SHAHEED MOHTARMA BENAZIR BHUTTO
INSTITUTE OF TRAUMA - KARACHI

No: PROC/SMBBIT/2025-26/171
Dated: 22-12-2025

The Director Information (Advertisement),
Information Department,
Government of Sindh,
Barrack No. 96,
Karachi.

22/12/25
R&I Incharge
Advertisement Section
Information Department
Govt. of Sindh, Karachi

SUBJECT: **ADVERTISEMENT OF TENDER**

Enclosed please find attached herewith seven copies of the following NIT- Reference # **PROC/SMBBIT/2025-26/170, Dated: 22-12-2025** for getting the same printed, in three leading newspapers, preferably Daily DAWN (English), Daily Jang (Urdu)& Daily Kawish (Sindhi) for advertisement as early as possible.

One copy each of the Newspapers containing the advertisement in question may please sent to this department for further action in the matter.

EXECUTIVE DIRECTOR / D.D.O
SMBB INSTITUTE OF TRAUMA, KARACHI

Copy submitted to the following for information and necessary action please;
1. PS to Secretary Health, Government of Sindh, Karachi.

SHAHEED MOHTARMA BENAZIR BHUTTO INSTITUTE OF TRAUMA

REF. NO: PROC/SMBBIT/2025-26/170
DATED: 22-12-2025.

TENDER NOTICE

SHAHEED MOHTARMA BENAZIR BHUTTO INSTITUTE OF TRAUMA, KARACHI, INVITES BIDS IN ACCORDANCE WITH THE **SINDH PUBLIC PROCUREMENT REGULATORY AUTHORITY (SPPRA) RULES (AS AMENDED TO DATE)** THROUGH **E-PROCUREMENT (ONLINE SUBMISSION)** FROM **REPUTABLE FIRMS** FOR THE **FINANCIAL YEAR 2025–26**. BIDDERS MUST BE **REGISTERED ON THE EPADS (SPPRA) PORTAL**, BE **ACTIVE TAXPAYERS**, AND BE DULY REGISTERED WITH THE RELEVANT AUTHORITIES, INCLUDING **GST, NTN, FBR ACTIVE TAXPAYERS LIST, PEC (CIVIL & ELECTRICAL), GENERATOR SET LICENSE, AND SRB**, AS APPLICABLE. THE INVITATION IS OPEN TO **CONTRACTORS, MANUFACTURERS, SUPPLIERS, AUTHORIZED DISTRIBUTORS**, ETC., WHO POSSESS **RELEVANT EXPERIENCE, TECHNICAL CAPABILITY, AND FINANCIAL CAPACITY**. **SCHEDULE FOR ONLINE BID SUBMISSION AND ONLINE OPENING OF TENDER:**

S. #	TENDER NAME	TENDER FEE	BID SECURITY	ISSUANCE OF TENDER DOCUMENTS	SUBMISSION OF TENDER DOCUMENTS ON EPADS SPPRA	OPENING OF TENDER
1.	**PROCUREMENT OF 1250KVA PRIME POWER GENERATORS, UP GRADATION OF EXISTING SYNCHRONIZING POWER PANEL WITH CIVIL & HVAC WORKS ON TURNKEY BAIS SUPPLY, INSTALLATION, TESTING & COMMISSIONING** **Ref # PROC/SMBBIT/(P&M-02)/2025-26** Bidding Procedure: Single Stage Two Envelop 46(2)	Rs. 10,000/-	5% of Quoted Amount	From 24-12-2025 To 08-01-2026 **Till 04:00 PM**	09-01-2026 **Upto 10:00 AM**	09-01-2026 at **10:30 AM**

1. COMPLETE SET OF TENDER DOCUMENTS CONTAINING BOQ, SPECIFICATION AND TERMS & CONDITIONS CAN BE PURCHASED FROM PLANNING & PROCUREMENT DEPARTMENT, **13TH FLOOR, SMBB INSTITUTE OF TRAUMA, CHAND BIBI ROAD, KARACHI** THROUGH **PAY ORDER** OF AS MENTIONED ABOVE EACH IN FAVOUR OF **SHAHEED MOHTARMA BENAZIR BHUTTO INSTITUTE OF TRAUMA.** UPLOADED TENDER PURCHASE RECEIPT ON (EPADS PORTAL SPPRA) WILL BE CONSIDERED VALID FOR THE QUALIFICATION OF THE BID. FAILURE TO UPLOAD THE TENDER PURCHASE RECEIPT SHALL RESULT IN REJECTION OF THE BID WITHOUT FURTHER CONSIDERATION. TENDER DOCUMENTS CAN ALSO BE DOWNLOADED FROM SPPRA WEBSITE **HTTPS://PORTALSINDH.EPROCURE.GOV.PK** AND **WWW.SMBBIT.GOS.PK.**
2. SUBMITTED BIDS WILL BE **OPEN** THROUGH E-PROCUREMENT ONLINE ON THE SAME TIME AND DAY (MENTIONED ABOVE) AT **13TH FLOOR PLANNING AND PROCUREMENT DEPARTMENT, SMBB INSTITUTE OF TRAUMA, CHAND BIBI ROAD, KARACHI**.
3. THE TENDERS SHALL BE OPENED BY PROCUREMENT COMMITTEE AS PER RULES OF E-PROCUREMENT SPPRA.
4. IN CASE OF HOLIDAY OR ANY INCIDENT, TENDERS WILL BE OBTAINED / SUBMITTED / OPENED ON THE NEXT WORKING DAY AS PER GIVEN SCHEDULE.
5. TECHNICAL AND FINANCIAL PROPOSAL SHALL BE UPLOADED ONLINE ON EPADS SPPRA WEBSITE AS PER SPECIFIED IN THE BIDDING DOCUMENT.
6. **THE BID SECURITY MUST BE SUBMITTED IN HARD COPY AT THE ABOVE-MENTIONED ADDRESS, IN A SEALED ENVELOPE, AS MENTIONED ABOVE. THE PAY ORDER FOR THE BID SECURITY MUST BE SUBMITTED PRIOR TO THE OPENING OF THE BID; FAILING WHICH, THE BID SHALL BE REJECTED. THE BID SECURITY SHALL BE MADE IN FAVOR OF SMBB INSTITUTE OF TRAUMA, KARACHI.**
7. ALL BID(S) SHALL INCLUDE GOVERNMENT TAXES. (**IF APPLICABLE**).
8. THE DEDUCTIONS IN THE BILLS WILL BE DONE AS PER GOVERNMENT RULES.

EXECUTIVE DIRECTOR / D.D.O
SMBB INSTITUTE OF TRAUMA, KARACHI

A COPY IS FORWARDED FOR INFORMATION TO:

1. NOTICE BOARD

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JangDotComDotPk jangdotcom jang_akhbar
باقاعدہ تصدیق شدہ اشاعت ABC CERTIFIED پاکستان کے ہر روزنامہ سے زیادہ
THE DAILY JANG KARACHI
روزنامہ جنگ کراچی
بانی میر خلیل الرحمن
WEDNESDAY DECEMBER 24, 2025
جلد 89 | بدھ 3 رجب المرجب 1447ھ 24 دسمبر 2025ء | نمبر 352

شہید محترمہ بینظیر بھٹو انسٹی ٹیوٹ آف ٹراما

ریفرنس نمبر: PROC/SMBBIT/2025-26/170 تاریخ: 22-12-2025

ٹینڈر نوٹس

شہید محترمہ بینظیر بھٹو انسٹی ٹیوٹ آف ٹراما، کراچی کو سندھ پبلک پروکیورمنٹ ریگولیٹری اتھارٹی (SPPRA) کے رولز (جو موجودہ تاریخ تک ترمیم شدہ ہیں) کے مطابق ای-پروکیورمنٹ (آن لائن جمع کرانے) کے ذریعے معروف فرموں سے مالی سال 26-2025 کے لیے بولیاں مطلوب ہیں، بولی دہندگان کو EPADS (ایس پی پی آر اے) پورٹل پر رجسٹرڈ ہونا چاہیے، فعال ٹیکس دہندگان کی فہرست میں شامل ہونا چاہیے اور متعلقہ حکام کے ساتھ باضابطہ طور پر رجسٹرڈ ہونا چاہیے، بشمول جی ایس ٹی، این ٹی این، ایف بی آر کی فعال ٹیکس دہندگان کی فہرست، پی ای سی (سول اور الیکٹریکل)، جنریٹر سیٹ لائسنس، اور ایس آر بی جیسا کہ قابل اطلاق ہے۔ یہ دعوت نامہ کنٹریکٹرز، مینوفیکچررز، سپلائرز، مجاز ڈسٹری بیوٹرز وغیرہ کے لیے اوپن ہے، جن کے پاس متعلقہ تجربہ، ٹیکنیکل صلاحیت اور فنانشل استطاعت موجود ہو۔ آن لائن بولی جمع کرانے اور آن لائن ٹینڈر کھلنے کا شیڈول:

نمبر شمار	ٹینڈر کا نام	ٹینڈر فیس	بڈ سیکیورٹی	ٹینڈر دستاویزات کا اجرا	EPADS SPPRA پر ٹینڈر دستاویزات جمع کرانا	ٹینڈر کھلنا
1	1250 پرائم پاور جنریٹرز کی خریداری، موجودہ SYNCHRONIZING پاور پینل کی اپ گریڈیشن کے ساتھ سول اور HVAC ورکس، ٹرنکی بیس سپلائی، انسٹالیشن، ٹیسٹنگ، کمیشننگ ریفرنس نمبر PROC/SMBBIT/(P&m-02)2025-26 بولی کا طریقہ کار: سنگل اسٹیج ٹو انویلپ (2)46	10,000/- روپے	5 فیصد حوالہ شدہ رقم کا	24-12-2025 تا 08-01-2026 شام 04:00 بجے تک	09-01-2026 صبح 10:00 بجے تک	09-01-2026 صبح 10:30 بجے

1. BOQ، تفصیلات اور شرائط وضوابط پر مشتمل ٹینڈر دستاویزات کا مکمل سیٹ پلاننگ اینڈ پروکیورمنٹ ڈپارٹمنٹ 13ویں منزل، SMBB انسٹی ٹیوٹ آف ٹراما، چاندنی بی روڈ، کراچی سے بذریعہ پے آرڈر بنام شہید محترمہ بینظیر بھٹو انسٹی ٹیوٹ آف ٹراما کے حق میں ادائیگی پر حاصل کیا جاسکتا ہے جیسا کہ اوپر ذکر کیا گیا ہے۔ (EPADS پورٹل SPPRA) پر اپ لوڈ کردہ ٹینڈر خریداری کی رسید کو بولی کی اہلیت کے لیے درست سمجھا جائے گا۔ ٹینڈر کی خریداری کی رسید اپ لوڈ کرنے میں ناکامی کا نتیجہ مزید غور کیے بغیر بولی کو مسترد کرنے کی صورت میں نکلے گا۔ ٹینڈر دستاویزات کو SPPRA کی ویب سائٹ https://portalsindh.eprocure.gov.pk اور www.smbbit.gos.pk سے بھی ڈاؤن لوڈ کیا جاسکتا ہے۔
2. جمع کرائی گئی بولیاں ای پروکیورمنٹ کے ذریعے ایک ہی وقت اور دن (اوپر مذکور) 13ویں منزل پلاننگ اینڈ پروکیورمنٹ ڈپارٹمنٹ، SMBB انسٹی ٹیوٹ آف ٹراما، چاندنی بی روڈ، کراچی میں کھولی جائیں گی۔
3. ٹینڈر زای پروکیورمنٹ SPPRA کے رولز کے مطابق پروکیورمنٹ کمیٹی کے ذریعے کھولے جائیں گے۔
4. چھٹی یا کسی بھی واقعے کی صورت میں ٹینڈرز دیئے گئے شیڈول کے مطابق اگلے ورکنگ ڈے پر حاصل کیے جائیں گے/جمع کیے جائیں گے/کھولے جائیں گے۔
5. ٹیکنیکل اور فنانشل تجویز EPADS SPPRA کی ویب سائٹ پر آن لائن اپ لوڈ کی جائے گی جیسا کہ بولی کے دستاویز میں بیان کیا گیا ہے۔
6. بڈ سیکیورٹی کو ایک سربمہر انویلپ میں، جیسا کہ اوپر ذکر کیا گیا ہے، اوپر دیے گئے پتے پر بشکل بارڈ کاپی جمع کرانا ہوگا۔ بڈ سیکیورٹی کے لیے پے آرڈر بولی کھولنے سے پہلے جمع کرانا ہوگا۔ جس میں ناکام ہونے پر بولی کو مسترد کردیا جائے گا۔ بڈ سیکیورٹی SMBB انسٹی ٹیوٹ آف ٹراما، کراچی کے نام بنائی جائیگی۔
7. تمام بولیوں میں حکومتی ٹیکسز شامل ہوں گے۔ (اگر قابل اطلاق ہو)۔
8. بلوں میں کٹوتیاں حکومتی قواعد کے مطابق کی جائیں گی۔

ایگزیکٹو ڈائریکٹر / D.D.O
SMBB انسٹی ٹیوٹ آف ٹراما، کراچی

INF/KRY/4460/2025

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DAILY KAWISH
Daily Kawish Hyderabad
روزانه
ڪاوش
Wednesday, 24 December, 2025
(جلد 36) اربع 24 ڊسمبر 2025ع بمطابق 03 رجب المرجب 1447ھ (شمارو 143) قيمت 40 رپيا

شهيد محترما بينظير ڀٽو
انسٽي ٽيوٽ آف ٽراما

ريفرنس نمبر: PROC/SMBBIT/2025-26/170 تاريخ: 22-12-2025

ٽينڊر نوٽيس

شهيد محترمہ بينظير ڀٽو انسٽيٽيوٽ آف ٽراما، ڪراچي، سنڌ پبلڪ پروڪيورمينٽ ريگيوليٽري اٿارٽي (SPPRA) جي قاعدن (هن وقت تائين ٽيل ترميمن سميت) موجب مالي سال 26-2025ء لاءِ اي-پروڪيورمينٽ (آن لائين جمع ڪرائڻ) ذريعي معتبر فرمن کان ٽينڊر گهرائي رهيو آهي. هولي ڏيندڙ (Bidders) لاءِ لازمي آهي ته اهي EPADS (SPPRA) پورٽل تي رجسٽرڊ هجن. فعال ٽيڪس پرينڊڙ هجن. ۽ لاڳاپيل ادارن سان باقاعده رجسٽرڊ هجن، جن ۾ FBR، NTN، GST ايڪٽو ٽيڪس پيئر لسٽ، PEC (سول ۽ اليڪٽريڪل)، جنريٽر سيٽ لائسنس، ۽ SRB (جيئن لاڳو هجي) شامل آهن. ڪنٽريڪٽرز، مينوفيڪچررز، سپلائرز، مجاز ورهائيندڙن وغيره لاءِ ٽينڊر گهرائڻ جي ڪليل دعوت آهي، جيڪي لاڳاپيل تجربي فني صلاحيت ۽ مالي گنجائش رکن ٿا. آن لائين ٽينڈر جمع ڪرائڻ ۽ کولڻ جو شيڊول هيٺين ريت آهي:

نمبر	ٽينڈر جو نالو	ٽينڈر في	بڊ سيڪيورٽي	ٽينڈردستاويزن جي جاري ٿيڻ جي تاريخ	EPADS SPPRA تي ٽينڈر دستاويز جمع ڪرائڻ جي تاريخ	ٽينڈر کلڻ جي تاريخ
1	1250 KVA پرائمر پاور جنريٽرز جي خريداري، موجوده سنڪرونائيزنگ پاور پينل جي اپ گريڈيشن، سول ۽ HVAC ڪر سميت (ترنڪي بنياد تي سپلاءِ، انسٽاليشن، ٽيسٽنگ ۽ ڪميشننگ) حوالو نمبر:PROC/SMBBIT/(P&M-02)/2025-26 بڊنگ جو طريقو : سنگل اسٽيج ٽو اينويلپ(2) 46	10,000/- رپيا	ڪوٽيد رقم جو 5%	24-12-2025 کان 08-01-2026 شام جو 4:00 وڳي تائين	09-01-2026 صبح جو 10:00 وڳي تائين	09-01-2026 صبح جو 10:30وڳي تائين

1. ٽينڈر دستاويزن جو مڪمل سيٽ، جنهن ۾ BOQ، وضاحتون ۽ شرط ۽ ضابطا شامل آهن، پلاننگ اينڊ پروڪيورمينٽ ڊپارٽمينٽ، 13هين ماڙ، شهيد محترمہ بينظير ڀٽو انسٽيٽيوٽ آف ٽراما، چاند بيبي روڊ، ڪراچي مان مٿي ڄاڻايل فيس جي ادائيگي بعد پي آرڊر ذريعي حاصل ڪري سگهجي ٿو جيڪو "شهيد محترمہ بينظير ڀٽو انسٽيٽيوٽ آف ٽراما" جي نالي تي هجڻ گهرجي. EPADS (SPPRA)تي اپ لوڊ ڪيل ٽينڈر خريداري جي رسيد کي هولي جي اهليت (Qualification) لاءِ صحيح ۽ قابل قبول سمجهيو ويندو. ٽينڈر خريداري جي رسيد اپ لوڊ نه ڪرڻ جي صورت ۾ هولي رد ڪئي ويندي. ٽينڈر دستاويز SPPRA ويب سائيٽ https://portalsindh.eprocure.gov.pk ۽ www.smbbit.gos.pk تان پڻ ڊائونلوڊ ڪري سگهجن ٿا.
2. جمع ڪرايل هوليون .(جيئن مٿي ڄاڻايو ويو آهي)ساڳئي ڏينهن ۽ ساڳي وقت تي 13هين ماڙ، پلاننگ اينڊ پروڪيورمينٽ ڊپارٽمينٽ، SMBB انسٽيٽيوٽ آف ٽراما، ڪراچي ۾ اي-پروڪيورمينٽ ذريعي آن لائين کوليون ويندیون.
3. پروڪيورمينٽ ڪميٽي پاران ٽينڈر SPPRA جي اي-پروڪيورمينٽ قاعدن موجب کوليا ويندا.
4. ڪنهن به موڪل يا اڻ وٽيندڙ صورتحال ۾ ٽينڈر ايندڙ ڪم واري ڏينهن تي ساڳئي شيڊول موجب حاصل ڪري، جمع ڪرائي سگهبا ۽ کوليا ويندا.
5. فني ۽ مالي تجويزون هولي دستاويزن موجب EPADS SPPRA ويب سائيٽ تي آن لائين اپ لوڊ ڪرڻ لازمي آهن.
6. بڊ سيڪيورٽي جي هارڊ ڪاپي مٿي ڄاڻايل پتي تي مهربند لفافي ۾ جمع ڪرائڻ لازمي آهي (جيئن مٿي ڄاڻايو ويو آهي) . بڊ سيڪيورٽي جو پي آرڊر هولي کولڻ کان اڳ جمع ڪرائڻ لازمي آهي. نه ڪرائڻ جي صورت ۾ هولي رد ڪئي ويندي. بڊ سيڪيورٽي SMBB انسٽيٽيوٽ آف ٽراما، ڪراچي جي نالي تي هجڻ گهرجي.
7. سيئي هوليون سرڪاري ٽيڪس سميت هجڻ گهرجن (جيڪڏهن لاڳو هجي).
8. بلن مان ڪٽوتيون سرڪاري قاعدن موجب ڪيون ويندیون.

ايگزيڪيوٽو ڊائريڪٽر/ ڊي. ڊي. او
SMBB،انسٽي ٽيوٽ آف ٽراما، ڪراچي.

INF/KRY/4460/2025

SHAHEED MOHTARMA BENAZIR BHUTTO INSTITUTE OF TRAUMA

REF. NO: PROC/SMBBIT/2025-26/170) DATED: 22-12-2025.

TENDER NOTICE

SHAHEED MOHTARMA BENAZIR BHUTTO INSTITUTE OF TRAUMA, KARACHI, INVITES BIDS IN ACCORDANCE WITH THE SINDH PUBLIC PROCUREMENT REGULATORY AUTHORITY (SPPRA) RULES (AS AMENDED TODATE) THROUGH E-PROCUREMENT (ONLINE SUBMISSION) FROM REPUTABLE FIRMS FOR THE FINANCIAL YEAR 2025-26. BIDDERS MUST BE REGISTERED ON THE EPADS (SPPRA) PORTAL, BE ACTIVE TAXPAYERS, AND BE DULY REGISTERED WITH THE RELEVANT AUTHORITIES, INCLUDING GST, NTN, FBR ACTIVE TAXPAYERS LIST, PEC (CIVIL & ELECTRICAL), GENERATOR SET LICENSE, AND SRB, AS APPLICABLE. THE INVITATION IS OPEN TO CONTRACTORS, MANUFACTURERS, SUPPLIERS, AUTHORIZED DISTRIBUTORS, ETC.,WHO POSSESS RELEVANT EXPERIENCE, TECHNICAL CAPABILITY, AND FINANCIAL CAPACITY. SCHEDULE FOR ONLINE BID SUBMISSION AND ONLINE OPENING OF TENDER:

s. #	TENDER NAME	TENDER FEE	BID SECURITY	ISSUANCE OF TENDER DOCUMENTS	SUBMISSION OFFENDER DOCUMENTS ON EPADS SPPRA	OPENING OF TENDER
1	PROCUREMENT OF 1250KVA PRIME POWER GENERATORS, UP GRADATION OF EXISTING SYNCHRONIZING POWER PANEL WITH CIVIL & HVAC WORKS ON TURNKEY BAIS SUPPLY, INSTALLATION, TESTING & COMMISSIONING Ref # PROC/SMBBIT/(P&M-02)/2025-26 Bidding Procedure: Single Stage Two Envelop 46(2)	Rs. 10,000/-	5% of Quoted Amount	From 24-12-2025 To 08-01-2026 Till 04:00 PM	09-01-2026 Upto 10:00 AM	09-01-2026 at 10:30 AM

1. COMPLETE SET OF TENDER DOCUMENTS CONTAINING BOQ, SPECIFICATION AND TERMS & CONDITIONS CAN BE PURCHASED FROM PLANNING & PROCUREMENT DEPARTMENT, 13th FLOOR, SMBB INSTITUTE OF TRAUMA, CHAND BIBI ROAD, KARACHI THROUGH PAY ORDER OF AS MENTIONED ABOVE EACH IN FAVOUR OF SHAHEED MOHTARMA BENAZIR BHUTTO INSTITUTE OF TRAUMA. UPLOADED TENDER PURCHASE RECEIPT ON (EPADS PORTAL SPPRA) WILL BE CONSIDERED VALID FOR THE QUALIFICATION OFTHE BID. FAILURE TO UPLOAD THE TENDER PURCHASE RECEIPT SHALL RESULT IN REJECTION OF THE BID WITHOUT FURTHER CONSIDERATION. TENDER DOCUMENTS CAN ALSO BE DOWNLOADED FROM SPPRA WEBSITE HTTPS://PORTALSINDH.EPROCURE.GOV.PK AND WWW.SMBBIT.GOS.PK.
2. SUBMITTED BIDS WILL BE OPEN THROUGH E-PROCUREMENT ONLINE ON THE SAME TIME AND DAY (MENTIONED ABOVE) AT 13TH FLOOR PLANNING AND PROCUREMENT DEPARTMENT, SMBB INSTITUTE OF TRAUMA, CHAND BIBI ROAD, KARACHI.
3. THE TENDERS SHALL BE OPENED BY PROCUREMENT COMMITTEE AS PER RULES OF E-PROCUREMENT SPPRA.
4. IN CASE OF HOLIDAY OR ANY INCIDENT, TENDERS WILL BE OBTAINED / SUBMITTED / OPENED ON THE NEXT WORKING DAY AS PER GIVEN SCHEDULE.
5. WORKING DAY AS PER GIVEN SCHEDULE. TECHNICAL AND FINANCIAL PROPOSAL SHALL BE UPLOADED ONLINE ON EPADS SPPRA WEBSITE AS PER SPECIFIED IN THE BIDDING DOCUMENT.
6. THE BID SECURITY MUST BE SUBMITTED IN HARD COPY AT THE ABOVE-MENTIONED ADDRESS, IN A SEALED ENVELOPE, AS MENTIONED ABOVE. THE PAY ORDER FOR THE BID SECURITY MUST BE SUBMITTED PRIOR TO THE OPENING OF THE BID; FAILING WHICH, THE BID SHALL BE REJECTED. THE BID SECURITY SHALL BE MADE IN FAVOR OF SMBB INSTITUTE OF TRAUMA, KARACHI.
7. ALL BID(S) SHALL INCLUDE GOVERNMENT TAXES. (IF APPLICABLE).
8. THE DEDUCTIONS IN THE BILLS WILL BE DONE AS PER GOVERNMENT RULES.

INF/KRY/4460/25

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STANDARD BIDDING DOCUMENT

GOVERNMENT OF SINDH

SHAHEED MOHTARMA BENAZIR BHUTTO INSTITUTE OF TRAUMA, KARACHI

TENDER TITLE	**PROCUREMENT OF 1250KVA PRIME POWER GENERATORS, UP GRADATION OF EXISTING SYNCHRONIZING POWER PANEL WITH CIVIL & HVAC WORKS ON TURNKEY BAIS SUPPLY, INSTALLATION, TESTING & COMMISSIONING**
TENDER REFERENCE #	**PROC/SMBBIT/(P&M-02)/2025-26**
PART	**A**
THE BID CONSISTS OF PART A AND PART B, AND SUBMISSION OF BOTH PARTS IS MANDATORY.	

NOTE:

1. **TENDER FEE: RS. 10,000/-(NON-REFUNDABLE)** IN SHAPE OF PAY ORDER IN FAVOR OF SHAHEED MOHTARMA BENAZIR BHUTTO INSTITUTE OF TRAUMA, KARACHI SHOULD SUBMIT TO PROCUREMENT DEPARTMENT IN PROPERLY MARKED SEALED ENVELOPE.

2. **IN ALL PROCUREMENTS OF SMBBIT THROUGH ELECTRONIC BID SUBMISSION. IT IS MANDATORY FOR ALL BIDDERS TO GET REGISTERED AT EPADS SPPRA.**

3. NO TENDER WILL BE ACCEPTED AFTER CLOSING TIME IN EPADS SPPRA.

4. ALL THE PARTICIPANTS MUST SIGN EACH & EVERY PAGE OF BID DOCUMENTS, ELSE OFFER WILL BE REJECTED.

TABLE OF CONTENT

BIDDING DATA SHEET

Procuring Agency	SMBB Institute of Trauma (SMBB-IT)
Address	Chand Bibi Road, Karachi
Name of Tender	**Procurement Of 1250 KVA Prime Power Generators, Up Gradation Of Existing Synchronizing Power Panel with Civil & HVAC Works On Turnkey Bais Supply, Installation, Testing & Commissioning** **PROC/SMBBIT/(P&M-02)/2025-26**
Bid Validity	90 Days, as per SPPRA Rule 2010 (Amended till date)
Amount of Bid Security	**5% of Total Bid Quoted Price**
Amount of Performance Security	**10% of Total Contract Price**
Last date of Selling of Bid	As per Mentioned in NIT
Date of Submission of Bid	As per Mentioned in NIT
Place of Submission	**Electronic Bid Submission at EPADS SPPRA**.
Venue of Opening of Bid	**13th Floor Planning & Procurement Department SMBB Institute of Trauma, Karachi**
Language of Bid	English
Bidding Procedure	Single Stage Two Envelope Procedure 46(2)
Advance Payment	Not Allowed / As per case
Period of Completion	**As per ANNEX-C**
Liquidity Damages	0.5% of the bid price per month after the period of Completion up to 10% maximum.
Inspection Authority	Nominated Inspection Committee of SMBB Institute of Trauma, Karachi.
Required Item Quality	All items will be procured on approved Specification basis.
Place of Delivery	2nd Floor Genset Room of SMBB Institute of Trauma, Karachi.

INSTRUCTIONS TO BIDDERS (I.T.B)

1. Shaheed Mohtarma Benazir Bhutto Institute of Trauma Karachi, invites e-bids through E-Pak Acquisition and Disposable System (EPADS) on CFR/CPT/C&F or DDP Basis (Excluding GST) from the Manufacturers or authorized Agents / Distributors of Manufacturers available on the _List of Active Taxpayers' of FBR/SRB (whichever is applicable) for the **"Procurement Of 1250 KVA Prime Power Generators, Up Gradation Of Existing Synchronizing Power Panel with Civil & HVAC Works On Turnkey Bais Supply, Installation, Testing & Commissioning"** as per Rule 46(2) of SPP Rules 2010 ―Single Stage-Two Envelopes Procedure. Bidding Documents containing detailed Terms and Conditions can be viewed/downloaded from https://portalsindh.eprocure.gov.pk/#/.

2. **Electronic Bids should be submitted through EPADS only. Manual bids shall not be received. Interested bidders are required to register themselves on the EPAD System at the link https://sindh.eprocure.gov.pk/#/supplier/registration for submission of electronic bids.**

3. Bidders are required to check that Tender Documents issued to them are complete in all respects as per table of content.

4. **LANGUAGE OF BID**: The bid prepared by the bidder, as well as all correspondence and documents relating to the bid exchanged by the bidder and the Procuring Agency shall be in English. Supporting documents and printed literature furnished by the bidder may be in another language provided these are accompanied by an accurate translation of the relevant passages in English, in which case for purposes of interpretation of the Bid, the translated version shall prevail.

5. Bidders should examine carefully the table of content. They should visit and inspect the site at their own expense and responsibility and obtain all necessary information prior to submitting the tender. Any detail / specification missing in the document should be obtained from Planning & Procurement Department before bidding. Once the tender is submitted, it will be assumed that no further clarification was required.

6. The original bid shall be typed or written in indelible ink by the bidder or person duly authorized. The person or persons signing the bid shall initial all pages of the bid. The name and designation of each person signing must be mentioned below the signature.

7. No bidder shall be allowed to alter or modify his bid after the bids have been opened. However, the procuring agency may seek and accept clarification to the bids that do not change substances of the bids.

8. The Procuring Agency may reject all bids or proposal at any time prior to the acceptance of a bid or proposal. The Procuring Agency upon request communicate to any supplier or contractor who submitted a bid or proposal, the grounds for its rejection of all bids or proposal, but is not required to justify those grounds.

9. The quoted rates shall be **inclusive of all costs and expenses of whatsoever description**, necessary to complete the works in all respects, together with all risks, taxes, duties, levies, liabilities, and obligations — whether specifically stated or implied — in the Tender Documents. In case of any **arithmetical error**

detected during evaluation, the tender price shall be **corrected accordingly** as per SPPRA Rules. However, if such correction **alters the total bid price or results in a change of the bid security amount**, the bid shall be **declared non-responsive and rejected.**

10. No unauthorized alteration may be made in the Tender documents. If any such alteration is made, tender may be liable for rejection.

11. Clarification, revision, addition or deletion, in the tender documents may be made by the authority before the submission and opening of Tender in the form of Addendum/ Corrigendum. This will be made only by formal Addendum/ Corrigendum issued by the concerned authority and will become part of the contract documents. Each Addendum shall be signed by the Vendor and returned with other Tender documents.

12. The entire Tender Documents, listed duly priced, signed & stamped on each page and completed must reach at designated place in due time and dates as defined in the Bidding Data of the Tender.

13. Contractor who will win the tender will be required to enter into a Contract Agreement as defined in the Form of Agreement.

14. All manufactured and other items should be used in the work in accordance with the instructions, specifications in the Tender Document and also in accordance with generally accepted norms of good workmanship.

15. For the purpose of comparison of bids quoted in different currencies, price shall be converted into Pakistani Rupees. The rate of exchange shall be the selling rate prevailing seven working days before the date of opening of the bids, as notified by the National Bank of Pakistan (NBP) / State Bank of Pakistan (SBP).

16. No bidder shall contact the Procuring agency on any matter relating to its bid, from the time of the bid opening to the time the contract is awarded. If the Bidder wishes to bring additional information to the notice of the Procuring agency, it should do so in writing.

17. PROCURING AGENCY'S RIGHT TO VERY QUANTITIES The Procuring Agency reserves the right to increase or decrease the quantity of stores originally specified in the Price Schedule and Schedule of Requirements without any change in unit price or other terms and conditions.

18. The Procuring agency's evaluation of a bid will take into account, in addition to the bid price quoted, the following;

a) Incidental costs

b) Delivery schedule offered in the bid;

c) Deviations in payment schedule

d) The cost of components, mandatory spare parts, and service

e) The availability of spare parts and after-sales services for the equipment offered in the bid;

f) The projected operating and maintenance costs during the life of the equipment; the performance and productivity of the equipment offered; and / or other specific criteria indicated in the Bid Data Sheet and / or in the Technical Specifications.

19. CORRUPT OR FRAUDULENT PRACTICES

a) The Procuring Agency and the Bidders / Manufacturers / Contractors are expected to observe the highest standard of ethics during the procurement and execution of the Contract. In pursuance of this policy, the relevant terms / phrases as may apply are defined below: **"corrupt practice"** means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in Contract execution; and **"fraudulent practice"** means a misrepresentation of facts in order to influence a procurement process or the execution of a Contract to the detriment of the Procuring Agency, and includes collusive practice among Bidders (prior to or after bid submission) designed to establish bid prices at artificial noncompetitive levels and to deprive the Procuring Agency of the benefits of free and open competition;

b) The Procuring Agency will take all possible administrative / legal measures if it is found that the Bidder recommended for award was / is engaged in corrupt or fraudulent practice(s) before or after signing of the contract resulting into the conviction of the proprietor under criminal case besides blacklisting of the firm either indefinitely or for such period of time as may be determined by the Procuring Agency.

c) Will declare a firm ineligible, either indefinitely or for a stated period of time, for the award of a Contract if it, at any time, determines that the firm has engaged in corrupt or fraudulent practices in competing for or in executing a Contract.

SALIENT FEATURES

1.	**Name of Work & Address**	**:**	**Procurement Of 1250 KVA Prime Power Generators, Up Gradation of Existing Synchronizing Power Panel with Civil & HVAC Works On Turnkey Bais Supply, Installation, Testing & Commissioning.** **Tender Reference No: - PROC/SMBBIT/(P&M-02)/2025-26.**
2.	**Place of Issuance of Tender**	**:**	**Planning & Procurement Department, 13th Floor SMBB Institute of Trauma, Karachi.** https://portalsindh.eprocure.gov.pk/#/
3.	**Tender Reference #**	**:**	PROC/SMBBIT/(**P&M-02**)/2025-26.
4.	**Method of opening of Tender**	**:**	It will be Single Stage Two Envelope 46(2) basis as per SPPRA Rules 2010 (Amended till date).
5.	**Online Bid submission**	**:**	https://portalsindh.eprocure.gov.pk/#/
a.	**Opening of Tenders**	**:**	Planning & Procurement Department situated at 13th Floor of SMBB Institute of Trauma, Karachi.
6.	**Date of Opening Financial Proposals**	**:**	As informed by Procurement Committee to all participants
7.	**Validity of Tenders**	**:**	90 days as per SPPRA Rules, 2010 (Amended till Date).
8.	**Amount of Bid Security**	**:**	5% of the Total Quoted amount in shape of pay-order / Demand draft from any schedule bank to be submitted along with Financial Proposal & a copy should be attached in Technical Proposal without showing the Amount (else the offer will be rejected).
9.	**Bid Currencies**	**:**	• Prices shall be quoted in PKR (D.D.P) basis also quote C&F price.
10.	**Supply of Equipment**	**:**	As mentioned in Schedule of Requirement **Annex-C.**
11.	**Installation Period**	**:**	It will start after receiving of equipment at site.
12.	**Warranty & Maintenance Period**	**:**	**Warranty & Maintenance period should be start from the date of Installation report which satisfactorily signed by end user / Deputy Manager Maintenance / Biomedical engineer.** **(This period will remain functional till (mentioned in items individually).**
13. (a)	**Contract Agreement**	**:**	The Bidder / Contractor shall enter & execute a formal Agreement as per the "Form" annexed with such modification as may be necessary.
(b)	**Stamp Paper / duty requirement for Agreement.**	**:**	Rs. @0.35% of the Contract Value or as prescribed by Government Laws.

14.	**Terms of Payment to Contractors.**	**:**	**A. Goods Supplied on D.D.P. Basis** • Payment shall be made in Pakistani Rupees (PKR). • Payment shall be released to the bidder within thirty (30) days of receipt of: o Original delivery challan(s), and o Invoice(s) in duplicate, duly completed in all respects and signed and stamped by the Chairman of the Inspection Committee. • The Inspection Committee shall conduct a physical inspection and submit a report certifying that the supplied goods conform to the specifications laid down in the bidding documents.
			B. Goods Supplied on C&F Basis • In case items are imported and supply orders are placed on C&F (Cost and Freight) basis, a Letter of Credit (L/C) shall be opened by the Procuring Agency, SMBB Institute of Trauma, Karachi, as consignee, in accordance with prevailing rules and regulations. • The contractor shall submit: o Proforma Invoice of the quoted amount on C&F basis from the country of origin, and o Insurance cover note, including PNRA fees, where applicable. • All documentation shall comply with the terms and conditions of the Letter of Credit and applicable statutory requirements.
15.	**Insurance**	**:**	The goods supplied under the Contract shall be delivered to the Procuring Agency after the payment of all taxes and customs duty, CESS, Octroi charges etc. Risk will be transferred to the Procuring Agency only After the delivery of these goods has been made to the Procuring Agency. Hence, payment of insurance premium, if any, shall be the responsibility of the Bidder.
16.	**Release of Bid Security of 5%**	**:**	For unsuccessful bidders, the Bid Security shall be released after the award of work against the said tender. For the successful bidder, the Bid Security shall be released after issuance of the Purchase Order and upon submission of the requisite Performance Security, as per **Salient Feature Sr. #18**
17.	**Security Deposit / Performance Security**	**:**	The successful bidder will have to deposit the requisite Performance security Bond in shape Pay order **(as per amount mentioned in bidding data sheet)** This will be released **as per salient feature Sr.#18.**

18.	**Release of Performance / Security Deposit of 10%**	**:**	• **5%** of Pay order will be released after the satisfactory supply and installation of the equipment. (Bidder will furnish Installation Certificate dully signed by authorized representative at the time of release of Bank Guarantee). • **5%** of Partial Pay order will be released after satisfactory completion of warranty / maintenance Period **(mentioned in Items individually).**
19.	**Variation in Contract Price**	**:**	Amount mention in Contract Agreement will prevail till execution and no variation in price shall be allowed on any ground including Currency Fluctuation/ Variation / Devaluation or whatsoever.
20.	**Taxes**	**:**	All taxes will be deducted as per prevalent laws of Country.
21.	**Approved makes.**	**:**	**As mentioned in items individually.**
22.	**Special Note Regarding Equipment's**	**:**	Technical and/or commercial offers failing to demonstrate compliance with the following requirements shall be rejected: a. The quoted system shall be of the latest and most advanced version. b. The bid shall cover the complete equipment as specified in the tender document. c. The bid shall include the complete range of required disposables and kits compatible with the quoted system. d. The bidder shall provide comprehensive technical documentation and specifications to the satisfaction of the end user and the procuring agency. **a.** e. All quoted items shall be quality-certified or approved by the relevant international regulatory or certification body of the respective industry.
23.	**Maintenance.**	**:**	Maintenance cost for all items for Period **(mentioned in items individually)** from the date of successful Installation shall be undertaken by the Contractor (Maintenance includes all Parts & Labor, etc. with Sufficient staff, during maintenance period).
24.	**Default in Preventive Maintenance, Breakdown and Emergency Calls.**	**:**	• In case of default by the Contractor with respect to maintenance, break down and emergency calls, the same will be carried out within 24 hours by the Procuring Agency and the cost so incurred will be paid from the Retention Money. • Moreover, an additional 10% of the amount spent would be charged from the concerned contractor being defaulter.

25.	**Cost To Be Quoted In B.O.Q.**	**:**	• The Contractors shall quote **DDP & C&F both** prices of the Equipment's including custom clearance etc. and delivering of Equipment at site with Installation & Commissioning cost. • It should also include cost during maintenance period including the parts and maintenance staff. • C&F prices also be needed.
26.	**Tax Exemption.**	**:**	Incase Purchase on C&F basis, the required Certificate will be issued by this office that the import has been made for this Institute, so as to avail the facility of exemption of duties / taxes, as per Government Rules / Policy according to the Sindh Public Procurement Rules, 2010 (Amended till date).
27.	**Transportation**	**:**	The Bidder shall arrange such transportation of the goods as is required to prevent them from damage or deterioration during transit to their final destination as indicated in the Schedule of Requirements. The goods shall be supplied on "D.D.P. & C&F" Basis at the SMBB Institute of Trauma, Karachi. Miscellaneous charges on logistics, transportation, Insurance, clearing from sea port / airport will also be paid / bear by the contractor(s).
28.	**Completion Time**	**:**	120 working days.
29.	**Supply, Installation, Testing & Commissioning**	**:**	Means all types works related to civil, furniture, plumbing, electrical, HVAC, UPS or etc. any type of work which is needed related to proper functioning of supplied equipment will completely responsibility of bidder / contractor. Bidder / Contractor shall visit & inspect the site at their own expense and obtain all necessary information prior to submitting the tender. Any detail or information required should be obtained from Planning & Procurement Department before bidding. Once the tender is submitted, it will be assumed that no further clarification was required.

TERMS & CONDITIONS OF TENDER

a) The registered Contractors / Suppliers / Manufacturers / Authorized Distributors should attach **BID SECURITY (as per amount mentioned under Bidding Data)** in shape of Bank Draft / Pay order issued from any scheduled Bank of Pakistan in favor of **SMBB Institute of Trauma Karachi A Bid Security in the form of a pay order from a scheduled bank must be submitted in favor of Shaheed Mohtarma Benazir Bhutto Institute of Trauma (SMBBIT) before the bid opening at EPADS SPPRA**. However, copy of same should be attached in technical proposal without showing the amount failing so the offer will be rejected.

b) **PERFORMANCE SECURITY:** The successful bidders will have to deposit the requisite Performance Security Bond in the shape of a Pay Order in favor of **SMBB Institute of Trauma, Karachi (as per mentioned in salient features of this bidding document point # 17)**. The same will be released after successful completion of contract period **as per point# 18 of salient features**.

c) Bid / offer will be evaluated as per (**Technical Evaluation Criteria** Mandatory as **Annex-A** and (**Technical Evaluation Criteria** Marking as **Annex-B**) and also the bid's Terms & Conditions.

d) Bid should be inclusive of all Government taxes (if applicable) and the same will be paid by the Contractor except withholding tax.

e) The firm will be responsible for all supply of all awarded items to Store Department of SMBB Institute of Trauma, Karachi / Trauma Emergency Response Centre Larkana / As per supply order. If it fails, the Security Deposit will be forfeited.

f) Procuring Agency shall disqualify a contractor, whether pre-qualified or not, if it finds at any time, that the information submitted by him concerning his qualification and professional, technical, financial, legal, or managerial competence as contractor was false and materially inaccurate or incomplete at any stage.

g) The bid security will be forfeited to the Government, if the bidder withdraws his bid after opening and before the expiry of the bid validity period or fails to sign the contract in stipulated time if the bid is accepted.

h) Arithmetical errors will be rectified on the following basis. If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail, and the total price shall be corrected. If the Supplier does not accept the correction of the errors, its bid will be rejected, and its bid security may be forfeited. If there is a discrepancy between words and figures, the amount in words will prevail.

i) The Procuring Agency may reject all or any bid at any time prior to the acceptance of a bid or proposals, subject to the relevant provision of SPP Rules, 2010 (Amended till date).

j) Bids shall remain valid for 90 days after the date of bid opening and same may be extended in terms of Rule 38 (2) (3) (4) of SPPRA Rules.

k) No tender will be entertained without Security deposit. The Security deposit will be forfeited, in case of non-submission of Performance security within seven (7) days of receipt of letter of Acceptance.

l) If the supplier fails to give supply and install within the stipulated period, liquidity charges will be imposed **(as per amount mentioned in bidding data sheet).**

m) If the Supplier fails to deliver any or all of the Goods or to perform the Services within the period(s) specified in the Contract, the Procuring agency shall, without prejudice to its other remedies under the Contract, deduct from the Contract Price, as liquidated damages, a sum equivalent to the percentage specified in Bidding Data of the delivered price of the delayed Goods or unperformed Services for each week or part thereof delay until actual delivery or performance, up to a maximum deduction of the percentage specified in Bidding Data. Once the maximum is reached, the Procuring agency may consider termination of the Contract.

n) The quoted rates should be valid till **30th June 2026;** Orders will be placed as per requirement on receiving demand from the concern department of Shaheed Mohtarma Benazir Bhutto Institute of Trauma, Karachi.

o) The bidders shall quote their full and final price both in figure and in words on free delivery basis to Shaheed Mohtarma Benazir Bhutto Institute of Trauma, Karachi.

p) Distributor once nominated by the manufacturer / importer will be for the whole contract period and manufacturer / importer cannot change its distributor during the contract period in any case.

q) The Procuring agency reserves the right at the time of contract award to increases / decrease & delete, the items / quantities of goods and services originally specified in the Schedule of Requirements without any change in unit price or other terms and conditions.

r) Quantities of tender items are on estimated basis and could vary according to the amount sanctioned, released and as per discretion of Procurement Committee.

I / We agree to above mentioned Terms & Conditions:

Name of Contractor: _____Signature: _____

CNIC#. (Copy must be attached): _____

Full Address: _____

Company Stamp: _____

GENERAL CONDITIONS OF CONTRACT (G.C.C)

1. **Definition:** In this Contract, the following terms shall be interpreted as indicated:
   a) **"The Contract"** means the agreement entered into between the Procuring Agency and the Bidder, as recorded in the Contract Form signed by the Parties, including all attachments and appendices thereto and all documents incorporated by reference therein
   b) **"The Contract Price"** means the price payable to the Bidder under the Contract for the full and proper performance of its Contractual obligations.
   c) **Goods** means all of the commodities, raw material, machinery and equipment, and/or other materials that the Supplier is required to supply to the Procuring Agency under the Contract.
   d) Related Services means the services incidental to the supply of the goods, such as insurance, installation, training and initial maintenance, printing of special instructions on the label and packing, design and logo of the Procuring Agency, transportation of goods up to the desired destinations and other such obligations of the Bidder covered under the Contract.
   e) **"GCC"** mean the General Conditions of Contract contained in this section.
   f) **"SCC"** means the Special Conditions of Contract.
   g) **"The Procuring Agency"** means the Shaheed Mohtarma Benazir Bhutto Institute of Trauma, Karachi.
   h) **"The Bidder"** means the individual or firm supplying the goods under this Contract.
   i) **"Day"** means official working day excluding national holidays.
2. **APPLICATION:** These General Conditions shall apply to the extent that they are not inconsistent with provisions of other parts of the Contract.
3. **STANDARDS:** The goods supplied under this Contract shall conform to the standards mentioned in the Technical Specifications goods eligibility criteria.
4. **USE OF CONTRACT DOCUMENTS AND INFORMATION:**
   a) The Bidder shall not without the Procuring Agency's prior written consent, disclose the Contract, or any provision thereof, or any specification, plan, drawing, pattern; sample, or information furnished by or on behalf of the Procuring Agency in connection there with, to any person other than a person employed by the Bidder in the performance of the Contract. Disclosure to such employed person shall be made in confidence and shall extend only, as far as may be' necessary, to such performance and not further or otherwise.
   b) Any document, other than the Contract itself, shall remain the property of the Procuring Agency and shall be returned (all copies) on completion of the Bidder's performance under the Contract.
   c) The Bidder shall permit the Procuring Agency to inspect the Bidder's accounts and records relating to the performance of the Supplies.
5. **PATENT RIGHTS:** The Bidder shall indemnify the Procuring Agency against all third- party claims of infringement of patent, trademark, or industrial design rights arising from use of the Goods or any part thereof in the country.
6. **ENSURING STORAGE ARRANGEMENTS:** To ensure storage arrangements for the intended supplies, the Bidder shall inform the Procuring Agency at least two weeks prior to the

arrival of the consignments at its store/warehouse. However, in case no space is available at its store/warehouse at the time of supply, the Procuring Agency shall, seven days prior to such a situation, inform the Bidder, in writing, of the possible time-frame of availability of space by which the supplies could be made. In case the Bidder abides by the given time frame, he will not be penalized for delay.

7. **INSPECTIONS, TESTS AND TRAINING:**
   a) The Procuring Agency or its representative shall have the right to inspect and/or test the goods to confirm their conformity to the Contract specifications at the cost payable by the Bidder.
   b) The Procuring Agency's right to inspect, test and, where necessary, reject the goods either at Bidder's premises or upon arrival at Procuring Agency's destinations shall in no way be limited or waived by reasons of the goods having previously been inspected, tested, and approved by the Procuring Agency or its representative prior to the goods shipment from the manufacturing point.
   c) Bidder shall provide the training to the designated staff of the SMBB Institute of Trauma, Karachi for the smooth operation of the equipment / instruments. Training plan should be attached with the offer.
8. **DELIVERY AND DOCUMENTS:** The Bidder shall in accordance with the terms specified in the Schedule of Requirements make delivery of the goods.
9. **INSURANCE:** The goods supplied under the Contract shall be delivered to the Procuring Agency after the payment of all taxes and customs duty, cess, octroi charges etc. Risk will be transferred to the Procuring Agency only after the delivery of these goods has been made to the Procuring Agency. Hence, payment of insurance premium, if any, shall be the responsibility of the Bidder.
10. **TRANSPORTATION:**
    a) The Bidder shall arrange such transportation of the goods as is required to prevent them from damage or deterioration during transit to their final destination as indicated in the Schedule of Requirements.
    b) The goods shall be supplied on **"D.D.P & C&F"** Basis at SMBB Institute of Trauma, Karachi / Trauma Emergency Response Centre Larkana / As per Supply order Store Department as per Schedule of Requirements on the risk and cost of the Bidder. Transportation including loading / unloading of goods shall be the responsibility of Bidder.
11. **INCIDENTAL SERVICES:** The Bidder will be required to provide to the Procuring Agency incidental services the cost of which should be included in the total bid price.
12. **WARRANTY / GUARANTEE:**
    a) **The term period of warranty / guarantee (mentioned in items specification individually)** from the date on which the Stores have been put into operation and demonstrated to the Institute staff. In any case this period shall not exceed six months beyond the warranty expiration period from the date of taking-over of goods.
    b) During the period of warranty / guarantee, the Contractor shall remedy, at his / her expense, all defects in design, materials, and workmanship that may develop or are revealed under normal use of the goods upon receiving written notice from the Institute; the notice shall indicate in what respect the goods are faulty.

c) The previsions of this Clause include all the expenses that the Contractor may have to incur for delivery and installation of such replacement parts, material and equipment as are needed for satisfactory operation of the goods at the SMBB Institute of Trauma, Karachi premises.

d) The contactor shall provide warranty / guarantee for supply of Machinery / Equipment etc. for at least 05 years (where applicable).

e) The bidder shall separately quote the price of service contract inclusive of parts as well as excluding the parts for 5 years (post warranty / guarantee period) in term of %age for total contract value.

f) In case of consumable items, kits, chemicals, films etc. the contractor shall remain responsible for specificity, efficacy & sensitivity with maximum period of expiry as much allowed by manufacturer.

g) The Procuring Agency shall promptly notify the Bidder in writing of any claims arising out of this warranty.

13. PAYMENT: The method and conditions of payment to be made to the Bidder under the Contract are specified in **Salient Feature point # 14.**

14. ASSIGNMENT: The Bidder shall not assign, in whole or in part, its obligations to perform to another party under this Contract, except with the Procuring Agency's prior written consent.

15. DELAYS IN THE BIDDER'S PERFORMANCE: Delivery of the goods shall be made by the Bidder in accordance with the time schedule prescribed by the Procuring Agency in the Schedule of Requirements

a) If at any time in the course of performance of the Contract, the Bidder encounters anything impeding timely delivery of the goods, he shall promptly notify the Procuring Agency in writing of the causes of delay and its likely duration. As soon as practicable, after receipt of the Bidder's notice, the Procuring Agency shall evaluate the situation and may, depending on merits of the situation, extend the Bidder's time for performance, with or without liquidated damages, in which case the extension shall be ratified by the Parties by a supplementary Contract to be treated as an addendum to the original contract.

b) Any undue delay by the Bidder in the performance of its delivery obligations shall render it liable to the imposition of liquidated damages.

16. PENALTIES / LIQUIDATED DAMAGES: In case deliveries are not completed within the time frame specified in the schedule of requirements / contract, a Show Cause Notice will be served on the Bidder which will be following by cancellation of the Contract to the extent of non - delivered portion of installments. No supplies will be accepted and the amount of Performance Guarantee / Security to the extent of non-delivered portion of supplies of relevant installments will be forfeited. If the firm fails to supply the whole installments, the entire amount of Performance Guarantee/Security will be forfeited to the Government Account and the firm will be blacklisted at least for two years for future participation in bids: The liquidated damage shall be 0.5 % per month or part thereof. The maximum amount of liquidated damages shall be 10% of the amount of contract. Once the cumulative amount of liquidated damages reaches ten percent (10%) of the amount of the contract, the Procuring Agency shall rescind the contract, without prejudice to other courses of action and remedies open to it.

17. **TERMINATION FOR DEFAULT:** The Procuring Agency may, without prejudice to any other remedy for breach of Contract, by a written notice of default sent to the Bidder, terminate this Contract in whole or in part if:
    a) the Bidder fails to deliver any or all installments of the goods within the period(s) specified in the Contract, or within any extension thereof granted by the Procuring Agency;
    b) the Bidder fails to perform any other obligation(s) under the Contract to the satisfaction of the Procuring Agency; and
    c) The Bidder, in the judgment of the Procuring Agency, has engaged itself in corrupt or fraudulent practices before or after executing the Contract.
18. **FORCE MAJEURE:** The Bidder shall not be liable for forfeiture of its Performance Guaranty/ Bid Security, or termination / blacklisting for default if and to the extent that this delay in performance or other failure to perform its obligations under the Contract is the result of an event of Force Majeure. For the purposes of this Clause Force Majeure means an act of God or an event beyond the control of the Bidder and not involving the Bidder's fault or negligence directly or indirectly purporting to mal-planning, mismanagement and /or lack of foresight to handle the situation. Such events may include but are not restricted to acts of the Procuring Agency in its sovereign capacity, wars or revolutions, fires, floods, earthquakes, strikes, epidemics, quarantine restrictions and freight embargoes. If a Force Majeure situation arises, the Bidder shall promptly notify the Procuring Agency in writing with sufficient and valid evidence of such condition and the cause thereof. The Committee, constituted for redressing grievances, will examine the pros and cons of the case and all reasonable alternative means for completion of purchase order under the Contract and will submit its recommendations to the competent authority. However, unless otherwise directed by the Procuring Agency in writing, the Bidder shall continue to perform its obligations under the Contract as far as is reasonably practical and shall seek reasonable' alternative means for performance not prevented by the Force Majeure event.
19. **TERMINATION FOR INSOLVENCY:** The Procuring Agency may at any time terminate the Contract by giving written notice of one-month time to the Bidder if the Bidder becomes bankrupt or otherwise insolvent. In that event, termination will be without compensation to the Bidder, provided that such termination will not prejudice or affect any right or remedy which has accrued or will accrue thereafter to the Parties.
20. **ARBITRATION AND RESOLUTION OF DISPUTES:**
    a) The Procuring Agency and the Bidder shall make every effort to resolve amicably by direct informal negotiations any disagreement or dispute arising between them under or in connection with the Contract.
    b) If, after thirty (30) days from the commencement of such informal negotiations, the Procuring Agency and the Bidder have been unable to resolve amicably a Contract dispute, either party may require that the dispute be referred to the Arbitrator for resolution through arbitration.
    c) In case of any dispute concerning the interpretation and/or application of this Contract is to be settled through arbitration, the arbitrator to be appointed with the approval of the Institute's BOG. The decisions taken and/or award given by the sole arbitrator shall be final and binding on the Parties.

21. PACKING:

a) The Bidder shall provide such packing of the Goods as is required to prevent their damage or deterioration during transit to their final destination, as indicated in the Contract. The packing shall be sufficient to withstand, without limitation, rough handling during transit and exposure to extreme temperatures, salt and precipitation during transit, and open storage. Packing case size and weights shall take into consideration, where appropriate, the remoteness of the Goods' final destination and the absence of heavy handling facilities at all points in transit.

b) The packing, marking, and documentation within and outside the packages shall comply strictly with such special requirements as shall be expressly provided for in the Contract, including additional requirements.

22. GOVERNING LANGUAGE: The Contract shall be written in English language. All correspondence and other documents pertaining to the Contract, which are exchanged by the Parties, shall be written in English.

23. APPLICABLE LAW: This Contract shall be governed by the laws of Pakistan and the courts of Karachi - Pakistan shall have exclusive jurisdiction.

24. Bidder offering radiology equipment failing under compliance with Pakistan Nuclear Regulatory Authority **(PNRA)** should be registered with the authority to install and commission. All expense / fees for **PNRA** for clearance of X-ray based equipment shall be borne by the supplier (where applicable).

25. Delivery and Documents

The supplier shall deliver the goods to the designated store or warehouse of Shaheed Mohtarma Benazir Bhutto Institute of Trauma (SMBBIT), Karachi in accordance with the terms of delivery and payment specified in the purchase order — either Delivery Duty Paid (DDP) for local supplies or through Letter of Credit (L/C) for imported goods.

The following documents must be provided in duplicate at the time of delivery:

For Local (DDP) Deliveries:

i. Original Delivery Challan showing item description, model, quantity, lot/batch number, registration number, expiry date (if applicable), and serial number (if applicable).
ii. Original Invoices showing item details, quantities, unit and total prices.
iii. Sales Tax Invoices (where applicable).
iv. Manufacturers or Bidder's Warranty Certificate.
v. Inspection Certificate issued by the nominated inspection committee.
vi. Certificate of Origin.
vii. Operator's Manual, Technical Manual, Service Manual, and Spare Parts Catalogue.

For Imported Deliveries (L/C-based):

i. Supplier's Invoice showing goods description, quantity, unit price, and total value.
ii. Bill of Lading or Air Waybill.

iii. Packing List identifying contents of each package.
iv. Insurance Certificate covering transit risk up to delivery at SMBBIT Karachi.
iv. Inspection Certificate (if applicable) issued by SMBBIT's nominated inspection authority.
v. Certificate of Origin and Manufacturer's Warranty.
vi. Operator, Technical, and Service Manuals with complete documentation.

The supplier shall notify SMBBIT at least one (01) week prior to shipment or delivery. Failure to provide documentation or advance intimation may result in rejection or delayed payment processing.

26. Delivery, Delays, damages & termination:

a) Delivery Timeline:

The supplier shall deliver all goods and complete the required services strictly within the time period mentioned in the scedule of Requirement or purchase order.

b) Delay Notification:

In case of any expected delay, the supplier must immediately inform the procuring agency in writing, stating the reason and expected duration of the delay. The procuring agency may, at its discretion, extend the delivery time with or without penalty, through written approval.

c) Late Delivery / Penalty:

If the supplier fails to deliver the goods or services within the specified time (without approved extension), a penalty (liquidated damages) shall be deducted from the total contract amount as per the rate mentioned in the bidding date point liquidity damages in tender or purchase order.

d) Maximum Penalty & Contract Termination:

If the maximum penalty limit is reached or the delay continues beyond an acceptable period, the procuring agency reserves the right to terminate the contract and arrange the goods or services from another source at the supplier's cost.

e) Unsatisfactory Performance:

The procuring agency reserves the right to terminate the contract if the supplier fails to perform any obligation under the contract or provides substandard goods or services.

I / We agree to above mentioned General condition of Contract (GCC):

Name of Contractor: _____Signature: _____

CNIC#. (Copy must be attached): _____

Full Address: _____

Company Stamp: _____

(ANNEX-A)

TECHNICAL EVALUATION CRITERIA (MANDATORY)

(Bidders are required to submit following documents in mentioned sequence with Proper Tagging)

S.#	MANDATORY REQUIREMENTS	YES	NO
1.	Compliance of Terms & Conditions / Instructions mentioned in the SBD, must submit the entire **STANDARD BIDDING DOCUMENTS**, duly signed & stamped on each page with Technical Proposal. 1. Attached authorized person CNIC copy. 2. Signed & stamped each and every page of Terms & Condition & all bidding documents. (**If above points compliance not found offer will be rejected**).		
2.	Compliance to the Technical Specifications and Requirements.		
3.	Compliance to bid validity period attached consent on company's letter head / E-Stamp paper valued Rs. 100/-		
4.	Compliance to Delivery Schedule as per Annexure-C consent on company's letter head / E-Stamp paper valued Rs. 100/-		
5.	Compliance to Payments, Terms & conditions, Salient Features consent on company's letter head / E-Stamp paper valued Rs. 100/-		
6.	Item-wise / Feature-wise product compliance / deviation sheet / statement duly sign and stamped must be attached.		
7.	Catalogue / Brochures / technical data sheet (having complete technical specifications of the offered good).		
8.	Valid Manufacturer Authorization: Original Equipment Manufacturers (OEM) or OEM's Authorized Distributors / Sole Agents in Pakistan for last 3 years are allowed to participate in the bidding process.		
9.	The manufacturer must furnish documentary evidence affirming their status as the original equipment manufacturer (OEM) of the quoted product, along with specific details regarding the manufacturing location.		
10.	Income Tax & GST Registration Certificates (with Active Taxpayer Status on FBR website).		
11.	**DRAP license showing importer of medical devices or proof of on-going process for registration. (Where applicable)**		
12.	Copy of Professional Tax 2025-26 (**Attach Copy of Valid Certificate**)		
13.	PNRA Registration Certificate (Where Applicable)		
14.	Income Tax Returns for the last 3 years must be attached as supporting documents for the verification of the turnover.		
15.	Copy of Valid Registration P.E.C. Certificate Category C-3 or above with following Codes: **1.** CE-10, EE-03 & ME-06.		
16.	Company Profile		
17.	Recent Bank Account Maintenance Certificate.		

18.	**Undertaking on e-stamp paper of Rs. 100/- to the effect that:** i. The bidder is neither blacklisted nor suspended by any National / International, including Provincial and Federal Government. ii. Any director or owner of the bidding company is not awarded any punishment from any Court of Law. iii. Bidder has submitted the correct and complete information along with the bid/offer. If any document / information is found forged / engineered / fake / bogus at any stage, the bidder may be declared as Blacklisted in accordance with law and the performance guarantee and payment, if any may be forfeited. (**Sample form attached as Annexure-K add above all three points must be included).**		
19.	**The bidder undertakes on a Rs. 100/- e-stamp paper that he has quoted his bid prices in Pakistani Rupees (PKR) on both Delivered Duty Paid (DDP) and Cost & Freight (C&F) basis. (Sample Performa attached as Annexure-L)**		
20.	Bidder already providing services at **SMBB-IT, Karachi** should obtain & attach a satisfactory performance certificate from competent authority of **SMBB Institute of Trauma, Karachi** (for the financial year in which the bidder last provided its services).		
21.	Human Resource including detail of Technical Team (Educational & Training Certificates to be attached) and Workshop details.		
22.	List of Installation of quoted equipment or equipment having the better specifications (Documentary evidence must be attached).		
23.	**Scanned Copy of the Bid Security Pay Order should be attached without showing the amount along with technical E-Bid document. The original pay order, in a sealed envelope, must be submitted to the Planning & Procurement Department, SMBBIT, prior to opening of Technical Bid.**		
24.	The Bid Form & Price Schedule(s) shall be inserted in the Financial Proposal. However, a copy of the same shall be inserted in the Technical Proposal after hiding the amount.		
25.	**Tender Purchase Receipt (Mandatory Requirement).** All bidders are required to upload the Tender Purchase Receipt along with the bid documents on the EPADS (SPPRA Portal). Important Note: • Pay Orders will not be accepted on the day of bid opening. • Only the uploaded Tender Purchase Receipt will be considered valid for the qualification of the bid. • Failure to upload the Tender Purchase Receipt shall result in rejection of the bid without further consideration. Tender purchases made as per notice inviting tender (NIT).		

- The bids not responsive to the MANDATORY QUALIFICATION CRITERIA provided above shall not be eligible for further Technical Evaluation.
- Joint Venture / Consortium Bids, Conditional Bids, Telegraphic Bids, Bids not accompanied by Bid Security of required amount and form, bids received after specific date and time and bids of Black Listed firms shall be treated as rejected / non-responsive.
- Alternative bids shall not be allowed.

(ANNEX-B)

BID EVALUATION CRITERIA (MARKING)

a. **THE BIDS SHALL BE EVALUATED ON MOST ADVANTAGEOUS BID BASIS** SPPRA Rule-2(x) amended till date.

b. The bids which are not responsive to the **MANDATORY QUALIFICATION CRITERIA** provided at **Annexure-A** shall not be eligible for further Technical Evaluation.

c. The bids shall be evaluated and compared on The bids shall be evaluated and compared on itemized basis OR on the basis of a group of similar nature goods OR goods compatible with each other.

d. Technical evaluation of the products will be assessed on the standards / specifications given at **ANNEXURE - E**.

e. **Bids are invited as per Single Stage – Two Envelope Procedure** in accordance with sub rule 2 of rule 46 of the Sindh Public Procurement Rules, 2010 (Amended till Date). In case, any bidder encloses the financial bid within the technical bid, the same shall be rejected summarily.

f. The following merit point system for weighing evaluation factors / criteria will be applied for technical bids / proposals. Bidders achieving **minimum 70% marks** will be qualified and considered only for further process / evaluation besides compliance of all mandatory clauses. Documentary evidence must be attached in support of your claim.

g. Technically qualified/successful bidder(s) shall be eligible for Financial Proposal(s). The Financial bids shall be opened in the presence of the Bidders at the scheduled date, time and venue communicated in advance.

h. Financial Bids of Proposals of Technically disqualified / rejected bidders will not be opened for financial bid and sealed bid security envelope shall be returned to the bidder.

i. Bids not accompanied by the Bid Security of required amount in the form of pay order shall be rejected.

j. The technical evaluation carried out by the Procurement Committee, SMBB Institute of Trauma, Karachi will be final, which will be assessed on experience basis of the Consultant(s) in the relevant specialty.

k. Procuring Agency shall not be responsible for any erroneous calculation of taxes and all differences arising out shall be fully borne by the Successful Bidder.

l. Only those Financial Proposals shall be announced / considered which were technically qualified by the Committee. Therefore, bidders are advised to give separate sealed envelope (s) of every quoted item and should mention the name of the item and tender serial number on the front of the sealed envelope in **BOLD and legible letters** to avoid confusion, otherwise, the Financial Proposal Envelope will be opened on qualified item basis and it will not be challenged by the bidder that procuring agency has opened the Financial Proposal of the disqualified items besides qualified items.

m. The price shall be converted into Pakistani Rupees to compare bids quoted in different currencies. The rate of exchange shall be the selling rate prevailing seven working days before the date of opening of the bids, as notified by the National Bank of Pakistan (NBP) / State Bank of Pakistan (SBP).

n. Marks obtained in the detailed technical evaluation will be carried forward band prorated. Tender will be awarded to the Responding Organization with maximum accumulative points (**Technical Score + Financial Score**).

o. The formula for technical scoring is "**Technical Marks / Score = Total Technical Marks of the respective bidder x 0.7"**.

p. The formula for financial scoring is that the lowest bidder gets 30% Marks and the other bidders score 30 multiplied by the ratio of the lowest bid divided by the quoted price.

Total Allocable marks for Technical Proposal = 70
Total Allocable marks in Financial Proposal = 30

Total Combined Allocable Score for individual bids = Marks obtained in Technical Evaluation + Marks obtained in Financial Evaluation = 100

EXAMPLE:

TECHNICAL EVALUATION

The formula to calculate the technical points / marks / score of the bidder is given below:
Technical Marks / Score = Total Technical Marks of respective bidder x 0.7

- **Solved Example of Financial Scoring:**

Technical scoring out of 100 = 85
Carried Forward & Prorated Technical scoring = 85 x 0.70

FINANCIAL EVALUATION

The formula to calculate the Marks for the price by the bidders other than lowest bidder is given below:

- **Financial Evaluation Score of individual quoted Product:**

= [Lowest quoted price of the item ÷ Next higher proposed price of the competing item] x Total Allocable financial score

- **Solved Example of Financial Scoring**:

If the lowest quoted price of an item is Rs. 86/- the same lowest will obtain score as below:
= [86 ÷ 86] x 30 = 30
= 30 marks being the lowest bidder for the quoted item
If the next higher quoted price of the same item is Rs. 105/- the marks obtained will be:
= [86 ÷ 105] x 30 = 24.57
If the next higher quoted price of the same items is Rs. 130/- the marks obtained will be:
= [86 ÷ 130] x 30 = 19.84 Marks and so on

ANNEXURE-B

BID EVALUATION CRITERIA (MARKING)

Quality and the following evaluation factors/ criteria will be employed on technical proposals. The number of points allocated to each factor shall be specified in the Evaluation Report. **Only bids securing minimum of 70% marks would be considered for further process.**

S#	PARAMETERS / SUB-PARAMETERS	Marks for Evaluation	Total Marks
1	**Conformity to the Purchaser's Specifications (Mandatory)**		**40**
1.1	Fully compliant with the required tender specifications (Product demonstration, previous technical / support experience of the product / firm may also be considered for technical evaluation)	40	
1.2	Compliant with minor deviation (up to 10 % subject to main function is not affected)	30	
1.3	Above 10% / non-compliant to required specifications.	Disqualify	
2	**Trained Product specialist**		**10**
2.1	**Two (02) marks** will be awarded for each Foreign-Trained Graduate Engineer (PEC-registered in Sindh) who has received Factory/OEM-level service training for the quoted product. Proof of travel documents and training certificates must be attached. Online training will not be accepted. (Attached Proof of travel document and training certificate, online training is not acceptable)	6	
2.2	Two (02) marks will be awarded for each Foreign-Trained Technical Specialist (Diploma/B.Tech or Science Graduate) who has received OEM-level service training for the quoted product. Proof of travel documents and training certificates must be attached. Online training will not be accepted (Attached Proof of travel document and training certificate, online training is not acceptable)	4	
3	**Manufacturer's Authorization**		**10**
3.1	Participating Firm is OEM direct representative (not agent / distributor) and has registered branch / Liaison office in Pakistan or the Sole distributor for more than 15 years. (Authorization certificate attested by embassy must be provided)	10	
3.2	Participating Firm is OEM direct representative (not agent / distributor) and has registered branch / Liaison office in Pakistan or the Sole distributor for more than 10 years. (Authorization certificate attested by embassy must be provided)	8	
3.3	Sole Authorized Distributor in Pakistan for last 5 Years (Authorization certificate attested by embassy must be provided)	6	
3.4	Sole Authorized Distributor for complete modality in Sindh / Pakistan for last 3 Years or the validity of authorization since issuance is of 3 years (Authorization certificate attested by embassy must be provided)	4	
3.5	Sole Authorized Distributor for limited product in Sindh / Pakistan for below 3 Years or the validity of authorization since issuance is of below 3 years.	0	

S#	PARAMETERS / SUB-PARAMETERS	Marks for Evaluation	Total Marks
4	**Human Resource (Technical Staff)**		**6**
4.1	**One (0.5) mark** will be awarded for each Graduate Engineer possessing valid PEC registration in Biomedical, Electronics, Mechatronics, Mechanical, or Industrial Engineering. A copy of the PEC registration card and the relevant degree must be submitted as proof.	4	
4.2	**(0.5) mark** will be awarded for each technical staff member holding a Diploma of Associate Engineer (DAE) or Bachelor of Technology (B.Tech) in Biomedical, Electrical, Electronics, Mechatronics, Mechanical, or Industrial Technology. Copies of DAE or B.Tech certificates must be provided with the bid.	2	
5	**Networking**		**4**
5.1	Networking setup across Pakistan (**1 mark for each setup**) (Proof of Registered office must be provided)	4	
6	**Experience/ Performance**		**10**
6.1	Product Relevant Experience / Product Previous Satisfactory Performance certificate of at least 03 public hospitals having minimum 5 years' Experience along with Installation Report and Supply order / Purchase Order of the firm in last 5 years, on letter head, signed and stamped by the Head of institution / Concern Officer of public sector. **0.5 mark for each after sale satisfactory performance certificate.**	5	
6.2	Product Relevant Experience / Product Previous Satisfactory Performance certificate of at least 03 reputable private tertiary care level hospitals having minimum 5 years' Experience along with Installation Report and Supply order/ Purchase Order of the firm in last 5 years, on letter head, signed and stamped by the Head of institution / Concern Officer of private sector. **0.5 mark for each after sale satisfactory performance certificate.**	5	
7	**Annual Turnover in EACH of the last three (03) financial years (Audited Statements of Accounts and Income Tax Return Forms must be attached as supporting documents)**		**10**
7.1	Turnover of PKR 1.0 Billion or above in EACH of the last three (03) financial years (i.e., cumulative turnover of PKR 3.0 Billion or above)	10	
7.2	Turnover of PKR 500 Million or above in EACH of the last three (03) financial years (cumulative ≥ PKR 1.5 Billion)	5	
7.3	Turnover of PKR 150 Million or above in EACH of the last three (03) financial years (cumulative ≥ PKR 450 Million)	4	
7.4	Turnover of PKR 50 Million or above in EACH of the last three (03) financial years (cumulative ≥ PKR 150 Million)	3	
7.5	Turnover below PKR 50 Million in any of the last three (03) financial years	0	
8	**Bonus points (Free of Cost Extended Warranty) (In accordance with the comprehensive warranty period including all parts).**		**10**
8.1	Free of Cost Extended Warranty for Two Years.	10	
8.2	Free of Cost Extended Warranty Period for One year	5	
	GRAND TOTAL		**100**

(ANNEX-C)

SCHEDULE OF REQUIREMENT

PROCUREMENT OF 1250 KVA PRIME POWER GENERATORS, UP GRADATION OF EXISTING SYNCHRONIZING POWER PANEL WITH CIVIL & HVAC WORKS ON TURNKEY BAIS SUPPLY, INSTALLATION, TESTING & COMMISSIONING. PRICE SCHEDULE FOR SMBB INSTITUTE OF TRAUMA KARACHI

A. GOODS SUPPLIED ON (DDP & C&F BASIS)

The entire quantity of the ordered goods shall be delivered within **12 Weeks** or earlier from the date of issuance of supply order / contract award or Establishment of LC.

i. The delivery period shall start from the date of Award of Contract / Contract Agreement.

Place of Delivery: SMBB Institute of Trauma (SMBBIT), Karachi. / Trauma Emergency Response Centre Larkano.

(ANNEX-D)

SPECIAL NOTE

1. Offered product's specifications sheet on company's letter head must be attached.
2. Item-wise / Feature-wise product compliance / deviation statement must be attached.
3. **Confirm delivery period must be specified.**
4. Port of Shipment and Country of origin of **"MAJOR PART(S) OF THE EQUIPMENT"** must be clearly reflected separately in the Technical and Financial bids. The Origin means the place where the ―goods are mined, grown, or produced.
5. Product specifications are only for widest possible competition and not to favor any single contractor or supplier nor put others at a disadvantage. However, the brand name, catalogue # / Name etc., if any, have only been used for the reference purpose. Equipment offered **"ATLEAST EQUIVALENT OR HAVING BETTER SPECIFICATIONS"** shall also be considered.
6. Equipment must be quoted with all the standard accessories, required for the operation of the equipment.
7. Quoted equipment should be of latest Model.
8. **UPS / Power protection for the equipment shall be incorporated in the systems and also included in bid amount (where applicable).**
9. **All the civil works and allied services will be carried-out by the bidder with the consultation of the Procuring Agency (if required) cost of all types of works included in bid amount.**
10. **All site-specific work to be required in the system viz. Lead Glass / special antistatic flooring, environment control / radiation protection must be included bidder quote (where applicable).**
11. The bidder **shall separately quote** the price of the **service contract for a period of five (05) years** *(post warranty / guarantee period)*:
    a) **Inclusive of spare parts**, and
    b) **Exclusive of spare parts**,

    Both to be quoted **in terms of percentage (%) of the total contract value**. **Non-compliance with this requirement shall result in outright rejection of the bid.**

I / We agree to above mentioned all clauses;

Name of Contractor: _____Signature: _____

CNIC#. (Copy must be attached): _____

Full Address: _____

Company Stamp: _____

Annexure - F

(A) PRICE SCHEDULE IN PAK RUPEES
Delivered Duty Paid (DDP BASIS)

FOR GOODS OFFERED WITHIN THE PROCURING AGENCY'S COUNTRY

Name of Bidder_____. IFB / NIT Number_____.

S#	Detailed Specification of Goods	Model / Cat No.	Name of Manufacturer	Country of Origin	Quantity of Stores	Unit	Unit Price on DDP Basis (Excluding GST)	Total Cost On DDP Basis (Excluding GST)
1	**2**	**2**	**4**	**5**	**6**	**7**	**8**	**9**
TOTAL AMOUNT IN PAK RS. ON DDP BASIS (EXCLUDING GST)								
TOTAL AMOUNT IN WORDS:								

Name _____

In the capacity of _____

Signed _____

Duly authorized to sign the Bid for and on behalf of _____

Date _____

Annexure - G

(B) PRICE SCHEDULE IN FOREIGN CURRENCY (CFR / CNF/ C&F / CPT - KARACHI BASIS)

FOR GOODS OFFERED FROM OUTSIDE THE PROCURING AGENCY'S COUNTRY

Name of Bidder_____. IFB / NIT Number _____.

S#	Detailed Specification of Goods	Model / Cat No.	Name of Manufacturer	Country of Origin	Port of Shipment	Quantity of Stores	Unit	Curr-ency	Rate Per Unit	Total Price
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Total Amount in Foreign Currency										

Name

_____

In the capacity of

_____

Signed

_____

Duly authorized to sign the Bid for and on behalf of

_____

Date

_____

NOTE:

Port of Shipment and Country of origin of ―MAJOR PART(S) OF THE EQUIPMENT must be clearly reflected separately in the Technical and Financial bids. The ―Original means the place where the ―goods are mined, grown, or produced.

Annexure - H

BID LETTER FORM

From:
(Registered name and address of the bidder)
To:
Executive Director,
Shaheed Mohtarma Benazir Bhutto Institute of Trauma, Karachi –74200

Dear Sir,
Having examined the bidding document and amendment thereon we undersigned, offer to provide services to the works including in conformity with the terms and conditions of the bidding document and amendments there on, for the following project in response to your tender call dated__

Tender Title: _____

We undertake to provide services/execute the above project or it part assigned to us in conformity with the said bidding documents for an estimated sum of Rs. (Rupees)(total bid amount in words and figures) which may vary in accordance with the schedule of prices attached herewith and coverage options made by SMBBIT or its user organization.

If our bid is accepted, we undertake to;

1) Provide services/execute the work according to the time schedule specified in the bid document,
2) Obtain the performance guarantee of bank in accordance with bid requirements for the due performance of the contract, and
3) Agree to abide by the bid conditions, including pre-bid meeting minutes if any, which remain binding upon us during the entire bid validity period and bid may be accepted any time before the expiration of that period.
4) We understand that you are not bound to accept the lowest or any bid you may receive, nor to give any reason for the rejection of any bid and that you will not defray any expenses incurred by us in bidding.

Place: Bidder's signature
Date: and seal.

Annexure - I

CONTRACT FORM

THIS AGREEMENT made the …….....Day of.....(year) Between the Procuring Agency (hereinafter "The SMBB INSTITUTE OF TRAUMA") of one part and ……. (Name of Vendor) of ……. (City and country of Vendor) (Hereinafter "the Supplier") of the other part:

WHEREAS the SMBB INSTITUTE OF TRAUMA is desirous that certain Supplies, as described in the bid document and briefly outlined below, should be provided by the Vendor.

Date of tender call:
Title of the project:
Brief outline of the work:

NOW THIS AGREEMENT WITNESSETH AS FOLLOWS;

In this agreement words and expression shall have the same meanings as are respectively assigned to them in the bid document referred to.

The following document shall be deemed to form and be read and construed as part of this Contract, viz.

1) Bid document(s)
2) Pre-bid conference minutes (if any),
3) Clarification on bid document issued (if any),
4) SMBB INSTITUTE OF TRAUMA notification of award.

In case of conflict among documents mentioned above, the documents mentioned above in reverse order will prevail over other documents. In consideration of the payments to be made by the SMBB INSTITUTE OF TRAUMA to the Supplier as hereinafter mentioned, the Supplier hereby covenants with the SMBB INSTITUTE OF TRAUMA to (**Tender Title ..**) and to remedy defects therein conformity,
in all respects, with the provisions of the contract.

The SMBB INSTITUTE OF TRAUMA hereby covenants to pay the Supplier in consideration of the provision of the goods and services and the remedying of defects therein, the contract price or such other sum as may become payable under the provisions of the contract at the times and in the manner prescribed by the contract.

Brief particulars of the services which shall be supplied / provided by the Supplier areas under:

Solutions, service or material	**Quantity**	**Unit price**	**Amount**	**Remarks**

IN WITNESS whereof the parties hereto have caused this Agreement executed the day and year above written.

Signed, sealed, delivered by_____the (for the Procuring agency)

Signed, sealed, delivered by_____the (for the Supplier)

Annexure - J

FORM OF PERFORMANCE SECURITY

(Bank Guarantee)

Guarantee No. _____ Executed on: Expiry date: _____

[Letter by the Guarantor to the Employer]

Name of Guarantor (Bank) with complete address (Scheduled Bank in Pakistan):

_____

Name of Principal (Contractor, Manufacturer, Supplier or any bidder) with complete address:

_____

Penal Sum of Security (express in words and figures):

_____

Letter of Acceptance No: _____ Dated: _____

KNOW ALL MEN BY THESE PRESENTS, that in pursuance of the terms of the Bidding Documents and above said Letter of Acceptance (hereinafter called the Documents) and at the are of the said Principal we, the Guarantor above named, are held and firmly bound unto the Executive Director, SMBBIT, Karachi (here in after called the Employer) in the penal sum of the amount stated above for the payment of which sum well and truly to be made to the said Employer, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the principal has accepted the Employer's above said Letter of Acceptance for (Name of Contract) for the _____ (Name of Project).

NOW THEREFORE, if the Principal (Contractor) shall well and truly perform and fulfill all the undertakings, covenants, terms and conditions of the said Documents during the original terms of the said Documents and any extensions thereof that may be granted by the Employer, with or without notice to the Guarantor, which notice is, hereby, waived and shall also well and truly perform and fulfill all the undertakings, covenants terms and conditions of the Contract and of any and all modifications of said Documents that may hereafter be made, notice of which modificationstotheGuarantorbeingherebywaived,then,thisobligationtobevoid;otherwiseto remain in full force and virtue till all requirements of Condition of Contract are fulfilled.

Our total liability under this Guarantee is limited to the sum stated above and it is a condition of any liability attaching to us under this Guarantee that the claim for payment in writing shall be received by us within the validity period of this Guarantee, failing which we shall be discharged of our liability, if any, under this Guarantee.

We,_____(the Guarantor), waiving all objections and defences under the Contract, do hereby irrevocably and independently guarantee to pay to the Employer without delay upon the Employer's first written demand without cavil or arguments and without requiring the Employer to prove or to show grounds or reasons for such demand any sum or sums up to the amount stated above, against the Employer's written declaration

that the principal has refused or failed to perform the obligations under the Contract which payment will be affected by the Guarantor to Employer's designated Bank & Account Number.

PROVIDED ALSO THAT the Employer shall be the sole and final judge for deciding whether the principal(Contractor) has duly performed his obligations under the Contractor has defaulted in fulfilling said obligations and the Guarantor shall pay without objection any sum or sums up to the amount stated above upon first written demand from the Employer forthwith and without any reference to the principal or any other person.

IN WITNESS WHEREOF, the above-bounden Guarantor has executed this Instrument under its seal on the date indicated above, the name and corporate seal of the Guarantor being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Witness:

_____

Guarantor
(Bank)
1._____ (Name, Title, Signature &Seal)

Signature:

_____

2. _____ Name:

_____

(Name, Title, Signature Seal) Title:

_____

(ANNEX-K)

AFFIDAVIT
(On Judicial Stamp Paper)

I/We, the undersigned [Name of the Supplier] hereby solemnly declare and undertake that:

1. I/We have read the contents of the Bidding Document and have fully understood it.
2. The Bid being submitted by the undersigned complies with the requirements enunciated in the bidding documents.
3. The Goods that we propose to supply under this contract are eligible goods within the meaning of this SBD.
4. The undersigned are also eligible Bidders within the meaning of the Standard Bidding Documents.
5. The undersigned are solvent and competent to undertake the subject contract under the Laws of Pakistan.
6. I/We have not paid nor have agreed to pay, any Commissions or Gratuities to any official or agent for SMBB Institute of Trauma related to this Bid or Award or Contract.
7. I/We are not blacklisted or facing debarment from any institute of Federal, Provincial Government or any Department /Agency/Organization/Autonomous body or Private Sector organization anywhere in Pakistan.
8. That undersigned has not employed any child labor in the organization/unit.
9. I/We understand that the Selection and Rate Contracting Committee of the Procuring Agency is not bound to accept the lowest or any other bid they may receive.

I/We affirm that the contents of this affidavit are correct to the best of our knowledge and belief.

Signatures with stamp Name: _____ Designation: _____

CNIC No._____**(Copy must be attached)**

For Messrs. [Name of Supplier]

Annexure – L

(DDP & C&F Prices Undertaking)

To: [Name of Procuring Agency]
Address: [Procuring Agency Address]

SUBJECT: UNDERTAKING REGARDING QUOTATION OF DDP AND C&F PRICES

I/We, [Bidder Name], on behalf of [Company Name], having our registered office at [Address], hereby solemnly undertake on a Rs. 100/- e-stamp paper that:

I/We have quoted our bid prices in Pakistani Rupees (PKR) on both Delivered Duty Paid (DDP) basis and Cost & Freight (C&F) basis.

The Procuring Agency, after evaluation, may issue the supply order based on the most economical cost. If the Procuring Agency chooses to award on a C&F basis, I/We shall provide the required proforma and manufacturer invoices without delay.

I/We understand that quoting prices on both DDP and C&F basis is mandatory. Failure to quote both prices shall entitle the Procuring Agency to reject the bid and/or forfeit our bid security as a penalty.

I/We understand that DDP and C&F prices will not be revealed during technical evaluation, and this undertaking confirms that both prices have been quoted.

Signed by: _____

Name: _____

Designation: _____

Company Seal: _____

Date: _____

Annexure - M

INTEGRITY PACT

DECLARATION OF FEES, COMMISSION AND BROKERAGE ETC PAYABLE BY THE SUPPLIERS/CONTRACTORS/CONSULTANTS

Contract Number: **NO.** **Dated:**
Contract Value: **Rs.**
Contract Title:

M/s._____hereby declares that it has not obtained or induced the procurement of any contract, right, interest, privilege or other obligation or benefit from Government of Sindh (GoS) or any administrative subdivision or agency thereof or any other entity owned or controlled by it (GoS) through any corrupt business practice.

Without limiting the generality of the foregoing, **M/s.** _____repres ents and warrants that it has fully declared the brokerage, commission, fees etc. paid or payable to anyone and not given or agreed to give and shall not give or agree to give to anyone within or outside Pakistan either directly or indirectly through any natural or juridical person, including its affiliate, agent, associate, broker, consultant, director, promoter, shareholder, sponsor or subsidiary, any commission, gratification, bribe, finder's fee or kickback, whether described as consultation fee or otherwise, with the object of obtaining or inducing the procurement of a contract, right, interest, privilege or other obligation or benefit, in whatsoever form, SMBBIT Karachi (PA), except that which has been expressly declared pursuant hereto.

M/s._____certifies that it has made and will make full disclosure of all agreements and arrangements with all persons in respect of or related to the transaction with PA and has not taken any action or will not take any action to circumvent the above declaration, representation or warranty.

M/s._____accepts full responsibility and strict liability for making any false declaration, not making full disclosure, misrepresenting facts or taking any action likely to defeat the purpose of this declaration, representation and warranty. It agrees that any contract, right, interest, privilege or other obligation or benefit obtained or procured as aforesaid shall, without prejudice to any other right and remedies available to PA under any law, contract or other instrument, be voidable at the option of PA.

Notwithstanding any rights and remedies exercised by PA in this regard, **M/s.** _____Agrees to indemnify PA for any loss or damage incurred by it on account of its corrupt business practices and further pay compensation to PA in an amount equivalent to ten time the sum of any commission, gratification, bribe, finder's fee or kickback givenby**M/s.**_____as aforesaid for the purpose of obtaining or inducing the procurement of any contract, right, interest, privilege or other obligation or benefit, in whatsoever form, from PA.

_____ _____

M/s. **Executive Director (D.D.O)**

STANDARD BIDDING DOCUMENT

GOVERNMENT OF SINDH

SHAHEED MOHTARMA BENAZIR BHUTTO INSTITUTE OF TRAUMA, KARACHI

TENDER TITLE	**PROCUREMENT OF 1250KVA PRIME POWER GENERATORS, UP GRADATION OF EXISTING SYNCHRONIZING POWER PANEL WITH CIVIL & HVAC WORKS ON TURNKEY BAIS SUPPLY, INSTALLATION, TESTING & COMMISSIONING**
TENDER REFERENCE #	**PROC/SMBBIT/(P&M-02)/2025-26**
PART	**B**

NOTE:

1. **TENDER FEE: RS. 10,000/-(NON-REFUNDABLE)** IN SHAPE OF PAY ORDER IN FAVOR OF SHAHEED MOHTARMA BENAZIR BHUTTO INSTITUTE OF TRAUMA, KARACHI SHOULD SUBMIT TO PROCUREMENT DEPARTMENT IN PROPERLY MARKED SEALED ENVELOPE.

2. **IN ALL PROCUREMENTS OF SMBBIT THROUGH ELECTRONIC BID SUBMISSION. IT IS MANDATORY FOR ALL BIDDERS TO GET REGISTERED AT EPADS SPPRA.**

3. NO TENDER WILL BE ACCEPTED AFTER CLOSING TIME IN EPADS SPPRA.

4. ALL THE PARTICIPANTS MUST SIGN EACH & EVERY PAGE OF BID DOCUMENTS, ELSE OFFER WILL BE REJECTED.

TABLE OF CONTENT

SCOPE OF WORK

Location of Site:
2nd Floor of SMBB Institute of Trauma, Karachi

Main Points of Contract:

1. Bidders must carefully read all the details of this bidding document and may visit and inspect the existing generating and allied systems at his own expense and responsibility, prior to submission of tender. After submission of bid, he shall be liable to comply all the terms and conditions including but not limited to mentioned in this document and no claim whatsoever shall be entertained.

2. Re-modification, Balance Work, Testing, and commissioning with full functionalization of existing 2 Nos. Cummins DG Sets (1250kW each) and its allied accessories installed at site complete in all respects with spare parts arrangement and replacement including all safeties & monitoring accessories to control & measure operational parameters and ensure that these 02 Nos. DG sets 1250kW each is compatible for connecting with each other as per required applicable standards and also maintain suitable operational environment for these generators to work.

3. The contractor shall arrange OEM trained technical resource of sync modules and PLC system to ensure uninterrupted power supply during installation and commissioning activities.

4. Complete control & Power wiring including termination at both ends module to module, module to generator or wherever required will be in scope of works. Complete in all respects.

5. Arrangement of temporary interconnection between Incoming Busway and Outgoing Busway of Diesel Genset # 02 while working on Synchronizing panel and replacing its busbar to ensure system integrity and backup power availability during work as per required applicable standards.

6. De-termination of existing cables installed from Diesel Genset # 01 to LT panels and handover to client.

7. Interconnection between Bus ways and 04 Nos. of Diesel Gensets using 99.99% Imported Copper bus bars links and appropriate measures and materials as per required applicable standards.

8. Interconnection between Busways and SYNCHRONIZING and AMF / ATS Panel using 99.99% Imported Copper bus bars links and appropriate measures and materials as per required applicable standards.

9. Interconnection between Busways and Synch Panels) placed in Electric room using 99.99% Imported Copper bus bars links and appropriate measures and materials as per required applicable standards.

10. Submission of manufacturer manuals, connection drawings, software, and programming manuals of all work after making them functional.

11. Submission of Copper certificate, breaker certificate, Synchronization module certificate, technical catalogues, component lists, Control drawings etc.

12. Submission of Third-party testing & inspection certificate.

13. Submission of operation & instruction manual, drawings and schematics in hardcopy and softcopy form detailing operating procedure and showing system failure scenarios of all equipment.

14. Supply, installation, re-modification, repairing, testing, and commissioning including transportation, shifting, and storing material at site, manufacturer manuals, drawings, submittals must be included in quoted price of all works & accessories, complete in all respects.

15. Repairing and shifting (as decided location) of existing Gen sets of 02 Nos. all the damages done to the building and existing system during work if any at no extra cost.

16. The contractor will do all the above work with his own forces and equipment.

17. The project will be on Turnkey basis which means that the contractor will be responsible for arranging all required items on its own including but not limited to batteries, sensors, even screws etc.

18. The essence of the contract is to ensure that the Diesel Generators Nos. 04 and Synchronization panel are functional and be able to run the desired load as mentioned in the specifications above all gen sets.

19. Operation & Maintenance during "Maintenance Period" of 12^{th} months after completion of job in all respects, including manpower deployment with existing manpower of the Institute and providing them all operational trainings of the system and replacement or repairing of spare parts and consumables along with periodic servicing during maintenance period as per manufacturer operational manuals of equipment and required applicable standards, at no extra cost.

Manufacturing Experience/Quality Assurance:

Subject to compliance with the requirements of the Contract Documents, acceptable manufacturers are to be firms regularly engaged in manufacture of all material specified in this document, whose products have been in satisfactory use under similar service conditions for not less than ten years.

The manufacturer shall have more than 10 years' experience in the supply and installation of synch module for projects in Pakistan and must have a permanently residing team of certified technician available at site within 36 hours of complain.

LV Switchgear Panel/Synchronization Panel:

The Low Voltage Distribution Panels shall be completed in all respects with material and accessories, factory assembled, tested, and finished according to the Specifications and to the standard requirements.

The Low Voltage Distribution Panel shall:

i. be front operation type,
ii. be suitable for 400 Volts, 3 phase 4 wire, 50 Hz system,
iii. be designed for flush mounting of all instruments on the front side,
iv. have incoming and outgoing cable termination arrangement, terminal block/line up terminals,
v. be provided with stainless steel name plate on the front side of door,

vi. have all incoming and outgoing connections from top or bottom according to site requirements,
vii. have door grounded by flexible braided copper strip,
viii. have wiring diagram in the pocket inside the door of Panel.
ix. have hinged protective metallic door required with knob/handle.
x. have cable hanging arrangement.
xi. have all Adjustable Type breakers
xii. have Control breakers (MCB Type)

All the components used in the Distribution panel shall be type tested and must comply with the requirements of applicable standards.

Components:

The Synchronization Panel shall be provided with components required for the satisfactory operation of the panel and of the electrical system and must comply with the requirements of applicable standards. Specifications of typical components which maybe included but not limited to are follows:

i. Control module

The synchronization control module monitors the generator and indicates operational status and fault conditions, automatically starting or stopping the engines smartly on demand load or fault conditions.

a) Control module should have comprehensive load sharing capabilities with minimum configurable 12 inputs and 12 configurable outputs.

b) It should have an ability to record the 500 minimum log events to facilitate easy maintenance.

c) Control module should have an extensive numbers of fixed monitoring and metering and protection features are included as well as comprehensive communication and system expansion option.

d) Module should have following key load share features:

- Sequential set start.
- Manual voltage/ frequency adjustment.
- Automatic hour run balancing.
- Dead bus sensing.
- Bus failure detection.
- Direct governor and AVR control.
- Main (utility de-coupling test mode option.
- It should have built-in reverse relay protection.
- Flexibility to synchronies from Grid power

e) RS485 remote communication ports should also be available with back lit LCD screen.

f) Standard Features:

- Voltage (L-L, L-N)

- Current (Phase)
- Average Volt, Amp, Frequency
- kW, KVAr, kVA (Average, Phase, %)
- Power Factor (Average, Phase)
- kW-hr, KVAr-hr (total)
- Generator stator and bearing temp (with optional module)

g) Generator Protection:

- Generator phase sequence
- Over/Under voltage (27/59)
- Over/Under frequency (81 O/U)
- Reverse Power (kW) (32)
- Reverse Reactive Power (KVAr) (32RV)
- Overcurrent (50/51)

h) Engine Monitoring:

- Coolant temperature
- Oil pressure
- Engine speed (RPM)
- Battery voltage
- Run hours
- Crank attempt and successful start counter
- Enhanced engine monitoring (with electronic engines)

i) Engine Protection

- Control switch not in auto (alarm)
- High coolant temp (alarm and shutdown)
- Low coolant temp (alarm)
- Low coolant level (alarm)
- High engine oil temp (alarm and shutdown)
- Low, high and weak battery voltage
- Over speed
- Over crank
- Low Oil Pressure

j) Control

- Run / Auto / Stop control
- Speed and voltage adjust
- Local and remote emergency stop
- Remote start/stop
- Cycle crank

k) Inputs & Outputs

- Two dedicated digital inputs
- Three analog inputs

- Six programmable digital inputs
- Eight relay out
- Two programmable digital outputs

l) Communications

- Primary and accessory CAN data links
- RS-485 annunciator data link
- Modbus RTU (RS-485 Half duplex)

ii. Bus Bars

The Bus bars shall be imported, tinned, made of 99.9% pure Copper high conductivity including accessories like, Fischer plates, nuts & bolts, mounting accessories etc. complete in all respects, electrolytic tin platted copper and shall be completely isolated and mechanically braced for the specified fault level. The identification of bus bars shall be by providing heat shrink color coded sleeves on complete bus bar lengths and these shall be red, yellow, and blue for phases and black for neutral. The earth bus bar shall be green.

The bus bars shall be for three phases, neutral and earth and shall be of appropriate size to meet the electrical and mechanical requirements of the system and must be suitable for the designed load of 6300A. The temperature rise shall not exceed 45oC at rated current.

Imported Copper certificate shall be submitted with bill of lading. Imported copper shall be checked prior to the installation at site.

iii. Digital Multimeter and Analyzers

All meters shall be flush mounting, Digital type with built-in selector switches. The front dimensions shall be 96 x 96 mm for meters.

The meters shall be of accuracy class 1.5 The ammeter shall be suitable for connection to 5 Amps secondary of current transformers or directly through shunt. The ammeters and voltmeters shall have measuring range as per the panel in which meters are installed.

iv. Current Transformers

Current transformers shall be provided having suitable transformation ratio. The current transformers shall be of suitable burden having accuracy class 1.0 The current transformers shall have 5 amps secondary.

v. Motorized/Manual Changeover Switches

Changeover switch must have three stable positions, unaffected by voltage fluctuations and vibrations, protecting loads from network disturbances. It must be capable of safe on-load switching for any type of load such that with its on-load transfer capabilities, it is not necessary to isolate loads prior to transfer.

vi. Electronic Voltage Relay

The voltage relay monitors the over voltage and the under voltage and the phase sequence L1, L2, L3 in an alternating three phase mains. Adjustment range +20% -20% of the nominal voltage.

vii. Air-Circuit Breaker

TP ACB with Motorized Spring Charge mechanism, Tripping coil, shunt trip coil, & adjustable UVT and Overload, ground fault, instantaneous, long & short time protection

Other possible components:

viii. Shunt Trip

- Under Voltage Trip
- Motor mechanism
- Synchronizing Module
- Battery Charger
- Dry Batteries
- Digital Voltmeter + VSS
- Digital Ammeter + ASS
- CT's
- 14- Pin Relay with Base
- Indication Lights R, Y, B
- DP MCB
- TP MCB
- Control Fuses with Base
- Emergency Stop
- Key Switch
- Push Reset
- Panel Socket
- Panel Light with limit switch
- Louver, Exhaust Fan with Thermostat
- 2.5mm Line Up Terminal

Installation:

All screws, nuts and bolts used for fixing the distribution board shall be galvanized. The Panel installation shall include connecting all incoming and outgoing cables. The cable entry in the boards shall be provided from top or bottom as required.

All labor, equipment and tools required for complete installation and shall be provided by the Contractor. All outgoing and incoming cable connections shall be made, and special care shall be taken in fixing cable boxes and in cable connections to have no danger of leakage during operation. Earthing connections shall be made with the existing earthing pits of generators made by the previous contractor. The installation work must comply with the requirements of applicable standards

Minimum Technical specifications of Synchronization Modules:

The synch controller modules must have the following minimum features but not limited to:

1. Expandable for both single and multiple gen-sets operating in standby or parallel modes.
2. Detachable modular construction for a variety of extension modules
3. Built-in synchronizer and load sharer to allow an integrated solution for gen-sets in standby, island parallel or mains parallel. Native cooperation of at least 4 gen-sets.
4. Able to support standard ECU types with future versions compatibility.
5. Ethernet and RS485 for remote internet connectivity.
6. Ability to connect with touch screen type HMI and/or other displays.
7. Capable of auto start load sharing, multi generator load share, mains control and bus-tie breaker control without need for separate control/automation PLC-based system
8. Should be able to synchronize both electronic and non-electronic gensets.
9. Automatically control change over from mains (utility) to generator supply or run generator in synchronization with the main (utility) to provide no-break operation.
10. Support of engines with ECU (Electronic Control Unit)
11. Integrated genset solution and signal sharing via CAN bus or similar protocol
12. Genset performance log
13. Built-in PLC (no external automation system or PLC required)
14. Separate TFT display
15. Configurable soft keys
16. Trends
17. Plug and play
18. Synch module and bus-tie module of same family/series
19. The synchronization control module monitors the generator and indicates operational status and fault conditions, automatically starting or stopping the engines smartly on demand load or fault conditions.
20. The synchronization control module must be able to run 1 generator for emergency load in case of synch failure.
21. It must have monitoring system on Modbus or TCP/IP which can be displayed on simple desktop PC via software provided along with modules.
22. Control module should have an extensive number of fixed monitoring and metering and protection features included as well as comprehensive communication and system expansion option.
23. Automatic synchronizing and power control (via speed governor or ECU)
24. Baseload, Import / Export, Temp by Power
25. Peak shaving
26. Voltage and PF control (AVR)
27. Generator measurement: U, I, Hz, kW, KVAr, kVA, PF, kWh, kVAhr
28. Mains measurement: U, I, Hz, kW, KVAr, PF
29. Inputs and outputs configurable for various customer needs
30. 1× RS232 / 2× RS485 / RJ-45 interface with Modbus support
31. Event-based history with customer-selectable list of stored values; RTC; statistic values
32. Interface to remote display units
33. USB slave interface

The synchronization module must comply with the requirements of applicable standards.

Proposed method of Performing Works:

The contractor is required to submit a narrative outlining the method of performing the Works. The narrative should indicate in detail and include but not limited to:

i. The sequence and methods in which he proposes to carry out the Works, including the number of shifts per day and hours per shift, he expects to work.
ii. A list of all major items of constructional and erection plant, tools and vehicles proposed to be used in carrying out the Works at Site, including number of each kind, make, type, capacity of all equipment, working condition, which shall be deployed by him for Electrical Work and Erection, Testing and Commissioning of the Works, in sufficient detail to demonstrate fully that the equipment and installation will meet all the requirements of the Technical Provisions.
iii. Design drawings and operation scenarios of Synchronization panels and components which he proposes to use during the work.
iv. The procedure for installation of equipment and transportation of equipment and materials to the site.
v. Organization chart indicating head office & field office personnel involved in management, supervision, and engineering of the Works to be done under the Contract.
vi. The contractor shall list in this Schedule the key personnel he will employ from Head office and from Site office to direct and execute the Works, together with their names, qualifications, experience, positions held and their nationalities.

The method must comply with the requirements of applicable standards.

Testing:

1. **Pre-Energization Third-party Inspection Certificate:**

i. Contractor will submit a list of at least 5 reputable, recognized third-party vendors engaged in supply, installation, testing & commissioning of Diesel Generators, Switchgears, and Synchronization panels & modules for last 10 years.
ii. Client will choose a vendor from the contractor provided list. However, client has the right to include any other vendor name in the above list and choose other than the provided list, if deemed necessary.
iii. The third-party vendor will thoroughly inspect & check all the works performed by the contractor as mentioned in this contract and will provide satisfactory certificate after performing the required tests as well in compliance with the requirements of applicable standards.
iv. Third-party inspection report must cover all the technical details of design & system compatibility and material quality after performing the required tests in compliance with the applicable standards.
v. The system will be energized after the obtaining of the above satisfactory certificate and the third-party vendor will be present at the time of energization.

2. **Pre-energization Check:**

Prior to energization, check all new and reused existing branch circuit cable, components, and wires for continuity of circuitry and for short circuits. Correct malfunction when detected.

3. **Voltage and Current Values:**

The voltage and current in each circuit shall be measured and recorded after all connections have been made and the circuit is under load.

4. **Earth Resistance Test:**
   Earth resistance tests shall be made by the Contractor on the existing earthing system of Generators made by the previous contractor, separating and reconnecting each earth connection as required in compliance with the applicable standards.

5. **Submittals:**
   Contractor shall furnish all instruments and personnel required for tests. Submit copies of certified test results and satisfactory certificates for review. Test reports shall include circuit tested, test type, date and time of test, test results, relative humidity, temperature, and weather conditions etc.

Final Submissions:

1. Contractor will submit operation, service & instruction manuals, drawings and schematics in hardcopy and softcopy form detailing operating procedure and showing system failure scenarios.
2. Manufacturer manuals of Generators and Synchronization panels & modules.
3. Single line diagram and layout of the complete power generation system.
4. Programming manuals, connection diagrams of Generators and Synchronization panels & modules showing & detailing operational & fault scenarios.
5. Copper certificate, breaker certificate, synch modules certificate and their catalogues, technical specifications, and company manuals.
6. As-built drawings showing all details including bus-bars arrangement and ratings/specifications.
7. Shop drawings, Isometric & disposed view of panels.
8. Technical catalogues of synchronization modules.
9. Component list of Synchronization panel.
10. Programming manuals & control drawings of synch panels and modules.
11. Testing, Commissioning, Monitoring, Installation& Completion report with Third Party Verification.
12. Earthing testing report of the system.
13. Any other necessary drawings, documents, manuals etc.
14. Magar testing report of the system.

Note: Vendor has to provide Operation & Maintenance during "Maintenance Period" of 24 months after completion of job in all respects, including manpower deployment with existing manpower of the Institute and providing them all operational trainings of the system and replacement or repairing of spare parts and consumables along with periodic servicing during maintenance period as per manufacturer operational manuals of equipment and required applicable standards all necessary drawings & its software access after the supply, Installation and commissioning, at no extra cost.

TECHNICAL SPECIFICATIONS

1.0 GENERAL

1.1 The work under this section consists of supplying, installing, testing and commissioning of Diesel generator set including control panel as specified herein and/or shown on Tender Drawings and stated in the Bill of Quantities.

1.2 The scope of work shall include but not limited to the following items:

a) The set shall be rated for Prime duty and suitable for indoor installation.

b) It shall be capable for unbalanced loads up to 30% of actual load and for continuous part load operation.

c) The set shall be capable of starting and operating at the rated output at fifty degree Celsius 70% Relative Humidity. The ratings must be substantiated with manufacturer's standard published data.

d) The engine shall be directly coupled to the alternator, and shall have a rated speed of 1500 rpm. The set shall be capable of sustaining without damage, 25% over speed, under any abnormal operating condition.

e) The engine-alternator set shall be mounted on suitable rigid frame skid with vibration isolators. The foundation bolts shall be furnished with the set.

f) The set shall be suitable for full load starting. When the generator is operating at no-load, the application of full load current should be possible with maximum transient voltage drop of 15% of the rated voltage. The time taken to restore the generator voltage to 97% of rated value should not exceed 3 seconds. The set shall be capable of starting and accepting full load within 15 seconds after receipt of starting signal.

2.0 STANDARDS AND CODES

2.1 The following Codes and Standards to the extent specified herein, form a part of this specification. When an edition date is not indicated for a Code or Standard the latest edition enforce at the time of proposal submitted shall apply:

a) BS 5514 Reciprocating Internal Combustion Engine
b) BS 4999 General Requirements for Rotating Electrical Machines
c) BS 5000-99 Rotating Electrical Machines of particular types

3.0 SUBMITALLS & SHOPDRAWINGS

3.1 The contractor shall submit the following drawings and documents related with each electrical system for consultant approval:

a) Original catalogues for the Alternator, Engine and Genset.

b) Schedule of Accessories and Fittings.

c) Generator set detail dimensioned Shop drawing. Equipment layout and other installation details as per manufacturer's recommendations.

d) Details and technical data concerning Diesel generator set.

e) Test Certificates and letters of authorization.

4.0 LIST OF APPROVED MANUFACTURER

4.1	Engine	:	Cummins, UK/China Caterpillar, USA MTU, Kohler
4.2	Alternator	:	Leroy Somer, UK Stamford, UK Caterpillar, USA Kohler
4.3	Genset	:	Cummins, /China Caterpillar, USA MTU, Germany Kohler, Aksa, Power Generation
4.4	Circuit Breaker	:	Siemens, Schneider Electric, Terasaki, Japan/Spain ABB
4.5	Magnetic Contactors	:	Telemechanique, France
4.6	Control Cable	:	Pakistan Cables or Approved Equivalent.
4.7	Earthing	:	Furse / Erico / Dehn or Approved equivalent as confirmed by Consultant.

5.0 TECHNICAL SPECIFICATIONS - ENGINE

5.1 Diesel Engine:

a) The Diesel Engine shall be four strokes, compression ignition, 1500 RPM suitable for Prime duty.

b) Electric starter motor operated on DC supply from lead acid batteries mounted on the skid. The batteries shall be furnished with the set.

c) The engine shall be equipped with an alternator type automatic charging system to diesel Engine control panel.

d) Suitable interlocks shall be provided to prevent simultaneous operation of both charging systems.

e) The batteries shall be of adequate ampere - hour capacity to satisfy the following requirements:

i. Crank the engine at firing speed for at least 15 seconds.
ii. If the engine does not start on the first attempt, crank the engine two more times for the above duration at an interval of 30 seconds between each cranking operation.
iii. Engine shall be rated for continuous duty with overload capability for operating at least 10% above the rated capacity for 1 hour continuously in any 12 hours operation.

5.2 Air Intake:

a) Air intake shall be through turbo charger and equipped with dry type filter.

b) Suitable attenuators shall be installed to reduce noise at the air inlet.

5.3 Engine Cooling:

a) Cooling system shall be designed for max ambient temperature 50 deg C at rated load.

b) Engine shall have a forced air-draft, water cooled radiator supplied with a core guard.

c) Coolant level sensor with water level switch / indicator max. water temperature at load.

d) Cooling system shall have an engine driven centrifugal pump for cooling water circulation.

e) Cooling shall be thermostatically controlled.

f) An engine shut down timer shall be provided to keep the engine running on no-load.

g) Exhaust air from the radiator shall be ducted through the air chamber into atmosphere ensuring satisfactory cooling.

5.4 **Engine Lubrication:**

a) A gear type positive pressure lubrication pump shall be provided with efficient filtration arrangement for the lubrication system.

b) Engine shall have a constant oil level regulator, gravity fed from an engine mounted lube oil reservoir.

c) Reservoir shall be equipped with an oil level gauge.

d) The crank case shall have graduated dip stick with low and full level marks.

5.5 **Exhaust System:**

a) Exhaust system shall be equipped with residential type silencer complete with muffler, exhaust manifold, flexible connector, exhaust elbow, exhaust pipe, rain cap, and associated fittings.

b) The exhaust line shall be taken outside the canopy covered with insulation material over its entire length through the shortest possible route, without any undue bends.

c) The silencer shall be mounted on top of the canopy with all fixing accessories.

5.6 **Speed Governor:**

a) Electronic Governor shall regulate engine speed to maintain the generator frequency ±0.5% of the rated frequency.

b) Stable engine speed shall be attained within 10 seconds after the starting of engine.

c) Stable engine speed shall be restored within 3 seconds of any sudden change in load, from no load to full load.

d) During the change of load or surge, the speed shall not vary more than ±5% of the rated speed.

5.7 **Fuel System:**

a) Fuel system shall be direct unit injection.

b) Fuel system of Diesel engine shall be without priming pump.

6.0 TECHNICAL SPECIFICATIONS - GENERATOR

6.1 Genset:

a) The generator shall meet requirements detailed in BS 4999/5000, IEC 34-1, and VDE0530.

b) The generator shall be synchronous and capable of carrying, continuously 10% over load of rated output with the field set for normal rated load excitation for 1 hour in every 12 hours operation. It shall be 4-pole, screen protected and drip proof to IP22 grade.

6.2 Excitation:

a) Exciter shall be permanent magnet type.

b) Self excitation shall be from brushless rotating diodes mounted on the main shaft for 3-phase full wave recitation.

6.3 Winding:

a) Alternator windings shall have Class H insulation and shall be impregnated for tropical use.

b) The temperature rise of winding under normal operating conditions and at rated load shall not exceed the limits specified for Class H insulation.

6.4 Voltage Regulation:

a) Automatic Voltage Regulator shall be solid state type with provision for manual setting.

b) Regulator shall be designed to protect the exciter when the set is running at reduced speed during starting or idling of the prime mover.

c) Voltage regulation shall be ±0.5% from no-load to full load.

d) Transient voltage drop shall be less than 15% at full load.

e) Time required restoring to steady state conditions after transient voltage fluctuation shall not exceed 3 seconds.

6.5 Short Circuit Capability:

a) Generator shall withstand, without injury, a 30 seconds three phase short circuit at its terminal when operating at rated output with fixed excitation.

6.6 **Generator Panel:**

a) The generator panel shall be designed for front access, completely assembled, wired and tested.

b) The control panel shall be microprocessor based including generator set monitoring, metering, control and display features. It shall be to IP54 grade.

c) The panel shall incorporate protection and control equipment, measuring instruments, control and instrument transformers, voltage regulator, governor controls, battery charger, indicating lamps, auto mains failure system, safety devices, annunciator, etc.

d) The panel shall incorporate 2 Nos. volt free auxiliary contacts (for starting another generator) in case this generator fails to start due to some fault or other reasons.

6.7 **Circuit Breaker:**

a) The circuit breaker shall be triple pole with adjustable releases for thermal overload, instantaneous over current, under voltage and over voltage.

6.8 **Instruments:**

a) Volt meter.

b) Ammeter

c) Frequency meter

d) Kilowatt – Hour - Meter.

e) Ammeter for battery charging current.

f) Kilowatt - Meter.

6.9 **Main Engine Panel:**

a) An instrument panel on the skid shall have calibrated gauges/meters to measure the following:

i. Engine Speed.
ii. Lube Oil Pressure and Temperature.
iii. Engine Water Temperature.
iv. Engine Running Hours.

6.10 **Safety Devices:**

a) Following safety devices shall be provided. The audible alarm shall operate on any fault condition and shall be resettable manually and automatically through a timer after 15 minutes:

A= Alarm SD = Shutdown TD = Adjustable Time Delay

i.	Engine Over speed	:	A, SD
ii.	Low Lube oil pressure	:	A, SD
iii.	High water temperature	:	A, SD
iv.	Over voltage	:	A, SD, TD=0-30 Sec
v.	Under voltage	:	A, SD
vi.	Over load	:	A, SD
vii.	Phase failure phase sequence	:	A, SD
viii.	Under / over frequency	:	A, SD
ix.	Short circuit / Tripping of breaker	:	A, SD, TD=0-1 Min
x.	Low level in fuel storage tank	:	A, SD, TD=0.5 Min
xi.	Winding temperature high	:	A, SD
xii.	Over crank	:	A, SD, TD=0-2 Mins
xiii.	Low crankcase oil level	:	A, SD,After 3 Successive Crank
xiv.	High crankcase oil level	:	A, SD
xv.	Charging alternator failure	:	A, SD
xvi.	Charger failure	:	A, SD

6.11 **Battery Charger:**

a) Battery charger shall be static type and shall provide for both trickle and boost charging of the batteries when the engine is not in operation.

b) The charger shall be of suitable capacity to fully recharge the completely discharged batteries within four hours boost charge.

6.12 **Battery:**

a) Gel type with 900 CCA (3 warranty)

6.13 **Spare Parts :**

Bidder shall provide all OEM recommended parts including consumables (exculing oil and Coolant) required for schedule maintenance / operation for first eight services (min 2000 running hours of operation) of the equipment but not limited to the following :

i. Oil Filter (8 sets)
ii. Fuel Filter (8 sets)
iii. Water Separator (8 sets)
iv. Air Filter (2 sets)
v. Fan belts (2 sets)
vi. Engine Genuine AVR (1 set)

6.14 **Mains Failure Sensing Unit, 3-phase, Adjustable:**

a) The panel shall incorporate automatic changeover system which shall be designed for the following functions:

i. To start the set immediately when the main supply fails or when phase sequence is reversed.

ii. To start the set within 0 to 1 minute (adjustable) whenever the mains supply voltage drops to 360 volts or rises to 440 volts. The setting voltages shall be adjustable within - 5% to + 5% respectively for the lower and upper ranges.
iii. To transfer the load from standby generator to main supply whenever the mains voltage returns ± 5% and persists for at least 3 minutes.
iv. To make two successive attempts, in case the set fails to start in the first attempt.
v. The system shall provide for immediate transfer of load to the generator, after the rated speed/frequency and voltage have been achieved.
vi. The system shall be self-resetting after each cycle of operation.
vii. The contractor shall arrange following site tests at his own cost including providing of load bank, if required by Consultant.
- Operation of all panel meters, gauges and other indicators.
- Demonstration of workability of safety devices & controls.
- Full load test for 4 hours and 110% load for one hour.
- Test of any other feature as described in this specification.

7.0 EXECUTION

7.1 Within one week of award of contract, the Contractor shall submit a detailed itemized schedule of works covering submission of shop drawings and technical details, manufacture and works testing of generator.

7.2 Within two weeks of award of contract, the Contractor shall submit to the Consultant a detailed shop drawing (in 3 copies) of the steel support structure for genset, the genset and acoustic canopies, fuel storage and delivery system, power & control cabling, earthling, etc.

7.3 Installation of the genset shall be carried out in accordance with the manufacturer's recommendations and the instructions of the Consultant.

7.4 The Contractor shall place the genset on M.S steel base with skid and vibration isolators. The weather proof canopy shall be installed as per requirement including all accessories complete in all respects. Power and control cables shall be terminated as per requirement including glands, lugs etc.

7.5 The exhaust pipe, minimum 3mm thickness, shall be connected to the exhaust manifold with flexible connector. The whole assembly shall be thermally lagged with 100mm thick mineral fiber having a density of not less than 8 kg. /cu.m clad with copper mesh, and an overall cover of 24 BG GI sheet. The residential type silencer shall be installed outside the canopy on top with all fixing accessories.

7.6 The Contractor shall install the genset panel, batteries, and make all cable, earthing, and control connections in accordance with the manufacturer's wiring diagrams and instructions.

7.7 The manual changeover switch and main incoming breaker shall be installed and power and control cable shall be terminated including cable gland, lugs etc. All control wiring between generator control panel and change over switch is to be carried out as per requirement by the gen set supplier.

7.8 All materials required for complete installation, commissioning, and testing, including but not limited to bolts, shims, pipes, ducts, hangers, vibration isolators, flexible connections, thermal lagging, brackets, radiator duct, and connections, cable glands, lugs, etc. shall be provided by the Contractor within his quoted price.

8.0 COMMISSIONING & TESTING

8.1 In addition to site tests, a manufacturer's standard test report/certificate shall be submitted, which shall include the following as a minimum for each genset:

a) Load test temperature rise

25% load	½ hour
50% load	½ hour
100% load	1 hour
110% load	1 hour

b) Transient responses (voltage and frequency regulations)

i. Application of Block Load 0 % - 60%
ii. Rejection of Block load 100 % - 0 %

c) Operation of automatic starting, control sequence, and all protection circuits/sensors. Operation of ATS. Transfer of load on mains supply failure and on restoration of mains supply.

8.2 Prior to acceptance of the installation, the equipment shall be subjected to an on-site test with full load for a minimum period of 4 hours, plus one hour at 110% load, at contractors expense including provision of load bank. Load bank of 110% shall be arranged by the contractor.

8.3 All operating fluids (including fuel, oil, lubricants, coolants, inhibitors, etc.) for the testing shall be provided by the Contractor, who shall commission the genset, making all initial adjustments and settings required, and test all the control and protection functions and circuits. Three copies of the witnessed test-report shall be submitted to the Consultant.

9.0 ELECTRIC INSPECTOR APPROVAL

10.1 The Contractor shall have the kWh meter sealed and the installation approved by the Electric Inspector. All costs on this account are deemed to be included in the contract price.

10.0 MAINTENANCE & WARRANTY

10.1 The Contractor, as a representative of the manufacturer, shall warranty the genset and system to be free from all defects for a period of one year from the date of commissioning.

10.2 All defective parts shall be replaced by the Contractor free of charge.

10.3 The Contractor shall train the Owner's staff in the proper operation and maintenance of the set.

10.4 The Contractor shall be required to provide in addition to warranty, after-sales service of a standard quality, which is internationally acceptable for 24 months maintenance period or 4000 hours of operation of gen set, whichever comes first, which shall include all spares and labor, monthly visits and trouble shooting.

10.5 The Contractor shall submit a priced draft of his standard annual service contract, including scope of work, daily charges for service men, travel mileage charges etc. for maintenance after expiry of Defect Liability Period.

END OF SECTION

ANNEXURE-A

1. Detailed technical literature and specifications, and current production status of engine and alternator for each genset.

2. Engine data:

   a) Type/Make: _____

   b) Country & Year of

      Manufacture: _____

   c) Name & Address of

      local agent : _____

   d) Normal prime power rating : _____ BHP at 1500 rpm at _____ deg.C ambient temperature and _____m altitude.

   e) Site Standby power rating _____ BHP at 1500 rpm at 50 deg.C ambient temp. and 300m altitude.

   f) No. of cylinders _____ arrangement _____

   g) Bore _____mm, Stroke _____mm, and Piston displacement _____mm cubic.

   h) Piston speed _____m/s. At 1500rmp, BMEP _____N/m sq. @ rated kW output.

   i) Aspiration _____

   j) Duty _____

3. Alternator Data:

   a) Type/make_____

   b) Country & Year of manufacture _____

   c) Name & Address of local agent _____

   d) Normal continuous power rating _____kW at 1500 rpm at 400 volts at _____ deg. C temp. And _____m altitude.

e) Site standby power rating _____kW at 1500 rpm, at 400 volts at 50 deg.C ambient temperature and 300m altitude.

f) Number and type of bearings _____

g) Exciter type _____

h) Telephone influence factor _____

i) Short circuit withstand _____ percent, for _____

Seconds.

j) Overload withstands _____ percent, for _____minutes.

4. Generating Set Data:

a) Type / Make _____

b) Country of Origin: _____

c) Name and address of local agent _____

d) Normal continuous power rating _____kW at 1500 rpm at 400 volts, at _____ deg.C and _____ m altitude.

e) Site standby power rating: _____ kW at 1500 rpm at 400 volts, at 50 deg. C and 300m altitude.

5. Panel & Instruments Data:

a) Main Switch Make _____; Rating _____; Cat No./Type _____

b) MCCB Make _____; Rating _____; Cat No./Type _____

c) Earth Leakage Relay Make _____; Range _____; Cat No/Type _____

d) Voltage Monitoring Relay Make _____; Range _____; CatNo/Type _____

e) Digital RPM Meter Make _____; Range _____: Cat No/Type _____

f) COS Make _____; Range _____; Cat No/Type _____

6. Engine manufacturer's certified curves for

   a) Engine BHP

   b) Fuel consumption at various loads (25%, 50%, 75%, 100%and 110%)

   c) Lube Oil consumption at various loads (25%, 50%, 75%, 100%and 110%)

7. Information on the set's motor starting capabilities, including maximum kVA/ voltage dip, and maximum kW characteristics.

8. Number of operating hours to major overhaul _____.

ANNEXURE-B

Generator Test Form

NAME OF CUSTOMER	:	_____
ADDRESS OF INSTALLATION	:	_____
GENSET MAKE + MODEL NO.	:	_____
GENSET SERIAL NO.	:	_____
ALTERNATOR SERIAL NO	:	_____
ALTERNATOR MAKE + MODEL NO.	:	_____
ENGINE MAKE + MODEL NO.	:	_____
ENGINE SERIAL NO.	:	_____
GENSET CONTINUOUS/PRIME POWER RATING	:	_____ KVA _____ KW @ 0.8 pF
RATED VOLTAGE	:	_____ / _____ VOLTS
SYSTEM	:	3 PHASE, 4 WIRE
FREQUENCY	:	50 HZ
SPEED	:	1500 RPM
CONTROL SYSTEM	:	MANUAL/AMF/SYNCHRONIZING
DATE OF TESTING	:	_____

_____
SIGNATURE OF OWNER/CONSULTANT

_____
SUPPLIER

_____
SIGNATURE OF ENGINEER

RECORDED BY : _____

TESTED BY : _____

DATE : _____

ANNEXURE-C

S.No	Description	Setting Range	Manufacturer's Recommended Setting	Setting By Commissioning Engineer	Proper Function / Tripping	Remarks
1.	**CIRCUIT BREAKER** Rating Long delay current Long delay time Short delay current Short delay time Instantaneous current					
2.	**TIMERS** Mains-fail timer Cycle-cranking timer Start-fail timer Alternator voltage timer Over-run/cool-down timer Mains return timer _____ timer					
3.	**MAINS FAIL UNIT** Voltage setting (failure) Voltage setting (return)					
4.	**OVERSPEED TRIP** Trip speed setting.					

5.	**COOLANT OVER TEMPERATURE TRIP** Alarm temperature Trip temperature					
6.	**LOW-OIL PRESSURE TRIP** Alarm pressure Trip pressure					
7.	**ALTERNATOR UVT** % Voltage trip					
8.	**VOLTAGE SETTINGS** No load voltage Full load voltage Voltage droop %					
9.	**FREQUENCY SETTINGS** No load frequency Full load frequency Frequency droop %					

10.	**ALTERNATOR OVER TEMPERATURE TRIP** Resistance/phase at ____ C Trip resistance/phase at ___ C					
11.	**INSULATION RESISTANCE** Windings to earth					
12.	**EARTH RESISTANCE** Frame earthing Neutral earthing					

RECORDED BY : _____

TESTED BY : _____

DATE : _____

SIGNATURE OF ENGINEER: _____

SECTION 26 23 13

AUTO SYNCHRONIZING

SECTION 26 23 13
AUTO SYNCHRONIZING

PART ONE GENERAL

1.1 REFERENCE

i) Read and confirm all electrical section of these specifications. The general instructions for electrical Division, Section 260100, apply to and form part of all electrical sections.

1.2 SYSTEM FEATURES

i) Sources (Diesel Generators) Automatic Load Management System
ii) Automatic Generator Synchronization.
iii) Automatic Load Shedding with 30 Nodes as per IEC 61850 & though load shedding server.
iv) System source Priority to be K E – Diesel Generators in that order.
v) Automatic Phase Reversal system (BY KE)
vi) Full Metering of all input sources
vii) Complete BMS Interface for reporting only and building fault inputs.
viii) Automatic PFI Disabling in all MDB's of project.
ix) Automation and Management Software
x) CAN Bus communication on Controllers with Class A wiring
xi) Interface with Diesel Fuel Management system to avoid Diesel Genset shutdown and timely switchover
xii) Surge Protection
xiii) Backup Battery Bank with Intelligent Automatic Battery Charger
xiv) Cooling fan Installed
xv) Buzzer should be installed on KE shutdown, resume and trip.

1.3 SCHEME PHILOSOPHY

i) The scheme will operate as per the sequence of operation on the drawings and the following cases:
   a) Case 1 : When KE is not available:

      i) In case of failure of KE the Diesel Generator source comes in to operation.

      ii) Diesel generators get started, synchronize on bus in sync panel and close its breaker in Panel.

      iii) If there is low load demand then only one diesel generator comes into operation & if load demand is high then the other diesel generator(s) get started.

   a) Communication between all the controllers takes place via Controller Area Network (CAN) bus.
   b) Neutral isolation is required on transformers to avoid circulating current.
   c) Shifting of supply from generator to KE without tripping, on resuming KE.

PART TWO PRODUCTS

2.1 EQUIPMENT

i) The automatic transfer shall be by Microprocessor Controlled Motorized Air Circuit breakers as per drawings.

ii) The auto synchronizing panel shall be state of the art digital logic controller configurable by software.

iii) The Control modules shall have a digital back-lit LCD display and all features shall be manually accessible & configurable at the panel location.

iv) The Switchgear shall comprise of all components necessary to interface with the selected D.G. set models.

v) In-built DC power supply to be part of the panel. Supplier to ensure it as per the applicable regulations, codes and standards.

vi) Ensure Neutral Isolation.

vii) Provide Suitable surge protection.

2.2 MAINS CONTROLLER

i) Features

a) AMF function based on mains failure outputs a signal to start the genset group.
b) Mains measurement: U, I, Hz, kW, kVAr, kVA, PF, kWh exp., kWh imp., kVAhr exp., kVAhr imp.
c) Bus measurement: U, Hz
d) Sum gensets kWh and kVAhr
e) Inputs and outputs configurable for various customer needs
f) Controller redundancy
g) RS232/RS485 interface with Modbus support; Analog / GSM / ISDN / CDMA modem support; SMS messages
h) The RS232/RS485 interface can serve as a bridge to all other controllers at the site (via CAN bus)
i) Event based history (up to 1000 records) with customer-selectable list of stored values; RTC; statistic values
j) DIN-Rail mount

ii) Protections

a) 3 phase integrated mains protections (U + f), voltage unbalance
b) Mains IDMT overcurrent + Short current protection, current unbalance, Mains Import/Export
c) Vector shift & ROCOF protection
d) All binary inputs free configurable for various protection types, Warning / Write history / Write history + Active call / Alarm Only / Alarm + History indication / Shutdown / Mains protect with fault reset / Sensor fail.
e) Phase rotation and phase sequence supervision
f) Application security

2.3 BUS COUPLER CONTROLLER

i) Features

a) Event-based history (up to 1000 records) with customer-selectable list of stored values
b) Sealed to IP65
c) AMF function based on mains failure, outputs a signal to start the genset group
d) Many SPtM-equivalent mains parallel modes (SysBaseload, Analog Extern SysBaseload, Import / Export, Analog Extern Import / Export, Temp by Power)
e) Peak Shaving
f) Mains measurement: U, I, Hz, kW, kVAr, kVA, PF, kWh exp.,kWh imp., kVAhr imp.
g) Bus measurement: U, Hz
h) Sum gensets kWh and kVAhr

ii) Integrated Fixed and Configurable Protection

a) Over voltage
b) Under voltage
c) Voltage asymmetry
d) Over frequency
e) Under frequency
f) Overcurrent
g) Current Unbalance
h) Overload
i) Earth fault
j) Reverse power
k) Synchronism check
l) Phase rotation
m) Under current
n) Power factor
o) Vector shift
p) ROCOF

2.4 REMOTE CONTROLLER

i) Features

a) Plug and Play operation (auto configuration based on controller application)
b) Direct connection to the controller (converters are not needed)
c) Simpler, faster and more comfortable control for the user
d) More information in less time
e) 5, 7” Color TFT Display
f) Auto configuration based on controller application
g) Active buttons – fast access to important data
h) Sealed to IP65
i) Customer configurable screen

2.5 APPROVED BRANDS FOR SYNCHRONIZING & CONTROL MODULES

- Deep Sea , UK
- Woodward , UK
- CompAp, Czech Republic

PART THREE EXECUTION

3.1 INSTALLATION

i) Locate, Install and connect transfer equipment.
ii) Check relay and solid state monitor and adjust as required.
iii) Install and connect battery and remote alarm
iv) Failure of electrical component or disarrangement of any part shall not permit the switch to remain in a neutral position and alarm and indications shall be provided.
v) The operating mechanism shall obtain its power from the source to which the load is being transferred,
vi) An auxiliary contact shall close, starting the engine – alternator set, when the voltage in any phase falls to 75% of rated for an adjustable period of 0.5 –6 seconds, factory set a 2 seconds. When the alternator voltage has risen to 90% of rated on all phases, the switches shall transfer from the normal to the emergency source.
vii) The switchgear panel shall transfer to the nominal source when all phases have remained above 90% of rated, for an adjustable time period of 0 to 30 minutes.
viii) The switchgear panel shall be equipped with a timer to keep the engine running for an adjustable period of 0 to 5 minutes after load has been retransferred to the normal source.
ix) The switchgear panel shall be equipped with an in – Phase monitor or equivalent arrangement for retransferring to the normal source.
x) One 4 – position off-auto-run-test control switch shall be provided on the front of the enclosure. The run position shall start the engine without operating the transfer switch. The test position shall simulate a power failure and shall transfer the load to the emergency source.
xi) The switchgear panel shall transfer when the voltage in any phase falls to 75% of rated, and shall retransfer when all phases have remained above 90% of rated, for an adjustable time period of a to 30 minutes.
xii) The switchgear panel shall be equipped with a timer to delay transfer for an adjustable period of 0 to 30 seconds, to prevent transferring during testing of the standby power system.
xiii) One 3 – position off-auto-test switch shall be provided on the front of the enclosure.
xiv) All control gear shall be calibrated for operating conditioned in a 50 °C ambient temperature.
xv) The ASALS panel shall be capable of fully interfacing with and operable through the BMS System deployed for the project.
xvi) Bus bar copper purity certificate for generator synchronizing panel and load take off panel. Only important and certified copper is acceptable.
xvii) Genset and load take off panel should have capability to interface with BMS and SCADA system.

-**End of Section-**

TECHNICAL SPECIFICATIONS
VENTILATION WORKS

DECEMBER, 2025

Table of Contents

1. VENTILATION & AC SYSTEM DESCRIPTION AND GENERAL REQUIREMENTS

1.1 VENTILATION & AC SYSTEM CONCEPT

Split AC units are provided in the Generator Syn. Panel Room which are designed for cooling in all seasons. Provision of mechanical fresh air supply inside Generator room is designed via fan and ducts arrangement for Generators ventilation requirements.

1.2 DESIGN CONDITIONS

Ventilation & AC System has been designed for the conditions listed hereunder. These conditions unless stated otherwise are being given for the information of the Contractor to enable him to select Ventilation & AC equipment, material and perform specified tests under these conditions.

PROJECT LOCATION DATA

City, Country	Karachi, Pakistan
North Latitude	24.8°
East Longitude	67°
Altitude, above Mean Sea Level	13ft (4m)

OUTDOOR DESIGN CLIMATIC CONDITIONS

a) Summer Dry Bulb Temperature:	104°F (40°C)
Wet Bulb Temperature:	83°F (28.3°C)
Daily range:	20°F (11.1°C)
b) Winter Dry Bulb Temperature	41.2°F (5.1°C)

INDOOR DESIGN ROOM CONDITIONS FOR AIR CONDITIONING AREAS

All Cooling areas (Generally)	75.2°F+2°F (24°C+1°C) 50% +/- 10% RH

1.3 NOISE CRITERIA

All Ventilation & AC equipment and air inlets/Outlets shall be selected by the Contractor such that the following noise criteria are not exceeded:

a) Air-conditioned areas	NC 30-40
b) Toilets and other Ventilated areas	NC 40-45

1.4 SCOPE OF WORK

The Contractor shall furnish all labor, materials, equipment, tools, appurtenances, services, temporary work and storage necessary to completely supply, install, test, commission, and maintain the new ventilating and air conditioning system, all in perfect operating condition in accordance with these Specifications and Drawings and as per manufacturer recommendation with Engineer's approval. The Contractor shall also adjust, balance and readjust all the air, water and refrigerant systems as specified and shown.

RELATED WORK

The Contractor shall provide all works related to Ventilation & AC system, whether specifically mentioned or not. These related works shall include, but not limited to:

a) Electrical Works as specified in BoQ.

b) All works related to DX/cooling coil condensate disposal from Ventilation & AC system up to points shown on the relevant trade drawings shall be the responsibility of the Ventilation & AC Contractor.

c) Cutting, patching and repairing civil works in accordance with Clause 1-7 of technical specifications.

d) Providing written information/shop drawings regarding location and sizes of access panels required in false ceiling to the persons responsible for false ceiling, through the Engineer.

e) Providing written information regarding location and sizes of door louvers, door undercuts, where required, to the persons responsible for door louvers and door undercuts, through the Engineer.

f) All wood-work required for satisfactory completion of the project as specified except decorative wood work provided to conceal Ventilation & AC equipment.

g) Concrete Pads and foundations for Ventilation & AC equipment.

h) Providing steel frames and springs for inertia pads and cork sheet/neoprene sheet for other pads.

i) Coordinating Ventilation & AC installation with other trades' work, by way of study of other trades' drawings and pointing out the areas of conflict to the Engineer before installing items of Ventilation & AC system.

j) All concrete foundations, including thickened structural slabs, housekeeping pads and concrete for inertia pads

1.5 GENERAL REQUIREMENTS

1.5.1 MATERIALS

All materials shall be of the highest grade, free from defects and imperfections, of recent manufacture and unused, and the classification and grades designated, conforming to the requirements of the latest issue of the appropriate specifications cited herein. All materials, supplies, and articles forming part of major equipment and not fabricated by the manufacturer of the equipment shall be the products of the recognized reputable manufacturers.

1.5.2 WORKMANSHIP

Workmanship and general finish shall be of the highest grade, in accordance with the requirements specified herein, and the best latest standard practice and to the satisfaction of the Engineer.

1.5.3 EQUIPMENT

a) All equipment shall be manufactured by companies which have had at least ten years of previous experience in the design and manufacture of equipment of comparable type, capacity and operating conditions, unless otherwise approved by the Engineer.

b) All equipment and materials supplied shall be from approved manufacturers who are adequately represented in Pakistan and shall be authorized distributer and supplier of recommended manufacturers capable of providing installation commissioning and after sales service and shall have been in this field for at least 10 years. All major equipment shall be imported directly from the manufacturers through their local agents. Import of this equipment through warehouses/Export Houses will not be accepted.

c) All equipment shall be of latest manufacture, not older than the year in which this contract is awarded and shall bear year of manufacture stamped on the manufacturer's name plate duly certified by the manufacturer.

d) When a manufacturer's product is specified by name, or equivalent, it shall be in the sole judgment of the Engineer as to acceptability of any product which is offered as equal to that specified.

e) Where two or more units of the same class of equipment are furnished, product of the same manufacturer shall be used; component parts of entire system need not be product of same manufacturer.

1.5.4 CHASES AND OPENINGS

The Contractor shall provide templates or details for chases and openings to be left in walls, floor and roof slabs and partitions to accommodate work under Ventilation & AC scope of works.

1.6 CUTTING, PATCHING AND REPAIRING

Required (other than listed in clause 1.4 of this section) for proper installation and completion of Ventilation & AC works, including masonry work, concrete work, carpentry work, painting and re-painting shall be performed by skilled craftsmen in respective trades, at expense of the Contractor. Cutting (do not cut and Patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio) and Patching shall include but not limited to Removal of existing construction necessary to permit installation or performance of other Work, Fitting and repair work required to restore surfaces to original conditions after installation of other Work. Construction at expense of the Contractor shall be cut only after obtaining written permission from the Engineer and all such area shall be restored to original conditions prior to Commissioning and also again prior to Final Acceptance.

Temporary support shall be provided of Work to be cut. to prevent damage, existing construction during cutting and patching shall be protected. Protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations shall be provided. Interference with use of adjoining areas or interruption of free passage to adjoining areas shall be avoided. Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to avoid interruption of services to occupied areas.

Engineer's Approval of cutting and patching proposal before cutting and patching shall be obtained. Approval does not waive right to later require removal and replacement of unsatisfactory work. Only Skilled worker to perform Cutting, Patching and Repairing Works.

1.7 LINES, LEVELS AND SPACES

The Contractor shall check dimensions at the building site and establish lines and levels for work specified in Specifications. The Contractor shall check with work of other trades to ensure proper clearance of piping, ductwork, conduit and other items. Any deviations observed between drawings and actual construction shall be brought to the notice of the Engineer. The erection supervisor shall regularly inspect, during progress of civil works, the areas allocated for installation of Ventilation & AC equipment and any conflict observed shall immediately be reported to the Engineer.

1.8 MACHINERY GUARDS

All moving parts of machinery shall be protected by strong guards to adequately protect all personnel working on or in the vicinity of equipment. Wherever possible, moving parts should be protected by guards supplied by the equipment manufacturer. All guards must be strongly attached to equipment and should be designed for easy removal for access, servicing, adjustment & maintenance.

1.9 TOOLS

The Contractor shall supply full set of latest tools in tool boxes, suitable and recommended by respective components and equipment manufacturer for maintenance of all System's components and of the plant furnished by him including the electrical equipment, for use by the Employer after Final Acceptance and "Defect Liability Period" as specified in relevant clause of the specifications.

1.10 SPARE PARTS

The spare parts for Ventilation & AC System shall be duplicates of the original parts furnished and interchangeable therewith. All spare parts shall be with proper packing / boxes and tagging.

1.11 ACOUSTIC TREATMENT

The noise criteria for different areas stated in Special Provisions is to be obtained. Sound measurements will be made at 5 feet (1.5 m) above floor level in the area served and not more than 5 feet (1.5 m) from the grilles, diffusers or other air devices being tested. Instruments for sound measurement shall be provided by the Contractor at his own cost.

Provision is to be made to minimize noise and vibration. However, different manufacturers' equipment has varying sound and vibration characteristics and it is, therefore, the responsibility of the Contractor to ensure that the requirements in these specifications are fully met by the equipment he is offering. If the Contractor has any requirements for additional vibration or sound isolation, these must be incorporated into the price quoted.

All equipment installed should not be audible inside the occupied areas and the Contractor must ensure that the equipment he is offering is quiet and supplied with all necessary silencers / sound attenuators to ensure satisfactory sound levels. Where

silencers are required, these must be incorporated into the price quoted for such equipment, if these are not specified separately.

1.12 EQUIPMENT LIFTING AND ALL SORTS OF HANDLING AND TRANSPORTATIONS

The Contractor shall be solely responsible for safe lifting and all sorts of handling of the equipment from the place of storage, source / vehicle / crane and alike used for all sorts of transportation, and lifting to location of final installation and finally on the respective foundations as per manufacturer's instructions.
Prior to lifting and all sorts of handling of the equipment's the following procedures shall be adopted:

a) Submit complete information of specialist firm of lifters/riggers to the Engineer and obtain approval.

b) Submit complete procedure and equipment to be used for lifting and all sorts of handling of the equipment in place. Identify on plans location of tripod, hoist, crane etc. that will transfer weight of the equipment to building and or adjoining structure and obtain approval.

All the above to be completed with minimum one month before the date of lifting and all sorts of handling of the equipment.

1.13 STORAGE ARRANGEMENTS

a) The Contractor shall make adequate arrangements for the storage of the materials arranged by him or supplied by the Employer. Adequate space for stores shall be provided on site to the Contractor.
b) The location of the store area shall be within the Site premises and/or selected with the consultation and approval of the Engineer/Consultant.

1.14 TECHNICAL SUBMITTALS OF EQUIPMENT AND MATERIALS

a) All drawings, other information and samples must be supplied to the Engineer as laid down in these Specifications and as and when agreed during site meetings, in the Progress Chart or as instructed by the Engineer.
b) The Contractor shall submit for approval, detailed submittals as specified and no material or equipment may be delivered to the job site or installed until the Contractor has in his possession the approved Data Sheet, Catalogue cuts or samples of particular material. All submittals shall be in English Language, easily readable and shall be supplied free of cost.
c) Submittals shall be giving full information as to capacity; performance at different operating and ambient conditions, dimensions, materials, electrical data and all other information pertinent to the adequacy of the submitted equipment or material shall be submitted for approval. All submittals shall be made atleast in triplicate with at least one in Original.
d) Approval rendered on submittals shall not be considered as a guarantee of measurements or building conditions. Where submittals are approved, said approval does not in any way relieve the Contractor from his responsibility for necessity of furnishing material, equipment or performing work as required by the Drawings and Specifications.

e) Failure of the Contractor in providing submittals drawings and information in ample time for checking shall not entitle him to an extension of Contract time and no claim for extension by reason of such default will be allowed.

1.15 SAMPLES

Contractor shall provide at his cost, samples of materials, instruments, accessories, electrical items, etc. for approval by the Engineer before order is placed for the same. Sample or sample boards shall be appropriate and shall be properly labeled to have a unique Identification or reference number. These samples shall include, but not limited to:

a) G.I. Sheet, each gauge to be used.
b) Duct sound liner and canvas cloth, metal cladding.
c) Pipe insulation, canvas cloth, metal cladding.
d) Insulation adhesive and tapes.
e) Diffusers, grilles and registers.
f) OA/EA louvers.
g) All types of dampers.
h) Power and Control Cables.
i) Pressure Gauges, thermometers (all types), etc.
j) Electrical cables
k) Vibration isolating springs, cork sheet, pipe hangers, supports and rollers.
l) Flexible duct connections.
m) Air filters (where specified local).
n) Electrical conduits and fittings.
o) Paints / coating (all types).
p) Anchor bolts studs, threaded rods, hangers and supports, etc. for hanging and supports arrangements.
q) Any other item required by the Engineer.

1.16 SHOP DRAWINGS

The Contractor shall make a detailed analysis of the requirements of work. Based upon such analysis he shall revise and amplify the Drawings and shall prepare detailed Shop Drawings for complete Ventilation & AC System and Equipment. Initially he shall submit 2 preliminary copies each of all such Shop Drawings to the Engineer for obtaining approval. Once basic agreement is reached with the Engineer regarding the details then the Contractor shall submit 6 (six) copies each of all such Shop Drawings and one sepia to the Engineer for obtaining approval of the Engineer. After obtaining approval and after having in possession these approved Shop Drawings, the Contractor shall use these Shop Drawings for fabrication, construction and installation.
The work described on any shop drawing submitted shall carefully be checked by the Contractor for all clearances, field conditions, maintenance of architectural conditions and proper coordination with all trades on the job. To this end, the Contractor during the

shop drawing stage, shall ensure that he receives drawings of all other trades that might interfere with the proper installation of his work. Any unresolved conflict between trades shall be referred to the Engineer for decision.

Equipment layout is to be detailed on shop drawings, showing the exact method of installing and clearly illustrating components to be used in making all connections.

The Contractor shall submit shop drawings of all sheet metal work for approval, before commencing any fabrication and installation work. Ductwork drawings must show clearances between ductwork and civil structure. All dampers, splitter dampers, fresh air inlets, exhaust outlets, connections to equipment and methods of support and any other details necessary for the satisfactory installation of the system must be indicated. Each type of grille, register, diffuser and louvre is to be referenced in a schedule and the type and size clearly indicated at each location. Taper and flat sides of ductwork at all transitions must be indicated, and all equipment, piping and ductwork must be located exactly by showing exact dimensions with column lines or other reference lines.

Duct bottom and piping center-line height from finished floor level shall be marked with every change in level.

Position of hangers and supports with type and method of installation of each hanger shall be given, detailing the type of hanger fixing with a reference number for each type.

Piping drawings must be fully detailed, showing all piping in double line and indicating the precise sizes of fittings, valves and equipment.

All general layout drawings shall be drawn to 1':1/4" (1:50) scale. Details of hangers, methods of fixing of pipes and ducts, detailed cross section of pipe, ducts and risers, details of control and piping hook-ups to equipment shall be drawn to 1':1" (1:10) scale.

The Contractor shall prepare Drawings and Schedules showing precise details of holes in concrete, masonry, etc. and necessary sleeves required for passage of ducts and pipes. Drawings and Schedules, approved by the Engineer must be available before any structural work requiring holes or other modifications, is constructed.

Signed and approved drawings shall not be deviated from unless a signed variation order or site instruction is issued in writing by the Engineer. Drawings returned to the Contractor for alteration or amendment are to be resubmitted for approval.

Amended or altered drawings shall show the nature of the amendment or alteration in a revision block on the drawing, together with revision number or letter and the date of the revision.

The Contractor shall be responsible for any discrepancies, errors or omissions in the drawings and other particulars supplied by him whether such drawings and particulars have been approved by the Engineer or not.

1.17 AS_BUILT DRAWINGS

The Contractor shall supply to the Engineer a set of "As-Built" drawings showing the Contract works as installed, together with any other information necessary for operation and maintenance. Six hard copies of each drawing and other information shall be supplied, along with a reproducible copy in the form of soft sets in CAD and PDF formats in CDs.

1.18 STANDARDS AND CODE REQUIREMENTS

All equipment and materials under Ventilation & AC Scope of Works shall be furnished in conformity with latest edition of applicable Standards of ASME, ASHRAE, AHRI, SMACNA, TIMA, AMCA etc. and applicable Government and Local Codes governing the same. In

case of conflict, the stricter requirements shown/specified shall govern. All equipment shall be rated and tested as per standards listed in ASHRAE Handbook (Latest Edition). Abbreviations for Codes and Standards referred in the Contract are as under:

1	ASME	American Society of Mechanical Engineers, USA
2	ASTM	American Society for Testing Materials, USA
3	ASHRAE	American Society of Heating, Refrigerating and Air conditioning Engineers, USA
4	NFPA	National Fire Protection Association, USA
5	AHRI	Air-conditioning, Heating and Refrigeration Institute, USA
6	SMACNA	Sheet Metal and Airconditioning Contractors National Association, USA
7	GOVERNMENT	Government of Pakistan
8	LOCAL	Local authorities of the city where project is located
9	I.E.E.	Institute of Electrical Engineers, London.
10	NEMA	National Electrical Manufacturers Association, USA
11	AMCA	Air Moving and Control Association Inc. USA.
12	P.S.	Pakistan Standards
13	B.S	British Standards
14	TIMA	Thermal Insulation Manufacturer's Association, USA.
15	EN	European Norm
16	EUROVENT	All relevant standards as applicable.

1.19 STANDARDS OTHER THAN THOSE SPECIFIED

Where the specifications provide requirements for material or equipment by specifying a standard such as for example, one of the American Society of Heating, Refrigerating and Air conditioning Engineers, which has its origin in one country, it is not the intention to restrict the requirements solely to that standard and that country. Other standard, including standards of other countries, will be accepted provided the requirements thereof, in the sole opinion of the Engineer are at least equal to the requirements of the standards specified. The Contractor may propose to the Engineer an equivalent standard other than that specified, in which case he shall submit the proposed standards and all other information to demonstrate and prove his proposed standard is equivalent in all significant respects to the standard specified. All submissions must be made in the English language.

1.20 PERMITS

The Contractor shall secure and pay for any necessary approvals, permits and inspections from Government or other controlling agencies where applicable as required by law, before commencing any work so as to avoid all delays during erection and turn over the official records of granting of permits to the Engineer.

1.21 SEQUENCE OF ERECTION

The sequence of erection of the Equipment shall conform to the requirements of the civil construction and of the Erection Instructions. Such information will be furnished to the Contractor by the Engineer upon request. Contractor's Work Programmed shall confirm to Construction Schedule shown on Drawings, or as directed by the Engineer.

1.22 INSTALLATION, ERECTION AND MAINTENANCE PLANT & TOOLS

The Contractor shall furnish all plant and tools including special plant and tools for the complete and proper installation erection and maintenance of the Ventilation & AC System and Equipment. Tools shall include the type of tools not normally available in the market as standard tools and are generally manufactured especially for use with the Ventilation & AC Equipment. All lifting devices shall be accurately machined to fit the parts to be handled. The wrenches and tools for maintenance, insofar as practicable, shall be mounted on a suitable hardwood or steel board arranged for wall mounting and provided with means for ready identification. The Contractor shall also provide refrigerant charging Plant if and when required. The Contractor may withdraw the Plant and Tools after its use.

1.23 RIGHT TO OPERATE PLANT

The Employer reserves the right to operate any and all Equipment after it has passed the Commissioning Tests and prior to Final Acceptance. All repairs or alterations found to be necessary during such operations, required of the Contractor, shall be made by the Contractor at such time as directed by the Engineer. The repairs or alterations shall be made in such a manner and at such a time as will cause the minimum interruption in the use of the Equipment by the Employer.

1.24 SUFFICIENCY OF RATES AND CURRENCY OF PAYMENT

All rates and amounts filled in the BOQ and Appendices by the Contractor for equipment/material whether locally procured or imported shall be deemed to include, but not limited to, the cost of items, custom duties, sales tax and surcharges, freight, marine insurance, local duties, sales tax and surcharges, clearance charges, inland transport and insurance, octroi, L/C opening charges, bank charges, etc. Payments to the Contractor shall be made in local currency.

1.25 PACKING OF EQUIPMENT AND MATERIALS

All equipment and material shall be adequately packed at the manufacturer's works to protect them against damage, scratching, corrosion, dust, rain and moisture during handling, transportation and storage. The packaging shall be rigid enough to withstand normal service incidental to shipping and handling. Wherever necessary, crates/boxes shall be provided with lifting hooks attached by means of vertical rods or plates to strong bottom supports to enable rigging.

The following information shall appear inside all packages:

a) Stock or identification number

b) Description of contents/packing list

c) Quantity of each item

d) Invoice number

e) Year of manufacture

1.26 INSPECTIONS AND TESTS AT SITE

1.26.1 INSPECTION BY ENGINEER

The Engineer shall inspect the works in progress as and when considered necessary by the Engineer and the Contractor shall provide full access and assistance to the Engineer for carrying out inspection to verify the conformity of works to general lay-out of Ventilation & AC System as designed and as shown on Drawings and as specified. Such inspection if made shall not relieve the Contractor from any obligations under the Contract.

1.26.2 TESTS

a) General

i. All tests as specified shall be carried out by the Contractor's workmen. The Engineer shall witness the tests.

ii. The Contractor shall give the Engineer at least seven days' notice in writing of the date on which any equipment will be ready for testing as provided in the Specifications and unless the Engineer shall attend within seven days of the date which the Contractor has stated in his notice, the Contractor may proceed with the tests in the Engineers absence and shall forthwith forward to the Engineer five duly certified copies of test readings, on the forms prescribed by the Engineer. The Engineer shall give twenty-four hours' notice in writing of his intention to attend any test.

iii. The Contractor shall provide all labor, materials, electricity, fuel, stores, apparatus, machines and instruments as may be necessary to carry out test.

iv. The cost of all Tests under this Clause shall be borne by the Contractor.

v. As and when any equipment or Ventilation & AC System or part thereof shall have passed any test the Engineer shall furnish to the Contractor a certificate in writing to that effect.

vi. The Engineer may reject any part or parts of Equipment, and Ventilation & AC System which he shall after testing decide is not performing in accordance with the Specifications and Drawings and he shall give to the Contractor within fourteen days of such testing notice in writing of such rejection stating therein the grounds upon which his decision is based.

vii. The results shall be filled out by the Contractor in the forms prescribed by the Engineer. Six copies of filled out forms shall be submitted to the Engineer for review and approval.

b) Preliminary Tests

Preliminary Tests as specified in Technical Specifications shall be carried out on all major Ventilation & AC equipment and such other equipment as the Engineer may require, on completion of installation of that equipment or at such time which the Engineer may require.

c) Pre-start and Commissioning tests

Pre-start and Commissioning Tests shall be carried out on all equipment, as Specified in Technical Specifications, when the Ventilation & AC System as a whole is ready for operation and the building has been sealed and door shutters and fenestration installed.

d) Performance Tests

These tests as specified in Technical Provisions shall be carried out after successful completion of Commissioning Tests, during appropriate season. Performance Tests may be carried out during Maintenance Period.

e) Reliability Trial Tests

On successful completion of Performance Tests on all equipment, and after having obtained certificate to that effect, in pursuant of sub-clause a (v) hereof, the Contractor shall inform the Engineer in writing of his readiness to commence the Reliability Trial Test of Ventilation & AC System. Ventilation Tests shall be carried in appropriate season and the Engineer shall, within fourteen days of receipt of such information forward his consent for commencement of Reliability Trial Test as specified in Technical Specifications, after having satisfied that all the requirements for such Tests have been completed.

If any Reliability Trial Test is not to the satisfaction of the Engineer, such test shall be repeated at such time at the Engineer may direct.

Payment shall be made for acceptable measured quantities of respective items on the basis site measurements and Bill of Quantities and shall constitute full compensation for all the works related to these items.

2. EQUIPMENT

2.1 GENERAL

a) All equipment shall be of such overall dimensions, operating weights, service area requirements and configuration that it can be located where shown on the plans without any adverse effect on its performance and clearance requirements. Electrical input kW shall not exceed kW as listed or specified in relevant electrical design drawings.

b) All equipment supplied under this section shall be brand new, factory manufactured and factory assembled (unless otherwise specified) and complete in all respects. The type, characteristics, capacity ratings, component sections of all equipment shall be as scheduled. All equipment shall be tested at factory for performance before shipment and certificate along-with test results shall be issued by the manufacturer.

c) All equipment shall be complete with all accessories necessary to serve the intended purpose, whether specified or not and its cost shall be included in the quoted price for Ventilation & AC Works.

d) The equipment shall be commissioned as per manufacturer's procedures and the supplier shall furnish a startup log indicating operating and safety control functions are mentioned. For more information, see the details given elsewhere in these specifications and provisions.

2.2 VENTILATION FANS

2.2.1 GENERAL

All Fan's air performance shall be tested according to AMCA Standard 21 or ASHRAE standard 51.
Expected air temperatures, altitude, windage, and system effects shall be taken into account when selecting the fans. Fan's Wheels shall be heavily and rigidly constructed and accurately balanced both statically and dynamically at factory, and be free from objectionable vibration or noises.

Actual brake horsepower of fan and drive shall not exceed nameplate rating of motor driving fan. Motor shall be included. Where applicable, fans shall be suitably selected and supplied for outdoor application. All fans shall be suitable for operation in Hot and Humid climate as per recommendations of the fan manufacturer and shall be complete in all respects. Housing shall be additionally protected against corrosion with two coats of factory applied corrosion resistant coatings. Lifting lugs shall be provided.

The manufacturer shall provide full technical detail of the product, with catalogues, dimension drawings, weights, hook-up details air side, electrical and electronics side etc. and each drive shall be provided with a full technical manual.

Fans Units shall be made of Hot-dip Galvanized steel housing Backward or forward inclined aluminum or Galvanized steel wheel at least two bolted or hinged access panels/doors Integral duct connection flanges, Adjustable motor pulley, Adjustable motor plate, Fan shaft mounted in ball bearing pillow blocks, Static free belts, Corrosion resistant fasteners, vibration isolators, with galvanized drain threaded socket connections for attachment to drain points, Filters and other accessories as per actual site requirements.

Fans shall be factory performance tested by the manufacturer as per procedure given in relevant standards. The manufacturer shall issue in soft and hard forms proper test reports and certificates confirming compliance of the equipment with specifications and capacity requirements. Details of factory performance tested are given elsewhere in this document.

Fans shall be selected as per the space available at site for installation considering service space requirements.

Fan Motors shall have IP-55 Protection, Class-F insulation. Moreover these motors shall be Specifically Designed and rated for 50◦C (122◦F) outdoor dry bulb temperature. Motors safeties shall include built-in thermal overload protection. The number of motor poles shall be selected by the manufacturer with a direct relationship to the fan revolution speed and the intended purpose. Electrical enclosure shall be as per fan application and installation location as scheduled and shown on drawings.

2.2.2 AXIAL FANS

Fan arrangement shall be either supply or exhaust. See Fan schedule / BOQ. Axial Fans shall be at least three airfoil blade type of metal construction, mounted on steel mounting plate with Orifice ring.
Fans shall be direct or belt driven and supplied complete with electric motor, backdraft dampers, anti-bird and anti-vermin screen, galvanized wall and duct collar and other accessories required for field installation.

Fan and motor assembly shall be statically and dynamically balanced.

Permanently sealed, pillow block bearings shall be selected for a minimum L10 life in excess of 100,000 hours (L50 average life of 500,000 hours) at maximum catalogued operating conditions. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts. The bearings shall be ball, roller or sleeve type of permanently lubricated and sealed type.

2.3 SINGLE SPLIT AIR-CONDITIONING UNITS

2.3.1 GENERAL

a) Single split air-conditioning units shall be self-contained split inverter type (except Floor Standing type which should preferably be inverter type), factory assembled, factory refrigerant charged, wired and tested units with air flow capacities and characteristics as shown on the Drawings /BOQs/Equipment Schedules.
b) AC Units shall be complete with all accessories required for field installation and satisfactory completion and operation of works.
c) Units shall be of such overall dimensions, weights, configuration, so that these may be located where shown.
d) All inter-connecting refrigerant piping with insulation, refrigerant charge for unit and piping and all safety controls shall be included.
e) Units shall be with latest technology inverter based variable speed compressors, refrigerant cooled inverter boards, variable speed BLDC fan motor (except Floor Standing type which should preferably be BLDC type), quiet, space saving, efficient low profile, washable filters, durable heat exchangers, wide operating range of temperatures, self-diagnostic control board and quiet variable speed blowers.
f) The units shall be charged with environment friendly refrigerant having ozone depletion factor of 0.00 (except Floor Standing type which should preferably be with ozone depletion factor of 0.00). Units shall be specifically design and labeled to operate and perform satisfactory at T1 conditions.

2.3.2 OUTDOOR OR CONDENSING UNIT (CUS).

a) Unit shall be weather-proofed and suitable for outdoor use and shall be assembled on a rugged frame.
b) The Cabinet shall have sheet steel panels coated with two coats of baked enamel paint. Internal protection devices on the compressor shall include a thermal overload relay and a pressure relief valve.
c) The compressor shall have internal spring mounts and external vibration isolation mounts to minimize noise and vibration.
d) Condenser coils shall be ⅜ inch (10mm) diameter seamless copper tubes mechanically bonded to aluminum fins and additionally protected with acrylic/epoxy coating along with special coating for protection against corrosion as per project location requirements.

e) Coils shall be provided with quick-connect couplings.
f) The condensing unit shall be of the vertical/horizontal discharge, air cooled type, and sized to deliver the required capacity matched to relevant DX-type indoor unit at specified Outdoor Design Conditions.
g) The condensing unit shall be of same manufacturer as that for the Indoor A.C. Unit.
h) The unit casing shall be constructed from galvanized sheet steel, zinc-phosphate and with a stoved enamel finish.
i) All access panels and the unit casing shall be provided with thermal and acoustic insulation.
j) All moving components such as compressors and condenser fan motors shall be anti-vibration mounted to minimize the transmission of vibration and noise.
k) Special coating shall be provided for each condensing unit casing, parts and Coils to protect it against corrosion as per project location requirements.
l) Coils shall be pressure tested to test pressure as per standards at factory.
m) Condenser fans shall be of direct drive with BLDC type variable speed fan motor (except Floor Standing type) statically and dynamically balanced propeller type. Weatherproof fan motors suitable for outdoor use, permanently lubricated and provided with built-in thermal overload protection shall be used. Fans shall be mounted on rubber vibration dampers.
n) All condensing units shall be weatherproof and capable of operating satisfactorily at high and low outdoor temperatures at full load.
o) Compressor, shall be of latest technology inverter based variable speed type, (except Floor Standing type) fully hermetic high-efficiency type, with high- and low-pressure safety switches, motor overload protection, crankcase heaters and oil pump.
p) The refrigerant circuit shall include adjustable thermostatic expansion valve, sight glass, liquid line dryer and other safety and controls devices for complete operation. The unit shall be with direct driven propeller fan, safety guards and heavy-duty motor.
q) Casing shall be weather proof, of steel construction finished with corrosion resistant paint, and shall be suitable for outdoor installation.
r) Inverter board shall be cooled by refrigerant circuit.
s) Internal overload protection located in the motor windings shall be provided.
t) The units shall be complete with refrigerant piping consisting of insulated copper pipes as per the details given elsewhere in technical specifications and all necessary valves and filter driers from the unit to the air cooler.
u) Suction and discharge pipes shall be equipped with pipe vibration dampers. Condensing units shall be factory pressure tested, evacuated and dehydrated.
v) The units shall be charged with environment friendly refrigerant having ozone depletion factor of 0.00 and installed on steel brackets of adequate strength fixed to the walls with expansion bolts or at locations as shown on drawings.
w) Compressor refrigerant holding capacity and amount of refrigerant shall be based on actual piping routes and selection shall be made accordingly.
x) Adequate protection for outdoor AC units from direct Sun light such as by providing corrugated G.I sheet, shall be installed as approved by the Engineer. Fan and Condenser Coil Sections shall have safety guards.

2.3.3 INDOOR OR EVAPORATOR UNIT (AC-UNITS).

a) The DX-type Indoor units shall be elegant, and of the type and capacitates as mentioned in Drawings /BOQs/Equipment Schedules.
b) Fresh-air connection shall be provided on side or rear of the units, if specified in Drawings/BOQs/Equipment Schedules or approved by the Engineer.
c) All component parts shall be selected, manufactured and assembled by the same manufacturer as for outdoor Condensing unit.
d) Each unit shall be constructed so as to prevent drumming, distortion and vibration and shall enable ease of handling and replacement of sections.
The units shall include the following sections:
   i- Washable filters conforming to ASHRAE Standard 52 latest edition
   ii- DX-type cooling coil
   iii- Supply air fan and motor (variable speed type)
   iv- Thermostat microprocessor type with digital display and set point adjustment
   v- Automatic air swing mechanism
   vi- Supply air plenum with adjustable grille
   vii- Condensate drain pump (for units other than wall mounted type)

e) The casing frame shall comprise of galvanized sheet steel, zinc-phosphate, with a stoved enamel finish and shall be provided with decorative cover with supply and return air grilles.
f) The decorative cover and grille shall be of ABS thermoplastic polymer with smooth finish in approved color.
g) Fan shall be statically and dynamically balanced centrifugal type with backwardly included or airfoil blades to suit the pressure and operating characteristics specified.
h) Fan housings shall be constructed from galvanized steel sheet. The casing shall be constructed to a truly volute form.
i) Shafts shall be cold finished, turned, and polished steel. Bearings shall be self-aligning, permanently lubricated ball bearings.
j) All parts of fans and motors liable to deterioration shall be protected by paint or grease before delivery to site.
k) Filters with dust resistance of 68% as per ASHRAE standards shall be provided. The filter media shall be washable, cleanable, reusable, chemical and moisture resistant, non-perishable, and flame resistant.
l) Cooling coils shall be manufactured from solid drawn seamless copper tube staggered in the direction of airflow. Tube return bends shall be copper and brazed to tube ends.
m) Coils shall be pressure tested to test pressure as per standards at factory.
n) Fins shall be of continuous aluminum protected with acrylic / epoxy coating having extended collars for spacing and bonding mechanically to the tube.
o) Tubes shall be expanded onto the fin collar by hydraulic pressure only.
p) No part of the coil tube ends or headers shall be external to the section. Coils shall be suitably sealed with grommets where connections pass through the unit casing.
q) The Indoor AC Unit shall incorporate a galvanized and sloped drain pan with integral insulation.
r) The pan shall be fitted with galvanized drain socket connections for attachment to drain points.
s) A manometric trap should be supplied and installed by the installing contractor.
t) The coil shall be easily removable from the unit for maintenance and cleaning purposes.
u) The coil shall include a thermostatically controlled expansion valve. Shut-off valves at supply and return connection in indoor units shall be provided.
v) Micro-processor-based thermostat with fan speed selector shall be supplied as part of the

units.

2.3.4 INSTALLATION OF SPLIT UNITS:

a) Supply and install the air-conditioning units as per relevant drawings.
b) Provision of space clearance required for units (indoor & outdoor) shall be strictly followed as per manufacturer's recommendations.
c) Indoor & outdoor units shall be installed properly levelled & aligned.
d) Indoor & outdoor units will be fixed with appropriate size Anchor/Brackets.
e) In case of front discharge condensing unit, the air discharge direction will be the same as the wind direction but symmetry will be maintained according to building orientation.
f) Outdoor unit and floor mounted indoor unit will be installed on concrete pad, & provided with cement plaster finish or steel structure as shown on drawings.
g) On all Outdoor Units, install rubber-in-shear vibration isolators below out-door unit.
h) On floor mounted indoor unit use 1-inch-thick (25 mm) neoprene pad. On ceiling suspended indoor units use rubber-in-shear isolators.

2.3.5 REFRIGERANT PIPING:

a) Refrigerant piping shall be copper tubing conforming to standards and source given in the relevant section of the specifications.
b) Use copper phosphorus filler metal for brazing rods.
c) Perform pipe brazing by flowing nitrogen gas through it.
d) Prevent ingress of foreign material and water vapor into refrigerant pipes. Keep pipe ends plugged.
e) All pipe passages thru walls/roof shall be thru a suitably sized pipe of the type given in the relevant section of the specifications to act as a sleeve.
f) Install the insulation on liquid and suction lines. Wrap all joints with self-adhesive aluminum tape. Thickness and type of the insulation shall be as per the details given in the relevant section of the specifications.
g) Insulated pipes exposed to the atmosphere shall be installed in a rectangular G.I sheet raceway, similar to a cable tray, with removable top cover, as per approved sample.
h) Install pipe supports at every meter distance and at every change of direction.
i) On all units, install refrigerant drier on liquid line with shut off valve on both sides of the drier and a bypass line with shut-off valve.
j) When brazing work is finished, check for leaks at the joints. For this purpose, pressurize piping by charging with nitrogen to a pressure of range as per the type of refrigerant charged in psig along with a small amount of refrigerant. Use refrigerant leak detector to check for leaks. For further details, refer to manufacturer recommended installation instructions.
k) After refrigerant-piping work is finished, evacuate the installed pipes along with indoor unit evaporator coil vacuum using a vacuum pump. The contractor is to have available on site and to use a calibrated vacustat preferably electronic for measuring the vacuum obtained for refrigerant lines.
l) The Consultant may witness all pressure testing and achieved vacuums on refrigerant lines.
m) After system is charged, all piping joints shall be checked for leakage using a Refrigerant detector.

2.3.6 CONDENSATE DRAIN PIPING:

a) Install drainpipes as and were shown on the relevant drawings.
b) Drainpipes shall of the pipe type and size in accordance as per the details given in the relevant section of the specifications.
c) Provide support at every 1 meter and at every change in direction.
d) Drainpipe shall be installed with proper slope but not less than 1:96.
e) Do-not connect drain piping to drainage system. Use in-direct connection.
f) Install the insulation drainage lines. Wrap all joints with self-adhesive aluminum tape. Thickness and type of the insulation shall be as per the details given in the relevant section of the specifications.
g) All pipe passages thru walls/roof shall be thru a suitably sized pipe of the type given in the drawings/relevant section of the specifications to act as a sleeve.

2.3.7 ELECTRIC WIRING:

a) Provide and install electric wiring and earthing from electric supply point provided by others either near outdoor unit or indoor unit as required. Provide all control wiring between indoor and outdoor unit.
b) Size of wires shall be as per manufacturer recommended installation instructions, shall be submitted for approval of the Engineer prior to commencement of the installation works. Other details of the electrical works shall be in accordance as per the details given in the relevant section of the specifications.

2.3.8 COMMISSIONING & TESTING:

a) The contractor shall be responsible for commission the air conditioning unit in accordance with manufacturer's recommendations.
b) The split units will have a guarantee/warranty period of the specified period given elsewhere in this section, and should any defects arise during this period which can be attributed to poor workmanship, improper material, or defective manufacture of the air conditioning units, for which the Consultant shall be the sole judge, the Contractor shall be required to replace or repair all defective parts, except compressors (burnt or otherwise) which shall be replaced with new compressors.
c) All repairs and replacement shall be as directed by the Consultant.

2.4 AIR FILTERS

2.4.1 GENERAL

a) Air filters shall conform to ISO16890-2016, EN 779-2012, ANSI /ASHRAE 52.2-2017, EN 1822-2019 /ISO 29463 and other relevant codes and standard. All filters shall be of type, capacities, efficiencies and characteristics as scheduled and as specified. Filters shall be complete with gas-kitted holding frames tested for leakages. Each filter cartridge shall be provided with gasket for proper sealing of filter bank.
b) Side access housings (for low and medium efficiency filters) filter mounting section shall be fully factory assembled and dimensionally compatible with factory fabricated Fans.

c) Each air system shall have its own air filters, and shall be of type and capacities as given in specifications herein, or as scheduled.

d) In selecting the sizes of the air filters, the space available in the Plant Room and fans etc., should be considered when selecting the filter.

e) Following information about each of the air filters proposed to be provided:

- Capacities in CFM or LPS and media air velocity.
- Initial and Recommended Final air pressure drop in inch of wc (Pa) for each type of filter.
- Manufacturer's performance guarantee certificate and technical information.

f) The Contractor shall install a multi-blade damper in the plenums of fans having high efficiency filters to balance the air system when the filtering media is new with low initial resistance.

g) Provide frames to allow withdrawal of filters. Low efficiency filters shall have slide withdrawal mechanism.

h) The fire prevention certificate shall conform to the BS EN 13501-1: Non-combustible materials / with limited combustibility, do not contribute to the development of a fire.

2.4.2 PANEL FILTERS

a) As per ASHRAE Standard 52, MERV-4 (G-2 per EN 779-2012) rating, filters media shall be aluminum screen/Mesh and Water Washable,
b) Up to MERV: 10 rating, filter media shall be Pleated, Panel / Throwaway Type: Air Washable/Disposable type,
c) Filters arranged in alternate layers of flat and herring bone-crimp, 4 layers of each per inch, rod reinforced and enclosed in a frame of 16-gauge galvanized steel with flush mitered corners. Pressure drop at 500 fpm (2.5 m/s) velocity shall not exceed 35 Pa and Holding frames shall be factory built of 16 gauge steel with felt air seal.
d) Panel filters for all ventilation fans (supply air fans) and outside Air Intake Louvers shall also be 2 inches (50mm) thick.

2.4.3 THROWAWAY DISPOSABLE SYNTHETIC MEDIA PANEL FILTERS – MERV: 5-8 (G-4 PER EN 779-2012)

a) Filters dust Spot efficiency of 20-35% and average arrestance shall be greater than 90% on 3-10 micron range when tested in accordance with ASHRAE Standard 52, and average arrestance of synthetic dust per EN 779-2012 shall be greater than 90%.
b) This filter shall be a pleated disposable filter utilizing synthetic media securely sealed in a die-cur beverage board frame made from same material as that of respective AHU or other equipment or as required by application. The filter shall be 2-inch (50mm) thick.

c) The filter shall be supplied with a 50mm deep cell (holding) frame made from same material as that of respective AHU or other equipment or as required by application with quick release clamps or hinge type spring clips for positive airtight clamping of the filter.

d) The filter shall have a rated face velocity of 500 FPM (2.5 m/s) with maximum initial resistance of 0.30 inch of wc (75 Pa) and final pressure drop of 0.72 inch of wc (200 Pa).

3. FOUNDATIONS, SUPPORTS AND VIBRATION ISOLATION

3.2 GENERAL

a) All equipment, piping and ductwork where used shall be mounted on or suspended from foundations and supports, all as specified, as shown and as required and duly approved by the Engineer. Also, Foundation, supports and vibration isolation shall account for seismic restraint requirements of the seismic zone in which the project is located.

b) Shop drawings, other information and templates for all concrete foundations where used, shall be provided by Contractor as per recommendations of the manufacturer of the equipment. Information provided in equipment catalogue will not suffice and the Contractor shall prepare and submit foundation shop drawings for all equipment. Necessary integral steel framings, concrete reinforcing rods welded to frame, anchor bolts, spring mountings, and neoprene pads and alike, shall be provided by the Contractor. The Contractor shall cooperate with those doing the flooring work to k2ensure proper installation of all these elements.

c) Foundations and vibration isolation mountings for various equipment, piping, and ductwork where used shall be as per requirements specified. Vibration isolators where used shall be of approved make.

d) Springs used for vibration isolation shall be single, open coil type and laterally stable, having a ratio of loaded height to mean coil diameter not greater than 1.25. Neoprene acoustical friction pads of appropriate thickness but not less than ¼'' (6mm) shall be provided between base plate and support. Springs shall be unhoused and held well clear of any part of suspended mass.

e) Isolated system if supported on a flat slab type base shall be held clear of supporting structure or pad by the minimum distance thought necessary for efficient housekeeping or 25 mm. Lower end of each spring shall be supported on a rigid, square steel base plate sufficiently thick to withstand a bearing pressure of 427 kPa. This plate should be complete with 3inch (75mm) thickness of type W neoprene waffle pad between under inside of plate and supporting structure. A 16-gauge steel shim plate bonded to pad surfaces shall separate adjacent thicknesses.

f) Spring base plate shall also be bounded to top layer of pad. Pad area should be chosen to suit hardness of neoprene.

g) All pipe hangers must be insulated from the building by cork inserts between the hanger bar fixing and the connection to the structure. Details of the Contractor's method of achieving this shall be submitted to the Engineer for approval. All ceiling hung equipment having fans and motor or other moving or rotating element as integral part of equipment shall have adequate vibration isolators.

h) Flexible duct connections, as specified elsewhere, shall be fitted wherever ducts cross building expansion joint, at suction and discharge end of each fan wherever shown on the drawings and as required. Flexible or metal round pipe/hose connections, as specified elsewhere, shall be fitted wherever Pipes cross building expansion joint with recommended live lengths as per pipe diameters. Manufacturers' recommendations on restraint, pressure, and temperature limitations must be strictly followed.

i) Details of all vibration isolators, flexible connections and base, housekeeping pads or alike;

considering manufacturer's recommendations shall be submitted to the Engineer for review and approval.

j) Materials, Types, and Configurations of Vibration Isolators shall be as per ASHRAE and Equipment manufacturer's recommendations with engineer's approval.

k) Materials, Types, and Configurations of Supports, Hangers and Fixing Accessories shall be as per ASHRAE, Other Applicable Codes and Standards and Equipment manufacturer's recommendations with engineer's approval. Refer to technical specifications given elsewhere in relevant sections of these specifications.

3.3 MOUNTING OF EQUIPMENT

3.3.1 FLOOR OR ROOF MOUNTED EQUIPMENT

a) All floor or roof mounted equipment shall be generally placed on at least 4inch (100mm) for indoor and 6inch (150mm) for outdoor, MS steel frame, unless otherwise indicated.
b) Base dimension shall not be less than 4 inches (100mm) larger in both directions than supported equipment.

c) Manufacturer's supported recommendation shall be followed, using anchor bolts at tie-in locations. Drawings shall be submitted to the Consultant for approval.

d) Final Height of concrete housekeeping pads and thickness of Cork-sheets shall be as per requirement of the selected equipment.

e) Protective curbs shall be provided on all sides of the pad to protect the cork sheet and pad edges.

f) The spring isolators shall preferably be supplied by equipment manufacturer and shall be from manufacturers specializing in manufacturing of vibration isolators.

g) Manufacturer's recommendations for prevention of vibration and noise travel to the structure shall be adopted. The foundation details shall be subject to the approval of the Engineer.

3.3.2 WALL-MOUNTED EQUIPMENT

a) All equipment installed through wall shall have 20-gauge galvanized sheet metal sleeve which shall remain in place permanently.
b) Space between the sleeves and duct shall be packed with non-combustible glass fiber insulation or approved equal minimum of 24 kg/m3 density and sealed with sealant.

c) Equipment installed through walls shall have adequate supporting wall brackets.

3.3.3 VIBRATION ISOLATION

a) Vibration isolation bases shall be provided and installed under all equipment susceptible of vibration generation, to prevent the transmission of vibration to the building structure.

b) Where fans and motors are integral parts of factory assembled Fan Units, and the fans and motors are not spring isolated from the assembly, the entire fan unit shall be mounted on vibration isolators.

c) Inertia pads as indicated on drawings or as required shall be reinforced cement concrete

pad, at least up to to 300 mm (12 inch) thick with 100mm (04 inch) steel channel all around to protect concrete edges. Reinforcing rods shall be welded to channel frame.

d) Floor mounted Fans with belt drives shall be mounted on continuous rails with sliding base for motor adjustment and fan-rails shall be mounted on vibration isolators as specified above. Where shown on Drawings or as required, continuous rails shall be mounted on Inertia pads and pads shall be mounted on vibration isolators.

e) Flexible duct connectors shall be installed to connect duct work with the Ventilation equipment to prevent vibration and noise travel.

3.4 MECHANICAL REQUIREMENTS AND INSTALLATION

a) Manufacture shall be able to design, build and assemble the unit on-site. The manufacturer shall provide all sizes, weights, mounting dimensions and wiring details with his offer.
b) Installed space and the unit sizing shall be suitable and easy to access and service maintenance.

c) Replacement of all major parts including filters, fan parts, motor, etc. shall be able to do without disassembling the whole unit.

d) The design of the frequency converter/Drive (VFD) and control system shall allow up to at least 100 meters of SWA (Single Wire Armour) cable to be used between the unit and the motor and allow the use of MICS (Mineral Insulated Copper Sheath) cable in the motor circuit for fire locations.

e) Fans shall be installed using spring isolators and as stated above to maintain minimum vibration of the fan. The fans shall be installed in accordance with manufacturer's instructions with engineer's approval.

f) The contractor shall provide certified factory test results and carry out site acoustic test so as to ensure the installation meeting requirements.

4. SHEET METAL DUCT WORK

4.1 MATERIAL

4.1.1 DUCTING

a) All duct work shall be of Hot-Dipped galvanized steel sheet unless otherwise indicated on Drawings. All ductwork shall meet the requirements of applicable codes and standards as per ASHRAE.
b) Galvanized steel shall be of lock forming quality (LFQ) and shall have a galvanizing coating of 280 grams total for both sides of one square meter of sheet with regular spangles.

c) The G.I. sheet shall conform to ASTM A-653/A-653M-13, ASTM A924/A924M-14 and other applicable codes and standards as per ASHRAE.

d) Galvanized steel sheet shall be of prime quality. Sheet shall be supplied in cut lengths coated by the Hot-Dip Method.

e) Certification shall be provided that samples representing each lot have been tested and

inspected and all requirements mentioned in relevant standard have been met.

f) A report of test results shall also be furnished. Product Inspection, quality assurance, Product Identification, Product Packaging and package making shall be proper and adequate.

4.1.2 STUCTURAL STEEL

Structural Steel shall be M.S. members rolled from Pakistan Steel billets or approved equivalent.

4.1.3 DUCT WORKS, DUCT SUPPORTS, HANGERS AND FIXING ACCESSORIES

a) All hangers, U-channel supports, brackets, expansion bolts / stud anchors etc. shall be of steel, factory fabricated, Hot-dip galvanized and standard catalogue products of approved manufacturers.
b) All fastening shall be such as to ensure permanent stability and to be capable of supporting at least three times the applied load.

c) Complete supporting and Hanging system selected must account for seismic restraint requirements for the seismic zone and tropical/climatic treatment requirements for the environmental zone, in which the project is located.

d) Duct-supporting elements shall consist of (1) hangers, which support from above; (2) supports, which bear load from below; and (3) restraints, such as anchors and guides, that limit or direct movement as well as support loads. Duct-supporting elements shall withstand all static and dynamic conditions, including but not limited to the following:

   i. Mass of Duct, control dampers, fittings, insulation, and fluid contents, including test fluid if using heavier-than-normal media.

   ii. Occasional loads such as, wind, and seismic forces.

   iii. Forces imposed by thermal expansion and contraction of pipe bends and loops.

   iv. Frictional, spring, and pressure thrust forces imposed by expansion joints in the system.

   v. Frictional forces of guides and supports

   vi. Other loads (e.g., vibration, reactive force etc.)

   vii. Test load and force.

e) In addition, duct-supporting elements shall be evaluated in terms of stress at the points of connection to the pipe and the building. Loads on anchors, cast-in-place inserts, and other attachments to concrete should not be more the allowable limit of the ultimate strength of the attachment, as determined by manufacturers' tests.

f) It is contractor's responsibility that all loads on the structure should be communicated to and coordinated with the structural engineer.

g) The following as well as other required documents and details as specified elsewhere in these specifications, all shall be submitted as per the details mentioned elsewhere in these specification for review and approval of the engineer.

i. Detail fabrication of ducts, anchors hangers, special duct support assemblies, alignment guides, expansion provisions, and their attachment to the building structure. Detail location of anchors, alignment guides.

ii. Complete supporting and Hanging system shall be designed, selected by the contractor and approved by the engineer as per project requirement based on all applicable codes and standards as stated in ASHRAE and SMACNA etc., without any additional cost.

iii. Where required, as per site, Special type of Complete supporting and Hanging system shall be designed, selected by the contractor and approved by the engineer as per project requirement based on all applicable codes and standards as stated in ASHRAE and SMACNA etc., without any additional cost.

4.2 DUCT CONSTRUCTION

a) The Tender/Bidding Drawings indicate generally the routes of all main and branch ducts and sizes. The Engineer reserves the right to change the runs and sizing of ducts to accommodate conditions during construction.

b) Ducts shall not pass in front of doorways or windows. Sufficient space is to be allowed for accessibility for servicing. Each part of the ducting system shall be complete in all details and aspects and provided with all automatic control works and accessories necessary for satisfactory operation of the system.

c) All sheet metal duct work shall be of a standard construction and erected in a first-class workmanlike manner. The duct work shall be constructed as per SMACNA Low Velocity Duct Construction Standards.

d) Where specified, duct work shall be provided with interior sound liner. Ducts shall be straight and smooth on the sides, with joints neatly finished. Where ducts are lined with interior sound liner, the dimensions required shall be for the net free area after liner is applied.

e) Ducts shall be anchored securely to the structure in an approved manner and shall be installed so as to be completely free from vibration under all conditions of operation.

f) Sheet metal ducts shall be properly braced and reinforced with steel angles, or other structural members approved by the Engineer. Unless otherwise required the internal ends of all slip joints shall be installed in the direction of flow.

g) Finished work shall show no flaking or peeling within 6mm (1/4 in) of a cut edge. The construction and gauge of material, size and spacing of stiffeners for duct work shall be as follows:

Larger size of duct mm (inch)	**Gauge (US)**	**Intermediate, bracing angle size. mm (inch)**	**Max. spacing b/w transverse joint and/or intermediate reinforcement. m (ft)**
thru 300 (12)	26	-	-
above 300 thru 450 (12 thru 18)	24	-	-
above 450 thru 750 (30 thru 42)	24	25 x 25 x 3 (1 x 1 x 1/8)	1.5 (5)

above 750 thru 1050 (42 thru 54)	22	25 x 25 x 3 (1 x 1 x 1/8)	1.5 (5)
above 1050 thru 1350 (54 thru 60)	22	40 x 40 x 3 (1 1/2 x 1 1/2 x 1/8)	1.5 (5)
above 1350 thru 1500 (60 thru 84)	20	40 x 40 x 3 (1 1/2 x 1 1/2 x 1/8)	1.5 (5)
above 1500 thru 2100	20	40 x 40 x 3 (1 1/2 x 1 1/2 x 1/8)	0.75 (2½)
above 2100 thru 2400 (84 thru 96)	18	40 x 40 x 5 (1½ x 1½ x 3/16)	0.75 (2½)
over 2400 (96)	18	50 x 50 x 6 (2 x 2 x ¼)	0.75 (2½)

h) All duct work in the finished areas shall be run parallel to the beams wherever possible. All outlet openings and open ends shall be kept closed with sheet metal caps during construction.

i) Rectangular duct shall be constructed by breaking the corners and grooving the longitudinal seams. Elbows and transformation sections may be formed with Pittsburgh corner seams but complicated fittings shall be constructed with double seams.

j) Angle bracing shall be of steel and shall be carried out on all four sides of the ducts. All bracing is to be in accordance with the current edition of ASHRAE Hand Books/SMACNA Standards. All angles for bracing and Sheet metal ductwork for outdoor use including cladding over ductworks and ductworks for untreated air shall be provided with a protective coating with thickness of each coat as per manufacturer recommendations should be provided.

k) Provision in ductworks works for testing, adjusting, balancing and commissioning shall be made by providing plugged test points or Plugged test ports at all types of dampers, Ducts entry and exits at each equipment and at other location as per requirement.

l) Installation and construction of ducts for removing smoke or grease-laden vapors from cooking equipment should be in accordance with NFPA Standard 96. Kitchen exhaust ducts that conform to NFPA Standard 96 must…

   i. Shall be constructed from carbon steel with a minimum thickness of 1.37 mm (16 gage) or stainless steel (type 304 or 430) sheet with a minimum thickness of 1.08 mm (18 gage);

   ii. Shall have all longitudinal seams and transverse joints continuously welded; and

   iii. Shall be installed without dips or traps that may collect residues, except where traps with continuous or automatic removal of residue are provided.

   iv. Test ports should not be installed in grease-rated ductwork, except for temporary measuring test holes, which are sealed by welding before equipment use. Because fires may occur in these systems (producing temperatures in excess of 1100°C), provisions are necessary for expansion in accordance with the following table. Ducts that must have a fire resistance rating shall be encased in materials with appropriate thermal and durability ratings.

m) For further details, refer to SMACNA and other relevant standards.

4.3 ELBOWS

a) Ducts shall be built with curves and bends, where required, to affect an easy flow of air. Curved elbows shall have a center line radius at least equal to 150% of the width of the duct unless otherwise indicated.

b) All duct curves having an inside radius smaller than the width of the curve shall be equipped with approved single thickness vanes.

c) Vertical ducts shall have full size bends where horizontal branches are taken off unless approved by the Engineer.

d) Where square elbows are used in changing directions, approved and aerodynamically correct vanes as per latest SMACNA Duct Construction Standards shall be used. These turning vanes must be free from vibration when the system is in operation.

4.4 HANGERS

a) Hangers and supports shall be fixed to the structure in a manner approved by the Engineer. All fastening shall be such as to ensure permanent stability and to be capable of supporting at least three times the applied load.

b) All ducts shall be suspended by means of factory threaded iron bars securely fastened to the angle iron bracing or U-channel placed under the duct. Bars shall be fastened to bracing only on un-insulated ducts.

c) Bars shall be welded to angles at ceiling, attached therein by anchor bolts and heavy iron washers. Where horizontal ducting is fixed to walls, columns, supported from floor slabs, etc. angle iron frames are to be fabricated and fitted to support rectangular ductwork and associated equipment.

d) Vertical ducts are to be supported by steel angles bolted to at least two sides of the duct and on the complete perimeter of the ducts where the larger duct dimension is greater than 24inch (600 mm).

e) Angle iron extensions shall be either grouted or bolted to the structure.

f) Hangers spacing and sizes shall be as follows:

Larger duct dimension. mm (inch)	**Threaded Rod dia. mm(inch)**	**Bottom Angle Size mm (inch)**	**Maximum Spacing m.(ft)**
thru 500 (20)	8 (3/8)	40 x 40 x 3 (1½ x 1½ x 1/8)	3 (10)
above 500 thru 1500 (20 thru 60)	8 (3/8)	40 x 40 x 3 (1½ x1½ x 1/8)	3 (10)
above 1500 thru 2100 (60 thru 84)	8 (3/8)	40 x 40 x 3 (1½ x1½ x 1/8)	2.2 (7½)
above 2100 thru 2350 (84 thru 94)	12 (1/2)	50 x 50 x 5 (2 x 2 x 3/16)	2.2 (7½)
over 2350 (94)	12 (1/2)	50 x 50 x 6 (2 x 2 x 1/4)	1.8 (6)

g) Hanger rods shall be cross-braced with similar diameter rod whenever the length of rod above duct work is more than 3 ft. (1 meter) to prevent swing of ducts.

h) All structural steel including hangers, hanger rods and angle iron shall be painted/coated with rust-inhibitive or protective paint/Coating of approved make one coat before installation and one coat after installation.

4.5 QUADRANTS FOR VOLUME DAMPERS

a) All dampers other than dampers behind registers and diffusers shall be fitted with substantial locking quadrants, mounted outside the duct in an accessible position.
b) On insulated ducts the quadrants shall be fastened to bearing plates flush with the outside finish of the insulation.

4.6 CONTROL DAMPERS

4.6.1 VOLUME CONTROL DAMPERS

a) A substantially constructed manual volume control damper of the butterfly or multiple blade type as per latest SMACNA Duct Construction Standards shall be fitted where shown on the Drawings and at all branch entries or exits with main ducts for balancing purposes.
b) Dampers shall have galvanized interlocking blades of 8 inches (200 mm) maximum blade width. Blades shall be fabricated from 16-gauge steel with seamed edges and a maximum length of 4 feet.

c) Volume control Dampers shall have parallel or opposed blades. It should be noted that these dampers shall be separate and independent from the dampers, hereinafter specified.

d) Volume Dampers are not required where splitters Dampers, as specified hereinafter, are installed.

4.6.2 MOTORIZED CONTROL DAMPERS

a) These dampers when installed on Fan Units mixing box or RA/EA/FA/SA adapter shall be fabricated as per fan Units Specifications.
b) All other motorized dampers shall be similar to Volume Dampers specified above, with parallel blade construction, except that provision for mounting of damper motor and linkage shall be provided and damper blades shall be mounted on permanently lubricated and sealed ball bearings.

c) Damper motor and linkage shall be supplied under 'Building Management and Control System (BMS/BAS) / Automatic Control System specified elsewhere in these Specifications.

4.7 FLEXIBLE CONNECTIONS

a) Flameproof flexible connections shall be furnished and installed on all suction and discharge connections of fans and air-conditioning units for prevention of transmission of vibration through the ducts to occupied spaces.
b) Flexible connections shall be fabricated from chemically impregnated canvas or glass fiber cloth. The flexible connection material shall conform to the European standard A2 Euro class EN 13501-1 for fire prevention.

c) Flexible connections are also to be provided wherever ducts cross building expansion

joints. Connections shall fit closely and are to be secured in an airtight fashion at connections to ductwork, fans and apparatus. The unclamped section of the flexible connection between apparatus and ductwork shall not be less than 6 (150mm) inches in length. Flexible connections shall not be painted or insulated.

d) Samples of the material shall be submitted to the Engineer for approval.

4.8 ACCESS DOORS AND PANELS

a) Wherever necessary, suitable access, openings, doors and frames to permit inspection, operation and maintenance of all filters, controls, dampers, bearings or other apparatus shall be provided in ducting as per SMCNA recommendation.
b) Doors shall be of double construction, of not lighter than 20-gauge G.I. sheet and shall have sponge rubber gaskets around their entire perimeter. On insulated duct work the space between the inner and outer door sheets shall be insulated as specified for the ductwork.

c) All access doors in sheet metal shall have air tight seal, shall be hung on heavy flat hinges and shall be secured in the closed position by means of wing type nuts and screws or coin operated catches.

4.9 SLEEVES

a) Where ducts pass through walls, partitions, or floors, wooden sleeves shall be provided by the Contractor and these sleeves shall remain in place permanently.
b) Annular space between sleeve and duct shall be packed with non-combustible glass fiber insulation, minimum of 1.5 lb./ft^3 (24 kg /cu.m.) densities and sealed with sealant.

4.10 TEST WELLS

a) The Contractor shall provide test wells for measurement of air velocity and static pressure for balancing purpose. These wells made up of a brass nipple with screwed caps are to be fixed into the duct or casing on the downstream sides of each fan, filter, AHU, air conditioner, and branch volume damper in each branch supply duct, and on upstream side of branch volume damper in each branch return.
b) The design of test wells shall be subject to Engineer's approval.

4.11 DUCT LEACKAGE TEST

All ducts to be manufactured as per "SMACNA" Standards. Duct leakage test to be carried out as per "SMACNA Ventilation Air Duct Leakage Test Manual" based upon light test mode analysis or air pressure test analysis as per Engineer's instructions.

5. PIPING AND PIPING SPECIALITIES

5.1 GENERAL

a) Each part of the piping system shall be complete in all details and aspects and provided with all control valves and accessories necessary for satisfactory operation of the system.
b) All piping shall be grouped wherever practicable and shall be erected to present a neat appearance. Pipes shall be parallel to each other and parallel or at right angles to structural members of the building and shall give maximum possible headroom.

c) Piping shall not pass in front of doorways or windows and shall be generally arranged so that it is at least 3 inches (75mm) above finished floor level and atleast 1 inch (25mm) from finished wall faces. Sufficient space is to be allowed for accessibility for servicing.

d) Piping shall be pitched for proper circulation and drainage. Run outs shall be graded in such a manner as to prevent air traps being formed within them when the mains expand or contract.

e) All drain piping shall pitch down in direction of flow at slope not less than as specified in these specifications and as mentioned in relevant drawings. All drains from items such as drip or moisture or condensate pans of air conditioners, Ventilation & AC equipment shall be piped to spill over an open sight drain, floor drain, roof gutter or other acceptable discharge points and shall be terminated with a plain end unthreaded G.I/U-PVC//Copper Pipe or of the specified type, 6 inches (150mm) above the drainage. Where required, calculations for Ventilation & AC equipment drain shall be submitted for engineer's review approval.

f) Piping shall not be installed passing through ductwork or directly under electric light fixtures or any other type of electrical installation.

g) In placing pipes through sleeves, near walls, partitions or in chases, care must be taken to provide sufficient space for pipe fittings and covering.

h) Before connecting upto return mains, the system of piping must be blown and flushed out. After flushing, all strainers shall be opened and baskets cleaned.

i) Provision in piping works for testing, adjusting, balancing and commissioning shall be made by providing plugged test points or Plugged test ports.

5.2 REFRIGERANT PIPING AND SPECIALITIES

a) The copper pipe/tube used shall be (ACR Grade), complying to ASTM B280 or approved equivalent. Copper fittings shall comply with B16.15, B16.18, B16.22, B16.24, B16.50, B1.20.1, WROT fitting meets NSF 61G. Bends shall be used of long radius of pre-formed bends.

b) Refrigerant piping shall be copper tubing, type L for Single Split DX Type Air Conditioning System, bright annealed, dehydrated and sealed. Soft tempered tubing shall be used where bending is required and where flare joints are used. Hard drawn tubing shall be used where no bending is required and silver-brazed joints are used, and for all tubing larger than 19 mm (3/4 inch.) as per approval of the Engineer.

c) Copper tube joint shall be brazed, except joints on lines 19 mm (3/4 inch.) or smaller which may be flared (single Split DX Type Air Conditioning Units). Fittings for flare joints shall be standard SF' forged brass flare-type with short shank flare units. Fittings for brazed joints shall be wrought copper or forged brass seat fittings. Cast seat type fittings will not be allowed for brazed joints.

d) Certification shall be provided that samples representing each lot have been tested and inspected as directed in ASTM B280 and all requirements have been met. A report of test results shall also be furnished. Product Inspection, quality assurance, Product Identification, Product Packaging and package making shall be as per ASTM B280.

e) Purge valves, 15mm, shall be packless diaphragm type refrigerant purging valves, mounted on a branch from the suction line before it returns to the condensing unit.

Discharge from valve shall be provided with removable seal cap. Valves shall be forged brass, 42 kg/cm^2 working pressure or as recommended by the manufacturer.

f) Refrigerant charging valves, 15mm, shall be packless diaphragm type refrigerant charging valves mounted on a branch from the liquid line leaving the condensing unit valve inlet shall be forged brass, 42 kg/cm^2, or as recommended by the manufacturer. Valves shall be rated at 35 kg/cm^2 working pressure or as recommended by the manufacturer.

g) Solenoid valves for refrigerant service shall be packless type, with stainless steel trim, rated for continuous duty service, provided with manual lift stems. The valve capacities shall be sufficient for the requirements of the installation at a pressure drop not in excess of 0.14 kg/cm^2 Valves shall be rated at 35 kg/cm^2 working pressure.

h) Refrigerant dehydrator shall consist of a Steel cylinder filled with a suitable desiccant through which the refrigerant is passed. The desiccant shall be such that it will not plug, cake, dust, channel or breakdown, and shall remove both water and acids from the refrigerant. The dryer shall be so constructed that none of the desiccant will pass into the refrigerant lines. The dryer working pressure rating shall be 42 kg/cm^2 or as recommended by the manufacturer. A dehydrator shall be provided in the liquid line to each evaporator and shall be piped with a three-valve by pass.

i) Sight glasses shall be double-port glass "see through" type with color-indicating moisture indicator and cover cap on each side. Sight glass shall be provided in liquid line immediately preceding each refrigerant expansion valve and in the liquid line leaving the condenser. Rating shall be 35 kg/cm^2 working pressure.

j) Flexible pipe shall be of seamless bronze construction with bronze wire braid covering, copper ferrules and standard copper tube ends. Tube ends shall be attached to the hose, braid and ferrules with high temperature zinc alloys.

5.3 REFRIGERANT PIPING INSTALLATION

a) The pipe work must be supported through its entire length according to good refrigeration practice. However, the brackets must not be positioned directly on the joints or headers. On horizontal pipe work the bracketing should be over the insulation to allow pipe movement due to contraction and expansions.
b) The vertical pipe work shall be bracketed at no more than 2000 mm (6.5ft).

c) The horizontal pipe work shall be bracketed at no more than 1500 mm (5ft) Pipe/Cable Tray installed on roof shall be installed minimum 150mm (6 inch) above finish floor level on approved supports.

d) The pipe work layout and the pipe sizing and layout shall must be approved according to the manufacturer standard, for minimum length and spacing of joint as well as the minimum thickness and type of pipe standard as mentioned above.

e) All installed pipe work lengths are to be accurately measured and recorded on the commissioning form. This information is required for accurate calculation of the additional refrigerant charge for the system. The weight of the additional refrigerant must also be recorded for future reference on laser printed Stainless steel sheet.

f) Welding and copper brazing must be carried out with flow of nitrogen through the pipes, recommended minimum gas pressure 0.02 MPa.

g) Oxygen free nitrogen must be passed through the pipe work during all brazing of joints to prevent the formation of oxidization scale on the inside surface of the pipes.

h) All pipe work shall be clean, de-hydrated and sealed. Pipe work shall be stored under dry conditions. Any pipe work found to be stored without the end caps should be rejected. Where sections are cut from a new coil any remaining lengths must be resealed. During the installation if the system has to be left unattended for any purpose whatsoever, the openings in the systems must be securely sealed.

i) Pipe work fittings for branching off to indoor units must be Y, T or header type Branch joints as supplied by manufacture. No other fittings are acceptable like expansion Valve or devices. The positioning and installation of these joints shall be strictly in accordance to the manufacturer's specification.

j) The equipment shall be installed in line with the manufacturer's specification and design standard as listed below.

k) Piping, Y, T or header distributor size and wiring sizes to be carried out as per manufacturer's recommendations/standard. However, given sizes in drawings are tentative and will be in the range of + 10%. Suppler to submit computerized selection with schematics.

l) Prior to finalization of equipment, the specialist supplier must select the outdoor unit/indoor unit based on considering actual pipe lengths/fittings, levels and all other considerations required etc., based on manufacturer's software and submit selection to the Engineer for approval.

5.4 CONDENSATE DRAIN PIPING

All condensate drains piping including fittings shall be of u-PVC ASTM D-1785, DIN 8077-8078, DIN 16962, AWWA C901, AWWA C906, and other applicable codes and standards as stated in ASHRAE and approved by the engineer.

5.5 PIPE SLEEVES

a) All pipe opening through walls, floor slabs, beams shall have sleeves with internal diameter at least 1 inch (25 mm) larger than the outside diameter of the pipe insulation passing through the sleeve or provide pipe sleeve of the diameter as shown on the relevant drawings.
b) All pipes passing through walls and beams shall be provided with uPVC pipe sleeve round pipes of similar material as mentioned in the above Clause 5.5.

c) Pipes passing through floor slabs or roof shall be provided with uPVC round pipe sleeves projecting 3 inches (75 mm) above finished floor level. Space between pipe and sleeve on roof top shall be packed with approved poly-sulphide sealant and where required, provide fiberglass atleast 1.5 lb/ft^3 (24 kg/m^3) density and sealed. All openings on roof shall be sealed water tight material as per approval of the Engineer.

d) Pipe sleeves which are provided for future provision shall be sealed with steel plate (20 gauge) and water proofing chemical shall also be provided on exposed steel plate. Tagging of future provision shall also be marked.

e) Flashing Sleeves: Flashing sleeves are to be provided where pipes pass through waterproof membranes. Flashing sleeves details are to be submitted to the Engineer for approval but

generally they shall be provided with an integral glance set into the membrane. The associated pipe shall also have a flange and shield which shall extend beyond the insert and be sealed with approved mastic.

5.6 QUALITY

a) The following as well as other required documents and details as specified elsewhere in these specifications, all shall be submitted as per the details mentioned elsewhere in these specification for review and approval of the engineer.
b) For each type of valve, include flow and pressure drop curves based on manufacturer's testing for diverting fittings, calibrated balancing valves, and automatic flow-control valves.

c) Detail fabrication of pipe anchors, hangers, special pipe support assemblies, alignment guides, expansion joints and loops, and their attachment to the building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

d) Complete supporting and Hanging system shall be designed, selected by the contractor and approved by the engineer as per project requirement based on all applicable codes and standards as stated in ASHRAE , ASTM, ASME B31, MSS standards etc., without any additional cost.

e) Where required, copies of certificates for welding and for Methods used to Join Metals such as Brazing and alike, procedures and personnel.

f) Where required, Written reports of tests shall also Include the following:

   i. Test procedures used.

   ii. Test results that comply with requirements.

   iii. Failed test results and corrective action taken to achieve requirements.

g) For hydronic specialties and valves to include in maintenance manuals.

h) Certification shall be provided that samples representing each lot have been tested and inspected as directed by ASHRAE, ASTM, ASME B31, MSS and other applicable codes and standards etc. and all requirements have been met.

i) A report of test results shall also be furnished. Product Inspection, quality assurance, Product Identification, Product Packaging and package making shall be as per requirements mentioned in applicable codes and standards, approved by the engineer.

j) Piping and piping specialties /hydronic specialties including valves etc., shall be selected and supplied based on test / analysis report of the water analysis to illustrate water quality available at Project site performed by authorized labs as per instruction of the engineer.

6. INSULATION

6.1 GENERAL

a) The Contractor shall provide insulation for the services and equipment specified hereafter or elsewhere in this specification. Insulation shall be as per the following Insulation Schedule.

b) Insulation material shall be non-combustible and shall be complete with vapor barrier, protection covering and jacketing (where specified), adhesives, insulation tape, duct sealer and/or sealing tape, fastening material.

c) Insulation shall be installed in conjunction with installation instruction issued by insulation manufacturer.

d) Where applicable, insulation shall be suitable for outdoor exposed application / use.

6.2 INSULATION AND ACOUSTIC LINER SCHEDULE

6.2.1 INSULATION SCHEDULE

Service	**Thickness in (mm)**	**Insulation Type**	**Vapor Barrier**	**Protection**
Refrigerant Piping for Single Split Type AC Unit				
i) Indoor	1/2in (13mm) min.	Elastomeric extruded Nitrile Rubber tubing (Class 0 type) to fit standard diameters of copper tubing	As per manufacturer	Insulation taping/protection provided heavy gauge (18 Gauge) corrosion resistant perforated G.I. cable tray / trunking for indoor with openable arrangements.
ii) Outdoor (Exposed on Roof and in Shafts)	1/2in (13mm) min.	Elastomeric extruded Nitrile Rubber tubing (Class 0 type) to fit standard diameters of copper tubing	As per manufacturer	Insulation taping/protection provided heavy gauge (18 Gauge) corrosion resistant Solid G.I. cable tray / trunking for outdoor with openable arrangements
Service	**Thickness in (mm)**	**Insulation Type**	**Vapor Barrier**	**Protection**
Condensate Drain Piping				
iii) Indoor	1/2in (13mm)	Elastomeric extruded	As per manufacturer	Insulation taping/protection.

	min.	Nitrile Rubber tubing (Class 0 type) to fit standard diameters of drain tubing		
iv) Outdoor	1/2in (13mm) min.	Elastomeric extruded Nitrile Rubber tubing (Class 0 type) to fit standard diameters of drain tubing	As per manufacturer	Insulation taping/protection & G.I / Al. sheet jacketing

6.2.2 ACOUSTIC LINER SCHEDULE

Service	Thickness in (mm)	Remarks
i) Sheet metal air plenum	1in (25mm)	In addition to external insulation Acoustic liner applied inside
ii) Supply/Return/ Outdoor Air Ducts, up to 10 ft from fan discharge /inlet	1in (25mm)	In addition to external insulation Acoustic liner applied inside

6.3 INSULATION MATERIALS

6.3.1 VAPOR BARRIER FOR DUCT AND PIPE INSULATION

Vapor barrier when specified shall be factory applied flame retardant reinforced aluminum foil, 0.02 mils thick with kraft paper.

6.3.2 ACOUSTIC LINER MATERIAL

Acoustic liner shall be 1.5 lbs./ft.3 (24 kg/m3) density fiber-glass with neoprene scrim and thermal conductivity value shall not exceeding 0.039 W/m/C at 50oF (10oC). Material shall conform to TIMA Standard AHC-101-1975 or with latest revisions.

6.3.3 REFRIGERANT PIPE INSULATION AND COOLING COIL CONDENSATE PIPE INSULATION

Shall be elastomeric, closed cell pre-formed rubber pipe insulation. Insulation shall conform to all of the relevant standards. Where applicable, insulation shall be suitable for outdoor exposed application / use.

6.3.4 INSULATION PROTECTION MATERIAL AND ACCESSORIES

a) Canvas

Minimum oz per sq.yd.(gm per m2) shall be as specified in Insulation Schedule.
The Canvas cloth shall be applied with atleast two sealing adhesive coats of polymeric/elastomeric water proofing and UL listed fire resistant sealant in approved color. Fire retardant paint shall be applied over canvas cloth as specified in Insulation Schedule/BoQ.

b) Jacket

26 gauge (US) Hot dipped galvanized steel sheet or aluminum sheet for ductwork and piping, 24 gauge (US) for breeching stack and 24 gauge (US) covered conduit. For further details, see Insulation Schedule/BoQ.

c) Banding

12 mm x 26-gauge galvanized steel or aluminum bands. Joints to be made by mechanical bender.

d) Insulation Tape

Insulation tape for joints shall be of aluminum foil type 50 mm (2 inch) wide, of make ABRO, USA or approved equal.

e) Adhesive

Adhesive for thermal insulation shall comply with ASTM Standard C 916-79 or equivalent. Adhesive for acoustic liner shall comply TIMA Standard AHC-101-1975 or equivalent. For better performance, adhesive material shall be provided as per manufacturer recommendation of thermal insulation and acoustic liner.

f) Duct Sealer

Sealer for duct joints shall be butyl rubber caulking, weather proof and water resistant, conforming to U.S. Federal Specification TT-S-001657 Type 1, as manufactured by Woodmont Products, INC, USA, or approved equal.

6.4 INSULATION APPLICATION

6.4.1 GENERAL

a) All Thermal and acoustic insulating materials shall be applied as specified hereinafter and as mentioned somewhere else in these specifications.
b) Insulation shall be applied in a smooth, clean, workmanlike manner and joints shall be tight and finished smooth.

c) All surfaces to be insulated shall be dry and free from loose scale, dirt, oil or water when insulation is applied. Insulation shall be applied in such a manner that there will be no air circulation within the insulation or between the insulation and the surface to which it is applied.

d) Surface imperfections in the insulation such as clipped edges, small joints or cracks and small voids, or holes not over 1 inch (25 mm) square shall be filled with like insulating material or with insulating cement.

e) Where a vapor barrier is fixed on site it shall be fixed in such a manner as to obviate the

possibility of moisture penetration. It shall be fixed where required by means of an approved type bituminous compound or approved equal for tightness.

f) Insulation for all services shall only be applied until after testing and approval for tightness obtained from the Engineer, unless otherwise instructed in writing by the Engineer.

g) Insulation for all services shall be continued through sleeves. The insulation on exposed risers shall extend through the floor.
Insulation is to be applied where indicated on the drawings or called for in these specifications.

6.4.2 REFRIGERANT PIPING AND CONDENSATE DRAIN PIPING INSULATION

a) Pre-formed rubber tubing insulation of Class 0 Type as per Insulation Schedule, shall be used with approved adhesive, and held by Aluminum bands. Insulation shall conform to all of the relevant standards.
b) Where applicable, insulation shall be suitable for outdoor exposed application / use.

c) All Joints, Branch, Headers and Common pipe of Piping must be insulated with the factory approved preformed insulation supplied with these fittings.

d) Longitudinal joints of pipe insulation shall be sealed with an overlap of vapor seal firmly fixed with an approved/specified adhesive.

e) Circumferential joints shall be sealed with insulation tape.

7. PAINTING AND IDENTIFICATION OF SERVICES

7.1 GENERAL

All material and labor for painting and identification of services shall be provided by the Contractor, as specified hereunder or stated elsewhere in this document:

7.2 PAINTING

a) All steel work in connection with supports for ductwork etc. exposed to the elements is to be painted with two coats of an approved rust preventive paint with thickness of each coat as per recommendation of the manufacturer.
b) All exposed metal surface of uninsulated ductwork, hangers, brackets, Air-devices etc. must be painted with two under-coats and two finishing coats of enamel paint of approved color.

c) All machinery and equipment which have been painted in factory to the satisfaction of the Engineer shall have a finishing coat of paint before Final Acceptance if the factory paint is damaged during transportation, storage or installation.

d) Identification bands shall be painted on piping or on insulation of frequent intervals. Lettering shall be agreed with the Engineer and shall Comply with ASME A13.1, and other codes and standards as per ASHRAE for, Tag, lettering size, length of color field, colors, and viewing angles of identification devices.

e) Internal surfaces of grilles, diffusers and register boxes and connections visible to occupants of rooms, shall be painted with two coats of dull black paint of other color as

directed by the Engineer.

f) All steel pipe, cradle, vibration isolation rails that will be covered, partially covered, set in cement or fill, or not accessible when the installation is completed, shall be given two coats of black asphalt paint.

7.3 MANUFACTURER's NAMEPLATES

a) Each unit or equipment shall be identified by a permanently attached, Factory Supplied name plate made of brass or other corrosion resistant material. Name plates of Equipment Installed outside shall be able to withstand severe weather and environment effects without any loss or damage to its data or information Printed/Marked on it. All ratings shall be in the unit system adopted for the Project, unless otherwise authorized by the Engineer. Some more details regarding Nameplates are also given in Special Provision of Ventilation & AC Works.

b) The Contractor shall arrange, at his cost, color and readable photographs of each piece of equipment nameplates with proper equipment tagging as used in project drawings, BoQ and as approved in submittals and shop drawings. At least three (03) sets of such photographs shall be submitted in Hard prints and in proper soft copies in CDs and USB Flash Drives for use of the employer.

c) Plates shall not be less in size than 6" x 3" (150 mm x 75 mm). Plates shall bear information pertaining to unit containing but not limited to the following.

i. System and unit designation from Schedule / BoQ of Equipment.
ii. Manufacturer's name and address (only distributor's or Agent's name and address will not be accepted).
iii. Rated capacity
iv. Temperature, pressure or other limitations
v. Electrical Data
vi. Date of manufacturer
vii. Rating data
viii. Any other Data as required by The Engineer

7.4 IDENTIFICATION TAGS, CHARTS AND NAMEPLATES

a) Dampers, controls, other items and equipment shall be designated by distinguishing numbers in English on the charts or diagrams. The Contractor shall provide engraved brass tags for all designated items with distinguishing numbers corresponding to those shown on the "As Built/Shop/Design/Charts" Drawings as per approval of the Engineer.

b) The tags shall be not less in size than 40 mm (1? inch). or as per requirement in diameter with depressed black numbers of 12mm (?) inch or as per requirement height.

c) The Contractor shall provide separate lists designating the location and function of each dampers and control.

d) The charts, diagrams and lists shall be of sizes, type and character as approved.

8. INSPECTION, TESTING AND COMMISSIONING

8.1 GENERAL

a) All mechanical and electrical equipment shall be subject to inspection and testing of material, parts, equipment and workmanship of the plant during manufacture, assembling and erection and upon completion to demonstrate compliance with Specifications, codes and standards and to ensure overall reliability of plant operation and performance.

b) For this purpose, the Engineer shall, at all reasonable times, be allowed free and ready access to the Contractor's shop and the shops of his suppliers for the purpose of inspecting the specified equipment components, or any other parts, and obtaining information as to the progress of the work. Failure on the part of the Engineer at this or any other time, to discover or reject materials of work which do not meet specified requirements shall not be deemed an acceptance thereof nor a waiver of defects therein.

c) The whole of the works supplied under this Contract shall be subject to inspection and tests by the Employer or Engineer should he so require, during manufacturing erection and after completion. The inspection and tests shall include, but not be limited to, the requirements of this Section of the Specifications.

d) Specific tests required by the various items of the Plant, Parts, materials and equipment shall be in accordance with the corresponding clauses of the Specifications.

e) The Contractor shall submit to the Engineer, one month prior to the date of commencement of the tests, six (6) copies of the complete test procedure. The procedure, method and points of measurement as well as the method of calculation shall be approved by the Engineer before any test is carried. Six (6) copies of the test results shall be furnished to the Engineer for his approval.

f) The Contractor shall supply all necessary testing instruments, and carryout any test of any kind on a piece of equipment, apparatus part of system or on a complete system if the Engineer requests such a test for determining specified or guaranteed data, as given in the Specifications or in the Schedule / BoQ of Equipment. Necessary skilled staff shall be provided by Contractor.

g) Any damage resulting from the test shall be repaired and/or damaged material replaced with intimation to the Engineer, all to the satisfaction of the Engineer, and at no extra cost to the Employer. Skilled staff shall be provided by the Contractor.

h) In the event of any repair or any adjustment having to be made, other than normal running adjustment, the tests shall be void and shall be recommenced after the adjustment or repairs have been completed.

i) All testing, balancing and final adjustment shall be in accordance with the provision of the applicable ASHRAE Standards, or other approved relevant standards and as recommended by the manufacturer.

j) If required by the Engineer, factory engineer or manufacturer's representative shall visit the site and issue the certificate of all compliance(s) shall be in accordance with their recommendations, without having any additional cost.

k) The Contractor shall test a piece of equipment, apparatus, parts of system or a complete

system in accordance with method and Schedule of Tests provided by the Engineer to determine Specified or Guaranteed data, given in the Specifications, Schedule / BoQ of Equipment and Contractor's Data Sheets.

8.2 FACTORY TESTS

Factory tests of equipment shall be carried out as per test procedures prepared by the manufacturer as per procedure given in relevant AHRI Standard or other relevant prevailing standard as recommended in ASHRAE Standards and specified full load and part loads conditions and approved by the Engineer. The testing of equipment shall include component testing (like pressure/leak testing of coils, pressure vessels, etc.) and complete Run tests to measure and verify the actual performance data with reference to the rated data. The manufacturer shall make necessary arrangements at factory to demonstrate such tests to the Engineer and / or Owner's representative (wherever required) and satisfy him that the equipment meets the required capacity and performance ratings. More details are given elsewhere in this document.

8.3 PRELIMINARY TESTS

8.3.1 GENERAL

All equipment shall be tested to determine the Specified and guaranteed data, and conformance to specified requirements, when operated independent of overall Ventilation & AC System, for noise, vibration, electrical data, air, water and refrigerant flow rates, temperatures, pressure and capacities.

8.3.2 REFRIGERANT PIPING SYSTEM

a) For Single Split Type AC units all the above-mentioned testing parameters shall be as per manufacturer recommendation duly approved by the engineer.

8.3.3 DUCTWORK

a) All joints in ducts and at outlets shall be physically inspected for air leakage. All dampers shall be tested for proper operation.
b) The ductwork's leakage test to be carried out as per "SMACNA Ventilation Air Duct Leakage Test Manual" based upon light test mode analysis or air pressure test analysis as per Engineer's instructions before application of insulation and total leakage shall not exceed 3%.

c) The test pressure shall be 250 Pa (1 inch) above the maximum pressure in the duct.

8.3.4 EQUIPMENT

All Ventilation & AC equipment shall be inspected for proper operation, noise and vibration. Tests shall be carried out with readings of temperature, pressure, RPM, ampere, voltage, flow rates, etc. to determine the Specified data.

8.3.5 ELECTRICAL EQUIPMENT

All electrical equipment shall be cleaned and adjusted on site before application of power. The following tests shall be carried out:

a) Wire and cable continuity tests

b) Insulation resistance tests, phase to phase and phase to earth, on all circuits and

equipment, using 500 volts megger. The megger reading shall not be less than one mega Ohm.

c) Earth resistance between metallic conduit systems and earth must not exceed half (1/2) ohm.

d) Phasing out and phase rotation tests.

e) Operating tests on all protective relays to prove their correct operation before energizing the main equipment.

f) Operating tests on all starters, circuit breakers, etc.

8.4 PRE-START AND COMMISSIONING TESTS

8.4.1 AIR BALANCING

a) All ventilating equipment, ductwork air inlet and outlets, air volume control dampers shall be adjusted and balanced to deliver within 10% of the specified quantities indicated on the Drawings. Where the equipment for systems depends upon controls for proper operation, functioning and performance, the later shall be operated simultaneously with the equipment or system during tests.

b) If the air quantities cannot be delivered without exceeding the speed range of the sheaves or the available horsepower, the Engineer shall be notified before proceeding with the balancing of air distribution system.

c) Any addition/replacements required to meet the specified flow rates shall be the responsibility of the Contractor at his own cost.

8.4.2 COMMISSIONING TESTS

a) Upon completion of air balancing and when the whole Ventilation & AC System is substantially complete and ready for operation as specified, the Contractor shall carry out Commissioning Tests. Appropriate Seasons are not necessary for these Tests, and the purpose of the tests is to start-up the whole Ventilation & AC System with manual and automatic controls and to put the whole Ventilation & AC plant in operation.

b) Equipment Tests as stated under Preliminary Tests shall be repeated during commissioning.

8.5 PERFORMANCE TESTS

a) All Ventilation & AC equipment shall be tested for performance after successful completion of Commissioning Tests to determine the Specified and Guaranteed Data at Specified Operating Conditions as shown in Equipment Schedule / BoQ and Specifications. These tests shall be carried out during appropriate seasons when the Design outside Conditions are met or approximated and when the building is fully sealed with glazing and door shutters. These performance tests shall continue for two months during summer and two months during winter.

b) The test data shall not deviate by more than five percent (5%) from the Guaranteed capacity data.

c) Should any part of the apparatus or system fail to meet the specification requirements, it shall be adjusted, repaired or replaced to the satisfaction of the Engineer by the Contractor at his own cost. The complete Commissioning Test shall then be repeated.

d) The date of commencement of the above-mentioned tests shall be subject to agreement with the Engineer.

8.6 RELIABILITY TRIAL TEST

a) After completing the above Preliminary Tests, adjustments, Commissioning Tests and Performance Tests, the Contractor shall carry out Reliability Trail Test for the whole system.
b) The trial tests both for summer and winter, shall last for a period of 30 consecutive days or as directed by the Engineer in summer and 15 consecutive days or as directed by the Engineer in winter during which time the whole of the system shall operate continuously or as directed by the Engineer without adjustment or repair to the satisfaction of the Engineer.

c) Should any part of the apparatus or system fail to operate continuously as specified, it shall be adjusted, repaired or replaced to the satisfaction of the Engineer and the Reliability Trial Test shall be repeated for another 15 consecutive days.

d) Reliability Trial Tests should be carried out during appropriate seasons where design conditions are met or approximated. Also, Reliability Trail Test shall be carried out as per proper test protocol approved by the Engineer.

9. AUTOMATION CONTROL SYSTEM

9.1 GENERAL

Motorized control dampers shall be provided on each supply air branch as shown in drawing for the generator room ventilation system. Dampers shall be automatically operated through a local control system and integrated with the generator.

9.2 VENTILATION FAN UNITS

9.2.1 Operation

a) Operation of the system may generally be as per manufacturer instructions issued as per project requirements. Operation of the Units will normally be via BMCS/BAS commands, which will start and stop the system at pre-defined times. The BMCS/BAS operator as required can also override BMCS/BAS commands.
b) The status of the Units will be shown on the BMCS/BAS by the message "Fan of Specific Code or codes-Running". In case of power failure, a massage will appear on the operator workstation "Unit Trip", respectively the BMCS/BAS will stop the Units. The unit will back to its normal operational position after the availability of Electric power from normal or emergency sources as per requirement.
c) Operation shall be per project requirements or as per Engineer's instructions, shall be finalized at submittal review stage without any additional cost.

9.3 DAMPER ACTUATORS

Damper actuators shall be electronic, and shall be direct coupled over the shaft, without the need for connecting linkage. The actuator should have electronic circuitry overload to prevent damage. For power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing. Non-spring return actuators shall

have an external manual gear release to allow positioning of the damper when the actuator is not powered. Torque produced by selected damper actuator shall be as per the requirement of the damper. Each actuator shall include end-switches for fully open and fully closed positions.

Local automatic control panel shall be provided for damper group, including terminal controller/PLC, fuses, relays, and terminal blocks.

Control Inputs:

- Generator RUN signal (forces damper OPEN).
- Local Auto/Manual selector switch with manual OPEN/CLOSE pushbuttons.

Outputs/Feedbacks:
- Analog output 0–10 V DC to actuator.
- Position feedback 0–10 V DC to controller/BMS.
- Digital feedback from end switches (OPEN/CLOSED).
- Fault/Status relay output to Automation Control System.

9.4 CONTROL CABLE AND OUTLETS/CONNECTORS

a) Cable for Control Wiring shall be Electronic and Fiber-Optic type as per BS EN 60794-1-2.
b) BACnet Communication cables Unshielded twisted-pair (UTP) and screened twisted-pair (ScTP) shall be category 6 or as per requirement.
c) Some more Details of Control cables can also be found given elsewhere in the relevant section of these specifications.
d) Unshielded twisted-pair (UTP) and screened twisted-pair (ScTP) telecommunications outlets/Connectors must meet the requirements of IEC Standard 60603-7, as well as ANSI/TIA/EIA Standard 568-B.2 and the terminal marking and mounting requirements of ANSI/TIA/EIA Standard 570-B.

LIST OF APPROVED MANUFACTURERS
VENTILATION WORKS

DECEMBER, 2025

APPROVED MANUFACTURERS LIST OF EQUIPMENT/ MATERIAL AND AS OFFERED BY THE BIDDER

(To be filled in and signed by the Bidder)

Equipment & Material shall be supplied only from the approved sources noted below. However in all cases the Contractor shall submit complete technical details of the equipment, material and obtain Consultants approval prior to delivery on site. Where option of "Approved Equivalent" is indicated, it shall be at the discretion of the Consultant to accept the alternate proposal submitted by the Contractor.

S.No.	Equipment/ Material	Recommended Manufacturers		Country of Origin		Offered Manufacturer by the Bidder with Country of Origin
		VENTILATION WORKS				
1	SPLIT AC UNITS	i	SAMSUNG	i	KOREA	
		ii	LG	ii	KOREA	
		iii	DIAKIN	iii	JAPAN/CHINA	
		iv	APPROVED EQUIVALENT	iv		
2	VENTILATION FANS	i	BVN	i	TURKEY	
		ii	ELTA	ii	MALAYSIA	
		iii	AIRENG with SIEMENS MOTOR	iii	PAKISTAN	
		iv	APPROVED EQUIVALENT	iv		
3	SEAMLESS MS PIPE FOR CHILLED WATER SYSTEM	i	HUFFAZ PIPES	i	PAKISTAN	
		ii	LONTRIN	ii	CHINA	
		iii	BAOLAI	iii	CHINA	
		iv	PROTECK	iv	CHINA	
		v	APPROVED EQUIVALENT	v		
4	CONDENSATE DRAIN uPVC PIPING	i	PAK ARAB	i	PAKISTAN	
		ii	DADEX ETERNIT	ii	PAKISTAN	
		iii	IIL	iii	PAKISTAN	
		iv	APPROVED EQUIVALENT	iv		
5	REFRIGERANT PIPING	i	MUELLAR	i	USA	
		v	APPROVED EQUIVALENT	v		
6	INSTRUMENT & GAUGES	i	WATTS	i	USA/ EUROPE	
		ii	WEISS	ii	USA	
		iii	TRERICE	iii	USA	
		iv	WEKSLER	iv	USA	
		v	APPROVED EQUIVALENT	v		
7	FLEXIBLE DUCT CONNECTOR	i	DUCTMATE	i	USA/CHINA	
		ii	APPROVED EQUIVALENT	ii		
8	AIR INLETS & OUTLETS, VOLUME DAMPERS ANR FIRE DAMPERS	i	RAIS BROTHERS	i	PAKISTAN	
		ii	SHAN INDUSTRIES	ii	PAKISTAN	
		iii	STEEL CRAFT	iii	PAKISTAN	
		iv	APPROVED EQUIVALENT	iv		
9	DUCTED SOUND ATTENUATORS	i	SONITECH	i	PAKISTAN	
		ii	SHAN CONTROLS	ii	PAKISTAN	
		iii	THERMEC	iii	PAKISTAN	
		iv	APPROVED EQUIVALENT	iv		

S.No.	Equipment/ Material	Recommended Manufacturers		Country of Origin		Offered Manufacturer by the Bidder with Country of Origin
10	POLYOLEFIN FOAM PIPING INSULATION, DUCT INSULATION & ACOUSTIC LINING	i	AEROFOAM	i	UAE	
		ii	THERMOBREAK	ii	THAILAND	
		iii	KFLEX	iii	MALAYSIA	
		iv	APPROVED EQUIVALENT	iv		
11	INSULATION FOR CONDENSATE DRAIN & REFRIGERANT PIPING	i	AEROFLEX	i	THAILAND	
		ii	SUPERLON	ii	MALAYSIA	
		iii	AEROFOAM	iii	UAE	
		iv	APPROVED EQUIVALENT	iv		
12	DURA DUCT	i	ADAMJEE	i	PAKISTAN	
		ii	APPROVED EQUIVALENT	ii		
13	G.I/ S.S/ AI. / METAL SHEET	i	ISL	i	PAKISTAN	
		ii	AISHA STEEL	ii	PAKISTAN	
		iii	APPROVED EQUIVALENT	iii		
14	ELECTRICAL AND CONTROL CABLES	i	FAST CABLES	i	PAKISTAN	
		ii	NEWAGE	ii	PAKISTAN	
		iii	PAKISTAN CABLES	iii	PAKISTAN	
		iv	APPROVED EQUIVALENT	iv		
15	HANGERS AND SUPPORT SYSTEM	i	HILTI	i	EUROPE	
		ii	FISCHER	ii	EUROPE	
		iii	SIKLA	iii	EUROPE	
		iv	INDEX	iv	EUROPE	
		v	APPROVED EQUIVALENT	v		
16	AUTOMATION CONTROL SYSTEM INCLUDING MOTORIZED CONTROL DAMPER ACTUATOR	i	JOHNSON CONTROLS	i	USA / EUROPE	
		ii	SCHNEIDER (T.A.C.)	ii	USA / EUROPE	
		iii	TRANE	iii	USA / EUROPE	
		iv	HONEYWELL	iv	USA / EUROPE	
		v	AIRTECK	v	AUSTRALIA	
		vi	APPROVED EQUIVALENT	vi		

BILL OF QUANTITIES

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BILL OF QUANTITIES
GENERATOR

S.No.	Description	Unit	Qty.	Supply	
				Rate	Amount
1	**DIESEL GENERATING SETS**				
1.1	Supply, Installation, testing, commissioning, lifting & Placement of 1250 KVA prime rating D.G Set with control panel including AMF, 4 pole circuit breaker, all synchronizing and BMS interfacing cards, 400/230 Volt, 50 Hz, 1500 RPM from ground floor to Parking level 2 with all required materials and installation accessories as per specifications including integral fuel day tank, radiator, residential silencer, complete in all respects as per specifications. this also includes fuel and lubricants for testing. complete in all respect.	Nos	2		
1.2	Supply and installation of Neoprene vibration isolator to inhibit vibration transfer from Generator Sets to the structure of the building.	Job	1		
1.3	Supply, installation and upgradation of AVR of existing 2 Nos gen set for Synchronization campability with new Syn. Panel with all required auxiliaries, controls, etc. as per requirements. Complete in all respect. Contractor should visit at existing gen set before quote this item to calculate the requirements and quote accordingly.	Job	1		
	TOTAL AMOUNT SECTION- 1				
2	**SYNCHRONIZING PANEL & ELECTRICAL WORKS**				
2.1	Supply, Installation, testing and commissioning of Synchronizing panel as per drawing and specifications complete in all respects. Contractor should visit the site before quote the installation item.	Nos	1		
2.2	Disconnecting and dismantling of existing Sych panel and allied works, handing over to client. Complete in all respect.	Job	1		
2.3	Disconnecting and removing of exiting Busway from gen sets to existing syn. Panel with all required accessories as per proposed drawings and client instructions. Complete in all respect.	Job	1		
2.4	reinstallation of existing removed bus way as mentioned in line item 2.3 with all required installation and mounting accessories as per new syn. Panel and client instructions. Complete in all respect.	Job	1		
2.5	Supply and installation of additional parts/peace of 2000A/3200A/4000A Busway to complete reinstallation of existing busway system with all installation and mounting accessories as per drawings and client instructions. Complete in all respect.	Job	1		
2.6	Supply & installation of control cables 4 core 2.5 Sq.mm PVC/PVC cables from each Generator to Panel to Synch panel / ATS including PVC conduits and all required installation and mounting accessories like cable gland, lugs, tie etc., complete in all respects.	Job	1		
2.7	Supply and installation of Wiring of split type A/C with 3x1C 4 sq.mm single core PVC insulated copper wire in 25mm dia. PVC conduit complete with all accessories, including terminations.	Nos	2		
2.8	Supply & installation Wiring of three phase split type A/C 4 core 4 sqmm PVC/PVC cables+ 1C 4 sqmm as ECC from DB to each unit including 25 mm dia PVC conduits and all installation accessories complete in all respects.	No	1		

S.No.	Description	Unit	Qty.	Supply	
				Rate	Amount
2.9	Supply, installation and Make necessary arrangement for temporary power supply from gen. sets to existing LT Panel to create the back up support during execution of above mentioned works, this includes supply of required size of cables with quantity, supports, lugs, glands etc. complete in all respect.	Job	1		
2.10	Supply & installation of copper links between busway flange and 4x2000A at gen set side including all installation and mounting accessories like metal box, lugs, glands, tie etc. complete in all respects.	Job	1		
2.11	Supply & installation of copper links between busway flange and Syn Panel and LV panel side ACB's including all installation and mounting accessories like lugs, glands, tie etc. complete in all respects.	Job	1		
2.12	Supply and installation of Wiring of light and fan point with 3x1.5 sq.mm single core PVC insulated 450/750 V grade copper wire in 25mm dia. PVC conduit surface/ concealed mounted including all accessories, etc.; 1.0 sq.mm 3-core PVC/PVC cable in flexible PVC conduit for final connection, complete in all respects.				
a)	Light point controlled by one switch	Nos.	5		
b)	Light point from point to point wiring.	Nos.	10		
2.13	Supply and installation of Wiring for 13A/15A, Multipin switch socket outlets with 3x1C-4.0 mm² PVC insulated copper wires in 25mm dia PVC conduit / trunking surface / concealed mounted and connections, with all accessories, (raw power circuit), complete in all respect as per drawing and specification.	Nos.	3		
2.14	Same as item no 2.13 but point to point wiring	Nos.	5		
2.15	Supply and installation of following 10A one way gang type switches / sockets **(Clipsal E- Series or MK equivalent)** as per design drawings, complete in all respect.				
a)	Two gang switch unit	Nos.	3		
b)	Three gang switch unit	Nos.	3		
c)	13A/15A Multipin switch socket unit.	Nos.	5		
2.16	Back Box: Supply and installation of 16 SWG sheet steel powder coated back box with brass earth terminal, complete in all respect.	Nos.	10		
2.17	supply, installation and connection of the following lighting fixtures as specified in the lighting fixtures schedule & specification complete with lamp, holders, electronic ballast, supports, hanging & fixing materials like rod, chain etc. including all mounting accessories. complete in all respect.				
a)	Fixture Type (Surface) Pacific light fixture with 2x 28 Watt LED lamps. Weather proof (IP 65).	Nos.	20		

S.No.	Description	Unit	Qty.	Supply	
				Rate	Amount
2.18	Supply, Installation, Termination and Commission of following Emergency lighting fixtures as specified in the light fixtures schedule & specification complete with lamp, holders, 3 Hour Back up battery, connector (Porcelain), supports, hanging & fixing materials(Such as Steel Rod/Chain), etc. including all required mounting and installation accessories. Complete in all respect.				
a)	Fixture Type (Surface/wall) Emergency light with 8 Watt LED lamp non maintained type.	Nos.	3		
b)	Fixture Type (Surface/Recessed Exit light) 8 watt LED lamp with Screen Print Legend maintained type Exit Light.	Nos.	2		
2.19	Supply and installation of 16 SWG Powder coated (as approved by Consultant) G.I Cable Tray/trunking with cover including factory fabricated bends, tees, reducers, hanging supports and other accessories etc. of the following size complete with all required mounting and installation accessories, as per drawings and specifications complete in all respects, to be installed on wall or in ceiling, run horizontal or vertical as required. Complete in all respect as per drawing and specification.				
a)	Cable Tray 250mm x 50mm (Perforated Type)	Mtr.	50		
2.20	Supply and installation of Chemically Enhanced Earth by using copper bonded rod 10ft, 40 ft deep, 4" dia boring and filled with soil conditioning chemical material including G.I Pipe and back filled chemical to enhance conductivity. Complete with termination clamps, 35 sqmm bare copper cable from earth rod/pipe to inspection ECP strip, manhole with cover etc. as shown in drawings and details complete in all respects. result of earth pit should not be more then 2 Ohms. this is contractor responsibility to achieve this result without any extra cost as required.	Nos	8		
2.21	Supply, installation and connection of the following PVC insulated earthing conductors directly buried from ECP to gen sets, syn. Panel and other equipment's as per consultant instruction or as per drawings and specifications. Complete in all respect.				
a)	2x1C-70mm² PVC cables (Green) with required size PVC conduit.	Mtrs.	400		
	TOTAL AMOUNT SECTION- 2				
3	**RADIATOR DUCTING**				
3.1	Supply, fabrication and installation of Radiator exhaust duct for 1250kVA using 22 gauge GI sheet, Flexible and MS angle connection. Anchoring on the wall/floor and complete supporting structure with all required installation and mounting accessories. The distance of the both radiator from the wall is 5ft, as shown in drawings, complete in all respect.	Job	2		
	TOTAL AMOUNT SECTION- 3				

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BILL OF QUANTITIES
GENERATOR

S.No.	Description	Unit	Qty.	Supply	
				Rate	Amount
4	**SILENCER PIPING & CLADDING**				
4.1	Supply, fabrication and installation of Critical Hospital grade exhaust silencer for-1250VA Diesel generator set.	Job	2		
4.2	Supply and Installation of exhaust pipeline for 1250kVA prime DG set. This also includes complete support structure, installation and mounting accessories and Flexible used in pipeline. The diameter of the exhaust pipeline is 16-inch or as per recommendation of principal. contractor should submit calculation of exhaust piping for review and approval to consultant.	Job	2		
4.3	Supply, Insulation and cladding on the exhaust pipeline using 80 kg/m³ density glass wool and 26 Gauge GI sheet. Box insulation and cladding of the bellow/ flexible pipe. Insulation and cladding includes inside the generator room.	Job	2		
	TOTAL AMOUNT SECTION- 4				
5	**SPARE PARTS /TOOLS**				
5.1	Supply of spare parts and tools for 1000 hours operation for 2 Nos 1250 KVA prime genset as per specifications according to the manufacturers recommendation. (list to be attached with bid document for consultant review)	Job	1		
	TOTAL AMOUNT SECTION- 5				
6	**FUEL TANK**				
6.1	Supply fabrication and installation of 2,500 liters day fuel tanks above ground. Complete as per following specification: - Fuel Tank Capacity = 2,500 liters - Type = Cylindrical Horizontal Flat End/Rectangle - Material = A-36 - Sheet Thickness = 4mm - Length = 2430mm - Depth = 1220 mm - Fuel tank Shell be finished with two coats of base primer and paint as per standard guide lines and good market practices. Including piping, valves as required, over flow tank, supports, stands as required from day tank to gensets. this also included piping from existing filling system to new fuel tank for filling of tank with bypass valves and other accessories as required to complete the fuel piping system. compete in all respect. Fuel Tank dimensions can be adjusted according to the site conditions.	Nos	2		
6.2	Supply and installation of fuel piping for 1250 KVA gen sets Including piping, valves as required, over flow tank, supports, stands/breakets as required from day tank to gensets. this also included piping from existing filling system to new fuel tank for filling of tank with bypass valves and other accessories as required to complete the fuel piping system. compete in all respect.	Nos	2		
6.3	Supply, fabrication and installation of Gravity Louver Non Return Damper at the end of radiator exhaust to prevent the return air exhaust from one DG Set to other DG Set with all required installation accessories, complete in all respect.	Nos	2		
	TOTAL AMOUNT SECTION- 6				

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BILL OF QUANTITIES
GENERATOR

S.No.	Description	Unit	Qty.	Supply	
				Rate	Amount
7	**SOUND PROOFING**				
7.1	Supply and installation of sound liners on the walls and roof of generator room. - installation of sound liners is approximate 12000ft². -Density of Rockwool is 60kg/m³-Perforated sheet is 24 swg with 50% perforation.	Job	1		
7.2	Supply and installation of Air exhaust acoustic M.S chamber at the exhaust radiator of-1250kVA Generator Set. Air exhaust acoustic chamber has following dimensions: Width = 7ft Height = 8ft Depth = 5ft. Or equivalent size as per principal recommendation. contractor will submit the design and calculations to consultant for review and approval.	Job	2		
7.3	Supply, fabrication and installation of removable/portable special designed wall at air exhaust side including bolted MS frame, Attenuators fabricated with G.I Sheet and Rockwool (one side of attenuator is perforated and other is solid)	Job	2		
7.4	Supply & Fixing of Acoustic Duct upward type for existing gensets. Complete with sound attenuator & sound liner.				
a)	EXISTING GENSETS	Nos	2		
7.5	Supply and installation of Air Intake acoustic M.S chamber at the Alternator of 2 x Generator Sets with vertical sound Attenuators fabricated with G.I Sheet and Rockwool.	Job	2		
7.6	Supply, fabrication and installation of Sound proof door at the entrance of the generator room to achieve the required sound level. Complete in all respect.	Nos	1		
	TOTAL AMOUNT SECTION- 7				
8	**FILTRATION SYSTEM**				
8.1	Supply, fabrication and installation of washable dust filters at air intake of generator room including fittings and supporting frame. Complete in all respect	Job	1		
	TOTAL AMOUNT SECTION- 8				
9	**CIVIL WORKS**				
9.1	Supply and Construction of RCC foundation 16'-6" x 6' x 6" with a ratio of 1:2:4 for 1250 kVA generating sets as per instruction of structure engineer in charge with all required construction materials like cement, iron, rati etc. Complete in all respect.	Job	1		
9.2	Supply, installation and Providing & laying Block masonry walls (at any height) including racking of joints with 1:4 cement sand mortar, the job includes steel reinforcement anchor of 3'-0" length on both sides of wall at every 3'-0' ft height including scaffolding labor and material, complete in all respect as per drawing and instructed by the Consultant/Architect.	Job	1		

S.No.	Description	Unit	Qty.	Supply	
				Rate	Amount
9.3	Supply, installation and Provide and apply 1:4 cement sand plaster of minimum thickness as specified including 200mm wide expanded galvanized metal lathe of 18 SWG at the junctions of concrete and block masonry, including G.I corner guard conduit chases, etc. fixed with G.I. masonry nails and G.I. sheet strip, rounded edges, drip moulds, grooves, smooth finished in line, level, plumb, curing, scaffolding, hacking of existing surface for bonding where necessary, wastage, etc. complete in all respect as per specifications and drawings. **Cement : Lucky/Falcon or approved equivalent**	Job	1		
9.4	Supply, installation and Provide and apply paint of approved quality minimum three coats of approved shade over required (coats) of primer to internal surfaces prepared smooth with carborundum stone, filling the depression with putty including scaffolding, etc. complete in all respect as per specifications and drawings. **Brand : Dulux/Jotun or approved equivalent**	Job	1		
	TOTAL AMOUNT SECTION- 9				
10	**DISMANTLING WORKS**				
10.1	Dismantling of existing 18 ft long 20 ft high wall, including removing and shifting of debris as per instruction of engineer in charge	Job	1		
10.2	Dismantling of existing sound proofing. Complete wall, ceiling & radiator exhaust. Loading of existing sound proofing material from power house & unloading at specified area as per instruction of engineer in charge.	Job	1		
10.3	Dismantling of complete existing genset fuel piping, exhaust piping, heat recovery piping, ducting, supports, stands etc. and clean the room as required and handing over to client.	Job	1		
10.4	after successful completion of project, contractor will submit the as built drawings in hard (A1 Sheet) and soft (AutoCAD) for client record. Before submit to client consultant should verify from site and contractor will help them to verify as built drawings from site. these shop drawings included each and every information as per site installations, sections, elevations, installation details, specification of materials etc. as required or mentioned by the consultant/Client. complete in all respect.	Job	1		
10.5	supply and installation of fire proof material 120 minutes fire rated minimum as per BS EN standard for all opening Ing in walls or ceiling after installation of all gen and allied works in gen room and syn. Panel room with all required installation material and accessories, complete in all respect.	Job	1		
10.6	Any missing items in any section of boq which required to complete the job. Contractor should include in the bid and these cost will quote over here and share the details along with bid for review and approval. This quoted amount included all kind of materials, labor, accessories etc. if any thing which is not considered over here and need to complete the system, contractor will bear the all cost and time.	Job	1		
	TOTAL AMOUNT SECTION- 10				
	Note: If the company qualifies to bid for the tender then it will be required to provide all relevant technical data sheets, specifications, maintenance manual etc., complete in all respect for necessary inspection /verification of the above specification.				

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BILL OF QUANTITIES
GENERATOR

S.No.	Description	Unit	Qty.	Supply	
				Rate	Amount
11.0	**HVAC and Allied Works**				
	Supply, Installation, Testing and Commissioning, Lifting , Shifting of the following as per drawings, equipment schedule, specifications:				
11.1	Supply and installation of Fresh air fans, Axial Metalic Type complete with Motor, anti bird and anti vermin screen, gravity shutter, power wiring / cables, and other accessories as per actual site, as defined in drawings, specifications and equipment schedule, complete in all respects:				
a)	Tag No. : FAF/1-1 to FAF/1-4	No.	4		
11.2	Supply and installation of Split Conventional type AC units, complete with hot dipped galvanized supports, refrigerant charge (environmental friendly refrigerant having zero ODP), Refrigerant Copper Piping (ACR tube -Type L) with closed cell elastomeric tubing insulation Class 0 Type (1/2 inch thickness) along with insulation protection, thermostat, controls, all power and control wiring from indoor to outdoor units, conduiting, mounting brackets and accessories as per actual site requirements, as defined in drawings, specifications and equipment schedule, complete in all respects:				
a)	Tag No. : AC/CU 1-1 to AC/CU 1-2 (2.0 RT)	No.	2		
11.3	Supply and installation of u-PVC Class D Condensate drain piping and 12 mm Closed cell foam tubing insulation (Class 0), covering, adhesives, etc. including piping specialties complete with fittings, hangers and supports, making connections and pressure testing, complete in all respect				
a)	20 mm (3/4 inch) Nominal Diameter	Job	1		
11.4	Supply and installation of Air Inlets and Outlets (neck sizes) including connections with air ducts and supports arrangements, complete in all respects (for details, see drawings, specifications and equipment schedule):				
a)	Anti-bird and Anti-vermin Screen Mesh Screen	Job	1		
11.5	Supply, Installation and Commissioning of 25mm thick Fiber-Glass sound liner for Air Ducting including accessories as per specifications and drawing	Job	1		
11.6	Supply and installation of Rectangular Ducting Hot dipped galvanizing coating of 275 g/m^2 and accessories; G.I sheet metal ducting including splitter dampers, take offs, elbows and other necessary fittings, wall/slab sleeves, cutting, fitting, fixing and cleaning, making wall opening, hangers and supports etc., duct connections with Fans including neoprene coated flexible duct connectors, complete with all bracings, hot dipped galvanized hangers & supports, access doors, etc. and ready for operation in all respect.				
a)	18 Gauge	Sft.	1200		
b)	20 Gauge	Sft.	760		
11.7	Supply and installation of 2" thick G4 Aluminum washable filter in filter box for fresh air supply	Sft.	60		
11.8	Air leakage testing of air ducts as per relevant code and standard.	Job	1		
11.9	Supply and installation of Automation Control System along with Motorized Control Damper (4 Nos. x 58" x 36") complete in all respect	Job	1		

S.No.	Description	Unit	Qty.	Supply	
				Rate	Amount
11.10	Testing, starting-up, commissioning, balancing, adjusting of the HVAC system (complete air side) from consultant and third party specialist, complete in all respects as per drawings, schedule and specifications & as per Engineer's Instructions.	Job	1		
11.11	Supply and installation of Electrical Works including all power and control wiring, conduiting & accessories. Complete in all respect.	Lot	1		
11.12	Supply and installation of Electrical Control Panels and Distribution Boards as per given drawings and specifications, complete in all respect.				
a)	Tag No. : MCC-01	No.	1		
11.13	Supply, Installation & commissioning of Vibration isolators for all fans as per drawings and specifications	Job	1		
11.14	Supply and installation of MS Metalic Equipment foundation with all required installation and mounting accessories and materials, complete in all respect.	Job	1		
11.15	Supply and installation of Heavy Guage MS Steel Platform with all required materials with installation and mounting accessories, complete in all Respect for Fans Placement as shown in drawings.	Job	1		
11.16	Supply and installation of Painting, Tag/Identification and Stenciling with all required materials and other accessories, complete in all respect.	Job	1		
11.17	Supply & Installation of items not listed in BOQ but required for satisfactory completion and operation of the system.(Contractors to provide list)	Lot	1		
	TOTAL AMOUNT SECTION- 11				

SUMMARY FOR BILL OF MATERIAL

SECTION	DESCRIPTION OF ITEMS	SUMMARY OF COST
		SUPPLY AMOUNT (Rs.)
1	DIESEL GENERATING SETS	
2	SYNCHRONIZING PANEL & ELECTRICAL WORKS	
3	RADIATOR DUCTING	
4	SILENCER PIPING & CLADDING	
5	SPARE PARTS /TOOLS	
6	FUEL TANK	
7	SOUND PROOFING	
8	FILTRATION SYSTEM	
9	CIVIL WORKS	
10	DISMANTLING WORKS	
11	HVAC WORKS	
TOTAL COST (Rs.)		

Rupees :
(_____
_

Contractor: _____
Sign & Stamp

SHAHEED MUHTARMA BENAZIR BHUTTO TRAUMA CENTER KARACHI.

ISSUED FOR TENDER ONLY

DRAWINGS OF

ELECTRICAL AND MECHANICAL WORKS

DECEMBER, 2025

LIST OF DRAWINGS

DRAWING NO.	DRAWING TITLE
EL-00	TITLE SHEET
EL-01	LEGENDS, LIST OF DRAWINGS, GENERAL NOTES & OTHER DETAILS
EL-02	GENERATOR ROOM LAYOUT PLAN
EL-03	GENERATOR ROOM SECTIONS
EL-04	SINGLE LINE DIAGRAM SYNC. PANEL

LIST OF APPROVED MANUFACTURER, SUPPLIER

1.	CIRCUIT BREAKER	SCHNEIDER , ABB
2.	INDICATION LIGHTS LED	SCHNEIDER, GIOVENZANA, FUJI
3.	CHANGEOVER / CAM SWITCHES	BRETER , CAMSCO , GGT, SOCOMEC, TELEGRON
4.	DIGITAL VOLT METER / AMMETER	SCHNEIDER , JANITZA , CIRCUTOR
5.	ENERGY ANALYZER	JANITZA , SCHNEIDER , CIRCUTOR
6.	LOAD BREAK SWITCH	SOCOMEC , SCHNEIDER
7.	ISOLATOR	SCHNEIDER , ABB , KATKO
8.	TIMER	AUTONICS, PANASONIC
9.	PHASE SEQUENCE RELAY	TELEMECANIQUE, EMRIL, PHOENIX
10.	SURGE PROTECTION DEVICE	SCHNEIDER, DEHN, ETI, DF
11.	EVR	EMRIL, PHOENIX

LEGENDS:

SYSTEM	SYMBOLS	DESCRIPTION
SWITCHGEARS		TP ACB
		TP MCCB
		TP MCB
		SP MCB / DP MCB
		LBS
	M	MOTORIZED BREAKER
		TP+N+E BUSBAR
		SURGE PROTECTION DEVICE
	R Y B	PHASE INDICATOR LIGHTS
	ATS	AUTO TRANSFER SWITCH
	COS	CHANGE OVER SWITCH
		TRANSFORMER
	G	GENERATOR
	UPS	UNINTERRUPTABLE POWER SUPPLY
		SUB MAIN DISTRIBUTION BOARD
		DISTRIBUTION BOARD
	PFI	POWER FACTOR IMPROVEMENT
		EARTHING/NEUTRAL
	EA	ENERGY ANALYZER
	UVT	UNDER VOLTAGE TRIPPING
	EVR	ELECTRONIC VOLTAGE RELAY
	OCR	OVER CURRENT RELAY
	DT	DELAY TIMER
	MM	MULTI METER
	ECP	EARTH CONNECTING POINT
		TPN ISOLATOR
		SPN ISOLATOR

NOTES

1. ALL SWITCHGEAR SHALL BE IP 42 RATED.
2. ALL SWITCHGEAR SUITABLE FOR 50 DEG C AMBIENT TEMPERATURE .
3. RUPTURING CAPACITY OF MAIN BREAKER ICU SHOULD BE EQUAL TO ICS (ICU=ICS) TO COMPLY IEC 60947-2.
4. ALL BUS BAR SHOULD BE IMPORTED 99.9% TINNED PLATED COPPER.
5. NEUTRAL BUS BAR SIZE SHOULD BE EQUAL TO PHASE BUS BARS.
6. EARTH BUS BAR SIZE SHOULD BE HALF TO PHASE BUS BARS.
7. PANELS SHOULD BE PROPERLY EARTH WITH BRAIDED COPPER STRIP.
8. MS SHEET SHOULD BE 14 /16SWG FOR ALL SWITCHGEARS.
9. CABLE ENTRY SHOULD BE TOP/BOTTOM.
10. BRASS CABLE GLANDS SHOULD BE PROVIDE FOR MAIN INCOMING CABLES BY THE CONTRACTOR.
11. ALL SWITCHGEAR SHALL HAVE POWDER COATED 100MICRONS
12. IF AUTO SYNCHRONIZATION IS FAILED THEN MANUAL OVER RIDE SHOULD BE PRESENT IN THE SYNC PANEL.
13. 630 A BREAKERS ARE SELECTED FOR FUTURE 200 KVA GENERATOR UPGRADES. THE TRIP SETTING MUST BE ADJUSTED TO THE GENERATOR'S FULL-LOAD CURRENT OF 288.7 A, AND CABLES ARE SIZED ACCORDINGLY TO THIS LOAD, NOT THE BREAKER'S FRAME RATING.

Project:

SMBBIT - Karachi

No.	Date	Revision
01	22-12-25	ISSUED FOR TENDER

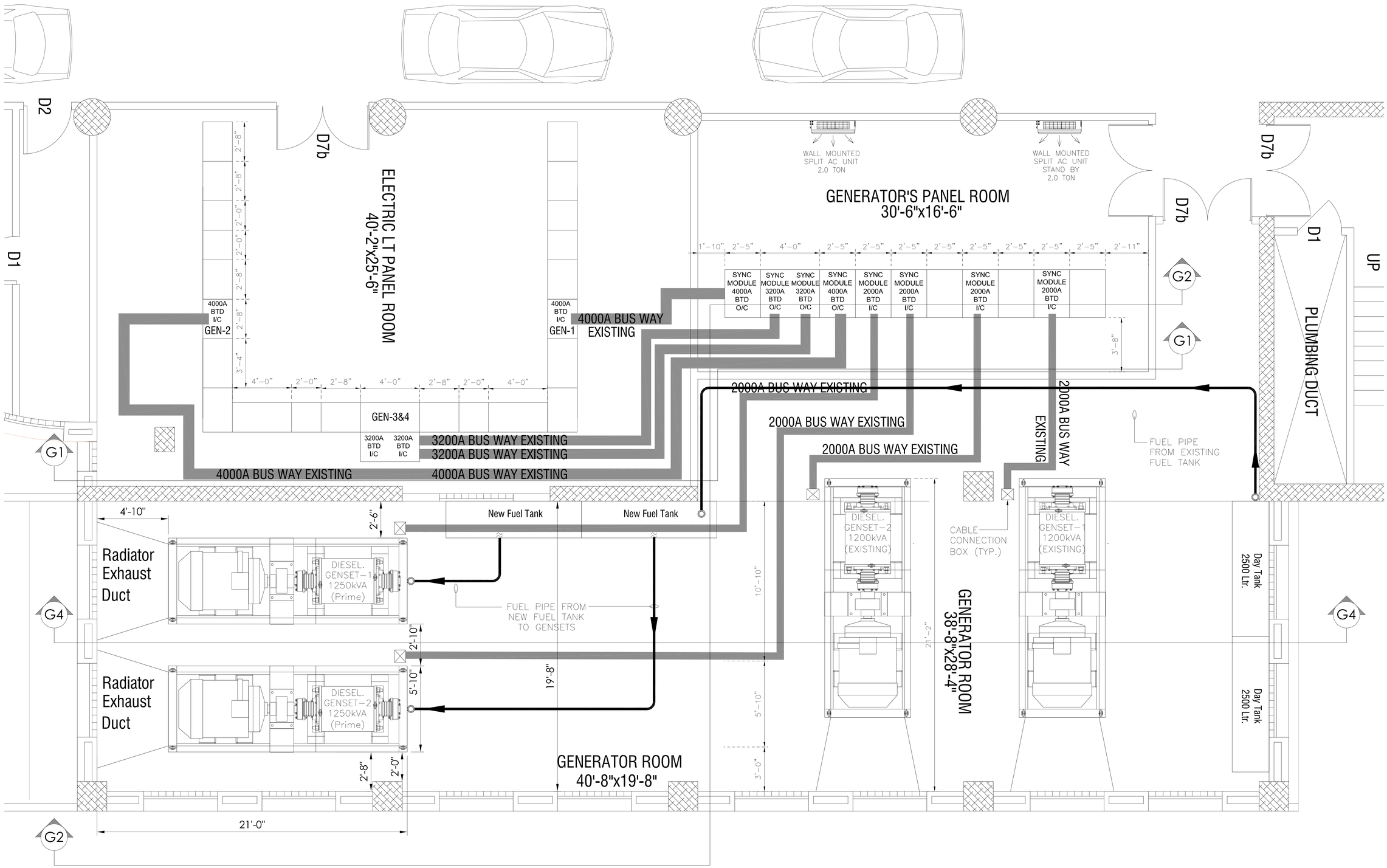
Drawing Status:

TENDER ONLY

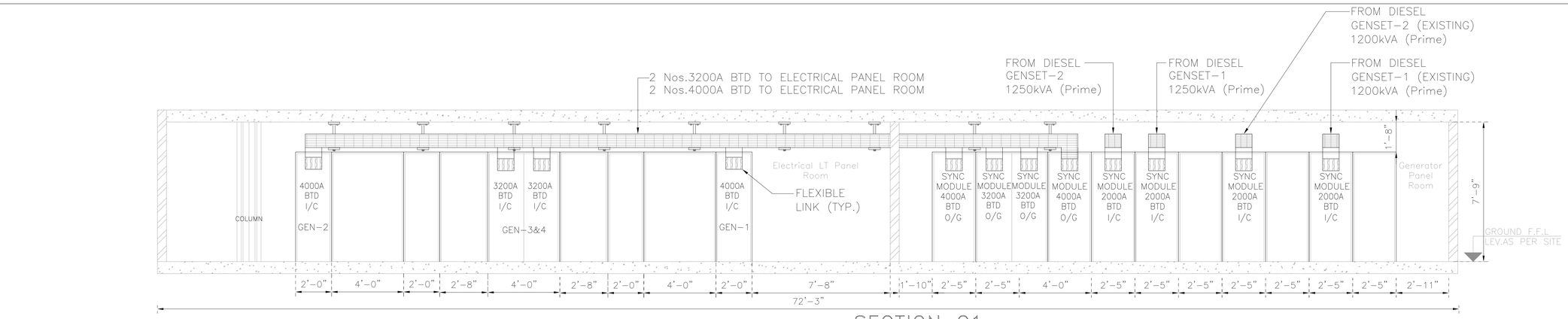
Drawing Title:

LEGENDS, LIST OF DRAWINGS, GENERAL NOTES & OTHER DETAILS

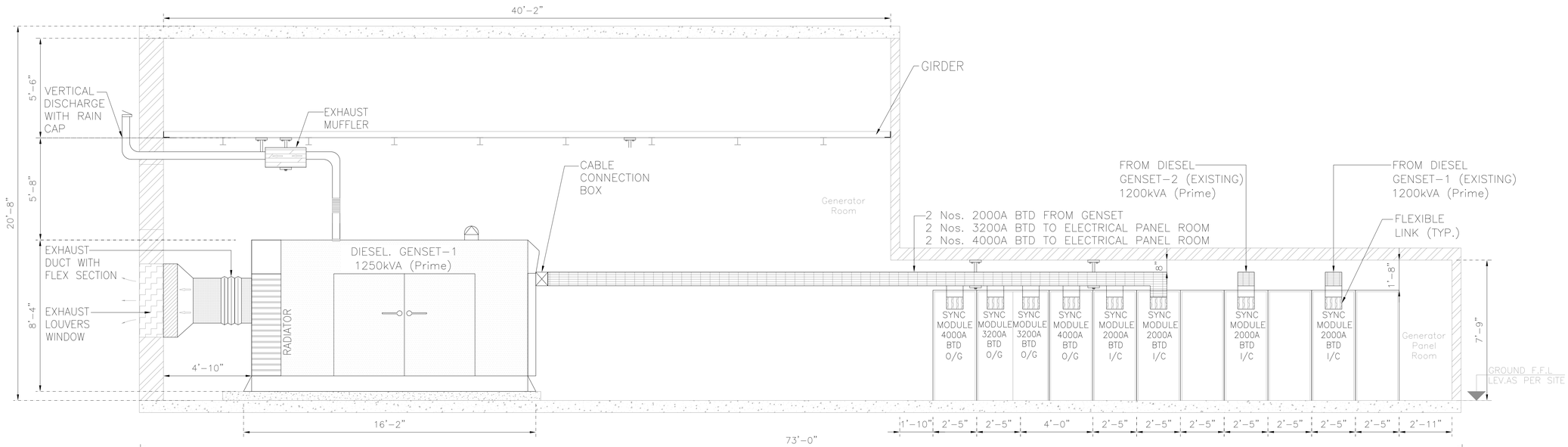
Drawn	A.K	Date	DECEMBER, 2025
Checked	SAAN	Scale	N.T.S
Proj. Engr.	SAAN	Job no.	E-1945
DRAWING NO:	EL-01		



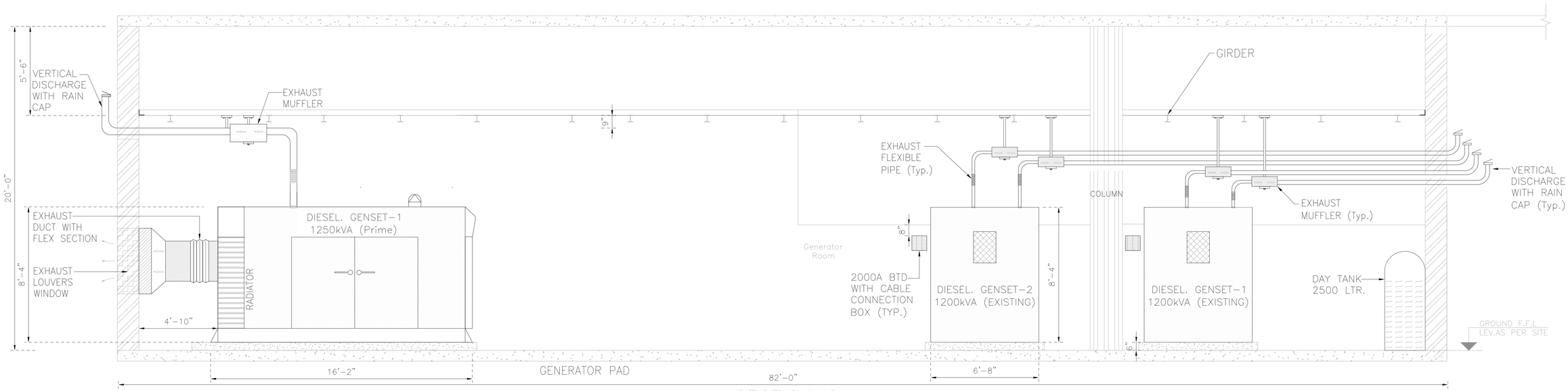
Project: SMBBIT - Karachi	No.	Date	Revision	Drawing Status: TENDER ONLY	Drawing Title: GENERATOR ROOM LAYOUT PLAN	Drawn A.K / Date DECEMBER, 2025
	01	22-12-25	ISSUED FOR TENDER			Checked SAAN / Scale 3/8"-1'-0" @ Sheet 30X40
						Proj. Engr. SAAN / Job no. E-1945
						DRAWING NO: EL-02



SECTION G1

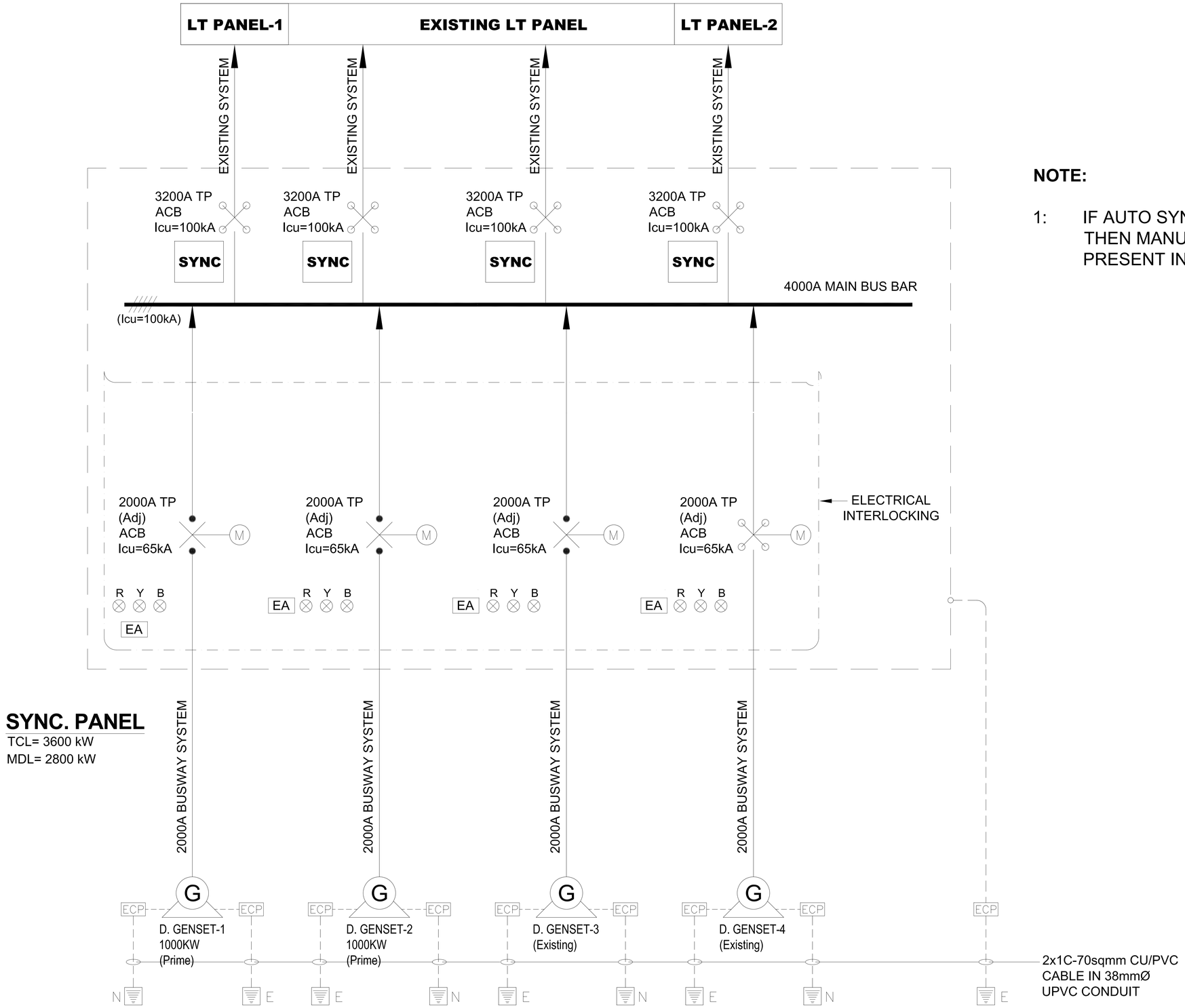


SECTION G2



SECTION G4

Project: SMBBIT - Karachi	No. / Date / Revision: 01 / 22-12-25 / ISSUED FOR TENDER	Drawing Status: TENDER ONLY	Drawing Title: GENERATOR ROOM SECTIONS
Drawn: A.K	Date: DECEMBER, 2025	Checked: SAAN	Scale: 3/8"-1'-0" @ Sheet 30X40
Proj. Engr.: SAAN	Job no.: E-1945	DRAWING NO.: EL-03	



SYNC. PANEL

TCL= 3600 kW

MDL= 2800 kW

NOTE:

1: IF AUTO SYNCHRONIZATION IS FAILED THEN MANUAL OVER RIDE SHOULD BE PRESENT IN THE SYNC PANEL.

Project:	No.	Date	Revision
SMBBIT - Karachi	01	22-12-25	ISSUED FOR TENDER

Drawing Status:	Drawing Title:		
TENDER ONLY	SINGLE LINE DIAGRAM SYNC. PANEL	Drawn A.K	Date DECEMBER, 2025
		Checked SAAN	Scale N.T.S
		Proj. Engr. SAAN	Job no. E-1945
		DRAWING NO: EL-04	

LIST OF DRAWINGS
SHAHEED MOHTARMA BENAZIR BHUTTO INSTITUTE OF TRAUMA

S.No.	DRAWING No.	TITLE
1	SMBBIT–M01	LIST OF DRAWINGS
2	SMBBIT–M02	HVAC SYSTEM STANDARD DETAILS AND LEGENDS
3	SMBBIT–M03	HVAC SYSTEM EQUIPMENT SCHEDULE
4	SMBBIT–M04	GENERATOR ROOM FRESH AIR VENTILATION LAYOUT & SECTION

Project:

SMBBIT - Karachi

No.	Date	Revision
01	22-12-25	ISSUED FOR TENDER

Architect :

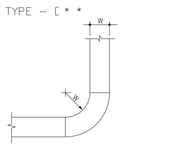
Drawing Status:

TENDER ONLY

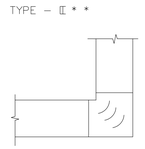
Drawing Title:

LIST OF DRAWING

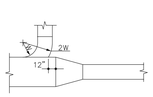
Drawn A.A	Date DECEMBER, 2025
Checked U.Y	Scale N.T.S @ Sheet 30X40
Proj. Engr. A.J	Job no. E-1945
DRAWING NO:	M-01



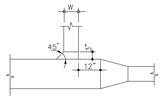
90° RADIUS ELBOW



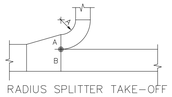
90° MITRE ELBOW



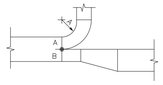
RADIUS TAKE–OFF



90° TAKE–OFF



RADIUS SPLITTER TAKE–OFF



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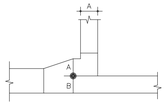

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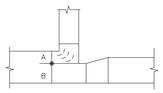

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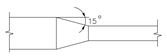
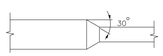


SIZE TRANSITION



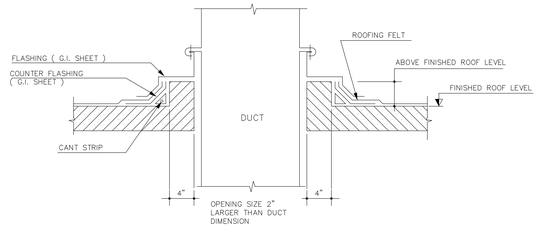
SIZE TRANSITION

NOTES :–

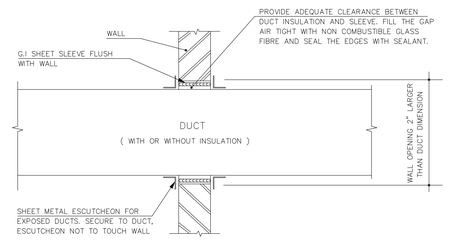
SIZE A & B DIMENSIONS IN PROPORTION TO AIR QUANTITIES IN EACH LEG OF SPLIT.

NORMALLY TYPE – I SHALL BE USED TYPE – I[ACCEPTABLE ONLY WHERE TYPE – [IS NOT POSSIBLE DUE TO SPACE CONSTRAINT

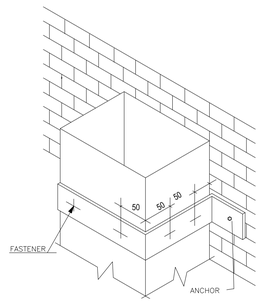
RECTANGULAR DUCT DETAILS



DUCT THRU ROOF

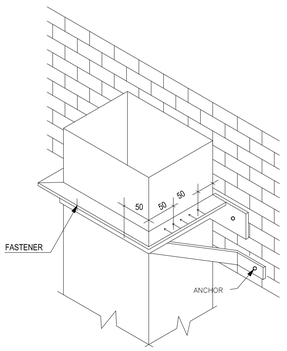


DUCT THRU WALL



RECOMMENED SIZING

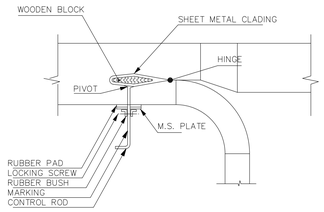
DUCT SIZE	BAND
450x300	40x16 G.A
600x500	25x3mm



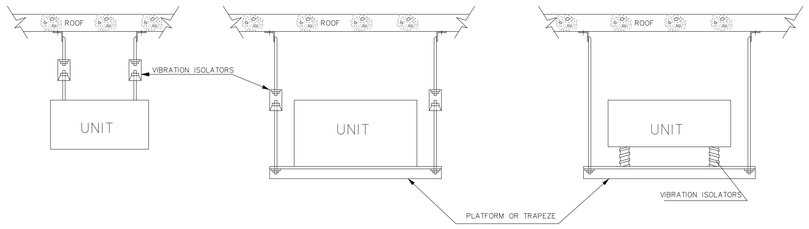
RECOMMENED SIZING

DUCT SIZE	ANGLE
750x300	25x25x3
900x450	25x25x3
1050x600	30x30x5
1200x750	30x30x5

RISER SUPPORTS FROM WALL



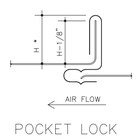
PARALLEL FLOW BRANCH WITH SPLITTER DAMPER



HVAC UNITS SUSPENSION (TYPICAL)

HVAC LEGEND

SYMBOL	ABRV.	DESCRIPTION
		DUCT TURNING UP
		DUCT TURNING DOWN
	VD	VOLUME DAMPER
200X150	AL	ACCOUSTIC LINING (SIZE SHOWN IS INSIDE DIMENSION)
	FC	FLEXIBLE CONNECTION IN DUCT
R D		INCLINED RISE / DROP IN THE DIRECTION OF FLOW
		SPLITTER DAMPER
		SECTION THRU SUPPLY DUCT
		SECTION THRU RETURN DUCT
		DUCT TRANSFORMATION RECTANGULAR TO ROUND AND VICE VERSA
		FLEXIBLE DUCT
		SECTION THRU EXHAUST AIR DUCT
	AP	ACCESS PANEL IN DUCT
	EF	EXHAUST FAN WITH BACK DRAFT DAMPERS
B 300X150 50 (TYP.2)		AIR INLET / OUTLET CODE 'B', NECK SIZE 300x150, FLOW RATE 50 L/S, 2 NOS.
24"x12"		AIR DUCT WIDTH x DEPTH,INCH.
	FD	FIRE DAMPER
		SECTION THROUGH OUTSIDE AIR DUCT
		CONDENSATE DRAIN
		SUPPLY AIR DUCT
		RETURN AIR DUCT
		EXHAUST AIR DUCT
		OUTSIDE AIR DUCT
		FRESH AIR DUCT
RS	RS	REFRIGERANT SUCTION
RD	RD	REFRIGERANT DISCHARGE
		FAN CAPACITY CODE 1,QUNTITY 1
	WF	WASHABLE FILTER
		MOTORIZED DAMPER
		FRESH AIR FAN
		SPLIT AC UNIT
		OUTDOOR UNIT

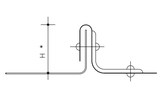


POCKET LOCK

ACME LOCK
GROOVED SEAM

DRIVE SLIP

PITTSBURGH LOCK



ANGLE REINFORCED
STANDING SEAM

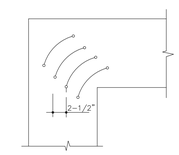
DOUBLE SEAM

CROSS JOINTS

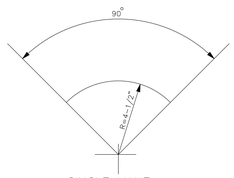
* DIMENSION " H " AS PER TABLE IN SPECIFICATION

LONGITUDINAL SEAM

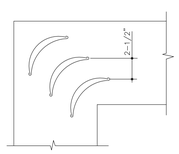
TYPICAL DUCT JOINTS



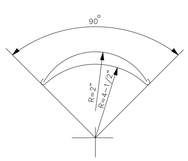
SINGLE VANED ELBOW



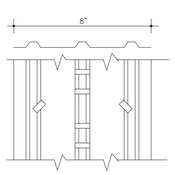
SINGLE VANE



LARGE DOUBLE VANE

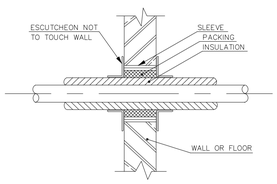


LARGE DOUBLE VANE

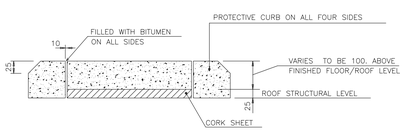


LARGE DOUBLE VANE RUNNER

VANED ELBOW DETAILS

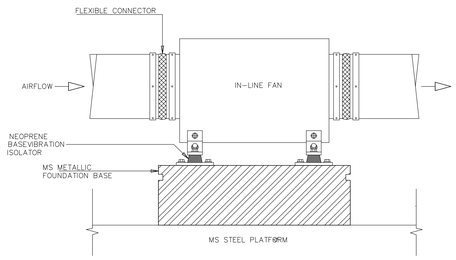


PIPE THRU WALL OR FLOOR

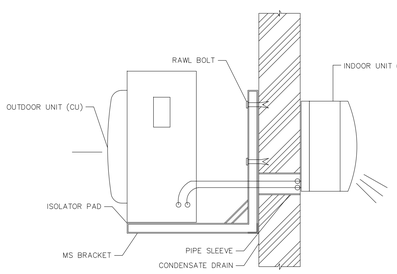


TYPICAL DETAIL OF CONCRETE PAD FOR EQUIPMENT (BY CIVIL CONTRACTOR)

NOTE–CORK SHEET SHALL BE SUPPLIED BY HVAC CONTRACTOR AND CONCRETE WORK WILL BE DONE BY CIVIL CONTRACTOR.



IN–LINE (FOUNDATION BASE MOUNTED)



OUTDOOR AND INDOOR INSTALLATION TYPICAL DETAIL

Project:	No.	Date	Revision	Architect :	Drawing Status:	Drawing Title:	Drawn	Date
SMBBIT - Karachi	01	22-12-25	ISSUED FOR TENDER		TENDER ONLY	HVAC SYSTEM STANDARD DETAILS & LEGENDS	A.A	DECEMBER, 2025
							Checked U.Y	Scale N.T.S @ Sheet 30X40
							Proj. Engr. A.J	Job no. E-1945
							DRAWING NO: M-02	

SCHEDULE OF AIR–COOLED DX–SPLIT AIRCONDITIONING UNITS

CODE	TYPE	QUANTITY	TOTAL COOLING CAPACITY (kW)	FILTER TYPE	CONDENSER AIR EDB (°C)	POWER SUPPLY	MANUFACTURER OR EQUIVALENT	REMARKS
AC/1–1 TO AC/1–2 CU/1–1 TO CU/1–2	HORIZONTAL WALL MOUNTED	2	7.0 (2.0 RT)	WASHABLE	40	400V/3ø/50Hz	AS SPECIFIED	

SCHEDULE OF FRESH AIR FANS

CODE	TYPE	AREA SERVED	SIZE (mm)	AIR FLOW RATE L/s (CFM)	E.S.P * (Pa)	ELECTRIC MOTOR POWER SUPPLY	LOCATION	SERVICE	MANUFACTURER OR EQUIVALENT	REMARKS
FAF/1–1 FAF/1–2 FAF/1–3 FAF/1–4	AXIAL DUCTED TYPE (METALLIC)	GENERATOR ROOM	1200	16525 (35000)	500	400V/3ø/50Hz	AS SHOWN	CONTINUOUS	AS SPECIFIED	WITH ANTI BIRD ANTI VERMIN SCREEN AND GRAVITY SHUTTER

NOTES:–

1–FANS SHALL HAVE DOUBLE SKINNED WEATHER PROOF CONSTRUCTION AND SHALL BE PROVIDED RAIN PROTECTION HOOD .

2–FANS SHALL BE PROVIDED WITH GRAVITY DAMPER, BIRD SCREEN AND VIBRATION ISOLATORS.

3–MOTOR SHALL BE RATED AND DESIGNED FOR 50 °C AMBIENT TEMPERATURE WITH CLASS F INSULATION, IP–55 PROTECTION AND TEFC TYPE.

4–MOTOR SHALL BE WITH THERMAL OVERLOAD PROTECTION.

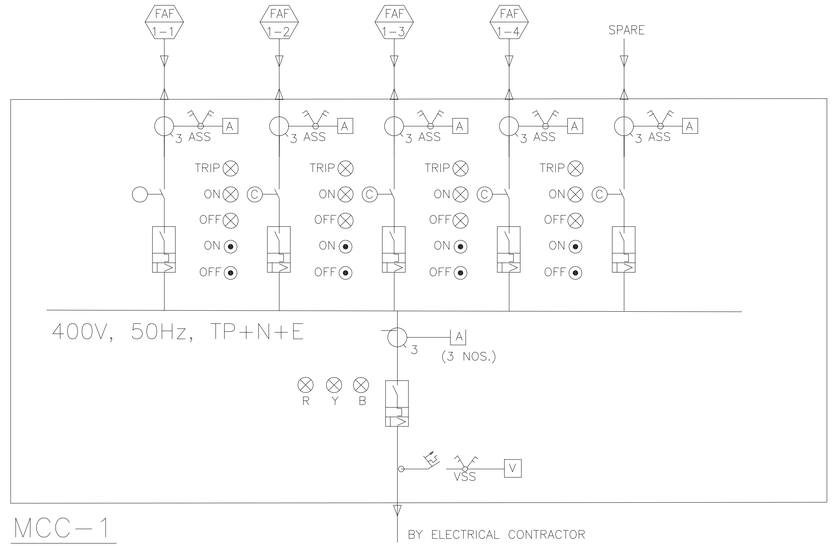
5–MOTOR MANUFACTURER SHALL BE SEIMENS OR APRROVED EQUIVALENT, SUITABLE FOR OPERATION IN SEVERE HOT AND HUMID CLIMATE/ENVIRONMENT.

LEGEND

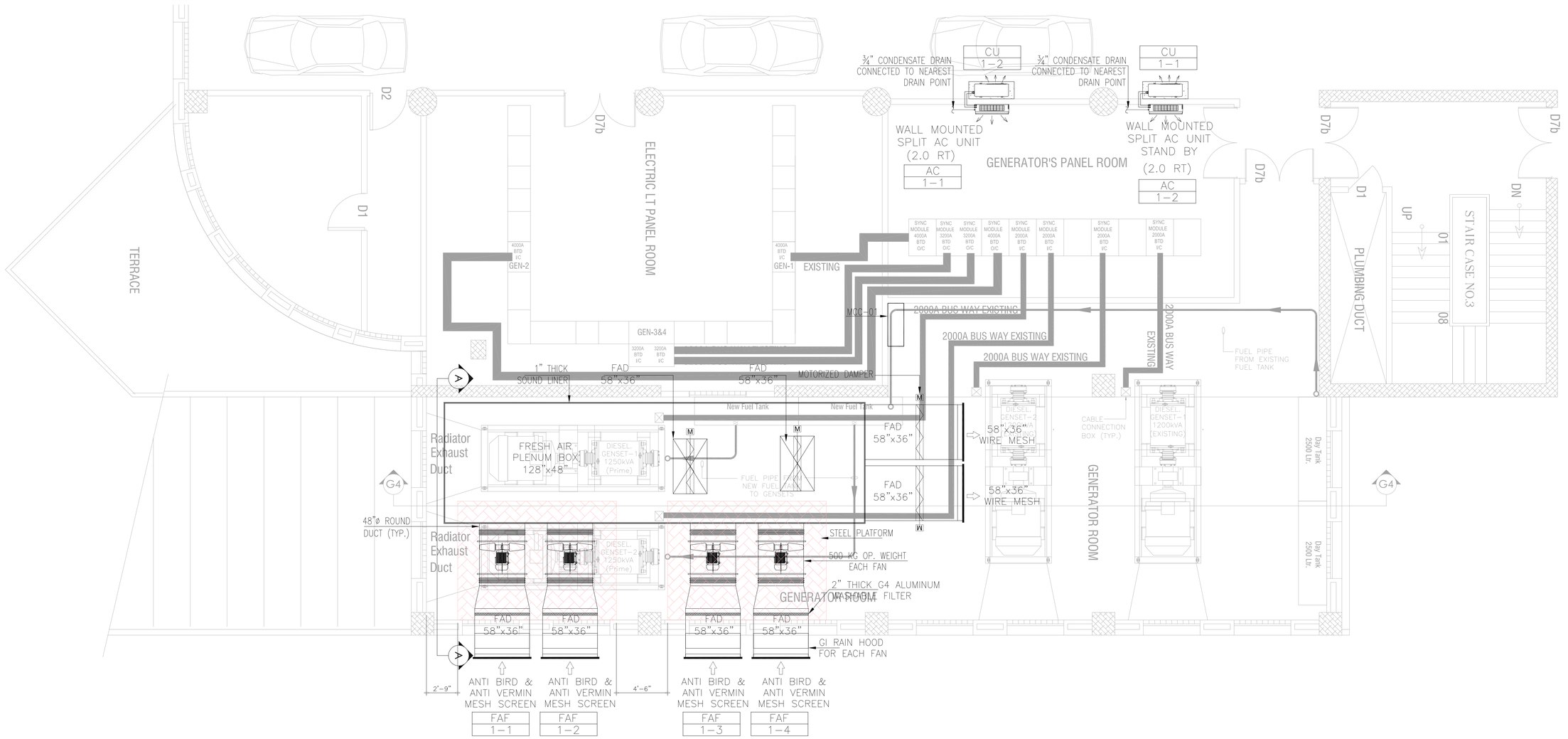
S.#	SYMBOL	DESCRIPTION
1		DISTRIBUTION BOARD (DB)
2		APPRATUS/EMERGENCY CONTROL PANEL (ACP/ECP)
3	Adj.	TRIPLE POLE, 500 VOLTS, MOULDED CASE CIRCUIT BREAKER (UNLESS MENTIONED OTHERWISE) Adj.–INDICATES ADJUSTABLE TYPE
4		SINGLE POLE, 250 VOLTS, MINIATURE CIRCUIT BREAKER (RUPTURING CAPACITY AND RATING INDICATED ON THE DRAWINGS)
5	3	THREE NOS SINGLE PHASE CURRENT TRANSFORMER
6	VSS	VSS – VOLTMETER SELECTOR SWITCH (7–POSITION)
7	V	AC VOLTMETER (MEASURING RANGE INDICATED ON DRAWING)
8	ASS	AMMETER SELECTOR SWITCH (4–POSITION)
9	A	AC AMMETER (MEASURING RANGE INDICATED ON DRAWING)
10		TRIPLE POLE 500V AIR BREAK MAGNETIC CONTACTOR
11	C	TRIPLE POLE 500V STARTER AS PER EQUIPMENT REQUIREMENT AND CONTRACT SPECIFICATION
12		PHASE INDICATION LAMPS R – RED, Y – YELLOW, B – BLUE, ON, OFF & TRIP
13		ON OR OFF PUSH BUTTONS

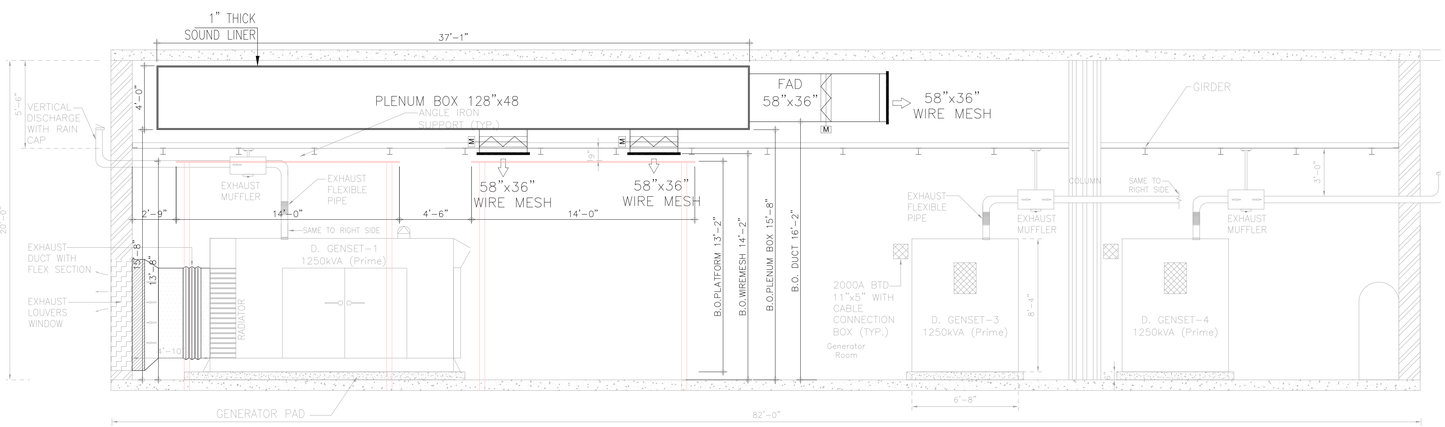
NOTES:-

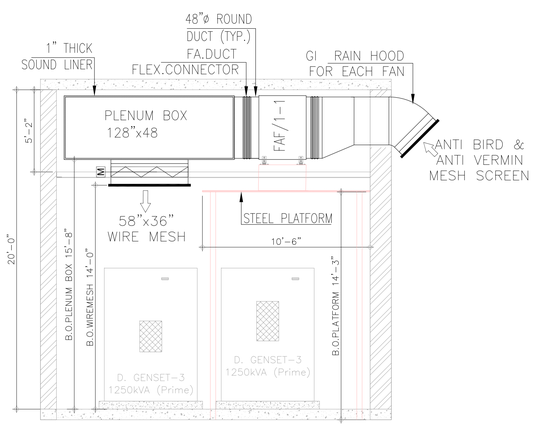
1-ELECTRICAL ACP/ECP/DB DIAGRAM BE PREPARED AS PER THE EQUIPMENT SELECTED. RATING OF CIRCUIT BREAKERS, CONTATCTORS AND ALL OTHER COMPONENTS SHALL DEPEND ON THE POWER REQUIREMENT OF EQUIPMENTS SUPPLYED BY THE CONTRACTOR AND HE SHALL SIZE THEM ACCORDINGLY WITHOUT ANY EXTRA COST.



Project:	No.	Date	Revision	Architect :	Drawing Status:	Drawing Title:	Drawn	Date
SMBBIT - Karachi	01	22-12-25	ISSUED FOR TENDER		TENDER ONLY	HVAC SYSTEM EQUIPMENT SCHEDULE	A.A	DECEMBER, 2025
							Checked U.Y	Scale N.T.S @ Sheet 30X40
							Proj. Engr. A.J	Job no. E-1945
							DRAWING NO: M-03	







Project:	No.	Date	Revision	Architect :	Drawing Status:	Drawing Title:	Drawn	Date
SMBBIT - Karachi	01	22-12-25	ISSUED FOR TENDER		TENDER ONLY	GENERATOR ROOM FRESH AIR VENTILATION LAYOUT & SECTION	A.A	DECEMBER, 2025
							Checked U.Y	Scale 1/4"-1'-0" @ Sheet 30X40
							Proj. Engr. A.J	Job no. E-1945
							DRAWING NO: M-04	