

**BANKI
KUU YA
KENYA**

**CENTRAL
BANK OF
KENYA**

**BANKI
KUU YA
KENYA**



**CENTRAL
BANK OF
KENYA**

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**TENDER FOR PROPOSED OFFICE MODERNIZATION
AND
CREATION OF WORK – STATIONS
-PHASE III PROJECT-
INCORPORATING FIRE SAFETY
OCCUPATIONAL SAFETY AND HEALTH SERVICES
FOR
CENTRAL BANK OF KENYA**

**TENDER NO. CBK/29/2012/2013/F
CLOSING ON 11TH JUNE, 2013 AT 10.30AM**

**SUB-CONTRACT CONDITIONS, SPECIFICATIONS AND
BILLS OF QUANTITIES FOR:**

PABX INSTALLATIONS

CLIENTS REPRESENTATIVES:

Director

Department of Estates, Supplies & Transport

Central Bank of Kenya

P.O. Box 60000 – 00200

NAIROBI.

APRIL 2013

**CENTRAL BANK OF KENYA
PROPOSED OFFICE MODERNIZATION AND CREATION OF WORK STATIONS-PHASE III
AT CENTRAL BANK OF KENYA – NAIROBI**

SUB-CONTRACT FOR PABX EQUIPMENT INSTALLATIONS

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**FEBRUARY, 2012
REVISION I 2012
REVISION II, OCTOBER, 2012
REVISION III, MARCH, 2013**

**CENTRAL BANK OF KENYA
PROPOSED OFFICE MODERNIZATION AND CREATION OF WORK STATIONS-PHASE III
AT CENTRAL BANK OF KENYA – NAIROBI**

SUB-CONTRACT FOR PABX EQUIPMENT INSTALLATIONS

SPECIAL NOTES FOR ALL TENDERERS:

Important: The site for the proposed works has a number of existing installations. The Sub-contractor will be required to ensure there's no interference with supply of services to neighbouring organizations. The sub-contractor will be required to take all precaution and care so that no damage will occur to the existing installations on site. The sub-contractor is also advised to secure all the necessary insurance policies as he will be solely held responsible for any damages to the existing system, injuries to persons resulting from his activities and/or interference with normal operations of the building that may result from his negligence, actions or otherwise.

1. These notes shall form part of these specifications and conditions.
2. The tenderer is required to check the number of pages in this document and should any be found to be missing or the figures indistinct, he must inform the Engineers at once and have the same rectified. Should the tenderer be in doubt about the precise meaning of any item, word or figures, or for any reason whatsoever observe any apparent omission of words or figures, he must inform the Engineer in order that the correct meaning may be decided upon before the date for the submission of the tenders.
3. No liability whatsoever will be admitted nor claim allowed in respect of errors in the completed tender due to mistakes in this document which should have been rectified in the manner described above.
4. The tenderer shall not alter or otherwise qualify the text of this specification. Any alteration or qualification made without authority will be ignored and the text of the specification as printed will be adhered to.
5. The tenderer shall be deemed to have made allowances in his unit prices generally to cover items of preliminaries or additions to Prime cost Sums or other items, if those have not been priced against the respective items.
6. The tenderer's price shall include all government taxes including duties, V.A.T. etc. No claims whatsoever will be allowed in respect of duties, VAT etc if the tenderer fails to include them in his unit prices. It is also to be noted that VAT will be included in the unit rates and NOT worked out as a percentage of the total.
7. In no case will any expenses incurred by the tenderer in preparation of this tender be reimbursed.
8. The copyright of this specification is vested in the Engineers and no part thereof may be reproduced without their express permission, given in writing.
9. The specifications must be priced in Kenya Currency i.e. Shillings and Cents.
10. All the tenderers must make a declaration that they have not and will not make any payment to any person which can be perceived as an inducement to enable them to win this tender.
11. The works shall be carried out in accordance with provisions of the 17th Edition of IEE wiring Regulations, the most current Kenya Standards governing such works, and relevant provisions of the current KPLC by-laws.

Signed (As in Tender)..... Date/Stamp.....

FORM OF TENDER

**To: Director,
Department of Estates, Supplies and Transport
Central Bank of Kenya,
Haile Selassie Avenue,
P O Box 60000-00200,
NAIROBI**

**CENTRAL BANK OF KENYA
PROPOSED OFFICE MODERNIZATION AND CREATION OF WORK STATIONS-PHASE III
AT CENTRAL BANK OF KENYA – NAIROBI
SUB-CONTRACT FOR PABX EQUIPMENT INSTALLATIONS**

1. In accordance with the Instructions to Tenderers, Conditions of Contract described or inferred to from the Kenya Association of Building and Civil Engineer Contractors (KABCEC), Form of Sub-Contract Agreement, Specifications, Drawings and Bills of Quantities for the execution of the above named Works, we, the undersigned offer to construct, install and complete such Works and remedy any defects therein for the sum of:

Kshs.....*[Amount in figures]*

Kenya Shillings.....*[Amount in words]*

2. We undertake, if our tender is accepted, to commence the Works as soon as is reasonably possible after the receipt of the Employer's Representative's notice to commence, and to phase the works in accordance with the building programme and to complete the whole of the works within the time of the main contract.
3. We agree to abide by this tender for 120 days from the date of official tender opening, and shall remain binding upon us and may be accepted at any time before that date.
4. Unless and until a formal Agreement is prepared and executed this tender together with your written acceptance thereof, shall constitute a binding Sub-Contract between us and the Main Contractor.
5. We understand that you are not bound to accept the lowest or any tender you may receive.
6. We submit the Name of as Surety who has signed the form attached and is willing to be bound to the Main Contractors in an amount equal to 5% of the sub-contract amount for the due performance of the sub-contract upto the date of completion of the works and who will when and if called upon sign a Bond to the offset without limitations on the same day as the Sub-contract Agreement is signed but in the event the surety name is not approved we agree to furnish within 7 days another surety to your approval.
7. We agree in the event of your acceptance of this Tender, to execute the formal Sub-contract Agreement within Fourteen (14) days from notification of acceptance.

Dated this day of20.....

Signature Name

In the capacity ofduly authorized to sign tenders for and on behalf of:

.....*[Name of Tenderer]* of.....*[Address of Tenderer]*

PIN No. VAT CERTIFICATE No.

Witness: Name

Address

Signature

NB: Tenderers are required to attach the surety undertaking, dully signed by the surety, to this Form of Tender.

**To: Director,
Department of Estates, Supplies and Transport
Central Bank of Kenya,
Haile Selassie Avenue,
P O Box 60000-00200,
NAIROBI**

Sirs,

FORM OF UNDERTAKING

We _____

of _____, being a duly registered Commercial Bank in Kenya, are willing to act as Surety and to be bound to (MAIN-CONTRACTOR) in the sum equal to Ten percent (10%) of the Sub-Contract Sum, for the due performance by

_____ (Tenderer)

of _____

of a Sub-Contract which he/they contemplate(s) entering into with the Main-Contractor for the supply, installation, testing and commissioning of PABX Equipment Installations as described in this document, and the accompanying relevant drawings for Central Bank of Kenya, according to the terms of the Performance Bank Guarantee a copy of which has been inspected by us without addition of any limitations.

We agree to enter into a Bank Guarantee under the above mentioned terms when and if called upon to do so.

Signature _____ (Surety)

Date _____

Witness _____

***To be completed by proposed Surety
and returned with Tender Documents.***

PART A:

INSTRUCTIONS TO TENDERERS

INSTRUCTIONS TO TENDERERS

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INSTRUCTION TO TENDERERS

Note: The tenderer must comply with the following conditions and instructions and failure to do so is liable to result in rejection of the tender.

GENERAL

1. Definitions

- (a) **“Tenderer”** means any person or persons partnership firm or company submitting a sum or sums in the Bills of Quantities in accordance with the Instructions to Tenderers, Conditions of Contract, Specifications, Drawings and Bills of Quantities for the work contemplated, acting directly or through a legally appointed representative.
- (b) **“Approved tenderer,”** means the tenderer who is approved by the Employer.
- (c) Any noun or adjective derived from the word **“tender”** shall be read and construed to mean the corresponding form of the noun or adjective **“bid”**. Any conjugation of the verb “tender” shall be read and construed to mean the corresponding form of the verb “bid.”
- (d) **Employer”** means **Central Bank of Kenya, P O Box 60000-00200, Nairobi, and Tel: 2860000**

2. Eligibility and Qualification Requirements

- 2.1 This invitation to tender is open to all tenderers who have been pre-qualified.
- 2.2 To be eligible for award of Sub-Contract, the tenderer shall provide evidence satisfactory to the Employer of their eligibility under Sub clause 2.1 above and of their capability and adequacy of resources to effectively carry out the subject Sub-Contract. To this end, the tenderer shall be required to update the following information already submitted during pre-qualification:-
 - (a) Details of experience and past performance of the tenderer on the works of a similar nature within the past five years and details of current work on hand and other contractual commitments.
 - (b) The qualifications and experience of key personnel proposed for administration and execution of the contract, both on and off site.
 - (c) Major items of construction plant and equipment proposed for use in carrying out the Sub-Contract. Only reliable plant in good working order and suitable for the work required of it shall be shown on this schedule. The tenderer will also indicate on this schedule when each item will be available on the Works. Included also should be a schedule of plant, equipment and material to be imported for the purpose of the Sub-Contract, giving details of make, type, origin and CIF value as appropriate.
 - (d) Details of subcontractors to whom it is proposed to sublet any portion of the Sub-Contract and for whom authority will be requested for such subletting.
 - (e) A draft Program of Works in the form of a bar chart and Schedule of Payment which shall form part of the Sub-Contract if the tender is accepted. Any change in the Program or Schedule shall be subjected to the approval of the Engineer. The program of works must be presented in detail, to include all milestones from commencement to commissioning, and handing over.
 - (f) Details of any current litigation or arbitration proceedings in which the Tenderer is involved as one of the parties.

2.3 Joint Ventures

Tenders submitted by a joint venture of two or more firms as partners shall comply with the following requirements:-

- (a) The tender, and in case of a successful tender, the Form of Agreement, shall be signed so as to be legally binding on all partners.
- (b) One of the partners shall be nominated as being in charge; and this authorization shall be evidenced by submitting a power of attorney signed by legally authorized signatories of all the partners.
- (c) The partner in charge shall be authorized to incur liabilities and receive instructions for and on behalf of any and all partners of the joint venture and the entire execution of the Sub-Contract including payment shall be done exclusively with the partner in charge.
- (d) All partners of the joint venture shall be liable jointly and severally for the execution of the Sub-Contract in accordance with the Sub-Contract terms, and a relevant statement to this effect shall be included in the authorization mentioned under (b) above as well as in the Form of Tender and the Form of Agreement (in case of a successful tender).
- (e) A copy of the agreement entered into by the joint venture partners shall be submitted with the tender.

3. Cost of Tendering

The tenderer shall bear all costs associated with the preparation and submission of his tender and the Employer will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the tendering process.

4. Site Visit

- 4.1 The tenderer is advised to visit and examine the Site and its surroundings and obtain for himself on his own responsibility, all information that may be necessary for preparing the tender and entering into a Sub-Contract. The costs of visiting the Site shall be the tenderer's own responsibility.
- 4.2 The tenderer and any of his personnel or agents will be granted permission by the Employer to enter upon premises and lands for the purpose of such inspection, but only upon the express condition that the tenderer, his personnel or agents, will release and indemnify the Employer from and against all liability in respect of, and will be responsible for personal injury (whether fatal or otherwise), loss of or damage to property and any other loss, damage, costs and expenses however caused, which but for the exercise of such permission, would not have arisen.
- 4.3 The Employer shall organize a site visit at a date to be notified. A representative of the Employer will be available to meet the intending tenderers at the Site.

Tenderers must provide their own transport. The representative will not be available at any other time for site inspection visits.

Each tenderer shall complete the Certificate of Tenderer's Visit to the Site, whether he in fact visits the Site at the time of the organized site visit or by himself at some other time.

TENDER DOCUMENTS

5. Tender Documents

- 5.1 The Tender documents comprise the documents listed here below and should be read together with any Addenda issued in accordance with Clause 7 of these instructions to tenderers.
- a. Special Notes for all Tenderers
 - b. Form of Tender
 - c. Form of Undertaking
 - d. Definitions
 - e. Instructions to Tenderers
 - f. Conditions of Contract
 - g. Agreement and Conditions of Sub-Contract for Building Works
 - h. Preliminaries and General Conditions
 - j. Technical Specifications for PABX Equipment
 - k. Bills of Quantities and Schedule of Unit Rates
 - l. Full Service Maintenance per year after expiry of defects liability period
 - m. Technical Schedule of Items Supplied
 - n. Standard Forms
 - o. Schedule of Drawings
- 5.2 The tenderer is expected to examine carefully all instructions, conditions, forms, terms, specifications and drawings in the tender documents. Failure to comply with the requirements for tender submission will be at the Tenderer's own risk. Pursuant to clause 23 of Instructions to Tenderers, tenders which are not substantially responsive to the requirements of the tender documents will be rejected.
- 5.3 All recipients of the documents for the proposed Sub-Contract for the purpose of submitting a tender (whether they submit a tender or not) shall treat the details of the documents as "private and confidential".

6. Clarification of Tender Documents

- 6.1 A prospective tenderer requiring any clarification of the tender documents may notify the Employer in writing or by telex, cable or facsimile at the Employer's mailing address indicated in the Invitation to Tender. The Employer will respond in writing to any request for clarification, which he receives earlier than 7 days prior to the deadline for the submission of tenders. Written copies of the Employer's response (including the query but without identifying the source of the inquiry) will be sent to all prospective tenderers who have purchased the tender documents.

7. Amendment of Tender Documents

- 7.1 At any time prior to the deadline for submission of tenders the Employer may, for any reason, whether at his own initiative or in response to a clarification requested by a prospective tenderer, modify the tender documents by issuing Addenda.
- 7.2 Any Addendum will be notified in writing or by cable, telex or facsimile to all prospective tenderers who have purchased the tender documents and will be binding upon them.
- 7.3 If during the period of tendering, any circular letters (tender notices) shall be issued to tenderers by, or on behalf of, the Employer setting forth the interpretation to be placed on a part of the tender documents or to make any change in them, such circular letters will form part of the tender documents and it will be assumed that the tenderer has taken account of them in preparing his tender. The tenderer must promptly acknowledge any circular letters he may receive.

- 7.4 In order to allow prospective tenderers reasonable time in which to take the Addendum into account in preparing their tenders, the Employer may, at his discretion, extend the deadline for the submission of tenders.

PREPARATION OF TENDERS

8. Language of Tender

- 8.1 The tender and all correspondence and documents relating to the tender exchanged between the tenderer and the Employer shall be written in the English language. Supporting documents and printed literature furnished by the tenderer with the tender may be in another language provided they are accompanied by an appropriate translation of pertinent passages in the above stated language. For the purpose of interpretation of the tender, the English language shall prevail.

9. Documents Comprising the Tender

- 9.1 The tender to be prepared by the tenderer shall comprise: the Form of Tender and Appendix thereto, a Tender Surety, the Priced Bills of Quantities and Schedules, the information on eligibility and qualification, and any other materials required to be completed and submitted in accordance with the Instructions to Tenderers embodied in these tender documents. The Forms, Bills of Quantities and Schedules provided in the tender documents shall be used without exception (subject to extensions of the schedules in the same format and to the provisions of clause 13.2 regarding the alternative forms of Tender Surety).

10. Tender Prices

- 10.1 All the insertions made by the tenderer shall be made in INK and the tenderer shall clearly form the figures. The relevant space in the Form of Tender and Bills of Quantities shall be completed accordingly without interlineations or erasures except those necessary to correct errors made by the tenderer in which case the erasures and interlineations shall be initialed by the person or persons signing the tender.

- 10.2 The tenderer for every item in the Bills of Quantities shall insert a price or rate whether the quantities are stated or not. Items against which no rate or price is entered by the tenderer will not be paid for by the Employer when executed and shall be deemed covered by the rates for other items and prices in the Bills of Quantities.

The prices and unit rates in the Bills of Quantities are to be the full [all-inclusive] value of the work described under the items, including all costs and expenses which may be necessary and all general risks, liabilities and obligations set forth or implied in the documents on which the tender is based. All duties and taxes and other levies payable by the Sub-Contractor under the Sub-Contract or for any other cause as of the date 7 days prior to the deadline for the submission of tenders, shall be included in the rates and prices and the total tender prices submitted by the Tenderer. Such duties to include import duty, Value Added Tax (VAT), local authority (levies) and any other taxes (levies that may be imposed by the government and/or local authorities.

Each price or unit rate inserted in the Bills of Quantities should be a realistic estimate for completing the activity or activities described under that particular item and the tenderer is advised against inserting a price or rate against any item contrary to this instruction.

Every rate entered in the Bills of Quantities, whether or not such rate be associated with a quantity, shall form part of the Sub-Contract. The Employer shall have the right to call for any item of work contained in the Bills of Quantities, and such items of work to be paid for at the rate entered by the tenderer and it is the intention of the Employer to take full advantage of unbalanced low rates.

- 10.3 Unless otherwise specified the tenderer must enter the amounts representing 10% of the sub-total of the summary of the Bills of Quantities for Contingencies and Variation of Prices [V.O.P.] payments in the summary sheet and add them to the sub-total to arrive at the tender amount.
- 10.4 The tenderer shall furnish with his tender written confirmation from his suppliers or manufacturers of unit rates for the supply of items listed in the Conditions of Contract where appropriate.
- 10.5 The rates and prices quoted by the tenderer are subject to adjustment during the performance of the Sub-Contract only in accordance with the provisions of the Conditions of Contract. The tenderer shall complete the schedule of basic rates and shall submit with his tender such other supporting information as required under the Conditions of Contract.

11. Currencies of Tender and Payment

- 11.1 Tenders shall be priced in Kenya Shillings and the tender sum shall be in Kenya Shillings.
- 11.2 Tenderers are required to indicate in the Statement of Foreign Currency Requirements, which forms part of the tender, the foreign currency required by them. Such currency should generally be the currency of the country of the Tenderer's main office. However, if a substantial portion of the Tenderer's expenditure under the Sub-Contract is expected to be in countries other than his country of origin, then he may state a corresponding portion of the Sub-Contract price in the currency of those other countries. However, the foreign currency element is to be limited to two (2) different currencies and a maximum of 30% (thirty percent) of the Sub-Contract Price.
- 11.3 The rate of exchange used for pricing the tender shall be selling rate or rates of the Central Bank ruling on the date seven (7) days before the final date for the submission of tenders.
- 11.4 Tenderers must enclose with their tenders, a brief justification of the foreign currency requirements stated in their tenders.

12. Tender Validity

- 12.1 The tender shall remain valid and open for acceptance for a period of one hundred and twenty (120) days from the specified date of tender opening or from the extended date of tender opening (in accordance with clause 7.4 here above) whichever is the later.
- 12.2 In exceptional circumstances prior to expiry of the original tender validity period, the Employer may request the tenderer for a specified extension of the period of validity. The request and the responses thereto shall be made in writing or by cable, telex or facsimile. A tenderer may refuse the request without forfeiting his Tender Surety. A tenderer agreeing to the request will not be required nor permitted to modify his tender, but will be required to extend the validity of his Tender Surety correspondingly.

13. Tender Surety

- 13.1 The tenderer shall furnish as part of his tender, a Tender Surety in the amount stated in the Appendix to Instructions to Tenderers.
- 13.2 The unconditional Tender Surety shall be in Kenya Shillings and be in form of a certified cheque, a bank draft, an irrevocable letter of credit or a guarantee from a reputable Bank approved by the Employer located in the Republic of Kenya.

The format of the Surety shall be in accordance with the sample form of Tender Surety included in these tender documents; other formats may be permitted subject to the prior approval of the Employer. The Tender Surety shall be valid for THIRTY (30) days beyond the tender validity period.

- 13.3 Any tender not accompanied by an acceptable Tender Surety will be rejected by the Employer as non-responsive.
- 13.4 The Tender Sureties of unsuccessful tenderers will be returned as promptly as possible but not later than twenty eight (28) days after concluding the Sub-Contract execution and after a Performance Security has been furnished by the successful tenderer. The Tender Surety of the successful tenderer will be returned upon the tenderer executing the Sub-Contract and furnishing the required Performance Security.
- 13.5 The Tender Surety may be forfeited:
 - (a) if a tenderer withdraws his tender during the period of tender validity: or
 - (b) in the case of a successful tenderer, if he fails
 - (i) to sign the Agreement, or
 - (ii) to furnish the necessary Performance Security
 - (c) if a tenderer does not accept the correction of his tender price pursuant to clause 24.

14. No Alternative Offers

- 14.1 The tenderer shall submit an offer, which complies fully with the requirements of the tender documents.

Only one tender may be submitted by each tenderer either by himself or as partner in a joint venture.

- 14.2 The tenderer shall not attach any conditions of his own to his tender. The tender price must be based on the tender documents. The tenderer is not required to present alternative construction options and he shall use without exception, the Bills of Quantities as provided, with the amendments as notified in tender notices, if any, for the calculation of his tender price.

Any tenderer who fails to comply with this clause will be disqualified.

15 Pre-Tender Meeting

- 15.1 The tenderer's designated representative is invited to attend a pre-tender meeting, which if convened, will take place at the venue and time stated in the Invitation to Tender. The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.
- 15.2 The tenderer is requested as far as possible to submit any questions in writing or by cable, to reach the Employer not later than seven days before the meeting. It may not be practicable at the meeting to answer questions received late, but questions and responses will be transmitted in accordance with the following:
 - (a) Minutes of the meeting, including the text of the questions raised and the responses given together with any responses prepared after the meeting, will be transmitted without delay to all purchasers of the tender documents. Any modification of the tender documents listed in --Clause 9 which may become necessary as a result of the pre-tender meeting shall be made by the Employer exclusively through the issue of a tender notice pursuant to Clause 7 and not through the minutes of the pre-tender meeting.

- (b) Non attendance at the pre-tender meeting will not be cause for disqualification of a bidder.

16 Format and Signing of Tenders

- 16.1 The tenderer shall prepare his tender as outlined in clause 9 above and mark appropriately one set "ORIGINAL" and the other "COPY".
- 16.2 The copy of the tender and Bills of Quantities shall be typed or written in indelible ink and shall be signed by a person or persons duly authorized to sign on behalf of the tenderer. Proof of authorization shall be furnished in the form of the written power of attorney, which shall accompany the tender. All pages of the tender where amendments have been made shall be initialed by the person or persons signing the tender.
- 16.3 The complete tender shall be without alterations, interlineations or erasures, except as necessary to correct errors made by the tenderer, in which case such corrections shall be initialed by the person or persons signing the tender.

SUBMISSION OF TENDERS

17 Sealing and Marking of Tenders

- 17.1 The tenderer shall seal the original and copy of the tender in separated envelopes, duly marking the envelopes as "ORIGINAL" and "COPY". The envelopes shall then be sealed in an outer envelope.
- 17.2 The inner and outer envelopes shall be addressed to the Employer at the address stated in the Appendix to Instructions to Tenderers and bear the name and identification of the Sub-Contract stated in the said Appendix with a warning not to open before the date and time for opening of tenders stated in the said Appendix.
- 17.3 The inner envelopes shall each indicate the name and address of the tenderer to enable the tender to be returned unopened in case it is declared "late", while the outer envelope shall bear no mark indicating the identity of the tenderer.
- 17.4 If the outer envelope is not sealed and marked as instructed above, the Employer will assume no responsibility for the misplacement or premature opening of the tender. A tender opened prematurely for this cause will be rejected by the Employer and returned to the tenderer.

18. Deadline for Submission of Tenders

- 18.1 Tenders must be received by the Employer at the address specified in clause 17.2 and on the date and time specified in the Letter of Invitation, subject to the provisions of clause 7.4, 18.2 and 18.3.
- Tenders delivered by hand must be placed in the "tender box" provided in the office of the Employer.
- Proof of posting will not be accepted as proof of delivery and any tender delivered after the above stipulated time, from whatever cause arising will not be considered.
- 18.2 The Employer may, at his discretion, extend the deadline for the submission of tenders through the issue of an Addendum in accordance with clause 7, in which case all rights and obligations of the Employer and the tenderers previously subject to the original deadline shall thereafter be subject to the new deadline as extended.
- 18.3 Any tender received by the Employer after the prescribed deadline for submission of tender will be returned unopened to the tenderer.

Modification and Withdrawal of Tenders

- 18.4 The tenderer may modify or withdraw his tender after tender submission, provided that written notice of the modification or withdrawal is received by the Employer prior to prescribed deadline for submission of tenders.
- 18.5 The Tenderer's modification or withdrawal notice shall be prepared, sealed, marked and dispatched in accordance with the provisions for the submission of tenders, with the inner and outer envelopes additionally marked "MODIFICATION" or "WITHDRAWAL" as appropriate.
- 18.6 No tender may be modified subsequent to the deadline for submission of tenders.
- 18.7 No tender may be withdrawn in the interval between the deadline for submission of tenders and the period of tender validity specified on the tender form. Withdrawal of a tender during this interval will result in the forfeiture of the Tender Surety.
- 18.8 Subsequent to the expiration of the period of tender validity prescribed by the Employer, and the tenderer having not been notified by the Employer of the award of the Sub-Contract or the tenderer does not intend to conform with the request of the Employer to extend the prior of tender validity, the tenderer may withdraw his tender without risk of forfeiture of the Tender Surety.

TENDER OPENING AND EVALUATION

19 Tender Opening

- 19.1 The Employer will open the tenders in the presence of the tenderers' representatives who choose to attend at the time and location indicated in the Letter of Invitation to Tender. The tenderers' representatives who are present shall sign a register evidencing their attendance.
- 19.2 Tenders for which an acceptable notice of withdrawal has been submitted, pursuant to clause 19, will not be opened. The Employer will examine the tenders to determine whether they are complete, whether the requisite Tender Sureties have been furnished, whether the documents have been properly signed and whether the tenders are generally in order.
- 19.3 At the tender opening, the Employer will announce the Tenderer's names, total tender price, tender price modifications and tender withdrawals, if any, the presence of the requisite Tender Surety and such other details as the Employer, at his discretion, may consider appropriate. No tender shall be rejected at the tender opening except for late tenders.
- 19.4 The Employer shall prepare minutes of the tender opening including the information disclosed to those present.
- 19.5 Tenders not opened and read out at tender opening shall not be considered further for evaluation, irrespective of the circumstances.

20 Process to be Confidential

- 20.1 After the public opening of tenders, information relating to the examination, clarification, evaluation and comparisons of tenders and recommendations concerning the award of Sub-Contract shall not be disclosed to tenderers or other persons not officially concerned with such process until the award of Sub-Contract is announced.
- 21.2 Any effort by a tenderer to influence the Employer in the process of examination, evaluation and comparison of tenders and decisions concerning award of Sub-Contract

may result in the rejection of the Tenderer's tender.

21 Clarification Tenders

21.1 To assist in the examination, evaluation and comparison of tenders, the Employer may ask tenderers individually for clarification of their tenders, including breakdown of unit prices. The request for clarification and the response shall be in writing or by cable, facsimile or telex, but no change in the price or substance of the tender shall be sought, offered or permitted except as required to confirm the correction of arithmetical errors discovered by the employer during the evaluation of the tenders in accordance with clause 24.

21.2 No Tenderer shall contact the Employer on any matter relating to his tender from the time of the tender opening to the time the Sub-Contract is awarded. If the tenderer wishes to bring additional information to the notice of the Employer, he shall do so in writing.

22 Determination of Responsiveness

22.1 Prior to the detailed evaluation of tenders, the Employer will determine whether each tender is substantially responsive to the requirements of the tender documents.

22.2 For the purpose of this clause, a substantially responsive tender is one, which conforms to all the terms, conditions and specifications of the tender documents without material deviation or reservation and has a valid bank guarantee. A material deviation or reservation is one which affects in any substantial way the scope, quality, completion timing or administration of the Works to be undertaken by the tenderer under the Sub-Contract, or which limits in any substantial way, inconsistent with the tender documents, the Employer's rights or the tenderers obligations under the Sub-Contract and the rectification of which would affect unfairly the competitive position of other tenderers who have presented substantially responsive tenders.

22.3 Each price or unit rate inserted in the Bills of Quantities shall be a realistic estimate of the cost of completing the works described under the particular item including allowance for overheads, profits and the like. Should a tender be seriously unbalanced in relation to the Employer's estimate of the works to be performed under any item or groups of items, the tender shall be deemed not responsive.

22.4 A tender determined to be not substantially responsive will be rejected by the Employer and may not subsequently be made responsive by the tenderer by correction of the non-conforming deviation or reservation.

23 Correction of Errors

Tenders determined to be substantially responsive shall be checked by the Employer for any arithmetic errors in the computations and summations. Errors will be corrected by the Employer as follows:

- (a) Where there is a discrepancy between the amount in figures and the amount in words, the amount in words will govern.
- (b) Where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will prevail, unless in the opinion of the Employer, there is an obvious typographical error, in which case adjustment will be made to the entry containing that error.

- (c) The amount stated in the tender will be adjusted in accordance with the above procedure for the correction of errors and, with concurrence of the tenderer, shall be considered as binding upon the tenderer. If the tenderer does not accept the corrected amount, the tender may be rejected and the Tender Security may be forfeited in accordance with clause 13.

24 Conversion to Single Currency

- 24.1 For compensation of tenders, the tender price shall first be broken down into the respective amounts payable in various currencies by using the selling rate or rates of the Central Bank of Kenya ruling on the date seven (7) days before the final date for the submission of tenders.
- 24.2 The Employer will convert the amounts in various currencies in which the tender is payable (excluding provisional sums but including Day-works where priced competitively) to Kenya Shillings at the selling rates stated in clause 25.1.

25 Evaluation and Comparison of Tenders

- 25.1 The Employer will evaluate only tenders determined to be substantially responsive to the requirements of the tender documents in accordance with clause 23.
- 25.2 In evaluating tenders, the Employer will determine for each tender the evaluated tender price by adjusting the tender price as follows:
 - (a) Making any correction for errors pursuant to clause 24.
 - (b) Excluding Provisional Sums and provision, if any, for Contingencies in the Bills of Quantities, but including Day works where priced competitively.
- 25.3 The Employer reserves the right to accept any variation, deviation or alternative offer. Variations, deviations, alternative offers and other factors which are in excess of the requirements of the tender documents or otherwise result in the accrual of unsolicited benefits to the Employer, shall not be taken into account in tender evaluation.
- 25.4 Price adjustment provisions in the Conditions of Contract applied over the period of execution of the Sub-Contract shall not be taken into account in tender evaluation.
- 25.5 If the lowest evaluated tender is seriously unbalanced or front loaded in relation to the Employer's estimate of the items of work to be performed under the Sub-Contract, the Employer may require the tenderer to produce detailed price analyses for any or all items of the Bills of Quantities, to demonstrate the relationship between those prices, proposed construction methods and schedules. After evaluation of the price analyses, the Employer may require that the amount of the Performance Security set forth in clause 29 be increased at the expense of the successful tenderer to a level sufficient to protect the Employer against financial loss in the event of subsequent default of the successful tenderer under the Sub-Contract.
- 25.6 Firms incorporated in Kenya where indigenous Kenyans own 51% or more of the share capital shall be allowed a 10% preferential bias provided that they do not sub-contract work valued at more than 50% of the Sub-Contract Price excluding Provisional Sums to a non-indigenous sub-contractor.

AWARD OF SUB-CONTRACT

26 Award

- 26.1 Subject to clause 27.2, the Employer will award the Sub-Contract to the tenderer whose tender is determined to be substantially responsive to the tender documents and who has offered the lowest evaluated tender price subject to possessing the capability and resources to effectively carry out the Sub-Contract Works.
- 26.2 The Employer reserves the right to accept or reject any tender, and to annul the tendering process and reject all tenders, at any time prior to award of Sub-Contract, without thereby incurring any liability to the affected tenderers or any obligation to inform the affected tenderers of the grounds for the Employer's action.

27 Notification of Award

- 27.1 Prior to the expiration of the period of tender validity prescribed by the Employer, the Employer will notify the successful tenderer by cable, telefax or telex and confirmed in writing by registered letter that his tender has been accepted. This letter (hereinafter and in all Sub-Contract documents called "Letter of Acceptance") shall name the sum (hereinafter and in all Sub-Contract documents called "the Sub-Contract Price") which the Employer will pay to the Sub-Contractor in consideration of the execution and completion of the Works as prescribed by the Sub-Contract.
- 27.2 Notification of award will constitute the formation of the Sub-Contract.
- 27.3 Upon the furnishing of a Performance Security by the successful tenderer, the unsuccessful tenderers will promptly be notified that their tenders have been unsuccessful.
- 27.4 Within Fourteen [14] days of receipt of the form of Sub-Contract Agreement from the Employer, the successful tenderer shall sign the form and return it to the Employer together with the required Performance Security.

28 Performance Guarantee

- 28.1 Within Fourteen [14] days of receipt of the notification of award from the Employer, the successful tenderer shall furnish the Employer with a Performance Security in an amount stated in the Appendix to Instructions to Tenderers.
- 28.2 The Performance Security to be provided by the successful tenderer shall be an unconditional Bank Guarantee issued at the Tenderer's option by an established and a reputable Bank approved by the Employer and located in the Republic of Kenya and shall be divided into two elements namely, a performance security payable in foreign currencies and a performance security payable in Kenya Shillings. The value of the two securities shall be in the same proportions of foreign and local currencies as requested in the form of foreign currency requirements.
- 28.3 Failure of the successful tenderer to lodge the required Performance Security shall constitute a breach of Sub-Contract and sufficient grounds for the annulment of the award and forfeiture of the Tender Security and any other remedy under the Sub-Contract. The Employer may award the Sub-Contract to the next ranked tenderer.

29 Advance Payment

An advance payment, if approved by the Employer, shall be made under the Sub-Contract, if requested by the Sub-Contractor. The Advance Payment Guarantee shall be denominated in the proportion and currencies named in the form of foreign currency requirements. For each currency, a separate guarantee shall be issued. The guarantee shall be issued by a bank located in the Republic of Kenya, or a foreign bank through a correspondent bank located in the Republic of Kenya, in either case subject to the approval of the Employer.

APPENDIX TO INSTRUCTIONS TO TENDERERS

1. CLAUSE 2.1

Change to read “This invitation Tender is open to all tenderers in the Category Specified”.

2. OMIT

Clauses 2.3, 4.3, 5.1, 11.2, 11.4, 25, 14.1, 13.1, 13.3, 13.4, 13.5, 15.1, 15.2

3. ADD TO CLAUSE 13.1 and 13.2

Tender surety will be required and the Tender Security shall be **2 % of the sub contract sum**.

4. CLAUSES 16.1 and 16.2

Only one set of tender document shall be submitted.

5. CLAUSES 6.1 AND 10.2

Change to 7 days (1 week)

6. CLAUSE 9.1

Appendix to Form of Tender to be omitted.

7. CLAUSE 19.2

Only the single tender document should be marked “WITHDRAWAL” OR “MODIFICATION”

8. CLAUSES 20.2, 20.3, AND 24(C)

Tender surety will be required.

9. CLAUSE 30

The Advance Payment Guarantee shall be in Kenya Shillings Only.

10. CLAUSE 16.1, 16.2, 17.1, and 17.2

Only one set of tender documents, filled in INK, shall be submitted.

11. ADD TO CLAUSE 28.1

Amount of performance security will be TEN per cent (10%) of sub-contract sum and bound to the appointed Main-contractor

12. ADD TO CLAUSE 28.2

Performance security shall not be divided in two elements and shall be payable in Kenya Shillings Only.

13. TENDER EVALUATION CRITERIA

The following information for procurement of services shall complement or amend the provisions of the instructions to tenderers. Wherever there is a conflict between the provisions of the instructions to tenderers and the provisions of the Appendix, the provisions of the Appendix herein shall prevail over those of the instructions to tenderers.

After tender opening, the tenders will be evaluated in 4 stages, namely:

1. Determination of Responsiveness (Mandatory Requirements)
2. Detailed Technical Examination
3. Financial Evaluation.
4. Recommendation for Tender Award

STAGE 1- DETERMINATION OF RESPONSIVENESS

This stage of evaluation shall involve examination of the pre-qualification conditions as set out in the Tender Advertisement Notice or Letter of Invitation to Tender and any other conditions stated in the bid document.

These conditions **MUST** include the following:

- i) Registration with Ministry of Public Works.
- ii) Certificate of Registration under Company's Act.
- iii) Manufacturers Letter of Authority.
- iv) Provision of Bid Security of Ksh 75,000(Seventy Five Thousand Shillings Only). Submitted in form of a Bank Guarantee or insurance bond from an Insurance company approved by the Public Procurement Oversight Authority (PPOA) and Valid beyond the Tender Validity Period.
- v) Completed Company Profile using the Qualification Information, Tender Questionnaire and Confidential Business provide in the Standard Forms.
- vi) Copy of current Tax Compliant Certificate issued by Kenya Revenue Authority (KRA) and valid beyond the tender closing date.
- vii) Provide Signed copies of Audited Company Accounts for the last 3years.

TECHNICAL EVALUATION CRITERIA

The detailed scoring plan shall be as shown in table 1 below: -

TABLE 1

| Item | Description (This includes Evaluation of Company Profile, Qualification Information, Tender Questionnaire and Confidential Business Questionnaire. | Point Scored | Max. Point | |
|------|---|--------------|------------|-----------|
| i | Key Personnel (Attach evidence) in the company relevant to the building construction industry who will actively be involved in the proposed project (MUST provide detailed CV accompanied by relevant academic and professional certificates from institutions recognized by the commission for higher education in Kenya Telephone contacts MUST be provided) | | | 30 |
| | Director of the firm <ul style="list-style-type: none"> Holder of degree/ diploma/HND in relevant Engineering field--5 Holder of certificate in relevant Engineering field-----3 Holder of trade test certificate in relevant Engineering field---2 No relevant certificate -----0 | | 5 | |
| | At least 1No. degree/diploma of key personnel in relevant Engineering field <ul style="list-style-type: none"> With over 10 years relevant experience -----10 With Between 5-9years relevant experience ----- 5 With under 5 years relevant experience ----- 1 | | 10 | |
| | At least 1No certificate holder of key personnel in relevant Engineering field <ul style="list-style-type: none"> With over 10 years relevant experience ----- 10 With Between 5-9years relevant experience ----- 5 With under 5 years relevant experience -----1 | | 10 | |
| | At least 2No artisan (trade test certificate in relevant Engineering field) <ul style="list-style-type: none"> Artisan with over 10 years relevant experience ----- 5 Artisan with Between 4-9 years relevant experience ----- 3 Artisan with Below 4years relevant experience ----- 1 Non skilled worker with over 10 years relevant experience ----1 | | 5 | |
| ii | Contract completed in the last five (5) years (Max of 5 No. Projects) <ul style="list-style-type: none"> Project of Similar nature Valued at Kshs. 20 Million and Above --4 Project of Similar nature valued between Kshs.10Million-19Million----- 2 Project of Similar nature valued below Kshs.10Million----- 0 No completed project of similar nature ----- 0 | | 20 | 40 |
| iii | On-going projects (Max of 5 No. Projects) <ul style="list-style-type: none"> Project of Similar nature Valued at Kshs. 20 Million and Above --4 Project of Similar nature valued between Kshs.10Million-19Million----- 2 Project of Similar nature valued below Kshs.10Million----- 0 No ongoing project of similar nature - -----0 | | 20 | |

PART B:
CONDITIONS OF CONTRACT

PART B: **CONDITIONS OF CONTRACT**

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PART B: CONDITIONS OF CONTRACT

1. Definitions

- 1.1 In this Contract, except where context otherwise requires, the following terms shall be interpreted as indicated;

“Bills of Quantities” means the priced and completed Bill of Quantities forming part of the tender [where applicable].

“Schedule of Rates” means the priced Schedule of Rates forming part of the tender [where applicable].

“The Completion Date” means the date of completion of the Works as certified by the Employer’s Representative.

“The Contract” means the agreement entered into by the Employer and the Contractor as recorded in the Agreement Form and signed by the parties.

“The Contractor” refers to the person or corporate body whose tender to carry out the Works has been accepted by the Employer.

“The Contractor’s Tender” is the completed tendering document submitted by the Contractor to the Employer.

“The Contract Price” is the price stated in the Letter of Acceptance.

“Days” are calendar days; **“Months” are** calendar months.

“A Defect” is any part of the Works not completed in accordance with the Contract.

“The Defects Liability Certificate” is the certificate issued by Employer’s Representative upon correction of defects by the Contractor.

“The Defects Liability Period” is the period named in the Appendix to Conditions of Contract and calculated from the Completion Date.

“Drawings” include calculations and other information provided or approved by the Employer’s Representative for the execution of the Contract.

“Employer” includes Central or Local Government administration, Universities, Public Institutions and Corporations and is the party who employs the Contractor to carry out the Works.

“Equipment” is the Contractor’s machinery and vehicles brought temporarily to the Site for the execution of the Works.

“Site” means the place or places where the permanent Works are to be carried out including workshops where the same is being prepared.

“Materials” are all supplies, including consumables, used by the Contractor for incorporation in the Works.

“Employer’s Representative” is the person appointed by the Employer and notified to the Contractor for the purpose of supervision of the Works.

“Specification” means the Specification of the Works included in the Contract.

“Start Date” is the date when the Contractor shall commence execution of the Works.

“A Sub-contractor” is a person or corporate body who has a Contract with the Contractor to carry out a part of the Work in the Contract, which includes Work on the Site.

“Temporary works” are works designed, constructed, installed, and removed by the Contractor which are needed for construction or installation of the Works.

“A Variation” is an instruction given by the Employer’s Representative which varies the Works.

“The Works” are what the Contract requires the Contractor to construct, install, and turnover to the Employer.

2. Contract Documents

- 2.1 The following documents shall constitute the Contract documents and shall be interpreted in the following order of priority;
- (1) Agreement,
 - (2) Letter of Acceptance,
 - (3) Contractor’s Tender,
 - (4) Conditions of Contract,
 - (5) Specifications,
 - (6) Drawings,
 - (7) Bills of Quantities or Schedule of Rates [whichever is applicable]

3. Employer’s Representative’s Decisions

- 3.1 Except where otherwise specifically stated, the Employer’s Representative will decide contractual matters between the Employer and the Contractor in the role representing the Employer.

4. Works, Language and Law of Contract

- 4.1 The Contractor shall construct and install the Works in accordance with the Contract documents. The Works may commence on the Start Date and shall be carried out in accordance with the Programme submitted by the Contractor, as updated with the approval of the Employer’s Representative, and complete them by the Intended Completion Date.
- 4.2 The ruling language of the Contract shall be English language and the law governing the Contract shall be the law of the Republic of Kenya.

5. Safety, Temporary Works and Discoveries

- 5.1 The Contractor shall be responsible for design of temporary works and shall obtain approval of third parties to the design of the temporary works where required.
- 5.2 The Contractor shall be responsible for the safety of all activities on the Site.
- 5.3 Any thing of historical or other interest or significant value unexpectedly discovered on the Site shall be the property of the Employer. The Contractor shall notify the Employer’s Representative of such discoveries and carry out the Employer’s Representative’s instructions for dealing with them.

6. Work Programme and Sub-Contracting

- 6.1 Within seven days after Site possession date, the Contractor shall submit to the Employer's Representative for approval a programme showing the general methods, arrangements, order and timing for all the activities in the Works.
- 6.2 The Contractor may sub-contract the Works (but only to a maximum of 25 percent of the Contract Price) with the approval of the Employer's Representative. However, he shall not assign the Contract without the approval of the Employer in writing. Sub-contracting shall not alter the Contractor's obligations.

7. The Site

- 7.1 The Employer shall give possession of all parts of the Site to the Contractor.
- 7.2 The Contractor shall allow the Employer's Representative and any other person authorized by the Employer's Representative, access to the Site and to any place where work in connection with the Contract is being carried out or is intended to be carried out.

8. Instructions

- 8.1 The Contractor shall carry out all instructions of the Employer's Representative which are in accordance with the Contract.

9. Extension of Completion Date

- 9.1 The Employer's Representative shall extend the Completion Date if an occurrence arises which makes it impossible for completion to be achieved by the Intended Completion Date. The Employer's Representative shall decide whether and by how much to extend the Completion Date.
- 9.2 For the purposes of this Clause, the following occurrences shall be valid for consideration;
- Delay by: -
- (a) force majeure, or
 - (b) reason of any exceptionally adverse weather conditions, or
 - (c) reason of civil commotion, strike or lockout affecting any of the trades employed upon the Works or any of the trades engaged in the preparation, manufacture or transportation of any of the goods or materials required for the Works, or
 - (d) reason of the Employer's Representative's instructions issued under these Conditions, or
 - (e) reason of the contractor not having received in due time necessary instructions, drawings, details or levels from the Employer's Representative for which he specifically applied in writing on a date which having regard to the date for Completion stated in the appendix to these Conditions or to any extension of time then fixed under this Clause was neither unreasonably distant from nor unreasonably close to the date on which it was necessary for him to receive the same, or

- (f) delay on the part of artists, tradesmen or others engaged by the Employer in executing work not forming part of this Contract, or
- (g) reason of delay by statutory or other services providers or similar bodies engaged directly by the Employer, or
- (h) reason of opening up for inspection of any Work covered up or of the testing or any of the Work, materials or goods in accordance with these conditions unless the inspection or test showed that the Work, materials or goods were not in accordance with this Contract, or
- (i) reason of delay in appointing a replacement Employer's Representative, or
- (j) reason of delay caused by the late supply of goods or materials or in executing Work for which the Employer or his agents are contractually obliged to supply or to execute as the case may be, or
- (k) delay in receiving possession of or access to the Site.

10. Management Meetings

- 10.1 A Contract management meeting shall be held regularly and attended by the Employer's Representative and the Contractor. Its business shall be to review the plans for the remaining Work. The Employer's Representative shall record the business of management meetings and provide copies of the record to those attending the meeting and the Employer. The responsibility of the parties for actions to be taken shall be decided by the Employer's Representative either at the management meeting or after the management meeting and stated in writing to all who attend the meeting.
- 10.2 Communication between parties shall be effective only when in writing.

11. Defects

- 11.1 The Employer's Representative shall inspect the Contractor's work and notify the Contractor of any defects that are found. Such inspection shall not affect the Contractor's responsibilities. The Employer's Representative may instruct the Contractor to search for a defect and to uncover and test any Work that the Employer's Representative considers may have a defect. Should the defect be found, the cost of uncovering and making good shall be borne by the Contractor. However, if there is no defect found, the cost of uncovering and making good shall be treated as a variation and added to the Contract Price.
- 11.2 The Employer's Representative shall give notice to the Contractor of any defects before the end of the Defects Liability Period, which begins at Completion, and is defined in the Appendix to Conditions of Contract.
- 11.3 Every time notice of a defect is given, the Contractor shall correct the notified defect within the length of time specified by the Employer's Representative's notice. If the Contractor has not corrected a defect within the time specified in the Employer's Representative's notice, the Employer's Representative will assess the cost of having the defect corrected by other parties and such cost shall be treated as a variation and be deducted from the Contract Price.

12. Bills of Quantities/Schedule of Rates

- 12.1 The Bills of Quantities/Schedule of Rates shall contain items for the construction, installation, testing and commissioning of the Work to be done by the Contractor. The Contractor will be paid for the quantity of the Work done at the rates in the Bills of Quantities/Schedule of Rates for each item. Items against which no rate is entered by the Tenderer will not be paid for when executed and shall be deemed covered by the rates for other items in the Bills of Quantities/Schedule of Rates.
- 12.2 Where Bills of Quantities do not form part of the Contract, the Contract Price shall be a lump sum (which shall be deemed to have been based on the rates in the Schedule of Rates forming part of the tender) and shall be subject to re-measurement after each stage.

13. Variations

- 13.1 The Contractor shall provide the Employer's Representative with a quotation for carrying out the variations when requested to do so. The Employer's Representative shall assess the quotation and shall obtain the necessary authority from the Employer before the variation is ordered.
- 13.2 If the Work in the variation corresponds with an item description in the Bill of Quantities/Schedule of Rates, the rate in the Bill of Quantities/Schedule of Rates shall be used to calculate the value of the variation. If the nature of the Work in the variation does not correspond with items in the Bill of Quantities/Schedule of Rates, the quotation by the Contractor shall be in the form of new rates for the relevant items of Work.
- 13.3 If the Contractor's quotation is unreasonable, the Employer's Representative may order the variation and make a change to the Contract Price, which shall be based on the Employer's Representative's own forecast of the effects of the variation on the Contractor's costs.

14. Payment Certificates and Final Account

- 14.1 The Contractor shall be paid after each of the following stages of Work listed herebelow (subject to re-measurement by the Employer's Representative of the Work done in each stage before payment is made). In case of lump sum Contracts, the valuation for each stage shall be based on the quantities so obtained in the re-measurement and the rates in the Schedule of Rates.
- (i) Advance payment **NIL** (*percent of Contract Price,*
[after Contract execution] *to be inserted by the Employer*).
 - (ii) First stage (*define stage*) **AS PER PROGRESS**
 - (iii) Second stage (*define stage*) **AS PER PROGRESS**
 - (iv) Third stage (*define stage*) **AS PER PROGRESS**
 - (v) After defects liability period.
- 14.2 Upon deciding that Works included in a particular stage are complete, the Contractor shall submit to the Employer's Representative his application for payment. The Employer's Representative shall check, adjust if necessary and certify the amount to be paid to the Contractor within 21 days of receipt of the Contractor's application. The Employer shall pay the Contractor the amounts so certified within 30 days of the date of issue of each Interim Certificate.

- 14.3 The Contractor shall supply the Employer's Representative with a detailed final account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Employer's Representative shall issue a Defect Liability Certificate and certify any final payment that is due to the Contractor within 30 days of receiving the Contractor's account if it is correct and complete. If it is not, the Employer's Representative shall issue within 21 days a schedule that states the scope of the corrections or additions that are necessary. If the final account is still unsatisfactory after it has been resubmitted, the Employer's Representative shall decide on the amount payable to the Contractor and issue a Final Payment Certificate.

The Employer shall pay the Contractor the amount so certified within 60 days of the issue of the Final Payment Certificate.

- 14.4 If the period laid down for payment to the Contractor upon each of the Employer's Representative's Certificate by the Employer has been exceeded, the Contractor shall be entitled to claim simple interest calculated pro-rata on the basis of the number of days delayed at the Central Bank of Kenya's average base lending rate prevailing on the first day the payment becomes overdue. The Contractor will be required to notify the Employer within 15 days of receipt of delayed payments of his intentions to claim interest.

15. Insurance

The Contractor shall be responsible for and shall take out appropriate cover against, among other risks, personal injury; loss of or damage to the Works, materials and plant; and loss of or damage to property.

16. Liquidated Damages

- 16.1 The Contractor shall pay liquidated damages to the Employer at the rate 0.01 per cent of the Contract price per day for each day that the actual Completion Date is later than the Intended Completion Date except in the case of any of the occurrences listed under Clause 9.2. The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages shall not affect the Contractor's liabilities.

17. Completion and Taking Over

- 17.1 Upon deciding that the Work is complete the Contractor shall request the Employer's Representative to issue a Certificate of Completion of the Works, upon deciding that the Work is completed.
The Employer shall take over the Site and the Works within seven days of the Employer's Representative issuing a Certificate of Completion.

18. Termination

- 18.1 The Employer or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract. These fundamental breaches of Contract shall include, but shall not be limited to, the following;
- (a) the Contractor stops Work for 30 days continuously without reasonable cause or authority from the Employer's Representative;
 - (b) the Contractor is declared bankrupt or goes into liquidation other than for a reconstruction or amalgamation;
 - (c) a payment certified by the Employer's Representative is not paid by the Employer to the Contractor within 30 days after the expiry of the payment periods stated in Sub-Clauses

14.2 and 14.3 hereabove.

- (d) the Employer's Representative gives notice that failure to correct a particular defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time.

18.2 If the Contract is terminated, the Contractor shall stop Work immediately, and leave the Site as soon as reasonably possible. The Employer's Representative shall immediately thereafter arrange for a meeting for the purpose of taking record of the Works executed and materials, goods, equipment and temporary buildings on Site.

19. Payment Upon Termination

19.1 The Employer may employ and pay other persons to carry out and complete the Works and to rectify any defects and may enter upon the Works and use all materials on Site, plant, equipment and temporary works.

19.2 The Contractor shall, during the execution or after the completion of the Works under this Clause, remove from the Site as and when required within such reasonable time as the Employer's Representative may in writing specify, any temporary buildings, plant, machinery, appliances, goods or materials belonging to him, and in default thereof, the Employer may (without being responsible for any loss or damage) remove and sell any such property of the Contractor, holding the proceeds less all costs incurred to the credit of the Contractor.

19.3 Until after completion of the Works under this Clause, the Employer shall not be bound by any other provision of this Contract to make any payment to the Contractor, but upon such completion as aforesaid and the verification within a reasonable time of the accounts therefore the Employer's Representative shall certify the amount of expenses properly incurred by the Employer and, if such amount added to the money paid to the Contractor before such determination exceeds the total amount which would have been payable on due completion in accordance with this Contract, the difference shall be a debt payable to the Employer by the Contractor; and if the said amount added to the said money be less than the said total amount, the difference shall be a debt payable by the Employer to the Contractor.

20 Corrupt Gifts and Payments of Commission

20.1 The Contractor shall not:

- (a) Offer or give or agree to give to any person in the service of the Employer any gifts or consideration of any kind as an inducement or reward for doing or forbearing to do or for having done or forborne to do any act in relation to the obtaining or execution of this or any other contract with the Employer or for showing or forbearing to show favour or disfavour to any person in relation to this or any other contract with the Employer.
- (b) Any breach of this Condition by the Contractor or by anyone employed by him or acting on his behalf (whether with or without the knowledge of the Contractor) shall be an offence under the Laws of Kenya.

21. Settlement of Disputes

21.1 Any dispute arising out of the Contract which cannot be amicably settled between the parties shall be referred by either party to the arbitration and final decision of a person to be agreed between the parties. Failing agreement to concur in the appointment of an Arbitrator, the Arbitrator shall be appointed by the chairman of the Chartered Institute of Arbitrators, Kenya branch, on the request of the

applying party.

22. APPENDIX TO CONDITIONS OF CONTRACT

THE EMPLOYER IS

Name: **Central Bank of Kenya**

Address: **P.O. Box 60000-00200, NAIROBI**

Name of Employer's Representative: **Director, Department of Estates, Supplies and Transport**

Address: **P.O. Box 60000-00200, NAIROBI**

The Works consist of **Supply, Delivery and Installation of PABX Equipment**

The Start Date shall be **as stated in the Letter of Acceptance**

The Intended Completion Date for the whole of the Works shall be **as stated in the letter of acceptance.**

The following documents also form part of the Contract: **(Only as listed in Clause 2)**

The Site Possession Date shall be **as stated in the letter of acceptance.**

The Site is located **along Haile Selassie Avenue.**

The Defects Liability period is **6 Months**

Amount of Tender Security: **2% of the sub-contract sum**

The name and Address of the Employer's representative for the purposes of submission of tenders is the **Project Architect, Edon Consultants International Ltd., P. O. Box 19684-00200, Nairobi.**

The tender opening date and time is **as per invitation letter.**

The amount of performance security is **10 percent** bank guarantee of the Sub-Contract Price.

Period of final measurement : **3 months after practical completion**

Liquidated and Ascertained damages: **Will be calculated pro rat to the main contract agreement**

Prime cost sums for which the

Contractor desires to tender : **NIL**

Period of honouring certificate : **To be advised**

Percentage of certified value retained: **10%**

Limit of retention fund : **5%**

PART C:

AGREEMENT AND CONDITIONS

OF SUB-CONTRACT FOR

BUILDING WORKS

PART C: AGREEMENT AND CONDITIONS OF SUB-CONTRACT FOR BUILDING WORKS

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ORIGINAL
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COUNTERPART
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1.0 AGREEMENT

1.1 This agreement is made on
between.....
of (or whose registered office is situated at).....
.....
(hereinafter called “the Contractor”) of the one part.....
and.....
of (or whose registered office is situated at).....
.....
(hereinafter called “the Sub-Contractor”) of the other part:

1.2 **SUPPLEMENTAL** to an agreement (hereinafter referred to as “the main contract”)
made on.....
between.....
.....
(hereinafter called “the Employer”) of the one part and the Contractor of the other part based on
the Agreement and Conditions of Contract for Building Works, published by the joint Building
Council, Kenya..... edition.

1.3 **WHEREAS** the Contractor is desirous of sub-letting to the Sub-Contractor.....
.....
.....
.....
Hereinafter called “the sub-contract works” at.....

On Land Reference No..... being part of the main contract works.

1.4 And whereas the Sub-Contractor has supplied the Contractor with a priced copy of the bills of
quantities (hereinafter referred to as “the sub-contract bills”), where applicable, which together
with the drawings numbered.....
.....
(hereinafter referred to as “the sub-contract drawings”), the specifications and the conditions of
sub-contract have been signed by or on behalf of the parties thereto.

And whereas the Sub-Contractor has had reasonable opportunity of inspecting the main contract or
a copy thereof except the detailed prices of the Contractor included in the bills of quantities or
schedule of rates.

1.5 And whereas the Architect, with the approval of the Employer, has nominated the Sub-Contractor
to carry out the works described at clause 1.3 herein:

NOW IT IS HEREBY AGREED AS FOLLOWS:

- 1.6 For the consideration herein stated, the Sub-Contractor shall upon and subject to the conditions annexed hereto carry out and complete the sub-contract works shown upon the sub-contract drawings and described by or referred to in the sub-contract bills, specifications and in the said conditions.
- 1.7 The Contractor shall pay the Sub-Contractor the sum of the Kshs (in words).....
.....
.....Kshs.....)
(hereinafter referred to as “the sub-contract price”) or such sum as shall become payable hereinafter at the times and in the manner specified in the said conditions.
- 1.8 The term ‘Architect’, ‘Quantity Surveyor’ and ‘Engineer’, where applicable, shall refer to the persons appointed by the Employer to administer the sub-contract in accordance with the main contract agreement. Where applicable, reference to the Architect shall be deemed to include reference to the Engineer.
- 1.9 In the event of the need to appoint a replacement Architect, Quantity Surveyor, Engineer or other specialist (whether named in this agreement or not) the Employer shall make such appointment as soon as practicable after the need for such appointment arises and shall communicate the appointment to the Sub-Contractor through the Contractor.
- 1.10 Where the sub-contract does not incorporate bills of quantities, the term “sub-contract bills” and “bills of quantities” wherever appearing shall be deemed deleted and replaced with the term “schedule of rates” as applicable.
- 1.11 The terms defined in clause 1.0 of the main contract shall have the same meaning in this sub-contract as that assigned to them therein.
- 1.12 AS WITNESS the hands of the said parties;

Signed by the said

.....(Contractor)

In the presence of

Name.....

Address.....

Signed by the said

.....(Sub-Contractor)

In the presence of

Name.....

Address.....

CONDITIONS OF SUB-CONTRACT

2.0 General Obligations of the Contractor

The Contractor shall:

- 2.1 Timeously obtain from the Architect on behalf of the Sub-Contractor all drawings, necessary details, instructions and other information required by the Sub-Contractor for the proper carrying out of the sub-contract works.
- 2.2 Provide all such facilities and attend upon the Sub-Contractor as required and as provided in the specifications, bills of quantities and these conditions to the extent compatible with the provisions of the main contract.
- 2.3 Observe, perform and comply with all the provisions of the main contract and of this sub-contract on the part of the Contractor to be observed, performed and complied with to ensure satisfactory completion of the sub-contract works.

3.0 General Obligation of the Sub-Contractor

- 3.1 The sub-Contractor shall be deemed to have notice of all the provisions of the main contract except the detailed prices of the Contractor included in the bills of quantities or in the schedule of rates
- 3.2 The Sub-Contractor shall carry out and complete the sub-contract works in accordance with this sub-contract and in all respects to the reasonable satisfaction of the Contractor and of the Architect and in conformity with all reasonable directions and requirements of the Contractor regulating the due carrying out of the contract works.
- 3.3 The Sub-Contractor shall observe, perform and comply with all the provisions of the main contract on the part of the Sub-Contractor to be observed, performed and complied with so far as they relate and apply to the sub-contract works or any portion thereof and are not inconsistent with the express provisions of this sub-contract as if all the same were set out herein.
- 3.4 Without prejudice to the generality of the foregoing requirements, the Sub-Contractor shall especially observe perform and comply with the provisions of clauses 9.0, 18.0, 19.0, 22.0, 30.0, 31.0, 34.0, and 36.0 of the main contract as they apply to the sub-contract works.

4.0 Sub-Contract Documents

- 4.1 The sub-contract documents for use in the carrying out of the sub-contract works shall be:-
 - 4.1.1 The agreement and these conditions.
 - 4.1.2 The sub-contract drawings as listed in the agreement
 - 4.1.3 The sub-contract bill of quantities or schedule of rates as applicable.
 - 4.1.4 The specifications as separately supplied or as contained in the sub-contract bills.
- 4.2 Upon the execution of the sub-contract, the Contractor shall register the agreement with the relevant statutory authority and pay all fees, charges, taxes, duties and all costs arising therefrom.

- 4.3 The manner of supplying contract documents, their custody, display on site and their interpretation in the event of discrepancies shall be as provided in the main contract in respect of the main contract documents with the necessary amendments made to refer to the sub-contract.

5.0 General Liability of the Sub-Contractor

- 5.1 The Sub-Contractor shall be liable for and shall indemnify the Contractor against and from:
- 5.1.1 Any breach, non-observance or non-performance by the Sub-Contractor, his servants or agents of any of the said provisions of the main contract and of this sub-contract.
 - 5.1.2 Any act or omission of the Sub-Contractor, his servants or agents which involve the Contractor in any liability to the Employer under the main contract.
 - 5.1.3 Any claim, damage, loss or expense due to or resulting from any negligence or breach of duty on the part of the Sub-Contractor, his servants or agents.
 - 5.1.4 Any loss or damage resulting from any claim under any statute or common law by an employee of the Sub-Contractor in respect of personal injury or death arising out of or in the course of his employment.
- 5.2 Provided that nothing contained in this sub-contract shall impose any liability on the Sub-Contractor in respect of any negligence or breach of duty on the part of the Employer, the Contractor, other sub-contractors or their respective servants or agents nor create any privity of contract between the Sub-Contractor and the Employer or any other sub-contractor.

6.0 Insurance Against Injury to Persons and Property

- 6.1 Without prejudice to his liability to indemnify the Contractor under clause 5.0 above, the Sub-Contractor shall maintain:
- 6.1.1 Such insurances as are necessary to cover the liability of the Sub-Contractor in respect of injury or damage or death arising out of or in the course of or caused by the carrying out of the sub-contract works.
 - 6.1.2 Such insurances as are necessary to cover the liability of the Sub-Contractor in respect of injury or damage to property including damage to the works arising out of or in the course of or by reason of the carrying out of the sub-contract works except for liability against the contingencies specified at clause 6.3 herein.
 - 6.1.3 The insurances required under sub clause 6.1.1 and 6.1.2 above shall be placed with insurers approved by the Contractor and the Architect.
- 6.2 Notwithstanding the provisions of clause 23.0 of these conditions, the Contractor shall not be obliged to make payments to the Sub-Contractor before the said policies have been provided.
- 6.3 Where clause 13.0 of the main contract applies, the sub-contract works, including materials and goods of the Sub-Contractor delivered to the works, shall as regards loss or damage by the contingencies stated at clause 13.0 therein, namely, fire, earthquake, fire following earthquake, lightning, explosion, storm, tempest, flood, bursting or overflowing of water tanks, apparatus or pipes, aircraft and other aerial devices or articles dropped therefrom, riot and civil commotion, be at the sole risk of the Contractor. The Contractor shall cover his liability for the works by procuring insurances as required in the said clause.

- 6.4 Where clause 14.0 or 15.0 of the main contract applies, the sub-contract works, including materials and goods of the Sub-Contractor delivered to the works shall, as regards loss or damage by the contingencies stated therein be at the sole risk of the Employer. The Employer shall cover his liability for the works by procuring insurances as required in the said clauses.
- 6.5 The Sub-Contractor shall observe and comply with the conditions contained in the policy or policies of insurance of the Contractor or of the Employer, as the case may be, as regards loss or damage which may be caused by the stated contingencies. For this purpose, the Contractor or the Employer, as the case may be, shall avail the said policies to the Sub-Contractor for his perusal.
- 6.6 If any loss or damage affecting the sub-contract works or any part thereof or any unfixed goods or materials is occasioned by any one or more of the said contingencies, then
- 6.6.1 The occurrence of such loss or damage shall be disregarded in computing any amounts payable to the Sub-Contractor under the sub-contract, and
- 6.6.2 The Sub-Contractor shall, with due diligence, restore the work damaged, replace or repair any unfixed materials or goods which have been destroyed or damaged, remove and dispose of any debris and proceed with the carrying out and completion of the sub-contract works.
- 6.6.3 The restoration of work damaged, the replacement and repair of unfixed materials and goods and the removal of debris shall be deemed to be a variation required by the Architect. Such work shall be paid for in accordance with clause 30.0 of the main contract.

7.0 Performance Bond

Before commencing the works, the Sub-Contractor shall provide one surety who must be an established bank to the approval of the Contractor and who will be bound to the Contractor in the sum equivalent to ten per cent (10%) of the sub-contract price for the due performance of the sub-contract until the certified date of practical completion. Notwithstanding the provisions of clause 23.0 of these conditions, no payments shall be made to the Sub-Contractor before the said bond is provided.

8.0 Possession of Site and Commencement of Works

- 8.1 Within the period stated in the appendix to these conditions, the Contractor shall give possession of the site of the works to the Sub-Contractor and such access as may be necessary to enable the Sub-Contractor to commence and proceed with the sub-contract works in accordance with the sub-contract.
- 8.2 On or before the date for commencement of works stated in the appendix to these conditions, the Sub-Contractor shall commence the carrying out of the sub-contract works and shall proceed regularly and diligently with the same in accordance with the sub-contract programme, the main contract programme and or with the progress of the main contract works and complete on or before the date stated in the appendix to these conditions as the date for practical completion or within any extended time granted under clause 25.0 of these conditions.

9.0 Architect's Instructions

- 9.1 The Sub-Contractor shall forthwith comply with all the instructions issued to him by the Architect, either directly or through the Contractor, in regard to any matter in respect of which the Architect is expressly empowered by the main contract conditions to issue instructions.

- 9.2 The manner of complying with or querying the validity of an Architect's instruction shall be as provided in clause 22.0 of the main contract. The Sub-Contractor shall not be obliged to carry out instructions not issued in the manner provided therein.

10.0 Variations

- 10.1 The term "variation" shall have the meaning assigned to it at clause 30.0 of the main contract.
- 10.2 The valuation of variations shall be made by the Quantity Surveyor in accordance with sub-clause 30.6 of the main contract.
- 10.3 Effect shall be given to the measurement and valuation of variations in interim certificates and by the adjustments of the sub-contract price.

11.0 Liability for Own Equipment

The construction equipment and other property belonging to or provided by the Sub-Contractor and brought onto the site for carrying out the works shall be at the sole risk of the Sub-Contractor. Any loss or damage to the same or caused by the same shall, except for any loss or damage due to any negligence, omission or default of the Contractor, be at the sole risk of the Sub-Contractor who shall indemnify the Contractor against loss, damage or claims in respect thereof. Insurance against any such loss, damages or claims shall be the sole responsibility of the Sub-Contractor.

12.0 Provision of Facilities by the Contractor

- 12.1 Where provided in the main contract, the Contractor shall supply at his own cost all necessary water, lighting, electric power, telephones and security required for the sub-contract works. Where not so provided, the Sub-Contractor shall provide the said services at his own cost.
- 12.2 Except as otherwise provided in the main contract, the Sub-Contractor shall construct at his own expense all necessary workshops, stores, offices, workers' accommodation and other temporary buildings required for the carrying out of the works at such places on site as the Contractor shall identify. The Contractor undertakes to give the Sub-Contractor the required space and all reasonable facilities for such construction. Upon practical completion of the works, the Sub-Contractor shall remove the said facilities and reinstate disturbed surfaces to the satisfaction of the Contractor.
- 12.3 The contractor shall provide, without charge, general attendance to the Sub-Contractor to facilitate the carrying out of the works which attendance shall include facilities for access to and movement within the site and sections or parts of the building or buildings where the subcontract works are being carried out, the use of temporary roads, paths and access ways, sanitary and welfare facilities.
- 12.4 The Contractor shall permit the Sub-Contractor to use, without charge, at all reasonable times, any scaffolding and hoisting equipment belonging to or provided by the Contractor while it remains so erected upon the site. The use by the Sub-Contractor of any other equipment, facilities or services provided by the Contractor for the works shall be subject to private arrangements between the parties hereto and shall not be regulated by these conditions.
- 12.5 Provided that such use of the scaffolding and hoisting equipment shall be on the express condition that no warranty or other liability on the part of the Contractor shall be created or implied in regard to fitness, condition or suitability for the intended purpose except that the Sub-Contractor shall be liable for any damage caused thereto or thereby.

- 12.6 Where required, the Contractor shall provide the facilities, equipment and the like and carry out any necessary builders' work within a reasonable time of the request by the Sub-Contractor to enable timely performance of the sub-contract.

13.0 Liability for Own Work

- 13.1 The Contractor and the Sub-Contractor shall be liable for the due carrying out of their respective works in accordance with their respective contracts without causing damage or injury to the works of the other or of other sub-contractors, and in particular:
- 13.2 Should the carrying out of the subcontract works cause injury or damage to the main contract works, or to the work of other sub-contractors, the Sub-Contractor shall rectify the damages so caused at his own cost.
- 13.3 Should the carrying out of the main contract works cause damage or injury to the sub-contract works, the Contractor shall rectify the damage at his own cost.
- 13.4 If in the course of carrying out the sub-contract works, the Sub-Contractor is required to carry out work not included in his sub-contract by reason of any materials or workmanship not being in accordance with the main contract or with other sub-contracts, the Contractor shall reimburse the Sub-Contractor the expenses incurred therein.

14.0 Co-Operation in Use of Facilities

- 14.1 The Contractor and the Sub-Contractor undertake to co-operate with each other and co-ordinate work arrangements and procedures required in carrying out their respective operations and in the use of site facilities and services to prevent interference, disruption or disturbance to the progress of the works or to the activities of other sub-contractors.
- 14.2 The Contractor and the Sub-Contractor undertake not to wrongfully use or interfere with the equipment, scaffolding, appliances, passage ways, temporary works, temporary buildings and other property belonging to or provided by the other party or by other sub-contractors.
- 14.3 Provided that nothing contained in this clause shall prejudice or limit the rights of the Contractor or of the Sub-Contractor in carrying out their respective statutory and or contractual duties under this sub-contract or under the main contract.

15.0 Assignment and Subletting

- 15.1 Neither the Contractor nor the Sub-Contractor shall, without the written consent of the other and the Employer, assign this sub-contract
- 15.2 The Sub-Contractor shall not sub-let the whole of the works without the written consent of the Contractor and the Architect
- 15.3 Provided that any assignment and any sub-contracts as well as this sub-contract shall terminate immediately upon termination (for whatever reason) of the main contract.

16.0 Work Prior To Appointment of Contractor.

- 16.1 Where the Sub-Contractor is appointed before the Contractor is appointed, any work done by the Sub-Contractor prior to the said appointment shall be treated as a separate contract between the Employer and the Sub-Contractor and shall be valued by the Quantity Surveyor and paid for directly by the Employer without the involvement of the Contractor.

- 16.2 Where the Sub-Contractor is appointed before the Contractor is appointed, the Sub-Contractor shall be permitted, when the identity of the Contractor is known and within 30 days thereof, to raise objections (on reasonable grounds) against entering into a sub-contract with the Contractor. If the Architect finds merit in the grounds raised, he shall direct that the Sub-Contractor be paid for work done in accordance with sub-clause 16.1 herein. Thereupon, the Sub-Contractor shall be relieved of further liability as regards the sub-contract works.
- 16.3 Where work which is outside the sub-contract is ordered directly by the Employer or the Architect, that work shall be treated as a separate contract between the Sub-Contractor and the Employer and shall be valued and paid for directly to the Sub-Contractor in accordance with sub-clause 16.1 herein without the involvement of the Contractor. The cost of equipment, facilities and the like provided by the Contractor to the Sub-Contractor and any builders' work carried out by the Contractor with regard to such work shall be paid directly by the Sub-Contractor to the Contractor.

17.0 Sub-Contractor Design

Where the sub-contract includes a design component by the Sub-Contractor, the design shall be to the approval of the Architect and the Employer. Notwithstanding any approvals, the Sub-Contractor shall be liable directly to the Employer for any consequences of failure or to be fit or suitable for the purposes for which the sub-contract works or the relevant part thereof were intended.

18.0 Specification of Goods, Materials And Workmanship

- 18.1 All materials, goods and workmanship shall, so far as procurable, be of the respective kinds and standards described in the sub-contract bills, specifications and drawings.
- 18.2 The provisions of clause 23.0 of the main contract regulating the procurement, specification and quality assurance of materials, processes and workmanship and the requirements of clause 24.0 therein dealing with the provision of samples and the carrying out of specified tests shall apply to the sub-contract in the same manner as they apply to the main contract.

19.0 Compliance with Statutory and Other Regulations.

The Sub-Contractor shall comply with all statutory and other regulations of competent authorities regulating the carrying out of the works in accordance with the provisions of clause 17.0 of the main contract, as applicable.

20.0 Royalties and Patent Rights

- 20.1 All royalties or other sums payable in respect of the supply and use of any patented articles, processes or inventions in carrying out the works as described by or referred to in the sub-contract bills, specifications or drawings shall be deemed to have been included in the sub-contract price.
- 20.2 The provisions of clause 25.0 of the main contract dealing with the same shall apply to the sub-contract in the same manner as they apply to the main contract.

21.0 Antiquities and Other Objects of Value

All fossils, antiquities and other objects of interest or value which may be found on the site or in excavating the same during the progress of the sub-contract shall be dealt with in accordance with the provisions of clause 44.0 of the main contract.

22.0 Suspension of Works

- 22.1 An instruction by the Architect to postpone or suspend the works under clause 28.0 of the main contract shall have the same effect on the sub-contract works as it has on the main contract works.
- 22.2 If the suspension arises due to default by the Contractor and the sub-contract works are adversely affected by the suspension, the Sub-Contractor shall be entitled to reimbursement by the Contractor of all expenses arising therefrom.
- 22.3 If the suspension arises due to default by the Sub-Contractor, the Sub-Contractor shall be liable to the Contractor for all expenses arising therefrom
- 22.4 A notice by the Contractor to suspend the works under clause 29.0 of the main contract shall have the same effect on the sub-contract works as it has on the main contract works.
- 22.5 Should the sub-contract works be adversely affected by suspension under clause 29.0 of the main contract, the Sub-Contractor shall be entitled to the remedies provided for at clause 25.0 and 26.0 of this sub-contract.

23.0 Payments

- 23.1 Procedures for originating and processing applications for payments and payment certificates as regards the sub-contract works shall be the same as those prescribed for the Contractor in the main contract at clause 34.0. All references therein to the Contractor shall be deemed to include references to the Sub-Contractor.
- 23.2 Before submitting an application for payment to the Quantity Surveyor in accordance with clause 34.1 of the main contract, the Contractor shall give the Sub-Contractor a notice of not less than 7 days to submit the details of the amounts which the Sub-Contractor considers himself entitled to for the relevant period. Such details, when received, shall be annexed to the said Contractor's application.
- 23.3 Where it is necessary to measure the sub-contract works for purposes of interim valuations or for the preparation of the final account, the Quantity Surveyor shall give the Sub-Contractor a reasonable opportunity to be present at the times of the measurements and to take notes and measurements as he may require.
- 23.4 Neither the Quantity Surveyor nor the Architect shall be bound to issue a valuation or a payment certificate in respect of the sub-contract works, as the case may be, whose value is less than the amount stated in the appendix to these conditions as the minimum amount of a payment certificate before the issue of the certificate of practical completion of the main contract or of the sub-contract, as applicable.
- 23.5 Provided that where the minimum amount of a certificate inserted in the appendix to these conditions has been achieved but the corresponding minimum inserted in the appendix to the main contract in respect of the Contractor's work has not been achieved, or the Contractor has not applied for payment within the stated period, the Architect may with the consent of the Contractor, issue a payment certificate directly to the Sub-Contractor for payment by the Employer.
- 23.6 Within 7 days of receipt by the Contractor of payment by the Employer, the Contractor shall notify and pay to the Sub-Contractor the total value certified therein in respect of the sub-contract works less the portion of the retention money attributable to the sub-contract works and less amounts previously paid to the Sub-Contractor.

- 23.7 Where certificates are not paid by the Employer within the prescribed period, the Sub-Contractor shall be entitled to be paid by the Contractor, upon receipt of payment from the Employer, the interest certified for the delay in accordance with sub-clause 34.6 of the main contract in respect of the portion of the sub-contract works included in the certificate.
- 23.8 Where the Contractor has received payment from the Employer but has not released the appropriate amount to the Sub-Contractor within the stated period, the Contractor shall pay to the Sub-Contractor in addition to the amount not paid, simple interest on the unpaid amount for the period it remains unpaid at the commercial bank lending rate in force during the period of default.
- 23.9 If, upon application by the Sub-Contractor and Architect agree, or if the Contractor fails to make payment to the Sub-Contractor in accordance with sub-clause 23.6 herein and continues such default for 14 days thereafter, the Architect may issue a payment certificate directly to the Sub-Contractor for payment by the Employer, where applicable, and deduct the amount from subsequent payments to the Contractor.
- 23.10 Upon the issue of the certificate of practical completion and the release of one half of the total amount of the retention money to the Contractor, the Contractor shall pay the portion attributable to the sub-contract to the Sub-Contractor within 7 days of receipt of the payment.
- 23.11 Upon the issue of the certificate of rectification of defects and receipt of the balance of the retention money by the Contractor, the Contractor shall pay the balance of the portion of the retention money attributable to the sub-contract to the Sub-Contractor within 7 days of receipt of the payment.
- 23.12 The sub-contract final account shall be agreed between the Sub-Contractor, the Contractor, the Quantity Surveyor and the architect and shall be annexed to the Contractor's final accounts which shall be agreed as provided for in the main contract. For purposes of finalizing the accounts, the Quantity Surveyor may request the Sub-Contract to submit further documents as he may deem necessary.
- 23.13 The final certificate issued under sub-clause 34.21 of the main contract shall be final and binding on the Sub-Contract in the same manner that it is binding on the Contractor.
- 23.14 If the Architect desires to secure final payment to the Sub-Contractor before final payment is due to the Contractor, the provisions of sub-clause 31.10 of the main contract shall apply.
- 23.15 The Contractor shall be entitled to deduct from or set off against any money due from him to the Sub-Contractor in interim certificates any sum or sums which the Sub-Contractor is liable to pay to the Contractor arising under or in connection with the sub-contract.

24.0 Practical Completion and Defects Liability

- 24.1 The Sub-Contractor shall proceed with the works regularly and diligently and complete the same within the period stated in the appendix to this sub-contractor or within such extended period as may be granted under clause 25.0 of this sub-contract.
- 24.2 Where the sub-contract works are to be completed in sections or where the sub-contract works are to be completed in advance of the main contract works, the provisions of clause 42.0 of the main contract shall apply, as appropriate, to the sub-contract in the same manner as they apply to the main contract.

24.3 The procedures for certifying practical completion and for dealing with defects in the sub-contract works as well as the main contract works are as prescribed at clause 41.0 of the main contract. Upon the issue of the certificate of practical completion of the whole of the works or of the sub-contract works, as applicable, the Sub-Contractor shall be entitled to release of one half of the retention money attributable to the sub-contract works within 7 days after the Contractor has received payment.

24.4 The balance of the retention money shall be released to the Sub-Contractor after the defects appearing in the works have been rectified in accordance with sub-clause 41.6 and 41.7 of the main contract and after the Contractor has received the said payment as provided for in sub-clause 34.16.3 of the main contract.

25.0 Extension of Time

25.1 Upon it becoming reasonably apparent that the progress of the sub-contract works is or will be delayed, the Sub-Contractor shall forthwith give written notice of the cause of the delay to the Contractor and to the Architect with supporting details showing the extent of delay caused or likely to be caused. Thereafter, the Architect shall evaluate the information supplied by the Sub-Contractor and if in his opinion the completion of the works is likely to be or has been delayed beyond the date for practical completion stated in the appendix to these conditions or beyond any extended time previously fixed under this clause, by any of the reasons entitling the Contractor to extension of time under sub-clause 36.1 of the main contract, then the Architect shall, so soon as he is able to estimate the length of the delay beyond the date or time aforesaid, recommend to the Contractor a fair and reasonable extension of time to be granted for the completion of the sub-contract works.

25.2 Thereupon, the Contractor shall grant in writing to the Sub-Contractor the recommended time. Provided that the Contractor shall not grant any extension of time to the Sub-Contractor without the written recommendation of the Architect. And provided that the Sub-Contractor shall constantly use his best endeavours to prevent delay and shall do all that may be reasonably required to proceed with the works.

25.3 The procedures for dealing with requests for extension of time and the observance of time limits prescribed at clause 36.0 of the main contract shall apply to the sub-contract in the same manner as they apply to the main contract.

26.0 Loss and Expense Caused by Disturbance of Regular Progress

26.1 If upon written application being made to the Sub-Contractor to the Contractor and to the Architect, the Architect is of the opinion that the Sub-Contractor has been involved in direct loss and or expense, for which he would not be reimbursed by a payment made under any other provision in this sub-contract, by reasons of the regular progress of the sub-contract works or any part thereof having been materially affected by any of the reasons which would entitle the Contractor to reimbursement under clause 37.0 of the main contract, the Quantity Surveyor shall assess the amount of such loss and or expense.

26.2 Any amount so assessed shall be added to the sub-contract price and if an interim certificate is issued after the date of assessment, any such amount shall be added to the amount which would otherwise be stated as due in such certificate as regards the Sub-Contractor's entitlement.

26.3 The procedure for dealing with loss and or expense claims prescribed at clause 37.0 of the main contract shall apply, to the sub-contract in the same manner as they apply to the main contract, as appropriate.

27.0 Damages For Delay In Completion

- 27.1 If the Sub-Contractor fails to complete the sub-contract works by the date for practical completion stated in the appendix to these conditions or within any extended time fixed under clause 25.0 herein, and the Architect certifies in writing that in his opinion the same ought reasonably so to have been completed, then the Sub-Contractor shall pay or allow to the Contractor a sum calculated at the rate stated in the said appendix as liquidated damages for the period during which the works shall so remain or have remained incomplete.
- 27.2 The Contractor may deduct such sum from any money due or to become due to the Sub-Contractor under the sub-contract or recover the same from the Sub-Contractor as a debt. Provided that the Contractor shall not be entitled to recover any liquidated damages from the Sub-Contractor without first obtaining the Architect's certificate of delay prescribed herein.

28.0 Fluctuations

- 28.1 Unless otherwise stated in the sub-contract bills or specifications, the sub-contract price shall be deemed to have been calculated to include all duties and taxes imposed by statutory and other competent authorities in the country where the works are being carried out, and
- 28.2 The sub-contract price shall be deemed to be based on currency exchange rates current at the date of tender as regards materials or goods to be specifically imported for permanent incorporation in the works.
- 28.3 Should duties and taxes vary during the period of the contract, compensation thereof shall be calculated in accordance with sub-clause 35.1 and 35.2 of the main contract.
- 28.4 Compensation for change in prices of goods and materials incorporated in the works and in the rates of wages provided for at sub-clause 35.3, 35.4 and 35.5 of the main contract shall not apply to the sub-contract unless specifically provided for in the bills of quantities or specifications.

29.0 Termination of Main Contract

- 29.1 If, for any reason, the Contractor's employment is terminated either under clause 38.0, 39.0 or 40.0 of the main contract, this sub-contract shall thereupon also terminate.
- 29.2 Upon termination, the Sub-Contractor shall cease all work and vacate the site. He shall not remove any equipment or any materials brought onto the site for the carrying out of the works without the written approval of the Contractor and the Architect.
- 29.3 Where the termination of the main contract occurs without the default of the Sub-Contractor, the Sub-Contractor shall be paid by the Contractor for work done in the like manner as the Contractor is paid at clause 39.5 of the main contract.
- 29.4 Where the termination of the main contract arises from a default by the Sub-Contractor, the adjustment of the sub-contract accounts shall be performed in the like manner as is provided at sub-clause 38.8 of the main contract regarding the main contract accounts.

30.0 Termination of Sub-Contract.

- 30.1 Without prejudice to any other rights and remedies which the Contractor may possess, if the Sub-Contractor shall make default in any one or more of the respects which would entitle the Employer to terminate the main contract under clause 38.0 therein, the Contractor shall give the Sub-Contractor a notice, with a copy to the Architect and to the Employer by registered post or recorded delivery specifying the default. Should the Sub-Contractor continue the default for 14 days after receipt of such notice or at any time thereafter repeat such default, and should the Architect certify that the Sub-Contractor is in default, the Contractor may terminate the sub-contract forthwith after the expiry of the notice provided that the notice is not given unreasonably or vexatiously. The termination letter shall be copied to the Architect and to the Employer.
- 30.2 Where the sub-contract is terminated due to the default of the Sub-Contract as in sub-clause 30.1 herein, the adjustment of sub-contract accounts shall be performed in the like manner as is provided at sub-clause 38.8 of the main contract regarding the main contract accounts.
- 30.3 Without prejudice to any other rights and remedies which the Sub-Contractor may possess, if, the Contractor shall make default in one or more of the respects which, if committed by the Employer, would entitle the Contractor to terminate the main contract under clause 39.0 therein, the Sub-Contractor shall give the Contractor a notice, with a copy to the Architect and to the Employer, by registered post or recorded delivery specifying the default. Should the Contractor continue the default for 14 days after receipt of such notice or at any time thereafter repeat such default, and should the Architect certify that the Contractor is in default, the Sub-Contractor may terminate the sub-contract forthwith after expiry of the notice, provided that the notice is not given unreasonably or vexatiously. The termination letter shall be copied to the Architect and to the Employer.
- 30.4 If the sub-contract is terminated due to the default of the Contractor as in sub-clause 30.3 herein, the Contractor shall pay the Sub-Contractor for work done in the like manner as the Contractor would be paid at sub-clause 39.5 of the main contract where the termination is done by the Contractor.
- 30.5 Where the sub-contract is terminated due to the default of the Contractor, all expenses arising from the termination shall be done wholly by the Contractor and the termination shall not create any liability on the Employer.
- 30.6 Where the sub-contract is terminated due to the default of the Sub-Contractor, the Sub-Contractor shall be liable to the Contractor for all expenses arising therefrom.

31.0 Settlement of Disputes

- 31.1 In case any dispute or difference shall arise between the Contractor and the Sub-Contractor, either during the progress or after the completion or abandonment of the sub-contract works, such disputes shall be notified in writing by either party to the other with a request to submit it to arbitration and to concur in the appointment of an Arbitrator within 30 days of the notice.
- 31.2 The dispute shall be referred to the arbitration and final decision of a person to be agreed by the parties. Failing agreement to concur in the appointment of an Arbitrator, the Arbitrator shall be appointed by the Chairman or Vice Chairman of The Architectural Association of Kenya or the Chairman or Vice Chairman of The Chartered Institute of Arbitrators, Kenya Branch, at the request of the applying party.
- 31.3 The arbitration may be on the construction of this sub-contract or on any matter or thing of whatsoever nature arising thereunder or in connection therewith including the rights and liabilities of the parties during the currency of the sub-contract and subsequent to the termination of the sub-contract.

- 31.4 Where the Sub-Contractor is aggrieved by the manner in which the Architect has exercised or failed to exercise his powers stipulated in the main contract, or in the sub-contract or by any action or inaction of the Employer, and in particular, if he is aggrieved by:
- 31.4.1 The failure or refusal of the Architect to recommend to the Contractor an extension of sub-contract time, or
 - 31.4.2 The extent of the recommended time, or
 - 31.4.3 The amount certified to the Sub-Contractor either in an interim or in a final certificate, or
 - 31.4.4 The issue of an instruction which the Sub-Contractor contends is not authorized by the main contract or the sub-contract, or
 - 31.4.5 Any other matter left to the discretion of the Architect in the main contract or in the sub-contract, then;-
- 31.5 Subject to the Sub-Contractor giving the Contractor such indemnity and security as the Contractor may reasonably require, the Contractor shall allow the Sub-Contractor to use the Contractor's name and, if necessary, shall join the Sub-Contractor in arbitration proceedings against the Employer to decide the matters in dispute or in difference.
- 31.6 Provided that no arbitration proceedings shall be commenced on any dispute or difference where notice of a dispute or difference has not been given by the applying party within 90 days of the occurrence or discovery of the matter or issue giving rise to the dispute or difference.
- 31.7 Notwithstanding the issue of a notice as stated above, the arbitration of such a dispute or difference shall not commence unless an attempt has in the first instance been made by the parties to settle such dispute or difference amicably with or without the assistance of third parties.
- 31.8 In any event, no arbitration shall commence earlier than 90 days after the service of the notice of a dispute or difference, except as provided for at sub-clause 31.9 herein.
- 31.9 Notwithstanding anything stated herein, the following matters may be referred to arbitration before the practical completion of the works or abandonment of the works or termination of the sub-contract without having to comply with sub-clause 31.8 herein.
- 31.9.1 Whether or not the issue of an instruction by the Architect is authorized by the main contract or these conditions, and
 - 31.9.2 Whether or not a payment certificate has been improperly withheld or is not in accordance with the main contract or these conditions or though issued, it has not been honoured.
- 31.10 All other matters in dispute shall only be referred to arbitration after the practical completion or alleged practical completion of the works or abandonment of the works or termination or alleged termination of the sub-contract, unless the Architect the Contractor and the Sub-Contractor agree otherwise in writing.
- 31.11 The Arbitrator shall, without prejudice to the generality of his powers, have power to direct such measurements, computations, tests, or valuations as may in his opinion be desirable in order to determine the rights of the parties and assess and award any sums which ought to have been the subject of or included in any payment certificate.

- 31.12 The Arbitrator shall, without prejudice to the generality of his powers, have power to open up, review and revise any certificate, opinion, decision, requirement or notice and to determine all matters in dispute which shall be submitted to him in the same manner as if no such certificate, opinion, decision, requirement or notice had been given.
- 31.13 Provided that any decision of the Architect which is final and binding on the Contractor under the main contract shall be final and binding between the Contractor and the Sub-Contractor.
- 31.14 The award of such Arbitrator shall be final and binding upon the parties.

APPENDIX**Clause**

Name of Sub-Contractor's insurers

6.0.....

Name of Sub-Contractor's surety

7.0.....

Amount of surety

7.0.....

Period of possession of site

8.1.....

Sub-Contract period

8.2.....

Date of commencement of works

8.2.....

Date for practical completion

8.2.....

Interval for application of payment
certificates

23.1.....

Minimum amount of payment certificate

23.4.....

Percentage of certified value retained

23.6.....

Limit of retention fund, if any

23.6.....

Name of the Sub-Contractor's bank for
purpose of interest calculation.

23.7, 23.8.....

Period of final measurement and valuation

23.12.....

Damages for delay in completion

27.1 – At the rate of Ksh.....

.....

Signed by the said:

.....
CONTRACTOR.....
SUB-CONTRACTOR

PART D:

PRELIMINARIES
AND
GENERAL CONDITIONS

PART D - PRELIMINARIES AND GENERAL CONDITIONS

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PART D

CONTRACT PRELIMINARIES AND GENERAL CONDITIONS

1.01 Examination of Tender Documents

The tenderer is required to check the number of pages of this document and should he find any missing or indistinct, he must inform the Engineer at once and have the same rectified.

All tenderers shall be deemed to have carefully examined the following:

- a) Work detailed in the Specification and in the Contract Drawings.
- b) The Republic of Kenya Document "General Conditions of Contract for Electrical and Mechanical Works".
- c) Other documents to which reference is made.

He shall also be deemed to have included for any expenditure which may be incurred in conforming with the above items (a), (b), (c) and observe this expense as being attached to the contract placed for the whole or any part of the work.

The tenderer shall ensure that all ambiguities, doubts or obscure points of detail, are clarified with the Engineer before submission of his tender, as no claims for alleged deficiencies in the information given shall be considered after this date.

1.02 Discrepancies

The Sub-contractor shall include all work either shown on the Contract Drawings or detailed in the specification. No claim or extra cost shall be considered for works, which has been shown on the drawings or in the specification alone.

Should the drawing and the specification appear to conflict, the Sub-contractor shall query the points at the time of tendering and satisfy himself that he has included for the work intended, as no claim for extra payment on this account shall be considered after the contract is awarded.

1.03 Conditions of Sub-contract Agreement

The Sub-contractor shall be required to enter into a Sub-contract with the Main Contractor.

The Conditions of the Contract between the Main Contractor and the Sub-contractor as hereinafter defined shall be the latest edition of the Agreement and Schedule of Conditions of Kenya Association of Building and Civil Engineering Contractors as particularly modified and amended hereinafter.

For the purpose of this contract the Agreement and Schedule of Conditions and any such modifications and amendments shall read and construed together. In any event of discrepancy the modifications and amendments shall prevail.

1.04 Payment

Payment will be made through certificates to the Main Contractor, unless he specifically agrees to forego this right, in which case direct payment can be made to the Sub-contractor. All payments will be less retention as specified in the Main Contract. No payment will become due until materials are delivered to site.

1.05 **Definition of Terms**

Throughout these Sub-contract documents units of measurements, terms and expressions are abbreviated and wherever used hereinafter and in all other documents they shall be interpreted as follows:

- i) **Employer:** The term “**Employer**” shall mean **Central Bank of Kenya**
- ii) **Architect:** The term “**Architect**” shall mean **Edon Consultants International Ltd.**
- iii) **Electrical Engineer:** The term “**Electrical Engineer**” shall mean **Feradon Associates Ltd.**
- iv) **Mechanical Engineer:** The term “**Mechanical Engineer**” shall mean **Feradon Associates Ltd.**
- v) **Quantity Surveyor:** The term “**Quantity Surveyor**” shall mean **Quanti-Bill Consultants**
- vi) **Main Contractor:** The term “**Main Contractor**” shall mean the firm or company appointed to carry out the Building Works and shall include his or their heir, executors, assigns, administrators, successors, and duly appointed representatives.
- vii) **Sub-contractor:** The term “**Sub-contractor**” shall mean the persons or person, firm or Company whose tender for this work has been accepted, and who has entered into a contract agreement with the Contractor for the execution of the Sub-contract Works, and shall include his or their heirs, executors, administrators, assigns, successors and duly appointed representatives.
- viii) **Sub-contract Works:** The term “**Sub-contract Works**” shall mean all or any portion of the work, materials and articles, whether the same are being manufactured or prepared, which are to be used in the execution of this Sub-contract and whether the same may be on site or not.
- ix) **Contract Drawings:** The term “**Contract Drawings**” shall mean those drawings required or referred to herein and forming part of the Bills of Quantities.
- x) **Working Drawings:** The term “**Working Drawings**” shall mean those drawings required to be prepared by the Sub-contractor as hereinafter described.
- xi) **Record Drawings:** The term “**Record Drawings**” shall mean those drawings required to be prepared by the Sub-contractor showing “as installed” and other records for the Sub-contract Works.
- xii) **Abbreviations:**
 - CM** shall mean **Cubic Metre**
 - SM** shall mean **Square Metre**
 - LM** shall mean **Linear Metre**
 - LS** shall mean **Lump Sum**
 - mm** shall mean **Millimetres**
 - No.** Shall mean **Number**
 - Kg.** shall mean **Kilogram**
 - BS** shall mean. **Current standard British Standard Specification published by the British Standard Institution, 2 Park Street, London W1, England**

“Ditto” shall mean the whole of the preceding description in which it occurs. Where it occurs in description of succeeding item it shall mean the same as in the first description of the series in which it occurs except as qualified in the description concerned. Where it occurs in brackets it shall mean the whole of the preceding description which is contained within the appropriate brackets.

1.06 **Site Location**

The site of the Sub-contract Works is situated at **Central Bank Building along Haile Selassie Avenue, Nairobi.**

The tenderer is recommended to visit the site and shall be deemed to have satisfied himself with regard to access, possible conditions, the risk of injury or damage to property on/or adjacent to the site, and the conditions under which the Sub-contract Works shall have to be carried out and no claims for extras will be considered on account of lack of knowledge in this respect.

1.07 **Duration of Contract**

The Sub-contractor shall be required to phase his work in accordance with the Main Contractor's programme (or its revision). The programme is to be agreed with the Main Contractor.

1.08 **Scope of Sub-contract Works**

The Sub-contractor shall supply, deliver, unload, hoist, fix, test, commission and hand-over in satisfactory working order the complete installations specified hereinafter and/or as shown on the Contract Drawings attached hereto, including the provision of labour, transport and plant for unloading material and storage, and handling into position and fixing, also the supply of ladders, scaffolding the other mechanical devices to plant, installation, painting, testing, setting to work, the removal from site from time to time of all superfluous material and rubbish caused by the works.

The Sub-contractor shall supply all accessories, whether of items or equipment supplied by the Main Contractor but to be fixed and commissioned under this Sub-contract

1.09 **Extent of the Sub-contractor's Duties**

At the commencement of the works, the Sub-contractor shall investigate and report to the Engineer if all materials and equipment to be used in the work and not specified as supplied by the others are available locally. If these materials and equipment are not available locally, the Sub-contractor shall at this stage place orders for the materials in question and copy the orders to the Engineer. Failure to do so shall in no way relieve the Sub-contractor from supplying the specified materials and equipment in time.

Materials supplied by others for installation and/or connection by the Subcontractor shall be carefully examined in the presence of the supplier before installation and connection. Any defects noted shall immediately be reported to the Engineer.

The Sub-contractor shall be responsible for verifying all dimensions relative to his work by actual measurements taken on site.

The Sub-contractor shall mark accurately on one set of drawings and indicate all alterations and/or modifications carried out to the designed system during the construction period. This information must be made available on site for inspection by the Engineer.

1.10 **Execution of the Works**

The works shall be carried out strictly in accordance with:

- a) All relevant Kenya Bureau of Standards Specifications.

- b) All relevant British Standard Specifications and Codes of Practice (Hereinafter referred to as B.S. and C.P. respectively).
- c) This Specification.
- d) The Contract Drawings.
- e) The Bye-laws of the Local Authority.
- f) The Architect's and/or Engineer's Instructions.

The Contract Drawings and Specifications to be read and construed together.

1.11 **Validity of Tender**

The tender shall remain valid for acceptance within 120 days from the final date of submission of the tender, and this has to be confirmed by signing the Tender Bond. The tenderer shall be exempted from this Bond if the tender was previously withdrawn in writing to the Employer before the official opening.

1.12 **Firm – Price Sub-contract**

Unless specifically stated in the documents or the invitation to tender, this is a firm-price Contract and the Sub-contractor must allow in his tender for the increase in the cost of labour and/or materials during the duration of the contract. No claims will be allowed for increased costs arising from the fluctuations in duties and/or day to day currency fluctuations. The Sub-contractor will be deemed to have allowed in his tender for any increase in the cost of materials which may arise as a result of currency fluctuation during the contract period.

1.13 **Variation**

No alteration to the Sub-contract Works shall be carried out until receipt by the Sub-contractor of written instructions from the Employer's Representative

Any variation from the contract price in respect of any extra work, alteration or omission requested or sanctioned by the Architect or Engineer shall be agreed and confirmed in writing at the same time such variations are decided and shall not affect the validity of the Contract. Schedule of Unit Rates shall be used to assess the value of such variations. No allowance shall be made for loss of profit on omitted works.

Where the Architect requires additional work to be performed, the Sub-contractor, if he considers it necessary, will give notice within seven (7) days to the Main Contractor of the length of time he (the Sub-contractor) requires over and above that allotted for completion of the Sub-contract.

If the Sub-contractor fails to give such notice he will be deemed responsible for the claims arising from the delay occasioned by reason of such extension of time.

1.14 **Prime Cost and Provisional Sums**

A specialist Sub-contractor may be nominated by the Architect to supply and/or install any equipment covered by the Prime Cost or Provisional Sums contained within the Sub-contract documents.

The work covered by Prime Cost and Provisional Sums may or may not be carried out at the discretion of the Architect.

The whole or any part of these sums utilized by the Sub-contractor shall be deducted from the value of the Sub-contract price when calculating the final account.

1.15 **Bond**

The tenderer must submit with his tender the name of one Surety who must be an established Bank only who will be willing to be bound to the Main Contractor for an amount equal to 10% of the Sub-contract amount as Clause 31 of the Main Contract.

1.16 **Government Legislation and Regulations**

The Sub-contractor's attention is called to the provision of the Factory Act 1972 and subsequent amendments and revisions, and allowance must be made in his tender for compliance therewith, in so far as they are applicable.

The Sub-contractor must also make himself acquainted with current legislation and any Government regulations regarding the movement, housing, security and control of labour, labour camps, passes for transport, etc.

The Sub-contractor shall allow for providing holidays and transport for work people, and for complying with Legislation, Regulations and Union Agreements.

1.17 **Import Duty and Value Added Tax**

The Sub-contractor will be required to pay full Import Duty and Value Added Tax on all items of equipment, fittings and plant, whether imported or locally manufactured. The tenderer shall make full allowance in his tender for all such taxes.

1.18 **Insurance Company Fees**

Attention is drawn to the tenderers to allow for all necessary fees, where known, that may be payable in respect of any fees imposed by Insurance Companies or statutory authorities for testing or inspection.

No allowance shall be made to the Sub-contractor with respect to fees should these have been omitted by the tenderer due to his negligence in this respect.

1.19 **Provision of Services by the Main Contractor**

In accordance with Clause 1.08 of this Specification the Main Contractor shall make the following facilities available to the Sub-contractor:

- a) Attendance on the Sub-contractor and the carrying out of all work affecting the structure of the building which may be necessary, including all chasing, cutting away and making good brickwork, etc., except that all plugging for fixing, fittings, machinery, fan ducting, etc., and all drilling and tapping of steel work shall be the responsibility of the Sub-contractor. Any purpose made fixing brackets shall not constitute Builder's Work and shall be provided and installed by the Sub-contractor unless stated hereinafter otherwise.
- b) The provision of temporary water, lighting and power: All these services utilized shall be paid for by the Main Contractor. The Sub-contractor shall, however, allow for additional connections/extensions required for his purposes.
- c) Fixing of anchorage and pipe supports in the shuttering, except that all anchorage shall be supplied by the Sub-contractor who shall also supply the Main Contractor with fully dimensioned drawings detailing the exact locations.
- d)
 - i) Provision of scaffolding, cranes, etc. but only in so far as it is required for the Main Contract Works. It shall be the Sub-contractor's responsibility to liaise with the Main Contractor to ensure that there is maximum co-operation with other Sub-contractors in the use of scaffolding, cranes, etc.
 - ii) Any specialist scaffolding, cranes, etc. by the Sub-contractor for his own exclusive use shall be paid for by the Sub-contractor.

1.20 **Suppliers**

The Sub-contractor shall submit names of any supplier for the materials to be incorporated, to the Engineer for approval. The information regarding the names of the suppliers may be submitted at different times, as may be convenient, but no sources of supply will be changed without prior approval.

Each supplier must be willing to admit the Engineer or his representative to his premises during working hours for the purpose of examining or obtaining samples of the materials in question.

1.21 **Samples and Materials Generally**

The Sub-contractor shall, when required, provide for approval at no extra cost, samples of all materials to be incorporated in the works. Such samples, when approved, shall be retained by the Engineer and shall form the standard for all such materials incorporated.

1.22 **Administrative Procedure and Contractual Responsibility**

Wherever within the Specification it is mentioned or implied that the Sub-contractor shall deal direct with the Employer or Engineer, it shall mean “through the Contractor” who is responsible to the Employer for the whole of the works including the Sub-contract Works.

1.23 **Bills of Quantities**

The Bills of Quantities have been prepared in accordance with the standard method of measurement of Building Works for East Africa, first Edition, Metric, 1970. All the Quantities are based on the Contract Drawings and are provisional and they shall not be held to gauge or to limit the amount or description of the work to be executed by the Sub-contractor but the value thereof shall be deducted from the Sub-contract Sum and the value of the work ordered by the Engineer and executed thereunder shall be measured and valued by the Engineer in accordance with the conditions of the Sub-contract.

All work liable to adjustment under this Sub-contract shall be left uncovered for a reasonable time to allow measurements needed for such adjustment to be taken by the Quantity Surveyor or Engineer. Immediately the work is ready for measuring the Sub-contractor shall give notice to the Quantity Surveyor or Engineer to carry out measurements before covering up. If the Sub-contractor shall make default in these respects he shall, if the Architect so directs, uncover the work to enable the necessary measurements to be taken and afterwards reinstate at his own expense.

1.24 **Sub-contractor's Office in Kenya**

The Sub-contractor shall maintain (after first establishing if necessary) in Kenya an office staffed with competent Engineer Manager and such supporting technical and clerical staff as necessary to control and coordinate the execution and completion of the Sub-contract Works.

The Engineer Manager and his staff shall be empowered by the Sub-contractor to represent him at meetings and in discussions with the Main Contractor, the Engineer and other parties who may be concerned and any liaison with the Sub-contractor's Head Office on matters relating to the design, execution and completion of the Sub-contract Works shall be effected through his office in Kenya.

It shall be the Sub-contractor's responsibility to procure work permits, entry permits, licenses, registration, etc., in respect of all expatriate staff.

The Sub-contractor shall prepare a substantial proportion of his Working Drawings at his office in Kenya. No reasons for delays in the preparation or submission for approval or otherwise of such drawings or proposals will be accepted on the grounds that the Sub-contractor's Head Office is remote from his office in Nairobi or the site of the Sub-contract Works or otherwise.

1.25 **Builder's Work**

All chasing, cutting away and making good will be done by the Main Contractor but the Sub-contractor shall mark out in advance and shall be responsible for accuracy of the size and position of all holes and chases required.

The Sub-contractor shall drill and plug holes in floors, walls, ceiling and roof for securing services and equipment requiring screw or bolt fixings.

Any purpose made fixing brackets shall not constitute builder's work and shall be provided and installed by the Sub-contractor unless stated hereinafter to the contrary.

1.26 **Structural Provision for the Works**

Preliminary major structural provision has been made for the Sub-contract Works based on outline information ascertained during the preparation of the Specification.

The preliminary major structural provision made will be deemed as adequate unless the Sub-contractor stated otherwise when submitting his tender.

Any major structural provision or alteration to major structural provisions required by the Sub-contractor shall be shown on Working Drawings to be submitted to the Engineer within 30 days of being appointed.

No requests for alterations to preliminary major structural provisions will be approved except where they are considered unavoidable by the Engineer. In no case will they be approved if building work is so far advanced as to cause additional costs or delays in the work of the Main Contractor.

1.27 **Position of Services, Plant, Equipment, Fittings and Apparatus**

The Contract Drawings give a general indication of the intended layout. The position of the equipment and apparatus, and also the exact routes of the ducts, main and distribution pipework shall be confirmed before installation is commenced. The exact siting of appliances, pipework, etc., may vary from that indicated.

The routes of services and positions of apparatus shall be determined by the approved dimensions detailed in the Working Drawings or on site by the Engineer in consultation with the Sub-contractor or the Main Contractor.

Services throughout the ducts shall be arranged to allow maximum access along the ducts and the services shall be readily accessible for maintenance. Any work, which has to be re-done due to negligence in this respect, shall be the Sub-contractor's responsibility.

The Sub-contractor shall be deemed to have allowed in his Sub-contract Sum for locating terminal points of services (e.g. lighting, switches, socket outlets, lighting points, control switches, thermostats and other initiating devices, taps, stop cocks) in positions plus or minus 1.2m horizontally and vertically from the locations shown on Contract Drawings. Within these limits no variations in the Sub-contract Sum will be made unless the work has already been executed in accordance with previously approved Working Drawings and with the approval of the Engineer.

1.28 **Checking of Work**

The Sub-contractor shall satisfy himself to the correctness of the connections he makes to all items of equipment supplied under the Sub-contract agreement and equipment supplied under other contracts before it is put into operation. Details of operation, working pressures, temperatures, voltages, phases, power rating, etc., shall be confirmed to others and confirmation received before the system is first operated.

1.29 **Setting to Work and Regulating System**

The Sub-contractor shall carry out such tests of the Sub-contract Works as required by British Standard Specifications, or equal and approved codes as specified hereinafter and as customary.

No testing or commissioning shall be undertaken except in the presence of and to the satisfaction of the Engineer unless otherwise stated by him (Sub-contractor's own preliminary and proving tests excepted).

It will be deemed that the Sub-contractor has included in the Sub-contract Sum for the costs of all fuel, power, water and the like, for testing and commissioning as required as part of the Sub-contract Works. He shall submit for approval to the Engineer a suitable programme for testing and commissioning. The Engineer and Employer shall be given ample warning in writing, as to the date on which testing and commissioning will take place.

The Sub-contractor shall commission the Sub-contract Works and provide attendance during the commissioning of all services, plant and apparatus connected under the Sub-contract Agreement or other Sub-contract Agreements, related to the project.

Each system shall be properly balanced, graded and regulated to ensure that correct distribution is achieved and where existing installations are affected, the Sub-contractor shall also regulate these systems to ensure that their performance is maintained.

The proving of any system of plant or equipment as to compliance with the Specification shall not be approved by the Engineer, except at his discretion, until tests have been carried out under operating conditions pertaining to the most onerous conditions specified except where the time taken to obtain such conditions is unreasonable or exceeds 12 months after practical completion of the Sub-contract Works.

1.30 **Identification of Plant Components**

The Sub-contractor shall supply and fix identification labels to all plant, starters, switches and items of control equipment including valves, with white traffolyte or equal labels engraved in red lettering denoting its name, function and section controlled. The labels shall be mounted on equipment and in the most convenient positions. Care shall be taken to ensure the labels can be read without difficulty. This requirement shall apply also to major components of items of control equipment.

Details of the lettering of the labels and the method of mounting or supporting shall be forwarded to the Engineer for approval prior to manufacture.

1.31 **Contract Drawings**

The Contract Drawings when read in conjunction with the text of the Specification have been completed in such detail as was considered necessary to enable competitive tenders to be obtained for the execution and completion of the Sub-contract works.

The Contract Drawings are not intended to be Working Drawings and shall not be used unless exceptionally they are released for this purpose.

1.32 **Working Drawings**

The Sub-contractor shall prepare such Working Drawings as may be necessary. The Working Drawings shall be complete in such detail not only that the Sub-contract Works can be executed on site but also that the Engineer can approve the Sub-contractor's proposals, detailed designs and intentions in the execution of the Sub-contract Works.

If the Sub-contractor requires any further instructions, details, Contract Drawings or information drawings to enable him to prepare his Working Drawings or proposals, the Sub-contractor shall accept at his own cost, the risk that any work, commenced or which he intends to commence at site may be rejected.

The Engineer, in giving his approval to the Working Drawings, will presume that any necessary action has been, or shall be taken by the Sub-contractor to ensure that the installations shown on the Working Drawings have been cleared with the Main Contractor and any other Sub-contractors whose installations and works might be affected.

If the Sub-contractor submits his Working Drawings to the Engineer without first liaising and obtaining clearance for his installations from the Main Contractor and other Sub-contractors whose installations and works might be affected, then he shall be liable to pay for any alterations or modification to his own, the Main Contractor's or other Sub-contractor's installations and works, which are incurred, notwithstanding any technical or other approval received from the Engineer.

Working Drawings to be prepared by the Sub-contractor shall include but not be restricted to the following:

- a) Any drawings required by the Main Contractor, or Engineer to enable structural provisions to be made including Builder's Working Drawings or Schedules and those for the detailing of holes, fixings, foundations, cables and paperwork ducting below or above ground or in or outside or below buildings.
- b) General Arrangement Drawings of all plant, control boards, fittings and apparatus or any part thereof and of installation layout arrangement of such plant and apparatus.
- c) Schematic Layout Drawings of services and of control equipment.
- d) Layout Drawings of all embedded and non-embedded paperwork, ducts and electrical conduits.
- e) Complete circuit drawings of the equipment, together with associated circuit description.
- f) Such other drawings as are called for in the text of the Specification or Schedules or as the Engineer may reasonably require.

Three copies of all Working Drawings shall be submitted to the Engineer for approval. One copy of the Working Drawings submitted to the Engineer for approval shall be returned to the Sub-contractor indicating approval or amendment therein.

Six copies of the approved Working Drawings shall be given to the Main Contractor by the Sub-contractor for information and distribution to other Sub-contractors carrying out work associated with or in close proximity to or which might be affected by the Sub-contract Works.

Approved Working Drawings shall not be departed from except as may be approved or directed by the Engineer.

Approval by the Engineer of Working Drawings shall neither relieve the Sub-contractor of any of his obligations under the Sub-contract nor relieve him from correcting any errors found subsequently in the Approved Working Drawings or other Working Drawings and in the Sub-contract Works on site or elsewhere associated therewith.

The Sub-contractor shall ensure that the Working Drawings are submitted to the Architect for approval at a time not unreasonably close to the date when such approval is required. Late submission of his Working Drawings will not relieve the Sub-contractor of his obligation to complete the Sub-contract Works within the agreed Contract Period and in a manner that would receive the approval of the Architect.

1.33 **Record Drawings (As Installed) and Instructions**

During the execution of the Sub-contract Works the Sub-contractor shall, in a manner approved by the Engineer record on Working or other Drawings at site all information necessary for preparing Record Drawings of the installed Sub-contract Works. Marked-up Working or other Drawings and other documents shall be made available to the Engineer as he may require for inspection and checking.

Record Drawings, may, subject to the approval of the Engineer, include approved Working Drawings adjusted as necessary and certified by the Sub-contractor as a correct record of the installation of the Sub-contract Works.

They shall include but not restricted to the following drawings or information:

- a) Working Drawings amended as necessary but titled "Record Drawings" and certified as a true record of the "As Installed" Sub-contract Works. Subject to the approval of the Engineer such Working Drawings as may be inappropriate may be omitted.
- b) Fully dimensioned drawings of all plant and apparatus
- c) General arrangement drawings of equipment, other areas containing plant forming part of the Sub-contract Works and the like, indicating the accurate size and location of the plant and apparatus suitability cross-referenced to the drawings mentioned in (b) above and hereinafter.
- d) Routes, types, sizes and arrangement of all pipework and ductwork including dates of installation of underground pipework.
- e) Relay adjustment charts and manuals.
- f) Routes, types, sizes and arrangement of all electric cables, conduits, ducts and wiring including the dates of installation of buried works.
- g) System schematic and trunking diagrams showing all salient information relating to control and instrumentation.
- h) Grading Charts.
- i) Valve schedules and locations suitability cross-referenced.
- j) Wiring and piping diagrams of plant and apparatus.
- k) Schematic diagrams of individual plant, apparatus and switch and control boards. These diagrams to include those peculiar to individual plant or apparatus and also those applicable to system operation as a whole.
- l) Operating Instruction

Schematic and wiring diagrams shall not be manufacturer's multipurpose general issue drawings. They shall be prepared specially for the Sub-contract Works and shall contain no spurious or irrelevant information.

Marked-up drawings of the installation of the Sub-contract Works shall be kept to date and completed by the date of practical or section completion. Two copies of the Record Drawings of Sub-contract Works and two sets of the relay adjustment and grading charts and schematic diagrams on stiff backing shall be provided not later than one month later.

The Sub-contractor shall supply for fixing in sub-stations, switch-rooms, boiler houses, plant rooms, pump houses, the office of the Maintenance Engineer and other places, suitable valve and instructions charts, schematic diagrams of instrumentation and of the electrical reticulation as may be requested by the Engineer providing that the charts, diagrams, etc., relate to installations forming part of the Sub-contract Works. All such charts and diagrams shall be of suitable plastic material on a stiff backing and must be approved by the Engineer before final printing.

Notwithstanding the Sub-contractor's obligations referred to above, if the Sub-contractor fails to produce to the Engineer's approval, either:-

- a) The Marked-up Drawings during the execution of the Sub-contract Works or
- b) The Record Drawings, etc., within one month of the Section or Practical Completion

The Engineer shall have these drawings produced by others. The cost of obtaining the necessary information and preparing such drawings, etc., will be recovered from the Sub-contractor.

1.34 **Maintenance Manual**

Upon Practical Completion of the Sub-contract Works, the Sub-contractor shall furnish the Engineer four copies of a Maintenance Manual relating to the installation forming part of all of the Sub-contract Works.

The manual shall be loose-leaf type, International A4 size with stiff covers and cloth bound. It may be in several volumes and shall be sub-divided into sections, each section covering one Engineering service system. It shall have a ready means of reference and a detailed index.

There shall be a separate volume dealing with Air Conditioning and Mechanical Ventilation installation where such installations are included in the Sub-contract Works.

The manual shall contain full operating and maintenance instructions for each item of equipment, plant and apparatus set out in a form dealing systematically with each system. It shall include as may be applicable to the Sub-contract Works the following and any other items listed in the text of the Specifications:

- a) System Description.
- b) Plant
- c) Valve Operation
- d) Switch Operation
- e) Procedure of Fault Finding
- f) Emergency Procedures
- g) Lubrication Requirements
- h) Maintenance and Servicing Periods and Procedures
- i) Colour Coding Legend for all Services
- j) Schematic and Wiring Diagrams of Plant and Apparatus
- k) Record Drawings, true to scale, folded to International A4 size
- l) Lists of Primary and Secondary Spares.

The manual is to be specially prepared for the Sub-contract Works and manufacturer's standard descriptive literature and plant operating instruction cards will not be accepted for inclusion unless exceptionally approved by the Engineer. The Sub-contractor shall, however, affix such cards, if suitable, adjacent to plant and apparatus. One spare set of all such cards shall be furnished to the Engineer.

1.35 **Hand-over**

The Sub-contract Works shall be considered complete and the Maintenance and Defects Liability Period shall commence only when the Sub-contract Works and supporting services have been tested, commissioned and operated to the satisfaction of the Engineer and officially approved and accepted by the Employer, provided always that the handing over of the Sub-contract Works shall be coincident with the handing over of the Main Contract Works.

The procedure to be followed will be as follows:

- a) On the completion of the Sub-contract Works to the satisfaction of the Engineer and the Employer, the Sub-contractor shall request the Engineer, at site to arrange for handing over.
- b) The Engineer shall arrange a Hand-over Meeting or a series thereof, at site.
- c) The Sub-contractor shall arrange with the Engineer and Employer for a complete demonstration of each and every service to be carried out and for instruction to be given to the relevant operation staff and other representatives of the Employer.
- d) In the presence of the Employer and the Engineer, Hand-over will take place, subject to Agreement of the Hand-over Certificates and associated check lists.

1.36 **Painting**

It will be deemed that the Sub-contractor allowed for all protective and finish painting in the Sub-contract Sum for the Sub-contract Works, including colour coding of service pipework to the approval of the Engineer. Any special requirements are described in the text of the Specifications.

1.37 **Spares**

The Sub-contractor shall supply and deliver such spares suitably protected and boxed to the Engineer's approval as are called for in the Specifications or in the Price Schedules.

1.38 **Testing and Inspection – Manufactured Plant**

The Engineer reserves the right to inspect and test or witness of all manufactured plant equipment and materials.

The right of the Engineer relating to the inspection, examination and testing of plant during manufacture shall be applicable to Insurance companies and inspection authorities so nominated by the Engineer.

The Sub-contractor shall give two week's notice to the Engineer of his intention to carry out any inspection or tests and the Engineer or his representative shall be entitled to witness such tests and inspections.

Six copies of all test certificates and performance curves shall be submitted as soon as possible after the completion of such tests, to the Engineer for his approval.

Plant or equipment which is shipped before the relevant test certificate has been approved by the Engineer shall be shipped at the Sub-contractor's own risk and should the test certificate not be approved new tests may be ordered by the Engineer at the Sub-contractor's expense.

The foregoing provisions relate to tests at manufacturer's works and as appropriate to those carried out at site.

1.39 **Testing and Inspection -Installation**

Allow for testing each section of the Sub-contract Works installation as described hereinafter to the satisfaction of the Engineer.

1.40 **Labour Camps**

The Sub-contractor shall provide the necessary temporary workshop and mess-room in position to be approved by the Architect.

The work people employed by the Sub-contractor shall occupy or be about only that part of the site necessary for the performance of the work and the Sub-contractor shall instruct his employees accordingly.

If practicable, W.C. accommodation shall be allocated for the sole use of the Sub-contractor's workmen and the Sub-contractor will be required to keep the same clean and disinfected, to make good any damage thereto and leave in good condition.

1.41 **Storage of Materials**

Space for storage will be provided by the Main Contractor but the Sub-contractor will be responsible for the provision of any lock-up sheds or stores required.

Nominated Sub-contractors are to be made liable for the cost of any storage accommodation provided specially for their use. No materials shall be stored or stacked on suspended slabs without the prior approval of the Architect.

1.42 **Initial Maintenance**

The Sub-contractor shall make routine maintenance once a month during the liability for the Defects Period and shall carry out all necessary adjustments and repairs, cleaning and oiling of moving parts. A monthly report of the inspection and any works done upon the installation shall be supplied to the Engineer.

The Sub-contractor shall also provide a 24 -hour break-down service to attend to faults on or malfunctioning of the installation between the routine visits of inspection.

The Sub-contractor shall allow in the Sub-contract Sum of the initial maintenance, inspection and break-down service and shall provide for all tools, instruments, plant and scaffolding and the transportation thereof, as required for the correct and full execution of these obligations and the provision, use or installation of all materials as oils, greases, sandpaper, etc., or parts which are periodically renewed such as brake linings etc., or parts which are faulty for any reason whatsoever excepting always Acts of God such as storm, tempest, flood, earthquake and civil revolt, acts of war and vandalism.

1.43 **Maintenance and Servicing After Completion of the Initial Maintenance**

The Sub-contractor shall, if required, enter into a maintenance and service agreement with the employer for the installation for a period of up to five years from the day following the last day of the liability for Defects Period which offers the same facilities as specified in Clause 1.41 (Initial Maintenance).

The terms of any such agreement shall not be less beneficial to the employer than the terms of Agreements for either similar installation.

The Sub-contractor shall submit with his tender for the works, a firm quotation for the maintenance and service of the installation as specified herein, which shall be based upon the present day costs and may be varied only to take into account increases in material and labour unit rate costs between the time of tendering and the signing of the formal maintenance and service agreement and which shall remain valid and open for acceptance by the Employer to and including the last day of the fifth complete calendar month following the end of the liability for Defects Period.

1.44 **Trade Names**

Where trade names of manufacturer's catalogue numbers are mentioned in the Specification or the Bills of Quantities, the reference is intended as a guide to the type of article or quality of material required. Alternate brands of equal and approved quality will be acceptable.

1.45 **Water and Electricity for the Works**

These will be made available by the Main Contractor. The Sub-contractor shall be liable for the cost of any water or electric current used and for any installation provided especially for their own use by the Main Contractor.

1.46 **Protection**

The Sub-contractor shall adequately cover up and protect his own work to prevent injury and also to cover up and protect from damage all parts of the building or premises where work is performed by him under the Contract.

1.47 **Defects After Completion**

The defects liability period will be six months from the date of completion of the Main Contract as certified by the Engineer.

1.48 **Damages for Delay**

Liquidated and ascertained damages as stated in the Main Contract Agreement will be claimed against the Main Contract for any unauthorized delay in completion. The Sub-contractor shall be held liable for the whole or a portion of these damages should he cause delay in completion.

1.49 **Clear Away on Completion**

The Sub-contractor shall, upon completion of the works, at his own expense, remove and clear away all plant, equipment, rubbish and unused materials, and shall leave the whole of the works in a clean and tidy state, to the satisfaction of the Engineer. On completion, the whole of the works shall be delivered up clean, complete and perfect in every respect to the satisfaction of the Engineer.

1.50 **Final Account**

On completion of the works the Sub-contractor shall agree with the Engineer the value of any variations outstanding and as soon as possible thereafter submit to the Engineer his final statement of account showing the total sum claimed sub-divided as follows:

Statement A - detailing the tender amounts less the Prime Cost and Provisional Sums, included therein.

Statement B - detailing all the variation orders issued on the contract.

Statement C - Summarizing statement A and B giving the net grand total due to the Sub-contractor for the execution of the Sub-contract.

1.51 **Fair Wages**

The Sub-contractor shall in respect of all persons employed anywhere by him in the execution of the Sub-contract, in every factory, workshop or place occupied or used by him for execution of the Sub-contract, observe and fulfill the following conditions:

- a) The Sub-contractor shall pay rates of the wages and observe hours and conditions of labour not less favourable than those established for the trade or industry in the district where work is carried out.
- b) In the absence of any rates of wages, hours or conditions of labour so established the Sub-contractor shall pay rates and observe hours and conditions of labour are not less favourable than the general level of wages, hours and conditions observed by other employers whose general circumstances in the trade or industry in which the Sub-contractor is engaged are similar.

1.52 **Supervision**

During the progress of the works, the Sub-contractor shall provide and keep constantly available for consultation on site experienced English - speaking Supervisor and shall provide reasonable office facilities, attendance, etc., for the Supervisor.

In addition, during the whole of the time the works are under construction, the Sub-contractor shall maintain on site one experienced foreman or charge-hand and an adequate number of fitters, etc., for the work covered by the Specification. The number of this staff shall not be reduced without the prior written approval of the Architect or Engineer.

Any instructions given to the Supervisor on site shall be deemed to have been given to the Sub-contractor.

Depending on the scope of coordination works required onsite, the Engineer shall recommend the appointment of a Resident Electrical Engineer, who will be required to be based on site. The Resident Engineer shall be appointed and paid by the Engineer. Provision to be made for the appointment of the Resident Engineer.

One copy of this Specification and one copy of each of the Contract Drawings (latest issue) must be retained on site at all times, and available for reference by the Engineer or Sub-contractor.

1.53 **Test Certificates**

The Sub-contractor shall provide the Engineer with three copies of all test reports or certificates that are or may be required by this Specification.

1.54 **Labour**

The Sub-contractor shall provide skilled and unskilled labour as may be necessary for completion of the contract.

1.55 **Discount to the Main Contractor**

No discount to the Main Contractor will be included in the tender for this installation.

1.56 **Guarantee**

The whole of the work will be guaranteed for a period of twelve (12) months from the date of the Architect's certification of completion and under such guarantee the Sub-contractor shall remedy at his expense all defects in materials and apparatus due to faulty design, construction or workmanship which may develop in that period.

PART E:
TECHNICAL SPECIFICATIONS
FOR
COMMUNICATIONS SERVICES

PART F: TECHNICAL SPECIFICATIONS FOR COMMUNICATIONS SERVICES

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1.0 AN OVERVIEW OF CABLING STANDARDS

1.1 ANS/TIA/EIA-568-A and ISO/IEC 11801

The latest editions of the ANS/TIA/EIA-568-A (568-A) AND iso/iec 11801 ('11801) cabling standards were both published in 1995. The following overview provides some of the requirements and recommendations of each standard including differences between them.

1.2 ANS/TIA/EIA-568-A

Commercial Building Telecommunications Cabling Standard.

The Telecommunications Industry Association (TIA) TR42.1 (formerly TR41.8.1) working Group on telecommunications cabling published the ANSI/TIA/EIA-568-A standard in 1995.

1.3 ISO/IEC 11801

Information Technology – Generic Cabling for Customer Premises.

The International Organization for Standardization (ISO) SC 25/WG 3 Working Group on telecommunications cabling published the ISO/IEC 11801 standard in 1995.

Following are highlights of the '568-A standard and related Telecommunication Systems Bulletins (TSBs) with notes on differences in terminology and technical requirements with respect to '11801. For clarity and consistency, '568-A based terminology is used in the following overview.

Purpose

- To specify a generic voice and data telecommunications cabling system that will support a multi-product, multi-vendor environment.
- To provide direction for the design of telecommunications equipment and cabling products intended to serve commercial enterprises.
- To enable the planning and installation of a structured cabling system for commercial buildings that is capable of supporting the diverse telecommunications needs of building occupants.
- To establish performance and technical criteria for various types of cable and connecting hardware and for cabling system design and installation.

Scope

- Specifications are intended for telecommunications installations that are "office oriented".
- Requirements are for structured cabling system with a usable life in excess of 10 years.
- Specifications addressed:
 - Recognized Media
 - Cable and connecting Hardware
 - Performance
 - Topology
 - Cabling Distance
 - Installation Practices
 - User Interfaces
 - Channel Performance

Cabling Elements

- Horizontal Cabling:
 - Horizontal Cross-connect (HC)
 - Horizontal Cable
 - Transition Point (optional)
 - Consolidation Point (optional)
 - Telecommunications-Outlet/Connector (TO)
- Backbone Cabling
 - Main Cross-connect (MC)
 - Interbuilding Backbone Cable
 - Intermediate Cross-connect (IC)
 - Intrabuilding Backbone Cable
- Work Area (WA)
- Telecommunications Closet (TC)
- Equipment Room (ER)
- Entrance Facility (EF)
- Administration

2.0 HORIZONTAL CABLING SYSTEM STRUCTURE

The horizontal cabling system extends from the telecommunications outlet in the work area to the horizontal cross-connect in the telecommunications closet. It includes the telecommunications outlet, an optional consolidation point or transition point connector, horizontal cable, and the mechanical terminations and patch cords (or jumpers) that comprise the horizontal cross-connect.

2.1 Some points specified for the horizontal cabling subsystem include:

- Recognized Horizontal Cables:
 - 4 pair 100 Ω unshielded twisted-pair.
 - 2-fiber (duplex) 62.5/125 μm or multimode optical fiber 9note: 50/125 μm multimode fiber will be allowed in '568-B)
- A minimum of two telecommunications outlets are required for each individual work area.
 - First outlet: 100 Ω twisted pair (category 5e is recommended)
 - Second outlet: 100 Ω twisted pair.
 - Two-fiber multimode optical fiber either 62.5/125 μm or 50/125 μm .
- One transition point (TP) is allowed between different forms of the same cable type (i.e. where undercarpet cable connects to round cable)
- 50 Ω coax and 150 Ω STP-A cabling is not recommended for new installations.
- Additional outlets may be provided. These outlets are in addition to and may not replace the minimum requirements of the standard.
- Bridged taps and splices are not allowed for copper-based horizontal cabling. (Splices are allowed for fiber).

- Application specific components shall not be installed as part of the horizontal cross-connect (eg. Splitters, baluns).
- The proximity of horizontal cabling to sources of electromagnetic interference (EM) shall be taken into account.

3.0 BACKBONE CABLING SYSTEM STRUCTURE

The backbone cabling system provides interconnections between telecommunications closets, equipment rooms, and entrance facilities. It includes backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connections. The backbone also extends between buildings in a campus environment.

- Equipment connections to backbone cabling should be made with cable lengths of 30m (98 ft) or less.
- The backbone cabling shall be configured in a star topology. Each horizontal cross-connect is connected directly to a main cross-connect or to an intermediate cross-connect, then to a main cross-connect.
- The backbone is limited to no more than two hierarchical levels of cross-connects (main and intermediate). No more than one cross-connect may exist between a main and a horizontal cross-connects may exist between any two horizontal cross-connects.
- A total maximum backbone distance of 90m (295 ft.) is specified for high band-width capability over copper. This distance is for uninterrupted backbone runs. (No intermediate cross-connect).
- The distance between the terminations in the entrance facility and the main cross-connect shall be documented and should be made available to the service provider.
- Recognized media may be used individually or in combination, as required by the installation. Quantity of pairs and fibers needed in individual backbone runs depends on the area served. Recognized backbone cables are:

100 Ω UTP

150 Ω stp-a

625/125 μ Multimode Optical Fiber

Single mode Optical Fiber

- Multipair cable is allowed, provided that it satisfies the power sum crosstalk requirements.
- The proximity of backbone cabling to sources of electromagnetic interference (EMI) shall be taken into account.
- Cross-connects for different cable types must be located in the same facilities.
- Bridged taps are not allowed.

3.1 WORK AREA:

The telecommunications outlet serves as the work area interface to the cabling system. Work area equipment and cables used to connect to the telecommunications outlet are outside the scope of '568-A and '11801, but are expected to be specified in the next edition of these standards.

4.0 OPEN OFFICE CABLING:

Additional specifications for horizontal cabling in areas with moveable furniture and partitions have been introduced in TIA/EIA TSB75. Horizontal cabling methodologies are specified for “open-office” environments by means of multi-user telecommunications outlet assemblies and consolidation points. These methodologies are intended to provide increased flexibility and economy for installation with open office work spaces that require frequent configuration.

HORIZONTAL DISTANCES OF COPPER LINKS (OPEN OFFICE)

Copper work area cables connected to a MuTOA, shall meet the requirements of ‘568-A (sec. 10.5 and 11.5). The maximum length of copper work area cables shall be determined according to:

$$C = (102 - H)/12$$
$$W = C - 7 (<29 \text{ m})$$

Where:

C is the combined length of the work area cable, equipment Cable, and patch cord (m).

W is the length of the work area cable (m).

H is the length of the horizontal cable (m)

The above equations assume that there is a total of 7m (23 ft.) of patch and equipment cables in the telecommunications closet. Table 1 shows the application of these formulae. The length of work area cables shall not exceed 20m (66 ft). The MuTOA shall be marked with the maximum allowable work area cable length.

| Length of Horizontal Cable | Maximum Length of Work Area Cable | Maximum Combined Length of Work Area Cables, Patch Cords, and Equipment Cable |
|----------------------------|-----------------------------------|---|
| H m (ft) | W m (ft) | C m(ft) |
| 90 (295) | 3 (10) | 10 (33) |
| 85 (279) | 7 (23) | 14 (46) |
| 80 (262) | 11 (36) | 18 (59) |
| 75 (246) | 15 (49) | 22 (72) |
| 70 (230) | 20 (66) | 27 (89) |

Table 1 – Maximum Length of Work Area Cables

5.0 HORIZONTAL DISTANCES OF OPTICAL FIBER LINKS (LONG WORK AREA CABLES)

For optical fiber cables, any length combination or length of the horizontal channel does not exceed 100m (328 ft).

When deploying a centralized fiber cabling topology, the general guidelines of TSB72 shall be followed.

6.0 TELECOMMUNICATIONS CLOSET

Telecommunications closets are generally considered to be floor serving facilities for horizontal cable distribution. They may also be used for intermediate and main cross-connects.

Some specifications related to the telecommunications closet:

- Closets shall be designed and equipped in accordance with ANSI/TIA/EIA-569-A.
- Cable stress from tight bends, cable ties, staples, and tension should be avoided by well-designed cable management.
- Only standards-compliant connecting hardware shall be used.
- Cables and cords used for active equipment connections are outside the scope of the standard (10m total allowed for patch cords, equipment cables, and work area cables for each link).
- Application-specific electrical components shall not be installed as part of the horizontal cabling.
- Horizontal cable terminations shall not be used to administer cabling system changes. Instead, jumpers patch cords, or equipment cords are required for re-configuring cabling connections

The two types of schemes used to connect cabling subsystems to each other and to equipment are known as interconnections and cross-connections.

DEFINITIONS:

Cross-Connection:

A connection scheme using patch cords or jumpers that attach to connecting hardware on each end.

Interconnection:

A connection scheme that provides for direct connections to building cabling from equipment without a patch cord.

7.0 TWISTED-PAIR (BALANCED) CABLING

The six categories of transmission performance specified for cables, connecting hardware and links are:

| Designation | Transmission Characteristics | Description |
|-------------|---|---|
| 3 | Transmission characteristics are specified up to 16 MHz. | Meets applicable category 3 and Class C requirements of ISO/IEC 11801 (including amendments A.1 & A.2), ANSI/TIA/EIA-568-A (including addenda A-1, A-2, & A.3) and TSB67. Requirements are specified to an upper frequency limit of 16MHz. |
| 4 | Transmission characteristics are specified up to 20 MHz | Meets applicable category 4 requirements of ISO/IEC 11801 (including amendments A.1 & A.2), ANSI/TIA/EIA-568-A (including addenda A-1, A-2 & A-3) and TSB67. Requirements are specified to an upper frequency limit of 20 MHz. This classification is a superset of 3 |
| 5 | Transmission characteristics are specified up to 100 MHz. | Meets applicable category 5 and class D requirements of ISO/IEC 11801 (including addenda A-1, A-2 & A-3), TSB67 and draft TSB95. Requirements are specified to an upper frequency limit of 100 MHz. This classification is a superset of 4. |
| 5e | Transmission characteristics are specified up to 100 MHz. | Performs to category 5e and additional class D requirements of draft amendment 3 of ISO/IEC 11801, and draft addendum 5 to ANSI/TIA/EIA-568-A. Requirements are specified to an upper frequency limit of 100 MHz. This classification is a superset of 5. |
| 6. | Transmission characteristics will be specified up to 250 MHz. | Performs to category 6 and class E requirements under development by ISO/IEC and TIA. |

Requirements are expected to be specified to an upper frequency limit of at least 250 MHz. This classification is a superset of 5e

- | | | |
|----|---|--|
| 7. | Transmission characteristics will be specified up to 600 MHz. | Performs to category 7 and class F requirements under development by ISO/IEC. Requirements are expected to be specified to an upper frequency limit of at least 600 MHz. This classification is an electrical superset of 6. |
|----|---|--|

Category 6 and 7 industry are currently under development.

8.0 UTP TELECOMMUNICATIONS OUTLET/CONNECTOR

- 8-position modular jack per IEC 60603-7 (.568-A states that all pairs must be connected).
- Pin/pair assignment: T568A Optional assignment to accommodate certain systems: T568B.
- Durability rating 750 mating cycles minimum.
- Backward compatibility and interoperability is required.

9.0 FULLY SHIELDED TELECOMMUNICATIONS OUTLET/CONNECTOR.

- Entirely new interface design to support class F cabling.
- Will require a new wiring pin/pair assignment.
- Transmission measurement methods for category 7 are under study.
- Durability rating 1000 mating cycles minimum.

10.0 UTP CONNECTING HARDWARE VS. CABLE NEXT PERFORMANCE.

- Specifications cover all types of connectors used in the cabling system including the telecommunications outlet/connector.
- Does not cover work area adapters, baluns, protection, MAUs, filters, or other application-specific devices.
- Temperature range -10°C (14°F) to 60°C (140°F).
- Outlets shall be securely mounted. Outlet boxes with unterminated cables must be covered and marked.
- Transmission requirements are much more severe than cable of a corresponding category.
- Performance markings should be provided to show the applicable transmission category and should be visible during installation (for example 5e) in addition to safety markings.
- Installed connectors shall be protected from physical damage and moisture.

10.1 UTP LINK PERFORMANCE MARKING AND IDENTIFICATION

- Link category marking should be clearly visible on both ends (component markings are not sufficient).
- Labelling, markings, and color-coding shall be provided in accordance with ANSI/TIA/EIA-606.

11.0 SCREENED CABLING (ScTP)

As a result of the release of TIA/EIA/IS-729 and the maturity of the '568-A and '11801 standards, telecommunications groups recognize the presence of an overall shield over four twisted-pairs; a media hybrid termed Screened Twisted-Pair or ScTP cabling.

11.1 ScTP:

- Color-coding:
Pair 1 = White/Blue-Blue
Pair 2 = White/Orange-Orange
Pair 3 = White/Green-Green.
Pair 4 = White/Brown-Brown
- 0.51mm (24 AWG) 100 Ω 4-pair enclosed by a foil shield.
- A copper conductor drain wire of .040mm (26 AWG) or larger shall be provided.
- Should be marked "100 Ω ScTP", in addition to any safety markings required by local or national codes.
- Same mechanical and transmission requirements apply to backbone and horizontal cables.
- Additional performance requirements, including surface transfer impedance, is specified in the IS-729 standard entitled, "Technical Specifications for 100 Ω Screened Twisted-Pair Cabling".

11.2 ScTP Connectors:

- Interface and pair assignments same as IEC 60603-7 ('568-A states that all 4 pairs must be connected).
- Additional transfer impedance and shield mating interface requirements specified in the IS-729 standard entitled, "Technical Specifications for 100 Ω Screened Twisted-pair Cabling".

11.3 ScTP Patch Cords:

- Specifications call for 26 AWG (7 strands @ 0.15mm) or 24 AWG (7 strands @ 0.20mm) stranded conductors.
- Allows for an overall shield.
- Less severe attenuation than horizontal cable.

11.4 ScTP Installation Practices:

- Shield shall be bonded at both ends at the "Telecommunication Grounding Busbar".
- The difference between the two grounds shall be no more than 1.0 V RMS.

12.0 FULLY SHIELDED CABLING (SSTP)

Fully shielded cabling requirements are under development by ISO. Cable and connector specification will extend to at least 600 MHz and are intended to support the pending class F cabling requirements.

12.1 Fully Shielded Cable:

- Color-coding:
Pair 1 = White/Blue-Blue
Pair 2 = White/Orange-Orange
Pair 3 = White/Green-Green
Pair 4 = White/Brown-Brown
- Four 0.51mm (24 AWG) or larger 100 Ω twisted-pairs each enclosed by an individual foil shield with an overall shield provided over the four-pairs.
- Mechanical and transmission requirements are under development by ISO.

12.2 Fully Shielded Connectors:

- Interface and pair assignments are under development by ISO and will be entirely different from the T568A and T568B assignments.
- Mechanical and transmission requirements are under development by ISO.

12.3 Fully Shielded Patch Cables.

- Mechanical and transmission requirements are under development by ISO.

12.4 Fully Shielded Installation Practices:

- Installation Practices are under development by ISO.-

12.5 TSB67

Transmission Performance Specifications for Field Testing of UTP Cabling Systems

This bulletin provides users with the opportunity to use comprehensive test methods to validate the transmission performance characteristics of installed category 5 and lower grade UTP cabling systems. The categories of UTP cabling systems in this bulletin also correspond with the UTP cabling categories of ANSI/TIA/EIA-568-A. Additional transmission performance and applicable field test requirements are referenced in TSB95, '568-A-5 and amendment 2 to '11801 (FDAM 2)

12.6 Some points specified for TSB67 transmission field testing for UTP Cabling Systems

- UTP cabling systems are comprised of cables and connecting hardware specified in TIA/EIA-568-A.
- Required test parameters include wire-map, length, attenuation, and crosstalk.
- Two levels of pass or fail are indicated, depending on measured margin compared to minimum specifications. Testing of NEXT loss is required in both directions.
- Level II equipment meets the most stringent requirements for TSB67 measurement accuracy. Level IIe equipment will be required to verify category 5e and FDAM 2 performance.
- Requirements are intended for performance validation and are provided in addition to '568-A requirements on components and installation practices.

13.0 OPTICAL FIBER CABLING

The current '568-A specification on optical fiber cabling consists of one recognized cable type for horizontal subsystems and two cable types for backbone subsystems:

Horizontal – 62.5/125 μ m multimode (two fibers per outlet).

Backbone - 62.5/125 μ m multimode or singlemode.

'568-B will allow the use of 50/125 μ m multimode optical fiber in both the horizontal and backbone in addition to the types listed above.

All optical fiber components and installed practices shall meet applicable building and safety codes

13.1 Optical Fiber Patch Cords:

- Shall be a two-fiber (duplex) indoor cable Of the same type as the cables to which they connect.
- Shall allow for easy connection and reconnection and ensure that polarity is maintained (568SC configuration required).
- Shall perform a pair-wise cross-over of fiber positions A and B. (If provided in simplex form, one connector shall be identified as "A" and the other "B".)

13.2 Installation of Optical Fiber Connecting Hardware:

- Connectors shall be protected from physical damage and moisture.
- Capacity for 12 or more fibers per rack space [44.5mm (1.75 in.)] should be provided.
- Optical fiber connecting hardware shall be installed:
 - To provide well organized installation with cable management.
 - In accordance with manufacturer's guidelines.

13.3 Optical Fiber Cabling Installation:

- A minimum of 1m (3.28 ft.) of two-fiber cable (or two buffered fibers) shall be accessible for termination purposes.
- Testing is recommended to assure correct polarity and acceptable link performance. Informative Annex H of '568-A is provided for recommended optical fiber link performance testing criteria.

13.4 Optical Fiber Work Area Connector:

- A simplex or duplex SC connector shall be used at the work area.
- Recommended adapter and connector is the 568SC (a duplex SC that is capable of simplex operation).

13.5 Optical Fiber Connections:

- Connector designs shall meet the requirements of the corresponding TIA FOCIS documents.
- Telecommunications outlet/connector boxes shall be securely mounted at planned locations.
- The telecommunications outlet/connector box shall have:
 - The ability to secure optical fibers.
 - Cable management means to assure a minimum bend radius of 25mm (1.00 in.) and should have slack storage capability.
 - Provisions for terminating a minimum of two optical fibers into a 568SC adapter.
- Identification of fiber types:
 - Multimode connectors and adapters shall be identified with the color beige.
 - Single mode connectors and adapters shall be identified with the color blue.
- The two positions in a duplex connector are referred to as "position A" and "position B".
- The 568SC adapter performs a pair-wise cross-over between position A and position B of two mated connectors.
- Optical fiber runs intended for future connections shall be stored in a telecommunications outlet/connector box.

13.6 Small Form Factor (SFF) Connectors:

- Qualified SFF duplex and multi-fiber connector designs may be used in the main cross connect, intermediate cross-connect, horizontal cross-connect, and consolidation points.
- A TIA Fiber Optic Connect Intermateability Standard (FOCIS) shall describe each SFF design.
- The SFF design shall satisfy the requirements specified in Annex A of the proposed '568-B.3 standard.
- Some advantages of SFF connectors include compact size, modular compatibility with the eight position modular copper interface, and adaptability to high-density network electronics.

13.7 TSB72 Centralized Optical Fiber Cabling Guidelines

This Telecommunications Systems Bulletin (TSB) provides the user with the flexibility of designing an optical fiber cabling systems for centralized electronics typically in single tenant buildings. It contains information and guidelines for centralized optical fiber cabling.

Some points specified in TSB-72 for a centralized optical fiber cabling system include:

- Intended for single-tenant users who desire centralized vs. distributed electronics.
- Implementation allows cables to be spliced or interconnected at the telecommunications closet such that cables can be routed to a centralized distributor for total cable lengths of 300m (984 ft.) or less, including patch cords or jumpers.
- Allows for migration from an interconnection or splice to a cross-connection scheme that can also support distributed electronics.
- Pull-through implementations are allowed when total length between the tele-communications outlet/connector and centralized cross-connect and centralized cross-connect is 90m (295 ft.) or less.
- Connecting hardware required to:
 - join fibers by re-mateable connectors or splices,
 - connectors shall be 568SC interface,
 - provide for simplex or duplex connection of optical fibers,
 - provide means of circuit identification,
 - allow for addition and removal of optical fibers.

Note: Some multi-mode fiber implementations may be limited to an operating range of 220m to support 1000BASE-SX.

13.8 TIA/EIA-568-A-1

Propagation Delay and delay Skew

This addendum to '568-A describes propagation delay and delay skew requirements for all '568-A compliant 4-pair 100 Ω cables. Propagation delay and delay skew requirements of multipair cables are subject to additional study.

Propagation delay is equivalent to the amount of time that passes between when a signal is transmitted and when it is received at the other end of a cabling channel. Delay skew is the difference between the pair with the least delay and the pair with the most delay. Transmission errors that are associated with excessive delay and the delay skew include increased jitter and bit error rates.

The maximum propagation delay skew requirement for 4-pair 100 Ω cables is frequency dependent and is specified by the following equation:

$$\text{Delay (ns/100m)} [534 + 36/\sqrt{f\text{MHz}}]$$

Cable delay skew shall not exceed 45 ns/100m between 1 MHz and the highest referenced frequency for a given category.

It is anticipated that the requirements of '568-A-1 will also be applicable to pending category 6 cable propagation delay and delay skew specifications while more stringent performance criteria will be specified for pending category 7 cables.

13.9 TIA/EIA-568-A-2

Corrections and additions to TIA/EIA-568-A

This addendum to '568-A provides modifications and corrections to the content of '568-A as a result of advances in telecommunications research and development. Revisions are as follows:

1. Centralized optical fiber cabling is referenced in two locations (5.2.1 and 7.4.1) as an alternative to the optical cross-connection located in the telecommunications closet when deploying 62.5/125 μm optical fiber cable in the horizontal. TIA/EIA TSB72 Centralized Optical Fiber Cabling Guidelines are also referenced.
2. The ANSI/ICEA reference in section 10.2.3 was updated to ANSI/ICEA S-90-661-1994 for specifying the physical and mechanical requirements of '568-A recognized cables.
3. Additional text was incorporated into section 10.4.3.4 specifying that the connecting hardware used for 100 Ω UTP cabling shall not result in or contain any transposed (e.g transposition of pairs 2 or 3) or reversed (also called tip/ring reversals) pairs. It is further noted that applications requiring transposed or reversed pairs shall utilize adapters, work area or equipment cords to swap pairs.
4. A reference to the TSB67 field test methodologies is added to section 10.6.4
5. The 568SC optical fiber connector axial pull off strength requirement was decreased from 22 N (5 lbf) to 19.4 N (4.4 lbf)
6. Globally, the word "polarization" was replaced with "polarity".
7. The initial contact resistance specified in Annex A for connecting hardware was increased from 1 m Ω to 2.5 m Ω and the contact resistance measurement method was re-written to be more user-friendly.

8. A provision for common mode terminations for testing connecting hardware NEXT loss and return loss was incorporated into Annex B. This revision accommodates telecommunications networking implementations that may employ common mode terminations in the active equipment.

13.10 TIA/EIA-568-A-3

Addendum 3 to TIA/EIS-568-A

As a result of the demand for open office architecture and the need to support multiple telecommunications applications in a shared sheath, this addendum to '568-A addresses revised performance specifications for hybrid cables. '568-A-3 also introduces a new term called "bundled cables" to describe 4-pair cable assemblies that are not covered by an overall sheath (as specified for hybrid cables), but by any generic binding method such as "speed-wrap" or "cable-ties"

The new hybrid and bundled cable requirements state that power sum NEXT loss between all non-fiber cable types within that cable shall be 3 dB better than the specified pair-to-pair NEXT loss for each cable type.

13.11 TIA/EIA-568-A-4

Production Modular Cord NEXT Loss Test Method and Requirements for Unshielded Twisted-Pair Cabling

TIA/EIA-568-A-4 defines a generic and non-destructive methodology for NEXT loss testing of modular plug cords. NEXT loss performance requirements for category 5 modular plug cords, when measured with the particular test head specified in the Standard, are provided. Note that, although the methodology may be used as the basis for determining the minimum NEXT loss performance requirements of other categories of modular plug cords, at present, the Standard does not define a test head or specific test limits for category 5e or category 6 patch cords. The methodology described in the Standard contains the detailed NEXT loss calculations (which are based upon patch cable NEXT loss, test head NEXT loss, and cable and connector attenuation contributions) for the determination of the NEXT loss limits for any category patch cord and suitably designed test head.

13.12 TIA/EIA-568-A-5

Transmission Performance Specifications for 4-pair 100 Ω Enhanced Category 5 Cabling.

'568-A-5 specifies enhanced category 5 (category 5e) performance requirements. These requirements are recommended for new category 5 cabling installations and are expected to become the de facto minimum standard for category 5 cabling. This document addresses the minimum equal level far-end crosstalk (ELFEXT) and return loss requirements necessary to support developments in applications technology and defines the minimum performance needed for a worst case for-connector channel to support applications that utilize full-duplex transmission schemes, such as Gigabit Ethernet. To ensure additional crosstalk headroom for robust applications support, this document also specifies power sum performance requirements for category 5e cables and cabling.

Addendum 'A-5 is a normative document and, unlike TSB95, it provides mandatory requirements, not recommendations.

13.13 TIA/EIA TSB95

Additional Transmission Performance Guidelines for 100 Ω 4-pair Category 5 Cabling.

TSB95 outlines minimum recommendations for the new channel parameters of return loss and equal level far-end crosstalk (ELFEXT). These return loss and ELFEXT recommendations are specified to ensure the support of Gigabit Ethernet over installed or "legacy" category 5 cabling and were derived from worst case performances of channels with only two connection points. The two-connector channel topology is consistent with the IEEE committee's assumption that cabling used to support Gigabit Ethernet systems will most likely utilize an interconnect instead of a cross-connect field and will not include a consolidation or transition point connection. Existing installed category 5 cabling should be verified to ensure that performance meets the minimum recommendations of this document. Channel configurations with three or

four connectors that meet the specified ELFEXT and return loss recommendations will also support Gigabit Ethernet. Because the specifications of this document are applicable for the qualification of existing, installed cabling only, they are not recommended to be used As the minimum performance criteria for new category 5 cabling.

13.14 TIA/EIA/IS-729

Technical Specifications for 100 Ω Screened Twisted-Pair Cabling.

IS-729 is an interim standard that supplements TIA-568-A and ISO/IES 11801 screened twisted-pair cabling specifications by describing additional technical requirements on the outlet interface, shield effectiveness, installation practices, and performance relative to ScTP links and components.

13.15 ISO/IEC 11801:1995 FDAM 2

Draft Amendment 2 to ISO/IEC 11801

The performance specifications in ISO amendment 2 provide new requirements for return loss and ELFEXT loss to compliment the existing ISO class D requirements. The new specified return loss and ELFEXT loss requirements are in harmony with the values proposed in '568-A-5, however, the document does not specify additional NEXT loss margin over and above the existing class D requirements. FDAM 2 also includes propagation delay and delay skew requirements for channels and permanent links that are in harmony with the requirements of TIA/EIA-568-A-1

The requirements of amendment 2 to ISO/IES 11801 are normative and this document will become the governing international standard for new class D cabling installations.

14.0 CABLING SPECIFICATION CROSS-REFERENCE CHART (ANSI/TIA/EIA-568-A AND ISO/IEC 11801)

The following chart provides a side-by-side comparison that highlights many of the fundamental similarities and differences between ANSI/TIA/EIA-568-A and ISO/IEC 11801.

ANSI/TIA/EIA-568-A (and addenda)
Commercial Building Telecommunications
Cabling Standard

ISO/IEC 11801 (and amendments)
Generic Cabling for Customer
Premises

14.1 HORIZONTAL UTP CABLE

- Solid 4-pair 0.51mm (24 AWG) specified (0.64mm (22 AWG) solid also allowed). An overall shield ((ScTP) is optional.
- Performance marking should be provided to show the applicable performance category. These markings do not replace safety markings.
- Colour-coding:

White/blue-blue
White/orange-orange
White/green-green
White/brown-brown.

14.2 HYBRID AND BUNDLED CABLES

Hybrid/Bundled cables:

- Hybrid/bundled cables that contain multiple units of recognized horizontal copper cables are subject to additional NEXT loss requirements between cable units. These requirements assure a minimum of 3 dB additional power sum crosstalk isolation between applications that may operate on adjacent binder groups.
- All detailed specifications for the individual cable units used in the hybrid assembly still apply.
- Hybrid bundled cables shall meet the transmission requirements specified in TIA/EIA-568-A-3.

14.3 UTP PATCH CORDS AND CROSS-CONNECT JUMPERS.

- Patch cords must use stranded cable for adequate flex life
- Standard cables must meet the minimum performance requirements for horizontal cable except that 20 percent more attenuation is allowed by '568-A and 50 percent more attenuation is allowed by '11801.
- Color-code for cross-connect jumpers: One conductor white, the other a visibly distinct color such as red or blue.
- Performance markings should be provided to show the applicable transmission category in addition to safety markings.
- Insulated O.D of stranded wires should be 0.8mm (0.032 in.) to 1mm (0.039 in.) to fit into a modular plug.
- Production performance specifications for plug cord assemblies are addressed in '568-A-4
- Color codes for stranded, 100 Ω UTP patch cord:

| | |
|---------------------|---------------------|
| Option 1 | Option 2 |
| White/blue-blue | PAIR 1 green-red |
| White/orange-orange | PAIR 2 black-yellow |
| White/green-green | PAIR 3 blue-orange |
| White/brown-brown | PAIR 4 brown-slate |

Note: Because of their identical pair groupings, patch cords terminated with either T568A or T568B pair assignments may be used interchangeably, provided that both ends are terminated with the same pin/pair scheme.

14.4 BACKBONE UTP CABLE

- Performance markings should be provided to show the applicable performance category. These markings do not replace safety markings.
- Services with incompatible signal levels should be partitioned into separate binder groups. Guidelines for shared sheaths are provided in Annex D of '568-A.
- Transmission requirements are equivalent to horizontal cables except that NEXT loss performance is based on power-sum rather than worst-pair characterization to allow for multiple disturbing signals (of the same type) in the same sheath.
- Note: Tip conductors have colored insulation that corresponds to that of the binder group. Ring conductors have colored insulation that corresponds to that of the pair.
- Backbone UTP cables consist of solid 0.51 mm (24 AWG) cables that contain more than four pairs (typically multiples of 25-pairs are used). An overall shield is optional.
- Color-coding (specified by reference to ICEA)

15.0 MODULAR WIRING REFERENCE

Modular Jack Styles:

There are four basic modular jack styles. The 8-position modular outlets are commonly and incorrectly referred to as "RJ45". The 6-position modular jack is commonly referred to as RJ11. Using these terms can sometimes lead to confusion since the RJ designation actually refer to very specific wiring configurations called Universal Service Order Code (USOC). The designation 'RJ' means Registered Jack. Each of these basic jack styles can be wired for different RJ configurations. For example, the 6-position jack can be wired as an RJ11C (1-pair), RJ14C (2-pair), or RJ25C (3-pair) configuration. An 8-position jack can be wired for configurations such as RJ61C (4-pair) and RJ48C. The keyed 8-position jack can be wired for RJ46S, and RJ47S. The fourth modular jack style is a modified version of the 6-position jack (modified modular jack or MMJ). It was designed to eliminate the possibility of connecting DEC data equipment to voice lines and vice versa.

15.1 MODULAR PLUG PAIR CONFIGURATIONS

It is important that the pairing of wires in the modular plug match the pairs in the modular jack as well as the horizontal and backbone wiring. If they do not, the data being transmitted may be paired with incompatible signals.

Modular cords wired to the T568A color scheme on both ends are compatible with T568B systems and vice versa.

15.2 STRAIGHT THROUGH OR REVERSED?

Modular cords are used for two basic applications. One application uses them for patching between modular patch panels. When used in this manner modular cords should always be wired "straight through" (pin 1 to pin 1, pin 2 to pin 2, pin 3 to pin 3, etc). The second major application uses modular cords to connect the workstation equipment (PC, phone, FAX etc) to the modular outlet. These modular cords may either be wired "straight-through" or "reversed" (pin 1 to pin 6, pin 2 to pin 5, pin 3 to pin 4, etc.) depending on the system manufacturer's specifications. This "reversed" wiring is typically used for voice systems. The following is a guide to determine what type of modular cord you have

15.3 HOW TO READ A MODULAR CORD

Align the plugs side-by-side with the contacts facing you and compare the wire colors from left to right. If the colors appear in the same order on both plugs, the cord is wired "straight-through". If the colors appear reversed on the second plug (from right to left), the cord is wired "reversed".

15.4 COMMON OUTLET CONFIGURATIONS

Two wiring schemes have been adopted by the '568-A and '11801 standards. They are nearly identical except that pairs two and three are reversed. T568A is the preferred scheme because it is compatible with 1 or 2-pair USOC systems. Either configuration can be used for Integrated Services Digital Network (ISDN) and high speed data applications. Transmission categories 3, 4, 5, 5e, and 6 are only applicable to this type of pair grouping.

USOC wiring is available for 1-, 2-, 3-, or 4-pair systems. Pair 1 occupies the center conductors, pair 2 occupies the next two contacts out, etc. One advantage to this scheme is that a 6-position plug configured with 1, 2, or 3 pairs can be inserted into an 8-position jack and still maintain pair continuity. A note of warning though, pins 1 and 8 on the jack may become damaged from this practice. A disadvantage is the poor transmission performance associated with this type of pair sequence. None of these pair schemes is cabling standard compliant.

10Base-T wiring specifies an 8-position jack but uses only two pairs. These are pairs two and three of T568A and T568B schemes.

The MMJ is a unique wiring scheme for DEC® equipment.

16.0 RECOMMENDED CABLING PRACTICES

Do's

- ☐ Terminate each horizontal cable on a dedicated telecommunications outlet.
- ☐ Locate the main cross-connect near the center of the building to limit cable distances.
- ☐ Maintain the twist of horizontal and backbone cable pairs up to the point of termination.
- ☐ Tie and dress horizontal cables neatly and with a minimum bend radius of 4 times the cable diameter.

Dont's:

- ☐ Do not use connecting hardware that is of a lower category than the cable being used.
- ☐ Do not create multiple appearances of the same cable at several distribution points (called bridged taps)
- ☐ Do not over-tighten cable ties, use staples, or make sharp bends with cables.
- ☐ Do not place cable near equipment that may generate high levels of electromagnetic interference.

17.0 UTP CONNECTOR TERMINATIONS

- Pair twists shall be maintained as close as possible to the point of termination.
- Untwisting shall not exceed 25mm (1.0 in) for category 4 links and 13mm (0.5 in) for category 5, category 5e, and category 6 links. Follow manufacturer guidelines for category 3 products, if no guidelines exist, then untwisting shall not exceed 75mm (3.0 in).
- Connecting hardware shall be installed to provide well-organized installation with cable management and in accordance with manufacturer's guidelines.
- Strip back only as much jacket as is required to terminate individual pairs.

17.1 UTP CABLING INSTALLATION PRACTICES.

- To avoid stretching, pulling tension should not exceed 110N (25 lbf) for 4-pair cables.
- Installed bend radii shall not exceed:
 - 4 times the cable diameter for horizontal UTP cables.
 - 10 times the cable diameter for multi-pair backbone UTP cables.
- Horizontal cables should be used with connecting hardware and patch cords (or jumpers) of the same performance category or higher.

- Avoid cable stress, as caused by:
 - cable twist during pulling or installation
 - tension in suspended cable runs
 - tightly cinched cable ties or staples
 - tight bend radii.
- Important Note: Installed UTP cabling shall be classified by the least performing component in the link.

18.0 ANSI/TIA/EIA-569-A

Commercial Building Standard for Telecommunications Pathways and Spaces.

The TIA TR42.3 (formerly TR41.8.3) Working group on Telecommunications Pathways & Spaces published the ANSI/TIA/EIA-569-A ('569-A) Standard in 1998.

Following are highlights of the '569-A Standard:

Purpose

- Standardize design and construction practices.
- Provides a telecommunications support system that is adaptable to change during the life of the facility.

Scope

- Pathways and spaces in which telecommunications media are placed and terminated.
- Telecommunications pathways and spaces within and between buildings.
- Commercial building design for both single and multi-tenant buildings.

Elements

- Horizontal
- Backbone
- Work Area
- Telecommunications Closet
- Equipment Room
- Main Terminal Space.
- Entrance Facility

18.1 HORIZONTAL

Pathways from telecommunications closet to work area.

Includes:

Pathway Types:

- Underfloor-Network of raceways embedded in concrete consisting of distribution and header ducts, trenches, and cellular systems.
- Access Floor-Raised modular floor tile supported by pedestals, with or without lateral bracing or stringers.
- Conduit-Metallic and nonmetallic tubing of rigid or flexible construction permitted by applicable electrical code.
- Tray & Wireway-Prefabricated rigid structures for pulling or placing cable.
- Ceiling-Open environment above accessible ceiling tiles and frame work.
- Perimeter-Surface, recessed, molding, and multichannel raceway systems for wall mounting around rooms or along hallways.

Space Types:

- Pull Boxes-Used in conjunction with conduit pathway systems to assist in the fishing and pulling of cable.
- Splice Boxes-a box, located in a pathway run, intended to hold a cable splice.
- Outlet Boxes-Device for mounting faceplates, housing terminated outlet/connectors, or transition devices.

Design Considerations:

- Grounded per code and ANSI/TIA/EIA-607 ('607)
- Designed to handle recognized media as specified in ANSI/TIA/EIA-568-A ('568-A)
- Not allowed in elevator shafts.
- Accommodate seismic zone requirements
- Installed in dry locations

18.4 BACKBONE

Pathways routed from closet-to-closet.

Building Backbone Types:

- Ceiling
- Conduit
- Sleeves-An opening, usually circular, through the wall, ceiling, or floor.
- Trays

Typically the most convenient and cost effective backbone pathway design in multi-story buildings, is to have stacked closets located one above the other, connected by sleeves or slots.

Design Considerations:

- Grounded per code and '607
- Accommodate seismic zone requirements
- Water should not penetrate the pathway system
- Tray, conduits, sleeves, slots penetrate closets minimum 25mm (1 in.)
- Designed to handle all recognized media (as specified in '568-A)
- Integrity of all fire stop assemblies shall be maintained.

18.3 WORK AREA

Primary location where the building occupants interact with dedicated telecommunications equipment.

Design Considerations:

- At least one telecommunication outlet box location shall be planned for each work area.
- This location should be coordinated with the furniture plan. A power outlet should be nearby.
- Control center, attendant, and reception areas shall have direct and independent pathways to the serving telecommunications closet.
- Furniture System design:
 - Cable access via walls, columns, ceilings, or floors. Fittings that transition between building and furniture pathways require special planning.
 - Furniture pathway fill capacity is effectively reduced by furniture corners, and connectors mounted within the furniture pathway systems.
 - Furniture pathways bend radius shall not force the installed cable to a bend radius of less than 25 mm (1 in.)
 - Furniture spaces designed to house slack storage, consolidation points, or multi-user telecommunications outlet assemblies shall provide space for strain relieving, terminating, and storing slack for the horizontal cables.

- Slack storage and furniture pathway fill, shall not affect the bend radius and termination of the cable to the connector.
- Furniture pathway openings shall comply with either of two sizes:
 - 1) Standard NEMA opening (NEMA OS 1 (Ref D. 14), WD-6 (Ref D. 15))
 - 2) Alternate opening:

Power/telecommunication separation requirements is governed by applicable electrical code for safety. Minimum separation requirements of Article 800-52 of ANS/NFPA 70 (National Electric Code) shall be applied.

18.4 TELECOMMUNICATIONS CLOSETS

Recognized location of the common access point for backbone and horizontal pathways.

Design:

- Dedicated to telecommunications function.
- Equipment not related to telecommunications shall not be installed, pass through or enter the telecommunications closet.
- Multiple closets on the same floor shall be interconnected by a minimum of one (78 (3) trade size) conduit, or equivalent pathway.
- Minimum floor loading 2.4 kPa (50 lbf/ft²).

Design Considerations:

- Minimum one closet per floor to house telecommunications equipment/cable terminations and associated cross-connect cable and wire.
- Located near the center of the area being served.
- Horizontal pathways shall terminate in the telecommunications closet on the same floor as the area served.
- Accommodate seismic zone requirements.
- Two walls should have 20mm (0.75 in.) A-C plywood 2.4m (8ft.) high.
- Lighting shall be a minimum of 500 lx (50 foot candles) and mounted 2.6m (8.5 ft.) above floor.
- False ceilings shall not be provided.
- Minimum door size 910mm (36 in.) wide and 2000mm (80 in.) high without sill, hinged to open outwards, or slide-to-slide or removable, and fitted with a lock.
- Minimum of two dedicated 120V 20A nominal, non-switched, AC duplex electrical outlet receptacles, each on separate branch circuits.
- Additional convenience duplex outlets placed at 1.8m (6 ft.) intervals around perimeter, 150mm (6 in.) above floor.
- Access to the telecommunications grounding system as specified by ANSI/TIA/EIA-607.
- HVAC requirements to maintain temperature the same as adjacent office area. A positive pressure shall be maintained with a minimum of one air change per hour or per code.

18.5 EQUIPMENT ROOM

A centralized space for telecommunications equipment that serves specific occupants of the building. Any or all of the functions of a telecommunications closet or entrance facility may alternately be provided by an equipment.

Location

- Site locations should allow for expansion.
- Accessible to the delivery of large equipment.
- Not located below water level.
- Away from sources of EMI
- Safeguards against excessive vibration
- Sizing shall include projected future as well as present requirement.

- Equipment not related to the support of the equipment room shall not be installed in, pass through, or enter the equipment room.

Design Considerations

- Minimum clear height of 2.4m (8 ft.) without obstruction.
- Protected from contaminants and pollutants.
- Access to backbone pathways.
- HVAC provided on a 24 hours-per-day, 365 days-per-year basis.
- Temperature and humidity controlled range 18° C (64° F) to 24° C (75° F) with 30% to 55% relative humidity measured 1.5m (5 ft.) above floor level.
- Separate power supply circuit shall be provided and terminated in its own electrical panel.
- Minimum lighting 500 ix (50 foot candles). Switch location shall be near entrance door to room.
- Minimum door same as telecommunications closet. Double doors without center post or sill is recommended.
- Access to ground per ANSI/TIA/EIA-607.

18.6 MAIN TERMINAL SPACE

Centralized space that houses the main cross-connect. Commonly used as a separate space in multi-tenant buildings to serve all tenants.

- Location considerations are as specified for equipment room.
- Provisioning area as specified for telecommunications closets except power is reduced to convenience receptacles.

18.7 ENTRANCE FACILITY

Consists of the telecommunications service entrance to the building and backbone pathways between buildings.

Location

- Providers of all telecommunications services shall be contracted to establish requirements.
- Location of other utilities shall be considered in locating the entrance facility.
- Alternate entrance facility should be provided where security, continuity or other special needs exist.
- Equipment not related to the support of the entrance facility should not be installed in, pass through, or enter the telecommunications entrance facility.
- Dry location not subject to flooding and close as practicable to building entrance point and electrical service room.

Design Considerations.

- Accommodate the applicable seismic zone requirements.
- A service entrance pathway shall be provided via one of the following entrance types: Underground, buried, Aerial, Tunnel.
- Minimum one wall should be covered with rigidly fixed 20mm (0.75 in.) A-C plywood.
- Minimum lighting same as telecommunication closet.
- False ceilings shall not be provided.
- Minimum door same as telecommunications closet.
- Electrical power same as telecommunications closet. No convenience receptacles mentioned.
- Grounding same as telecommunications closet.

18.8 MISCELLANEOUS

- Fire stopping per applicable code
- Horizontal pathway separation from Electromagnetic interference (EMI) sources:
 - Separation between telecommunications and power cables (Article 800.52 of ANSI/NFPA 70)
 - Building protected from lightning (ANSI/NFPA 780 (Ref D.4)
 - Surge protection (Article 280 of ANSI/NFPA 70 and 9.11 of ANSI/IEEE 1100 (Ref D.1)
 - Grounding (ANSI/TIA/EIA-607)
 - Corrected faulty wiring (Section 7.5 of ANSI/IEEE 1100)
- Reducing noise coupling:
 - Increase separation from noise sources
 - Electrical branch circuit line, neutral, and grounding conductors should be maintained close together.
 - Use of surge protectors in branch circuits
 - Use fully enclosed grounded metallic raceway or locate cabling near grounded metallic surface.

19.0 TIA/EIA-569-A-1

Perimeter Pathway Addendum

This addendum deals with the construction, applications, premises design and installation of perimeter pathways also known as surface raceway systems.

It describes both single and multi channel systems mounted on walls at a variety of heights and directions. The sizing of such pathways are based on 40% fill for initial installations but allows up to 60% fill for moves adds or changes to the installed cabling system during its life cycle. Fitting for perimeter raceway systems must allow for the bend radius requirements of the installed cable.

20.0 TIA/EIA-569-A-2

Furniture Pathway Fill Addendum.

The sizing of such pathways are based on 40% fill for initial installations but allows for up to 60% fill for moves, adds and changes to the installed cabling system during its life cycle. Furniture fittings such as outlets and connectors used to terminate the installed cables need to be considered when determining the percentage of fill. Fish and pull techniques may result in reduced capacity of the pathway as compared to furniture manufacturers which allow placing cables into the pathways.

20.1 SP-4198

Revision to subclause 4.3, “Access Floor”, of TIA/EIA-569-A

Introduces low profile floors as compared to standard height floors. Low profile floors are 6” or lower while standard height floors are 6” or greater. This revision describes the use of access floors as it refers to guidelines and installation.

20.2 SP-4517

Addendum 4 to ANSI/TIA/EIA-569-A Poke-Thru Devices

A poke-thru is a device for routing cables through a floor while maintaining the fire-rating integrity of the floor. These devices are an option for routing horizontal cables when other pathway types are not typical. Types include flush floor mount and those that rise up above floor level, also known as pedestal, raised, tombstone or monument.

PART F:
TECHNICAL SPECIFICATIONS FOR THE PABX
EQUIPMENT.

1. SYSTEM INFORMATION

1.1. *Specification*

- 1.1.1. This specification details the minimum technical requirements for a Private Automatic Branch Exchange (PABX) to be supplied.
- 1.1.2. The PABX technical and operational characteristics not mentioned in this specification shall comply with the current Communications Commission of Kenya (CCK) specification for PABX's for connection to Kenya's Public Switched Telephone Network (PSTN).
- 1.1.3. The PABX offered shall also comply with ITU-T(International Telecommunications Union) Standards and Technical values
- 1.1.4. The Provision of Clause 1.1.2 shall also apply to issues pertaining to installation and commissioning of the offered PABX, maintenance and administration, documentation and compliance with this specification.
- 1.1.5. The PABX offered shall be manufactured in manufacturing facilities holding "ISO 9001-2008" Quality System Certificate

1.2. *Type approval*

- 1.2.1. The offered PABX's shall be those that are already type approved by CCK.

1.3. *Capacity*

- 1.3.1. The PABX shall have an equipment capacity as shown here at the time of commissioning:-
 - 2000 extension,
 - 6 No ISDN Links,
 - 12 out-of-area extensions.
- 1.3.2. The PABX shall have an ultimate capacity of 2500 ports providing for at least 8 ISDN Links and 16 out -of area- extensions
- 1.3.3. It shall be possible to extend the capacity of the PABX in modular steps. The preferred units of growth are:-
 - (a) Extension –4, 8, or 16
 - (b) Trunks – 2, 4
- 1.3.4. The PABX shall have Four (4) operator consoles but shall have provision of extending up to Six (6) operator consoles.

1.4. *Operator's console Specifications*

- 1.4.1. The operator consoles (s) shall be cordless. It shall be possible to site them with or remotely from the PABX equipment.
- 1.4.2. The bidder shall state the maximum distance (in metres) that a console can be sited remotely from the PABX.
- 1.4.3. The consoles shall be powered from the PABX.
- 1.4.4. The console shall be designed to cater for visually handicapped operators.
- 1.4.5. Function keys (hold, phonebook, transfer, menu, flash and redial and etc.) facilitating operator functions shall be available on the operator console.
- 1.4.6. It shall be possible to answer calls using the console when micro telephone is not used (hands free) and to carry out the other process related to the system. No additional power supply (battery, adapter, etc.) shall be required for this process.
- 1.4.7. The console shall be equipped with 60 * 120 pixel graphical screen with backlight to display the number of the extension making the call and receiving the call and extension name if the extension is registered in the phone book, number of waiting calls, date/time and the status of any failure that may arise in the exchange.
- 1.4.8. It shall be possible to adjust the screen angle to prevent light reflection.
- 1.4.9. At least 16 double function programmable keys shall be available in the console set. It shall be possible to assign extension and external line numbers (PTT, IP line, GSM, etc.) to these keys. These keys shall facilitate following up availability of a certain extension. It shall be possible to directly call the stored number or to collect incoming calls to the defined extension by pressing the said key. It shall also be possible to define some functions (conference, night service, automatic calling, etc.) to these keys.
- 1.4.10. It shall be possible to equip the console with Bluetooth feature when deemed necessary. This feature shall make it possible to connect a Bluetooth headphone to the console or to connect a cell phone with Bluetooth capability to use the phone book of the cell phone and to place a GSM call using GSM line of the cell phone via console.
- 1.4.11. Using the Bluetooth feature, the user shall be able to place his/her GSM calls using the cell phone's GSM line via digital set and to answer an incoming call via the digital set in the same manner.
- 1.4.12. It shall be possible to connect an additional programmable double function keypad to the console set, if deemed required. The additional keypad shall include at least 28 illuminated keys.
- 1.4.13. The operator shall be able to intervene with the calls based on the programming which is done from operating terminal. In this case, the extension who is called by the operator shall hear a tone notifying that the operator is in line.
- 1.4.14. The operator shall be able to temporarily disable his/her console by pressing a key. No calls shall be forwarded to the said console after this process and the calls shall be forwarded to other consoles.

- 1.4.15. The operator shall be able to prevent the party on the other side of the line from hearing her/his conversation while listening to that party's conversation.
- 1.4.16. It shall be possible to connect a headset to the operator console when desired. The operator shall be able to make a selection with a key to use the handset or headset to make a call. It shall also be possible to connect Bluetooth earphone when desired.

1.5. ***Technology***

- 1.5.1. The design and construction of the PABX shall employ the latest technology, and shall be of the state of the art, and of high reliability. The system shall be capable of supporting technological developments and shall be possible to update the system version.
- 1.5.2. The PABX shall be High Capacity Hybrid and shall employ stored program control and pulse code modulation (PCM) techniques, or other more modern and proven switching techniques.
- 1.5.3. The design shall be modular in concept, and plug-in type (no physical individual wiring on the PABX) to allow for ease of installation, step-by-step expansion and for a maintenance philosophy of on-site card/module replacement.
- 1.5.4. Expansion of the system should be by simply inserting additional modules in existing expansion slots pursuant to 1.5.3 above and configuring the system to recognise the additional capabilities. The processor installed initially should be able to handle the ultimate capacity requirements.
- 1.5.5. The PABX shall provide various and flexible facilities to enable transparent interworking with digital local area networks (LAN's), and integrated voice and data communications.
- 1.5.6. The PABX shall have provision for interconnection to the public packet switching network.
- 1.5.7. The structure of exchange MUST be in conformance with IP (Internet Protocol), Euro ISDN and ISDN DECT (Wireless Technology System) features.
- 1.5.8. It shall be possible to connect the exchange to ISDN (BRI and/or PRI) lines to be supplied by PTT and the software related to this capacity shall be supplied with the system.
- 1.5.9. The exchange shall be able to establish a network with exchanges of the same model over the ISDN PRI and IP and operate on a single system. Each exchange in the network in the network shall be able to survive with its own external lines independent of the other exchanges, should the connection be interrupted.
- 1.5.10. The PABX system shall be equipped with SNMP support. It shall be possible to access the system remotely to monitor its status, to provide software and to create system back up. It shall be possible to change settings of the exchange remotely through password and to be possible to upload music played on hold and greeting messages. It should also be possible to change IP address of the update server through the system interface.
- 1.5.11. It shall be possible to monitor the alarm information remotely by means of SNMP support available in the system.

- 1.5.12. The PABX shall be able to provide 2Mb/s digital trunks and ISDN facilities.
- 1.5.13. Non-volatile ROM/PROM memories shall be used for the system-operating programme. Data held in RAM memories shall be protected against erasure during periods of power failure.
- 1.5.14. It shall be possible to make scheduled system backups automatically on preset dates.
- 1.5.15. The system shall be able to interpret the caller ID signals sent by various communications operators (Analogue, ISDN, GSM, etc) and shall facilitate observing this information through operators set, digital telephone sets and analogue systems equipped with a display.
- 1.5.16. The authorized uses/operators shall be capable of intruding any external line call. It shall be possible to set time limit to any call based on extensions.
- 1.5.17. The system shall be in a structure of a private branch exchange with stored program control. It shall be possible to perform the administration such as changing system parameters, extensions authorities, defining hunting groups and executive-secretary mode through the OMC Terminal.
- 1.5.18. The exchange shall be capable of operating with the following units:-
- Dial Pulse (DP) telephones
 - DTMF telephones
 - Digital telephones
 - Analogue telephones
 - IP telephones
 - IP Video Phones
 - Soft Phone (Software based telephones) applications
 - Other Exchanges (PABX)
 - ISDN PRI 2 Mbps (E1) Networks
 - 2 and 4 Wired Continuous and Discontinuous E & M circuits
 - Internal Portable handset systems (DECT Standard)
 - Fax Devices
 - Data Extensions
 - Voice Message Systems
 - IP Circuits
- 1.5.19. The operating and Maintenance Terminal to be supplied along with the exchange shall be equipped with at least Core2 Duo 2.0 GHz processor, 2 TB RAM, 320 GB 7200 rpm HDD, DVD writer, mouse, keyboard and 19" LCD Monitor. One Laser Printer shall be supplied with each maintenance and operating terminal.. This maintenance and operating terminal to be connected to the exchange via Ethernet port and to be protected with passwords

- 1.5.20. The maintenance and operating terminal shall be in English to provide ease of use and operation for technical employees
- 1.5.21. Changes made to the system while programming the exchange shall take effect immediately and there shall be no need to restart the exchange.
- 1.5.22. Should the power to the exchange be interrupted completely, the information in the exchange shall be protected and the exchange shall start its normal operation without losing any data and information when power is restored. There must be no need to reload the information, should the power be interrupted after changes made to the exchange are transferred to the system memory.
- 1.5.23. The exchange shall determine all hardware configurations automatically, it shall detect configuration changes and it shall not use the functional parameters that become inconsistent due to changes in the configuration.
- 1.5.24. All of the electronic circuit cards located inside the system shall be sliding and slotted and the card input and outputs shall be connected to each other via male and female connectors.
- 1.5.25. The internal and external system cards shall be protected against sudden power surges
- 1.5.26. Signalling of extension and line circuits in the system shall be capable of detecting 12 / 16 kHz billing signal.
- 1.5.27. It shall be possible to make conference calls with at least 3 participants using the exchange. The exchange shall also be equipped with multi conference capability (1 for conference of 32, 2 for 16 and 4 for 8). It shall facilitate visual conference calling for up to 4 extensions.
- 1.5.28. It shall be possible to forward incoming calls for an extension to a predefined extension, voice message system or operator if the relevant call is not answered.
- 1.5.29. It shall be capable of connecting a call made via an external line to another external line.
- 1.5.30. It shall be possible to limit long distance outgoing calls and it shall also be possible to divide extensions into at least 30 groups with this purpose. And each extension shall be able to make outgoing call via the external lines assigned to that extension group.
- 1.5.31. The exchange shall include night service mode feature which shall be activated manually by authorized individuals or automatically at certain times. It shall also be possible to define and identify those extensions that shall not be affected by the night service mode.
- 1.5.32. Incoming calls made to the exchange shall be distributed equally to the operators.
- 1.5.33. The exchange shall be equipped with LCR/ARS (Least Cost Routing/Automatic Route Selection) feature. The exchange shall analyze the numbers dialed by the extensions and shall automatically control the day of the week, time and external line conditions based on the dialed number and shall use the most appropriate route to connect the call. Should additions, deletions or changes to the dialed numbers be required, the exchange shall carry out this operation automatically.
- 1.5.34. A shared memory area with possibility of expansion to facilitate saving at least 1000 phone numbers shall be available in the exchange; it shall be possible to call the numbers saved in the said memory using short codes. The extensions with limited authorization shall also be able to access and call the numbers saved in the shared memory, if deemed necessary.

- 1.5.35. It shall be possible to assign a name with at least 10 (ten) characters to the exchange extensions. The names of the extensions that are stored in the exchange shall be displayed on all telephone devices (analog, digital and IP) equipped with a display.
- 1.5.36. It shall be possible to connect GSM interface unit to exchange external lines to make more economic calls that to GSM numbers via this device. It shall also be possible to obtain the call cost, caller/called extension information and date and time data using billing program.
- 1.5.37. It shall be possible to mark a part of or all of the external lines on the exchange as DISA line. It shall be possible to reach the extensions by sending DTMF tones when DISA lines are called. It shall be possible to receive the calls from DISA lines with internal dial tone or recorded greeting message.
- 1.5.38. It shall be possible to send a record containing information on the phone number from which the code is dialled as well as the date and time to the printer connected to the system computer or the exchange when a certain code is dialled using a phone device
- 1.5.39. It shall be possible to program the system so that the incoming calls from external lines will ring at operator or the desired extension on basis of the external line.
- 1.5.40. The extension to which a certain external line has been assigned shall be able to use the external line for outgoing external calls initiated by the extension. The said line shall not be used by other internal extensions.
- 1.5.41. The extensions shall be able to call the exchange via an external line marked as DISA and make calls using another external line in the exchange by entering his/her password within his/her authority levels.
- 1.5.42. It shall be possible to direct the calls transferred to the extension from external lines or external line calls intended to ring for the extension to an operator or voice message system, within a programmable course of time if they are not answered.
- 1.5.43. Executive-secretary applications shall provide the following features available for digital extensions:
- It shall be possible to connect one secretary to more than one director.
 - Secretary shall be able to monitor busy status of the director and vice versa.
 - The secretary shall be able to access the director using a single key and vice versa.
 - The director shall be able to call the secretary even if the secretary is busy.
 - Calls for the director shall primarily be received by the secretary and the secretary shall be able to transfer these calls, if deemed necessary.
 - The director shall be able to cancel the line transfer feature temporarily

1.6. ***Types of Traffic***

- 1.6.1. The PABX shall be capable of handling internal traffic, external traffic to and from the public telephone network, and traffic to and from other PABX's. It shall be capable of switching both analogue and digital traffic.
- 1.6.2. The PABX shall be capable of functioning as a tandem exchange for satellite PABX's.

- 1.6.3. The PABX shall be capable of operating with or without operator consoles.
- 1.6.4. The PABX system shall be capable of switching traffic associated with Clauses 1.5.5, 1.5.6, 1.5.7 and 1.5.8

1.7. ***Components, Materials and Finishes***

- 1.7.1. The components, materials and finishes used in the equipment shall comply with the standards of Kenya Bureau of Standards. In absence of the same, other internationally recognised standards shall be applied. These standards shall be stated.
- 1.7.2. The performance of the equipment shall meet the relevant latest ITU Recommendations. Compliance with these recommendations shall be stated.
- 1.7.3. Electrical wiring used for the PABX and associated equipment shall meet IEE wiring regulations. The wires shall be of sufficient current rating and able to withstand high accidental short-circuit voltages.
- 1.7.4. The parts and components used in the PABX and accessories shall preferably be available in the world market from more than one manufacturer.
- 1.7.5. For future system expansion, the same or compatible or equivalent equipment shall be readily available.
- 1.7.6. The bidder shall guarantee the availability of all spare components, parts and cards for at least ten (10) years.

1.8. ***Protection***

- 1.8.1. The PABX system offered shall be protected from internal and external power source hazards and shall prevent injury to users, operators, installation and maintenance staff and serious damage to the equipment and accommodation.

It is mandatory that the PABX installed is protected against over-voltage situation of the lines. Specifically all the lines (exchange and extension) running to points outside the building of installation shall be protected. The Bidder shall state how protection of the PABX offered is achieved and where the units are installed e.g. on card, MDF, etc.
- 1.8.2. Adequate protection must be provided on mains units and line units connected to the local network against lightning and any other high voltage surges. Under no circumstances shall the presence of high voltage cause damage to any common control equipment.
- 1.8.3. Rare gas discharge protectors shall be employed for primary over voltage protection between the extension and trunk lines and the PABX, and these shall be located preferably in the PABX cabinet or in a distribution or connection box close to the PABX.
- 1.8.4. The PABX system shall conform to the IEC DIN 68-2-6 and DIN IEC 68-2-36, standards of sinusoidal and random vibration.

1.9. **Noiseless Operation**

- 1.9.1. The PABX offered shall be noise-free as it will be installed in an office environment.

1.10. **Environment**

- 1.10.1. The equipment shall be fully protected against dust, corrosion and shall be designed to operate normally at 90% humidity.
- 1.10.2. Where air-conditioning is required, it shall be quoted for separately. The PABX will be expected to withstand failure of air-conditioning equipment for a minimum period of twelve (12) hours without degradation in service.
- 1.10.3. Ambient operative conditions:-
- Outdoor ambient temperature: 5°C to 50 °C.
 - Outdoor relative humidity: up to 90% RH
 - Altitude: up to 3500 m.a.s.l.

Normal tropical conditions of strong sunshine, insects, fungus growth, etc, must be withstood.

2. FUNCTIONS AND FEATURES

2.1. **General**

- 2.1.1. The PABX shall include features in Sub-Section 2.2.
- 2.1.2. It shall be possible to programme or configure the PABX so that the extensions shall be capable of offering additional features given in Sub-Section 2.3.
- 2.1.3. It shall be acceptable if the additional features in Sub Section 2.2.5 are offered at the expense of at most a similar number of features in Sub-Section 2.2.4. The provision of this clause shall only affect those extensions indicated in Clause 2.1.2.
- 2.1.4. In Sub-Sections 2.2.4 and 2.2.5, the first and second columns indicate the clause number and the feature respectively.
- 2.1.5. Where the definition of a feature differs from the provisions of Clause 2.1.4, the bidder shall provide a concise description of such feature and include any condition or limitation applicable to it. The description shall also indicate the manner in which the feature operates and, where a user feature is involved, the method by which the facility is invoked and cancelled.
- 2.1.6. The bidder shall clearly indicate any deviations or omissions from the list of functions and features which are not mentioned in this specification but which can be provided by the PABX offered.

2.2. *Features of the offered system*

2.2.1. **Selection of Trunks**

The PABX shall be equipped with a capacity to determine the most economic (least cost) call routing. For example, calls to a particular cellular network shall be routed through the appropriate air interface trunk, and calls to a particular fixed network routed through an appropriate trunk, etc, such that the cost of the call shall always be always minimum.

The Tenderer shall indicate how this function is implemented in the offered system.

2.2.2. **Voice Messaging**

2.2.2.1. The PABX system offered shall be able support voice messaging and processing. The Bidder should state whether the Voice Messaging and Processing system is an integral part of the PABX or a stand-alone unit connected to the PABX.

The Bidder shall quote separately the cost of hardware and software required to implement voice messaging and processing system. Detailed system description shall be presented.

The following are some of the mandatory features and facilities:

- i) Voicemail with the following features.
 - a) Announcement service.
 - b) Day and time stamp of messages.
 - c) Auto calling.
 - d) Message redirection.
 - e) Message archiving.
 - f) Message editing.
 - g) Message rewind, pause, and fast forward.
 - h) Fax mail and fax on demand.
 - i) Broadcast lists.
 - j) Remote access
- ii) Automated Attendant.
- iii) Voice Response.
- iv) Audio text.

2.2.3. **Multi-tenant**

2.2.3.1. The system offered shall be able to support multi tenancy in order to cater for different Central Bank of Kenya departments and organisations and/or individuals who may be accommodated in the CBK Headquarters building.

2.2.3.2. It shall be able to assign group of extensions to a group of lines exclusively.

2.2.3.3. It shall be able to assign consoles to particular individual users.

2.2.3.4. It shall have the capability to carry out billing as per assigned group representing different organisations and individuals.

2.2.4. List of Required Features

Column 3 indicates the classification of the feature – whether standard (S) or optional (O).

Column 4 indicates the equipment on which the feature should be available – whether on the main PABX system (M), on the operator console (C) and on the extension telephone (E).

| Clause Number | Feature | Classification | Available on |
|---------------|--|----------------|--------------|
| 2.2.4.1. | Alarm indication | | |
| | a) Major Alarm | S | M, C |
| | b) Minor Alarm | S | M, C |
| | c) Console Alarm | S | M, C |
| | d) System on Reserve Power | S | M, C |
| | e) UPS | S | M, C |
| | f) Complete and computerized diagnostic equipment. | O | M |
| 2.2.4.2. | Automatic Call-Back | | |
| | a) Busy extension | S | C, E |
| | b) No reply from extension | O | |
| | c) Trunk Busy | S | E |
| 2.2.4.3. | Abbreviated dialling | | |
| | a) System lists | S | C, E |
| | b) Personal lists | S | C, E |
| 2.2.4.4. | Automatic Night Switching | S | M |
| 2.2.4.5. | Automatic Supervision | S | C |
| 2.2.4.6. | Brokers Call | O | E |
| 2.2.4.7. | Busy Line Display | S | C |
| 2.2.4.8. | Call Diversion No Reply (Extension) | | |
| | a) To a nominated Extn | O | E |
| | b) To Operator | O | E |
| 2.2.4.9. | Call Diversion No Reply (DDI Trunk) | S | M |
| 2.2.4.10. | Call Diversion, Extension Busy | | |
| | a) To a nominated Extn | S | E |
| | b) To Operator | S | E |

| | | | |
|-----------|-------------------------------------|---|---|
| 2.2.4.11. | Call Diversion Busy (DDI Trunks) | S | M |
| 2.2.4.12. | Call Diversion Follow Me | S | E |
| 2.2.4.13. | Call Diversion All calls | | |
| | a) To nominated Extn | S | E |
| | b) To operator | S | E |
| 2.2.4.14. | Call Hold | S | E |
| 2.2.4.15. | Call Information Logging | S | M |
| 2.2.4.16. | Call Metering | | |
| | a) Operator controlled | S | C |
| | b) Individual metering | S | C |
| | c) Printed statement | S | M |
| 2.2.4.17. | Call Progress Indication | S | C |
| 2.2.4.18. | Call Queuing and Supervision | S | C |
| 2.2.4.19. | Call Splitting | S | C |
| 2.2.4.20. | Call Storage and Retrieval | S | C |
| 2.2.4.21. | Call Transfer | | |
| | a) Extn free | S | E |
| | b) Extn busy | O | E |
| 2.2.4.22. | Call Waiting Information | S | C |
| 2.2.4.23. | Camp-on Extensions | S | E |
| 2.2.4.24. | Camp-On Trunk Lines | S | E |
| 2.2.4.25. | Class of Service | S | M |
| 2.2.4.26. | Common Answering | S | C |
| 2.2.4.27. | Call Restriction | S | E |
| | a) Restricted access | S | E |
| | b) Restricted dialling | | |
| 2.2.4.28. | Conference | | |
| | a) Extn controlled 3-party | S | E |
| | b) Extn controlled Add-On | S | E |
| | c) Operator controlled conference | S | C |
| | d) Meet-me conference | O | E |
| 2.2.4.29. | Console Answering of Incoming Calls | S | C |

| | | | |
|-----------|--|---|------|
| 2.2.4.30. | Console-less Operation | S | M |
| 2.2.4.31. | Control of Trunk Group Access | S | C |
| 2.2.4.32. | Data Transmission | S | M, E |
| 2.2.4.33. | Data Line Security | S | E |
| 2.2.4.34. | Dial Call Pick-UP (Group Pick-Up) | S | E |
| 2.2.4.35. | Directed Call Pick-Up (Individual Extensions) | S | M |
| 2.2.4.36. | Dial tone Detection | S | M |
| 2.2.4.37. | Diary Service | O | E |
| 2.2.4.38. | Direct Dial-In | | |
| | From Public Exchange | S | M |
| | From Inter PABX Trunks | S | M |
| 2.2.4.39. | Direct Dial-In Calls Barred | O | E |
| 2.2.4.40. | Direct Outward Dialling | S | E |
| 2.2.4.41. | Direct-In Lines | S | M |
| 2.2.4.42. | Discriminatory Ringing | | |
| | a) Internal Calls | S | M |
| | b) Trunk and Operator controlled Calls | S | M |
| | c) Diverted back Calls | S | M |
| 2.2.4.43. | Distinctive Dial Tone on a diverted extension (Reminder dial tone) | S | M |
| 2.2.4.44. | Distinctive Ringing Tone on diverted calls (Diverted ringing tone) | O | M |
| 2.2.4.45. | Delayed Answer Supervision | S | C |
| 2.2.4.46. | DTMF To DP Conversion | S | M |
| 2.2.4.47. | Emergency Transfer of Exchange Lines | S | E |
| 2.2.4.48. | Enquiry Call | S | E |
| 2.2.4.49. | Executive Intrusion | S | E |
| | Executive Intrusion Barred | S | E |
| 2.2.4.50. | Extension Group Hunting | | |
| | a) Hunt Group number | S | M, E |
| | b) Cyclic hunting | S | M, E |
| | c) Sequential hunting | S | M |

| | | | |
|-----------|---|---|------|
| | d) Secretarial hunting | S | M |
| 2.2.4.51. | Extension Line Lock Out | S | M |
| 2.2.4.52. | Extension Assured Access to outgoing trunks | O | E |
| 2.2.4.53. | Extn to Extn Call – Auto | S | E |
| 2.2.4.54. | Extn to Extn Call – via Operator | S | E |
| 2.2.4.55. | Extn to Trunk connections via Operator | S | E |
| 2.2.4.56. | Extn to Trunk connections via Operator Barred | O | E |
| 2.2.4.57. | Fault Type Display | S | M, C |
| 2.2.4.58. | First Party Release on Internal Calls | S | M |
| 2.2.4.59. | Immediate Ringing | S | M |
| 2.2.4.60. | Immediate Ringing Tone | S | M |
| 2.2.4.61. | Individual Trunk Line Selection | S | C |
| 2.2.4.62. | Lamp Check | S | C |
| 2.2.4.63. | Line Lock-out Display | S | C |
| 2.2.4.64. | Mixed DTMF/DP signalling on same Extn Line | S | M |
| 2.2.4.65. | Music on | | |
| | a) Hold | S | M |
| | b) Camp-On | S | M |
| 2.2.4.66. | Multi-Console Operation | S | M |
| 2.2.4.67. | Night Service | | |
| | a) Dial Answer Night | S | M |
| | b) Designed Extn Night Service | S | M |
| | c) Individual Night Service | O | M |
| | d) Night Service Intrusion | S | M |
| 2.2.4.68. | Number Unobtainable Tone (on spare and barred numbers or codes) | S | M |
| 2.2.4.69. | Operator Assistance | S | C |
| 2.2.4.70. | Operator Call-In | S | C |
| 2.2.4.71. | Operator Camp-On | S | C |

| | | | |
|-----------|--------------------------|---|------|
| 2.2.4.72. | Operator Intrusion | S | C |
| 2.2.4.73. | Paging Service | | |
| | Audio | S | C, E |
| | Visual | O | C, E |
| 2.2.4.74. | Paged Call Pick-Up | S | E |
| 2.2.4.75. | Reserve Power | | |
| | a) PABX | S | M |
| | b) For volatile memories | S | M |
| 2.2.4.76. | Selective Answering | S | C |
| 2.2.4.77. | Series Call | S | C |
| 2.2.4.78. | Tie Lines | S | M |
| 2.2.4.79. | Time and Date Display | S | C |
| 2.2.4.80. | Tone Demonstration | S | M, C |
| 2.2.4.81. | Traffic Recording | S | M |
| 2.2.4.82. | Trunk Busyng By Operator | S | C |

2.2.5. Additional Features

| Clause Number | Feature | Classification | Available on |
|---------------|------------------------|----------------|--------------|
| 2.2.5.1. | Auto Alarm | S | C, E |
| 2.2.5.2. | Controlled O/G call | S | C |
| 2.2.5.3. | Do not Disturb | S | C, E |
| 2.2.5.4. | Local call Restriction | S | C, E |
| 2.2.5.5. | Manual Line Service | S | M |
| 2.2.5.6. | Message waiting | S | C, E |
| 2.2.5.7. | Single Digit Dial | S | C, E |

2.3. Activation of Features

- 2.3.1. Where it is necessary on an established call to invoke a certain feature, the use of either auxiliary or digit buttons to effect this shall not interfere with the call already established. Where this is not possible, then the call will automatically or otherwise be put on hold. Music-on-hold will automatically be extended to the other party while feature accessing signals are extended to the user. Preference will be given to systems whose features can be accessed using both DP and DTMF extension instruments.

2.4. ***Classes of Service***

- 2.4.1. It shall be possible to restrict access to the public and private networks to individual extensions or groups of extensions.
- 2.4.2. It shall be possible to restrict use of data services to individual extensions or groups of extensions.
- 2.4.3. The minimum required call restriction categories shall be the following:-
- a) International
 - b) National
 - c) Local
 - d) Internal

Item (d) provides for some extensions to be receive only. The restriction of the various categories of calls shall be possible on individual extensions or designated groups of extensions.

2.5. ***C.P.U. Failure Transfer***

- 2.5.1. In case of total system or power supply failure, selected lines shall be automatically switched over to pre-determined extensions. The maximum number of such selected lines shall be stated. All lines not switched through to extensions shall automatically be busied.
- 2.5.2. The return of the system shall not result to established calls being lost.
- 2.5.3. Failure of one CPU (or any key part) should result in automatic switchover to the standby without loss of already established calls or data received for establishing calls.

2.6. ***Operator Console Features***

- 2.6.1. The provision of this sub-section shall complement those already provided in Sub-Section 2.2. Provisions under this Sub-Section shall not be taken to override or replace those in Sub-Section. 7.2.
- 2.6.2. The operator console shall have an information screen showing at least the following:-
- a) the dialled number (s)
 - b) date and time
 - c) status of number dialled
 - d) calls on queue
 - e) type of call (internal/external) alarms

- 2.6.3. Incoming calls should be presented to all consoles simultaneously
- 2.6.4. Two lightweight headsets shall be supplied for each console.
- 2.6.5. The bidder shall state all other functions and features available to the operator via the console.

3. TRUNKING, GRADE OF SERVICE AND NUMBERING

3.1. *Trunking*

- 3.1.1. The offered PABX shall be able to handle at least 0.12Erl of originating plus terminating traffic per extension, with the grade of service quoted under Clause 3.2.1.

3.2. *Grade of Service*

- 3.2.1. The average busy hour grade of service required after local dial tone is 0.02. This grade of service applies to the following types of calls:-
- Internal calls.
 - Incoming exchange calls to extensions via the operator.
 - Outgoing exchange calls from extension (automatic access).
 - Outgoing calls from operator positions, but reverted to extensions.
 - Calls barred access to exchange lines.
 - Assistance calls
- 3.2.2. Different grades of service shall apply to the following type of calls:-
- Direct inward Dialling (DID) = 0.02
 - Outgoing from operator position, but reverted to extensions that have access to exchange lines = 0.03
 - Outgoing to another PABX via tie lines = 0.03
 - Incoming from another PABX via tie lines = 0.02
- 3.2.3. The probability of a call being blocked before dial tone is provided shall not exceed 0.005. Also, the probability of a dial tone connection being delayed for more than two seconds after lifting the handset shall not exceed 0.01.
- The bidder shall provide a detailed grade of service applicable in the offered PABX.

3.3. **Numbering Plan**

- 3.3.1. The PABX shall provide flexible numbering allocations within the plan shown here below:-

| PABX NUMBERING PLAN | | |
|---|-----------------|-----------------------|
| | Local Extension | Out-of-area extension |
| Access to Extensions | 2 * *, 3 * * | 8 * * |
| Access to O/G Exchange lines | 9 | Barred |
| Operator assistance calls to Service | 0 | 0 |
| Common Answer Night Service | 8 | 8 |
| Access to special features e.g. paging, data network etc. | 1 * * | 1 * * |
| Legend: * = 0 to 9 inclusive, A = Extension number | | |

- 3.3.2. The numbering scheme shown in Sub-Section 3.3.1 is standard. The PABX shall be capable of different numbering arrangements to be adopted for special cases.
- 3.3.3. Extension numbers shall not be tied to specific equipment positions, but shall be capable of allocation freely to line circuits by maintenance personnel.

4. **CHARGING SYSTEM**

- 4.1. The PABX shall contain or include a detailed charging/telephone management system.
- 4.2. Where the charging system is not an integral unit of the PABX, the bidder shall propose details of hardware and software necessary for such a system.
- 4.3. The bidder shall give details of the charging system showing among other standard charge information, the flow of data process, file arrangement, sample input/output format and menus on a VDU.
- 4.4. It shall be possible to input and store data containing information on charging and tariffs to allow for automatic calculation of call charges for various type of calls.
- 4.5. The system shall be capable of outputting data on a VDU, and on a hard copy. It shall also be possible to output and store the data on computer external disks or tapes. It shall be possible to recall and display on a VDU and hard copy, billing data as given in Clause 4.5 for a specified period of time. Such recalled data may be resident in the charging system or in external storage devices.

- 4.6. The data output given in Clause 4.5 shall show the following minimum information in respect of all calls routed over trunks to the public exchange.
- (a) Calling extension number.
 - (b) Where the call was transferred to another extension and identity of the second extension.
 - (c) The dialled number. The system shall be capable of recording a minimum of 16 digits.
 - (d) The date and time at which the call was originated.
 - (e) The total duration of the call.
 - (f) The charges with respect to each call.
- 4.7. In addition to billing calls for each extension, the charging system shall be capable of billing designated groups of extensions related to Departments or Sections within CBK if need arises.
- 4.8. Data, as provided in Clause 4.6, that has not been output on a hard copy or other external storage devices shall be protected from accidental or malicious erasure. The bidder shall give details on how such protection is achieved.
- 4.9. It shall be possible to pre-set the maximum call charges per extension. The system shall give an indication, either by automatically lowering the class of service of an extension or otherwise, that an extension has attained its maximum call charges. It shall not be possible, by use of a special security code, to re-set charges accrued by an extension.
- 4.10. The charging system shall be capable of periodically outputting billing data automatically and in hard copy format after pre-determined intervals of time. It shall also be possible to output billing data by system interrogation.

5. TRANSMISSION

| | | |
|------|--------------------------------------|---|
| 5.1. | Attenuation | The attenuation loss measured on any exchange line connection through the PABX shall not be more than 1.0 dB at 1000 Hz – terminated at 600 Ω . A maximum of 6.0 dB loss shall be acceptable for inter-PABX connections. |
| 5.2. | Inter-channel cross-talk attenuation | Inter-channel cross-talk attenuation between extensions shall be greater than 70 dB over the frequency range 300 – 3400Hz |
| 5.3. | Nominal Impedance | The nominal impedance of extension and exchange lines shall be 600 Ω . |
| 5.4. | Impedance Imbalance to Earth | The impedance imbalance to earth shall not be worse than 40dB over the frequency range 300 – 600Hz and 46 dB over the frequency range 600-3400Hz measured at the Main Distribution Frame (MDF). |
| 5.5. | Return Loss | The return loss measured against the nominal impedance shall not exceed –65 dBmOp with the channel terminated in the nominal impedance. |
| 5.6. | Idle Channel Noise | The idle noise (weighted) shall not exceed –65 dBmOp with the input and output ports of the channel terminated in the nominal impedance. |
| 5.7. | Group Delay | The group delay shall be less than 100 micro seconds over the frequency range 300 – 3400 Hz. |

6. SIGNALLING AND PUBLIC NETWORK INTERFACE

6.1. *General*

The bidder shall provide comprehensive details on the signalling and interface characteristics of the offered PABX

6.2. *Trunk line circuit*

The trunk line circuits to be used as both-way non-DDI circuits shall have the following functions and hardware specifications.

6.2.1. *Idle state*

6.2.1.1. The nominal impedance shall be 600 ohms.

6.2.1.2. In the idle state the trunk shall be compatible with a Remote line and Automatic Line test equipment. The exchange Line Termination seen from the public exchange shall appear electrically as follows: 1.8 μ F in series with 1000 ohms.

6.2.2. *Exchange Line Characteristics*

The offered PABX shall be able to interface with the public exchanges with the following characteristics:

- 6.2.2.1. Have nominal impedance of 600 ohms.
- 6.2.2.2. Have varying loop resistance of up to 1500 ohms, with a minimum insulation resistance of 30,000 ohms between line to line or line to earth.
- 6.2.2.3. The exchange lines can be programmed for both ways or unidirectional working.
- 6.2.2.4. Both loop disconnect pulsing and dual tone multi-frequency signal is employed in the public exchange lines but one at a time. The trunk line circuit shall be capable of interfacing with exchange line with the above characteristics.

6.2.3. *Seizure-Incoming Calls*

The calling signal from the public exchange will be interrupted ringing as specified below. The trunk line circuit shall apply a low resistance loop of less than 300 ohms to the exchange line as an answer signal. Ring Trip shall occur either during the silent period or the ringing interval.

6.2.3.1. *Ringing Detector:*

The trunk line ringing detector connected across 'a' and 'b' wires shall respond to the following signal applied on the exchange line by the public exchange.

- a) The calling signal provided on the exchange line by the public exchange shall be sinusoidal AC signal which consists of earthed interrupted ringing applied on the 'b' wire and a -48V battery on the 'a' wire.
- b) On ring trip the public exchange reverses the conditions to provide -48V battery on the b and earth on the a wire.
- c) Immediate ring is available on all crossbar and digital public exchanges installed in Kenya.
- d) The ringing supply is 75V rms +/- 20%
- e) The ringing signal frequency is 25 Hz +/- 2 Hz.
- f) The ringing cadence is 1000 ms ON 3000 ms OFF +/- 100ms.

6.2.3.2. *Detector Sensitivity:*

The ringing detector shall respond to ringing signal with the following characteristics:

- Ringing voltage : 20V rms
- Ringing frequency : 23-27 Hz
- Duration of signal : 500 msec.

6.2.3.3.

Detector Response:

The detector shall respond to the incoming ringing signal in the following manner:

- to follow the incoming cadence
- to respond within 100 ms of the presence of the incoming signal
- to respond for less than 100 ms due to DC transients at the end of each call.

6.2.4.

Busy Status

6.2.4.1.

During speech as well as during the hold condition, the trunk shall provide a DC loop to the public exchange line without any disconnection.

6.2.4.2.

Each trunk circuit card shall have LED to indicate busy status (and/or trunk lock out).

6.2.4.3.

A busy trunk line circuit shall be provided by a guard signal to protect it against subsequent seizure by other users.

6.2.4.4.

The trunk shall remain busy for a period after call termination in order to give incoming calls priority over originating.ⁱ

6.2.4.5.

The trunk circuit shall not be damaged by polarity change nor shall it respond to this change.

6.2.5.

Line Seizure and Line Current

During line seizure for outgoing calls, the PABX trunk line circuit shall be capable of applying the following seizure conditions to the public exchange:

6.2.5.1.

A low resistance loop – typically 300 ohms.

6.2.5.2.

An earth potential applied to the 'b' of the exchange. On receipt of an earth potential on the 'a' wire from the public exchange, the PABX seizing condition will change from earth to a low resistance loop.

6.2.5.3.

The minimum line current of 20 mA through a feed bridge of 2x200 ohms (400 ohms) will flow through the line under extreme conditions.

6.2.5.4.

During the shortest line condition, a maximum of 80 mA will flow (at 0 ohms line resistance).

6.2.5.5.

The trunk line shall not be sensitive to polarity change on the line nor be damaged by the same.

6.2.6.

Dial Tone Detection

The public exchange supply a dial tone with the following specifications:

- Frequency: 400 – 450 Hz
- Signal level: – 15 to – 20 dBm

The PABX dial tone detector shall therefore be able to detect dial tone under the following conditions:

- Frequency 400 – 450 Hz.
- Signal level –35 dBm.
- Dial tone must be present for 1 sec. or more.
- When dial tone disappears as the detector must respond within 50 msec.

6.2.7. *Dial (Loop) Pulses*

- 6.2.7.1. Dialling signal shall be sent as loop disconnect pulses. These could be generated in response to the timed driving signals.
- 6.2.7.2. Loop disconnections shall be equal to the number of pulses necessary for a particular digit.
- 6.2.7.3. Impulse distortions within PABX due to the operate and release time lags shall be less than 5 msec.
- 6.2.7.4. The PABX shall send pulse to the public exchange with the following specifications:
- Dial speed 10 pps
 - Make/Break : pulse ratio : 2:1
 - Break time : 66 msec.
 - Make time : 33 msec.
 - Interdigit pause (min) : 250 msec.
- 6.2.7.5. To avoid the influence of the inductances of the transmission path during pulsing, it is desirable that provision shall be made to either short circuit or open the transmission coil in conjunction with dialling pulse signals.

6.2.8. *Dial Tone Multi-frequencies*

The Dual Tone Multifrequency (DMF) signalling to ITU-T recommendation Q23 is applicable on some exchange lines in Kenya. The PABX shall therefore be capable of transmitting DTMF signals having the parameters shown below.

6.2.8.1. *DTMF signals: Allocation of frequencies to digits and symbols.*

| LOW FREQUENCY | HIGH FREQUENCY | | | |
|---------------|----------------|------|------|------|
| | 1209 | 1336 | 1477 | 1633 |
| 697 | 1 | 2 | 3 | A |
| 770 | 4 | 5 | 6 | B |
| 852 | 7 | 8 | 9 | C |
| 941 | * | 0 | # | D |

6.2.8.2. *DTMF Tone Limits:*

- a) Frequency deviation : +/- 1.5%
- b) Duration of pulse : 60 msec.
- c) Duration of internal between pulses: 60 msec.
- d) Signal amplitude into a 600 ohm Load at zero:
 - High frequency group : -6dBm +/-2dBm
 - Low frequency group : -8dBm +/-2dBm
- e) Amplitude differential: High group signal amplitude relative +2dB +/- 1dB

- f) Distortion of DTMF signals. The total power level of Harmonic and Inter Modulation components shall be at least 20 dB below the level of individual signalling frequency.
- g) The level of the two frequencies must be within 1 dB of the final value within 7 msec.

6.2.9. *Answer and supervision*

- 6.2.9.1. It is not mandatory for public exchanges to provide answer supervision on exchange lines. On some public exchanges, and depending on the type of call, a reversal of the exchange line polarity may occur when a call is answered, the PABX signalling arrangement should not depend on such reversals and should if necessary ignore it when it does occur.
- 6.2.9.2. The PABX shall provide answer supervision on DDI lines from the public exchange and on inter-PABX tie lines.
- 6.2.9.3. Through clearing shall be provided on all outgoing calls where the signalling system permits. When PABX extension or PABX operator clears, the PABX switching equipment and circuit to the public exchange or distant PABX shall be released.

The PABX shall maintain a guarding condition on the trunk to prevent further seizure until the equipment at the distant end has fully released from the previous call. The PABX shall connect the idle state conditions to the PSTN line for a minimum period of 2 seconds after the end of the PSTN disconnect clear signal, before seizing it for a new outgoing call. During this time, the PABX shall be capable of recognising a new incoming call.
- 6.2.9.4. On incoming exchange and inter PABX calls, if the caller clears first and external circuit has been released at the far end, the PABX switching equipment shall be released. If the called extension fails to clear, it shall receive PABX dial tone for the normal time out period after which it shall be placed on extension line lock out.

If the called extension clears first, the PABX switching equipment shall be released.

6.2.10. *Protection*

- 6.2.10.1. The trunk line circuit shall be protected against any external electrical interference. The protection provided shall meet the requirements as described in the section dealing with PABX protection. In general the trunk line circuit shall be protected against the following:
 - Lightning strikes
 - 240V rms
 - Any other over voltages.
- 6.2.10.2. The transversal AC voltages which do not disturb proper functioning of trunk line circuit shall not cause any damage to other circuits.
- 6.2.10.3. The construction of the trunk line circuit shall be such that any external interference to the circuit shall not effect the common control circuits. The supplier of the PABX is required to provide a committal statement on the above.

- 6.2.10.4. The trunk line circuit shall be protected against mishandling. To achieve this safety requirement, it may be necessary to:
- provide an earth strap on the PABX to be worn by anyone handling the PABX to avoid electrostatic damages
 - Provide a clear warning in a conspicuous position on the PABX of the possible dangers resulting in mishandling.

6.2.11. *Metering Signal Detection*

- 6.2.11.1. Signal Characteristics. The signal from public exchanges is 12 kHz +/- 1% generated at 1 V rms +/- 5%.
- 6.2.11.2. The Detector. The detector circuit shall be connected between 'a' and 'b' wire and able to indicate by periodic pulses the charge for a particular call. The circuit shall be able to detect a signal of the following characteristics:
- Signal frequency 12 kHz +/- 1%.
 - Pulse duration min 100 msec, e.m.f. min 60 mV.
- 6.2.11.3. The circuit shall cause an insertion loss of at least 16 dBn.

6.3. *Direct Dialling In From Public Exchanges*

6.3.1. *Impedance*

The nominal impedance shall be 600 ohms. Loop disconnect pulsing and DTMF signals according to ITU-T Q23 shall be applied by the public exchange.

6.3.2. *Idle State*

During idle state, the public exchange shall apply -48V battery on the *b* (ring) wire, and earth on the *a* (tip) wire. The battery feed shall be via a supervisory circuit consisting of a 200 ohm + 200 ohm balanced feed. The DDI circuit should draw some idle current from public exchange voltage of -48 V DC. This current enables the public exchange to check the availability of DDI trunk.

This minimum current shall be between 5 mA and 35 mA. Because this is a supervisory current, it must flow in a specific direction as follows: '*b*' wire through the trunk and back to *a* wire.

6.3.3. *Seizure*

DDI trunks are incoming only. Seizure shall be by battery reversal from the public exchange occurring on the line. At the same time the public exchange impedance becomes 400 – 500 ohms. The polarity reversal should result in change of direction of current flow. The DDI circuit should detect this reversal and interpret it as a seizure signal. The public exchange shall expect a seizure acknowledgement in the form of high current ranging between 15 mA to 80 mA.

6.3.4. *Answer Signal*

The answer signal returned by the PABX DDI circuit shall be a low resistance loop resulting in high current. PABX shall not effect reversal of line polarity.

6.3.5. *Operating Loop Limit*

The resistance of the external circuit shall be 1500 ohms or more. The minimum insulation resistance shall be 30,000 ohms between line to line and line to earth.

6.3.6. *Backward Busying*

The public exchange shall block the DDI trunk if loop or ground or battery on *a* wire and/or *b* wire are detected during idle condition. It shall therefore be possible to busy the outgoing end of the circuit by applying any of the above busying signal at the PABX.

6.3.7. *Clear Signals*

Public exchange clears first: When the public exchange clears first, a reversal of potential is placed on 'a' and 'b' terminals of the DDI circuit. The PABX shall detect this reversal and interpret it to mean "clear signal from public exchange".

PABX clear first: When PABX clear first, the DDI trunk should go from a low impedance loop (operating) to a high impedance loop (idle). The public exchange will recognise this high impedance and will send a polarity reversal on *a* & *b*. This is the signal the PABX should recognise as a clear signal from the public exchange.

6.4. *Both –way Inter-PABX Circuits(Tie Lines)*

6.4.1. Tie lines are inter-PABX circuits which in Kenya are allowed to interconnect different switching equipment of the same organisation. Therefore, calls on ties should not be programmed to access public lines. PABX offering tie line must be able to meet this requirement.

6.4.2. *Signalling Method*

6.4.2.1. Loop calling with loop disconnects dialling or DTMF shall be employed between PABXs where a continuous metallic path between PABXs exists.

6.4.2.2. Outband (E&M) signalling shall be employed where a dc signalling path between PABXs is not available.

6.4.2.3. Supplier shall provide details of signalling system for use on dc circuit whose resistance is beyond the limits of a loop disconnect dialling.

6.4.3. *Dial Tone Detection*

- 6.4.3.1. The PABX shall detect dial tone as specified in this document. To avoid confusion with busy tone, the detector shall operate only to tones supplied continuously for a period in excess of 600 msec.
- 6.4.3.2. The dial tone detector shall operate to a tone at a minimum power level of –35 dBm.
- 6.4.3.3. It shall be possible to arrange for the automatic cancellation of the call if dial tone is not detected within 20 seconds of seizure of the trunk and for the return of busy tone to the caller.

6.4.4. *Loop Signalling Trunk*

| | |
|---------------------------|--|
| Impedance | The nominal impedance shall be 600 ohms. |
| Low Resistance Loop | The low resistance loop applied by the trunk termination shall be less than 300 ohms |
| Operating Loop Limits | The resistance of the external circuit shall be 1500 ohms or more. The minimum insulation resistance shall be 30,000 ohms between line to line and line to earth. |
| Trunk conditions | The trunk shall be fully described during the following conditions: <ul style="list-style-type: none">– idle state– seizure– answer supervision– pulsing |
| Outband Signalling Trunk. | The conditions of the equipment shall be stated for the signalling limits and conditions of the E&M signalling wires, stating the signalling conditions at calling and called PABXs for the following signals: <ul style="list-style-type: none">– idle– seizure– hold– digit pulse– answer– clear forward– call held– clear back– forward held– clear forward– backward busy– forward busy |

6.5. *Interface to Digital Trunk*

6.5.1. *Definition*

A digital trunk is defined as an interface between various E1 digital trunk formats and the PABX transmission format.

A digital trunk shall provide a transmission/switching interface requirement and shall perform the following functions:

- a) Provide HDB- to binary coding
- b) Retiming
- c) Frame alignment and supervision
- d) Channel mapping
- e) Provide various signalling schemes
- f) Alarm detection
- g) Presents test condition

6.5.2. The digital trunk shall be able to carry:

- a) Voice,
- b) Data,
- c) Common Channel signalling

6.5.3. The digital trunks shall be capable of operating in synchronous or asynchronous environments.

6.5.4. *Interfaces*

The digital trunk shall provide digital receive and transmit connections between the outside plant and the PABX at 2Mb/s.

6.5.5. *Characteristics of Signal at the Output Port*

The signal at the output port shall be as specified in the ITU-T Rec G703 and summarised below:

| PULSE SHAPE | | NORMALLY RECTANGULAR |
|---|-------------------|----------------------|
| PAIRS IN EACH DIRECTION | COAXIAL PAIR | SYMMETRICAL PAIR |
| Test Load | 75 ohms resistive | 120 ohms resistive |
| Nominal peak of a space | 2.37 V | 3V |
| Peak voltage of a space | 0+/- 0.237V | 0 +/- 0.3 V |
| Pulse width (nominal) | 244 ns | 244 ns |
| Ratio of amplitude of Positive & negative pulse at nominal half amplitude | 0.95: 1.05 | 0.95 :1.05 |

6.5.6. *Return Loss*

The return loss at the input port shall comply with the figures shown below. The percentages are for frequencies of the nominal bit rate.

| | | |
|----------------------|---|------------------------|
| 2.5% to 5% | : | 12 dB |
| 5% to 100% | : | 15 dB |
| 100% to 150% | : | 14 dB |
| The nominal bit rate | : | 2048 kbit/s +/- 50 ppm |

6.5.7. *Man-Machine interface*

The digital trunk interface board shall be equipped with a serial asynchronous interface to connect a terminal or modem. The interface will comply with the following ITU-T V24 standards as shown below:

| CIRCUIT | TERMINAL | |
|---------|--------------|-----------|
| | DTIB | MODEM DCE |
| 102 | GND | GND |
| 103 | TX (output) | RX |
| 104 | RX (input) | TX |
| 105 | RTS (output) | CTS |
| 106 | CTS (input) | RTS |
| 107 | DSR (input) | DTR |
| 108 | DTR (output) | DSR |
| 109 | CD | CD |

The electrical signals TX, RX, RTS, CTS, DSR, DTR and CD shall comply to ITU-T Rec. V28.

7. **INSTALLATION, COMMISSIONING AND TRAINING**

7.1. *General*

- 7.1.1. The Contractor shall propose a typical layout plan of the proposed PABX equipment.
- 7.1.2. The successful Bidder (Contractor) shall install, test and commission the PABX system, including all internal cabling and strapping.
- 7.1.3. The connection from the PABX trunk lines and extensions to the external network will be at the MDF.
- 7.1.4. The PABX and all associated equipment shall be installed and commissioned in the presence of a project engineer appointed by CCK.

7.2. *Installation Materials*

- 7.2.1. The Contractor shall include in his offer a list of materials necessary for the installation such as irons, cables, jumper wires etc.
- 7.2.2. The contractor shall supply all the necessary materials for the completion of installation work and for cut-over work on a turn-key basis.
- 7.2.3. The contractor shall supply all he necessary materials for earthing connection.

- 7.2.4. The Contractor shall propose to supply the Main Distribution Frame (MDF), or a suitable flexibility point where the external lines will interface with the internal network. Detailed electrical, and mechanical characteristics of the offered flexibility point including cabling and jumpering arrangements, capacity and terminal blocks shall be provided. The type and dimensions of the MDF (where applicable) and terminal blocks shall also be given.
- 7.2.5. The proposed flexibility point shall contain protector modules with test jacks, break springs, over-voltage gas tube arrestors. The type, dimensions and line capacity of the protector unit and rates of voltage and current for the fuses and arrestors shall be stated.
- 7.3. ***Cabling and Wiring***
- 7.3.1. All wires and cables interconnecting the various PABX sub-systems shall be installed on/in cable runways and/or ducts in the building.
- 7.3.2. The conductors carrying power, control, supervisory, and audio and digital signals shall be shielded to avoid undesirable mutual interference.
- 7.3.3. High voltage and low voltage conductors shall be physically separated to avoid accidental high voltage contact.
- 7.3.4. Openings made in the building and holes on floor and walls for any passage of cable runways shall be sealed with non-inflammable material to prevent the ingress of dust, water and fire after installation of the equipment.
- 7.4. ***Cut-over***
- 7.4.1. The contractor shall confirm the proper functioning of all the equipment installed at site such as individual functions of each item specified in this specification, overall through-connection between any inlet and outlet, interworking operations with the local public exchange and other facilities as well as the detailed charging system.
- 7.4.2. It shall be the responsibility of the contractor to carry out extension line pre-testing before cutover.
- 7.4.3. The Contractor shall provide CBK with the procedures and other information required for successful cutover at least two weeks before the start of commissioning of the PABX.
- 7.5. ***Simulation of Failure***
- 7.5.1. The contractor shall simulate partial and total failure of the system to test compliance with all the requirements set.
- 7.6. ***Acceptance Test***
- 7.6.1. CBK shall implement the Acceptance Test about the following items:-
- i) That the installation work has been completed and the installed system is suitable for operation.
 - ii) That the installation work has been completed and the installed system is suitable for operation.
 - iii) That the maintenance spares, units, components, tools and test equipment has been supplied.

- iv) That all manuals, computer media, drawings and documents have been supplied.
 - v) That the required training has been completed.
- 7.6.2. Acceptance tests shall be carried out by the Contractor in the presence of and under the direction of the CBK appointed project engineer.
- 7.6.3. A function test shall be conducted and shall comprise check-up of the functions of the equipment on the specified items according to the facilities required in this specification.
- 7.6.4. A call-through performance test shall be performed. It shall aim to confirm performance figures submitted by the contractor and shall comprise of generating artificial automatic calls in both normal and overloaded conditions.
- 7.6.5. A PABX service test shall be carried out to confirm service requirements such as service restriction, routing and signalling.
- 7.6.6. Call charge processing test shall be carried out to ensure the performance of software and hardware by using actual call charge data obtained by generating test calls.
- 7.6.7. The Contractor shall submit within three (3) months after the signing of the contract the target performance figures for acceptance test for approval by CBK.
- 7.6.8. After commissioning, service quality of the PABX facilities installed shall be given for live calls as follows:-
- i). The percentage of calls judged as faulty due to faults existing in the PABX facilities against all calls in twenty four (24) hours shall be less than 0.1%.
 - ii). The service quality in (i) above shall be maintained for one (1) year from the date of issue of the Acceptance Certificate.
- 7.6.9. CBK shall accept all facilities upon confirmation by the project engineer that the service quality has been achieved and all defects and faults have been cleared.
- 7.6.10. If within one (1) year from the date of issue of the Acceptance Certificate, any part of the system breaks down or becomes defective or fails, under proper use of the system, due to faulty or improper design, defective materials, poor workmanship, defective manufacture and fabrication, the contractor shall replace every such defective part and re-deliver new ones complying with the requirements of this specification, at no extra cost to CBK.
- 7.7. **Training**
- 7.7.1. The Contractor shall provide necessary training to CCK personnel to obtain sufficient theoretical and practical knowledge for operation, maintenance and administration of the PABX and its associated facilities.
- 7.7.2. Training shall be given to CCK technicians and operator console operators who will participate in the operation, maintenance and administration of the installed equipment and shall consist of two parts; classroom training and on-the-job training. Prior to training the contractor shall submit a training syllabus to CCK for approval.

- 7.7.3. Classroom training shall be before or during the installation period. The following shall be included in this training:-
- a) Outline of the installed system.
 - b) Fault localisation.
 - c) Routine maintenance and operation.
 - d) System administration including man-machine communication operations.
 - e) Fault and statistics recording.
- 7.7.4. On job training shall aim at giving participants the necessary practical exercises on site
- 7.7.5. The number of trainees and duration of courses shall be determined by both the contractor and CBK.
- 7.7.6. The contractor shall furnish to each trainee all textbooks, drawings and lecture materials for the respective training course. All printed and lecture materials shall be in English language.

8. POWER

- 8.1.1. The contractor shall furnish to each trainee all textbooks, drawings The Contractor shall provide a comprehensive and detailed proposal for the power system for the offered PABX.
- 8.1.2. The PABX will be expected to work in the absence of commercial power for a period of up to one hour.

9. MAINTENANCE AND ADMINISTRATION

9.1. General

- 9.1.1. Maintenance staff shall not be required to carry out preventive maintenance and routine testing on the system, except for the standby batteries.
- 9.1.2. The operation of the system shall be monitored by range of continuously run automatic diagnostic functions.
- 9.1.3. On site repairs shall be limited to the replacement of faulty printed circuit cards or assemblies.

9.2. *Automatic Diagnostic Function*

9.2.1. The automatic diagnostics shall include tests on:

- a) Speeches paths
- b) Signalling paths
- c) Supervisory tones
- d) Receivers/Registers
- e) Dial Pulse Generating equipment
- f) Memories
- g) MF tone generators
- h) Power supplies

9.2.2. The automatic diagnostic will normally be continuously running but shall be suspended when the processor loading exceeds 60 per cent.

9.2.3. Faulty items or speech paths shall be automatically busied out of service. To ensure that malfunctioning of the fault detection circuits does not cause a shut down of the system, not more than 50% of any group of equipment or of the speech paths shall be taken out of service. Should this happen, a major alarm shall be indicated.

9.3. *Alarms*

9.3.1. Malfunctions shall be indicated to operating and maintenance staff by alarms appearing on the panels in the equipment cabinet and operator consoles.

9.3.2. A major alarm shall indicate that a fault has occurred resulting in a system failure, and that the PABX is operating on standby or in the Emergency Transfer of Exchange lines mode.

An audible signal shall accompany visual alarms.

Alarms shall be categorised as follows:-

- a) Major
- b) Minor Alarm
- c) System on reserve power supply

9.3.3. A minor alarm shall indicate that a fault has been detected which is insufficiently serious to cause a system failure.

9.4. ***Fault Location***

- 9.4.1. By the use of simple, built-in aids such as cabinet, shelf, card alarms or indicators, and by following clearly defined test procedures a maintenance engineer shall be able to locate a fault down to a printed circuit board level.
- 9.4.2. The maintenance engineer shall be able to select speech paths, trunks, receivers, registers etc., for test or monitoring purposes with the PABX operating normally.
- 9.4.3. It is expected that in the majority of cases a fault condition can be remedied by the change of a circuit board or assembly. In cases where such action is ineffective it shall be possible to apply additional diagnostic procedures using portable test equipment.
- 9.4.4. As an aid to fault location maximum possible use shall be made of LED's on circuit boards and maintenance panels etc., to indicate the status of a circuit and the location of faulty cards.

9.5. ***Spares***

- 9.5.1. The Contractor shall guarantee the supply of spare parts for a period of at least 15 years following the supply of the PABX system.
- 9.5.2. The Contractor shall provide recommendations for determining the number of spare printed circuit boards assemblies and consumable spares to be held on site. In addition the Contractor shall provide a priced schedule of spares containing the qualities of spare parts recommended by the manufacturer for correct maintenance of PABX for the first two (2) year.

9.6. ***Test Equipment***

- 9.6.1. The equipment shall, as much as possible, operate on the basis of Built-In Test Equipment (BITE). If any additional test equipment will be necessary to augment the built-in facilities available on the PABX, these will be also quoted for by the supplier.

9.7. ***Tools***

Contractors shall provide details and prices of tools and their purposes required by maintenance engineers.

9.8. ***Programming***

- 9.8.1. The methods adopted for programming the system for the initial installation and subsequent re-arrangement and/or additions shall be as simple as possible and suitable for use by non-specialist staff.
- 9.8.2. Programming shall be secure against interference by unauthorised persons. Contractors shall state the measures employed to achieve this security.
- 9.8.3. It shall be possible to perform a system dump-load to and from an external storage device. Contractors shall provide information on a suitable device for such use.
- 9.8.4. It shall be possible to program the system from an external device such as teletype, maintenance test panel, and (to a limited extent) from an extension user's telephone instrument.
- 9.8.5. Contractors shall provide a table listing the programming instructions/commands that may be applied.

- 9.8.6. It shall be possible to identify the programme (generic, issue etc) provided by a key-activated display on the equipment panel.
- 9.8.7. Contractors shall provide a priced schedule of the complete programming equipment.

9.9. ***Traffic Recording***

- 9.9.1. Facilities shall be provided for measuring the PABX traffic. The data obtained from the measurements shall be sufficient to enable a check to be made on the adequacy of equipment provisioning and also to observe whether effective use is being made of the features available in the system.
- 9.9.2. Two types of records shall be provided:-
- a) Call count – the number of times a device or a feature is taken into use.
 - b) Occupancy – the duration for which a circuit is in use.
- 9.9.3. The data shall be printed on hard copy in a format that will allow immediate interpretation of the information. It is desirable that '*Occupancy counts*' be converted into either CCS or Erlangs before output.
- 9.9.4. It shall be possible to select any of the following methods for obtaining traffic data:-
- a) Automatic modem. The system shall be capable of providing records automatically at pre-determined intervals.
 - b) On a local printer on request from the test line/test set.

9.10. ***Peripheral Devices***

Connections between the PABX and external peripheral devices shall be via a standard ITU-T V24 interface.

10. DOCUMENTATION AND SOFTWARE

10.1. ***Documentation***

- 10.1.1. The Contractor shall supply one set of documentation on the PABX and other facilities written in English covering the following information:-
- i. Technical description including circuit diagrams.
 - ii. Traffic calculations and dimensioning data.
 - iii. Detailed description of features.
 - iv. Identification of components for ordering purposes.
 - v. Installation instructions.
 - vi. Programming instructions.
 - vii. Test procedures
 - viii. Maintenance data including procedures for location of faults.
 - ix. Administration of the system
 - x. Extension users hand books.
 - xi. Operating instructions for the operator consoles.

- 10.1.2. The documentation shall be sufficiently detailed and comprehensive to enable a competent technician to install, programme, and commission and maintain the system. Maximum use should be made of flow charts to describe step by step the procedures to be followed during installation, testing and maintenance operations.

10.2. **Software**

- 10.2.1. The Bidder shall include in his proposal the price quotation for system software, and software for the itemised charging, as well as telephone management system software.
- 10.2.2. The Bidder shall also include the price quotation for the software necessary for additional services but not required at the initial stage, if any.
- 10.2.3. The Contractor shall provide the software of the PABX and all other related facilities. The software shall include all the necessary programmes and data required for a complete and satisfactory operation, maintenance and administration of the proposed system.
- 10.2.4. The Contractor shall provide appropriate capability for back-up of all operational and system data.
- 10.2.5. The software shall be licensed to CBK and shall include updates from time to time.
- 10.2.6. The Contractor shall provide the software support upon request for at least fifteen (15) years after the date of issue of the Acceptance Certificate.

11. COMPLIANCE

- 11.1. The Contractor shall provide a signed "*Statement of Compliance*" with this specification, clause by clause and shall provide a cross reference to the relevant section of the manufacturer's literature for each clause.
- 11.2. Where the tendered system cannot meet any clause in this specification, the Contractor shall indicate whether a similar feature or characteristic is available. Details of such alternatives or deviations shall be given in a separate signed statement "*Particulars of Deviation from the Specifications*".

PART G:

**BILLS OF QUANTITIES AND SCHEDULE OF
UNIT RATES**

PART G: BILLS OF QUANTITIES WITH SUMMARY AND SCHEDULE OF UNIT RATES

| CLAUSE NO. | DESCRIPTION | PAGE |
|-------------------|----------------------------|-------------|
| 1. | GENERAL NOTE TO TENDERERS | G/3 |
| 2. | STATEMENT OF COMPLIANCE | G/4 |
| 3. | BILL NO. 1: PABX EQUIPMENT | G/5 |
| 4. | BILL NO. 2: GENERAL ITEMS | G/7 |
| 5. | SUMMARY PAGE | G/11 |
| 6. | SCHEDULE OF UNIT RATES | G/12 |

BILLS OF QUANTITIES AND SCHEDULE OF UNIT RATES

1. General Note to Tenderers

- 1.1 The total of the prices in the summary of prices shall include for the whole of the Contract works in accordance with the specifications as defined before and shall be carried forward to Form of Tender.
- 1.2 Any prices omitted from any item, section or part of the price schedule shall be deemed to have included in another item, section or part.
- 1.3 The prices shall include for all obligations under the Contract including and not limited to:
 - a) Supply of any materials, equipment, apparatus, fittings, spares and tools
 - b) Insurance
 - c) Clearing and forwarding
 - d) Delivery, handling and storage at site
 - e) Packing for storage
 - f) Replacing any defective or damaged item
 - g) Installation
 - h) Testing
 - i) Painting
 - j) Commissioning
 - k) Maintenance during the defects liability period
- 1.4 The unit rates shall include import duty and VAT where applicable, and shall be expressed in Kenya Shillings.
- 1.5 Any tenderer whose firm uses the title “Engineer” or “Engineering” must provide evidence of registration of at least one of the directors by the Engineers Registration Board of Kenya to avoid disqualification.
- 1.6 Any tenderer who fails to price the General items will be deemed to have allowed 5% of his tender price to cover these items.

2. Statement of Compliance

- a) I confirm compliance of all clauses of the General Conditions, General Specifications, Particular Specifications, Technical Specifications in this tender.
- b) I confirm I have not made and will not make any payment to any person, which can be perceived as an inducement to win this tender.

Signed:*for and on behalf of the Tenderer*

Date:

Official Rubber Stamp:

CENTRAL BANK OF KENYA
PROPOSED OFFICE MODERNIZATION AND CREATION OF WORK STATIONS-PHASE III AT
CENTRAL BANK OF KENYA – NAIROBI
ELECTRICAL INSTALLATIONS – BILLS OF QUANTITIES
BILL NO. 1 – SUPPLY / INSTALLATION OF PABX EQUIPMENT

| Item No. | Description | Qty | Unit | Rate | Amount KShs. Cts. |
|------------------------------|--|-----|------|------|----------------------|
| | Supply, install, test, commission and set to work (to the full satisfaction of all the Parties) the following: | | | | |
| 1.00 | Fully programmable, High Capacity Hybrid Electronic PABX complete with an integral control unit/MDF assembly and all accessories as described in the Technical Specifications (Part B) . The set to be fully configured | 1 | No. | | |
| 1.01 | State the following:- Make of telephone equipment on offer _____ Country of origin _____ Number of institutions already using this type of equipment in Kenya _____ (A technical brochure and product catalogues must be enclosed) | | | | |
| 1.02 | Power back-up unit for the PABX with a minimum 12-hour back-up time when all the extensions and lines are in use (State make and type). | 1 | No. | | |
| 1.03 | Sollatek hi-volt guard. | 4 | No. | | |
| 1.04 | Line protectors, as Furse or equivalent. | 90 | No. | | |
| 1.05 | Amphinol connectors | 120 | Pcs | | |
| 1.06 | Allow for transferring of all the existing lines and terminating into the new PABX, and termination of all the extensions into the telephone sets. | | Item | | |
| 1.07 | Allow for the Connection of the new PABX to the existing MDF (Please visit site before pricing this item) | | | | |
| 1.08 | Allow for testing and comprehensive programming (for customization of the telephone system to each of the extensions). Other tailor made programming to user's needs, including conducting a general demonstration to all users and handing over of a completely operational installation and all manuals as spelt out in the Technical Specifications | | Item | | |
| Total C/F to Page G/6 | | | | | |

**CENTRAL BANK OF KENYA
PROPOSED OFFICE MODERNIZATION AND CREATION OF WORK STATIONS-PHASE III AT
CENTRAL BANK OF KENYA – NAIROBI
ELECTRICAL INSTALLATIONS – BILLS OF QUANTITIES**

BILL NO. 1 – SUPPLY / INSTALLATION OF PABX EQUIPMENT

| Item No. | Description | Qty | Unit | Rate | Amount | |
|----------------------------------|---|-----|------|------|--------|------|
| | | | | | KShs. | Cts. |
| | Total B/F to Page G/5 | | | | | |
| 1.09 | Allow for liaison with CCK for certification of the installed equipment. | | Item | | | |
| 1.10 | <p>Warranty: The warranty period for the workmanship, all materials and the equipment installed will be _____ months after commissioning.</p> <p>(Note: A minimum of 12 calendar months will be accepted. During warranty, all defective workmanship/materials will be replaced free of cost.</p> | | | | | |
| 1.11 | <p>Any other items to complete the installation satisfactorily please state after visiting the site.</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> | | | | | |
| Total C/F to Summary Page | | | | | | |

CENTRAL BANK OF KENYA
PROPOSED OFFICE MODERNIZATION AND CREATION OF WORK STATIONS-PHASE III AT
CENTRAL BANK OF KENYA – NAIROBI
ELECTRICAL INSTALLATIONS – BILLS OF QUANTITIES
BILL NO. 2 – GENERAL ITEMS

| Item No. | Description | Qty | Unit | Rate | Amount KSh Cts |
|-----------------------------|---|-----|------|------|-------------------|
| 2.00 | <p>Supply, install, test, commission and set to work (To the full satisfaction of all parties to the contract) the following: -</p> <p>Carry out comprehensive PABX Equipment installations testing and analysis, after installations. Prior to testing and commissioning conduct comprehensive programming of the system by approved manufacturer's representative to perform as instructed by the Engineer, including ringing patterns The testing and commissioning will be done as detailed below.</p> <ul style="list-style-type: none"> i) Prior to commencement of the work the contractor shall submit a procedure for the inspection, testing and commissioning of the system. This procedure shall include for the visual and functional check/test of all components of the system - the visual check will cover the standard of workmanship, the functional quality of the equipment and general compliance with the system specification and the functional tests shall check the operation of the system as a whole. ii) Commissioning will be undertaken by a qualified person using the approved inspection, testing and commissioning procedure. iii) On successful commissioning of the system, in terms of the specified requirements, a Taking Over Certificate shall be completed. This is the written notification to the Service Provider/installer that the client has taken over the system in terms of the Agreement. Payment cannot be effected without this certificate iv) The Final Completion date for the system is determined from the Hand over Certificate. The taking over date is also that date on which the warranty period is deemed to have commenced. v) Each equipment in the installations shall be supplied with a complete installation manual and comprehensive operating instructions. In addition, cabling and wiring information, a list of all equipment with associated serial numbers, etc (as specified) and any other information that may be required by the client from time to time and a copy of the taking Over Certificate shall be provided in a A4 hard cover arch lever type file | | | | |
| Total C/F to Page G8 | | | | | |

CENTRAL BANK OF KENYA
PROPOSED OFFICE MODERNIZATION AND CREATION OF WORK STATIONS-PHASE III AT
CENTRAL BANK OF KENYA – NAIROBI
ELECTRICAL INSTALLATIONS – BILLS OF QUANTITIES
BILL NO. 3 – GENERAL ITEMS

| Item No. | Description | Qty | Unit | Rate | Amount KSh Cts |
|-----------------------------|--|------------|-------------|-------------|---------------------------|
| | Total C/F to Page G7 | | | | |
| | <p>vi) The contractor shall provide basic operating training on the system, using the operating instructions, for client staff prior to the Taking over Certificate being issued. This training shall be sufficient to ensure correct operation of the system. The contractor shall issue certificates to certify that the operators are proficient in the operation of the system on successful completion of the system training. This training MUST be in the manufacturer's representative's presence.</p> <p>vii) The above documentation shall be handed to a selected client representative at the time of commissioning. The documentation to be as detailed below:-</p> <p>viii) System Documentation - all documentation relating to the installation shall be concise, complete and unambiguous. Information shall be provided sufficient to install, test and commission, operate and maintain the system. Operating instructions shall be designed to minimize the possibility of incorrect operation of the system.</p> <p>ix) Component documentation - documentation relating to the components of the installation system shall also be concise, complete and unambiguous. Sufficient information shall be provided to ensure the integration of the component with any other of the system's components. Component documentation shall include the following:-</p> <p>a) Name of manufacturer and / or supplier, including MANUFACTURER's certification of the installation and components, with a written 36-month performance warranty.</p> <p>b) Description of equipment.</p> <p>c) Standard to which component claims compliance.</p> <p>d) Name or mark of the certification body.</p> | | Item | | |
| Total C/F to Page G9 | | | | | |

**CENTRAL BANK OF KENYA
PROPOSED OFFICE MODERNIZATION AND CREATION OF WORK STATIONS-PHASE III AT
CENTRAL BANK OF KENYA – NAIROBI
ELECTRICAL INSTALLATIONS – BILLS OF QUANTITIES**

BILL NO. 2 – GENERAL ITEMS

| Item No. | Description | Qty | Unit | Rate | Amount KSh Cts |
|------------------------------|--|------------|-------------|-------------|---------------------------|
| | Total B/F from Page G8 | | | | |
| 2.01 | Acquire and submit a Bank Guarantee for 10% of the sub-contract sum, as a Performance Guarantee. | | Item | | |
| 2.02 | Acquire and submit Insurance for the sub-contract work. | | Item | | |
| 2.03 | Allow for presentation of all the required samples as per specifications, Bills of Quantities and Drawings. | | Item | | |
| 2.04 | Prepare and submit Working Drawings as follows:- i) Draft soft copy in Archicad® and Autocad® 2000 in CD-RW. ii) Amended soft copy in Archicad® and Autocad® 2000 in CD-RW. iii) 5 Final soft copies in Archicad® and Autocad® 2000 in CD-RW to Architect, Client, Quantity Surveyor, and Engineer (2 copies) iv) 3 Draft hard-copies of Working Drawings in Ao (Scales 1:50, 1:25) to Engineer, Architect and Main Contractor. v) 2 Amended hard copies of Working Drawings in Ao (Scales 1:50 and 1:25) to Engineer, Architect and Main Contractor. vi) 11 No. Final hard copies of working drawings in Ao (Scales 1:50, 1:25) to Engineer (3 copies), Architect (1 copy), Quantity Surveyor (1 copy), Client (3 copies), Contractor (3 copies). (Note: Full set of drawings to be presented as per drawing list). | | Item | | |
| 2.05 | As item no. 2.04, but for Record (As-Installed) Drawings comprising: <ul style="list-style-type: none"> Fully dimensioned drawings of all plants and apparatus. General arrangement drawings of equipment, plant etc. Routes – types and sizes and arrangement of all pipework. System schematics and trunking diagrams showing all salient information relating to control and instrumentation. | | | | |
| Total C/F to Page G10 | | | | | |

**CENTRAL BANK OF KENYA
PROPOSED OFFICE MODERNIZATION AND CREATION OF WORK STATIONS-PHASE III AT
CENTRAL BANK OF KENYA – NAIROBI
ELECTRICAL INSTALLATIONS – BILLS OF QUANTITIES
BILL NO. 3 – GENERAL ITEMS**

| Item No. | Description | Qty | Unit | Rate | Amount KSh Cts |
|--|---|-----|------|------|-------------------|
| | Total B/F from Page G9 | | | | |
| | <ul style="list-style-type: none"> Grading charts Wiring and piping diagrams of plant and apparatus. Schematic diagram of individual plants and switch and control boards. All the required operating instructions for all panels, boards, control panels etc. | | Item | | |
| 2.06 | Provide a year's (12 months') initial maintenance upon expiry of the Defects Liability Period. The maintenance to be carried out every quarter (3 months) for a period of 12 months. | | Item | | |
| 2.07 | <u>All other items</u> of general preliminary to cover, but not limited to:- <ul style="list-style-type: none"> Attendance on all other sub-contractors, such as for UPS Installations, Structured LAN Cabling, Fire Detection and Alarm System, Electrical Installations, Audio Visual Installations, Generator Installations, Lift Services, Solar Water Heating, V-Sat services etc. Hiring and keeping a Supervisor/Foreman on site Constant supervision of the works. Provision of all the required spares. Testing and Inspection of materials/works. Provision of labour camps. Storage of materials. Initial maintenance (During Defects Liability) Protection of the works/materials Clearing away on completion. Preparing Final Account. Providing all Test Certificates, etc. | | Item | | |
| Total for General Items Carried Forward to Summary Page | | | | | |

**CENTRAL BANK OF KENYA
PROPOSED OFFICE MODERNIZATION AND CREATION OF WORK STATIONS-PHASE III AT
CENTRAL BANK OF KENYA – NAIROBI
ELECTRICAL INSTALLATIONS – BILLS OF QUANTITIES**

SUMMARY PAGE

| ITEM NO. | DESCRIPTION | AMOUNT KSHS CTS |
|---|---|-------------------------|
| 1. | Preliminaries, B/F from Part D | |
| 2. | Bill No. 1: Supply / Installation of PABX Equipment B/F from Page G/6 | |
| 3. | Bill No. 2: General Items, B/F from Page G/10 | |
| 4. | Sub-Total | |
| 5. | Add 10% of the Sub-total in Item No. 4 above as contingency | |
| Total Amount Carried to Form of Tender | | |

Total Amount in words

.....

Tenderer's Name and Stamp

Signature.....

Date

PIN No.

VAT No.

Witness

Address

Signature

Date

**CENTRAL BANK OF KENYA
 PROPOSED OFFICE MODERNIZATION AND CREATION OF WORK STATIONS-PHASE III AT
 CENTRAL BANK OF KENYA – NAIROBI
 PABX EQUIPMENT INSTALLATIONS
 BILLS OF QUANTITIES**

SCHEDULE OF UNIT RATES

| ITEM | <i>DESCRIPTION</i> | UNIT | RATE (KShs) |
|-------------|---------------------------|-------------|------------------------|
| 1.00 | PABX Equipment | No. | |
| 1.01 | Power Back Up Unit | No | |
| 1.02 | Line Protectors | No | |
| 1.03 | Amphenol Connectors | m | |
| 1.04 | Sollatek hi-volt guard | m | |
| | | | |

**CENTRAL BANK OF KENYA
 PROPOSED OFFICE MODERNIZATION AND CREATION OF WORK STATIONS-PHASE III AT
 CENTRAL BANK OF KENYA – NAIROBI
 PABX EQUIPMENT INSTALLATIONS
 BILLS OF QUANTITIES
SCHEDULE OF UNIT RATES**

| ITEM | DESCRIPTION | UNIT (HR) | RATE (KShs) |
|-------------|------------------------|----------------------|------------------------|
| | HOURLY RATES | | |
| 01 | Unskilled labourer | | |
| 02 | Semi-skilled labourer | | |
| 03 | Skilled labourer | | |
| 04 | Foreman | | |
| 05 | Supervisor | | |
| 06 | Senior Supervisor | | |
| 07 | Junior Manager | | |
| 08 | Manager | | |
| 09 | Senior Manager | | |
| 10 | Non-Executive Director | | |
| 11 | Executive Director | | |
| | | | |

PART H:

**FULL SERVICE MAINTENANCE PER YEAR
AFTER EXPIRY OF DEFECTS LIABILITY
PERIOD**

PART H: FULL SERVICE MAINTANANCE PER YEAR AFTER EXPIRY OF DEFECTS LIABILITY PERIOD

SPECIAL NOTES

1. The tenderer is advised to note that their price shall be used in the evaluation of the tenders.
2. The tenderer shall price for both labour and consumables (materials) during the 12 months full service period in appenix A of this section. The price shall be for supply, installation, testing and commissioning including all taxes applicable at the time of tender.
3. The tenderer shall list and price the consumable/ spare parts/ materials to be used during the 12 months full service period in appenix B of this section. The price shall be for supply, installation, testing and commissioning including all taxes applicable at the time of tender.
4. The tenderer shall list and price the consumable/ spare parts/ materials to be used during the 36 months full service period. This list is to be comprehensive as possible and shall inculde major spares as cards, fan motors etc. The price shall be for supply, installation, testing and commissioning including all taxes applicable at the time of tender. These are the spare parts that are not required during the normal routine maintenance. These spare parts shall only be paid for as and when repalced. The tenderer shall give the details of these spare parts in in appenix C of this section.
5. The price quoted for the above shall be as per the Standard Maintanance Tender Document.
6. The tenderer shall be required to the sign the 12 Months after Defects Liability Maintanance Contract based on the price quoted and the Standard Maintanance Tender Document refered to in item 5 above.
7. The tenderer **MUST** fill all the prices and rates in the Appendices A, B and C of this section. Failure to do so shall lead to disqualification.

APPENDIX 'A'

PRICE FOR FULL NORMAL ROUTINE MAINTANANCE PER YEAR AFTER DEFECTS LIABILITY PERIOD

| Item | Description | Kshs | Cts |
|---|--|------|-----|
| 1.0 | Labour costs per month | | |
| 2.0 | Material costs for spare parts (consumables) per month – see Appendix C of this section | | |
| Sub-total for one (1No.) Month Maintenance after the Defects Liability Period (Not to be carried to Form of Tender) | | | |
| Grand Total for 12 Months Maintenance after the Defects Liability Period (Not to be carried to Form of Tender) | | | |

Signed by the Tenderer.....

Official Stamp

Date.....

APPENDIX 'B'

**SCHEDULE OF UNIT RATES OF SPARES THAT MAY BE REQUIRED DURING 12
MONTHS AFTER DEFECTS LIABILITY MAINTENANCE PERIOD (ATTACHMENTS
ARE ALLOWED IF THE LIST IS LONG)**

| Item | Description | Unit | Qty | Cost(Kshs.) |
|--|-------------|------|-----|-------------|
| | | | | |
| Total (Not to be carried to Form of Tender) | | | | |

Signed By Tenderer

Official Stamp

.....

Date

APPENDIX 'C'

**PRICE BREAKDOWN OF SPARES / CONSUMABLES TO BE USED DURING 12 MONTHS
AFTER DEFECTS LIABILITY MAINTENANCE PERIOD**

**NOTE: The Price Total in this Appendix C SHOULD tally with the Grand Price Total
in Appenix A of this section.**

| Item | Description | Unit | Qty | Cost(Kshs.) |
|--|-------------|------|-----|-------------|
| | | | | |
| Total (Not to be carried to Form of Tender) | | | | |

Signed By Tenderer

Official Stamp

.....

Date

PART I:

**TECHNICAL SCHEDULE OF ITEMS
TO BE SUPPLIED**

PART I: TECHNICAL SCHEDULE OF ITEMS TO BE SUPPLIED

CONTENTS

| <u>CLAUSE NO.</u> | <u>DESCRIPTION</u> | <u>PAGE</u> |
|--------------------------|----------------------------|--------------------|
| 1. | GENERAL NOTES TO TENDERERS | I3 |
| 2. | TECHNICAL SCHEDULE | I4 |

TECHNICAL SCHEDULE

1. General Notes to the Tenderer

- 1.1 The tenderer shall submit technical schedules for all materials and equipment upon which he has based his tender sum.
- 1.2 The tenderer shall also submit separate comprehensive descriptive and performance details for all plant apparatus and fittings described in the technical schedules. Manufacturer's literature shall be accepted. Failure to comply with this may have his tender disqualified.
- 1.3 Completion of the technical schedule shall not relieve the Contractor from complying with the requirements of the specifications except as may be approved by the Engineer.

2. TECHNICAL SCHEDULE

| ITEM | DESCRIPTION | MANUFACTURER | COUNTRY OF ORIGIN | REMARKS (Catalogue No.etc.) |
|-------------|------------------------|---------------------|------------------------------|--|
| 1.00 | PABX Equipment | | | |
| 1.10 | Power Back Up Unit | | | |
| | Line Protectors | | | |
| 1.11 | Amphenol Connectors | | | |
| 1.12 | Sollatek hi-volt guard | | | |

PART J:
STANDARD FORMS

CONTENTS OF SECTION J

| | TITLE | PAGE |
|-----|---|-------------|
| 1. | Performance Bank Guarantee | J/3 |
| 2. | Tender Questionnaire | J/4 |
| 3. | Confidential Business Questionnaire | J/5 |
| 4. | Key Personnel | J/7 |
| 5. | Schedule of Contracts completed in the last five (5) years | J/8 |
| 6. | Schedule of on-going projects | J/9 |
| 7. | Evidence of Financial Resources to Meet Qualification Requirements | J/10 |
| 8. | Bidders Bank Information | J/11 |
| 13. | Schedule of Major Items of Contractor's equipment proposed for carrying out the works | J/12 |

NOTE:

Tenderers must duly fill these Standard Forms as a mandatory requirement as they will form part of the evaluation criteria.

PERFORMANCE BANK GUARANTEE

**To: Director,
Department of Estates, Supplies and Transport
Central Bank of Kenya,
Haile Selassie Avenue,
P O Box 60000-00200,
Nairobi.**

Dear Sir,

WHEREAS(hereinafter called “the Contractor”) has undertaken, in
pursuance of Contract No. dated to execute
..... (hereinafter called “the Works”);

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you
with a Bank Guarantee by a recognised bank for the sum specified therein as security for compliance with
his obligations in accordance with the Contract;

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee:

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the
Contractor, up to a total of:

Kshs. (*amount of Guarantee in figures*)

Kenya Shillings (*amount of Guarantee in words*),

and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or
sums within the limits of Kenya Shillings

..... (*amount of Guarantee in words*) as aforesaid
without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us
with the demand.

We further agree that no change, addition or other modification of the terms of the Contract or of the Works
to be performed thereunder or of any of the Contract documents which may be made between you and the
Contractor shall in any way release us from any liability under this Guarantee, and we hereby waive notice
of any change, addition, or modification.

This guarantee shall be valid until the date of issue of the Certificate of Completion.

SIGNATURE AND SEAL OF THE GUARANTOR

Name of Bank

Address

Date

TENDER QUESTIONNAIRE

Please fill in block letters.

1. Full names of Tenderer:
.....
2. Full address of Tenderer to which tender correspondence is to be sent (unless an agent has been appointed below):
.....
3. Telephone number (s) of Tenderer:
.....
4. Telex/Fax Address of Tenderer:
.....
5. Name of Tenderer's representative to be contacted on matters of the tender during the tender period:
.....
6. Details of Tenderer's nominated agent (if any) to receive tender notices. This is essential if the Tenderer does not have his registered address in Kenya (name, address, telephone, telex):
.....
.....

Signature of Tenderer

CONFIDENTIAL BUSINESS QUESTIONNAIRE

You are requested to give the particulars indicated in Part 1 and either Part 2 (a), 2 (b) or 2(c) and (2d) whichever applies to your type of business.

You are advised that it is a serious offence to give false information on this Form.

Part 1 – General

Business Name

Location of business premises: Country/Town.....

Plot No..... Street/Road

Postal Address..... Tel No.....

Nature of Business.....

Current Trade Licence No..... Expiring date.....

Maximum value of business which you can handle at any time:

Kenya Shillings.....

Name of your bankers.....

Branch.....

Part 2 (a) – Sole Proprietor

Your name in full..... Age.....

Nationality..... Country of Origin.....

Citizenship details

Part 2 (b) – Partnership

Give details of partners as follows:

| | <i>Name in full</i> | <i>Nationality</i> | <i>Citizenship Details</i> | <i>Shares</i> |
|----|---------------------|--------------------|----------------------------|---------------|
| 1. | | | | |
| 2. | | | | |
| 3. | | | | |
| 4. | | | | |

Part 2(c) – Registered Company

Private or Public

State the nominal and issued capita of the company:

Nominal KShs.

Issued KShs.

Give details of all directors as follows:

| | <i>Name in full</i> | <i>Nationality</i> | <i>Citizenship Details*</i> | <i>Shares</i> |
|----|---------------------|--------------------|-----------------------------|---------------|
| 1. | | | | |
| 2. | | | | |
| 3. | | | | |
| 4. | | | | |

Part 2(d) Interest in the Firm:

Is there any person/persons in the employment of the Government of Kenya who has interest in this firm?

Yes/No (Delete as necessary)

I certify that the above information is correct.

| | | |
|-------|-----------|-------|
| | | |
| Title | Signature | Date |

** Attach proof of citizenship*

KEY PERSONNEL

Qualifications and experience of key personnel proposed for administration and execution of the Contract.

| POSITION | NAME | YEARS OF EXPERIENCE (GENERAL) | YEARS OF EXPERIENCE IN PROPOSED POSITION |
|-----------------|-------------|--|---|
| | | | |

I certify that the above information is correct.

.....

Title

.....

Signature

.....

Date

CONTRACTS COMPLETED IN THE LAST FIVE (5) YEARS

Work performed on works of a similar nature, complexity and volume over the last 5 years.

| PROJECT NAME | NAME OF CLIENT | TYPE OF WORK AND YEAR OF COMPLETION | VALUE OF CONTRACT (Kshs.) |
|--------------|----------------|---|---------------------------------|
| | | | |

I certify that the above works were successfully carried out and completed by ourselves.

.....

Title

.....

Signature

.....

Date

SCHEDULE OF ON-GOING PROJECTS

Details of on-going or committed projects, including expected completion date.

| PROJECT NAME | NAME OF CLIENT | CONTRACT SUM | % COMPLETE | COMPLETION DATE |
|---------------------|-----------------------|-------------------------|-----------------------|----------------------------|
| | | | | |

I certify that the above works are currently being carried out by ourselves.

.....

Title

.....

Signature

.....

Date

EVIDENCE OF FINANCIAL RESOURCES TO MEET QUALIFICATION REQUIREMENTS

(Cash in hand, Lines of credit, e.t.c. List below and attach copies of supportive documents)

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

BIDDERS BANK INFORMATION

(This should be for banks that may provide reference if contacted by the employer)

| NAME OF BANK | BANK BRANCH | ACCOUNT NAME | ADDRESS | TELEPHONE |
|--------------|-------------|-----------------|---------|-----------|
| | | | | |

**SCHEDULE OF MAJOR ITEMS OF CONTRACTOR'S EQUIPMENT PROPOSED FOR
CARRYING OUT THE WORKS**

| ITEM OF EQUIPMENT | DESCRIPTION, MAKE AND AGE (Years) | CONDITION (New, good, poor) and number available | OWNED, LEASED (From whom?), or to be purchased (From whom?) |
|----------------------|--------------------------------------|--|--|
| | | | |

PART K:
SCHEDULE OF DRAWINGS