan sempurna.
- c. Kerja-kerja memeriksa paip sediaada serta memasang fitting, filter / straner sehingga system dapat berfungsi dengan sempurna.
- d. Kerja-kerja memasang / membuat supply duct untuk unit ducted blower baharu termasuk kerja berkaitan sehingga sistem berfungsi dengan sempurna.
- e. Kerja-kerja menaiktaraf panel kawalan sehingga system dapat berfungsi dengan sempurna.

#### 1.4 AHU No. 4 ( 350,000 Btuh ) – Ducted Blower

- a. Kerja-kerja mencabut 1 set peralatan sediaada termasuk peralatan berkaitan. Peralatan tersebut hendaklah di simpan ditempat yang diarahkan sebagaimana oleh pegawai inden.
- b. Kerja memasang 1 unit ducted blower berkapasiti 350,000 Btuh termasuk kerja berkaitan sehingga sistem berfungsi dengan sempurna.
- c. Kerja-kerja memeriksa paip sediaada serta memasang fitting, filter / straner sehingga system dapat berfungsi dengan sempurna.
- d. Kerja-kerja memasang / membuat supply duct untuk unit ducted blower baharu termasuk kerja berkaitan sehingga sistem berfungsi dengan sempurna.
- e. Kerja-kerja menaiktaraf panel kawalan sehingga system dapat berfungsi dengan sempurna.

#### **Nota :**

*Kontraktor tidak dibenarkan mengambil / mengeluarkan peralatan penyaman udara sedia ada yang diganti dari kawasan JKPTG. Peralatan hendaklah disimpan di tempat selamat dan pastikan kawasan kerja bersih daripada sebarang peralatan yang tidak diingini.*

2. Membersih dan membuang semua peralatan yang tidak berkaitan di tempat kerja.
3. Kontraktor hendaklah bertanggungjawab pada kerja-kerja “hacking” dan “making good” kesemua dinding dan lantai. Pastikan peralatan yang dipasang boleh beroperasi dalam keadaan baik tanpa sebarang pertambahan kos.

4. Kontraktor juga dikehendaki mengambil gambar bagi kerja yang dijalankan sebelum, semasa dan selepas pemasangan di buat dan diserahkan 2 salinan kepada JKR Caw. Kej. Mekanikal. Pastikan peralatan pelanggan atau kawasan kerja sentiasa selamat dan bersih.
5. Tempoh jaminan kecacatan hendaklah selama dua belas (12) bulan daripada tarikh siap kerja.

## SECTION 2

### GENERAL CONDITIONS

#### 1. Scope Of Work

The work covered by this specification is for the supply of materials, appliances, labour and necessary incidentals for the complete installation, testing and commissioning of the aforesaid system as described in Section 1.

#### 2. Example Of Non Compliance In Submission Of Quotation

**2.1** The **Jabatan Ketua Pengarah Tanah Dan Galian (Persekutuan) Negeri Kelantan** wishes to draw the attention of tenders who in the past have been submitting tenders which do not comply fully with the tender specification and/or the terms and conditions of tendering. Examples of such non compliance are as follows:

- i. Certain components of equipment offered not meeting the specification (e.g. offering squirrel cage motors against slip-ring motor; and suction pumps against horizontal spig casing pump).
- ii. Certain materials offered not meeting specification (e.g. steel against stainless steel; Class B against Class C pipes).
- iii. Certain materials equipment offered not approved by the relevant Approving Authorities (e.g. Jabatan Kesihatan dan Keselamatan, TNB., J.K.R., Jabatan Bomba, etc.)
- iv. Equipment offered not supported by relevant manufacturer's catalogues/technical literatures and certificates of quality compliance.
- v. Certain components offered are below the capacity or size specified.
- vi. Schedule of technical data submitted are either vague or doubtful e.g.:
  - a. 'to be submitted'
  - b. 'to comply'
  - c. 'ABC brand or equivalent' - Unnamed equivalent should not be submitted.
  - d. 'Local make' without indicating specific brand name.
  - e. Phrase like 'As specified' and 'or approved equivalent'
- vii. Tenders containing inaccuracies, inconsistencies, omissions, ensures, alterations or typing/arithmetical errors.
- viii. Schedule of Technical Data, Summary of Prices, Schedule of Rates and Schedule of Works in Progress not duly filled.
- ix. Imposition of conditions and terms or qualifications, contrary to JKR's conditions of contract (e.g. quoting in foreign currency, currency fluctuation clause, reduced validity period etc).
- x. Form of Quotation unsigned without tender price completion period.
- xi. When required, general arrangement drawings, dimension of equipment offered are not provided, making it difficult to judge whether the

equipment offered will fit into the space provide in the building for plant room, lift wells etc.

xii. For Provision Bill of Quantities, items are either grossly inflated or deflated entailing price adjustments.

xiii. Spare parts offered are short of specified quantities.

**2.2** As result, much efforts and valuable time has to be incurred in scrutinizing such discrepancies in border-line cases when clarification are sought, the tender than agrees to conform to original terms and conditions of tendering and/or offer alternative components/materials in order to comply fully to technical specifications at no extra cost. The process in both time consuming and cumbersome and should not be necessary if only each tenderer has taken due care in preparing his tender submission in the first instance.

**2.3** HENCE FORTH, **JABATAN KETUA PENGARAH TANAH DAN GALIAN (PERSEKUTUAN) NEGERI KELANTAN**, WILL NO LONGER ATTEMPT TO SEEK FURTHER CLARIFICATION ONCE A TENDER HAS BEEN SUBMITTED. The tenderer is therefore strongly advised to submit each and every tender with due care and to ensure that it is in full compliance with technical specifications and terms and conditions of tendering. Failure to comply with instruction will render the tender invalid.

### **3. Pricing Of Quotations**

Quotations for the above-mentioned shall be submitted on a lump sum basis for the supply, installation, testing and commissioning of the complete plant as described further in this specification and the tender price shall include all changes for transport, handling, Government Custom Duties, Sales Tax and other taxes when applicable, and all charges for the servicing and maintenance of the complete plant during the warranty period.

It is to be clearly understood that the successful tenderer shall pay all Government Custom Duties and other taxes which may be payable on all materials for use in work to be performed under this specification, and no tax exemption certificates will be supplied by the **Jabatan Ketua Pengarah Tanah Dan Galian Persekutuan Negeri Kelantan, Kementerian Air, Tanah dan Sumber Asli**.

### **4. Submission Of Quotation**

The tenders must be made on the Form of Quotation, Along with all relevant blanks in the Schedule of Technical Data, Schedule of Rates, Summary of Prices and all other Schedules annexed to this is incomplete duly filled up/ Any quotation which is incomplete or which does not include the whole of the works covered by this specification will not be considered.

All drawings and specifications must be returned together with the quotation to the office of **Jabatan Ketua Pengarah Tanah Dan Galian Persekutuan, WP Putrajaya** at the time of tendering.

Tenderers shall furnish together with his quotation, such details, technical literatures, manuals, etc. as specifically requested or otherwise and all information which is necessary for the complete assessment of the tender. Quotation which does not comply fully with the requirements of this clause will not be considered.

### **5. Acceptance Of Quotation (Mode Of Acceptance)**

The Government shall not be bound to accept the lowest or any quotation.

#### **6. The Meaning Of The Term 'Or Other Approved Equivalent'**

It shall be noted that where in this Specification, a manufacturer's name and material or equipment catalogue number is quoted followed by the phrase "or other approved equivalent" such reference is intended as a guide to the type of construction performance, general appearance and quality standard of manufacture and shall in no way, exclude the offer of suitable alternative of similar standard and characteristics. The latter shall be approved by the Superintending Officer.

#### **7. Alternative Offer**

Should the tenderer consider there be any advantage to **Jabatan Ketua Pengarah Tanah Dan Galian Persekutuan Negeri Kelantan**, by modification to the Specification, he may draw attention to such by an attached document stating the reduction of amount of his tender, if accepted by the **Jabatan Ketua Pengarah Tanah Dan Galian Persekutuan Negeri Kelantan** required in the tender document.

#### **8. Installation Period**

The tenderer is to state in his tender the time required for delivery of the equipment to site and the time required for completion of the entire installation, both relative to the date of notification of the acceptance of tender.

#### **9. Drawing**

##### **i. J.K.R. Drawings**

The drawings applicable to this installation are listed in the Schedule of Drawings and should be considered as diagrammatic and approximate only. The specification and drawings are intended to be minutely explanatory and complete, but all work called for one, even is not by the other, shall be fully executed.

##### **ii. Tenderer's Drawing**

The tenderer shall submit together with his tender general dimensioned drawings showing all the major items of the equipment being offered so as to show the suitability of the equipment arrangement within the allocated space.

##### **iii. Working Drawings**

Before any work can be executed, dimensioned drawings of the plant, materials, service connections and other information required for work or services to be provided by others, shall be submitted in triplicate to the S.O. for approval. These drawings shall be submitted in ample time for checking and shall be modified as necessary if requested by the S.O., and resubmitted for approval of any drawings by the S.O. does not exonerate the Sub-Contractor from any responsibility under the contract terms and conditions.

After completion of the installation work, and at least 3 weeks prior to the Schedule Date of Practical Completion, the as installed drawings shall be brought to completion and two sets of prints provided to the S.O. for comment and approval. Within one week of receiving the S.O.'s comments and

requirements, the Contractor shall make all necessary amendments and resubmit one set of prints to the S.O. for final approval.

The Contractor shall furnish to the S.O. a complete set of reproducible transparent prints and three sets of bound ordinary prints of the installed drawings.

#### **10. Regulations**

All work to be performed under this contract shall be in accordance with the best commercial practice and shall comply with the regulations and by laws of the following authorities:

- i. Jabatan Kerja Raya
- ii. Jabatan Keselamatan & Kesihatan Pekerja
- iii. Tenaga Nasional Berhad
- iv. Jabatan Bomba & Penyelamat
- v. Bekalan Air
- vi. All other authorities having jurisdiction over the whole or part of the mechanical installation in the locality.

The Contractor shall obtain and fill in all notices when required by the above mentioned authorities, and shall obtain all consents necessary for the various works to be executed by him and shall pay all fees in connection therewith.

The Contractor shall draw to the attention of the Superintending Officer anything mentioned in this Specification which is inconsistent with the regulations of the above authorities and shall obtain further instructions from him before proceeding with any work.

#### **11. Programme Of Work**

The Contractor shall prepare in collaboration detailed schedule of work based on the time requirements of the Contract Schedule and the programme must be approved by the S.O. This schedule of work shall indicate clearly the sequence of operation required to complete the works of the Contract, and also the commencement and completion dates of each section of the work.

#### **12. Workmanship**

The work described in this specification shall be performed by workmen skilled in the installation, testing and commissioning and servicing of the aforesaid plant. All necessary work shall be executed in good work-manlike manner so as to prevent a neat and finished appearance.

The S.O. shall decide, whether or not the finished piece of work is satisfactory, and if in its opinion any material or equipment has not been properly installed or finished, the successful tenderer, must replace the materials or equipments in a manner entirely satisfactory and without additional cost to the Jabatan Kerja Raya.

#### **13. Obvious Work**

The Contractor shall provide all materials and necessary fittings and perform any work which is obviously necessary for the proper and efficient functioning of the complete installation even though such materials or work may not be explicitly mentioned in the Specification.

#### **14. Materials**

The Contractor shall supply and deliver to site all necessary fittings, equipment, materials, tools, plant and hoist to complete the installation apart from those specifically mentioned to be supplied by others.

All materials and equipment to be supplied under this specification shall be new and unused and shall generally be of the best quality as regards design, manufacture and performance.

#### **15. Site Limitation**

Before submitting his quotation, the tenderer shall thoroughly acquaint himself with the nature of the work required, all the features of the building and site which may influence his work. In particular, the tenderer shall ensure that the equipment offered shall be able to fit into the space allocated. The contractor shall in no way be relieved from the full execution of the contract in the event of any unforeseen difficulties arising.

#### **16. Access To Site**

The Contractor shall be allowed access to the building during normal working hours. At times other than these, he must make his own arrangements with the Contractor and he shall be held responsible for the building and its contents at all times when the contractor is not in attendance.

#### **17. Supervision**

The Contractor shall have in his direct employ at all times a skilled and efficient supervisor who is empowered to receive and carry out instructions. This supervisor must be thoroughly competent in supervising the works and shall be to the approval of the S.O.

#### **18. Cleaning**

The Contractor shall remove all rubbish and scrap materials resulting from his work and leave each section of the installation tidy as soon as he completes it. On completion of his work the Contractor shall promptly remove all materials and equipment belonging to him from the site except such materials and equipment as the proprietor agree to store for use during the maintenance period.

#### **19. Cutting And Making Good**

Minor cutting, drilling, etc., necessary for the installation of the work under this contract shall be carried out and made good by the Contractor.

The Contractor shall inform and seek the permission of the S.O. for any openings or holes require in floors, beams, wall, partitions, ceiling or any section under the contractor's work before proceeding with the cutting or hacking. Wherever possible, the Contractor openings so that he may be incorporated in the building construction. In such cases, the Contractor shall fix the location of the openings and coordinate his measurements with the Contractor on site as the work progresses. Failure on the part of the Contractor to do so will result in the Contractor having to carryout this work at his own expenses.

Any damage to finished Contractor's work caused by the Sub-Contractor shall be made good at the latter's expense.

## **20. Protection Of Plant And Materials**

The Contractor shall be entirely responsible for all apparatus, equipment and materials furnished by him in connection with this work, and special care shall be then to protect all parts, thereof in such a manner as may be necessary or as directed.

This protection shall include covers, erasing, stores, sheds or other means to protect the apparatus, equipment and materials from the weather and the ingress of dirt, grit, plaster or other foreign substances. Special care shall be taken to keep all open ends of pipes, ducts, etc., closed while in storage or in the course of installation, and to keep hangings supplied and placed in their proper position.

The Contractor will be allocated space for storage and huts. Huts shall be not be erected without prior reference to the contractor.

## **21. Protection Of Property And Personnel**

The Contractor shall take precautions to avoid causing unnecessary damage to the work of other trades.

The Contractor's workmen will be required to conform to the general regulations governing personnel on the site and must keep to the working space allocated to him. The interest of the project must be safeguard in every way and any person interfering with the job or making himself objectionable will be liable to be dismissed.

All precautions shall be taken for the safety of personnel on site. Barriers shall be erected and warning notices displayed where required and as directed by the Superintending Officer.

## **22. Patent Rights**

The Contractor shall fully indemnify the Government against any action, claims or demands, costs or expenses arising from or incurred by or infringement of letters, patent rights and design, trademark or name, copyright or other protected means in respect of any machine, plant work, materials or things, system, method of using, fixing working or arrangement used, fixed or supplied by him or the sub-ordinate Contractor to whom he has sublet the portion of work.

All payments or royalties payable in one sum or by installments or otherwise shall be included by the Contractor in his tender, and shall be paid by him to whom they may be due or payable.

In the event of any claims being made or action brought against the Government in respect of such matters as aforesaid the Contractor shall immediately be notified there of, and he shall, at his sole expense, conduct all negotiations for the settlement of the same or any litigation that may arise there from.

## **23. Payments Adjustments Etc.**

The payments of the Contractor and the adjustment of the correct amount from time to time shall be carried out in accordance with the following clauses and the signing of the contract by the contractor shall be taken as the acceptance of these terms.

### 23.1 Statements

The contractor shall submit with each claim for progress payments, a statement or account on the proper form containing the following:

- i. Value of work carried out on the site, with sufficient details to enable the Superintending Officer to make an assessment of values.
- ii. If so required by the Superintending Officer, receipts other evidence of payments made to merchants by the Contractor.
- iii. A proper statement of account showing the contract amount and the item, and amounts of any variation authorized since the proceeding statement, whether additions or deductions, together with any docket schedule of quantities or other information necessary for the checking thereof.

### 23.2 Variations

If the Sub-contractor in the course of executing the Contract discovers a discrepancy which would require a variation, he shall notify the Superintending Officer and the claim for the variation shall be attached to his notification. However, no work shall be done until a variation order has been issued by the Superintending Officer. No payment shall be made or any extra work done other than those authorised by the Superintending Officer.

If the opinion of the Sub-contractor, any instructions issued by the Superintending Officer involve extra work, he shall make a claim and receive a variation order for same before proceeding with such work.

## 24. Operating Instructions And Tutition

After completing the installation and before handing it over to the **Jabatan Ketua Pengarah Tanah Dan Galian Persekutuan Negeri Kelantan**, the Contractor shall arrange to instruct, free of charge, one or more **Jabatan Ketua Pengarah Tanah Dan Galian Persekutuan Negeri Kelantan**, in all aspects of correct operation and maintenance of the installation, including checking and fault finding in case of breakdown during normal working hours. This period of instruction shall extend for a minimum of four (4) weeks with the plant in continuous normal operation.

In conjunction with the above tuition, the Contractor shall supply in triplicate printed sets of operating instructions which shall clearly indicate the sequence of operation for starting and stopping the entire plant and shall include the precautions to be taken. The operating instructions shall complete with an "As completed wiring diagram and a schematic layout of the operating instructions shall be supplied permanently mounted in a glazed frame to be hand up on the plant room wall adjacent to the electrical switch board.

## 25. Repair Manuals And Spare Parts

The Contractor shall supply in triplicate complete sets of repair manuals and spare parts books for all the equipment comprising the complete installation installed by hi. In addition, the contractor shall submit in triplicate, within one month of notification, a detailed, and itemized list of equipment and spare parts, which the manufacturer's of the supplied equipment consider as essential to be kept in ready stock for the purpose of yearly service and maintenance. Each item shall be priced in the original contract submission.

## 26. Tools

The Contractor shall supply a complete set of tools for testing & commissioning. The Contractor shall supply a complete the following equipment for use during the contract period

Note: Type and model of the equipment will discuss later within the budget.

## 27. Testing And Commissioning

On completing the installation work for the complete mechanical system, the Contractor shall carry out tests on all individual sections of the system to prove that the individual specified for all equipment can be produced and maintained. He shall also carry out tests on the plant as a whole to prove that the equipment has been properly adjusted and calibrated to produce the required guaranteed performance as called for according to specifications of this tender.

The Contractor shall notify the **Jabatan Ketua Pengarah Tanah Dan Galian Persekutuan Negeri Kelantan**. when these tests are to be conducted so that a **Jabatan Ketua Pengarah Tanah Dan Galian Persekutuan Negeri Kelantan**. representative may be present to see that the tests are carried out satisfactorily.

Further adjustments to the control shall also be made whilst the building is occupied and the installation is in use during the defects liability period. No additional cost shall be charged in carrying out these adjustments.

## 28. Maintenance And Guarantee

The maintenance and guarantee period shall be one year from the date of handing over the completed installation to the Jabatan Kerja Raya. This guarantee shall include those provide by the manufacturer of the equipment installed and all materials and workmanship supplied by the Contractor.

During this period, the Contractor shall at his own expense, remedy and supply/replace all defective parts or items, inclusive of all consumable items so that the complete mechanical system is maintained in a first class running order. This maintenance shall include regular and systematic checking, cleaning and necessary adjustments to the equipment. The Sub-Contractor shall also provide adjustments to the service as required by the **Jabatan Ketua Pengarah Tanah Dan Galian Persekutuan Negeri Kelantan** in the event of a breakdown of the plant. Replacement made during the maintenance and guarantee period may, at the discretion of the Superintending Officer be subjected to a similar maintenance and guarantee period from the date of replacement.

## 29. Names And Alternative Offers

Whenever proprietary names are mentioned in this Specification or in the Drawings they are indicative of the type and quality only. Articles of alternative manufacture may be considered provided they are equal in all respects as regards design, quality, appearance and finish.

Any alternative offer which differs from that specified in this specification must be clearly stated and described by the tenderer under the Schedule Of Altenative in this document.

## 30. Schedule Of Prices

The tenderer shall complete the Schedule of Prices as set out in this document. All prices quoted shall be inclusive of Government Custom Import Duty and Government Surtax at current rate.

### **31. Schedule Of Rates**

The tenderer shall complete the Schedule of Rates as set out in this document. The price quoted shall include cost of materials, cutting, fixing in position, labour, supervision, labour, supervision, profit and everything else necessary for the completion of the installation.

This schedule shall be part of the tender and the event of the contract being awarded the quantities and extension shall be cancelled and the net rates in the said schedule shall be used for the measurement and valuation of any alteration for addition to or omission from the works as described in this Specification and drawings. If, however, it is not practicable to apply the net rates in the manner mentioned above, such alternations, additions and omissions as are ordered shall be valued at rates or prices as may be agreed but where the valuation of the said alterations, additions and omissions cannot be so agreed, then on the basis of the value of the material used and labour employed thereon in day work at the day work rates quoted in this tender.

### **32. Power Factor Requirement**

The monthly average power factor of all the equipment supplied shall be not less than 0.90.

The above condition is to be achieved by power factor improvement equipment or devices, if the power factor correction is done other than at the load, then 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 equipment used shall conform to IEC 70/70A standards and shall be suitable for continuous operation at a nominal voltage of 415V and up to 440V, 50Hz, 3 phase. Capacitors used shall be dry type with self-healing protective and discharge devices. Loss shall not exceed 0.5/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 & 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. AK.W.hr meter & a KVar.hp meter shall be incorporated in switchboards with a connected total rated equipment load of 50kw and above. This 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.

## SECTION 3

### TECHNICAL SPECIFICATION

#### 1. Scope Of Work

The work above shall be carried out in accordance with the specification.

The work covered by this section consist of furnishing all labor, supervision, material and equipment necessary in work, complete and tested ready for satisfactory service as shown and as specified.

#### 2. Regulations And Standards

Generally, the equipment and installation shall lie in accordance with the following:

- i. The requirement of the relevant Statutory Authority
- ii. The requirement of the Factory and Machinery Department
- iii. The requirement of the Director General of Electricity Supplies Authority
- iv. The requirements of the Local Telecommunications Authority.
- v. The requirements of the Fire Authority Jabatan Bomba Malaysia.
- vi. The requirements of the Government Health Authority
- vii. The requirements of the Environmental Authority, Jabatan Alam Sekitar.
- viii. The requirements of the applicable Building Regulations.
- ix. The requirements of the local electricity supply agency Tenaga Nasional Berhad.

#### 3. Air-Conditioning

##### 3.1 Air Cooled Split Unit

Each air-cooled split unit shall consist of an air-cooled condensing unit and fan coil unit. The condensing unit shall contain hermetic compressors and the air-cooled condenser complete with fan(s) and motor drives. The fan coil unit shall contain direct expansion cooling coil/s complete with centrifugal fan(s) with drives, refrigerant controls and accessories.

The air-cooled split unit system for standard rating temperatures and minimum coefficient of performance (COP) shall be accordance with Table 1 and Table 2.

**Table 1: ACMV system equipment, electrically driven: Standard rating temperatures – cooling (MS1525:2007)**

| Item                             | Air-cooled |          | Water-cooled (water-source) |        |
|----------------------------------|------------|----------|-----------------------------|--------|
|                                  | Dry-bulb   | Wet-bulb | Inlet                       | Outlet |
| Room air entering equipment (°C) | 27         | 19       | -                           | -      |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |    |    |      |      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|------|------|
| Condenser ambient<br>(air-cooled) (°C)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 35 | 24 | -    | -    |
| Refrigerant-water heat<br>exchanger (°C)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | -  | -  | 29.4 | 35.0 |
| <p>NOTES:</p> <p>1. Data in this table apply to following types of equipment:</p> <p>a. Central Air Conditioners Air Evaporatively and Water Cooled, ARI Std 210/240</p> <p>b. Commercial/ Industrial Unitary Air-Conditioning Equipment, ARI Std 340/360</p> <p>2. Standard Ratings are also based on other standard rating conditions such as but not limited to electrical conditions; cooling air quality, requirements for separated (split) assemblies; and minimum external static conditioned-air flow resistance, as provided in the applicable standards.</p> |    |    |      |      |

**Table 2: Unitary air-conditioners, electrically driven: Minimum COP – cooling  
(MS1525:2007)**

| Equipment                                                 | Size                                            | Sub-category                       | Minimum COP |
|-----------------------------------------------------------|-------------------------------------------------|------------------------------------|-------------|
| Air Conditioners:<br>Air cooled with<br>condenser         | < 19 kW <sub>r</sub>                            | Split system                       | 2.7         |
|                                                           |                                                 | Single package                     | 2.7         |
|                                                           | ≥ 19 kW <sub>r</sub> and<br><35 kW <sub>r</sub> | Split system and Single<br>package | 2.6         |
|                                                           | ≥ 35 kW <sub>r</sub>                            | Split system and Single<br>package | 2.5         |
| Air Conditioners:<br>Water and<br>evaporatively<br>cooled | < 19 kW <sub>r</sub>                            | Split system and Single<br>package | 3.0         |
|                                                           | ≥ 19 kW <sub>r</sub> and<br><35 kW <sub>r</sub> | Split system and Single<br>package | 3.5         |
|                                                           | ≥ 35 kW <sub>r</sub>                            | Split system and Single<br>package | 3.6         |

### 3.1.1 Condensing Section

#### i. Compressors

The compressor shall be of hermetic Rotary type and shall be assembled complete with all necessary accessories on a steel base with vibration isolator e.g. spring-mounted type.

Compressors shall be equipped with oil failure control, dual pressure control, safety valves, suction and discharge valves, crankcase heaters, suction gas strainer, oil sight glass and other accessories if necessary. The condenser shall be suitable for condensing temperature at 48°C (120°F) with air entering at 35 °C (95 F) DB.

The compressor and motor shall be run not more than 2900 rpm and the compressor cooling capacity rating and power rating shall be based on approved standard. The motor shall be of the AC Induction type specifically designed for operation on 400 volts (+10%,-6%), 3 phase, 50 Hz single phase electric supplies, where ever applicable.

#### ii. Refrigerant

Therefrigerant used in the split units shall be R22/R410A.

#### iii. Condenser Fan/s and Motor/s

The condenser fan/s shall be propeller type, direct driven by heavy duty motor with aluminium blades, zinc plated steel tube and spiders, and shall have safety guards not concealed by casing.

#### iv. Condensing Coil

The condensing coil of each condensing coil shall be extended surface direct expansion coils of factory approved, constructed from copper tube with aluminium fins or copper fins or as specified in Schedule of Design Requirement and having not less than 8 finsper 25 mm. Bonding of the fins to the tube shall be by mechanical means to ensure a positive lasting bond. The coil shall be fitted with headers and a suitable distribution network designed to produce uniform distribution of refrigerant over the face of the coils. Each header shall be fed through a thermal expansion valve and solenoid valve.

#### v. Condensing Unit Casing

The casing shall be fabricated from galvanized mild steel sheets properly formed for close fit and structural rigidity. The cabinet frame shall be all-welded. All access panels shall be so constructed as to be easily removable. All inside and outside surfaces of the cabinet shall be wear-resistant baked-on enamel, attractively finished.

#### vi. Condensing Unit Bracket/ Support

All condensing units shall be properly supported and anchored to the building structure using galvanised steel brackets and supports which shall be fixed to the building structure by means of inserts or expansion shields of adequate size and number to support the loads imposed there on.

vii. Anti Corrosion Coating for Marine Condition (if required)

All aluminium fins for the condensing coil shall have **anti corrosion coating** able to withstand 1000 hours salt spray test run in accordance with JIS-Z-2371, 1988.

The condensing unit casing, bracket and support shall in addition be protected with anti-corrosion coating. The anti-corrosion coating material and method statement shall be approved by S.O.

### 3.1.2 Fan Coil Section

i. Casing Construction

The fan coil unit housing shall be constructed from hard plastic reinforced and braced with steel angle framework for maximum rigidity. Each unit shall have predrilled flanges with identical hole locations to permit easy assembly of adjoining sections or modules.

ii. Insulation for casing of ceiling cassette fan coil unit

iii. The casing for the fan coil unit (ceiling cassette type) in the ceiling space immediately below the roof and non conditioned area shall be externally insulated with not less than 10 mm thick, closed cell nitrile rubber to . The closed cell nitrile rubber insulation shall have density of not less than 55 kg/m<sup>3</sup> and shall have thermal conductivity not more than of 0.036 W/m.K. The closed cell nitrile rubber insulation shall be fire-retardant and the insulation material shall be approved by Jabatan Bomba dan Penyelamat Malaysia.

iv. Evaporator Cooling Coils

The cooling coils of each unit shall be extended surface direct expansion coils of approved manufacture, constructed from copper tube with aluminium fins or as specified in Schedule of Design Requirement and having not less than 8 fins per 25mm. Bonding of the fins to the tube shall be by mechanical means to ensure a positive lasting bond. The coils shall be fitted with headers and a suitable distribution network designed to produce uniform distribution of refrigerant over the face of the coils. Each header shall be fed through a thermal expansion valve and solenoid valve.

v. Centrifugal Fan

The fan/s of each unit shall be double width, double inlet, multi-blade centrifugal type. All fans shall be statically and dynamically balanced and tested after being installed on properly sized hollow or solid shafts. The fan housings shall be constructed with die- formed streamlined inlets and side sheets.

The maximum outlet velocity of the fans shall not exceed 9.1 m/s (1800 fpm). The fans shall be either forward curve or backward inclined and airfoil depending on the sizes.

vi. Air Filters

The air filters for the unit shall be with an average Dust Extraction Efficiency on A.F.I. Test of at least 80% and washable. Test certificate for the above condition shall be made available. Filters shall be arranged in banks in sufficient numbers to operate on the correct manufacturer's rating. The filter frame shall consist of an outer section able to be permanently mounted and a quick release removable gate section from which the filters only can be removed for changeover and washing. The frame shall be fabricated from 1.25mm thick zinc coated annealed steel, phosphated after fabrication, prime etched and enamel paint finished. Heavy aluminium frames may also be used. The filters shall be supported on both sides by 12 gauge wire mesh at intervals of not more than 100mm apart in each direction.

vii. Remote Controller

The air cooled split unit controllers shall be mounted in an individual casing. Individual wired at maximum height of 1.5 meter from floor level or wireless remote controller shall be provided. All controllers shall be of factory-assembled and tested.

### **3.1.3 Anti-Recycle Protection**

The system shall be coupled with anti-recycle protection to prevent the compressor to restart again immediately after it was stopped.

## **3.2 Pipeworks**

### **3.2.1 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 in accordance with the best engineering practice to conform the diagrams and layouts shown in the Tender Drawings.

### **3.2.2 Regulations**

All pipelines shall be constructed in accordance with the relevant Regulations and Standard.

### **3.2.3 Type of Pipes**

i. Refrigerant Piping

All refrigerant pipes for the air-conditioning system shall be constructed from hard drawn seamless copper refrigerant pipes with copper fittings and silver soldered joints. The refrigerant piping arrangements shall be in accordance with good practice within the air-conditioning industry, and are to include expansion valves, solenoid valves, shut off valves, strainers, sight glass, charging connections, suction line insulation and all other such items normally

forming part of proper refrigerant circuits.

The sizes of the refrigerant piping shall conform to the requirements of the system capacity specified. The Air-Conditioning Contractor will be entirely responsible for the correct refrigerant piping design and the proper interconnections of the complete refrigerant circuit.

The suction line pipe size, the hot-gas line pipe size and the liquid line pipe size shall not be less than the manufacturer's specified outside diameter. All refrigerant pipes shall be properly supported and anchored to the building structure using steel hangers, anchors, brackets and supports which shall be fixed to the building structure by means of inserts or expansion shields of adequate size and number to support the loads imposed there on.

Complete charge of refrigerant and approved refrigerant oil for the normal operation of the air-conditioning system shall be furnished and installed by the Air-Conditioning Contractor. Where refrigerant piping above 80mm O.D has to be used, then the refrigerant piping may be constructed from extra heavy quality black iron steam pipes with welded joints, in lieu of hard drawn copper refrigerant pipes.

Up to and including 50mm bore, pipes shall be seamless copper to BS 659. Above 65 mm (2½") bore pipes shall be galvanized steel heavy gauge to BS EN 10255:2004.

ii. Drain Pipes

Drain pipes shall be of PVC Class C for all sizes.

### **3.2.4 Insulation of pipes**

i. Refrigeration Pipe

The whole of the liquid and suction refrigerant lines including all fittings, valves and strainer bodies, flanges, etc. shall be insulated with 50 mm thick closed cell flexible expanded rubber compound or approved equivalent.

ii. Drain Pipe

All drain pipe carrying condensate water from AHU/FCU shall be insulated with 25 mm thick closed cell flexible expanded rubber compound to prevent condensation.

## **3.3 Ventilation And Exhaust Systems**

### **3.3.1 Exhaust Fan**

All exhaust fans shall be of the propeller or centrifugal type as indicated in the Schedule of Design Requirement. Each fan shall be capable of continuous operation and shall have a capacity as indicated in the Schedule Design Requirement and in the accompanying drawings, when running at the speed specified against the friction in the system.

The exhaust fans shall be manufactured from PVC or plastic type fans and shall be accurately balanced on bright steel shaft in ball or sleeve

bearings. The fans shall be window-mounted or wall-mounted to suit the particular installations. Wall mounted fans shall be supplied with wall boxes and wall plates suitable for removal for cleaning, or built-in wall where shown in the accompanying drawings.

The fan motors shall be suitable for operation on single phase, 230V and 50 cycles supply. Where specifically indicated controllers and/or suitable speed regulators giving a minimum of 3 forward speeds and 'off' shall be supplied.

### **3.3.2 General Exhaust System**

General exhaust system shall be supply and install as per tender drawings and Schedule of Design Requirement. The exhaust system supply and install shall be in accordance with good engineering practice and shall be most suitable to the application or desired objectives.

### **3.3.3 Ducts and Fittings**

All ductwork, diffusers, grilles, dampers, quadrants, insulation hangers, supports and all other accessories shall be supply and install as indicated in the tender drawings.

For all ducts that are exposed to the outside, they shall be fitted with weather proof hood or cover.

### **3.3.4 Interlocking Devices**

Interlocking devices shall be supplied and installed as indicated in the drawing and Schedule of Design Requirement.

The interlocking devices shall operate in such a way, that, fans associated with each air conditioning zone or function unit shall be interlocked as a group with the fans to operate when the unit is operating and to stop when the unit stops.

### **3.3.5 Fan Switches**

Fan switches shall be supply and install at the location as indicated in the drawings. A power supply connection terminated to an isolator will be provided under Electrical Works. All the wiring necessary from the isolator onwards to all the A/C equipment shall be done by the Contractor. The type of switches is also described in the drawing and the Schedule of Design Requirement.

## **3.4 Electrical Motor Efficiency Requirement**

### **3.4.1 General**

All electric motors shall be drip proof, fan cooled and fully tropicalised, and shall be furnish with Class "E" insulation to BS 2757 and BS 2613 and shall be specifically designed for operation on 50 cycles electric power supplies. All electric motors shall be furnished with isolator gears and appropriate starter gears which shall be fully tropicalised and comply with BS 587.

All motors of 1.1 kW and above shall be wound for 400V/3 ph/50 Hz electric supply. All motors less than 1.1 kW shall be designed for 230V/1ph/50Hz electric supply.

Thermal overload protection devices in all phases, over current devices and under voltage releases shall be furnished and incorporated in the circuits of all the electric motor.

### 3.4.2 Output Rating and Duty

Unless specific circumstances apply, motor continuous rating should not normally exceed 30% of its estimated maximum load.

### 3.4.3 Motor efficiencies

All A.C. 2 pole and 4 pole, 3 phase induction motors, in the range 1.1 to 90 kW shall be high efficiency motors, EFF1 or EFF2 classified under MS1525:2007 as shown in Table 4 and Table 5. Selection of efficiency class shall be as follows:

**Table 3: Selection of Efficiency Class**

| Application          | Efficiency Class |
|----------------------|------------------|
| Chilled Water Pump   | EFF1             |
| Condenser Water Pump | EFF1             |
| Cooling Tower Fan    | EFF1             |
| AHU Blower Fan       | EFF1             |
| Exhaust Fan          | EFF1             |

Motor energy efficiencies are to be tested according to MS IEC60034-2:2005 or its latest edition.

**Table 4: Class definition for 4-pole motors (MS1525:2007)**

| Motor Capacity<br>(kW ) | Motor Efficiency (%) |                  |
|-------------------------|----------------------|------------------|
|                         | Motor Class Eff2     | Motor Class Eff1 |
| 1.1                     | ≥ 76.2               | ≥ 83.8           |
| 1.5                     | ≥ 78.5               | ≥ 85.0           |
| 2.2                     | ≥ 81.0               | ≥ 86.4           |
| 3                       | ≥ 82.6               | ≥ 87.4           |
| 4                       | ≥ 84.2               | ≥ 88.3           |
| 5.5                     | ≥ 85.7               | ≥ 89.2           |
| 7.5                     | ≥ 87.0               | ≥ 90.1           |
| 11                      | ≥ 88.4               | ≥ 91.0           |
| 15                      | ≥ 89.4               | ≥ 91.8           |
| 18.5                    | ≥ 90.0               | ≥ 92.2           |
| 22                      | ≥ 90.5               | ≥ 92.6           |
| 30                      | ≥ 91.4               | ≥ 93.2           |
| 37                      | ≥ 92.0               | ≥ 93.6           |
| 45                      | ≥ 92.5               | ≥ 93.9           |

| Motor Capacity<br>(kW ) | Motor Efficiency (%) |                  |
|-------------------------|----------------------|------------------|
|                         | Motor Class Eff2     | Motor Class Eff1 |
| 55                      | ≥ 93.0               | ≥ 94.2           |
| 75                      | ≥ 98.6               | ≥ 94.7           |
| 90                      | ≥ 93.9               | ≥ 95.0           |

**Table 5: Class definition for 2-pole motors (MS1525:2007)**

| Motor Capacity<br>(kW ) | Motor Efficiency (%) |                  |
|-------------------------|----------------------|------------------|
|                         | Motor Class Eff2     | Motor Class Eff1 |
| 1.1                     | ≥ 76.2               | ≥ 82.8           |
| 1.5                     | ≥ 78.5               | ≥ 84.1           |
| 2.2                     | ≥ 81.0               | ≥ 85.6           |
| 3                       | ≥ 82.6               | ≥ 86.7           |
| 4                       | ≥ 84.2               | ≥ 87.6           |
| 5.5                     | ≥ 85.7               | ≥ 88.6           |
| 7.5                     | ≥ 87.0               | ≥ 89.5           |
| 11                      | ≥ 88.4               | ≥ 90.5           |
| 15                      | ≥ 89.4               | ≥ 91.3           |
| 18.5                    | ≥ 90.0               | ≥ 91.8           |
| 22                      | ≥ 90.5               | ≥ 92.2           |
| 30                      | ≥ 91.4               | ≥ 92.9           |
| 37                      | ≥ 92.0               | ≥ 93.3           |
| 45                      | ≥ 92.5               | ≥ 93.7           |
| 55                      | ≥ 93.0               | ≥ 94.0           |
| 75                      | ≥ 98.6               | ≥ 94.6           |
| 90                      | ≥ 93.9               | ≥ 95.0           |

### 3.4.4 Power Factor Requirement

All motor from 2 hp. to 100 hp. shall have a power factor of not less than 0.85 at 80% loading.

Motors over 100 hp. shall have a power factor of not less than 0.90 at 80% loading. The abovecondition is to be achieved by power factor improvement equipment or devices. However, ifthe power factor correction is done other than at the load, than the cabling, electrical switchingprotection devices between the load and the point of correction shall be rated according to theworst power factor condition that they may be subjected to.

Power factor improvement equipment used shall conform to IEC 70/70A standards and shall be suitable for continuous operation at a normal voltage of 415 V and up to 440 V,50 Hz, 3 phase.

Capacitors used shall be dry type with self-healing properties and discharge devices. Loss shall not exceed 0.5 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 15 VA and minimum accuracy of Class 1.

A kW-hr meter and a kVAR meter shall be incorporated in switchboards with a connected total load of 50 kW and above.

This Contractor shall be liable to pay any surcharge, or part thereof, levied by the Tenaga Nasional as a consequence of low power factor of the installed equipment.

### **3.5 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.

#### **3.5.1 Description of System**

The work specified under this section shall include but not necessarily limited to the following:

- i. All noise and vibration generated by mechanical equipment shall be isolated from the building structure.
- ii. All piping and ductwork in the building which is connected to vibration isolated equipment shall be isolated at connections to the building structure.
- iii. All piping and ductwork in equipment rooms and up to 15m from vibrating equipment shall be isolated from the building structure by means of noise and vibration isolation hanger, guides and supports.
- iv. All piping and ductwork vertical risers shall be isolated from the building structure by means of noise and vibration isolation guides and supports.
- v. All piping and ductwork to be isolated according to this section of the specifications shall freely pass through walls and floors without rigid connections. Penetration points shall be sleeved or otherwise formed to allow passage of piping or ductwork, and maintain a minimum of 1"

and maximum of 2" clearance around the outside surfaces. This clearance space shall be tightly packed with fibrous material or with engineered pipe penetration seals and shall be caulked airtight and water proof after installation of the piping or ductwork.

The whole of the work, including the particulars and/or deviations shown on the drawings and/or specified in the following clauses shall be in accordance with the appropriate ASHRAE Standards or such other National Standards as may be approved by the SO.

### **3.5.2 Design Standards and Verifications**

The design of noise and vibration control equipment shall comply and not limited to the following Codes and Authorities:

- i. ASHRAE 2003 (Chapter 47 – Noise and Vibration Control)
- ii. SMACNA
- iii. ARI 885 - 1998

Submittals and data requirements:

- i. Descriptive Data:
  - a. Schedules of equipment isolator.
  - b. Catalogues and data sheets on vibration isolators.
- ii. Detailed and dimensioned Working Drawings including:
  - a. Details of equipment bases including dimensions, structural member sizes and support point locations.
  - b. Details of isolation hangers for ceiling hung equipment, piping and ductwork.
  - c. Details of mountings for floor supported equipment, piping and ductwork.
  - d. All hanger, mounting or pad drawings shall indicate deflections and model numbers as well as any other requirements in the specifications.
  - e. Spring diameters, rated loads and deflections, heights at rated load and closed height shall be provided for all springs shown in the submittals in tabular form.
  - f. Complete flexible connector details.

### **3.5.3 Noise Control**

The sound power levels of the equipment shall be carefully examine as well as construction and installation methods to ensure that the equipment selection meets the sound level required.

All adjustments, modifications and testing shall be carried out to achieve the specified noise level. All supplied equipment from which noise is emanated shall be selected such that specified noise levels are not exceeded or shall be fitted with approved sound attenuation.

All rotating machine shall be properly balanced and shall be designed with clearances and mechanisms suitable for the noise level requirements.

Rotating machinery shall be mounted on approved vibration isolating mountings. The mountings shall be protected from drips and damage, and where necessary, additional mass shall be fixed to the machinery to damp

vibration.

The loading of the mounting shall be adequate to ensure correct operation. Materials used to seal the spaces containing the isolating materials shall be flexible so that vibration is not transmitted and the seal is not damaged.

All connections to rotating machinery shall be of flexible type. Duct connections shall be isolated by flexible nylon fabric or canvas connections.

Pipe connections shall be suitably flexed for the duty involved. Approved flexible connectors shall be provided where insufficient flexibility can be transmitted to the building structure. Flexibility connectors shall be so positioned that no stress can be put on the pipes due to end reaction. Electric motors for all air conditioning unit and ventilation fans shall be quiet in operation to deliver noise level criteria as set out in Table 6.

On completion of the installation, precise measurements of the noise levels in the various areas shall be made. Octave band sound pressure levels in the various areas within the building and at certain positions outside the building due to the operation of the equipment included in this contract shall not exceed the noise level criteria set out in the Table 6.

Where dispute arises over the classification of any area under the following schedule the S.O. determination of the space type and function of the area, as listed in Table 6, shall be final.

**Table 6 : Recommended Noise Criteria (NC) – Room Criteria (RC) and Maximum Sound Pressure Level (Lp) for Different Indoor Activity**

| Type of Area                       | Max Level NC-RC |          |
|------------------------------------|-----------------|----------|
|                                    | Level           | Lp (dBA) |
| <b>RESIDENCES</b>                  |                 |          |
| Residences, Apartment, Condominium | 35              | 40       |
| <b>HOSPITALS &amp; CLINICS</b>     |                 |          |
| Private rooms                      | 35              | 40       |
| Operating rooms                    | 40              | 45       |
| Wards, corridors                   | 40              | 45       |
| Laboratories                       | 40              | 45       |
| Lobbies, waiting rooms             | 45              | 50       |
| Washrooms, toilets                 | 50              | 55       |
| <b>OFFICES</b>                     |                 |          |
| Board rooms                        | 30              | 35       |
| Conference rooms                   | 35              | 40       |
| Teleconference rooms               | 25              | 30       |
| Executive offices                  | 40              | 45       |
| General offices                    | 40              | 45       |
| Reception rooms                    | 45              | 50       |

| Type of Area                                            | Max Level NC-RC |          |
|---------------------------------------------------------|-----------------|----------|
|                                                         | Level           | Lp (dBA) |
| General open offices                                    | 45              | 50       |
| Drafting rooms                                          | 45              | 50       |
| Halls & corridors                                       | 60              | 65       |
| Tabulation and computation areas                        | 50              | 55       |
| <b>AUDITORIUMS</b>                                      |                 |          |
| Multi-purpose halls                                     | 30              | 35       |
| Lecture halls                                           | 35              | 40       |
| Planetariums                                            | 35              | 40       |
| Lobbies                                                 | 45              | 50       |
| <b>LABORATORIES (with fume hoods)</b>                   |                 |          |
| Testing/research, minimal speech communication          | 55              | 60       |
| Research, extensive telephone use, speech communication | 50              | 55       |
| Group Teaching                                          | 45              | 50       |

**Table 6: Recommended Noise Criteria (NC) – Room Criteria (RC) and Maximum Sound Pressure Level (Lp) for Different Indoor Activity (cont')**

| Type of Area                                        | Max Level NC-RC |           |
|-----------------------------------------------------|-----------------|-----------|
|                                                     | Level           | Lp (dBA)  |
| <b>PERFORMING ARTS SPACES</b>                       |                 |           |
| Drama Theaters                                      | <b>25</b>       | <b>30</b> |
| Concert and recital halls                           | <b>25</b>       | <b>30</b> |
| Music Teaching Studios                              | <b>25</b>       | <b>30</b> |
| Music Practice Rooms                                | <b>35</b>       | <b>40</b> |
| <b>MASJID / RUMAH IBADAT</b>                        | <b>35</b>       | <b>40</b> |
| <b>SCHOOLS</b>                                      |                 |           |
| Lecture/Classrooms                                  | <b>40</b>       | <b>45</b> |
| Classrooms up to 750 ft2 [75 m2]                    | <b>40</b>       | <b>45</b> |
| Classrooms over 750 ft2 [75 m2]                     | <b>35</b>       | <b>40</b> |
| Lecture rooms for more than 50 (unamplified speech) | <b>35</b>       | <b>40</b> |
| Laboratories                                        | <b>45</b>       | <b>50</b> |
| Recreation halls                                    | <b>50</b>       | <b>55</b> |
| Corridors & halls                                   | <b>50</b>       | <b>55</b> |
| <b>PUBLIC LIBRARIES</b>                             |                 |           |

| Type of Area                                          | Max Level NC-RC |          |
|-------------------------------------------------------|-----------------|----------|
|                                                       | Level           | Lp (dBA) |
| Libraries, museums                                    | 40              | 45       |
| <b>COURT ROOMS</b>                                    | 40              | 45       |
| i) Unamplified speech                                 | 35              | 40       |
| ii) Amplified speech                                  | 40              | 45       |
| <b>RESTAURANTS, CAFETERIA</b>                         |                 |          |
| Restaurants                                           | 45              | 50       |
| Cafeterias                                            | 50              | 55       |
| <b>INDOOR SPORTS ACTIVITIES</b>                       |                 |          |
| Gymnasiums                                            | 45              | 50       |
| School and college gymnasiums                         | 50              | 55       |
| Large seating capacity spaces (with amplified speech) | 55              | 60       |
| <b>AIRPORT</b>                                        |                 |          |
| Tickets sales offices                                 | 40              | 45       |
| Lounges, waiting rooms                                | 50              | 55       |
| <b>OUTSIDE MECHANICAL PLANT ROOM</b>                  |                 |          |
| 1m away from external wall                            | 70              | 75       |

#### 3.5.4 Vibration Control

The vibration isolation shown on the drawings and Specification is as per minimum requirement. The installed equipment isolator shall be able to damp the vibration to the magnitude as per manufacturer's recommendation.

All vibration isolation shall be mounted on vibration isolators and complete with the flexible connections to prevent the transmission of vibration and noise to the building structure. Vibration isolators shall be selected in accordance with the weight distribution.

Mountings installed outdoor shall be protected from corrosion as per recommended by manufacturer with a minimum of cold galvanizing paint if not specified. For corrosive environment, the minimum requirement shall be of hot dipped galvanized.

The isolators installed for all mechanical equipment shall have a minimum deflections as per listed in the Vibration Isolators in Table 7 below. Any dispute arises in Table 17; all decision shall be referred and decided by S.O.

**Table 7 : Vibration Isolators Schedule**

| Equipment                                                                                      | Isolators                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Remarks                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Centrifugal, Screw and Reciprocating Chiller                                                   | <ol style="list-style-type: none"> <li>1. Restrained type steel spring in series with a layers on top and bottom plate each 9.0mm minimum thick neoprene pads/ natural rubber. <ul style="list-style-type: none"> <li>• When equipment on stable ground minimum deflection is 19mm.</li> <li>• When equipment on concrete slab above floor level the minimum deflection is 38mm.</li> </ul> </li> </ol>                                                                           | <ol style="list-style-type: none"> <li>a) There should not be any rigid ties to any structure. All Connection shall be flexible.</li> <li>b) All pipe work within the plant room shall have steel spring hangers of min 25 mm total static deflections in series with neoprene.</li> </ol>                                                                                                         |
| Chilled Water Pump, Condenser Water Pump and All Other (End Suction, Split Casing, and Others) | <ol style="list-style-type: none"> <li>1. Un-housed type steel spring in series with a layer of 9.0mm minimum thick neoprene pads/ natural rubber. <ul style="list-style-type: none"> <li>• When equipment on stable ground minimum deflection is 19mm.</li> <li>• When equipment on concrete slab above floor level the minimum deflection.</li> </ul> </li> <li>2. Inertia block shall be according to operation weight ratio (min 1:1.2 ratio) and min 150mm thick.</li> </ol> | <ol style="list-style-type: none"> <li>a) There should not be any rigid ties to any structure. All connection shall beflexible.</li> <li>b) All pipe work within the plant room shall have steel spring hangers of min 25 mm total static deflections in series with neoprene.</li> <li>c) The inertia blocks shall be large enough to support the pipe work including the first elbow.</li> </ol> |
| Cooling Towers                                                                                 | <ol style="list-style-type: none"> <li>1. Restrained type steel spring in series with a layers on top and bottom plate each 9.0mm minimum thick neoprene pads/ natural rubber. <ul style="list-style-type: none"> <li>• When equipment on stable ground minimum deflection is 19mm.</li> <li>• When equipment on</li> </ul> </li> </ol>                                                                                                                                           | <ol style="list-style-type: none"> <li>a) There should not be any rigid ties to any structure. All connection shall be flexible.</li> <li>b) All pipe work connected to cooling towers shall have flexible joints.</li> </ol>                                                                                                                                                                      |

| Equipment                                                                                                | Isolators                                                                                                                                                                                                                                   | Remarks                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                          | upper floor or critical area above floor level the minimum deflection is 89mm.                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Air Handling Unit                                                                                        | <ol style="list-style-type: none"> <li>1. A layer of minimum 9.0mm thick neoprene pad.</li> <li>2. For critical area, un-housed type steel springs in series with a layer of 9.0mm minimum thick neoprene pads / natural rubber.</li> </ol> | <ol style="list-style-type: none"> <li>a) There should not be any rigid ties to any structure. All connection shall be flexible.</li> <li>b) All pipe work within the plant room shall have steel spring hangers of min 25 mm total static deflections in series with neoprene.</li> <li>c) Pipe work to equipment shall have flexible joints.</li> <li>d) All ductwork to equipment shall have flexible connection.</li> </ol> |
| Fan coil units (Up to 7.5kW)                                                                             | 1. Spring isolators (floor or hanger type) of minimum 19mm deflections.                                                                                                                                                                     | a) There should not be any rigid ties to any structure. All connection shall be flexible.                                                                                                                                                                                                                                                                                                                                       |
| Fan Coil Units (11kW and above)                                                                          | 1. Spring isolators (floor or hanger type) of minimum 89mm deflections.                                                                                                                                                                     | b) All ductwork to equipment shall have flexible connection.                                                                                                                                                                                                                                                                                                                                                                    |
| Condensing Units                                                                                         | <ol style="list-style-type: none"> <li>1. Floor mounted unit - A layer of minimum 9.0mm thick neoprene pad.</li> <li>2. Suspended type - spring isolators of minimum 38mm deflections.</li> </ol>                                           | <ol style="list-style-type: none"> <li>a) There should not be any rigid ties to any structure. All connection shall be flexible.</li> <li>b) Pipe work to equipment shall have flexible connections.</li> </ol>                                                                                                                                                                                                                 |
| Mechanical Ventilation Fan (Axial, Centrifugal, Fan Heads, Cabinet Fans, Fan Sections) – up to 560mm dia | 1. Double deflection steel spring with neoprene element in shear hanger of supports of min 19mm deflections.                                                                                                                                | <ol style="list-style-type: none"> <li>a) There should not be any rigid ties to any structure. All connection shall be flexible.</li> <li>b) All ductwork to equipment shall have flexible connection (if any).</li> </ol>                                                                                                                                                                                                      |
| Mechanical Ventilation Fan (Axial, Centrifugal, Fan Heads, Cabinet Fans, Fan Sections) – 610mm           | 1. Un-housed type steel spring in series with a layer of 9.0mm minimum thick neoprene pads/                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                 |

| Equipment     | Isolators                                                                                                                                                | Remarks                                                                                   |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| dia and above | natural rubber with minimum 19mm deflection.<br><br>2. Inertia block shall be according to operation weight ratio (min 1:1.2 ratio) and min 150mm thick. |                                                                                           |
| Propeller Fan | 1. A layer of minimum 9.0mm thick neoprene pad.                                                                                                          | a) There should not be any rigid ties to any structure. All connection shall be flexible. |

### 3.5.5 Piping

Equipment installed on vibration isolators exhibits some motion or movement from pressure thrusts during operation. Vibration isolators have even greater movement during starting-up and shutdown. The piping system shall be flexible enough to:

- i. Reduce vibration transmission along the connected piping.
- ii. Permit equipment movement without reducing the performance of vibration isolators.
- iii. Accommodate equipment movement or thermal movement of piping at connections without imposing undue strain on the connections and equipment.

In general, water pipes shall be sized to maintain average flow velocities of not more than 2.2 m/s. Flow velocity at 12 m/s maximum for pipe 50mm and smaller. A pressure drop limitation of 4 ft of water per 100 ft of pipe length with a maximum velocity of 3.0 m/s for larger pipe sizes.

Isolation hangers shall be used for all piping in mechanical equipment rooms and up to 15 m from vibrating equipment. The first three isolation hangers/supports from all mechanical equipment should provide the same deflection as the equipment isolators, with a maximum limitation of 50mm deflection. The remaining isolation hangers within 15 m should be spring or combination spring and rubber with minimum of 20mm deflection.

The first vertical pipe riser entering the building shall be supported by spring isolators designed to support the riser filled with water, if it is a water line. Assigned loads must be within the building design limits at the support points. Neutral central resilient anchors close to the center of the run shall direct movement up and down. The anchors and guides must be rigidly attached to the structure and shall be capable of holding an upward force equal to the water weight when the system is drained. The remaining vertical pipe riser shall be supported by natural rubber/neoprene pad with minimum thickness of 9 mm.

All pipe penetrations through wall; floors and ceiling shall be isolated from direct contact with the structure.

### 3.5.6 Ductwork

The main supply air ductwork shall be internally insulated with acoustic insulation for the length as specified in the tender drawing. If unspecified, it shall be taken as 5m from the fan or 1m beyond the first bend, whichever is the longest.

Isolation hangers shall be used for all ductwork in mechanical equipment rooms and up to 15 m from vibrating equipment. The first three isolation hangers/supports from all mechanical equipment should provide the same deflection as the equipment isolators, with a maximum limitation of 50mm deflection. The remaining isolation hangers within 15 m should be spring or combination spring and rubber with minimum of 20mm deflection.

The acoustic performance of the fiberglass internal insulation of duct shall not be less than those stated in the Table 8 below for the thickness indicated and in accordance to BS EN 20354 / BS 3638. The air erosion resistance for the internal insulation shall not be less than 2500 fpm and comply with ASTM C1071-05e7 and ASTM C1534-07.

**Table 8 : Absorption Coefficient**

| Frequency, Hz                 | 125  | 250  | 500  | 1000 | 2000 | 4000 | NRC  |
|-------------------------------|------|------|------|------|------|------|------|
| Absorption Coefficient (25mm) | 0.08 | 0.20 | 0.56 | 0.93 | 0.84 | 0.92 | 0.63 |
| Absorption Coefficient (50mm) | 0.19 | 0.49 | 0.87 | 0.97 | 0.97 | 1.04 | 0.83 |

### **3.6 Electrical Works**

#### **3.6.1 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.

The Contractor shall provide the following electrical equipments and services:

- i. All electric motors, starters, isolators, cable boxes and isolating switches for the air conditioning and ventilation services.
- ii. Conduit, cable tray, cabling and control wiring from the electrical isolator in the sub-switchboards to the air conditioning switchboards (control panels).
- iii. Conduit, cable tray, cabling and control wiring from the air conditioning switchboards (control panels) to the various items of air conditioning and ventilation equipments.
- iv. All control equipments, control wiring and associated works.

- v. Conduit and wiring including control switches and fused spare outlets as indicated in the tender drawings.
- vi. Conduits wiring for thermostat in the conditioned areas.
- vii. Relays for FF detectors in the AC Control Panel/Switchboard.

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:

- i. Supply, installation and connection of the sub-mains to main air conditioning plant switchboard and to the isolators in the sub-switchboards for the AHUs.
- ii. Lighting and power socket outlets in the plant rooms.

Unless specified elsewhere, all equipment, switchgears, 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, 4 wire, 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.

### **3.6.2 Main Air Conditioning Switchboard**

#### **i. Types Of Air Conditioning Switchboard**

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

- a. Self-contained, floor mounted, flush fronted, metalclad cubicle type suitable for front and rear access;
- b. Self-contained, floor mounted, flush fronted, metalclad cubicle type suitable for front access;
- c. 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 415/240 V (+10%, -6%), 3 phase, 4 wire, 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 IEC60439-5 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        | $I \leq 600A$         | Suruhanjaya Tenaga                                                                                                                                        |
| II       | $600A < I \leq 2000A$ | Suruhanjaya Tenaga & Partial Type Test accordance with MS IEC 60439-1<br>i. Short Circuit Test (Clause:80203)<br>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.**

## ii. Enclosures

### a. 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 but not limited to:

#### 1) Duty & Standby Pump:

- Red, Yellow and Blue lights for phase indication in duplicate.
- Red flashing light for A/C FAIL and PUMP ON MANUAL.
- Green light for PUMP RUN.
- Yellow light for PUMP TRIP.
- START and STOP push button.

- Switch off for A/C isolate and AUTO MANUAL selector switch.
  - An ammeter and voltmeter shall be provided.
  - MANUAL START push button.
  - Amber light for AUTO ON, AUTO CRANK ON, MANUAL ON, and AUTO CRANK FAIL.
  - 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.
- 2) 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.

#### **b. 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 2m 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 2m 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.

### **c. 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 grommets and dust seal to exclude dust and dirt. Meshed louvre 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.

### **iii. 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 colored 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).

iv. **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 'I' and 'O' 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: -

- a. Service - In this position the main and control contacts are engaged.
- b. 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.
- c. 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.

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 earthing bar using of 3mm x 25mm tinned copper tape.

#### v. **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: -

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

vi. **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 overcurrent 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.

vii. **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 gauge 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.

#### viii. **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 <i>typical industrial application</i> |
|         | AC-4                 | Squirrel-cage motors: starting, plugging <sup>1</sup> , inching <sup>2</sup>                                   |
|         | 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                                  |

| Current | Utilization Category | Typical Applications                                                             |
|---------|----------------------|----------------------------------------------------------------------------------|
|         | AC-8c                | Hermetic refrigerant compressor motor control with automatic resetting overloads |

- ix. Plugging – Stopping a motor rapidly by reversing the primary power connection.
- x. 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.

### 3.6.3 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.

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

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

For overcurrent 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 overcurrent 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.

#### **3.6.4 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.

##### **i. 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  $\pm 2\%$ . 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  $\pm 1.5\%$ .

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  $\pm 0.5\%$  at the supply voltage and frequency characteristic. **(For Chiller System Only)**

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  $\pm 1.5\%$ .

Frequency meters shall be of reed type with frequency range from 45 Hz. to 55Hz. and accuracy of  $\pm 5\%$ . 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 °C 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 $\pm 2$ digit |
| Currents (A): per phase             | 0.5% of reading $\pm 2$ digit |
| Frequency (Hz)                      | 0.1 Hz $\pm 1$ digit          |
| Power Factor: total                 | 1% of reading $\pm 2$ digit   |
| Active Power (kW): total            | 1% of reading $\pm 2$ digit   |
| Reactive Power (kVAr): total        | 1% of reading $\pm 2$ digit   |
| Apparent Power (kVA): total         | 1% of reading $\pm 2$ digit   |
| Active Energy (kWh): total          | 1% of reading                 |
| Reactive Energy (kVArh): total      | 1% of reading                 |
| Maximum Demands (A, W, VA): total   | 1% of reading $\pm 2$ 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 (If applicable). All time base logged-in data can be retrieved and downloaded to a personal computer (PC) using serial communication port (If applicable). PC connecting cable and data retrieving PC program shall be provided (If applicable).

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



## ii. **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.

### **3.6.5 Surge Protection Device**

The surge protective devices (SPDs) shall be one-port type compatible with the 240/415V (+10%, -6%), 3 phase, 4 wire, 50Hz with solidly earthed neutral supply system it is protecting. The SPDs shall be of the type complying with MS IEC 61643-1, MS IEC61643 -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 isoceraunic 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 voltageswitching 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 IEC61643-311 respectively.

The maximum continuous operating voltage ( $U_c$ ) of SPDs shall be minimum 175V for SPDs connected between L-N and (L-E). When SPDs connected between (N-E), the rating of  $U_c$  shall be minimum 240V. The continuous operating current ( $I_c$ ) 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 ( $I_{max}$ ) 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 (SPD)*.
2. *SPD* tidak lagi berfungsi apabila 'petunjuk' bertukar warna/ Tidakmenyala.
3. Sila 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 ( $I_{cu}$ ) for the switchboards and DB respectively. The  $I_{cs}$  shall be 50% of the  $I_{cu}$ .

| <b>Location Category</b>                                                 | <b>1.2/50<math>\mu</math>s (Uoc) Voltage Generator</b> | <b>8/20 <math>\mu</math>s (Isc) Current Generator</b> | <b>Voltage Protection Level (Up)</b> | <b>Maximum Discharge Current, I<sub>max</sub> (8/20 <math>\mu</math>s) per mode</b> |
|--------------------------------------------------------------------------|--------------------------------------------------------|-------------------------------------------------------|--------------------------------------|-------------------------------------------------------------------------------------|
| Main Switchboard (MSB)                                                   | $\geq 20$ kV                                           | $\geq 10$ kA                                          | $\geq 1800$ V                        | $\geq 65$ kA                                                                        |
| Sub-Switchboard(SS B)receivingenergy from MSBlocatedin the same building | $\geq 10$ kV                                           | $\geq 5$ kA                                           | $\geq 1500$ V                        | $\geq 40$ kA                                                                        |
| SSBreceivingenergy from MSBlocatedin otherbuilding                       | $\geq 20$ kV                                           | $\geq 10$ kA                                          | $\geq 1800$ V                        | $\geq 65$ kA                                                                        |
| Distribution Board(DB)receivingenergy from SSBlocatedin the same         | $\geq 6$ kV                                            | $\geq 3$ kA                                           | $\geq 1200$ V                        | $\geq 20$ kA                                                                        |

| Location Category                                                                                                                    | 1.2/50 $\mu$ s (Uoc) Voltage Generator | 8/20 $\mu$ s (Isc) Current Generator | Voltage Protection Level (Up) | Maximum Discharge Current, I <sub>max</sub> (8/20 $\mu$ s) per mode |
|--------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|--------------------------------------|-------------------------------|---------------------------------------------------------------------|
| building (for cases where the SSB located in other building with MSB)                                                                |                                        |                                      |                               |                                                                     |
| Distribution Board(DB)receivingenergy from SSBlocatedin thesame building (for cases where the SSB located in otherbuilding with MSB) | $\geq 10$ kV                           | $\geq 5$ kA                          | $\geq 1500$ V                 | $\geq 40$ kA                                                        |
| DBreceivingenergyfromthelicenseorMSB/SSBlocatedin other building                                                                     | $\geq 20$ kV                           | $\geq 10$ kA                         | $\geq 1500$ V                 | $\geq 40$ kA                                                        |
| SocketOutletorTerminalEquipment                                                                                                      | $\geq 2$ kV                            | $\geq 1$ kA                          | $\geq 500$ V                  | $\geq 10$ kA                                                        |

### 3.6.6 System Of Wiring

The system of wiring shall be either 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 galvanised 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.

### **3.6.7 Types Of Cable**

#### **i. PVC Insulated PVC Sheathed Cable**

PVC insulated PVC sheathed cables of 300/500 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 70°C and comply with MS 138.

#### **ii. 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°C and comply with MS 138.

#### **iii. 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.

#### **iv. 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.

#### **v. 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 150°C. For temperature exceeding 150°C, 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.

### **3.6.8 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.

### **3.6.9 Metallic Conduits**

Steel conduits shall be of galvanised, heavy gauge, screwed type complying with MS275-1, 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, IEC 61035-2-1, 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 hardstanding. Junction boxes, outlet boxes etc. shall be of galvanised sheet steel or alloy material or malleable cast iron. The covers shall be galvanised sheet steel or alloy material with thickness not less than 1.2 mm. Accessories such as junction boxes down dropping to luminaires shall have die-cast cone-shaped metal cover.

### **3.6.10 Cable Trunking**

Cable trunkings shall comply with IEC 61084. They shall be fabricated from galvanised 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:

| <b>NOMINAL SIZE(mm x mm)</b> | <b>MINIMUM WALL THICKNESS (mm)</b> |
|------------------------------|------------------------------------|
| 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 samethickness 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 1000mm 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.

### **3.6.11 Cable Trays**

Cable trays system shall comply with MS IEC 61537 and shall be fabricated from perforated galvanised 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 galvanised 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 galvanised cable trays shall also be of hot dipped galvanised 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.

### **3.6.12 Cable Ladder**

Cable ladder system shall comply with MS IEC 61537 and fabricated from mild steel and finished in hot-dipped galvanised 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 shall 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.

### **3.6.13 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:

-

| <b>Type of Fitting</b>                        | <b>Mounting Height (mm)</b> |
|-----------------------------------------------|-----------------------------|
| Suspended ceiling luminaries and ceiling fans | 2400                        |
| Wall mounted luminaries and wall bracket      | 2050                        |

|                                                                                                        |      |
|--------------------------------------------------------------------------------------------------------|------|
| fans                                                                                                   |      |
| 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 |

### 3.6.14 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.

### 3.6.15 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 cased in Perspex sheet and riveted on the outside front cover of the switchboard.

### 3.6.16 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: -

| kW           | PHASE | CONSTRUCTION  | STARTER                       |
|--------------|-------|---------------|-------------------------------|
| Below 0.75   | 1     | -             | Capasitor start induction run |
| 0.75 to 2.25 | 3     | Squirrel Cage | Direct on Line                |
| 2.25 to 7.5  | 3     | Squirrel Cage | Soft Starter Type             |
| Above 7.5    | 3     | Wound Rotor   | Soft Starter Type             |

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.

### **3.7 General Works**

#### **3.7.1 Cleaning, Painting And Identification**

##### **i. General**

- a. The painting works shall include all equipment, piping, fittings, valves, hangers, conduits, framework, ductwork, insulation, registers, diffusers, grilles, switchboard, machinery etc. and all other works exposed to view.
- b. 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.
- c. No painting shall be done in unsuitable weather. Each coat of painting shall only be applied when the previous coat is completely dry.
- d. The Contractor shall provide all tarpaulins, sheets and covering to protect the floors, walls and other works belonging to other trades.

##### **ii. Cleaning**

All equipment and piping whether insulated or not shall be thoroughly cleaned and degreased upon completion of his work before any painting is carried out.

##### **iii. Metal Surfaces**

All metal works shall be thoroughly wire brushed to remove rust 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.

##### **iv. Insulated Surfaces**

Exposed insulated surfaces shall first be sealed with an approved pigmented sealer. One (1) coat of undercoat and two (2) coats of approved high gloss paint shall be applied to the surfaces.

##### **v. Painting of Pipelines**

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.

##### **vi. Colors**

The following color code shall be employed for the entire installation:-

Housing, ductwork and insulation

Light Ivory

|                                      |                       |
|--------------------------------------|-----------------------|
| Chilled water supply pipes jacketing | Blue                  |
| Chilled water return pipes jacketing | Light Blue            |
| Condenser water supply pipe          | Green                 |
| Condenser water return pipe          | Light Green           |
| Registers, diffusers and grilles     | to match surroundings |
| Pumps                                | Jade Green            |
| Fan housing                          | Light Grey            |
| Electrical conduits                  | Orange                |
| Hangers, supports etc                | To S.O.'s approval    |

**vii. 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 one (1) under glass in suitable frame, and the other one 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.

**viii. Name Plates**

Supply and install on each of the following, identification nameplates consisting of a lamacoid plastic plate with engraved lettering. The plate size and lettering shall be subject to the approval of the S.O.: -

- a. All AHU/FCU, ventilation units and all other exhaust equipments
- b. All starters for AHU/FCU, fans, pumps, compressors, etc.
- c. Ducting - Each main duct run shall be identified by reference to system and area(s) served.
- d. Controls - All control components including thermometers nameplates shall bear the system number and the identification of the control function.

**3.7.2 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 but not limited to pipes, pipe fittings, cables, detectors, hanger and support system for ducts, hanger and support system for pipes, duct and pipe insulation, diffuser and grilles and etc.

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

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## **SCHEDULE**

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## SCHEDULE A

### SCHEDULE OF DESIGN REQUIREMENT OF EQUIPMENT

SEBUT HARGA MEMBEKAL, MENUKARGANTI DAN MENYELENGGARA SISTEM PENYAMAN UDARA JENIS WATER COOLED PACKAGE KEPADA JENIS AIR COOLED PACKAGE C/W INDOOR AND OUTDOOR UNIT, WIRING, PANEL ELECTRIC, BRACKETS, CORING, HACKING, PUNCHING OF HOLES IN FLOOR/WALL, MAKING GOOD, PAINTING, PLINTH, PVC CONDUIT & CABLE TRAY DI BANGUNAN JABATAN KETUA PENGARAH TANAH DAN GALIAN PERSEKUTUAN NEGERI KELANTAN, KEMENTERIAN AIR, TANAH DAN SUMBER ASLI TERMASUK KERJA-KERJA BERKAITAN.

#### A. Sistem Penyaman Udara

| BIL. | NAMA BILIK                     | JENIS PENYAMAN UDARA             | CAPACITY<br>FCU (BTU/HR) | QTY |
|------|--------------------------------|----------------------------------|--------------------------|-----|
| 1.   | <b><u>Bangunan Utama :</u></b> |                                  |                          |     |
| a.   | AHU No.1                       | Air Cooled Package Ducted Blower | 200,000                  | 1   |
| b.   | AHU No.2                       | Air Cooled Package Ducted Blower | 250,000                  | 1   |
| c.   | AHU No.3                       | Air Cooled Package Ducted Blower | 300,000                  | 1   |
| d.   | AHU No.4                       | Air Cooled Package Ducted Blower | 350,000                  | 1   |

## SCHEDULE B

### SCHEDULE OF TECHNICAL DATA OF EQUIPMENT OFFER

The tenderer must complete this Schedule of Technical Data Of Offer as set out below. All information asked for must be given correctly and supported by copies of manufacturer's published technical data for the equipment being offered including alternatives if any. Details specification given below without support document from supplier or manufacturer is disqualified.

#### 1. Air Cooled Package (Ducted Blower)

| FAN COIL UNIT |                                                                                       | TENDERER'S PROPOSAL |             |             |             |
|---------------|---------------------------------------------------------------------------------------|---------------------|-------------|-------------|-------------|
|               |                                                                                       | 200,000 btu         | 250,000 btu | 300,000 btu | 350,000 btu |
| a             | Make & type                                                                           |                     |             |             |             |
| b             | Model (Indoor/ Outdoor) Unit                                                          |                     |             |             |             |
| c             | Dimension (Height x Width x Depth)                                                    |                     |             |             |             |
| d             | Power Source (V/Ph/Hz)                                                                |                     |             |             |             |
| e             | Power Consumption (W/HP)                                                              |                     |             |             |             |
| f             | Running Current (Ampere)                                                              |                     |             |             |             |
| g             | Refrigerant Pipe Size (Discharge/ Suction)mm                                          |                     |             |             |             |
| h             | Type of refrigerant used                                                              |                     |             |             |             |
| i             | Total cooling capacity rating, Btu/h @ 54.4 CCT with designed entering air conditions |                     |             |             |             |
| j             | Method of capacity control                                                            |                     |             |             |             |
| k             | Sensible heat capacity (under conditions as above)                                    |                     |             |             |             |

#### 1.1 Coil

| FAN COIL UNIT |                                       | TENDERER'S PROPOSAL |             |             |             |
|---------------|---------------------------------------|---------------------|-------------|-------------|-------------|
|               |                                       | 200,000 btu         | 250,000 btu | 300,000 btu | 350,000 btu |
| a             | Coil Tube Material                    |                     |             |             |             |
| b             | Tube Diameter                         |                     |             |             |             |
| c             | Tube Thickness                        |                     |             |             |             |
| d             | Fin Material                          |                     |             |             |             |
| e             | Cooling coil Face area m <sup>2</sup> |                     |             |             |             |

| FAN COIL UNIT |                        | TENDERER'S PROPOSAL |             |             |             |
|---------------|------------------------|---------------------|-------------|-------------|-------------|
|               |                        | 200,000 btu         | 250,000 btu | 300,000 btu | 350,000 btu |
| f             | Cooling coil rows/fins |                     |             |             |             |

## 1.2 Indoor Blowing Fan

| FAN COIL UNIT |                                                                    | TENDERER'S PROPOSAL |             |             |             |
|---------------|--------------------------------------------------------------------|---------------------|-------------|-------------|-------------|
|               |                                                                    | 200,000 btu         | 250,000 btu | 300,000 btu | 350,000 btu |
| a             | Fan Running Current                                                |                     |             |             |             |
| b             | Fan air flow (cfm)                                                 |                     |             |             |             |
| c             | Fan Motor Protection (Yes (type)/ No)                              |                     |             |             |             |
| d             | Evaporator fan motor rpm                                           |                     |             |             |             |
| e             | Air Filter Type (Washable/ Anti Fungus)                            |                     |             |             |             |
| f             | Type of air distribution (Air Deflector (Manual/ Auto) No Of Ways) |                     |             |             |             |
| g             | Material Of Casing and Material Of Coating                         |                     |             |             |             |
| h             | Drain Pipe Size                                                    |                     |             |             |             |
| i             | Net Weight Indoor Unit                                             |                     |             |             |             |
| j             | Sound Pressure Level (dBA)                                         |                     |             |             |             |

## 1.3 Outdoor Unit

### 1.3.1. Compressor

|   |                                | TENDERER'S PROPOSAL |             |             |             |
|---|--------------------------------|---------------------|-------------|-------------|-------------|
|   |                                | 200,000 btu         | 250,000 btu | 300,000 btu | 350,000 btu |
| a | Make & Model of compressors    |                     |             |             |             |
| b | Type of compressors            |                     |             |             |             |
| c | No. of compressors             |                     |             |             |             |
| d | Each compressor motor hp & rpm |                     |             |             |             |
| e | Type of motor starter          |                     |             |             |             |
| f | Make of motor starter          |                     |             |             |             |
| g | Volts/ Phase/ Cycle            |                     |             |             |             |
| h | Full load/ Running ampere      |                     |             |             |             |

|   |                              | TENDERER'S PROPOSAL |             |             |             |
|---|------------------------------|---------------------|-------------|-------------|-------------|
|   |                              | 200,000 btu         | 250,000 btu | 300,000 btu | 350,000 btu |
| i | Compressor Capacitor (uF)    |                     |             |             |             |
| j | Compressor protection device |                     |             |             |             |
| k | Sound Pressure Level (dBA)   |                     |             |             |             |

### 1.3.2. Condenser Coil

| CONDENSER COIL UNIT |                                                                        | TENDERER'S PROPOSAL |             |             |             |
|---------------------|------------------------------------------------------------------------|---------------------|-------------|-------------|-------------|
|                     |                                                                        | 200,000 btu         | 250,000 btu | 300,000 btu | 350,000 btu |
| a                   | Tube (Material/ Diameter/ Thickness)                                   |                     |             |             |             |
| b                   | Fin (Material/ Thickness)                                              |                     |             |             |             |
| c                   | Row                                                                    |                     |             |             |             |
| d                   | No Of Fin/ Inch                                                        |                     |             |             |             |
| e                   | Face Area m <sup>2</sup>                                               |                     |             |             |             |
| f                   | Coating for condenser coils rows/fins type of coating (Please mention) | YES / NO            | YES / NO    |             |             |

### 1.3.3. Condenser Fan

|   |                                                           | TENDERER'S PROPOSAL |             |             |             |
|---|-----------------------------------------------------------|---------------------|-------------|-------------|-------------|
|   |                                                           | 200,000 btu         | 250,000 btu | 300,000 btu | 350,000 btu |
| a | Fan Type/Drive (Belt/ Direct)                             |                     |             |             |             |
| b | Blade Material                                            |                     |             |             |             |
| c | Fan Diameter                                              |                     |             |             |             |
| d | Rated Running Current                                     |                     |             |             |             |
| e | Overall Outdoor Dimension (Width x Length x Depth)        |                     |             |             |             |
| f | Outdoor Unit Weight kg                                    |                     |             |             |             |
| g | Casing Material Galvanised Mild Steel (Yes/No)/ Thickness |                     |             |             |             |

#### 1.4 Starter Panels for Air Cooled Split

|   |                         | TENDERER'S PROPOSAL |             |             |             |
|---|-------------------------|---------------------|-------------|-------------|-------------|
|   |                         | 200,000 btu         | 250,000 btu | 300,000 btu | 350,000 btu |
| a | Make/ Type of starter   |                     |             |             |             |
| b | Rated Voltage/Phase     |                     |             |             |             |
| c | Over Load Current (Amp) |                     |             |             |             |
| d | Rated amps/ kW (HP)     |                     |             |             |             |
| e | Sequence Timer          |                     |             |             |             |

#### 1.5 Microcomputer Remote Controller for Air Cooled Split

|   |                                                                 | TENDERER'S PROPOSAL |             |             |             |
|---|-----------------------------------------------------------------|---------------------|-------------|-------------|-------------|
|   |                                                                 | 200,000 btu         | 250,000 btu | 300,000 btu | 350,000 btu |
| a | Make                                                            |                     |             |             |             |
| b | Model                                                           |                     |             |             |             |
| c | Fan Motor Speed Control (Hi, Medium, Low)                       | YES / NO            |             |             |             |
| d | Timer On/Off The unit can be pre set to On and Of Automatically | YES / NO            |             |             |             |
| e | Electronic Thermostat                                           | YES / NO            |             |             |             |
| f | Sleep mode                                                      | YES / NO            |             |             |             |

#### 1.6 Metal Trunking For Refrigerant Piping

| UNIT |                          | TENDERER'S PROPOSAL |             |             |             |
|------|--------------------------|---------------------|-------------|-------------|-------------|
|      |                          | 200,000 btu         | 250,000 btu | 300,000 btu | 350,000 btu |
| a    | Make                     |                     |             |             |             |
| b    | Material of construction |                     |             |             |             |

#### 1.7 Hangers/ Brackets For Air-Cooled Split Unit

|   |                          | TENDERER'S PROPOSAL |             |             |             |
|---|--------------------------|---------------------|-------------|-------------|-------------|
|   |                          | 200,000 btu         | 250,000 btu | 300,000 btu | 350,000 btu |
| a | Make                     |                     |             |             |             |
| b | Material of construction |                     |             |             |             |

### 1.8 Securing Bolts And Nuts for Hangers/Brackets

|   |                  | TENDERER'S PROPOSAL |             |             |             |
|---|------------------|---------------------|-------------|-------------|-------------|
|   |                  | 200,000 btu         | 250,000 btu | 300,000 btu | 350,000 btu |
| a | Type of material |                     |             |             |             |

### 1.9 Painting

|   |                  | TENDERER'S PROPOSAL |             |             |             |
|---|------------------|---------------------|-------------|-------------|-------------|
|   |                  | 200,000 btu         | 250,000 btu | 300,000 btu | 350,000 btu |
| a | Type/ Brand      |                     |             |             |             |
| b | Mode of painting |                     |             |             |             |

## **SPECIFICATION FOR COMPREHENSIVE SERVICE AND MAINTENANCE OF THE AIR CONDITONING PLANT AND ANCILLARY EQUIPMENT**

### **A. SERVICE AND MAINTENANCE DURING GUARANTEE PERIOD**

#### **1. GENERAL**

- i. This portion of the specification shall cover all service and maintenance work to be carried out during the guarantee period of twelve (12) months from the date of handing over of the Air Conditioning & Ventilation System installation.
- ii. This maintenance work shall include the supply of all materials, appliances, labour and necessary incidentals. All works shall be performed in accordance with the best commercial practice and must be in strict accordance to this specification.
- iii. The Contractor shall have in his direct employment, skilled workmen and technicians to carry out the servicing and repair work. Such workmen shall be expected to perform quality works in accordance to good engineering practice and to the satisfaction of the S.O.
- iv. All materials to be supplied in connection with the work shall be new and unused and shall in general be of the best quality as regards to manufacture and performance.
- v. The Contractor shall provide a LOG BOOK in the plant room to record date, time and details of each maintenance service per formed.
- vi. The normal daily function of starting, operating and stopping of the Air Conditioning And Ventilation System will not be included in the maintenance service. However, it shall include emergency services when called upon.

#### **1.1 Supervision**

The Contractor shall have a foreman in charge of the service, maintenance and repair work to be carried out. The foreman must be thoroughly competent in supervising such work involving central air conditioning plant of all types and shall be in direct employ of the Contractor and acceptable to the S.O.

### **2. SCOPE OF WORK**

#### **2.1 Duties**

The Contractor shall service and maintain all machinery and equipment comprising the complete air conditioning and ventilation system and other ancillary equipment. The work to be performed shall include regular and systematic checking, cleaning and wherever necessary adjustment and balancing of the system.

The cleaning of supply air diffusers shall be included in this maintenance

service. All paint finishes shall be inspected, cleaned and repainted as necessary.

The Contractor shall also be required to attend to any emergency service and repair during normal working hours or overtime hours.

## **2.2 Check List**

The Check List as set out at the end of this part of this specification shall be used as a guide to the service, maintenance and repair work to be carried out and shall in no way relieve the Contractor from executing any other work necessary.

## **2.3 Defects Report**

It shall be the responsibility of the Contractor to report and advise in writing to the S.O., any defects in the air conditioning equipment and ancillary equipment in order that preventive maintenance to be carried out.

The report shall state observed defects and its cause, the parts to be replaced or renewed and shall also include and estimate of the cost of repairs required.

## **2.4 Repairs**

The Contractor shall repair all defects in the air conditioning system including all ancillary equipment on the instructions of the S.O. The costs of such repairs shall be separate and shall not be included in the costs for monthly service and maintenance. However, the Contractor shall rectify all defects in repairs at his own expenses during the maintenance and guarantee period which follows from the date of practical completion.

All repairs on the complete air conditioning plant and ancillary equipment shall be guaranteed by the Contractor against defects in workmanship and materials for a period of one (1) year to take effect from the date of completion of the repairs.

## **2.5 Consumable Materials**

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

- i. All oils and grease required for lubrication of compressors, fan bearings, motor bearings, pivots and other moving parts.
- ii. All refrigerant required to replace refrigerant losses in the refrigerant system.
- iii. All carbon brushes required to replace worn brushes in electric motors.
- iv. All consumable filter elements.
- v. All electric contact points required to replace worn electric contact points in switch gears, motor starter gears, electric control gears and electric relays.

- vi. All electric fuses required to replace blown fuses.
- vii. 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 rates quoted by the Contractor for the service and maintenance of the complete air conditioning plant and ancillary equipment after the guarantee period.

**B. SERVICE AND MAINTENANCE RECORDS**

1. The Contractor shall provide a service and maintenance record book for the complete the Air Conditioning plant service and maintenance by him. This record book shall be kept in the plant room and briefed details of all service, maintenance and repairs carried out shall be entered 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 and accurate detailed records and duplicate of all service, maintenance and repair works carried out by him. This record shall be in the form of a Maintenance/Repair Sheet, and shall be countersigned by the S.O. each time the Air Conditioning plant is attended to by the Contractor.

**C. RATES FOR SERVICE AND MAINTENANCE**

The Contractor shall quote the rates for the service and maintenance of the complete Air Conditioning plant and ancillary equipment in the form provided in the column provided under Clause D.

These rates quoted by the Contractor at the time of tenders, shall hold good for the period of three (3) years commencing from the expiry of the guarantee period.

The Contractor maybe required to enter into a contract for the above periods with the Government on the Standard Form Of Contract for service and maintenance of Air Conditioning Plant and Ancillary Equipment, a copy of which maybe inspected of the office of the **PengarahJabatan Pengangkutan Jalan Negeri Kelantan**.

**D. SCHEDULE OF RATES FOR THE COMPREHENSIVE SERVICE AND MAINTENANCE OF THE COMPLETE AIR-CONDITIONING PLANT AND ANCILLARY EQUIPMENT AFTER WARRANTY PERIOD**

The Tenderer is to note that the prices quoted will be binding in the event that the Government decides to accept either of them immediately after the free maintenance period.

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

**RATES BASED ON CONTRACT PERIOD OF THREE YEARS ONLY**

|                                                                                                                                                                                                                                                                                                                   |                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| For service and maintenance of the complete Air-Conditioning Plant and Ancillary Equipment at the above premises in strict accordance and for supply of all consumable materials listed and whenever required and to provide emergency repair service during normal working hours and overtime hours as required. | <u>Charge Per Year</u> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|

## SCHEDULE C

### SCHEDULE OF PRICE

The prices entered in this schedule shall be for the supply, installation, testing and commissioning of the complete system and other ancillary equipment in accordance with the requirements of the scope of works and specifications.

Total tender sum for the supply, installation, testing , commissioning and servicing for twelve (12) month. .

#### Summary Of Price

| ITEM | DESCRIPTION        | PAGE | AMOUNT (RM) |
|------|--------------------|------|-------------|
| A    | PRELIMINARIES      |      |             |
| B    | PENYAMAN UDARA     |      |             |
| C    | MISCELLANEOUS      |      |             |
|      | <b>*TOTAL (RM)</b> |      |             |

RINGGIT MALAYSIA :

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.....  
(Tandatangan Penyebutharga)  
Nama:  
Jawatan:  
Alamat Syarikat Berserta Cop:

.....  
(Tandatangan Saksi)  
Nama:  
Jawatan:  
Alamat Syarikat Berserta Cop:

Tarikh :

Tarikh :

| ITEM                                                        | DESCRIPTION OF WORK                                                                                                                                                                                                                                                               | UNIT | QTY. | RATE      | AMOUNT |
|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----------|--------|
| <b>A</b>                                                    | <b><u>PRELIMINARIES</u></b><br>Preliminaries and compliance with conditions of contract and specifications including all insurance premiums, cost of as installed drawings, tools, manual, provisional of competent personels on site in accordance with the Electrical Act. etc. |      |      |           |        |
| 1                                                           | Allowance insurance against personal injuries and damage to property                                                                                                                                                                                                              | L/S  | 1    |           |        |
| 2                                                           | Allowance for insurance of works                                                                                                                                                                                                                                                  | L/S  | 1    |           |        |
| 3                                                           | Premium for Employees' Social Security Acts, 1969 (SOCSO)                                                                                                                                                                                                                         | L/S  | 1    |           |        |
| 4                                                           | Allowance for shop drawings, as-built drawings, maintenance and operation manual as stated in the specifications                                                                                                                                                                  | L/S  | 1    |           |        |
| 5                                                           | Preparation document for this project inclusive four (4) nos contract document and others related                                                                                                                                                                                 | set. | 4    |           |        |
| 6                                                           | The contractor shall provide the following items of a standard to be approved by S.O for the sole of supervising staff.<br>i _____<br><br>ii _____                                                                                                                                |      |      |           |        |
| <b>SUB TOTAL A : PRELIMINARIES<br/>(Carried To Summary)</b> |                                                                                                                                                                                                                                                                                   |      |      | <b>RM</b> |        |

| ITEM     | DESCRIPTION OF WORK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | UNIT | QTY. | RATE | AMOUNT |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|--------|
| <b>B</b> | <b>SISTEM PENYAMAN UDARA</b><br>Kerja-kerja membekal, menukarganti & menyelenggara system penyaman udara jenis water cooled package kepada jenis air cooled package c/w indoor and outdoor unit, wiring, panel electric, brackets, coring, hacking, punching of holes in floor/wall, making good, painting, plinth, PVC conduit & cable tray serta kerja-kerja berkaitan sehingga sistem dapat beroperasi dengan keupayaan sebenar di bangunan Jabatan Ketua Pengarah Tanah Dan Galian (Persekutuan) Negeri Kelantan sebagaimana berikut :- |      |      |      |        |
| 1        | <u>AHU No. 1 ( 200,000 Btuh )</u><br><u>– Ducted Blower</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |      |      |      |        |
| a        | Kerja-kerja mencabut 1 set peralatan sediaada termasuk peralatan berkaitan. Peralatan tersebut hendaklah di simpan ditempat yang diarahkan sebagaimana oleh pegawai inden.                                                                                                                                                                                                                                                                                                                                                                  | set  | 1    |      |        |
| b        | Kerja memasang 1 unit ducted blower berkapasiti 200,000 Btuh termasuk kerja berkaitan sehingga sistem berfungsi dengan sempurna.                                                                                                                                                                                                                                                                                                                                                                                                            | set  | 1    |      |        |
| c        | Kerja-kerja memeriksa paip sediaada serta memasang fitting, filter / strainer sehingga system dapat berfungsi dengan sempurna.                                                                                                                                                                                                                                                                                                                                                                                                              | set  | 1    |      |        |
| d        | Kerja-kerja memasang / membuat supply duct untuk unit ducted blower baharu termasuk kerja berkaitan sehingga sistem berfungsi dengan sempurna.                                                                                                                                                                                                                                                                                                                                                                                              | lot  | 1    |      |        |
|          | <b>* Sambungan dari muka surat<br/>sebelah</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      |      |      |        |
| e.       | Kerja-kerja menaiktaraf panel kawalan sehingga system dapat berfungsi                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | lot  | 1    |      |        |

| ITEM | DESCRIPTION OF WORK                                                                                                                                                        | UNIT | QTY. | RATE | AMOUNT |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|--------|
|      | dengan sempurna.                                                                                                                                                           |      |      |      |        |
| 2    | <u>AHU No. 2 ( 250,000 Btuh )</u><br><u>– Ducted Blower</u>                                                                                                                |      |      |      |        |
| a    | Kerja-kerja mencabut 1 set peralatan sediaada termasuk peralatan berkaitan. Peralatan tersebut hendaklah di simpan ditempat yang diarahkan sebagaimana oleh pegawai inden. | set  | 1    |      |        |
| b    | Kerja memasang 1 unit ducted blower berkapasiti 250,000 Btuh termasuk kerja berkaitan sehingga sistem berfungsi dengan sempurna.                                           | set  | 1    |      |        |
| c    | Kerja-kerja memeriksa paip sediaada serta memasang fitting, filter / strainer sehingga system dapat berfungsi dengan sempurna.                                             | set  | 1    |      |        |
| d    | Kerja-kerja memasang / membuat supply duct untuk unit ducted blower baharu termasuk kerja berkaitan sehingga sistem berfungsi dengan sempurna.                             | lot  | 1    |      |        |
| e.   | Kerja-kerja menaiktaraf panel kawalan sehingga system dapat berfungsi dengan sempurna.                                                                                     | lot  | 1    |      |        |
| 3    | <u>AHU No. 3 ( 300,000 Btuh )</u><br><u>– Ducted Blower</u>                                                                                                                |      |      |      |        |
| a    | Kerja-kerja mencabut 1 set peralatan sediaada termasuk peralatan berkaitan. Peralatan tersebut hendaklah di simpan ditempat yang diarahkan sebagaimana oleh pegawai inden. | set  | 1    |      |        |

| ITEM | DESCRIPTION OF WORK                                                                                                                                                        | UNIT | QTY. | RATE | AMOUNT |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|--------|
| b    | Kerja memasang 1 unit ducted blower berkapasiti 300,000 Btuh termasuk kerja berkaitan sehingga sistem berfungsi dengan sempurna.                                           | set  | 1    |      |        |
| c    | Kerja-kerja memeriksa paip sediaada serta memasang fitting, filter / strainer sehingga system dapat berfungsi dengan sempurna.                                             | set  | 1    |      |        |
| d    | Kerja-kerja memasang / membuat supply duct untuk unit ducted blower baharu termasuk kerja berkaitan sehingga sistem berfungsi dengan sempurna.                             | lot  | 1    |      |        |
| e    | Kerja-kerja menaiktaraf panel kawalan sehingga system dapat berfungsi dengan sempurna.                                                                                     | lot  | 1    |      |        |
| 3    | <u>AHU No. 4 ( 350,000 Btuh )</u><br><u>– Ducted Blower</u>                                                                                                                |      |      |      |        |
| a    | Kerja-kerja mencabut 1 set peralatan sediaada termasuk peralatan berkaitan. Peralatan tersebut hendaklah di simpan ditempat yang diarahkan sebagaimana oleh pegawai inden. |      |      |      |        |
| b    | Kerja memasang 1 unit ducted blower berkapasiti 350,000 Btuh termasuk kerja berkaitan sehingga sistem berfungsi dengan sempurna.                                           |      |      |      |        |
| c    | Kerja-kerja memeriksa paip sediaada serta memasang fitting, filter / strainer sehingga system dapat berfungsi dengan sempurna.                                             |      |      |      |        |
| d    | Kerja-kerja memasang / membuat supply duct untuk unit ducted blower baharu termasuk kerja berkaitan sehingga sistem berfungsi dengan sempurna.                             |      |      |      |        |
| e    | Kerja-kerja menaiktaraf panel kawalan sehingga system dapat berfungsi dengan sempurna.                                                                                     |      |      |      |        |

| ITEM                                                              | DESCRIPTION OF WORK | UNIT | QTY. | RATE      | AMOUNT |
|-------------------------------------------------------------------|---------------------|------|------|-----------|--------|
|                                                                   |                     |      |      |           |        |
| <b>SUB TOTAL B: (Carried To Summary)</b><br><b>PENYAMAN UDARA</b> |                     |      |      | <b>RM</b> |        |

| ITEM                                                             | DESCRIPTION OF WORK                                                                                                                                                                                                               | UNIT | QTY. | RATE      | AMOUNT |
|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----------|--------|
| <b>C</b>                                                         | <b><u>MISCELLANOUS</u></b>                                                                                                                                                                                                        |      |      |           |        |
| 1                                                                | To make good and clear all disposal from site as per S.O Satisfaction                                                                                                                                                             | L/S  | 1    |           |        |
| 2                                                                | Service and maintenance during the defects and liability period                                                                                                                                                                   | L/S  | 12   |           |        |
| 3                                                                | Testing and commissioning                                                                                                                                                                                                         | L/S  | 1    |           |        |
| 4                                                                | Perhubungan dengan Pengilang asal bagi urusan khidmat nasihat termasuk bayaran Allocation/Fees for Professional Engineers to submissions, stamp fee dan lain-lain sehingga sistem penyaman udara dapat berfungsi dengan sempurna. | L/S  | 1    |           |        |
| 5                                                                | Trade in value bagi peralatan penyaman udara                                                                                                                                                                                      | L/S  | 1    |           |        |
| <b>SUB TOTAL D : (Carried To Summary)</b><br><b>MISCELLANOUS</b> |                                                                                                                                                                                                                                   |      |      | <b>RM</b> |        |

### SCHEDULE OF INSTALLATION

The tenderer must submit the following information, ascertaining his capability to complete the works by the stipulated date.

- a) Delivery Period of equipment : \_\_\_\_\_ Weeks from award tender
- b) Installation Period required : \_\_\_\_\_ Weeks
- c) Testing and commissioning : \_\_\_\_\_ Weeks  
Period of equipment required

---

|              |          |              |              |
|--------------|----------|--------------|--------------|
| <b>TOTAL</b> | <b>:</b> | <b>_____</b> | <b>Weeks</b> |
|--------------|----------|--------------|--------------|

---

Tarikh : .....

(Tandatangan Penyebutharga)

Nama:

Alamat (Dengan Cop):

Tarikh : .....

(Tandatangan Saksi)

Nama:

Alamat:

---

## **LAMPIRAN**

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**LATAR BELAKANG DAN KEDUDUKAN KEWANGAN  
PENYEBUTHARGA/SYARIKAT-SYARIKAT LAIN YANG TERLIBAT BERSAMA  
SYARIKAT PENYEBUTHARGA  
NO. SEBUT HARGA : JKPTG SH16/2018**

**SEBUT HARGA MEMBEKAL, MENUKARGANTI DAN MENYELENGGARA SISTEM  
PENYAMAN UDARA JENIS WATER COOLED PACKAGE KEPADA JENIS AIR  
COOLED PACKAGE C/W INDOOR AND OUTDOOR UNIT, WIRING, PANEL  
ELECTRIC, BRACKETS, CORING, HACKING, PUNCHING OF HOLES IN  
FLOOR/WALL, MAKING GOOD, PAINTING, PLINTH, PVC CONDUIT & CABLE TRAY  
DI BANGUNAN JABATAN KETUA PENGARAH TANAH DAN GALIAN  
PERSEKUTUAN NEGERI KELANTAN, KEMENTERIAN AIR, TANAH DAN SUMBER  
ASLI TERMASUK KERJA-KERJA BERKAITAN.**

**BAHAGIAN A : LATAR BELAKANG PENYEBUTHARGA**

| <b>BIL.</b> | <b>PERKARA</b>                                                         | <b>MAKLUMAT</b>  |
|-------------|------------------------------------------------------------------------|------------------|
| 1.          | Nama Syarikat                                                          |                  |
| 2.          | Tarikh Syarikat Ditubuhkan                                             |                  |
| 3.          | No. Pendaftaran Syarikat                                               |                  |
| 4.          | Tarikh Daftar dengan Kementerian Kewangan Malaysia                     |                  |
| 5.          | Tarikh Sah Laku Sijil Pendaftaran dengan Kementerian Kewangan Malaysia |                  |
| 6.          | Taraf Bumiputera                                                       | Ada/Tiada        |
| 7.          | Jika ada, No. Pendaftaran                                              |                  |
| 9.          | Tarikh Sah Laku Sijil Pendaftaran Kontraktor Bumiputera                | (Jika Berkaitan) |
| 10.         | Alamat Pendaftaran Syarikat                                            |                  |
| 11.         | Alamat Surat Menyurat                                                  |                  |
| 12.         | No. Telefon Syarikat                                                   |                  |
| 13.         | No. Faks Syarikat                                                      |                  |
| 14.         | Pendaftaran dengan Kementerian Kewangan /                              | Ada / Tiada      |

| BIL. | PERKARA                                                                                                                                                                                               | MAKLUMAT                                                                |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
|      | JKR / PUSAKABUMI / dll                                                                                                                                                                                |                                                                         |
| 15.  | Bidang Pendaftaran (Kepala)                                                                                                                                                                           |                                                                         |
| 16.  | Sub-bidang Pendaftaran (Sub-kepala)                                                                                                                                                                   |                                                                         |
| 17.  | Hakmilik Syarikat                                                                                                                                                                                     | Persendirian / Perkongsian / Koperasi / Sdn. Bhd. / Berhad / Enterprise |
| 18.  | Modal Dibenar (RM)                                                                                                                                                                                    |                                                                         |
| 19.  | Modal Berbayar (RM)                                                                                                                                                                                   |                                                                         |
| 20   | Butiran Kewangan Syarikat<br><b>Sila sertakan salinan penyata salah satu daripada item berikut:</b><br>1. Purata 3 bulan terakhir dalam bank<br>2. Deposit tetap<br>3. Kemudahan kredit daripada bank |                                                                         |
| 21.  | Kontrak Dengan Kerajaan<br>(Beritahu sama ada Syarikat tuan mengalami penggantungan atau penamatan kontrak dengan Kerajaan oleh kerana pelanggaran syarat-syarat kontrak)                             |                                                                         |

23. Butir - butir Lembaga Pengarah Syarikat (gunakan lampiran jika ruangan tidak mencukupi)

| Bil. | Nama | Kad Pengenalan | Warganegara | Peratus Pegangan Saham |
|------|------|----------------|-------------|------------------------|
| 1.   |      |                |             |                        |
| 2.   |      |                |             |                        |
| 3.   |      |                |             |                        |
|      |      |                |             |                        |

24. Pengurusan Syarikat (gunakan lampiran jika ruangan tidak mencukupi).

| Bil. | Nama | Jawatan | Pengalaman |
|------|------|---------|------------|
| 1.   |      |         |            |
| 2.   |      |         |            |

|    |  |  |  |
|----|--|--|--|
| 3. |  |  |  |
| 4. |  |  |  |

25. Struktur Pengurusan Syarikat :-

25.1 Eksekutif

| Bil. | Taraf             | Bil. Kakitangan | Peratusan |
|------|-------------------|-----------------|-----------|
| 1.   | Bumiputera        |                 |           |
| 2.   | Bukan Bumiputera  |                 |           |
| 3.   | Bukan Warganegara |                 |           |

25.2 Bukan Eksekutif

| Bil. | Taraf             | Bil. Kakitangan | Peratusan |
|------|-------------------|-----------------|-----------|
| 1.   | Bumiputera        |                 |           |
| 2.   | Bukan Bumiputera  |                 |           |
| 3.   | Bukan Warganegara |                 |           |

26. Peratusan pekerja - pekerja dari segi kaum yang digunakan oleh Syarikat tuan bagi menjalankan sebutbarga ini :-

| Bil. | Warganegara | Peratusan |
|------|-------------|-----------|
| 1.   | Melayu      |           |
| 2.   | Cina        |           |
| 3.   | India       |           |
| 4.   | Lain – Lain |           |

27. Bilangan kakitangan (Nyatakan bilangan kategori kakitangan yang berkaitan dengan kerja-kerja perkhidmatan ini)

| Bil | Kategori – Pengurusan, Profesional & Kakitangan/ Sokongan | Bilangan / Jumlah | Catatan |
|-----|-----------------------------------------------------------|-------------------|---------|
|     |                                                           |                   |         |
|     |                                                           |                   |         |
|     |                                                           |                   |         |
|     |                                                           |                   |         |

|  |  |  |  |
|--|--|--|--|
|  |  |  |  |
|  |  |  |  |

Saya mengaku bahawa segala keterangan yang diberikan di atas adalah benar.

.....

Nama dan Tandatangan

Cop Rasmi Syarikat:

Tarikh : .....

\* Potong mana yang tidak berkenaan

## BAHAGIAN B : KEDUDUKAN KEWANGAN PENYEBUTHARGA

1. **RINGKASAN ASET DAN LIABILITI** seperti yang ditunjukkan dalam Lembaran Imbangan (*Balance Sheet*) yang diaudit bagi tahun kewangan terakhir.

| Aset<br>(A)      | Liabiliti<br>(B) | Nilai Kewangan<br>(Nilai) (A - B) |
|------------------|------------------|-----------------------------------|
| Semasa : RM_____ | Semasa: RM_____  | Modal Pusingan : RM_____          |
| Tetap : RM_____  | Tetap : RM_____  | Modal Tetap : RM_____             |
| Jumlah : RM_____ | Jumlah : RM_____ | Nilai Bersih : RM_____            |

## 2. AKAUN WANG DI TANGAN (*CASH IN HAND*)

- a. Nama dan Alamat Bank di mana akaun dibuka:

.....  
.....

- b. Nombor Akaun: .....

## 3. KEMUDAHAN KREDIT (jika ada) – Lampirkan.

- a. Nama dan Alamat Bank / Institusi Kewangan yang memberi kemudahan kredit (gunakan lampiran jika ruang tidak mencukupi):

| Bil. | Nama Bank | Alamat |
|------|-----------|--------|
| 1.   |           |        |
| 2.   |           |        |
| 3.   |           |        |

- b. Bentuk dan baki amaun yang boleh digunakan untuk projek pembekalan

|       |                                                             |    |       |
|-------|-------------------------------------------------------------|----|-------|
| (i)   | <i>Overdraf</i> atau Talian Kredit                          | RM |       |
| (ii)  | <i>Overdraf</i> Bercagar                                    | RM |       |
| (iii) | Pinjaman Tetap yang akan /<br>layak diperolehi untuk projek | RM |       |
| (iv)  | Kemudahan-kemudahan lain                                    | RM | _____ |
|       | Jumlah                                                      | RM | _____ |

### **BAHAGIAN C : PENGAKUAN PENYEBUTHARGA**

Saya memperakui bahawa segala keterangan dan pernyataan di atas adalah sah dan benar.

Cop Rasmi / Meteri Syarikat :

Tandatangan Penyebutharga : .....

Tarikh : .....

Nama : .....

No. Kad Pengenalan : .....

Jawatan Rasmi dalam Syarikat : .....

Di hadapan;

Tandatangan Saksi : .....

Tarikh : .....

Nama : .....

No. Kad Pengenalan : .....

Jawatan Rasmi dalam Syarikat : .....

## LAMPIRAN D

### SULIT

#### LAPORAN SULIT DARIPADA BANK / INSTITUSI KEWANGAN MENGENAI KEDUDUKAN KEWANGAN PENYEBUTHARGA

NO. SEBUTHARGA JKPTG SH016/2018

**SEBUT HARGA MEMBEKAL, MENUKARGANTI DAN MENYELENGGARA SISTEM  
PENYAMAN UDARA JENIS WATER COOLED PACKAGE KEPADA JENIS AIR COOLED  
PACKAGE C/W INDOOR AND OUTDOOR UNIT, WIRING, PANEL ELECTRIC,  
BRACKETS, CORING, HACKING, PUNCHING OF HOLES IN FLOOR/WALL, MAKING  
GOOD, PAINTING, PLINTH, PVC CONDUIT & CABLE TRAY DI BANGUNAN JABATAN  
KETUA PENGARAH TANAH DAN GALIAN PERSEKUTUAN NEGERI KELANTAN,  
KEMENTERIAN AIR, TANAH DAN SUMBER ASLI TERMASUK KERJA-KERJA  
BERKAITAN.**

(Borang ini hendaklah dilengkapkan oleh pihak Bank atau Institusi Kewangan lain dan diserahkan kepada Penyebutharga dalam satu sampul berlakri untuk disertakan bersama-sama sebutharganya sekiranya Penyebutharga mempunyai kemudahan kredit dengan Bank / Institusi Kewangan yang berkenaan).

Kepada :

**Jabatan Ketua Pengarah Tanah dan Galian Persekutuan,**

Kementerian Air, Tanah dan Sumber Asli,

Bahagian Khidmat Pengurusan,

Seksyen Pentadbiran dan Kewangan,

Aras 1, Blok Podium 1,

No. 25, Persiaran Perdana, Presint 4,

62574 WP. Putrajaya

MALAYSIA.

Nama Penyebutharga : .....

- I. KEMUDAHAN KREDIT yang boleh digunakan untuk pelaksanaan Projek:  
Kemudahan Kredit yang telah dilulus dan kemudahan kredit tambahan minimum  
yang layak diperolehi oleh Penyebutharga adalah seperti berikut:

| Bentuk Kemudahan Kredit   | Baki Daripada Yang Telah Diluluskan (RM) | Tambahan Minima Yang Akan Diluluskan (RM) | Jumlah (RM) |
|---------------------------|------------------------------------------|-------------------------------------------|-------------|
| <i>Overdraft</i>          |                                          |                                           |             |
| <i>Overdraft Bercagar</i> |                                          |                                           |             |

| Bentuk Kemudahan Kredit                                   | Baki Daripada Yang Telah Diluluskan (RM) | Tambahan Minima Yang Akan Diluluskan (RM) | Jumlah (RM) |
|-----------------------------------------------------------|------------------------------------------|-------------------------------------------|-------------|
| Talian Kredit yang akan/layak diperolehi untuk projek ini |                                          |                                           |             |
| Kemudahan Lain (sila nyatakan)                            |                                          |                                           |             |
| Jumlah                                                    |                                          |                                           |             |

II. ULASAN-ULASAN mengenai kedudukan kewangan dan akaun Penyebutharga.

.....  
 .....  
 .....  
 .....

Tandatangan untuk dan bagi pihak bank:

Meteri Bank:

.....

Nama Bank : .....  
 Nama Pegawai : .....  
 Jawatan : .....  
 Tarikh : .....

**SURAT AKUAN PENYEBUTHARGA**

**Kepada:**

**Ketua Pengarah Tanah dan Galian Persekutuan,  
Jabatan Ketua Pengarah Tanah dan Galian Persekutuan,  
Kementerian Air, Tanah dan Sumber Asli,  
Seksyen Pentadbiran dan Kewangan,  
Aras 1, Podium 1, Wisma Sumber Asli,  
No. 25, Persiaran Perdana, Presint 4,  
Pusat Pentadbiran Kerajaan Persekutuan  
62574 PUTRAJAYA**

Tuan,

**SEBUTHARGA BIL. JKPTG SH16/2018:**

**SEBUT HARGA MEMBEKAL, MENUKARGANTI DAN MENYELENGGARA SISTEM PENYAMAN UDARA JENIS WATER COOLED PACKAGE KEPADA JENIS AIR COOLED PACKAGE C/W INDOOR AND OUTDOOR UNIT, WIRING, PANEL ELECTRIC, BRACKETS, CORING, HACKING, PUNCHING OF HOLES IN FLOOR/WALL, MAKING GOOD, PAINTING, PLINTH, PVC CONDUIT & CABLE TRAY DI BANGUNAN JABATAN KETUA PENGARAH TANAH DAN GALIAN PERSEKUTUAN NEGERI KELANTAN, KEMENTERIAN AIR, TANAH DAN SUMBER ASLI TERMASUK KERJA-KERJA BERKAITAN.**

Di bawah dan tertakluk kepada Arahan Kepada Penyebutharga, saya yang menurunkan tandatangan di bawah ini adalah dengan ini mengambil bahagian sebutharga dan menawarkan untuk melaksanakan perkhidmatan di atas mengikut penentuan spesifikasi yang ditetapkan di dalam Dokumen Sebutharga yang didapati secara percuma bagi tempoh perkhidmatan selama tiga puluh enam (36) bulan.

2. Saya yang menurunkan tandatangan di bawah ini bersetuju menerima serta mematuhi dan terikat dengan semua Syarat-syarat Kontrak dan Spesifikasi Sebutharga ini dan bersetuju di atas harga yang ditawarkan sebagai asas perkiraan bagi pembayaran perkhidmatan yang telah dipesan oleh Jabatan Ketua Pengarah Tanah dan Galian Persekutuan.

3. Dengan ini juga telah difahami bahawa Jabatan Ketua Pengarah Tanah dan Galian Persekutuan berhak menerima atau menolak sebarang sebutharga ini, sama ada harga yang ditawarkan rendah, tinggi atau sama ada dengan sebutharga-sebutharga yang lain. Saya juga bersetuju untuk menerima kesemua atau sebahagian dari item-item yang ditawarkan dan sedia mengikut kehendak dan pertimbangan Jabatan Ketua Pengarah Tanah dan Galian Persekutuan. **Saya juga bersetuju bahawa harga sebutharga yang**

**saya beri ini akan sah laku (*valid*) dan tidak ditarik balik dalam tempoh sembilan puluh (90) hari dari tarikh tutup sebutharga.**

4. Selanjutnya saya bersetuju sekiranya sebutharga saya diterima, saya akan mengikat perjanjian kontrak serta memberi bon pelaksanaan dalam tempoh **empat belas (14) hari** dari tarikh terima surat tawaran dari Jabatan Ketua Pengarah Tanah dan Galian Persekutuan.

5. Saya juga mengesahkan, setelah menyemak sendiri iaitu semua dokumen yang digunakan untuk sebutharga ini adalah yang sebenar yang terdapat di dalam Dokumen Sebutharga.

Nama Penyebutharga: ..... \* .....  
Tandatangan

Penyebutharga  
Alamat dan  
Cop Rasmi: .....  
.....  
.....

Tarikh: .....

Nama Saksi: ..... \* .....  
Tandatangan Saksi

Alamat: .....  
.....  
.....

*\* wajib ditandatangani*

## **KLAUSA PENCEGAHAN RASUAH DALAM DOKUMEN PEROLEHAN KERAJAAN**

### **PERINGATAN KESALAHAN RASUAH**

- (i) Sebarang perbuatan atau percubaan rasuah untuk menawar atau memberi, meminta atau menerima apa-apa suapan secara rasuah kepada dan daripada mana-mana orang berkaitan perolehan ini merupakan suatu kesalahan jenayah di bawah Akta Suruhanjaya Pencegahan Rasuah Malaysia 2009 (Akta 694).
- (ii) Sekiranya mana-mana pihak ada menawar atau memberi 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)
- (iii) Tanpa prejudis kepada tindakan-tindakan lain, tindakan tatatertib terhadap anggota perkhidmatan awam dan menyenaraihitamkan kontraktor atau pembekal boleh diambil sekiranya pihak-pihak terlibat dengan kesalahan rasuah di bawah Akta Suruhanjaya Pencegahan Rasuah Malaysia 2009 (Akta 694)
- (iv) Mana-mana kontraktor atau pembekal yang membuat tuntutan bayaran berkaitan perolehan ini walaupun tiada 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 di bawah Akta Suruhanjaya Pencegahan Rasuah Malaysia 2009 (Akta 694)

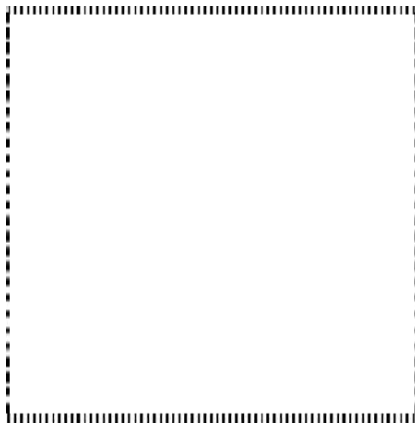
### **“Termination on Corruption, Unlawful or Illegal Activities”**

- a. Without prejudice to any other rights of the Government, if the [Company/Firm], its personnel, servants or employees is convicted by a court of law for corruption or unlawful or illegal activities in relation to this [Agreement/Contract] or any other agreement that the [Company/Firm] may have with the Government, the Government shall be entitled to terminate this [Agreement/Contract] at any time, by giving immediate written notice to that effect to the [Company/Firm].
- b. Upon such termination, the Government shall be entitled to all losses, costs, damages and expenses (including any incidental costs and expenses) incurred by the Government arising from such termination.
- c. For the avoidance of doubt, the Parties hereby agree that the [Company/ Firm] shall not be entitled to any form of losses including loss of profit, damages, claims or whatsoever upon termination of this [Agreement/ Contract].

**LAPORAN KEEMPUYAAN LOJI DAN PERALATAN PENTENDER**

(Penyebutharga hendaklah mengemukakan bukti dan dilengkapi dengan gambar-gambar berkaitan dengan peralatan atau loji kepunyaannya bagi kerja-kerja membaikpulih peralatan Mekanikal dalam format yang dinyatakan di bawah ini).

i. Peralatan



Nama Peralatan:

Untuk Diisi Oleh Pegawai  
Pemeriksa

.....

Nama:

a. Model:

Jawatan:

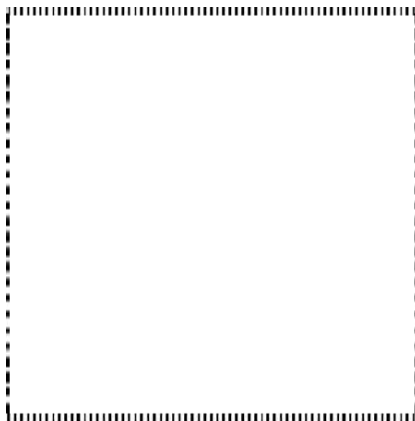
.....

Cop Jabatan:

Markah:



ii. Peralatan



Nama Peralatan:

Untuk Diisi Oleh Pegawai  
Pemeriksa

.....

Nama:

b. Model:

Jawatan:

.....

Cop Jabatan:

Markah:



iii. Peralatan

Nama Peralatan:

Untuk Diisi Oleh Pegawai  
Pemeriksa

Nama:

c. Model:

Jawatan:

Cop Jabatan:

Markah:

iv. Peralatan

Nama Peralatan:

Untuk Diisi Oleh Pegawai  
Pemeriksa

Nama:

d. Model:

Jawatan:

Cop Jabatan:

Markah:

v. Peralatan

Nama Peralatan:

Untuk Diisi Oleh Pegawai  
Pemeriksa

Nama:

e. Model:

Jawatan:

Cop Jabatan:

Markah:

**JADUAL PENGALAMAN SYARIKAT  
JKPTG SH16/2018**

**SEBUT HARGA MEMBEKAL, MENUKARGANTI DAN MENYELENGGARA SISTEM PENYAMAN UDARA JENIS WATER COOLED PACKAGE KEPADA JENIS AIR COOLED PACKAGE C/W INDOOR AND OUTDOOR UNIT, WIRING, PANEL ELECTRIC, BRACKETS, CORING, HACKING, PUNCHING OF HOLES IN FLOOR/WALL, MAKING GOOD, PAINTING, PLINTH, PVC CONDUIT & CABLE TRAY DI BANGUNAN JABATAN KETUA PENGARAH TANAH DAN GALIAN PERSEKUTUAN NEGERI KELANTAN, KEMENTERIAN AIR, TANAH DAN SUMBER ASLI TERMASUK KERJA-KERJA BERKAITAN.**

Senaraikan kerja yang telah disiapkan berkaitan dengan kontrak Perkhidmatan Pembersihan yang telah dijalankan untuk tempoh 3 tahun terakhir.

| <b>Nama Kontrak</b> | <b>Jabatan/<br/>Agensi/<br/>Perunding<br/>yang<br/>mengawas<br/>kontrak</b> | <b>Harga<br/>Sebutharga<br/>(RM)</b> | <b>Tempoh</b> | <b>Nama &amp; No.<br/>Telefon Pegawai<br/>bertanggungjawab<br/>mengawas<br/>kontrak untuk<br/>dihubungi</b> |
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**JADUAL KERJA DALAM TANGAN  
JKPTG SH16/2018**

**SEBUT HARGA MEMBEKAL, MENUKARGANTI DAN MENYELENGGARA SISTEM PENYAMAN UDARA JENIS WATER COOLED PACKAGE KEPADA JENIS AIR COOLED PACKAGE C/W INDOOR AND OUTDOOR UNIT, WIRING, PANEL ELECTRIC, BRACKETS, CORING, HACKING, PUNCHING OF HOLES IN FLOOR/WALL, MAKING GOOD, PAINTING, PLINTH, PVC CONDUIT & CABLE TRAY DI BANGUNAN JABATAN KETUA PENGARAH TANAH DAN GALIAN PERSEKUTUAN NEGERI KELANTAN, KEMENTERIAN AIR, TANAH DAN SUMBER ASLI TERMASUK KERJA-KERJA BERKAITAN.**

Senaraikan kerja yang telah disiapkan berkaitan dengan kontrak Perkhidmatan Pembersihan yang sedang dijalankan mulai Oktober 2018 dan ke atas.

| <b>Nama Kontrak</b> | <b>Jabatan/<br/>Agensi/<br/>Perunding<br/>yang<br/>mengawas<br/>kontrak</b> | <b>Harga<br/>Sebutharga<br/>(RM)</b> | <b>Tempoh</b> | <b>Nama &amp; No.<br/>Telefon Pegawai<br/>bertanggungjawab<br/>mengawas<br/>kontrak untuk<br/>dihubungi</b> |
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