

VOLUME 1:

The General Conditions of the Contract covering this Contract is FIDIC 1999 (CONDITIONS OF CONTRACT FOR CONSTRUCTION) issued by Ministry of Public Works and Housing (M.O.P.W.H)

- Part one for Construction Civil Works.
- Part two for Electrical Works.
- Part three for Mechanical Works.

VOLUME 2:

A- Instructions to Tender.

B- Particular Condition of Contract.

C- Supplementary Particular Condition of Contract.

D- Forms of Tender, Guarantees, Agreements, etc

A-INSTRUCTION TO TENDERS

Tender No:

Project:

Project description:

- Interior Design and decoration of Petra Visitor Center, this project contains basement and ground floor with approximate total area of (980 m2).

- All according to the project Drawings, Specification and B.O.Q.

(1) **Contractors**, who are invited by the advertisement for this Tender and wish to participate in tendering, may obtain a copy of the Tender Documents distributed as mentioned in the Invitation to tendering to tender upon payment of the price quoted for the said Document.

(2) **Tender Documents for this contract include the following :**

- Invitation to tender including the advertisement.
- Volume one:
General Conditions of Contract
- Volume two:
 - A- Instructions to Tender.
 - B- Particular Condition of Contract.
 - C- Supplementary Particular Condition of Contract.
 - D- Forms of Tender, Guarantees, Agreements, etc.
- Volume three:
 - Part 1: Technical Specifications for Civil and Architectural Works.
 - Part 2: Technical Specifications for Electro- Mechanical Works.
- Volume four:
Drawings

(3) **Tenderers Acquaintance to Project and Site Conditions:**

Any tenderer wishing to participate in this Tender shall have visited the Site of the Works and become acquainted with it, and shall have obtained, on his own responsibility and at his own expense, all information necessary for the purpose of preparing his tender. Furthermore, he shall have understood the nature of the works and the circumstances pertaining to the project, as well as all local customs, the required types of labor and labor conditions, and all other conditions related to this Tender or which affect his tender prices.

- a. The Tender shall be submitted on the Form of Tender included in this Volume. The Tender shall complete the Form of Tender, the Bill of Quantities, and shall sign the Tender Document in the Specified Places.
- b. The unit rates column in the Bill of Quantities shall be clearly filled out in numerals and words.
- c. The Tenderer shall not make any changes or modifications to the Tender Documents.
Should he have made such modifications, or have violated any of these instructions, his tender may be disqualified.

However, if the Tenderer wishes to submit further alternative offers, or add some reservations or notes, he may do so in a separate letter attached to the Tender, provided he submits his original (base) tender as required.

The Tenders' Committee may choose to examine his alternative offer(s), or reject it.

(4) Documents Included in the Tender:

The Tenderer shall submit his Tender in accordance with these instructions and the "Invitation to Tender". The tender shall consist of:

- 4.1. The Bid with the Form of Tender (on letterhead of the Tenderer) and the appendix.
- 4.2. Tender Guarantee.
- 4.3. Priced Bill of Quantity.
- 4.4. Qualification Information and documents as listed below.

The tender shall be accompanied by the following documents and information:

- a. The status of the Tenderer's firm, the letter of authorization empowering the authorized agent to sign on behalf of the firm. If the Tenderer is a joint venture, then the joint venture agreement must be submitted. The joint venture agreement shall expressly state that the parties to the agreement are bound jointly and severally, both and each, and shall be signed by the joint venture parties. The Tender and Performance Guarantees must be submitted in the name of both parties' firms, jointly.
- b. Experience and qualifications of the Tenderer and a description of project completed and these under construction, stating their actual percentage of completion.
- c. The names of Sub-Contractors whom the Tender proposes to employ in the construction of this project, provided that he names the Electro –Mechanical sub contractor who is supposed to be classified in the same class as the prime contractor or the classification grade specified in the special conditions.
- d. The Tenderer shall submit with his tender a Guarantee or a certified check to the order of the Employer, in the amount as specified in the Tender Call Notice, as an indication of his good intention in participating in the Tender. This guarantee shall be issued by a bank or a financial corporation duly licensed in Jordan, and shall be returned to the Tenderer if he is not awarded this Tender, at the direction of the Employer within one week from the date of award of the Tender.
- f. A price analysis of the main items in the Tender, showing the costs of plant, materials, workmanship, administrative overheads, and expenses and profits required to complete such items of work.
- g. Any other information as requested in the Particular Conditions, or the Particular Specifications or the instruction to Tenderers.
- e. The Tenderer's full official address in Jordan. If, however, his principal place of business is outside Jordan, then the Tenderer shall specify an address, and to which all correspondence and notices will be sent. Any notice or letter sent in registered mail to the said address shall be considered as if it had been delivered to him.

(5) Prices Quoted:

The prices quoted by the Tenderer against the items in the Bills of Quantities shall cover all his obligations under the Contract and all matters and things necessary for the proper execution and maintenance of the Works, including profit, and preliminaries (unless separate items pertaining to such items are mentioned in the Bills of Quantities).

(6) Clarification of Ambiguities:

Should there be any ambiguity, discrepancy or contradiction in the Tender Documents, or should there be a need for further information of clarification of the Tender Documents, then the Tenderer shall submit his written request to the (Tendering Directorate) for the clarification of ambiguities at a date not later than (7) days prior to the date of submission of the Tender. The answers to these queries shall be distributed to all participating Tenderers. Such clarification shall not be taken as a reason for requesting extension of the time set for submission of tenders.

(7) Submission of Tenders:

a. Tenders shall be submitted complete in a sealed envelope on which is written:

- Tender No. :
- Project :
- The name of the Tenderer:

And shall be deposited in the Tender Box specified by the Employer in the invitation to Tender on or before the time and date specified for submission.

b. Any tender received after the deadline for submission of tenders will be returned unopened to the Tenderer.

c. Tenders will be opened by a tender committee formed by the Tendering Directorate, and in the presence of Tenderers' representatives who choose to attend at the place and time specified in the invitation to Tender, unless stated otherwise in the Invitation to Tender.

(8) Validity of Tenders:

The submitted Tender shall be considered binding on the Tenderer, may not be withdrawn after its submission, and shall remain binding for a period of ninety (90) days from the date of submission, unless a longer period is specified in the Invitation to Tender.

(9) Currency of Tender:

The unite rates and prices shall be quoted by the Tenderer entirely in **Jordan Dinars**.

(10) Evaluation of Tender:

Tenders will be examined and evaluated at the sole discretion of the tender committee, with the participation of the consultants. No objections to any of the decisions made in evaluating the tenders shall be entertained. The Employer shall have the right to negotiate with the two lowest bidders to reach a reasonable price in case it is decided that the tender is acceptable; otherwise the Employer shall have the right to re-tender the project.

(11) Method of Checking of Tenders:

Tenders will be examined and evaluated in accordance with the Government Tenders Regulations issued in accordance with the Government Works Bye laws (with which the tenderer shall be deemed to have acquainted him).

a. If an error or contradiction should be found in any Tender between the given total of any item or the total tender sum and what is actually derived from application of the unit prices, then the Committee has the right to amend the total of such an item and the total of all amounts (Tender Sum).

b. If there should be a contradiction between the rates written in numerals and those written in words, then the rate written in words shall be considered binding, and the Tender Sum shall be adjusted accordingly.

c. If there should be any error in mathematical operations, then the sums shall be corrected and the corrected Tender Sum shall be binding on the Tenderer.

d. Where the Tenderer has not filled in a unit price for one or more items, where the sum of these items was equal or greater than 2% of the total price of the Tender after auditing, then the Tender Committee has the right to reject the Tender. But if the sum of these items were less than 2% of the total price of the Tender after auditing then the Tenders Committee has the right to consider such unpriced items as being included within the unit prices of other items in the Tender; and the Tenderer shall execute such unpriced items (if the Tender is awarded to him) at his own expense. For this exercise, the unit price of these items will be calculated as an average of other Tenderers' unit prices.

- e. If the Tenderer has priced any item which, in the opinion of the committee, is wrong or excessive, then the Committee may reject his tender or decide upon a reasonable unit rate derived from comparison with other tenders, and the Tenderer shall have no right to object to such action.

(12) Environmental Safety:

The Tenderer should ensure that he has reviewed "Environmental and Safety Measures" as pointed in the special conditions of contract, which will be binding to him if he is awarded the Tender.

(13) Rejection of Tenders:

The Tenders Committee reserves the right to disregard any Tender which does not comply with all that is required in these Instructions to Tenderers.

Furthermore, the Tenders Committee reserves the right to reject any Tender without the need to justify such action.

The Committee has the right to choose the Tender which it deems suitable, and to award the Tender without being bound to accept the lowest priced Tender. Unsuccessful Tenderers shall have no right to claim any compensation from the Employer.

(14) Advance Payment Guarantee:

The successful Tenderer may obtain an Advance Payment after the submission of an Advance Payment Guarantee as per the enclosed form, in the sum stated in the "Appendix to Tender", drawn on an approved registered bank in Jordan, as surety for the Contractor's fulfillment of his contractual obligations.

(15) Performance Guarantee:

The Tenderer who is awarded the Tender shall call in at the Employer's Office within (14) days from the date of award to sign the Contract Agreement. The successful Tenderer shall submit to the Employer a Performance Guarantee as per the enclosed form, in the sum stated in the "Appendix to Tender", drawn on an approved registered bank in Jordan, as surety for the Contractor's fulfillment of his contractual obligations.

(16) Defects Liability Guarantee:

The Contractor shall submit to the Employer a Defects liability Guarantee after receiving the "Taking-Over Certificate" as per the enclosed form, and in the sum specified in the Form of Defects liability Guarantee, to guarantee the execution of the maintenance and its completion, and as a surety for the Contractor's fulfillment of the Contract obligations. The Employer shall then, after presentation of this Defects liability Guarantee, return to the Contractor the Performance Guarantee mentioned above.

(17) Forfeit of Tender Guarantee:

If the successful Tenderer should delay or refuse to sign the Contract Agreement, or if he is unable to present the required Performance Guarantee, then the Employer shall have the right to forfeit the Tender Guarantee enclosed with his Tender without resort to the Courts, and the Tenderer shall have no right to claim for the said Tender Guarantee or any compensation thereof.

B- Particular Conditions of Contract

Clause 1-General Provisions

Add new definition 1.1.2.2. Employee

In the Contract the Employer is considers the First Party.

Add new definition 1.1.2.11

1.1.2.11- Employee

Any person or entity employed by the Employer as defined in the Appendix to tender including persons working in Governmental offices and / or companies associated with the Employer.

Add new definition 1.1.4.13, 1.1.4.14 and 1.1.4.15

1.1.4.13- Other Payments

Payments made to others in connection with the project. Such payments include but not limited to commissions, consulting fees, agent fees and / or other forms of payments.

1.1.4.14 – Prohibited Payments

Payments made to an "employee", as defined in these conditions, in connection with the project. Such payments include but not limited to commissions, consulting fees, agent fees and / or other forms of payments.

Definition 1.1.6.1-Contractor's Documents

Add to the end of the paragraph the wording "The Contractor's" submissions shall also include soft copies of all submitted drawings inclusive of shop, as- built drawings or other forms as instructed or required by the Engineer and the Contract.

Sub-Clause 1.5- Priority of Documents

Amend the sequence of document priority as:

- (a) Contract Agreement
- (b) Letter of Acceptance
- (c) Letter of Tender
- (d) Tender Addenda
- (e) Particular Conditions
- (f) General Conditions
- (g) The Drawings
- (h) The Technical Specification
- (i) Bills of Quantities and Methods of Measurement,
- (j) Other schedules

Sub-Clause 1.6-Contract Agreement

Replace the wording "shall be borne by the Employer"by"shall be borne by the Contractor".

Clause 2- The Employer's

Sub-clause 2.3- Employer's Personnel

Add the following wording to the end of the Sub-Clause :

"In case of other contractors working (or will be working) for the Employer on site during the Time for Completion of the works, it is the Employer's obligation to:

- a) Notify the Contractor in writing of the names and scope of work for each of the other Contractors working will be working on site, and
- b) Ensure that similar provisions for cooperation and compliance to provide safety procedures are reflected in their contracts.

Sub-clause 2.4- Employer's Financial Arrangements

Add the following wording to the end of the Sub-Clause:

The Employer shall confirm the Contractor, by commitment letter for the financial arrangement by the Contract price.

Clause 3- The Engineer

Sub-clause 3.1- Engineer's Duties and Authority

The Engineer is required to obtain the prior approval of the Employer before exercising the following specified authorities:

- (a) Appointment of Sub-Contractors (Sub-Clause4.4).
- (b) Nominated Sub-Contractors (Sub-Clause5).
- (c) Granting extension of time for completion (Sub-Clause8.4).
- (d) Application of Delay Damages (Sub-Clause8.7).
- (e) Suspension of Works (Sub-Clause8.8).
- (f) Taking over of works (Clause10).
- (g) Issuance of variation orders (Sub-Clause13.3).
- (h) Issue orders for works suspension.

Sub-Clause 3.4 Replacement of the Engineer

Delete the content of this Sub-Clause and replace by the following wording:

"If the Employer intends to replace the Engineer, the Employer shall, not less than 28 days before the intended date of replacement, give notice to the Contractor of the name, address and relevant experience of the intended replacement Engineer.

If the Contractor has reasonable objection to the appointment of the replacement Engineer, the Contractor shall notify the Employer in writing to that effect with in (14) calendar days with the supporting particulars. The Contractor shall enclose with the notification any particulars in support of his objection. The Employer shall, upon receipt of the Contractor's written notice and particulars, make his decision which shall be conclusive and final.

Additional Sub-Clause 3.6

The Engineer or the Contractor's representatives have to invite each others for Administrative meetings for studding work matters; the Engineer will prepare for meeting minute, and submit to the meeting attendance a copy to each of them and to the Employer taking into consideration that any responcipiltes for any needed actions are according to Contract lows.

Clause 4-The Contractor

Sub-Clause 4.1-Contractor's General Obligations

Add to end of Paragraph 2 the following wording:

"The said documents shall include but not be limited to the following:

1. Shop and "As Built" drawings for all disciplines based upon actual site conditions (Replica of design drawings shall not be acceptable).
2. Method statements for all of the works to be executed.
3. Construction schedule.
4. Any other requirements as stipulated in the Technical Specifications and Conditions of Contract excluding those stated in other Sub-Clauses.

The requirements for Temporary Works to be executed, provided, kept, maintained and operated by the Contractor (if any) shall be clearly stipulated in the Contract Documents. Any temporary works to be provided by the Employer shall also be clearly shown and indicated in the Contract Documents".

Add to end of the clause the following:

"The Contractor shall be responsible for maintaining the Works, or any part thereof, in the condition required by the Contract and shall replace, repair and make good any loss or damage to the same whatsoever or however caused, until the taking over by the Employer".

Sub-Clause 4.2-Performance Security

Delete paragraphs 2 and 3 and replace by the following wording:

The Contractor shall deliver the Performance Security to the Employer within 14 days after receiving the letter of Acceptance and shall send a copy to the Engineer. Otherwise, the submitted Contractor's bid shall be considered as withdrawn by the Contractor and the Employer shall be entitled to forfeit the Tender Guarantee previously submitted by the Contractor.

The Performance Security shall be in the form of a Bank Guarantee and shall follow the sample annexed to these Particular Conditions unless otherwise specified in the Appendix to Tender. If the Performance Security is not in the form of the Bank Guarantee, then it shall be issued by a licensed local bank approved by the Employer. If the Bank Guarantee is to be issued by a foreign bank, the Contractor is to have the approval of the Employer on the issuing entity and the Security issued shall be endorsed by a licensed local bank.

The Contractor shall ensure the Performance Security is valid and enforceable in the value stated in the Appendix to Tender until the Contractor has executed and completed the works specified. The Performance Security shall remain valid until issuance of the Performance Certificate by the Engineer in accordance to clause 11.9 of these Conditions.

If the terms of the Performance Security specifies an expiry date and it is determined that the Contractor is entitled to receive either the Taking Over Certificate or the Performance Certificate at a date 28 calendar days prior to the expiry date, the issuing bank shall automatically extend the validity of the Performance Security by three months additional periods until the such time as the works have been completed and any defects have been remedied. In the event that the issuing bank fails to extend the guarantee for whatever reason at a date three (3) days prior to its expiry, then the Employer shall have the right to demand its payment.

Sub-Clause 4.4-Sub-Contractors

Delete the first paragraph and replace by the following wording:

"The Contractor is permitted to subcontract to other contractors at maximum the limit specified in the Appendix to tender excluding any Works subcontracted to nominated subcontractors in accordance to Clause 5.1. The Engineer shall ensure that the maximum limits of Works Subcontracted are not exceeded in the given Bids or during the execution of the Works and shall inform the Employer in the event of any violation of these limits.

All proposed Subcontractors shall be local Contractors with sufficient experience in performing the Works Subcontractor. If the proposed subcontractor is form outside Jordan, he is to be affiliated with a local Contractor/entity. All proposed Subcontractors shall be approved by the Employer prior to commencing the Works on site.

The Contractor shall attach to his Bid a list showing the Works he intends to subcontract indicating the name and experience of the proposed Subcontract and the percentage of the Works for each Subcontract"

Sub-Clause 4.7-Setting Out

Delete the first paragraph and replace by the following wording:

"The Contractor shall set out the works in relation to original points, lines and levels of reference specified in the contract or notified in writing by the Engineer. The contractor shall provide the appliances, equipment and labour necessary for completing the setting out works to the accuracy and correctness stipulated in the Contract and to the satisfaction of the Engineer.

The Contractor is responsible for preserving all benchmarks, sight rails, pegs and any other forms used in the setting out of the Works.

Upon completion of excavation works, the Contractor is required to provide, to the approval of the Engineer, an as-built setting out plan showing the level of the different project sectors, the benchmarks and guide levels as specified or requested by the Engineer.

The checking of any setting out plan or of any subsequent line or level by the Engineer shall not, in any way, relieve the contractor of his responsibility for the accuracy of the works thereof.

If, at any time during the execution of the Works, an error appears in the position, levels, dimensions or alignment of any part of the Works, the Contractor, shell at his own cost, rectify such error to the satisfaction of the Engineer and in accordance to the Technical Specifications of the Contract.

2nd Paragraph, 3^{ed} line: Add the wording "during the early stages of construction to give time for the Engineer to answer any queries that the Contractor may have after "their accuracy".

Sub-Clause 4.8-Safty Procedures

Add the following wording to the end of the Sub-Clause:

"If there are several Contractors working at site at the same time ,the list of safety procedures required from the Contractor shall be reviewed, and the Employer's liabilities in such procedures shall be clearly defined.

The Contractor, Employer and Engineer shall comply with the national building codes regarding general safety and related matters.

Sub-Clause 4.9-Quality Assurance

Add the following wording to the end of the Sub-Clause:

"The need for a Quality Assurance System to be defined for the works and submitted by the Contractor for the approval of the Engineer shall be clearly specified in the Appendix to Tender.

If specified, the form and details of the Quality Assurance System to be submitted shall be agreed with the Engineer before commencement of works on site.

Sub-Clause 4.20-Employer's Equipment and free Issue Material

For this sub-clause to apply the Additional Particular Conditions should describe each item which the Employer will provide and or for operate and should specify all necessary details with same type facilities further provision may be necessary in order to clarify aspect as liability and insurance.

Sub-Clause 4.22-Security of the site

Add to the end of the Sub-Clause the following wording:

"The Contractor shall also adhere, at his own cost, to any additional provision required for security on site as details in the Technical Specifications.

The Contractor is required to protect the entire project facilities from theft, arson or other form of unlawful acts throughout the total Completion and Defect Liability periods. Should any theft, arson or other unlawful act occur in the project facilities during the periods stated above, the Contractor shall be liable for reimbursing, at his own cost, the Employer for any damages or theft in items occur.

If other Contractors shall be working at the same time on site, the Employer obligations and each other contractor should be specified in the additional particular conditions.

Additional Sub-Clause 4.25- Temporary Site Offices, Furniture

The Contractor shall supply and furnish temporary site offices (**Caravan**) for the Engineer's site staff with **total area of 40 m²** consisting of two offices, one toilet, Store room, kitchen, sump pit, full time service, electricity, water tank. (**Note: these offices are for contractor ownership**).

The offices shall be fully furnished with the following items. Offices and furniture will end to the ownership of the Contractor at the end of the project.

Disk

One Manger desk with drawers unit and rotaring arm chair and 4 chairs.

Cupboards

Three steel Cupboards + box files 30 no.

Refrigerator

11 foot Ref.

Meeting Table

One meeting table + 12 chairs

- A/C units heat cool number as needed for offices area.
- Measuring equipments and calculators (2).
- Fire extinguisher 6Kg. number (2).
- Tea / coffee Equipments.
- New photocopy machine A3, A4.
- 1 personal computers latest models

- Intel Core 2 Duo Processor (2.20GHz) 800MHz FSB, 2MB CASH
- 2 GB DDR2 RAM
- 200 GB HDD SATA
- CRT 17"
- Supermulti DVD
- Fax. LAN 10/100/1000
- Card reader
- USB 2.0
- Key board: Arabic / English
- Mouse: infrared and mouse pad.
- System case, monitor and keyboard must carry the same brand name.
- All computer components must be supplied by the mother company.
- Min 4 free PCI/ISA expansion slots.
- MK power cables.
- All drivers must be delivered with the P/C, such as CD-ROM,VGA, SOUND..etc
- System packaging (cartoons) must NOT be opened at all. They must be sealed and wrapped by the mother company- Otherwise, it will be rejected.

The Contractor shall submit site offices drawings before starting to construct them.

The Contractor shall make the offices operational within 15 days as of the date of receiving the Order to Commence.

The Contractor shall furnish, make arrangement for, carry out customary maintenance and janitorial services, and shall be responsible for the safety and security of the offices.

The Contractor shall provide the **supervisor engineer** with one mobile phone with 5 mega pixel built in digital camera with 60 JDs charging cards monthly, with Zain line.

Clause 6- Staff and Labour

Sub-clause 6.5 –working Hours

Add the following wording to the end of the Sub-Clause:

"The Contactor shall be liable for the full costs of any additional fees or overtime costs payable to the Engineer and his representatives for the supervision of the works outside the assigned working hours as stipulated in the Appendix to Tender. In case of any extension (or delays) thereof to the Works, these additional fees shall also be applicable notwithstanding any delay damages imposed by the Employer. Such fees shall be based on the Engineer's staff Schedule of Rates as appended to the Contract with the hours calculated in accordance to the prevailing labour laws.

The Employer may, without prejudice to any other form of payment, deduct the amount due as additional fees from any monies retained under the Contract or which may become due to the Contactor. The payment of such additional fees shall not prejudice the Employer's right to compensate for any other damages or costs sustained as a result of the Works.

The procedure to be followed for any overtime work shall be as described below:

Any request by the Contractor for work outside the assigned hours shall be made in writing by the Contactor a minimum of 24 hours before commencement of the proposed works and submitted to the Engineer. The Engineer shall thereafter appoint the necessary staff to supervise the assigned works as requested by the Contractor. Following completion of the assigned overtime works, an overtime sheet shall be filled by the Engineer indicating the works performed and the number of overtime hours completed and shall be signed jointly with the Contractor. A summary of overtime hours worked shall be compiled and submitted to the Employer at the end of each month as part of the Contractor's Interim Payment application."

Sub-Clause 6.6- Facilities for Staff and Labour

Replace in the 1st paragraph, last sentence the wording "facilities for the Employer's personnel as stated in the specification "by" the temporary and other facilities for the Employer's personnel and supervision staff as Specification ".

Sub-Clause 6.8-Contactor's Superintendence

Amend paragraph 1 as follows: Add the wording "and sufficient "after "necessary ".

Delete paragraph 2 and replace by the following wording:

"Superintendence shall be given by a sufficient number of site personnel with the minimum specified being as given in the list below .mobilization of the staff required shall be at the beginning of the project otherwise monthly deductions shall be imposed in the form of the amounts listed in the table below.

<u>Description</u>	<u>Experience</u>	<u>No</u>	<u>Full/Part Time</u>	<u>Financial Deductions</u>
Project manager(Arch.)	12years	1	Full	2500 JD/month
Site Eng (Arch. with a experience in a same kind of projects)	5 years	1	Full	1500 JD/month
Elect.Eng.	10 years	1	Part time (2 visits/ week)	1200 JD/month
Mech.Eng.	10 years	1	Part time (2 visits/ week)	1200 JD/month

Adequate number of the superintendence staff shall be fluent in the language of the Contract as specified in the Appendix to tender with the minimum being the project manager.

The assigned superintendence staff shall have adequate knowledge of the operations to be carried out (including the methods and techniques required, the hazards likely to be encountered and methods of preventing accidents) for the satisfactory and safe execution of the Works. The Contractor shall also provide on site in connection with the execution and completion of the works and remedying of any defects thereafter only such technical assistants, foreman and other staff as are skilled and experienced in their respective trades or works complemented by the different forms of labour as in necessary for the proper and timely fulfillment of the Contractor's obligation under the Contract."

Sub-Clause 6.11-Disorderly Conduct

Add to the end of Sub-Clause the following wording:" in the event of any disorderly conduct, the Engineer shall be at liberty to take any legal action that he sees suitable to prevent any further such conduct."

Clause 7 plant, Materials and Workmanship

Sub-Clause 7.1 – Manner of Execution

Add to the end of the Sub-Clause the following wording:

"The Contractor shall submit for the approval of the Engineer a detailed and thorough statement illustrating the manner and methods to be used for the implementation of the different works (i.e., temporary and permanent) on site complemented with the equipment, plant and labour to be used for each .Upon approval of the method statement by the Engineer, the Contractor shall not vary his methodology without first acquiring the approval of the Engineer in writing."

Sub-Clause 7.4 –Testing

Add to the end of the second paragraph the following wording:

"The Contactor shall bear the full costs of all tests stated and /or required to be performed by the Contractor during construction and on completion as deemed necessary to fulfill his Contractual obligations."

Sub-Clause 7.4 (Continued)

The Contractor shall also submit to the Engineer's approval, the names of three well established and experienced testing laboratories in Jordan prior to commencing the Works on site.

Add new Sub-Clause 7.9

Sub-Clause 7.9: Supply and Installation of Project Materials

All materials shall be considered supplied by the Contactor from vendors of his own selection and installed as part of his Contract unless otherwise clearly indicated in lists to be attached to the Appendix to Tender. These lists (if any) shall indicate all nominated vendors for Contractor as part of his Contract and those materials supplied by the employer but installed by the Contractor as part of his Contract and those materials supplied and installed by the Employer for purposes of security or other. In case of the latter, the Contractor shall be responsible for any coordination to be performed during construction if and when needed by the Employer.

It is the responsibility of the Contractor to take the above lists into consideration during tender formulation and construction Contract.

Clause 8 Commencement, Delays and Suspension

Sub- Clause 8.1-Commencement of Works

Add the following wording to the Sub-Clause:

The period for the issuance of the order to commence shall be within the time specified in the "Appendix to Tender".

The commencement shall not be later than what is specified in the "Appendix to Tender".

Sub-Clause 8.2 Times for Completion

If the work in contract needed to be handed over partially (in stages) this must be mentioned in Appendix to Tender or in the additional particular condition.

Sub- Clause 8.3- Program

Add the following wording to the Sub-Clause:

The Work Program shall be submitted in the form of bar chart or Critical Path Method, supplemented with number of personnel and equipment, and the dates of procurement of plant and materials.

The Contractor shall take into consideration the Engineer's comments, and amend his program to suitable technical standard, and shall submit it within (14) days from the date of the Order to Commence, and shall submit the amended program within (7) days from the date of revision by the Engineer

Sub-Clause 8.7 Delay Damages

Add the following wording to the Sub-Clause:

"The sum of the total delay damages agreed upon between the Employer and Contractor shall be deducted from the Contractor's Final Payment Certificate. However if the delays encountered to the works are major, the Employer has the right to deduct the delay damages in interim amounts from any payment certificate due at the time.

Payment of the delay damages shall be in accordance with the Appendix to Tender and in the currencies and proportions in which the Contract is specified ".

Clause 10- Employer's Taking Over

Sub-Clause 10.1- Taking Over Of the Works and Sections

Delete the content of paragraph 3 and replace by the following wording:

- a-"when the whole of the works or any part thereof are completed and can be used its intended purpose and has passed the required tests for completion as per Contract, the Contractor shall give the Engineer a notice to that affect (with a copy to the Employer) accompanied by a written undertaking to complete any outstanding works or remedies as soon as possible during the defects Notification period. This said notice and the attached written for inspection of the works and issuance of a taking over certificate.
- b-Within 14 calendar days after receiving the Contactor's notice, the Engineer shall inspect the works, prepare and submit a report of his findings during inspection to the Employer with a copy to the Contractor. In this report, the Engineer may certify the completeness of the works inspected and recommend taking over of the said Works or specify the nature and scope of the remaining works needed to be completed before the taking over can take place and period required by the Contactor for competing these remaining works and remedies in an acceptable manner to be the Engineer. If the Contractor has any objections on the submitted Engineer's report, he may notify the Employer of these objections in writing within (14) days from receipt of the report. In such a case, the Employer shall, within (14) from receipt of the report. In such a case, the Employer shall, within (14) days from the receipt date of the Contractors notification, give his decision to the Contractor in writing which will be final.
- c- If the Works are ready for taking over, the Employer shall ,within(10)days after receipt of the Engineers report, form a Taking Over Committee of maximum 2 members plus the Engineer or his representative and notify the Contractor in writing of the date proposed for carrying out the inspection. The proposed date of inspection shall not be earlier than (7) days from the date of taking over notification by the Employer. Tow days prior to the inspection date proposed, the Engineer and The Contractor shall forward to the committee members all necessary lists, data, schedules and drawings needed to facilitate their inspection.
- d- On the proposed date of inspection, or on an alternative date as agreed between the Employer and the Contractor, the Taking over Committee shall conduct, in the presence of the Contractor or his authorized representative, an inspection of the Works. Within (3) days from the date of inspection ,the Taking Over Committee shall prepare minutes of the taking over process which shall be signed by all members and forwarded to the Contractor for signature. Copies of the signed minutes shall be handed over to the Employer, Engineer and the Contractor. In the event that the Taking Over Committee fails to conduct the necessary inspection or prepare its minutes within (15) days from the date of inspection as agreed with the Contractor and their reasons for such action are not acceptable by the Contractor, then the date of inspection as agreed shall be considered as the date of take over of the works by the Employer.
- e- In the event that the Contractor does not raise any written objections regarding the taking over minutes within (7) days of receipt ,the Engineer shall ,within (7) days of the receipt date of the taking over minutes ,issue a Taking Over Certificate specifying the completion date of the Works pursuant to the Contract which shall

form the date for commencement of the Defects Liability Notification period .in the Taking Over Certificate, the Engineer shall specify all Works to be completed or remedied by the Contractor and the period for their completion commencing from the defects liability notification date

If within (7) days of receipt, the Contractor objects on the content of the taking over minutes in writing to the Employer with a copy of the Engineer, the Engineer shall study the Contactor's objections and report his findings in writing to the Employer with a copy to the Contractors objections and report his findings in writing to the Employer with a copy to the Contactor."

Add new Sub-Clause 10.5

Sub –Clause 10.5: Defects Liability Security

Upon issuing the Taking over Certificate, the Contractor shall issue a Defects Liability Security to the percentage stipulated in the Appendix to Tender.

The Defect Liability Security shall be in the form of a Bank Guarantee issued by a reputable local bank, and approved by the Employer or a foreign bank approved by the Employer with a local Jordanian affiliate .If the Defects Liability Security is in another form other than a Bank Guarantee, it shall be issued by a financial establishment, other than Capital Bank of Jordan, registered to work in Jordan and approved by the Employer.

The wording of the Defects Liability Security shall be as per enclosed form in Section D of Volume 1.

The Defects Liability Security shall remain valid until 21 days after the issuance of the Performance Certificate by the Engineer in accordance to clause 11.9 of these Conditions.

Clause 12- Measurement and Evaluation

Sub –Clause 12.1-Works to be measured

Delete the wording "Except as otherwise stated in the Contract, whenever any permanent worksend of Clause' and replace by the following wording:

The Contractor shall prepare the measured on printed forms and sketches supplied by and at his own cost .The Contractor is required to have the agreement of the Engineer on the format of the Measurement Forms prior to proceeding with printing .

Prior to the submission of the Interim Payment Certificate or the Statement at Completion or the final statement , a copy of the measurement shall be submitted to the Engineer for his approval along with all support documentation required by the engineer in the evaluation of the submitted measurements such as vouchers ,returns sketches, drawings ,x-sections etc....Within 10 working days of the measurements calculation submission to the Engineer, a meeting will be arranged between the Engineer and the Contractor to discuss and agree on any differences noted in the measurement. Failing agreement, the measurement made by the Engineer or approved by him, shall be taken to be the correct measurement of such part of the engineer or approved by him shall be taken to be the correct measurement of such part of the works unless the Contractor, within 7 days of such meeting, lodges with the Engineer notice of the respects in which such measurement are claimed to be incorrect.

On receipt of such notice, the Engineer shall review the measurements and either confirm or vary them.

The corrected copy of the measurement, based on the above, will be prepared and signed by the Contractor and then submitted to the Engineer for his signature. The corrected measurement along with all supporting documentation will then be incorporated by the Contractor in the preparation of the Interim Payment Certificates, Certificate at Completion and Final Payment Certificate prior to submission in accordance to Sub-Clause 14.3 of these conditions."

Sub-Clause 12.3 –Evaluation

Paragraphs a & b are canceled and replaced by:

- a) In case of difference in the measured quantity for the item by more or less 20% of the quantity in BOQ or any other priced tables and the result of multiplying the change in quantity by the unit price fixed in Contract for this item by 1% from Contract acceptable price and this item not mentioned in the Contract as a fixed price item or.
- b) The Work issued by instruction order for variation according Clause 13 and the item without a unit price in the Contract.
- c) The item without suitable unit price in the Contract due to different in nature of work about any item in the Contract on the work is executed within similar Conditions, new unit price will be devised from items related with moderate modifications to include the effect what mentioned in paragraphs (a and/or b) above according to that must be applicable from them, and if there is no items related to this work the detected new unit price will be fixed according to state cost for execution of works pulse a suitable profit taking into consideration other related matters and until the reaching an agreement on the suitable unit price or evaluation of it, the Engineer will fix a Permanents unit price to be used in Interim Payments.

In all cases the new unit price will be applied as follows:

In case of increase in quantity the new price will be applied for the quantity that increased about that mentioned in B.O.Q and the case of decrease the new unit price will be applied for the amount remained in B.O.Q.

Clause 13- Variations and Adjustments

Sub-Clause 13.7-Adjustments for Changes in Legislation

Add at the end of Paragraph 1 the following wording:

"Price adjustment shall be affected only when a formal decree has been issued to that effect by the Government or its concerned Ministry."

Sub-Clause 13.8 Adjustment for Changes in costs

Original text in paragraph 3 is canceled and substituted by:

Adjustment in costs due to change in price according to the following principals:

- a- Changes in main materials price needed in the permanent works after the basic date, it price should be revised for the purpose of calculation and either in increase or decrease according to that follows:
 - 1- If the change is due to Government decision for prices fixed by the Government and/or .
 - 2- According to regular circulations issued by Ministry of Public Works and Housing (MOPW) after taking the opinion of an permanent special specific committee appointed by MOPW Minster, one of its members is Contractors association representative in accordance to materials which are not priced by the government includes following :
 - Price of main material locally manufactured for each month from prices in reference to announced materials price from companies products such materials.

- Price of main materials imported from outside the Hashemite kingdom of Jordan (H.K.J) for each month, from months of regular circulation showing the date of change in prices according to the information submitted the official authorities and others such as custom to the price in the production country or other announcement.

3- Adjustment in Contract items priced in increase or decrease due to change in main materials price changes the Contractor will be compensate or deduct the difference in main material prices due to change in prices.

But this adjustment in price will not include, any difference due to application of clause 13.7 also Sub-Clause 13.8-b. Minister of Public Works and Housing MOPW will be taken regarding adjustment in price.

Main material defined in paragraph (a) that includes the compensation in accordance of project mature among material tabulated at the end of Appendix to Tender.

b- If the Payments for the Contractor is paid in Jordan Diner and a decrease in price of Jordan Diner against U.S Dollar or Euro prices according to announced of Jordan Central Bank and its day circulation at any time following the date of submissions of Tender ,compensation of Contractor on direct loss due to change in price of JD against US dollar or euro at the time of paying material prices and equipment that inter in the permanent works and that purchased from foreign markets ,in this case following conditions to compensate the Contractor on his looses when he is paid with JD :

- The decrease not exceeds 5% of principle value for the changing price at time of principle date.
- Quantity surveying for material on site not be done and the Contractor will compensate for materials needed for work completion after the date of currency change ,payment for losses will not be paid also the additional in these materials and machinery .
- The Contractor will not be paid for his over head and prefects.
- The effect in change in price in any material decrease in value of work item in B.O.Q by 2% from Contract acceptable price.

c- If the prices of form technical input data of construction manufactured locally materials consumed materials for all license of contracting or for the price consumed material and equipment and spear parts for Contractors equipments for roads ,water, drainage and exceed the presenting in change in it 5% from the prices of related items or 5000 JD which is less.

The Contactors will be compensating for it in accordance to equations approved by Ministry MOPWH.at suitable time.

d- Compensations in paragraph b & c not applicable for Contactors part of his payment in foreign currency.

e- In case of raise in fuel prices need for Contractors equipment raised by 5% from the purchasing price at the date of summation of Tenders.

Construction Contractor compensation will be in accordance to equations issued by Ministry of MOPWH for the charge of the mentioned 5%.

Clause 14-Contract Price and Payment

Add to the end of paragraph 3 the following wording:

"The second installment of the advance payment shall amount to 5 % of the accepted Contract price and shall be paid to the Contractor within two weeks from completion of mobilization (i.e., equipment and manpower required to complete the works) and the project's temporary facilities as specified.

If it is proven to the Employer that the Contractor used the advance payment for purpose other than the project, the Employer shall have the right to immediately demand payment under the advance payment guarantee not withstanding any objection on the part of the Contractor."

Delete paragraph 5 and replace with the following wording:

"The advance payment shall be repaid through deductions in Payment Certificates .Commencement of repayment and the amount of percentage deductions shall be as stipulated in the Appendix to Tender 10%of Interim Payment. Whenever a percentage deduction is stipulated, the amount of repayment shall be calculated as the specified percentage of the difference between the total value of the permanent works in the BOQ (excluding the deduction of retention) and the same value in the preceding Interim Certificate until such time as the advance Payment has been paid in full".

Sub-Clause 14.3-application for interim payment certificate

Paragraph e is canceled and replaced it

Deduct amount of money which paid to the Contractor in previous interim payment
Add the following wording to the end of the Sub-Clause:

"the contractor shall notify the Engineer (with a copy to the Employer) in writing of the submission of the complete application .if the engineer considers the submission to be incomplete, the Engineer shall return the application to the Contractor with a cover letter (copy of which shall be forwarded to the employer) indicating all missing items ore amendments needed to the included. The Contractor shall thereafter resubmit the application to the engineer (with copy to the Employer) once all requested adjustments have been included".

Sub-Clause 14.5-plant and materials intended for the Project

Add to paragraph 4 the wording "or otherwise is specified in the Appendix to tender "after "eighty percent".

Sub-Clause 14.8-Delayed Payment

Replace in paragraph 1, the wording "financing charges compounded monthly "by "financing charges stated in the Appendix to Tender ".

Sub-Clause 14.9-Payment of Retention Money

Add to the end of this Sub-Clause the following wording:

"Upon the Employer's consent, a guarantee for the amount of (50%) of the retained money may be provided by the contractor to the employer once the amount of retention money reaches (60%) of the maximum amount stated in the appendix to tender.

Upon the application of this aforementioned paragraph, the return of the grantee is subject to the works having been taken over and the Contractor's submission of the defects liability guarantee .upon approval by employer, the remaining retention money may also be replaced by a guarantee which will only be returned as specified earlier in the clause (i.e., after the latest of the expiry dates of the defects liability notification periods".

Sub-Clause 14.10- Statement at Completion

Add to the end of paragraph 1 the wording "the submitted statement shall be accompanied by the contractor's written discharges in accordance to form D-10 of the contract Documents"

Sub-Clause 14.11- Application for Final Payment Certificate

Replace the content of paragraph (b) of the Sub-Clause with the following wording:

(b) Any further sums which the Contractor consider being due to him under the Contractor or otherwise in connection explicitly to now matters or occurrence after issuing the Taking – Over Certificate.

Sub-Clause 14.12-Dicharge

Add after term "Performance Security "the following wording:
"Or Defects liability Guarantee as the case may be"

Clause 16- Suspension and Termination by Contractor

Sub-Clause 16.1-Contractor's Entitlement to Suspend Work

Delete Paragraph 1 and replace by the following wording:

If the Engineer fails to certify any payment certificate in accordance to the provisions of Sub-Clause 14.6 (issue of interim payment certificate) or the Employer fails to pay the Contractor's certified outstanding amounts in accordance to Sub-Clause 14.7 (payment) ,the Contractor may ,after giving not less than a (21) calendar day notice to the employer ,suspend the works (or reduce t6he rate of progress) unless and until such time as the reason given in the Contractor's notice have been complied to or fulfilled".

Sub-Clause 16.2-Termination by Contractor

Delete from paragraph 1, item (a) of the contractor termination conditions and renumber the remaining items from (a) to (f).

Amend in Paragraph 2 the wording "Subparagraph (f) or (g) "to "Subparagraph (e) or (f) ".

Clause 17- Risk and Responsibility

Sub-Clause 17.7- Structural liability for the works

Add to the clause the following:

The Contractor shall be liable for the structural stability and integrity of the shoring Works for a total period of eighteen (18) months after completion of the structure or until the completion of the concrete works covering the areas in question whichever is longer.

Sub-Clause 17.8 Use of Explosive Materials

The Contractor shall take all necessary measures and precautions in connection with the use, transport and storage of explosive materials and shall comply with any Engineer's instructions regulations and law issued by the concerned authority and any other requirement in relation to this subject needed to fulfill his contractual obligations. This also applies to all combustible materials and other that may cause danger in its use, transport and /or storage.

The Contractor shall (1) obtain the necessary permits and approvals from the related authorities and sources ,(2) abide in full with all instructions given by the concerned parties and (3) submit for the Engineer's approval the arrangements and procedures to be implemented before any use, transport and storage of explosive materials is permitted on site.

All approvals given by the Engineer or local authority for the use, transport and storage of explosive materials shall not relieve the contractor of his sole responsibilities and commitments under the Contract.

Sub-Clause 17.9 Bribery

Bribery ,in whatever form, whether made by the contractor or any of his subcontractors or by any of their employees to any member of the employer's staff or the engineer or his staff, shall constitute sufficient cause to terminate this contract and any other contracts between the contractor and the Employer ,this in addition to any legal liabilities resulting from such termination .for the purpose of this Sub-Clause ,any modification or change to the works ,or to the level of workmanship ,or to obtain any personal benefit ,shall be deemed as bribery.

The Employer shall be entitled to collect any compensation entitled to him in respect of any loss resulting from termination of contract for this reason and he can deduct such amounts from any moneys due to the contractor or from his guarantees.

Sub-Clause 17.9.1 Declaration of Other and Prohibited Payments

Other payments

- i- The Contractor shall fully declare ,in the Declaration of Other Payments from (From D11)enclosed in the Contract documents, all payments made or agreed to be paid to others by him or on his behalf or through his sub-contractors or their representatives or agents in connection but not limited to the Invitation to Submit Bids for the execution of this Contract or the Bidding process itself or the award to the Contractor or the negotiations to sign the Contract or the actual execution of the project. The Contractor shall attach to the declaration a detailed description of any payments made (or to be made) and the reason thereof behind the payments.
- ii- In case of the Contractor's breach of the provisions of paragraph (a),the Employer shall, at his own option and discretion, have the right to take all or any of the following actions listed:
 - 1. Terminate the contract taking into consideration the provisions of Sub-Clause 15.2 (termination by employer) of these conditions;
 - 2. Deduct from the moneys due to the contractor under this Contract, an amount equal to two times the amount of these other payments ;and
 - 3. Instruct the contractor to pay promptly to the employer an amount equal to two times the amount of these other payments and the contractor shall declare, in terms of this Sub-Clause, his irrevocable acceptance to this instruction.
 - 4. Taking into consideration paragraph (d) ,the two parties of the Contract shall declare that the total amounts that the employer is entitled to in terms of paragraph (b) will not exceed two times the total sum of all other payments .
- iii- The Contractor shall agree to incorporate, in all agreements made with Sub-Contractors, suppliers or consultants in relation to the contract, clauses or provisions similar to those stated in the abovementioned paragraphs(a) and(b) on the condition that the contents of these clauses shall not be less restrictive than that of the paragraphs referred to and shall clearly state the right of the Employer to enforce these clauses or provision immediately against any of these Sub-Contractor, Suppliers and Consultants. The Contractor also agrees to promptly furnish the Employer with complete true copies of the signed agreement with the Sub-Contractors, Suppliers and Consultants to verify the inclusion of the abovementioned clauses.

- iv- No party or person is at liberty to allege that the contents of the paragraph above make lawful or permissible any of Other Payment that are otherwise prohibited under the applicable laws and regulations and that the Employer's rights as stipulated in the above paragraphs are in addition to any rights that the Employer or any other party may have under the laws and regulations applicable in Jordan.
- v- The contents of the above paragraphs shall remain valid even after the completion of the Contract.

Sub-Clause 17.9.2 -Prohibited payment

- (a) The Contractor shall fully declare, in the Declaration of Prohibited Payments from (from D12) enclosed in the Contract documents, that no prohibited payment or promises for prohibited payment were made to the Employer directly or indirectly regardless whether by the Contractor or on his behalf, or by his Sub-Contractors or the Bidding process itself or the award to the Contractor or the negotiations to sign the Contract or the actual execution of the project.

The Contractor shall undertake not to make nay prohibited payments or promise such payments whether directly by the Contractor himself or his subcontractors or any of their Employees, agents or representative to any "Employee" in connection with the amendment, renewal, extension or actual execution.

- (b) In case of the Contractor's breach of the provisions of paragraph (a) the Employer shall, at his own option and discretion, have the right to take all or any of the following actions listed:
 - i- Terminate the Contract taking into consideration the provisions of Sub-Clause 15.2 (Termination by Employer) of these conditions.
 - ii- Deduct from the moneys due to the Contractor under this Contract ,an amount equal to two times the amount of these other payments and
 - iii- Instruct the Contractor to pay promptly to the Employer an amount equal to two times the amount of this Other Payment and the Contractor shall declare, in terms of this Sub-Clause, his irrevocable acceptance to this instruction.

Taking into consideration paragraph (d) the two parties of the contract shall declare that the total amounts that the employer is entitled to in terms of paragraph (b) will not exceed two times the total sum of all other payments .

- (c) The Contractor shall agree to incorporate in all agreements made with Sub-Contractors, suppliers or consultants in relation to the Contract ,clauses or provisions similar to those stated in the abovementioned paragraph (a) and (b) on the condition that the contents of these clauses shall not be less restrictive than that of the paragraph referred to and shall clearly state the right of the Employer to enforce these clauses or provisions immediately against any of these Sub-Contractors, suppliers and Consultants to verify the inclusion of the abovementioned clauses.
- (d) No party or person is at liberty to allege that the contents of the paragraphs above make lawful or permissible any of the other payment that are otherwise prohibited under the applicable laws and regulations, and that the employer's right as stipulated in the above paragraph are in addition to any rights that the employer or any other party may have under the laws and regulations applicable in Jordan.
- (e) The contents of the above paragraphs shall remain valid even after the completion of the Contract.

Clause 18- Insurance

Sub-Clause 18.1-General Requirements for Insurances

Add to the end of paragraph 1 the following wording:

"The insuring party shall be as stated in the Appendix to Tender the Contractor is the insured part, insurance policy must include a condition regarding cross liability for the Employer, the Contractor as a two spare parts.

Sub-Clause 18.2-Insurance for Works and Contractor's Equipment

Modify paragraph 1 by replacing the wording:

"For not less than the full reinstatement cost" by the wording "to the amount being as stated in the Appendix to Tender".

115% from the contractor Acceptable price

Add new item f:" all applicable deductibles shall be as specified in the appendix to Tender. The insuring party shall be responsible for payment of all deductibles ".

Sub-Clause 18.3- insurance Against Injury to persons and Damage to Property

Add to paragraph 3 item (a) the following wording:"at condition in writing and in advance by the employer ".

Add to paragraph 3 item (c) the following wording after 'contract ' "at the amount stated in the appendix to tender ".

Add new (e) to paragraph 3: "shall be extended to cover liability for third party loss, damage, death or bodily injury which may occur to any physical or to any person ".

Clause 20-Claims, Disputes and Arbitration

Sub-Clause 20.1- Contractor's Claims

Add to the end of this Sub-Clause the following new paragraph:

"If either the Employer or the contractor are dissatisfied with any decision of the Engineer, then either of the Employer or the Contractor may no the fifteenth day after the day on which the Engineer's decision was received, give notice to the other, with copy to the Engineer, of his intention to declare a dispute ".

Delete Sub-Clause 20.2, 20.3, 20.4, 20.7 and 20.8

Modify the numbering of remaining Sub-Clause accordingly (i.e., 20.5 shall be and 20.6 shall be 20.3)

Sub-Clause 20.2- Amicable Settlement

Replace in paragraph 1 the word "of dissatisfaction "by" with "to declare a dispute ".

Replace in paragraph 1 the wording "under Sub-Clause 20.4" with "under Sub-Clause 20.1".

Sub-Clause 20.3-Arbitration

Delete Paragraph 1 which starts with "unless settled amicablyLanguage for communication defined in Sub-Clause (1.4) " and replace with the following wording:

"All Disputes, if not settled amicably, shall be referred directly to arbitration for settlement in accordance to the following:

- (a) The dispute shall be finally settled in accordance with the Jordanian arbitration law in effect (unless otherwise agreed by both parties):
- (b) The arbitration board shall be formed consisting of one or three members appointed in accordance with the applicable law; and
- (c) The arbitration procedure shall be conducted in the language for communication defined in Sub-Clause 1.4 (law and language).
- (d) The arbitration procedures shall be conducted in Amman, Jordan (unless otherwise agreed between the two parties)."

C-Supplementary Conditions

The Contractor must take into consideration the following:

A. General Commitments

- i- To decrease noise and environmental pollution as much as possible.
- ii- The (site) shall not be used for purpose other than the execution of the works.
- iii- Draining of floodwater and pumped water and others to prevent damages to other parties.
- iv- To preserve trees, lawns, and fences in an acceptable manner whenever possible, re-plant any trees and lawns damaged as a result of the works and reinstate fences to its original state in accordance to the Engineer's instructions.
- v- In case there is need to erect scaffolding on neighboring properties, the Contractor shall get the owner's permission before any work is to be erected and later perform the necessary protection works to prevent any damage to the property .upon completion, the Contractor shall remove any materials or equipment from the site and make good the property area at his own expense.

B. Work Management Control

- i- The Contractor shall cooperate with the Engineer in arranging the dates of site meetings and in the preparation of minutes of meetings.
- ii- The Contractor shall prepare a special register for weather conditions to register the maximum and minimum air temperatures, humidity, average rainfall in millimeters and hours of rainfall for each day.
- iii- The Contractor shall take photographs to show work progress and to prepare the reports (6 copies).
- iv- In case of remedying defects, he shall put a schedule for such works and inform the Engineer's representative of its accomplishments first hand.
- v- The Contractor shall provide the site with sign in the number, size and shape as agreed to with the Engineer showing the name of the project and the name of the Employer and any other information's according to sign drawing .
- vi- In case the Engineer or the Engineers representative reject an item or any work, the Contractor shall ,before starting to remedy such condition ,submit his suggestions to reinstate or remedy to the Engineer's representative or the Engineer to avoid ruction of error.
- vii- The Contractor is required to submit detailed shop drawings and other forms of drawings as is specified in the Contract or instructed by the engineer, for approval by the engineer .these drawings shall show all works to be executed based upon actual site measurements. This requirement shall apply to all based upon actual site measurement .this requirement shall apply to all disciplines included in the Contract scope.
- viii- The Contractor is required to submit as built drawings for all completed works in the form and detail as is specified in the Contract or required by the Engineer. The time of submission shall be as specified in the Contract or instructed by the Engineer one soft copy and three hard copies.
- ix- Upon failure to submit any of the required submissions stipulated by the Contract or instructions in the form(s) stipulated in the Contract.

C. Practicing the contracting profession and performing his duties in connection with the Contract:

i- Good practice

If a full description of an item, product or workmanship was not specified, then it is nevertheless understood that this item or work shall be suitable for the purposes of the Contractor or what can be logically understood from its contents for a good execution practices, including the scripts of items and the general and standard specification in practice.

Ii- Required Specification Standards

If a Standard Specification such as (A.S.T.M) or (B.S.S) or others are specified for an item, the Contractor shall submit a copy of the said standard to the Engineer along with the certificate of origin certifying that the items provided are in conformity with such standards to the satisfaction of the Engineer .

Iii- restrictive specifications

If a single source should be specified for an item or products, the Contractor shall be bound to such item, and shall not change that single source without the written approval of the Engineer accompanied by the approval of the Employer.

Iv- Hidden Utilities Marks

The Contractor shall place clear signs wherever hidden utilities are in place and to prepare clear survey drawings for them to facilitate its relocation during testing, maintenance, repair or its operation.

V-Work staging

The project shall be executed over two stages: skeleton works and finishing works; the Owner has the right to cancel the second phase of the project without any financial consequences.

D. In case the owner wants to implement the items that had been cancelled during the negotiation period, the contractor shall be committed to the prices quoted in the contract before cancelling items to reduce total construction budget as per items and prices shown in the attached tables.

D-Forms of Tender, Guarantees, Agreements, etc.

D1-Letter of Tender

Project:
Contract No:
To M/S:

1- Having visited the site and examined the Conditions Of Contract ,Drawings, Technical Specifications, Bills of Quantities, Appendix to Tender, and other Schedule and any subsequent addenda issued during the Tender process for the above-mentioned project, we, the under signed, offer to execute, complete and hand-over whole of the said Works for abovementioned project and remedy any defects therein in conformity with the said Drawings and other Documents for the :

Total Tender Price:
JD.....

Or such other sum as may be ascertained in accordance with the above-mentioned Tender.

2- We agree to appoint the DAB in accordance with Clause 20-General Conditions. And we will agree on appoint their numbers as in Appendix to Tender.

3- We agree to abide by this Tender for the period of ninety (90) days from the date fixed for receiving the same and it shall be remain binding upon us and may be acceptable at any time before the expiration of the period ,and we agree that Appendix to Tender is apart of the letter of Tender.

If our Tender is accepted, we will obtain the performance guarantee in accordance to sub-clause 4.2 General Conditions and to commence the work at the date of commencement order and hand-over the whole of said Works for the above mentioned project and remedy any defects in accordance with the demands and Contract Documents and during the contract duration period.

4- Unless and until a formal agreement is prepared and executed, this Tender, together with your award thereof, shall constitute binding contract between us.
Also we know that you are not bound to accept the lowest priced Tender or any other Tender you may receive.

Dated this day: Month: Year:

Tenderer signature:in the capacity of:

Duly authorized to sign tenders for and on behalf of:

Address:

Signature of witness:

Name of witness:

Date:

5- The Contractor hereby governments to execute the whole worked, complete and maintain the works and hardnover, the Employer guarantee to pay those Contract price in all respect with the provision of contract at the dates and manners fixed in the Contract.

Upon what mentioned above the parties agreed to prepare this agreement and sign it at the above fixed date in accordance with the uniform rules of the Hashemite kingdom of Jordan.

First party (the Employer)

second party the Contractor

Signature:

Signature:

Name:

Name:

In the capacity of:

In the capacity of:

D2-APPENDIX TO TENDER

Project:
Contract:

No	Item	Sub-Clause	Data
1.	Employer's name :	1.1.2.2 & 1.3	Petra Development and Tourism Region Authority سلطة اقليم البترا التنموي السياحي
2.	Engineer's name: Bitar Consultants architect Engineers and Project Managers. Address : 130 Al-Mu'tasem Str. 2nd Circle Jabal Amman	1.1.2.4	
3.	Contractor's name	1.1.2.3 & 1.3	
4.	Time for Completion of the Works	1.1.3.3	150 days
5.	Tender guarantee (bid bond)	instructions	17600 JD
6.	Defects Notification Period	1.1.3.7	(365) days for civil works and (720) day for electromechanical works
7.	Agreed Form of Electronic Data Transmission	1.3	Facsimile
8.	Governing Law	1.4	Jordanian Law in effect
9.	Ruling language	1.4	English or Arabic Language
10.	Language of Communications	1.4	English or Arabic Language
11.	Review & Approval period by Engineer	1.9, 7.2	A minimum of fifteen (15) calendar days
12.	Time for access to the Site	2.1	Upon formal handing over of site by Employer
13.	Amount of Performance Guarantee	4.2	10% of the Accepted Contract Price
14.	Limit of Subcontracting	4.4	33%
15.	Quality Assurance System	4.4	Not Required
16.	Normal working hours	5.6	(8) hours a day, Sat-Thu
17.	Commencement of Works	8.1	Upon receipt from Engineer of Commencement Letter
18.	Handover of Works	8.2	The Works as a Whole
19.	Amount of Delay Damages	8.7	(470 JD) each delay day
20.	Maximum amount of Delay Damages	8.7	(15%) of the Accepted Contract Price
21.	Bonus for Early Completion	8.13	Not Applicable
22.	Defect Liability Guarantee	10.5	(5%) of the final Contract sum
23.	Percentage rate paid to the Contractor of the Disbursed Provisional sum	13.5 b	15%
24.	Material subject to price adjustment due to changes in cost	13.8	In accordance to the table attached to the end of this Appendix

APPENDIX TO FORM OF TENDER (Continued)

No	Item	Sub-Clause	Data
25.	Total advance payment	14.2	(10%) of the Accepted Contract Price.
26.	Payment of Advance	14.2	(10%) from each interim payment
27.	% Deduction of Retention Money	14.3	(10%) of payment
28.	Maximum limit of Retention Money	14.3	(5%) of the Accepted Contract Price
29.	Plant and Materials for payment when delivered to the site	14.5	All Materials and Plant which are incorporated in the Permanent Works.
30.	Percent for inclusion of Materials and plant	14.5	80% of invoice or 65% of BOQ item unit price whichever is less
31.	Minimum amount of Interim payment Certificate	14.6	(84700 JD) Only
32.	Interest rate (financing charges)	14.8	(9%) compounded yearly
33.	Currency /Currencies of Payment	14.15	The Jordanian Dinar
34.	Rate of Exchange	14.15	N/A
35.	Insuring Party	18.1	The Contractor
36.	Periods for submission of insurance	18.1	Prior to commencement of any works site.
37.	Amount of insurance	18.2	115% off (Accepted Project price + Value of Materials supplied by Employer)
38.	In case the parties fail to appoint the Arbitrators, the jurisdiction to the appoint them shall be	20.6	According to the Jordanian Arbitration Law in Force.

Material Price Adjustment

The List of materials subject to price adjustment, in accordance to Sub-Clause 13-8 of the Condition of Contract, is as shown below:

1. Building Projects:

- 1.1. Cement.
- 1.2. Steel Reinforcement, Structural steel including steel sheets, steel sections and Purlins.
- 1.3. Aluminum.
- 1.4. Asphalt.
- 1.5. Boilers, Radiators and Burners.
- 1.6. Cables.
- 1.7. Vitrified Pieces.
- 1.8. Works listed in item (4)- Electromechanics.

2. Electro-Mechanical Works and Projects:

- 2.1. All types of Burners and Boilers (vapors and water).
- 2.2. All types and accessories of heating and sanitary pipes.
- 2.3. Cables.
- 2.4. Control Panels, Main Distribution Boards and Lighting Units.
- 2.5. Telephone Exchanges.
- 2.6. Lighting towers posts and attached lighting units.
- 2.7. Coolers, A/C units, Chillers, Evaporators, Compressors, Diffusers and Fan Coil Units.
- 2.8. Lifts and accessories (Ropes/Wires, Rails, Motors).
- 2.9. Radiators, Burners and Heat Exchangers.
- 2.10. All types of Pumps.
- 2.11. Fire Fighting and Fire Alarm Systems.
- 2.12. Steam networks.
- 2.13. Electrical Generators.

D3-Form of Tender Guarantee

Project:
Contract no:
To: M/S

We have been informed that the Tenderer (Principal) is submitting an offer for such Contract in response to your invitation and that the conditions of your invitation which are set out that the Tenderer submit a Tender Guarantee with his tender and upon his request our bank..... hereby irrevocably under take to pay you the Beneficiary/ Employer ,a total amountupon receipt by us of your demand in writing and written statement stating that :

- a- the principal (Tenderer) without your agreement, with drawn his offer after the latest time specified for its submission and before the expiry of its period of validity (90) day or
- b- You awarded the Contract to the principle and has failed to comply with Sub-clause 1.6 of the Conditions of Contract or
- c- You awarded the contract to the principal he has failed to submit Performance Guarantee to comply with Sub-clause 4.2 of the Conditions of Contract .

In conditions that the statement must be received before ending of the Guarantee validity which is (90) days, and will be returned to us, this Guarantees is subject to the uniform Rules for Demand Guarantees in the Hashemite kingdom of Jordan.

Signature of Guarantor/bank:

Name of authorized signatory:

Date:

D4-Form of agreement

Project:

This agreement made this.....day of month of.....,200

Between

The Employer:
As the first party

The Contractor:
As the second party

Whereas the first party is desirous that the works should be constructed completed and maintained for the Projectand has accepted the tender submitted by the second party for the construction, completion and maintenance of the said works,

Now this Agreement Witnesseth as Follows:

1. In this Agreement words and expressions shall have the same meanings as respectively assigned to them in the General Conditions in the Conditions of Contract for Construction Works (hereinafter referred to as the "General Condition").
2. The following documents shall be deemed to form and be read and construed in their entirety as part of the Agreement ,viz:
 - a- The Letter of Acceptance.
 - b- Letter of Tender
 - c- Tender Adenda
 - d- The Condition of Contract parts I,II,IV.
 - e- Technical Specification.
 - f- The Drawings
 - g- The priced Bill of Quantities and any other Bills.
3. Acceptable Tender price
Contract Duration Time
4. The Employer hereby covenants to pay the Contractor in Consideration for the execution, completion and maintenance of the work the Contract price at times and in manner prescribed by the Contract.
5. The Contractor hereby covenants to execute the whole worked, complete and maintain the works and hand-over, the Employer and Guarantee to pay those Contract price in all respect with the provision of Contract at the dates and manners Fixed in the Contract.

Upon what mentioned above the parties agreed to prepare this Agreement and sign it at the above fixed date in accordance with the Uniform Rules of the Hashemite Kingdom of Jordan.

First party (the Employer)
Signature:

second party the Contractor
Signature:

Name:

Name:

In the capacity of:

In the capacity of:

D7-Performance Guarantee

To: M/S.....

Please to informed that our bank (called the Guarantor)..... hereby declare that this Guarantor is responsible to you, on behalf of the Contractor, up a total of amount.....as a Guarantee for execution of the Contract awarded to him and according to Contract Documents.

We guarantee to pay for you upon your first written demand and without cavil or argument or previous notice or judicial or administrative procedures, any sum or sums within the limits of (amount of guarantee) as aforesaid without your needing to prove or to show grounds or reasons for your demands for the amount specified here in this Guarantee is valid from the date ofuntil date of handing-over the Contract Works in accordance of Contract Conditions.

Preliminary datemonthyear.....

This Guarantee shall be renewed automatically and unconditionally by the Guarantor under the same conditions for the extension period to Contract duration such time of official substantial completion of project and issue of Defects liability Guarantee.
Guarantee/Bank

Guarantor Bank

Name of Authorized Signature

Date.....

D8-Defects liability Guarantee

To Messer:

We have the pleasure to inform you that our bank,
.....has
guaranteed by a Financial Guarantee, the Contractor messers.....
.....

in relation to Tender No. (/)

Pertaining to the Project

For an amount of (.....)**JD.**

for the commitments of the Contractor for his whole obligations regarding maintenance of the works of the above mentioned Project, to ensure the obligations of the Contractor towards the remedial and /or completion any pending works as part of defects liability period.

We undertake to pay the said amount at your at your first demand and without any warning or reservation or for any other reason and without any consideration to any objection from the Contractor.

This Guarantee shall remain valid from the date of issuance and until final completion of the works and the completion of the repairs in conforming with the Contract; and shall be extended automatically until the Final Handing-Over of the Works, and shall not be cancelled without your written approval .

Guarantor's Signature:

Authorized to sign :

Witnessed by :

Date :

D9-Advance payment guarantee

To:M/S.....

Please be informed that our bankGuarantee the Contractor an amount.....regarding the Advance Payment Guarantee, for Contract

No:project :.....
.....

To insure the Contractor in repaying the amount of Advance Payment in accordance to Contract Conditions.

We further agree to pay the above mentioned amount of money or any remaining money after the amounts recovered by you at the first written demand from you regardless any objection or reservations by the Contractor.

This guarantee shall remain valid from the date of the Advance Payment under the Contract until you have fully recovered the Advance Payment amount from the Contractor.

Guarantor signature:

Authorized to sign :

Date :

D10-Discharged of Interim Payment at Taking Over

To: M/S
Attn: Ms

We, the undersigned and fixing our seals below
.....
.....

Declare that we have received from an amount of (JD.....)as an interim payment at the initial taking –over of the remodeling of the
.....

We therefore hereby discharge From the foresaid amount and from all amounts that we previously received as part of the above-named project payment disbursements with our reservation and undertaking to submit all details of the claims to.....within a period of (84) eighty four days from the date of this discharge, supported documentation .

In the event that we do not submit these claims the aforesaid duration, we hereby waive our rights to claim, whatever the type and value of this claim, and we discharge.....
.....from any rights, financial or other ,in relation to the above mentioned Project Taking place prior to Taking Over of the project .

Issued on:

Contractor's name:

Name of authorized person to sign :

Signature of authorized person to sign:

Seal:

D11-Discharge Statement

To: M/S.....
Attn: Ms.....

We, the undersigned and fixing our seals below
.....
.....
Declare that we have received from an amount of (JD.....)

As a final payment in pursuance of the provisions of Sub-Clause (14.11, 14.12, 14.13) of the General Conditions of the contract for the remodeling of the.....
.....

We therefore hereby declare by this statement that we have submitted all our claims regarding this Contract; hence we dischargefrom any rights in relation to the above-mentioned project, a general comprehensive, absolute and irrevocable discharge.

Issued on:

Contractor's name:

Name of authorized person to sign:

Signature of authorized person to sign:

Seal:

D12-Contractor's Commitments

1. **Contractor** :
2. **General Director** :
3. **Classification Grade** :
4. **Ceiling Grade** :
5. **Project under Construction:**

SN	Project's name	Awarded value JD	Execution period	Commencement Date	% completed	Remarks
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
Total						

D13-Declaration for other Payments

To:M/S

Attn:Ms:.....

Project:

Contract:

We, the undersigned and fixing our seals below

.....

.....

Declare that we aware of the previsions under Sub-Clause 17.9.1 of the Particular Conditions of Contract and in compliance with these clauses; we enclose a properly signed declaration disclosing all direct or indirect commissions, consulting fees, agent fees or others and anything of value paid or agreed to be paid to any person "third party "we also attach a detailed description of this other payments and to whom it was paid to and the basis thereof whether made or to be made directly or indirectly by us or non our behalf or by our Sub Contractor or on their behalf or by their staff, agents or the bidding itself or the award to the Contractor or the negotiations to sign the Contract for its actual execution.

We also undertake to promptly present a written declaration to the Employer of the existence of any other payments including, for example ,a details description of the reason thereof ,on the date of paying or forced to pay, whichever occurs first .we also agree that the Employer to take the actions mentioned under the abovementioned clause at the event of any violations or breach by us of the provisions of paragraph (a)of the above mentioned Clause and we abide ourselves to all what is mentioned under this clause .

Issued on:

Contractor's name:

Name of authorized person to sign:

Signature of authorized person to sign:

Seal:

(*) The Contractor shall submit the Declaration for other Payments in separate envelope .in the event that the Contractor did net pay any commissions, fees or any of the matters stated in Sub-Clause (17.10) he shall state so in the submitted Declaration. The Bids of all Contractors that do not submitted Declaration will be rejected.

D14-Declaration for prohibited payments*

To:M/S

Attn:Ms:.....

Project :

Contract:

We, the undersigned and fixing our seals below

.....

.....

Declare that we aware of the previsions under Sub-Clause 17.9.2 of the Particular Conditions of Contract and in compliance with these Clauses; we enclose a properly signed declaration disclosing all direct or indirect commissions, consulting fees, agent fees or others and anything of value paid or agreed to be paid to any person "third party "we also attach a detailed description of this other payments and to whom it was paid to and the basis thereof whether made or to be made directly or indirectly by us or non our behalf or by our Sub Contractor or on their behalf or by their staff, agents or the bidding itself or the award to the Contractor or the negotiations to sign the Contract for its actual execution.

We also undertake to promptly present a written declaration to the Employer of the existence of any other payments including, for example ,a details description of the reason thereof ,on the date of paying or forced to pay, whichever occurs first .we also agree that the Employer to take the actions mentioned under the abovementioned Clause at the event of any violations or breach by us of the provisions of paragraph (a) of the above mentioned Clause and we abide ourselves to all what is mentioned under this clause .

Issued on:

Contractor's name:

Name of authorized person to sign:

Signature of authorized person to sign:

Seal:

(*) the Contractor shall submit the declaration for other Payments in separate envelope .in the event that the Contractor did net pay any commissions, fees or any of the matters stated in Sub-Clause (17.10) he shall state so in the submitted declaration. The Bids of all Contractors that do not submitted declaration will be rejected.

D15-Proposed Joint Venture form

Name of joint venture :			
	Name of partners	Nationality	Share in %
1	Lead partner:		
2	Partner(a):		
3	Partner (b):		
4	Partner(c):		
5	Partner(d):		

To be enclosed:

- Power of attorney for the signatory on behalf of the J/V;
- Company registration for each partner
- Joint venture agreement as per the provisions of article 3.2 of the instructions to tenderers.

The undersigned hereby declare that the above-mentioned information forms part of the tender and that any mistake or omission would be sufficient reason for the said tender to be disqualified.

Date thisday of20

Name:

Signature:

In the Capacity of:

Duly authorized to sign for and on behalf of:

(Tenderer)

D16-Updated Qualification Data

Pursuant to **Instructions to Tenders**, the Tenderer is requested to confirm with this form, the continuation of the validity of the "Pre-Qualification information "submitted earlier to the Employer. The Tenderer is to confirm, by indicating "yes" or "no" any change that may affect his pre-qualification in respect of:

	DESCRIPTION	CHANGED	
		YES	NO
1	Company Management		
2	Work load in On-going projects		
3	Financial Capability		
4	Resource		
5	Litigation		

The tender is requested to attach to this tender full detail for each of the items marked "yes" in this form.

Notwithstanding the above, the Tendered is required to present the below mentioned data as part of his tender:

- **evidence of access to lines of credit and availability of other financial resources;**
- **work commitments acquired since last pre-qualification (if any);**
- **change litigation information since last pre-qualification (if any);and**
- **change in critical resources (if any)**

Date thisday of20

Signature

In the capacity of

Name of Signatory (printed).....

Duly authorized to sign for and on behalf of

D17-Information about Tenderer

Name of Tender:

Headquarters Address:

Tel:, Tele fax:

Established where and when:
.....

Registered Capital

Contractor's Bank(s):

Name of authorized representative (as per enclosed power of attorney)

In the capacity of
.....

Signature of authorized representative:
.....

- To be enclosed:**
-Power of Attorney;
- Company Registration.

The undersigned hereby declares that the above-mentioned information forms part of the tender and that any mistake or omission would be sufficient reason for the said Tender to be disqualified.

Date thisday of20

Name

Signature

In the Capacity of

Duly authorized to sign for and on behalf of

(Tenderer)

VOLUME 3:

Specifications

- Part one for Construction Civil Works.
- Part two for Electrical Works.
- Part three for Mechanical Works.

CIVIL AND ARCHITECTURAL WORKS

SECTION - 1

CONCRETE WORKS

Cement

(Item reference 302/1.a).

Ordinary Portland cement shall also be used for concrete works such as ground floor slab on grade and all foundations and basement walls.

Reinforcing Materials

(Item reference 302/6).

Reinforcing bars shall be high –grade- deformed steel bars (grade 60) with yield strength not less than 4200 kg/cm². For bars of 8 mm diameter or less, mild steel bars (grade 40) shall be permitted to be used.

Manufacturer's test certificates for all clauses of reinforcement shall be supplied when required by the Engineer. Specimens sufficient for three tensile tests and three cold bending tests per 50 tons of bars or fraction thereof and for each different size of bar or quality provided for the Engineer tests shall be rejected if results for each batch are not in accordance with the Specifications..

Wire for binding reinforcement bars shall conform to the AASHTO

“Specifications for cold-drawn steel wire for concrete reinforcement “or equal approved. The diameter of the wire shall not be less than 1.5 mm and the binding shall be twisted tight with proper pliers. The free ends of the binding wire shall be bent inwards.

Classes of Concrete

(Item reference 306/1).

Classes of Concrete are defined in the Drawings and in BOQ.

Strength shall be in accordance with table 3/3. in general specification for building

Concrete design mix

(Item reference 306/3).

Concrete design mix is required for casting in situ concrete, using water/cement ratio as specified.

-ready mixed concrete will be used for all concrete works

Precast Concrete Curbs

(Item reference 326).

Concrete curbs shall be Grade 20 of characteristic strength 20N/mm²; the size for each piece shall be as follows :

Length	500 mm
Height	300 mm
Thickness at bottom to 100mm height	150 mm
Thickness at top	120 mm

Measurement:

According to item 327/1

Rate prevalence:

According to item 328/1

SECTION – 2

BLOCK WORK

1- Classification and size of Block:

(Item reference 603/3 and 603/4).

- 2- Block for external and internal walls shall be hollow concrete block of cellular type and normal density not less than 2 t/m³ and of strength not less than 3.5 N/mm².
- 3- Size of blocks shall be 400 mm long, 200 mm height and width shall be according to Drawings and BOQ.
- 4- Rates for block work shall include for the supply of all necessary materials, manufacturing, sampling and testing, hauling, hoisting, scaffolding, curing and erection of block work to the dimensions shown in drawings.
- 5- Rates for block work shall include for all rough and fair cutting and waste, bonding with wall ties to reinforced concrete members and forming openings.
- 6- Rates for block work shall include for the construction of reinforced concrete lintels at all openings, sills, jambs around windows and copping over parapets

Measurement

According to item 620/1

Rate prevalence:

According to item 619/1

SECTION – 3

WALL AND CEILING FINISHING

Plasticizers

(Item reference 702/1.e)

Plasticizers shall be used for cement sand plaster mortar for both undercoat and finishing layers. Plasticizers shall be of well-known manufacturers approved by the Engineer.

Metal Lath

(Item reference 702/1.f)

Metal lath for plaster shall be fixed to the positions indicated in the general conditions or herein. Types of metal lath shall be as follows:

1- Strip mesh

Width of strip shall be 200 mm, weighing not less than 0.2 kg/m.

2- Corner mesh

Width for each wing shall be 100 mm, total weight 0.20 kg/m.

3- Corner beads

Width for each wing shall be 35 mm, total weight 0.17 kg/m. corner-beads shall be used for window jambs to full height if required, and for vertical external angles to full height.

Corner beads shall be used also for door jambs to full height if required.

Alternatively, corners shall be rounded as per the Engineers' instructions.

4- Plaster stop beads

Plaster stop beads shall be used to provide a neat finished plaster edges at expansion joints.

Prime coat (knobby layer)

(Item reference 702/2.a)

All walls and ceilings shall be sprayed with a thick prime coat (knobby layer) to form a key, cement content not less than 400kg/m³

Application of Plaster

(Item reference 702/6)

- Item (702/6.J) shall be applied for ceilings and soffits as well as walls.
- The application of oily putty to rendered surfaces shall not be permitted.

Fixing Wall Tiles

(Item reference 708/5)

Fixing of wall tiles shall be by cement and mortar.

Joints for Wall Tiles

(Item reference 708/6.f)

- 1-Joints for wall tiles shall be 2 or 3 mm in both directions using special spacers.
- 2-Pointing will be by using pre-mixed cement grout.
- 3-Special corner beads (p.vc) must be used .

Rate Prevalence and Measurement Rules

(Item reference 711/3)

Add the following clause:

Rates for tyrolean plaster (shebris) shall also include the top coat, and additives to guarantee impermeability for all plaster coats.

Measurement and Rate Prevalence

According to items 711/1, 711/3, 711/7

Quantities determined shall be paid for at the contract price per unit of measurement.

Price inclusion includes P.VC cover beads.

SECTION – 4

FLOOR WORK

Cement Tiles

(Item reference 804)

Cement tiles shall be class A, size 40x40x3 cm.

Ceramic Tiles

(Item reference 805)

Ceramic tiles shall be vitrified, water absorption less than 4% and 0.3% max. for fully vetrified granite tiles, minimum thickness 6mm for walls, 8 mm for floors, of a color approved by the Engineer. The tiles shall be of the same material and color all through the depth, including the surface layer.

Marble

(Item reference 806)

Marble or Granite shall be of types mentioned in BOQ items first choice, for sills, stairs, skirting and counter tops shall be to the dimensions and thickness' indicated in the Drawings, and with chamfer for exposed edges. All exposed surfaces and edges shall be mechanically ground and polished to the satisfaction of the Engineer.

SECTION – 5

DAMP PROOF COURSES

Damp Proofing Materials for Roofs

(Item reference 902/5)

Damp proofing materials for roofs shall be reinforced elasto-plastic polymers modified bitumens according to specifications in this section.

Elasto-plastic roofing material:

Shall be, torch applied bitumenous membrane reinforced by polyester, complying with BS 747:1977 and amendment and to the following particular specifications:

1. Description:

- Thickness/layer : 4 mm
- Nominal wt./layer: 4.4 kg/m²
- Reinforcement: non woven polyester, 200 gm/m²-BS 747/1977
- Coating material : SBS modified bitumen.
- Method of application: Torch-applied.

2. Characteristics of the polyester reinforcement:

Characteristic	Test Method	Minimum requirement
Tensile Strength-long./50 mm	UEAtc MOAT30:1984	900
Tensile Strength-Transv./50 mm	UEAtc MOAT30:1984	750
Elongation at Break:	UEAtc MOAT30:1984	
- Longitudinal %		50
- Transverse %		55

3. Characteristics of the membrane:

Characteristic	Test Method	Minimum requirement
Penetration at 25 c, dmm	ASTM-D5	20-30
Softening Point	ASTM-D36	115 c
Resistance to static indentation	UEAtc MOAT27:1983	Not perforated at 25 kg,class L4

4. Certificates:

The felt shall have a valid certificate issued by the manufacturer and an approved local laboratoy. The certificate is to confirm the particular specifications given in 1,2 and 3.

5. Tests:

The following tests shall be carried out by a local laboratory on specimens from supplied materials on site. The costs of tests to be included in the Contractor rates:

- Low temperature flexibility.
- Softening point.
- Break strength and elongation at break for both directions.
-

6. Anti-dust priming coat:

Anti-dust priming asphalt coat shall comply with ASTM-D41

7. Application:

Application shall be according to the manufacturer's printed and approved instructions.

8. Sheets arrangement:

Shall be with a minimum overlap of 100 mm.

9. Membrane protection:

The top of the sheets shall be covered with a layer of aggregates.(Slates)

Measurement

According to item 915/1

Rate Prevalence

According to items 916/1, 916/3

Price to include 10x10 sand & cement fillet.

SECTION - 6

METAL WORK

1- Steel Works

(Item reference 1003)

Item 1003 for (Fasone works) shall be considered where applicable.

Material shall be mild steel to comply with BS 4360, hollow steel sections are to comply with (BS 4848; part 2). Sheet steel is to comply with (BS 1449: part 1).

Steel works are to be formed according to the general arrangement shown in the Drawings for the structure, their general setting out, as well as sizes of members. Statements of Specifications and BOQ shall also be considered.

The Contractor is to be solely and entirely responsible for the preparation of shop Drawings required for the true and proper execution of the work to enable him to provide structures complete, structurally sound, able to be erected, and delivered in good working order.

Doors are to be flush, constructed with surface sheets. Tops and edges of doors and sashes are to be closed flush and watertight. **Hinges shall be heavy-duty steel with rustproof steel pins.** Doors shall be provided with **cylinder mortise lock European made**, withdrawn by hands and by key from both sides, and suitable for steel doors. Rubber door stops shall be 38 mm dia. with iron lug. 32 mm deep, overall size 59 mm deep fixed to floor. For exterior door the glass shall be wired glass.

2- Aluminum Works

(Item reference 1004)

Add the following amendment: Exposed aluminum surfaces are to have Anodized Aluminum - finish of not less than **40 microns** thickness. Aluminum elements are to be of approved sections, special for double glazing, where applicable and in conformity with Drawings and the specifications contained herein. Glass for windows and doors shall be as mentioned in BOQ items, except for bathrooms which- shall have tinted- or sandblasted- glass.

Aluminum accessories:

- a- Sliding doors and windows, will be provided by:
 - sheaved rollers mortised in the bottom rail ball bearing type, roller housing shall be cast iron, roller wheels shall be stainless steel with nylon tire.
 - Flash handles with hook bolt locking set first choice.
 - Sliding fly-screen with aluminum frame and aluminum fly screen mesh diameter of its coir 0.2mm average first choice.

- b- Hung windows:
 - Two heavy duty cylinder lock with handles as shown in drawing.
 - Three part hinges for two leaf door 3 each for each leaf .
 - Set closing device hydraulic surface mounted rack and pin on door closer suitable for leaf weight.
 - Mastic sealants :
Mastic under frames : Acrylic Gap filler .

Mastic for pavement, parts , any frames, inside and outside: mildew resistant sealant.

All mastic sealants, and other accessories are first choice, from a known manufacture approved by the Engineer.

The Contractor must submit to the Engineer samples from all accessories sealants, hinges, hooks, rubber..etc..

3- structural double glazing curtain wallsmust be manufactured by an approved company specially made system for curtain walls. Glass according to that mentioned in BOQ. Shop drawing must be submitted from the contractor for approved, with all needed and design calculations for the facads.

SECTION – 7

WOODWORK

Natural Wood

(Item reference 1102/1)

Softwood shall be European redwood of color varying from yellow to reddish - brown. Hardwood shall be beech.

Timber shall be grade one (according sub item 1102/1.b).

Plywood

(Item reference 1102/2)

Shall be made of hardwood-veneers, 3 ply of a total thickness 5mm. Plywood that is to be painted is to be grade 2. Adhesive shall be grade WBP.

Block-board

(Item reference 1102/3)

Block-board shall conform to BS 3444 and shall be of a thickness and sizes shown in the Drawings. Block-board shall be grade 2 and adhesive grade BR.

Laminated plastic sheets

(Item reference 1102/6)

Plastic laminates, where shown in the Drawings, shall be standard-grade, **rough finish**, not less than 1 mm thick, bonded to the furniture materials by adhesive conforming to BS 1204.

Nails and screws

(Item reference 1102/9)

The use of nails for fixing items of joinery will not be permitted. Screws shall be countersunk- and puttied.

Ironmongery

(Item reference 1102/10)

Ironmongery shall be of an approved range and according to specifications indicated herein. All Ironmongery shall be fixed in accordance with the manufacturer's instructions and oiled on completion.

Wood door hinges shall be stainless steel, heavy duty, and high frequency. Length of knuckle and leaves shall be minimum 100 mm with bottom tip removable pin. Thickness of plate shall be minimum 3mm, knuckle diameter minimum 13mm, base material shall be steel. Use 3 number for each leaf with steel or chromed wood screws 8 No. 6x30mm for each hinge.

Sign type Locks shall be mortise which fits into the edge of the door, and shall be normal or bathroom, or cylinder lock as indicated in BOQ or Drawings.

All doors shall have rubber stops 38-mm diameter with iron lug 32 mm deep, overall size 59 mm deeply fixed to floor.

The door's lock handle set shall be stainless steel.

Mortise bolts for double leaf doors shall be one pair lever action bolts, made of brass 25 mm width, 11 mm shoot diameter, 22 mm shoot projection and 150 mm length.

Toilet doors shall be protected by 1mm (grade 304) stainless steel kick plate at the bottom 15 cm from both sides

Traditional Wooden Doors

(Item reference 1107/1)

Hollow cored, flush doors shall be constructed to sizes indicated in the Drawings, fitted to give uniform clearance of not more than 3 mm at heads and jambs. Sizes of flush doors given in Drawings are nominal, allowance shall be made for any under cutting required. Stiles and rails shall be made of European redwood grade 1.

Manufactured Flush Doors

(Item reference 1107/2)

Manufactured flush doors shall conform to subitem-1107/2.b, with the following particularly specified modifications.

- a. Filling shall be white wood strips with 25 mm clear distance, or solid core chipboard or solid core -fiberboards.
- b. Bottom rail width shall be minimum 90 mm.
- c. Surface plywood shall be 5 mm thick., faced by 1 mm thick plastic laminated layer.

Door Sizes

(Item reference 1107/3)

All doors either traditional or manufactured shall conform to the sizes indicated in the Drawings. Also doors specially made for fire resistance as mentioned in BOQ items.

Wood Fixed Furniture

(Item reference 1110)

Fixed furniture shall be supplied and fixed according to the Drawings. Blackboard in all joinery elements is to have hardwood lipped edges.

Carcass

(Item reference 1110/1)

Carcass shall be made of Block-board grade 1. Framed work shall be properly mortised and tanned, glued, and cramped together and doweled where necessary. The use of nails for fixing any items of joinery will not be permitted. All screws shall be of stainless steel, countersunk and puttied all according to drawings.

Doors for Fixed Furniture

(Item reference 1110/2)

Doors for fixed furniture shall be made of Block-board grade 1. Pulls shall be extruded aluminum channel section 100x12mm on the face with clear finger space of not less than 20mm, and steel all thread-fixing screws with nuts and washer. Door hinges are to be heavy-duty brass piano type.

Locks shall be cylinder type, with zinc case, brass bolt, brass cylinder with four pin tumbler, brass pins, phosphorous bronze springs, and supplied with two nickel silver keys.

Drawers

(Item reference 1110/3)

Drawers shall be made of natural hardwood for front, back and sides. Bottom shall be made of 5mm plywood. Drawers shall be provided with pulls and locks same as doors.

Shelves

(Item reference 1110/4)

Shelves shall conform to the Drawings and shall be made of Block-board, unless otherwise shown in the Drawings.

8-SECTION

GLAZING

a. Single Glazing:

Glass shall be clear, plain glass unless otherwise indicated in the Drawings, thickness 6mm. External windows shall have air infiltration grade A.

One unit of each consignment of similar external window shall be tested for water-tightness under static pressure, air infiltration, and wind resistance. Tests shall be according to JSS 423/1985, JSS 424/1985, JSS 425/1985 and JSS 426/1985.

The costs of samples and of making tests on external windows shall be borne by the Contractor.

b. Double Glazing:

b.1. shall be a sealed double glazing to DIN 1259, 1286 part 1, 52294

consisting of 6mm cardinal advanced or equivalent low-E and heat strengthened, 12mm air filling and 6mm clear float glass fully tempered and according to drawings and BOQ schedules.

b.2. Design properties :

U- value = 2.7 w/m².c and a noise reduction of 30 dB.

b.3. Frame and glazing method must not allow moisture to collect at the edge of the unit seal. The glazing system should ensure that water cannot penetrate to the edge seal of the unit. (Fully bedded framing system). The edge seal of the unit should be protected from moisture by surrounding it with a compatible glazing compound and sealant.

It is important to insure that there are not any gaps present in the sealant, which tend to trap any moisture compounds used must be fully compatible with the glass, the unit seal and the framing material.

The costs of samples and of making test on external windows shall be borne by the contractor.

SECTION - 9

PAINTING AND DECORATING

Stopping

(Item reference 1302)

Stopping for plasterwork shall be plaster based filler, for joinery and metal shall be puttied complying with BS544 and shall be tinted to match the color of the undercoat.

Steel and Iron Primer

(Item reference 1304/1a (1))

Shall be synthetic, oil modified alkyd base, with a high resistance to rust, water and oil.

Nonferrous Metal Primer

(Item reference 1304/1.a2))

Shall be vinyl butyral - phosphorous acid primer for conditioning. Primer shall be supplied in two components to be mixed according to manufacturer's recommendations and instructions.

Wood Primer

(Item reference 1304/1.b)

Shall be oil modified alkyd base primer pigmented with titanium dioxide and lead-based pigments and strengthened with special extender pigments.

Cement Surfaces Primer

(Item reference 1304/1.c)

Shall be formulated with alkali resistant vinyl chloride, vinyl acetate ethylene grafted terpolymer, and pigmented with chalk resistant titanium dioxide and strengthened with silicate type extender pigments. Primer shall have excellent sealing properties, alkali resistance, excellent holds out for all types of latex, oil and synthetic base paints.

Metal and wood Finishing Paints

(Item reference 1304/3.a and b)

Shall be high gloss, long oil type alkyd base enamel, designed for interior and exterior use. Powder coated paint not less than 60 microns gauge

Exterior Finishing Paints

(Item reference 1304/3c-1)

Shall be of two layers textured plastic paints of high quality vinyl chloride/vinyl acetate/ethylene grafted terpolymer based of medium grain. All surfaces should be dry, clean and free of oil, grease, dirt and other foreign substances.

Interior finishing Paints

(Item reference 1304/3c-2)

Shall be emulsion paints based on the stable copolymer of vinyl and acrylic monomers, and pigmented with chalk resistant titanium dioxide and fade resistant colored pig, or shall be high gloss, oil type alkyd base enamel designed for interior and exterior use, Type of interior paints to be applied to the surfaces and indicated in drawings and as instructed by Consultant.

Application

(Item reference 1306)

After priming, a minimum of three coats shall be applied. The Contractor will be required to repaint at his own expense any work on which the paint is found to be incorrectly applied, or if the applied coats do not result in complete coverage.

Colors

(Item reference 1307/12)

colors shall be according to the written instructions of the Consultant, and among any color in the general color catalog

Measurement Rules

(Item reference 1315/1)

Delete branches b, c, d and f of subitem 1315/1 and add the following:

- Painting rates for wood and metal doors to be included in the rates of relevant door.
- Painting rates for pipes to be included in the rates of relevant pipes.
- Painting rates for security grills and balustrades to be included in the rates of relevant item.

Section – 10

SUSPENDED CEILING:

1-Mineral fiber suspended ceiling :

Mineral fiber suspended ceiling system, tiles and hanging system is approved made by one of these company

- 1- Armstrong .
- 2- Dyken.
- 3- USG.
- 4- AMF .

catalogues and samples must be submitted to Engineer.

All according to the specification in section 13 item 1/1312 (a,b,c,d).

- a- material type 111 class 25.
- b- Sizes 60cm x 60 cm x 15mm.
- c- Testes (1,2,3,4,5,6,7,8).

- 1-Noise reduction the noise reduction coefficient must be from (0.65-0.75).
- 2-Sound Transmission from 35-39
- 3-Light Reflectance (LR-1) reflection ratio must be above 0.75.

2-Gypsum board suspended ceiling :

Gypsum board suspended ceiling system, boards and hanging system produced in the following countries is approved.

- 1- Sudi Arabia product .
- 2- Kwait product .

According to the specification in section 13 item 2/1312 and suspension system according to item 1312 /5 classification C/2 intermediate-duty and Indirect hanging suspended system manufactured by Knauf or Boral , the tests as shown in item 1312/5/h and the general condition as in 1312/5/Z .

3-Gypsum board tiles suspended ceiling :

Gypsum board tiles product by Boral or same like it :

- sizes (60x60x1) cm.
- Finishing
 - Vinyl laminated for face .
 - Aluminum foil for back .

Ecophon Focus™ E

Attractive suspended ceiling, easy removal of individual tiles. Has a recessed visible grid and a tegular edge design, creating a ceiling with a shadow effect that accentuates each tile and partially conceals the grid system. The visible surface of each tile is 10 mm below the grid. Each tile is easily demountable.

The systems consist of Ecophon Focus E tiles and Ecophon Connect grid systems, with an approximate weight of 3 kg/m². The tiles are manufactured from high density glass wool utilizing the 3RD Technology. The visible surface has an Akutex™ FT coating and the back of the tile is covered with glass tissue. The edges are painted. For best performance and system quality, use Ecophon connect grid and accessories. The grid is manufactured from galvanized steel.

Sound Absorption: Test results according to EN ISO 354.

Classification according to EN ISO 11654, and the single value ratings for NRC and SAA according to ASTM C 423.

Influence of climate: The tiles withstand a permanent ambient RH up to 95% at 30°C without sagging, warping or delaminating (ISO 4611).

Fire safety: The glass wool core of the tiles is tested and classified as non-combustible according to EN ISO 1182. The systems are classified as fire protective covering according to NT FIRE 003.

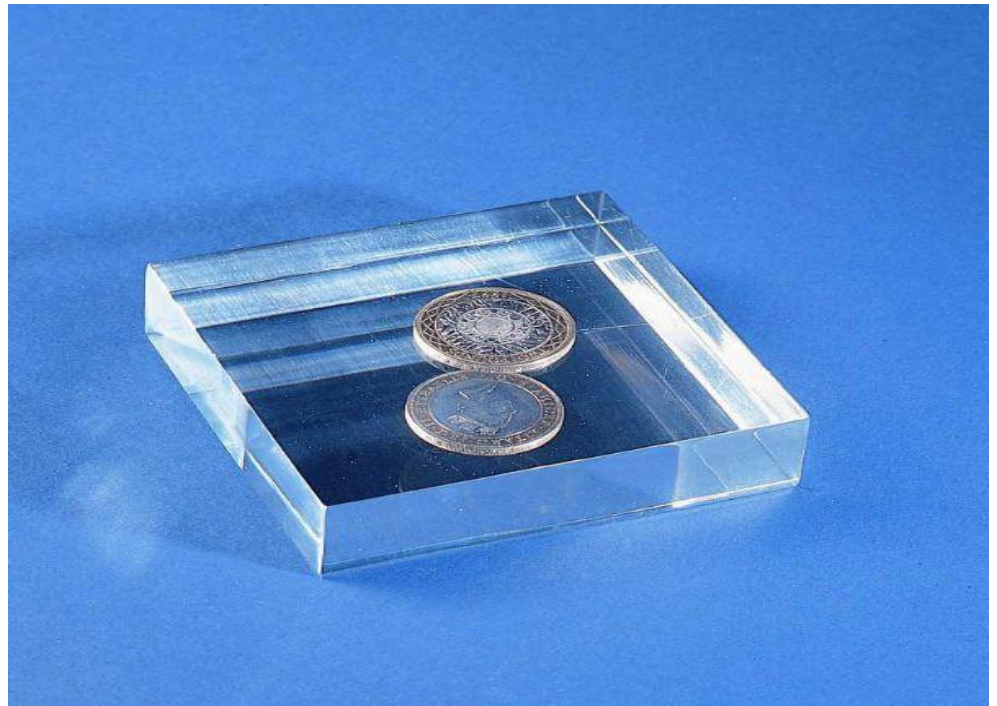
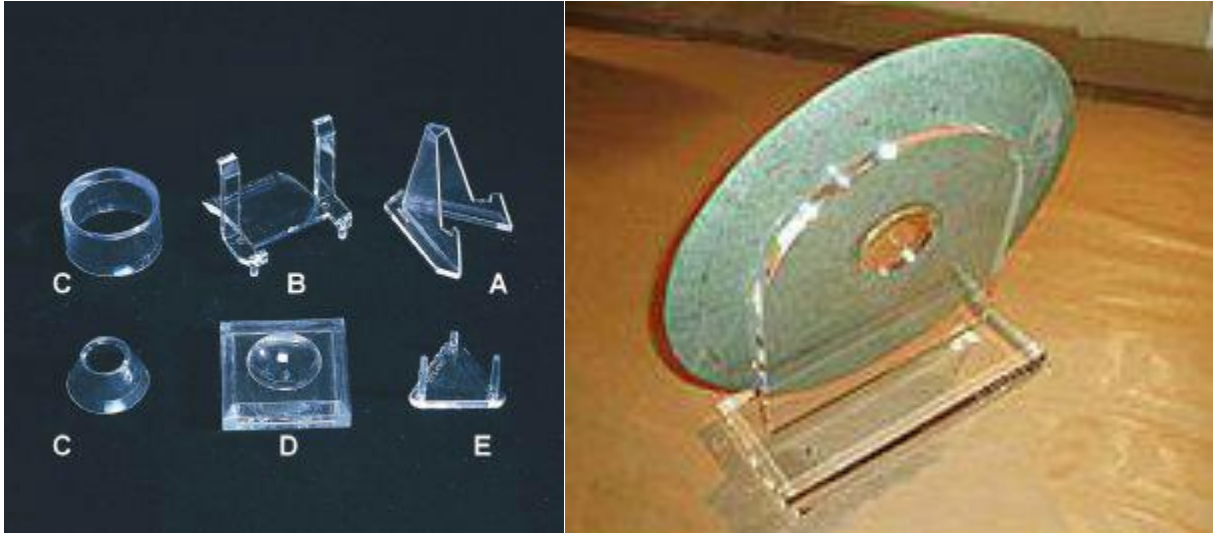
Installation: Installed according to installation diagrams, installation guides and drawing aid. For information regarding minimum overall depth of system see quantity specification.

A

APPENDEX (A) – CIVIL WORKS

The contractor shall supply holders made of Plexi glass, made to particular measures to support the relics (**a-Ceramic containers**, **b-Ceramic plates** and **c-Coins**) of different sizes and shapes according to each object/ Relic size, function and location, see suggested types below as recommended samples, the holders shall be strong enough to safely support the particular pieces and aesthetically sound.

The contractor shall provide the engineer with drawings and samples to get prior approval before manufacturing and supply.



ELECTRICAL WORKS
Special specifications

Work under This Contract: -

The electrical installation covered under this division of the specifications shall include the supply and installation of the following: -

1. Lighting distribution network system: -

- a. Indoor, Outdoor, and other special lighting installation.
- b. Power socket outlet network.
- c. Electrical fittings and accessories.
- d. Earthing system.

2. Addressable Fire Alarm System.

3. Telephone Installations

4. Computer network System

5. Sound System.

6. (CCTV) system.

7. Security System.

8. Uninterruptible Power Supply System (UPS).

1-LIGHTING NETWORK INSTALLATION

1.1. Lighting Distribution Network:-

Complete distribution network system for lighting and power from the service boxes, and terminals to all electrically operated equipment, including feeder and sub-feeder lines, distribution and sub-distribution panel boards, wiring and control equipment.

* The electrical power supply will be: -

- 400 Volt between phases.
- 230 Volt between phases and Neutral.
- Incoming supply: LV, 3ph + n + e
- 50 Hz. (Cycle).
- Directly grounded Neutral.

* Design parameters: BS 7671 and 7430 or equal and equivalent.

1.2. Drawings: -

- a. The Engineering Drawings issued with these specifications indicate the approximate location of all electrical apparatus.
- b. The contractor shall check architectural, plumbing, heating and ventilation drawings to overcome possible installation conflict. If some changes from the original plans be necessary to resolve such conflicts, the contractor shall secure the Engineer's approval, before any installation work is started.
- c. Discrepancies shown on different drawings or between drawings and specifications shall be brought to the attention of the Engineer for a decision.
- d. The contractor shall visit the site before submitting his price.
- e. The contractor shall submit three prints of shop drawings of scale 1:100, and no equipment shall be ordered unless such drawings are fully reviewed and approved by the Engineer.
- f. At Handing over, one tracing and three prints of scale 1:100 and two sets of compact disks (CD) compatible with A.CA.D14 software. As-Built Drawings" shall be submitted, complete with technical literature and instruction manuals.

1.3. Regulations & Tests:-

- a. All work shall be installed in a neat and workmanlike manner, so as to be readily accessible for operation.
- b. All work shall be designed and carried out in accordance with all current requirements of the following, where applicable: -
 - All Jordanian statutory requirements.
 - Bylaws, Regulations and requirements of the local Authorities.
 - Requirements of the utility supply companies.
 - Requirements of the fire officer.
 - European and British standards ruling at the time of contract.
 - British standard codes of practice ruling at the time of contract.
 - BS 7671-16th Edition of the regulation for Electrical Installations.
 - IEE guidance notes.
- c. Equipment's, spares and accessories to be delivered into the stores of the Employer.

- d. All Electrical equipment shall be tested in operation for proper performance to the satisfaction of the Engineer.
- e. Muger Tests. Earth meter test, Insulation test, and Continuity tests, must be made after installation has been completed, and just before final placing in service, of the equipment.
- f. The maintenance period for all electrical works should be for two years from the date of handing over and acceptance including spare parts needed.
- g. The consultant has the right to increase, decrease and cancel the quantity of any item or any part of the item in the B.O.Q during the execution of the project works, according to the project needs.
- h. Electrical contractor shall be responsible for dismantling and removing all old and unwanted existing electrical installations in site without any charges, and according to Engineer's instructions.
- i. All materials should be new and in accordance with the latest relevant approved standards and governing authorities and of the best quality obtainable (three types shall be submitted for approval). Materials of first class product of a reputable European manufacturer should be used provided that confirm the specifications and shall be accepted by the Engineer/ client.
- j. The contractor should provide at least three types of catalogues and samples for electrical materials to the Engineer for approval before ordering them.

1.4. Engineer and Workmen: -

The contractor shall have an experienced Electrical Engineer and good experienced technicians to proceed with the work

The client representative has the right to refuse: The Engineer and/or any of the technicians.

1.5. Conduit Installation: -

- a. Conduit installation shall be carried out in heavy gauge P.V.C. conduit complying with B.S. 4607 and BS 6099. Or according to latest B.S. or in galvanized Conduits Complying with B.S 4568 or according to latest B.S or similar standards.
- b. No. Conduit of less than 20mm inside diameter shall be used.
- c. Where the conduits are buried in wall, ceiling or floor, P.V.C Conduits and accessories shall be used. For surface installation, galvanized conduits and accessories shall be used in location where they will be subjected to mechanical damage.
- d. Throughout the electrical installation the loop-In system of wiring shall be employed.
- e. All draw-boxes and junction boxes shall be ample size to permit the cables being drawn in and out. At lighting and switch points, the conduit shall be terminated in a suitable box, provided with internal lugs, to permit back-plates or switch grids being attached to them, by metal threaded screws.
- f. The position of draw-in boxes shall be arranged so that they will always be readily accessible and an adequate number of draw-in boxes shall be provided in a conduit run, to ensure that cables can be installed or removed without damage.
- g. Efficient means shall be provided to seal-boxes and fittings, against the increase of dirt during the building construction.
- h. Conduit shall be installed at least 150 mm clear of, and preferably above hot pipes (water or steam) and 50 mm clear of gas, water and any other services .
- i. The ends of all conduit shall be carefully reamed, to remove all burrs or sharp edges on the inside.
- j. All bends are to be made on site to suit building dimensions and not more than two right angle bends will be permitted, without the inter-position of draw box.

- k. All conduits shall be swabbed through before wiring is commenced, and cables shall not be drawn into any section of the system until all conduit and draw boxes are fixed in position, and completed in all respects.
- l. Conduits shall be run in a symmetrical manner and for surface runs shall be secured by distance saddles at intervals not exceeding 700 mm.
For surface conduit runs, conduit boxes shall be of the raised back pattern
- m. Where conduits cross expansion joints, expansion couplers shall be installed at the position of the expansion joint and at right angles to it. An earth wire shall be installed between the nearest conduit box on each side of coupling.
- n. Galvanized steel Conduits: -
Conduits and fittings shall be class 4 heavy protection both inside and outside welded steel, screwed hot-dip Zinc coated, sherardizing inside and outside
 - All joints in the conduits shall be screwed.
 - All conduits shall be free from rust patches or mechanical damage.
 - All exposed threads, die marks and other abrasion shall be painted with tow coats of an approved metallic paint immediately after the conduit is installed.
 - Conduit and conduit fittings shall comply with B.S 4568 or according to latest B.S or similar.
 - Used for exposed electrical installations (surface mounted) or where necessary.

Note: -

All Electrical installation should be carried out by heavy gauge P.V.C. conduit and P.V.C. accessories according to B.S. 4607 for buried installation, but shall be carried out by heavy protection galvanized steel Conduits according to BS 4568 or equal and equivalent, for exposed electrical installations (surface mounted) .

1.6. Separate Conduit Runs:-

There shall be a distance of at least 300 mm. between high voltage (power, lighting and heating), conduit runs and low voltage (Telephone, Bell, T.V., Computer) conduit runs.

There shall also be a separate conduit run for each type of electrical installation (Power, light, telephone ... etc.).

1.8. Cable: -

- a. All cables shall be of one manufacture only, and shall be delivered to site with the maker's seal, labels or other proof of origin intact.
- b. All cables shall be color coded in accordance with the Jordan Regulations.
- c. Cables shall be installed in one length from terminal point to terminal point. No through joints will be allowed unless specially specified by the Engineer.
- d. Cable core identification color coding shall be employed throughout the installation and the following colors shall be used:-

PHASE A	: RED
PHASE B	: YELLOW
PHASE C	: BLUE
NEUTRAL	: BLACK
EARTH	: GREEN OR YELLOW GREEN

- e. All P.V.C. insulated cables multi core or single core shall be rated at 600/1000 volts and comply with B.S... 6004., and BS. 6469 OR equal and equivalent .
- f. Cables shall not be drawn into conduits until work is completed, and permanently fixed.

1.9. For external lightings:-

The work shall be carried out according to drawings and Engineer instructions. The external lighting distribution board shall be installed as shown in External lights drawing which are equipped with main and branch MCB's. Contactor and timer with automatic push buttons. Buried under ground PVC/PVC cables of the sizes and routes shown in drawings, shall be installed from the external distribution board to external lighting fixtures shown in drawing. The cables shall run in suitable underground conduits when using PVC/PVC cables, they shall run in galvanized conduit if they are surface mounted, specially when they run on walls and external surfaces.

The external lighting points will consist of conduits, water proof boxes, under ground cables, and all civil works needed to complete the work in good order. The external lighting points can be underground cables or cables in PVC conduits (buried) or cables in galvanized conduits (Surface mounted) including all necessary accessories needed for the external lighting purposes.

1.10. Bonding and Earthing: -

- a. All conduit connections, switchboards, fittings, etc., shall be properly screwed together to ensure perfect mechanical and electrical continuity through out.
- b. Great care is to be taken in bonding and earthing the installation and tests are to be carried out as the work progress to check the earth continuity of all metal work, conduits ... etc., and earth continuity conductors.
- c. All exposed metal work, structural or otherwise, and all the metal work of any gas or water services, shall be bonded to the earthing termination of the intake position in according with IEE Regulations
- d. No earth continuity conductors shall be less than 2.5mm² tinned copper cable insulated and colored green.
- e. The frames of all electric motors and starting panels, etc., are to be efficiently "earthed ".

1.11. Lighting Switches and socket outlets:-

- a. All lighting switches shall comply with B.S. 3676 or IEC-669 or equal and equivalent. and shall be of the rating specified on way, two ways, or other type as required. Where grouped together and connected to the same phase, they shall be mounted in a multi-gang box with common cover plate, where grouped together and connected to different phases. Phase barrier switch boxes with common cover plate and secondary cover plate having a suitable warning inscription shall be used.
- b. Switch shall be of the AC ONLY type (10 Amp. rating), enclosed in metal clad boxes and suitable for surface or flush mounting as required. Switches shall be of the weatherproof pattern for exterior situations.
- c. Flush mounted switches shall have a grid assembly. One and Two gang switch-plates shall be mounted on a gang box. Three and four gang switch-plates shall be mounted on a two-gang box.
- d. 13 Ampere 3 Pin socket outlets with switch shall be of the fused pattern incorporating a robust shutter mechanism operated by the earth pin on insertion or withdrawal of the plug. The sockets

and boxes shall comply with B.S. 1363 and B.S. 4662 respectively. The sockets also shall comply with BS546 or BS 196 or equal and equivalent.

- e. All 13 Ampere 3 Pin socket outlets with switch shall be complete with a fused plug top, and weatherproof 13-ampere switch socket - outlets shall be complete with the fused top entry plug.
- f. All outlet box feeding fixed equipment such as fans, pumps, boilers, air handlers. ... Etc., shall be equipped with a switch fuse rate, as shown on the drawings and shall be of the same series of the conduits and shall have the same protective coatings. They shall be provided with suitable covers, and shall have enough openings of the proper size for the introduction and securing of conduits, they shall comply with the standards requirements
- g Recessed access floor box :

General:

- Manufactured within a BS5750.
- Carpet trim and lid tray molded from top quality "Nylon 66".
- Carpet trim reinforced with steel for increased strength.
- Strong lid tray hinge design ensures reliable lid operation.
- Lid tray comprises 3 mm galvanized steel housed in a moulded tray thus insulating the steel, avoiding earthing leads.
- Strong design for lid lifting handle allows frequent use without failure.
- 3 or 4 compartment access floor box are the same physical size. Carpet trim/ Lid tray assembly and mounting frame common to both boxes.
- Box base and grid assembly can be left in floor void with accessory plates pre-wired with flying leads or hard wiring.
- Carpet trim and lid tray assembly reversible though 180°.
- Carpet trim and lid tray, a separate assembly, need not be fitted to box base and mounting frame until carpet installation is imminent.

- At least 75 mm overall depth of box from top of access floor allows installation in most situations.
- Color of mouldings is grey, with toning light grey accessory plates, or according to engineer's approval.

Compartment Access Floor Box:

It comprises three distinct assemblies, the box base, the mounting frame and the carpet trim/ lid tray assembly. The overall dimensions of the unit are not less than 34cm X 21cm X 7.5cm deep.

The box base has knockouts in each long side to accept both 20 mm and 25 mm conduits (at least 8 knockouts).

These entries can be replaced with grommets to allow cable access. Dividing fillets are provided to separate services. The box base comes complete with a grid to accept arrangement of interchangeable accessory plates that can either be supplied with or without the respective accessories. The box base and grid are manufactured from galvanized steel. The mounting frame manufactured from galvanized steel is suitable for moulding in at least 33 cm X 20cm hole cut into any access floor panel with two fixing holes in each long side.

The carpet trim / lid tray assembly is manufactured from “Nylon 66” finished in grey with the carpet trim molding reinforced with steel. The lid tray assembly is fitted with a strong lifting handle and two cable outlets pivoting on a strong steel section held securely within the moulded lid tray assembly.

Every floor box shall accept 2 No. twin 13 A, 3 pin SW, socket outlets with indication lamps, and 2 No. Boxes for RJ 45 data outlets. According to drawings and Engineer’s instructions. (Prices of socket outlets and boxes for data outlets shall be in separate items).

All wirings shall be in PVC conduits buried in floor under tiles, installed from distribution Boards, or data Boxes to access floor boxes as shown in drawings and according to engineer’s instructions.

1.12. Feeders and Sub-Feeder Installations: -

- a. Feeders and sub-feeder lines to distribution panel boards or to motor control centers shall be either single (P.V.C.) wires inside conduits or multi-core cables run exposed in trenches, or cable shafts, and comply with BS 4066 or BS 6004 or equal and equivalent.
- b. Where exposed cables are liable to mechanical damage or running through location with flammable materials, they shall be inside conduits or in enclosed cable trenches as required by the Engineer.
- c. No joint or splices shall be accepted on main or sub-feeder lines.
- d. The cables shall not be buried directly under the concrete or under the floor tiles.
- e. The contractor shall take special care while installing and commissioning electrical installations in such a way not to spoil other services.

f- Installation of Underground cables:

The under ground cables shall be laid in trenches not less than 75cm below the ground level. The sides of trenches shall be trimmed neatly and the bottom shall be leveled and smoothed. The width of trenches shall not be less than 40 cm. After the cables are laid, the trenches shall be backfilled to a depth of 15cm with fine selected soil free from lumps, metallic or other foreign inclusions or, where required by Engineer, by washed sand and bricks. The remainder of the trench shall be backfilled in an approved manner with soil, which shall be rammed down and thoroughly consolidated.

Where two or three cables are laid in one trench, the cables shall be pulled straight and spaced not less 15 cm (center line to center line).

Where the cables cross the asphalt or concrete roads and enter into buildings they should pass through heavy duty (heavy gauge) PVC pipes covered with concrete as indicated on the drawings. The ducts should extend one meter beyond the kerb line of the road in either side.

The proposed routes of cables are shown on the layout drawings. The contractor should check location of other services and shall submit final cable routes drawings for approval of the electrical and site Engineers before commencement of any cable layout work.

Where under ground cables are required, all the above civil works shall be included with the price of cables.

1.13. Main Distribution Board: - (MDB):-

This contract calls for the supply and installation of an indoor type low voltage switch- board assembly, which should be suitable for operation at 230/400 Volt, 3 phase, 4 wire, 50 Hz. MDB should be factory assembled and tested in according with the latest applicable regulations and

manufactured to BSEN 60439 to form-2, type 2 or equal and equivalent, including phase separation barriers and terminal shields and should be equipped with the following: -

- a. Main moulded case circuit breaker, hand operated 4 poles, rating indicated on the drawings and having a minimum interrupting capacity of 60 K.A at 400 volt and equipped with an adjustable instantaneous trip device short circuit protection and fixed tripping device for overload protection. To comply with capacities according to item (b) below, and manufactured to BSEN 60947 or equal and equivalent and associated padlocking facilities.
- b. Branch moulded case circuit breakers with interrupting capacities as follow: -
 1. Up to 100 A rating : 25 KA
 2. 125 A to 250 A rating : 35 KA
 3. 300 A to 800 A rating : 50 KA
- c. MDB should consist of a completely enclosed, free standing metal structure with frames and insulating blocks to support and brace all main buses to withstand an available circuit current of at least 60 KA RMS symmetrical at 400 Volts. Metal structure used of 2 mm thickness. Enclosure shall be manufactured to BSEN 60529 and 50102 to IP43,IK05 or equal and equivalent.
- d. All main bus-bars and bus connections to breakers should consist of electrical grade copper of a sufficient size to limit temperature rise 50 deg. cent. over and average ambient temperature outside the enclosure of 40 deg. cent.
- e. A laminated plastic nameplate engraved with white characters on a black background shall be furnished for each device on the MDB.
- f. Installation Fiber to be used above all MCCB'S and below the metallic sheet cover above the MCCB'S.
- g. Installation of three Ammeters and one voltmeter with S/S (Selector Switch).
 - The contractor shall submit three copies of schematic drawings of MDB to the Engineer for approval before manufacturing and installing boards, showing ratings, rupturing capacity of all breakers, size and dimensions of bus bars, Dimensions of Boards and thickness of all metallic sheets, paintings,...etc.
 - All (MCCB)-Moulded case circuit breakers in MCC, Main Distribution Boards shall be of adjustable type.
- h. The contractor shall submit three copies of schematic drawings of MDB to the Engineer for approval before manufacturing and installing boards, showing ratings, rupturing capacity of all breakers, size and dimensions of bus bars, Dimensions of Boards and thickness of all metallic sheets, paintings, . . . etc.
- i. Main Electrical distribution board shall be manufactured and installed in accordance with Electrical Distribution Company regulations and specifications where the project is belonged.

1.15. Distribution Boards :-

Low voltage distribution panel boards for lighting, socket outlets and other appliances should be manufactured to BSEN 60439 to form 2 type 2 or equal and equivalent, totally enclosed in a robust sheet construction stove enameled and manufactured to BSEN 60529 and 50102 or equal and equivalent to IP43,IKOS, arranged for recessed or surface mounting. The panels have to contain main isolating switch and miniature (quick) circuit breakers (MCB's) plug-in type of rating and number as shown on the drawings and manufactured to BSEN 60898/IEC 60974 or equal and equivalent. Adequate bus-bars of appropriate current capacity, which should be at least equal to the rating of the protective device, through which the particular panel is fed. An insulated neutral bar should be provided with a sufficient number of ways to ensure that the neutral conductor of every circuit will be

connected to a separate way. The ground terminal bar should be securely fixed to the cabinet and having a sufficient number of ways to connect all ground conductors.

Single pole MCB's should be at least 60 Amps frame size with trip rating as indicated on the drawings, and having interrupting capacity at least 6000 A, 3 Pole miniature circuit breakers should have an internal common trip to prevent phasing. All MCB's should be equipped with thermal and magnetic trip devices for overload and short circuit protection and should comply with B.S. 3871 part 1.

No. MCB's of more than 60 Amps rating should be used.

For larger ratings moulded case circuit breakers of 22 KA minimum interrupting capacity should be used.

All wires in the boards should be numbered with special numbered rings, either phases or neutrals.

Earth leakage circuit breaker of suitable trip rating (0.03) A or (0.3) Amp. should be installed in distribution boards where needed .

Maximum Number of PVC insulated Standard Copper Cables through the Conducts

Nominal Conduct or size mm ²	Ø20 mm or $\frac{3}{4}$ "	Ø 25 mm or 1"	Ø 32 mm or $1\frac{1}{4}$ "	Ø 38 mm or $1\frac{1}{2}$ "
1.5	8	18	20	-
2.5	5	11	17	-
4.0	4	8	13	-
6.0	3	6	10	-
10.0	2	4	6	-
16.0	-	3	4	5
25.0	-	-	3	5
35.0	-	-	2	3
50.0	-	-	2	3

1.16 - LIGHTING FIXTURES

General: -

All Fluorescent tubes used in the project should be tri-phosphor, which produce 100 lm. Per watt.

All Fluorescent fitting shall contain be supplied with electronic ballast

All ballast's power factor shall be 0.9 at least (Cos. = 0.9).

All fixtures should be powder painting and approved by the engineer.

- All spot light and lighting fixtures with LED lamps, shall be supplied with electronic driver.
- Design parameter according to CIBSE lighting Guide LG2, LG3, LG4 and LG7 or equal and equivalent.
- CIBSE code for lighting -2002 or equal and equivalent.
- BS 5266, 7671, BSEN 50102 AND 60529 or equal and equivalent.
- All outdoor luminaries shall be rated to IP65 IK09.
- All lighting fixtures of the project shall be according to details shown in drawing no E003 & E004.

Type A:-

Recessed in false ceiling and of metallic housing white cast aluminium square wallwasher lighting fixture, powder coated. 0°-90° Tilt with 13W high power LED lamps. 870lm , color temperate 3000k° warm white, complete with electronic control gear, IP20. The recessed lens wallwasher shall be directed to wall panels as shown in drawings.

As to ERCO - Logotec Recessed lens wallwasher 81289000 or equal approved.

Type AA:-

Same as type (A) but spot light with 5W LED lamps, 290lm , IP20. This spot shall be directed to showcases as shown in drawings.

As to ERCO - Logotec Recessed Spot light 81293000 or equal approved.

Type B :-

Fluorescent fixture 2x36 W surface mounted with prismatic diffuser and electronic ballast, Body shall be stove enameled sheet steel channel section base of ample dimension to house control gears, powder painted (IP40).

Type C:-

Projector of die-cast aluminum housing, extruded aluminum cover, glass diffuser, stainless steel screws, equipped with 1X9W LED lamp 12V warm white, 30° LED beam angle (IP65).the fixture shall be mounted in showcases as shown in drawings.

As to GPE LED – HATOR 2412 or equal approved.

Type D:-

Spot light with 1x5W LED lamp adjustable, glass cover (diffuser), recessed in Ceiling of showcases, 12V, warm white, 30° LED beam angle complete with all accessories (IP20).

As to TARGTTI – Link LED 1T2662 or equal approved.

Type DA:-

MONOLED spot light with 1x1.5W LED lamp, recessed in shelves of showcases, 12V, warm white, 30° LED beam angle complete with Aluminum optics for a controlled beam and all accessories (IP20).

As to TARGTTI – MONOLED 1T1845 or equal approved.

Type E:-

Self contained non-maintained Emergency light fittings class of protection IP40.

+The fitting shall comprise of metal housing stove enamel white inside, or of sintered nickel cadmium battery 12 V output, a constant current charger, Silicone transistor inverter and solid state charger- over switch. The batteries shall be capable of supplying power to fluorescent tubes (2x8w) for at least three hours under normal conditions. These light fittings will not operate but on the failure of normal supply, they shall be immediately switched on. The battery should recharged automatically on supply resumption, and an indication lamp should show that and it shall be equipped with test switch. The fittings shall be provided with a vandal - resistant opal poly carbonate or acrylic diffuser. The fitting shall be suitable for ceiling or wall mounting and shall comply to BS 4533 section 102,22 or IEC 598-2-22 or VDE 0108.

Type E1:-

Same as type (E) but with (3W LED lamp) decorative maintained complete with exit sign & suspended chains or arm, and all accessories needed.

Type G:-

The fixture will be fixed, recessed in false ceiling (60X60cm) with 4x14W T5 Fluorescent fixture with mirror louver and electronic ballast, IP20. Body shall be made from heavy-gauge sheet steel stove enameled white inside and outside. The fixture shall be provided with improved low brightness louver ensuring minimum glare according to standards. The louver is mirror finish and from polished anodized aluminum arranged in such away to give optimum light distribution to work place and can be easily removed for maintenance, and shall have frame of all sides. All control gears and accessories shall be housed within the fixture, such that they are hidden and shouldn't be seen from below.

Type F:-

A flexible tube that uses ultra bright LED's. The outer jacket of the tube is constructed of two layers of PVC which has an effect on the optical enhancement of the LED color and light transmission efficiency. Thus, maintaining the highest stability and lowest amount of lumens depreciation over time. The tube shall also be structured with a white PVC base jacket that is designed to shape the light that is emitting from the LED and to redirect the light upward and outward to the surface of the product thus enhancing the actual and perceived brightness.

The tube may be available in eight different colors, (Red, Yellow, Orange, Blue, Green, Pink, neutral white and warm white).

Tubes that emit red, neutral white and warm white colors consume 6.6W/meter is consumed via tubes that emit the remaining colors, tube contains 79led per meter .

Type FA:-

Same as type "F" but STRIP 14.4W/meter 60 LED/m warm white, complete with all accessories needed. shall be mounted in showcases as shown in drawings.

Type H:-

Metallic spot light with 2x26W energy saving lamp compact fluorescent, with glass cover (diffuser), recessed in False Ceiling complete, with Electronic ballast in PVC enclosure and all accessories (IP20).

Type HA:-

Same as type "H" but complete with dimmable Electronic ballast.

Type K:-

Fluorescent fixture 1x35W T5 lamp (batten type) without reflector - Body shall be stove enameled sheet steel channel section base of ample dimension to house the electronic control gear, with a stove enameled sheet steel white inside and outside, powder painted (IP20), warm white, to be mounted above stretch ceiling.

Type KA:-

Same as type "K" but complete with 1x14WT5 lamp

Type N:-

(1X18W) Compact Fluorescent lighting fixture, with opal diffuser, mounted above mirror (WP.) – IP42, complete with Electronic ballast, lamp holders and all accessories needed.

Type O:-

1x18W Compact Fluorescent energy saving lamp Bulk head fixture (IP55)- outdoor wall mounted with powder painted aluminum or metal base and tough polycarbonate diffuser (W.P) protected by metallic guard mesh, vandal proof.

Type P:

1x26W Compact Fluorescent energy saving lamp circular fixture, die - cast aluminum housing , surface mounted with opal diffuser, IP44.

Type R:

Metallic spot light with 2x18W Compact Fluorescent energy saving lamp, opal diffuser, recessed in False Ceiling complete, with Electronic ballast in PVC enclosure and all accessories (IP44).

Type S:

Square ceiling surface mounted lighting fixture with 2x24W compact fluorescent not integrated lamp, 2G7 socket and electronic ballast, and anodized extruded aluminum body and opal diffuser, (IP40).

As to NOVALUX - ANNA E013P2024AO or equal approved.

Type SA:

Round ceiling mounted lighting fixture with 1x22w fluorescent circular lamp, and anodized extruded aluminum body and opal diffuser, (IP40).

As to NOVALUX – ANNA E013P1022AO or equal approved.

Type L:-

Spot light with 1x7.5W LED lamp adjustable, die-cast aluminium body, recessed in False Ceiling , 12V complete with driver and all accessories (IP20).

As to TARGTTI – Link LED 1T2662 or equal approved.

Note: -

- * All lighting fixture should be earthed.
- * The contractor shall co-ordinate with other services in the project, and shall be very careful while fixing the lighting fixtures in all parts of the project.
- * The contractor (Main and sub-main contractors) shall make sure that the lighting fixtures and false ceiling grid are according to the same standard (Metric, Imperial or Din).

The false ceiling system shall be of the exposed tee-lay in grid type, and lighting fixture shall be of the lay in type.

The fixture cover shall be operable from below for lamp and ballast maintenance.

- * glow fittings (fixtures) in offices. Shall be supported by two numbers threaded steel rods, min 6mm dia or by strong steel wires attached to ceiling slab. According to Engineer's approval.

* All fluorescent lighting fixtures shall be complete with ballasts, capacitors, lamps and all accessories needed.

* Manufacturing and test process of lighting fixtures shall be supervised by the Engineer.

* All lighting fixtures shall be approved by Engineer before supplying to the site for installation (Three types of every fixture shall be submitted for approval).

All lighting fixtures should be earthed

1.17. Earthing System:-

Design parameter: according to BS7430 or IEC 364-5-54 or equal and equivalent.

General:-

The earthing system shall be in full compliance with the requirements of the "Regulations" and these specifications.

Unless otherwise specified all equipment used for earthing shall be of copper or approved copper alloys materials, and shall be specially manufactured for the purpose.

Equipment earthing shall consist of connecting all non-current carrying metal parts of the wiring system to earth source.

Earthing Rods:-

1. Earthing rods shall be of the steel core copper jacketed type in one continuous length.
2. Earthing rods top shall be permanently accessible through a covered access pit, as shown on the drawings.
3. Earthing rods shall be made of high strength steel alloy core with a molten welded copper covering, and shall have a conical point and be chamfered at top to prevent mushrooming during driving.

Earthing Connectors:-

1. Earthing connectors for connecting cable to pipe shall be split coupling bolted pressure type.
2. Body of clamp shall be cast of high copper alloy provided with four durum or verdure oval shank bolts nuts and lock washers for connections. Cable shall be fastened to connector with double U-bolts.
3. Earth pit with suitable cover should be made.

Earthing Of Panel Boards :-

1. Panel boards shall be earthed by connecting an earthing conductor from the main rods to the cabinet and earthing bushings on the incoming and outgoing feeder to conduits, which should be according to B.S and Jordanian Standards.
2. Panel boards which are interconnected by conduits shall be earthing by connecting the earth connector to the cabinet to earthing bushings or the incoming feeder conduits.
3. Earthing bushings shall be as specified in the sub-division "Conduit and Fittings".

Earthing of Receptacles:-

All receptacles shall be earthed by connecting a conductor from the receptacle earthing terminal to earthing bushings on the incoming.

1.18 Metallic Cable Trunking:-

Steel cable trunking shall be made of painted Zinc coated steel. It shall have inward flanges on the body for strengthening and it is complete with easily fitted covers, which are locked in place and fixed to the body by suitable screws.

Standard trunking accessories such as Tees, angle tees, four way through boxes, offsets.. etc. shall be used. These accessories shall be made by the same steel trunking manufacturer and included in the price of trunking. Each length of cable trunking and accessories shall comply with BS2989 and BS4678 or equivalent standard.

When PVC trunking is required, it shall be of PVC conduits specifications.

1.19. Cable Tray:-

- a. Cable tray shall be provided as indicated or required for the proper installation of the cables.
- b. Trays and its accessories shall be made of heavy gauge perforated sheet steel, hotdip galvanized, of thickness ... not less than 1.6 mm.
- c. Trays shall be fixed to the supporting structure by approved suspension rods or steel angle brackets at distances not exceeding 1 meter.
- d. Tray fill density should not be more than 40%.
- e. Perforated cable trays are not allowed to be used for communication, sound system, and fire alarm system cables.
- f. Trays should be covered by steel hot dip galvanized covers fastened according to the manufacturer recommendation and to be included in cable trays price.
- g. Cables running on trays should be firmly clamped (Every 2 meters for vertical run, and every 5 meters for horizontal run) .
- h. Tees, angle tees, offset fittings should be factory fabricated by the same manufacturer of the cable tray.

Install energy star qualified equipment for 90% of equipment (Computers, PABX, and Cafeteria equipment...etc).

2. ADDRESSABLE FIRE ALARM SYSTEM

GENERAL:

1.1. SUMMARY

- a. *This Section covers fire alarm systems, including initiating devices, notification appliances, controls, and supervisory devices.*
- b. *Work covered by this section includes the furnishing of labor, equipment, and materials for installation of the fire alarm system as indicated on the drawings and specifications.*
- c. *The Fire Alarm System shall consist of all necessary hardware equipment and software programming to perform the following functions:*
 1. *Fire alarm and detection operations*
 2. *Control and monitoring of elevators, smoke control equipment, door hold-open devices, fire suppression systems, emergency power systems, and other equipment as indicated in the drawings and specifications.*
 3. *Two-way supervised firefighter's phone operations*
 4. *One-way supervised automatic voice alarm operations.*

1.2. ACCEPTABLE MANUFACTURERS

- a. *Manufacturers: The equipment and service described in this specification are those supplied and supported and represent the base bid for the equipment.*
- b. *Being listed as an acceptable Manufacturer in no way relieves obligation to provide all equipment and features in accordance with these specifications.*
- c. *The Manufacturer shall be a nationally recognized company specializing in fire alarm and detection systems. This organization shall employ factory trained, and shall maintain a service organization within 100 miles of this project location. The Manufacturer and service organization shall have a minimum of 10 years experience in the fire protective signaling systems industry.*

1.3. RELATED DOCUMENTS

- a. *Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.*

b. The work covered by this section is to be coordinated with related work as specified elsewhere in the specifications. Requirements of the following sections apply:

1. Division 16: "Basic Electrical Materials and Methods."

2. Division 16: "Wiring Methods."

3. Division 13: "Fire Suppression"

4. Division 15: "Fire Protection"

5. Division 15: "HVAC Systems"

6. Division 13: "Building Automation and Control"

c. The system and all associated operations shall be in accordance with the following:

1. NFPA 72, National Fire Alarm Code

2. NFPA 70, National Electrical Code

3. NFPA 101, Life Safety Code

4. NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems

5. Other applicable NFPA standards

6. Local Jurisdictional Adopted Codes and Standards

7. ADA Accessibility Guidelines

1.4. SYSTEM DESCRIPTION

a. General: Provide a complete, non-coded, addressable, microprocessor-based fire alarm system with initiating devices, notification appliances, and monitoring and control devices as indicated on the drawings and as specified herein

b. Software: The fire alarm system shall allow for loading and editing instructions and operating sequences as necessary. The system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control unit. Loss of primary and secondary power shall not erase the instructions stored in memory. System shall be capable of storing dual configuration programs with one active and one in reserve. Panel shall be capable of full system operation during a new configuration download.

c. History Logs: The system shall provide a means to recall alarms and trouble conditions in chronological order for the purpose of recreating an event history. A separate alarm and trouble log shall be provided.

d. Recording of Events: Record all alarm, supervisory, and trouble events by means of system printer. The printout shall include the type of signal (alarm, supervisory, or trouble) the device identification, date and time of the occurrence. The printout differentiates alarm signals from all other printed indications

e. Wiring/Signal Transmission:

- 1. Transmission shall be hard-wired, addressable signal transmission, dedicated to fire alarm service only.*
- 2. System connections for initiating (signaling) circuits and notification appliance circuits shall be Class B.*
- 3. Circuit Supervision: Circuit faults shall be indicated by a trouble signal at the FACP. Provide a distinctive indicating audible tone and alphanumeric annunciation.*

f. Remote Access:

- 1. FACP shall have the capability to provide Remote Access through a Dial-Up Service Modem using the public switched telephone system of a private switched telephone system.*
- 2. A personal computer or technician's laptop, configured with terminal emulation software shall have the ability to access the FACP for diagnostics, maintenance reporting and information gathering.*
- 3. FACP shall have the capability to provide Remote Access through a listed Internet Interface via a standard web browser user interface.*

g. Required Functions: The following are required system functions and operating features:

1. *Priority of Signals: Alarm events have highest priority. Subsequent alarm events are queued in the order received and do not affect existing alarm conditions.*

Priority Two, Supervisory and Trouble events have second-, third-, and fourth-level priority respectively. Signals of a higher-level priority take precedence over signals of lower priority even though the lower-priority condition occurred first. Annunciate all events regardless of priority or order received.

2. *Noninterfering: The activation of an addressable device does not prevent the receipt of signals from subsequent activations.*

3. *Transmission to Remote Central Station: Automatically route alarm, supervisory, and trouble signals to a remote central station service transmitter provided under another contract.*

4. *Annunciation: Operation of alarm and supervisory initiating devices shall be annunciated at the FACP and the remote annunciator, indicating the location and type of device.*

5. *General Alarm: A system general alarm shall include:*

a. Indication of alarm condition at the FACP and annunciator(s).

b. Identification of the device that is the source of the alarm at the FACP.

c. Operation of audible and visible notification devices throughout the building until silenced at FACP.

d. Closing doors normally held open by magnetic door holders.

e. Unlocking designated doors.

f. Shutting down supply and return fans serving zone where alarm is initiated.

g. Closing smoke dampers on system serving zone where alarm is initiated.

h. Initiation of smoke control sequence through the building temperature control system.

i. Notifying the local fire department.

j. Initiation of elevator recall in accordance with ASME/ANSI A17.1, when specified detectors or sensors are activated.

6. Supervisory Operations: Upon activation of a supervisory device such as fire pump power failure, low air pressure switch, and tamper switch, the system shall operate as follows:

a. Activate the system supervisory service audible signal and illuminate the LED at the control unit.

b. Pressing the Supervisory Acknowledge Key will silence the supervisory audible signal while maintaining the Supervisory LED "on" indicating off-normal condition.

c. Record the event in the FACP historical log.

d. Transmission of supervisory signal to remote central station.

e. Restoring the condition shall cause the Supervisory LED to clear and restore the system to normal.

7. Alarm Silencing: If the "Alarm Silence" button is pressed, all audible and visible alarm signals shall cease operation.

8. System Reset

a. The "System Reset" button shall be used to return the system to its normal state. Display messages shall provide operator assurance of the sequential steps ("IN PROGRESS", "RESET COMPLETED") as they occur. The system shall verify all circuits or devices are restored prior to resetting the system to avoid the potential for

*re-arming the system. The display message shall indicate "ALARM PRESENT,
SYSTEM RESET ABORTED."*

b. Should an alarm condition continue, the system will remain in an alarmed state.

9. A manual evacuation (drill) switch shall be provided to operate the notification appliances without causing other control circuits to be activated.

10. WALKTEST: The system shall have the capacity of 8 programmable pass code protected one person testing groups, such that only a portion of the system need be disabled during testing. The actuation of the "enable one person test" program at the control unit shall activate the "One Person Testing" mode of the system as follows:

a. The city circuit connection and suppression release circuits shall be bypassed for the testing group.

b. Control relay functions associated to one of the 8 testing groups shall be bypassed.

c. The control unit shall indicate a trouble condition.

d. The alarm activation of any initiation device in the testing group shall cause the audible notification appliances to sound a voice announcement code to identify the device or zone.

e. The unit shall automatically reset itself after signaling is complete.

f. Any momentary opening of an initiating or notification appliance circuit wiring shall cause the audible signals to voice announce the trouble condition.

h. Analog Smoke Sensors:

1. Monitoring: FACP shall individually monitor sensors for calibration, sensitivity, and alarm condition, and shall individually adjust for sensitivity. The control unit shall determine the condition of each sensor by comparing the sensor value to the stored values.

2. Environmental Compensation: The FACP shall maintain a moving average of the sensor's smoke chamber value to automatically compensate for dust, dirt, and other conditions that could affect detection operations.

3. Programmable Sensitivity: Photoelectric Smoke Sensors shall have a minimum 8 sensitivity levels ranging from 0.5% to 3.7%, programmed and monitored from the FACP.

4. Sensitivity Testing Reports: The FACP shall provide sensor reports that meet NFPA 72 calibrated test method requirements. The reports shall be viewed on a printed paper for annual recording and logging of the calibration maintenance schedule.

5. The FACP shall automatically indicate when an individual sensor needs cleaning. The system shall provide a means to indicate that a sensor requires cleaning. When a sensor's average value reaches a predetermined value, (3) progressive levels of reporting are provided. The first level shall indicate that a sensor is close to a trouble reporting condition and will be indicated on the FACP as "ALMOST DIRTY." This condition provides a means to alert maintenance staff of a dirty sensor without creating a trouble in the system. If this indicator is ignored, a second level "DIRTY SENSOR" condition shall be indicated at the FACP and subsequently a system trouble is reported. The sensor base LED shall glow steady giving a visible indication at the sensor location. The "DIRTY SENSOR" condition shall not affect the sensitivity level required to alarm the sensor. If a "DIRTY SENSOR" is left unattended, and its average value increases to a third predetermined value, an "EXCESSIVELY DIRTY SENSOR" trouble condition shall be indicated at the control unit.

6. The FACP shall continuously perform an automatic self-test on each sensor which will check sensor electronics and ensure the accuracy of the values being transmitted. Any sensor that fails this test shall indicate a "SELF TEST ABNORMAL" trouble condition.

7. Magnet test activation of smoke sensors shall be distinguished by its label and history log entry as being activated by a magnet.

i. Audible Alarm Notification: By voice evacuation and tone signals on loudspeakers in areas as indicated on drawings.

1. Automatic Voice Evacuation Sequence:

a) The audio alarm signal shall consist of an alarm tone for a maximum of five seconds followed by an automatic digital voice message. At the end of the voice message, the

alarm tone shall resume. This sequence shall sound continuously until the "Alarm Silence" switch is activated.

b) All audio operations shall be activated by the system software so that any required future changes can be facilitated by authorized personnel without any component rewiring or hardware additions.

j. Speaker: Speaker notification appliances shall be listed to UL 1480.

- 1. The speaker shall operate on a standard 25VRMS or 70.7VRMS NAC using twisted/shielded wire.*
- 2. The following taps are available: 0.25W, 0.50W, 1.0W and 2.0W. At the 1.0W tap, the speaker has minimum UL rated sound pressure level of 84dBA at 10 feet.*
- 3. The speaker shall have a frequency response of 400 to 4000 Hz for Fire Alarm and 125 to 12 kHz for General Signaling.*

k. Manual Voice Paging

- 1. The system shall be configured to allow voice paging. Upon activation of any speaker manual control switch, the alarm tone shall be sounded over all speakers in that group.*
- 2. The control panel operator shall be able to make announcements via the push-to-talk paging microphone over the pre-selected speakers.*
- 3. Facility for total building paging shall be accomplished by the means of an "All Call" switch.*

. Fire Suppression Monitoring:

- 1. Water flow: Activation of a water flow switch shall initiate general alarm operations.*
- 2. Sprinkler valve tamper switch: The activation of any valve tamper switch shall activate system supervisory operations.*

3. *WSO: Water flow switch and sprinkler valve tamper switch shall be capable of existing on the same initiating zone. Activation of either device shall distinctly report which device is in alarm on the initiating zone.*

m. Power Requirements

1. *The control unit shall receive AC power via a dedicated fused disconnect circuit.*
2. *The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal AC power in a normal supervisory mode for a period of 24 hours with 30 minutes of alarm operation at the end of this period. The system shall automatically transfer to battery standby upon power failure. All battery charging and recharging operations shall be automatic.*
3. *All circuits requiring system-operating power shall be 24 VDC and shall be individually fused at the control unit.*
4. *The incoming power to the system shall be supervised so that any power failure will be indicated at the control unit. A green "power on" LED shall be displayed continuously while incoming power is present.*
5. *The system batteries shall be supervised so that a low battery or depleted battery condition or disconnection of the battery shall be indicated at the control unit and displayed for the specific fault type.*
6. *The system shall support NAC Lockout feature to prevent subsequent activation of Notification Appliance Circuits after a Depleted Battery condition occurs in order to make use of battery reserve for front panel annunciation and control*
7. *The system shall support 100% of addressable devices in alarm or operated at the same time, under both primary(AC) and secondary (battery) power conditions.*
8. *Loss of primary power shall sound a trouble signal at the FACP. FACP shall indicate when the system is operating on an alternate power supply.*

1.5. SUBMITTALS

a. *General: Submit the following according to Conditions of Contract and Division*

1 Specification Sections.

1. Product data sheets for system components highlighted to indicate the specific products, features, or functions required to meet this specification. Alternate or as-equal products submitted under this contract must provide a detailed line-by-line comparison of how the submitted product meets, exceeds, or does not comply with this specification.

2. Wiring diagrams.

3. Shop drawings showing system details including location of FACP, all devices, circuiting.

4. System Power and battery calculations to assure that the system will operate per the prescribed backup time periods and under all voltage conditions per UL and NFPA standards.

5. System operation description including method of operation and supervision of each type of circuit and sequence of operations for all manually and automatically initiated system inputs and outputs. A list of all input and output points in the system shall be provided with a label indicating location or use of IDC, NAC, relay, sensor, and auxiliary control circuits.

6. Operating instructions for FACP.

7. Operation and maintenance data for inclusion in Operating and Maintenance Manual. Include data for each type product, including all features and operating sequences, both automatic and manual. Provide the names, addresses, and telephone numbers of service organizations.

8. Product certification signed by the manufacturer of the fire alarm system components certifying that their products comply with indicated requirements.

9. Record of field tests of system.

b. Submission to Authority Having Jurisdiction: In addition to routine submission of the above material, make an identical submission to the authority having jurisdiction.

Include copies of shop drawings as required to depict component locations to facilitate review. Upon receipt of comments from the Authority, make resubmissions if required to make clarifications or revisions to obtain approval.

1.6. QUALITY ASSURANCE

- a. Installer Qualifications: A factory authorized installer is to perform the work of this section.*
- b. Each and all items of the Fire Alarm System shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by Underwriters Laboratories, Inc. (UL), and shall bear the "UL" label.*

2. PRODUCTS

2.1. FIRE ALARM CONTROL PANEL (FACP)

- a. General: Comply with UL864, "Control Units for Fire-Protective Signaling Systems".*
- b. The following FACP hardware shall be provided:*

1. *Power Limited base panel with cabinet and door, 240 VAC input power.*
2. *2,000 point capacity minimum.*
3. *2,000 points of Network Annunciation at FACP Display when applied as a Network Node*
4. *Municipal City Circuit Connection with Disconnect switch, 24VDC Remote Station (reverse polarity), local energy, shunt master box, or a form "C" contact output.*
5. *One Auxiliary electronically resettable fused 2A @24VDC Output, with programmable disconnect operation for 4-wire detector reset.*
6. *One Auxiliary Relay, SPDT 2A @32VDC, programmable as a trouble relay, either as normally energized or de-energized, or as an auxiliary control.*
7. *Where required provide Intelligent Remote Battery Charger for charging up to 110Ah batteries.*
8. *Power Supplies with integral intelligent Notification Appliance Circuit Class B or Class A for system expansion.*
9. *Four (4) form "C" Auxiliary Relay Circuits (Form C contacts rated 2A @ 24VDC, resistive), operation is programmable for trouble, alarm, supervisory of other fire response functions. Relays shall be capable of switching up to ½ A @ 120VAC, inductive.*
10. *The FACP shall support (6) RS-232-C ports and one service port.*
11. *Remote Unit Interface: supervised serial communication channel for control and monitoring of remotely located annunciators and I/O panels.*
12. *Programmable DACT for either Common Event Reporting or per Point Reporting.*
13. *Service Port Modem for dial in pass code access to all fire control panel information.*

- c. Cabinet: Lockable steel enclosure. Arrange unit so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single unit is required to form a complete control unit, provide exactly matching modular unit enclosures.*
- d. Alphanumeric Display and System Controls: Panel shall include an 80 character LCD display to indicate alarm, supervisory, and component status messages and shall include a keypad for use in entering and executing control commands.*
- e. Voice Alarm: Provide an emergency communication system, integral with the FACP, including voice alarm system components, microphones, amplifiers, and tone generators. Features include:*
- 1. Amplifiers comply with UL 1711, "Amplifiers for Fire Protective Signaling Systems." Amplifiers shall provide an onboard local mode temporal coded horn tone as a default backup tone. Test switches on the amplifier shall be provided to test and observe amplifier backup switchover. Each amplifier shall communicate to the host panel amplifier and NAC circuit voltage and current levels for display on the user interface.*
 - 2. Dual alarm channels permit simultaneous transmission of different announcements to different zones or floors automatically or by use of the central control microphone. All announcements are made over dedicated, supervised communication lines. All risers shall support Class A Class B wiring for each audio channel.*
 - 3. Eight channel digitally multiplexed audio for systems that require more than two channels of simultaneous audio. Up to 8 channels of audio shall be multiplexed on either a style 4 or style 7 twisted pair.*
 - 4. Emergency voice communication audio controller module shall provide up to 32 minutes of message memory for digitally stored messages. Provide supervised connections for master microphone and up to 5 remote microphones.*
 - 5. Status annunciator indicating the status of the various voice alarm speaker zones and the status of fire fighter telephone two-way communication zones.*
- f. Distributed Module Operation: FACP shall be capable of allowing remote location of the following modules; interface of such modules shall be through a Style 7 (Class A) Style 4 (Class B) supervised serial communications channel (SLC):*

1. Amplifiers, voice and telephone control circuits
2. Addressable Signaling Line Circuits
3. Initiating Device Circuits
4. Notification Appliance Circuits
5. Auxiliary Control Circuits

2.2. PRINTER

- a. Fire Alarm Control Unit shall be capable of operating printers; output shall be ASCII from an RS-232-C connection with an adjustable baud rate.
- b. Each RS-232-C port shall be capable of supporting and supervising a remote Printer; the FACP shall support as many as two (2) remote displays. The Fire Alarm Control Panel shall support five (5) RS-232-C ports.

2.3. REMOTE LCD ANNUNCIATOR

- a. Provide Remote LCD Annunciator with the same "look and feel" as the FACP operator interface. The Remote LCD Annunciator shall use the same Primary Acknowledge, Silence, and Reset Keys, Status LED's and LCD Display as the FACP.
- b. Annunciator shall have super-twist LCD display with two lines of 40 characters each. Annunciator shall be provided with four (4) programmable control switches and associated LED's.
- c. Under normal conditions the LCD shall display a "SYSTEM IS NORMAL" message and the current time and date.
- d. Should an abnormal condition be detected the appropriate LED (Alarm, Supervisory or Trouble) shall flash. The unit audible signal shall pulse for alarm conditions and sound steady for trouble and supervisory conditions.
- e. The LCD shall display the following information relative to the abnormal condition of a point in the system:

1. 40 character custom location label.
2. Type of device (e.g., smoke, pull station, water flow).
3. Point status (e.g., alarm, trouble).

f. Operator keys shall be key switch enabled to prevent unauthorized use. The key shall only be removable in the disabled position. Acknowledge, Silence and Reset operation shall be the same as the FACP.

2.4. SYSTEM PRINTER

a. General: Provide a dot-matrix type, listed and labeled as an integral part of the fire alarm system.

2.5. EMERGENCY POWER SUPPLY

a. General: Components include battery, charger, and an automatic transfer switch.

b. Battery: Sealed lead-acid. Provide sufficient capacity to operate the complete alarm system in normal or supervisory (non-alarm) mode for a period of 24 hours. Following this period of operation on battery power, the battery shall have sufficient capacity to operate all components of the system, including all alarm indicating devices in alarm or supervisory mode for a period of 30 minutes.

2.6. ADDRESSABLE MANUAL PULL STATIONS

a. Description: Addressable single action type, red LEXAN, with molded, raised-letter operating instructions of contrasting color. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common with the control units.

b. Protective Shield: Where required provide a tamperproof, clear LEXAN shield and red frame that easily fits over manual pull stations. When shield is lifted to gain access to the station, a battery powered piercing warning horn shall be activated. The horn shall be silenced by lowering and realigning the shield. The horn shall provide 85dB at 10 feet and shall be powered by a 9 VDC battery.

2.7. SMOKE SENSORS

a. *General: Comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems." Include the following features:*

1. *Factory Nameplate: Serial number and type identification.*
2. *Operating Voltage: 24 VDC, nominal.*
3. *Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore normal operation.*
4. *Plug-In Arrangement: Sensor and associated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. Base shall provide break-off plastic tab that can be removed to engage the head/base locking mechanism. No special tools shall be required to remove head once it has been locked. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control unit.*
5. *Each sensor base shall contain an LED that will flash each time it is scanned by the Control Unit (once every 4 seconds). In alarm condition, the sensor base LED shall be on steady.*
6. *Each sensor base shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.*
7. *Each sensor shall be scanned by the Control Unit for its type identification to prevent inadvertent substitution of another sensor type. Upon detection of a "wrong device", the control unit shall operate with the installed device at the default alarm settings for that sensor; 2.5% obscuration for photoelectric sensor, 135-deg F and 15-deg F rate-of-rise for the heat sensor, but shall indicate a "Wrong Device" trouble condition.*
8. *The sensor's electronics shall be immune from false alarms caused by EMI and RFI.*
9. *Sensors include a communication transmitter and receiver in the mounting base having a unique identification and capability for status reporting to the FACP. Sensor address shall be located in base to eliminate false addressing when replacing sensors.*
10. *Removal of the sensor head for cleaning shall not require the setting of addresses.*

b. *Type: Smoke sensors shall be of the photoelectric. Where acceptable per manufacturer specifications, ionization type sensors shall not be used.*

c. *Bases: Relay output, sounder and isolator bases shall be supported alternatives to the standard base.*

d. Duct Smoke Sensor: Photoelectric type, with sampling tube of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied. Sensor includes relay as required for fan shutdown.

1. Environmental compensation, programmable sensitivity settings, status testing, and monitoring of sensor dirt accumulation for the duct sensor shall be provided by the FACP.

2. The Duct Housing shall provide a supervised relay driver circuit for driving up to 15 relays with a single "Form C" contact rated at 7A @ 28VDC or 10A @ 120VAC. This auxiliary relay output shall be fully programmable. Relay shall be mounted within 3 feet of HVAC control circuit.

3. Duct Housing shall provide a relay control trouble indicator Yellow LED.

4. Compact Duct Housing shall have a transparent cover to monitor for the presence of smoke. Cover shall secure to housing by means of four (4) captive fastening screws.

5. Duct Housing shall provide two (2) Test Ports for measuring airflow and for testing. These ports will allow aerosol injection in order to test the activation of the duct smoke sensor.

6. Duct Housing shall provide a magnetic test area and Red sensor status LED.

7. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housing front cover.

8. Where indicated a NEMA 4X weatherproof duct housing enclosure shall provide for the circulation of conditioned air around the internally mounted addressable duct sensor housing to maintain the sensor housing at its rated temperature range. The housing shall be UL Listed to Standard 268A.

2.8. HEAT SENSORS

- a. *Thermal Sensor: Combination fixed-temperature and rate-of-rise unit with plug-in base and alarm indication lamp; 135-deg F fixed-temperature setting except as indicated.*
- b. *Thermal sensor shall be of the epoxy encapsulated electronic design. It shall be thermistor-based, rate-compensated, self-restoring and shall not be affected by thermal lag.*
- c. *Sensor fixed temperature sensing shall be independent of rate-of-rise sensing and] programmable to operate at 135-deg F or 155-deg F. Sensor rate-of-rise temperature detection shall be selectable at the FACP for either 15-deg F or 20-deg F per minute.*
- d. *Sensor shall have the capability to be programmed as a utility monitoring device to monitor for temperature extremes in the range from 32-deg F to 155-deg F.*

2.9. ADDRESSABLE CIRCUIT INTERFACE MODULES

- a. *Addressable Circuit Interface Modules: Arrange to monitor one or more system components that are not otherwise equipped for addressable communication. Modules shall be used for monitoring of water flow, valve tamper, non-addressable devices, and for control of evacuation indicating appliances and AHU systems.*
- b. *Addressable Circuit Interface Modules will be capable of mounting in a standard electric outlet box. Modules will include cover plates to allow surface or flush mounting. Modules will receive their operating power from the signaling line or a separate two wire pair running from an appropriate power supply as required.*

c. *There shall be the following types of modules:*

1. Type 1: Line Powered Monitor Circuit Interface Module

- a) *This type of module is an individually addressable module that has both its power and its communications supplied by the two wires multiplexing signaling line circuit. It provides location specific addressability to an initiating device by monitoring normally open dry contacts. This module shall have the capability of communicating four zone status conditions (normal, alarm, current limited, trouble) to the FACP.*
- b) *This module shall provide location specific addressability for up to five initiating devices by monitoring normally closed or normally open dry contact security devices. The module shall communicate four zone status conditions (open, normal, abnormal, and short). The two-wire signaling line circuit shall supply power and communications to the module.*

2. Type 2: Single Address Multi-Point Interface Modules

- a) *This multipoint module shall provide location specific addressability for four initiating circuits and control two output relays from a single address. Inputs shall provide supervised monitoring of normally open, dry contacts and be capable of communicating four zone status conditions (normal, open, current limited, and short). The input circuits and output relay operation shall be controlled independently and disabled separately.*
- b) *This dual point module shall provide a supervised multi-state input and a relay output, using a single address. The input shall provide supervised monitoring of two normally open, dry contacts with a single point and be capable of communicating four zone status conditions (normal, open, current limited, and short). The two-wire signaling line circuit shall supply power and communications to the module.*
- c) *This dual point module shall monitor an unsupervised normally open, dry contact with one point and control an output relay with the other point, using a single address. The two-wire signaling line circuit shall supply power and communications to the module.*

3. Type 3: Line Powered Control Circuit Interface Module

- a) *This module shall provide control and status tracking of a Form "C" contact. The two-wire signaling line circuit shall supply power and communications to the module.*

4. Type 4: 4-20 mA Analog Monitor Circuit Interface Module

- a) *This module shall communicate the status of a compatible 4-20 mA sensor to the FACP. The FACP shall annunciate up to three threshold levels, each with custom action message; display and archive actual sensor analog levels; and permit sensor calibration date recording.*
- d. *All Circuit Interface Modules shall be supervised and uniquely identified by the control unit. Module identification shall be transmitted to the control unit for processing according to the program instructions. Modules shall have an on-board LED to provide an indication that the module is powered and communicating with the FACP. The LED's shall provide a troubleshooting aid since the LED blinks on poll whenever the peripheral is powered and communicating.*

2.10. MAGNETIC DOOR HOLDERS

- a. *Description: Where required Units shall be listed to UL 228. Units are equipped for wall or floor mounting as indicated and are complete with matching door plate. Unit*

shall operate from a 120VAC, a 24VAC or a 24VDC source, and develops a minimum of 25 lbs. holding force.

b. Material and Finish: Match door hardware.

2.11. ADDRESSABLE ALARM NOTIFICATION APPLIANCE

a. Addressable Notification Appliances: The Contractor shall furnish and install Addressable Notification Appliances and accessories to operate on compatible signaling line circuits (SLC).

1. *Addressable Notification appliance operation shall provide power, supervision and separate control of horns and strobes over a single pair of wires. The controlling channel (SLC) digitally communicates with each appliance and receives a response to verify the appliance's presence on the channel. The channel provides a digital command to control appliance operation. SLC channel wiring shall be unshielded twisted pair (UTP), with a capacitance rating of less than 60pf/ft and a minimum 3 twists (turns) per foot.*
2. *Class B (Style 4) notification appliances shall be wired without requiring traditional in/out wiring methods; addressable "T" Tapping shall be permitted. Up to 63 appliances can be supported on a single channel.*
3. *Each Addressable notification appliance shall contain an electronic module and a selectable address setting to allow it to occupy a unique location on the channel. This on-board module shall also allow the channel to perform appliance diagnostics that assist with installation and subsequent test operations. A visible LED on each appliance shall provide verification of communications and shall flash with the appliances address setting when locally requested using a magnetic test tool.*

b. Addressable Controller: Addressable Controller shall supervise Channel (SLC) wiring, communicate with and control addressable notification appliances. It shall be possible to program the High/Lo setting of the audible (horn) appliances by channel from the addressable controller.

c. Horn: Addressable horn shall be listed to UL 464. Horn appliances shall have a High/Lo Setting, programmable by channel from the addressable controller or by appliance from the host FACP. The horn shall have a minimum sound pressure level of 83 or 89 dB @ 24VDC. The horn shall mount directly to a standard single gang, double gang or 4" square electrical box, without the use of special adapter or trim rings. Appliances shall be wired with UTP conductors, having a minimum of 3 twists per foot.

d. Visible/Only: Addressable strobe shall be listed to UL 1971. The V/O shall consist of a xenon flash tube and associated lens/reflector system. The V/O enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings. Appliances shall be wired with UTP conductors, having a minimum of 3 twists per foot. V/O appliances shall be provided with different minimum flash intensities of 15cd, 75cd and 110cd. Provide a label inside the strobe lens to indicate the listed candela rating of the specific Visible/Only appliance.

e. Audible/Visible: Addressable combination Audible/Visible (A/V) Notification Appliances shall be listed to UL 1971 and UL 464. The strobe light shall consist of a xenon flash tube and associated lens/reflector system. Provide a label inside the

strobe lens to indicate the listed candela rating of the specific strobe. The horn shall have a minimum sound pressure level of 83 or 89 dB @ 24VDC. The audible/visible enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings. Appliances shall be wired with UTP conductors, having a minimum of 3 twists per foot. The appliance shall be capable of two-wire synchronization with one of the following options:

- 1. Synchronized Strobe with Horn on steady*
- 2. Synchronized Strobe with Temporal Code Pattern on Horn*
- 3. Synchronized Strobe with March Time cadence on Horn*
- 4. Synchronized Strobe firing to NAC sync signal with Horn silenced*

f. Accessories: The contractor shall furnish the necessary accessories.

3. EXECUTION

3.1. INSTALLATION, GENERAL

a. Install system components and all associated devices in accordance with applicable NFPA Standards and manufacturer's recommendations.

1. Installation personnel shall be supervised by persons who are qualified and experienced in the installation, inspection, and testing of fire alarm systems.

3.2. EQUIPMENT INSTALLATION

- a. *Furnish and install a complete Fire Alarm System as described herein and as shown on the plans. Include sufficient control unit(s), annunciator(s), manual stations, automatic fire detectors, smoke detectors, audible and visible notification appliances, wiring, terminations, electrical boxes, and all other necessary material for a complete operating system.*
- b. *Existing Fire Alarm Equipment shall be maintained fully operational until the new equipment has been tested and accepted.*
- c. *Equipment Removal: After acceptance of the new fire alarm system, disconnect and remove the existing fire alarm equipment and restore damaged surfaces. Package operational fire alarm and detection equipment that has been removed and deliver to the Owner. Remove from the site and legally dispose of the remainder of the existing material.*
- d. *Water-Flow and Valve Supervisory Switches: Connect for each sprinkler valve required to be supervised.*
- e. *Device Location-Indicating Lights: Locate in the public space immediately adjacent to the device they monitor.*

3.3. WIRING INSTALLATION

- a. *System Wiring: Wire and cable shall be a fire rated type and listed for its intended use by an approval agency acceptable to the Authority Having Jurisdiction (AHJ) and shall be installed in accordance with the appropriate articles from the current approved edition of NFPA 70: National Electric Code (NEC).*
- b. *Contractor shall obtain from the Fire Alarm System Manufacturer written instruction regarding the appropriate wire/cable size to be used for this installation. No deviation from the written instruction shall be made by the Contractor without the prior written approval of the Fire Alarm System Manufacturer.*
- c. *Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm initiating device circuits wiring and a different color code for supervisory circuits. Color-code notification appliance circuits differently from alarm-initiating circuits. Paint fire alarm system junction boxes and covers red.*

3.4. FIELD QUALITY CONTROL

a. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.

b. Service personnel shall be qualified and experienced in the inspection, testing, and maintenance of fire alarm systems.

c. Pretesting: Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved.

d. Final Test Notice: Provide a 10-day minimum notice in writing when the system is ready for final acceptance testing.

e. Minimum System Tests: Test the system according to the procedures outlined in NFPA 72.

f. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

g. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log.

h. Final Test, Certificate of Completion, and Certificate of Occupancy:

1. Test the system as required by the Authority Having Jurisdiction in order to obtain a certificate of occupancy.

3.5. CLEANING AND ADJUSTING

a. Cleaning: Remove paint splatters and other spots, dirt, and debris. Clean unit internally using methods and materials recommended by manufacturer.

b. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels and adjusting controls and sensitivities to suit actual occupied conditions. Provide up to three visits to the site for this purpose.

3.6. TRAINING

a. *Provide the services of a factory-authorized service representative to demonstrate the system and train Owner's maintenance personnel as specified below.*

1. *Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventive maintaining of the system. Provide a minimum of 8 hours' training.*

2. *Schedule training with the Owner at least seven days in advance.*

3- TELEPHONE INSTALLATION

3.1. General:-

The telephone installation distribution network shall be arranged as indicated on the drawings.

* maintenance period for all Telephone works should be for two years from the date of handing over including spare parts needed .

3.2. Telephone Wiring:-

- a. Multi-pair armored under ground cables for installation between MTB (Main Telephone Box) and the terminal Boxes in buildings (TTB`s). The wires should be 0.6 mm².
- b. Two pair cables should be P.V.C. insulated and P.V.C. sheathed. The wires should be 0.6mm minimum.
- c. Internal telephone installation shall run in P.V.C conduits for buried installation and shall run in galvanized conduits for surface installations.
- d. All civil works needed for underground telephone cables are included with the price of the cables.
- e. Three types of reputable manufacturers shall be submitted for approval.

3.3. Telephone Terminal:-

- a. Telephone terminal cabinet shall be sheet metal enclosure, surface or flush mounted, and should be approved by the engineer.
- b. Cabinets shall enclose the necessary terminal blocks for terminating and tapping telephone cables.
- c. Every telephone terminal to have a number. The same number should be in the associated telephone box. Using numbered rings on wires.
- d. Telephone socket outlet shall be of RJ 11 type.

a. Attendant Console Features:

The console shall have, but not limited to the following features:-

1. No. of attendance consoles are 4

2. The consoles are provided with both hand set and head set

3. Busy Override:

The attendant shall be able to break into any established connection after a warning tone.

4. Splitting:

The attendant shall be able to speak privately with any outside or local part.

5. Incoming Call:

Incoming call shall be received and directed by the attendant.

6. Night Service:

Arrangements shall be provided to route the calls, to pre-selected extension.

7. Direct Service:

The attendant preferable shall have a direct access to the trunk group (C.O. lines) without dialing and access code.

8. System Alarm:

The attendant console shall have visual alarm to display the type of alarm (Major, Minor, Etc.), in case to system failure. Audible alarm is preferable.

9. Camp-on Busy:

This feature enables the attendant to complete the incoming call to a busy extension, until the extension becomes idle. Through the waiting time the caller shall have an indication, which indicates that the extension is busy.

10. Attendant Call Back:

Incoming calls, transferred to an extension, shall return back to the attendant if not answered within a specified time.

11. Follow Me:

This feature enables any extension to transfer the coming calls to another extension if he leaves his office.

12. Music on Hold

13. Can call any extension by pressing one push button.

14. Call queue.

15. Telephone sets to operate with one telephone pair and one or two telephone pairs max. for multilane sets. And operator console.

b. Training program:

Contractor should instruct and train no less than five persons of the owner's staff in the operation and maintenance of every system, device and piece of equipment in the systems, with emphasize on roper start-up, operating and shut down procedure, preventive maintenance, overhand and maintenance methods, adjustment and calibration of equipment, instrument and control, the use of tools and safe practice.

4- COMPUTER NETWORK SYSTEM

4.1. Data Outlets :-

4P UTP cat6 cables in P.V.C. rigid conduits of 1” diam, complete with boxes and all needed accessories, to be installed for every outlet from the data draw box in server room to the data outlets or where needed according to drawings. Data outlet should be provided with RJ45 face plate. The work shall be supplied, installed and connected as shown in drawings and specifications .

4.2. Data Boxes:-

PVC conduits of Data outlets for every floor shall be connected to metallic Draw Box recessed in wall at suitable height from floor , and shall be supplied with a suitable door. Box and door shall be powder painted from inside and outside.

Data draw Boxes in floors shall be connected to main data box in control room by using Cat "6" cables in PVC conduits of 50mm diameter (shop drawings shall be submitted before starting the work showing routs and all necessary details for approval).

4.3. Wiring and commission of computer network system shall be done by contractor.

- All data outlets shall be numbered and labeled from both ends.
- Structured Cable:- Cable to be used in computer network are unshielded twisted pair (UTP) category "6" 4 pair, Compliant with TIA/EIA-568-B.2-1, and shall be installed and connected directly from data outlets to patch panel cabinet in computer rooms as shown in drawings
- Face plates:- Computer outlets face plates support more than on snap in part for the connector modules of RJ 45 for computers.

4.4. Communication Cabinet:

It is a computer lab Wall-Mounted Communication Cabinet. It shall be installed & mounted in control room at 2 mt. from finish floor level.

Component		Specification
Dimension	Width	Standard 19" EIA
	Height	As shown in drawings & BOQ.
Door	Type	Glass or Plexi
Power distribution strip		≥ 4 MK Socket, Mounted into the cabinet.
Security		Key lock
Cooling		≥ 4" Fans (2 Nos.)
Warranty		2 Years, Parts & Labor (On- Site)

4.5. Patch panel:

- 24 Port category 6 UTP
- Should be mounted into the Communications Cabinet.

Metal Frame:

- Aluminum
- Three cut outs to accommodate 8 ports each

Front Bezel:

- 3 bezels of 8 ports each
- High impact FR grade ABS
- Two side bezels

Servers: Servers shall be supplied and installed by the owner.

Note:-Contractors shall have to:-

- Label both ends of each cable.
- Use cable ties (not tape) to keep cables in the same location together.
- Stay at least 1m away from fluoesant light and other source of electrical interference.
- Lacing of patch panel should be accordance with best international standards, such that no strains of cables behind or inside the cabinet.
- From patch panel side, cable length should be adequate for easily and tidily connections.

Tests:

Testing of computer network should include but not limited to the following:-

- a- Network mapping, attenuation of all cables.
 - b- Resistance and connectivity (pass or fail).
 - c- To determine (test) length of cables.
 - d- Print out of the results.
- Three types of reputable products shall be submitted for approval.

5. SOUND SYSTEM

The system shall be installed in conference room as shown in drawings as follow:

5.1. Amplifier:-

Amplifier, 120w output power with 5 mixed inputs with separate control, front panel selector, Vu meter with LED display, signal peak monitoring lamp with chime feature, 230 V/50 Hz. Amplifier shall be enclosed in suitable rack of black colour, with glass front doors and lock, supplied by same manufacturer of sound equipment.

5.2. Ceiling loud speakers with matching transformer:

- recessed type / Hi quality.
- Rated power : 6w (6-3,1.5w).
- Frequency Response : 50 Hz-13 KHz.
- Sound pressure level : 101 db.
- Finish : white ABS.

5.3. Desk – top microphone stand with dynamic:

Cardioid microphone, On/Off pushbutton, including 5 – meter – long cable terminating in an XLR plug and a pair for terminals for priority when these are fitted to connector on an amplifier and the On/ Off pushbutton is pressed, priority is activated and the LED will light up.

5.4. Hand held microhone with cable:

Dynamic, cardioid, 1.5mv (-56db) sensitivity, 100-18000 Hz bandwidth, of black metal colour.

5.5. Wireless Handheld microphone:

it shall be of rugged construction for extreme reliability, cardoid unidirectional dynamic with afrequency response of 50 to 15000Hz, with a diversity receiver, built in transmitter and external antenna, operating range upto 60mt, can be used along side other microphones without risk of distortion. An On/Off Switch and power indicator are included in microphone housing.

5.6. Wires and conduits:

one pair twisted stranded conductor of (1.5mm²) cross sectional area shall be used for ceiling loud speakers in PVC conduits above the false ceiling.

5.7. The free maintinance period shall be for two years including all parts needed.

5.8. After installation the system shall be tested under operation conditions to demonstrate operation of all equipments, wiring, and connections.

5.9. Performance tests shall be applied to ensure satisfactory operation of the system and to verify the sound quality. Any adjustment necessary to meet this specification shall be performed without any additional cost to the owner.

5.10. The system shall be manufactured by specialized well known reputable manufacturer.

5.11. The contractor shall remove the whole of the system and re-install a new similar one if an unsolvable problem occurred in the system.

5.12. LCD video data projector 3500 ANSI Lumens:

LCD Projector With high performance (3500 Lumens, 1000:1 Contrast Ratio) and easy to use features including manual lens shift, optional lenses and advanced networking. Combined with a common sense design and simple user functionality the CP-X505 is a cost effective solution for day-to-day use.

Complete with the following features:

- 3500 ANSI Lumens with Optical Zoom
- Full Connectivity
- Wired LAN
- Quick Start and Instant Off
- Input Source Naming
- My Button
- Resolution Preset
- Whiteboard Mode and Blackboard Mode

5.13. Motorized Projection Screen

- Shall have approx.3 amps Motor.
- Shall be three wire quick reversal type motor , oiled for life .
- Shall be provided with automatic thermal overload cut –out and integral interlocking gears.
- Shall have pre-set but adjustable limit switches to automatically stop screen fabric in the "up" and "down" position.
- Stop action shall be positive to prevent coasting .
- The roller shall be of rigid metal and mounted in one heavy duty brackets equipped with self aligning bearings
- Motor shall be mounted inside of roller, secured to the case with a steel motor mount bracket.
- Screen surface shall be flame retardent and mildew resistant matte white type
- Case shall be of wood , with a black primer coat .
- Heavy metal bracket shall be supply for mounting screen to wall or ceiling .
- Shall be complete with three position control switch with cover plate .
- Screen to shall list by underwriters ' laboratories CSA.
- Dimensions shall be 2mx2m as shown in B.O.Q .

5.14. Plasma Screen 42 inches:

Plasma Widescreen Television combines the latest flat panel technology with stylish design. Offering a whole range of features, this Plasma TV will fit perfectly into any environment. complete with TV Tuner & The following specifications:

- 106cm Visible Plasma Widescreen Television
- 3DS Spatial Sound

- HD Ready
- New ALiS 1080 Panel(1024 x 1080)
- High Screen Resolution of 1024 x 1080 pixels
- 3 x SCART Sockets
- HDMI and Component Sockets
- 15-pin D-Sub PC Socket
- Panel Luminance of 1400cd/m²
- Contrast Ratio 4000:1
- 2 x 10W RMS Output

6. CCTV SYSTEM

6.1. Introduction

The CCTV System should be able to connect to the building network through (TCP/IP).where the user can use his own PC to watch the system.

6.2. DVR (Digital Video recorder)

6.2.1. Description

The Digital Video Management System design shall be a microprocessor-based video processor, multiplexer, and recorder operating on and using the security of the Microsoft® Windows XP Professional operating system.

The system shall store 900 hours of video and support as many as five simultaneous Network Client users.

6.2.2. Performance Specifications

The Digital Video Management System software must meet the following minimum features, functions and specifications:

The Digital Video Management System and its components shall be thoroughly tested before shipping from the manufacturer's facility.

The Digital Video Management System shall be available with 16 camera inputs, 16 alarm inputs , one time sync input, one "initiate export" input, one PS/2 style mouse input, one PS/2 style keyboard input, one SVGA monitor output, one video alarm capture display card (VACD) composite video output, 16 camera outputs (passive loop through), 16 alarm outputs , one "watchdog" system reset notification output, one serial communications connector, one parallel

printer output, four rear USB and two front USB connectors and one network connector. The time sync input, when activated, shall reset the system clock to the nearest hour. The “initiate export” input, when activated, shall signal the unit to begin exporting the most recently recorded data to the unit’s CD-RW drive. The system reset notification output shall be activated when the system “watchdog” resets the unit after an DVR system error or failure.

The Digital Video Management System shall be designed specifically for the video security industry, utilizing a patented proprietary compression scheme called Active Content Compression (ACC) that differentiates motion from video noise. This scheme allows images to be compressed into a file that is 1/9 the size of what they would be if compressed with MPEG-4 images, using far less disk space. Motion JPEG and MPEG-4, or any variation thereof, are not acceptable alternatives.

The Digital Video Management System’s proprietary compression scheme, ACC, must perform between 25% and 200% better than MPEG-4, and between 30% and 3700% better than M-JPEG and Wavelet. The manufacturer must offer a “white paper” on their public website detailing the performance testing used to develop these statistics.

The Digital Video Management System shall use record mode settings linear or circular/continuous.

The Digital Video Management System shall provide for simultaneous recording, playback, transmitting, database searching and archiving. One channel of audio and up to eight text inputs shall be supported with required hardware properly installed and set up according to manufacturer’s instructions. Live audio shall be available for listening while viewing live video. Up to 15 cameras shall be configurable as visible or covert by the authorized user.

The Digital Video Management System shall provide network access through an internal network connections that supports 100BaseT (100 Mbps) network operation.

The Digital Video Management System shall include the ability to accept text through a network connection, as well as through a serial input with an RS-232 connection. The unit shall be able to mix serial inputs and TCP/IP input in any combination up to 16 channels of text.

The Digital Video Management System shall be capable of recording greater than 55 days on 320 GB of internal hard drive storage using the following parameters:

- RESOLUTION – 2CIF
- VIDEO MODE – PAL
- QUALITY – NORMAL
- SENSITIVITY – NORMAL
- AGGREGATE RECORD RATE – 50 IPS (PAL)
- NUMBER OF CAMERAS – 16
- RECORD AUDIO – ON

- MOTION – CASUAL (FOR EXAMPLE, A ROOM OR HALLWAY WITH A COUPLE OF OCCUPANTS OR FAIRLY FREQUENT TRAFFIC; A SIDEWALK OR STREET WITH SOME TRAFFIC AND LITTLE MOTION DUE TO WIND, LIGHT, OR CAMERA NOISE)

THE DIGITAL VIDEO MANAGEMENT SYSTEM (DVMS) SHALL, AT A MINIMUM, COMBINE MULTIPLEXING, ALARM DETECTION, EVENT DETECTION, VIDEO, AUDIO, AND TEXT RECORDING.

THE DIGITAL VIDEO MANAGEMENT SYSTEM MANUFACTURER SHALL INCLUDE ON THEIR PUBLIC WEBSITE A MINIMUM OF THE FOLLOWING TOOLS, DIRECTLY RELATED TO THE SUPPORT OF THE DVMS SYSTEM:

- KNOWLEDGE BASE ARTICLES
- APPLICATION SOLUTIONS
- VIRTUAL PRODUCT DEMOS
- DIGITAL DEMO NETWORK
- SOFTWARE DOWNLOADS
- SUPPORT DOCUMENTS
- SOFTWARE REGISTRATION
- TRAINING INFORMATION AND REGISTRATION
- RECORD DURATION CALCULATOR
- INCIDENT DOWNLOAD CALCULATOR
- LIVE VIDEO DOWNLOAD CALCULATOR

THE DIGITAL VIDEO MANAGEMENT SYSTEM MUST UTILIZE A CHASSIS NO LARGER THAN FOUR RACK UNITS IN HEIGHT, AND BE SUITABLE FOR EITHER DESKTOP OR RACK MOUNT INSTALLATIONS. THE UNIT MUST FIT WITHIN A STANDARD VIDEO RACK AS WELL AS A SERVER RACK.

THE DIGITAL VIDEO MANAGEMENT SYSTEM'S CHASSIS SHALL INCLUDE THREE INDICATOR LIGHTS EASILY VIEWED FROM THE FRONT PANEL. THESE INDICATOR LIGHTS MUST BE COLORED RED, YELLOW, AND GREEN TO SIGNIFY SYSTEM STATUS.

THE DIGITAL VIDEO MANAGEMENT SYSTEM'S OPERATING SYSTEM (OS) SHALL BE MICROSOFT WINDOWS XP PROFESSIONAL TO PROVIDE INCREASED RELIABILITY, SECURITY, AND PERFORMANCE.

THE DIGITAL VIDEO MANAGEMENT SYSTEM SHALL BE MSI COMPLIANT, ENABLING ADMINISTRATORS TO PROVIDE BETTER CORPORATE DEPLOYMENT, AND PROVIDE A STANDARD FORMAT FOR COMPONENT MANAGEMENT.

THE DIGITAL VIDEO MANAGEMENT SYSTEM'S USER INTERFACE MUST BE EASY TO USE, ALLOWING THE USER TO ACCESS ALL OPERATIONS USING ONE-CLICK BUTTONS, PULL-DOWN MENUS, ADJUSTABLE SLIDERS, AND TABBED SCREENS.

The unit must simultaneously record, play back and archive video, text and audio while using sophisticated search functions to define and find only those important events that meet certain criteria. The system must also have the ability to host multiple remote users, archive data, and search for data, all while recording multiple video and text streams. The user must have the ability to specify text criteria, such as a specific ASCII text stream, to schedule recording and search for video, allowing for recording only the video associated with the specified text.

THE DIGITAL VIDEO MANAGEMENT SYSTEM'S LIVE VIDEO DISPLAY MUST PROVIDE REAL-TIME MOTION IN ANY SCREEN FORMAT (FULL, 2X2, 3X3, AND 4X4). THE OPERATOR SHALL HAVE THE ABILITY TO EXPAND ANY VIEW TO FULL SCREEN WITH A SINGLE CLICK OF THE MOUSE.

THE DIGITAL VIDEO MANAGEMENT SYSTEM MUST INCORPORATE SELF-MONITORING ANALYSIS AND REPORTING TECHNOLOGY (S.M.A.R.T.), INCORPORATING A SUITE OF ADVANCED DIAGNOSTICS THAT MONITOR THE INTERNAL OPERATION OF A DRIVE AND PROVIDE EARLY WARNING FOR MANY TYPES OF POTENTIAL PROBLEMS. THIS SHALL ALLOW THE DRIVE TO BE REPAIRED OR REPLACED BEFORE ANY DATA IS LOST OR DAMAGED.

USING THE INTEGRATED CD-RW THE DIGITAL VIDEO MANAGEMENT SYSTEM SHALL ALLOW USERS TO SAVE VIDEO, AUDIO, AND TEXT TO A STANDARD RECORDABLE CD. THE OPTION TO INCLUDE THE PLAYER SOFTWARE ON THE CD SHALL BE AVAILABLE SO THAT NO ADDITIONAL SOFTWARE NEEDS TO BE PURCHASED. THE UNIT MUST INCLUDE THE ABILITY TO EXPORT THE LATEST VIDEO, AUDIO, AND TEXT TO A CD UNTIL THE CD IS FULL.

THE DIGITAL VIDEO MANAGEMENT SYSTEM SHALL ALLOW FOR THE FOLLOWING ALARM RECORDING SETTINGS:

- IMAGE RATE
- QUALITY
- SENSITIVITY

THE DIGITAL VIDEO MANAGEMENT SYSTEM SHALL INCORPORATE AN ADJUSTABLE ALARM DURATION WITH THE PRE-ALARM AND MINIMUM ALARM DURATION PROGRAMMABLE UP TO 60 SECONDS. THE UNITS MUST ALSO ALLOW PROGRAMMABLE RECORDING TIMES (ALARM SCHEDULES) FOR EACH DAY OF THE WEEK, IN THIRTY MINUTE INCREMENTS.

THE DIGITAL VIDEO MANAGEMENT SYSTEM MUST WORK WITH THE FOLLOWING DOME CAMERA HANDLERS: AD168, MP48, AD1024 MATRIX, VM96RTT, RS422 DOME CONTROL, VM16/ADTT16, VM16E/ADTT16E, PELCO MATRIX SWITCH (MODELS 6700, 6800, 8500, 9500, 9750 OR 9760) AND USB-CCTV.

THE DIGITAL VIDEO MANAGEMENT SYSTEM MUST INCLUDE ALARM-TRIGGERED DOME EVENTS, ALLOWING THE OPERATOR TO CONFIGURE DOMES TO RESPOND TO ALARM CONDITIONS VIA NETWORK CLIENT™ OR GUI (USING SUPPORTED DOME CONTROL HANDLERS). THE EVENT CAN BE A MOTION FILTER (MOTION DETECTION, PERIMETER PROTECTION, LIGHT CHANGE AND MOTION EXCEPTION), A WIRED ALARM, VIDEO LOSS, OR A MANUALLY GENERATED ALARM. THE UNIT MUST HAVE THE ABILITY TO MOVE A SINGLE DOME, OR MULTIPLE DOMES, TO PRESET POSITIONS OR PATTERNS.

THE DIGITAL VIDEO MANAGEMENT SYSTEM SHALL OFFER RECORDING RATES OF UP TO 50 (PAL) IPS AT 1CIF AND 50 IPS (PAL) AT 2CIF. THE UNIT SHALL BE ABLE TO MIX RECORD SPEEDS AND QUALITY SETTINGS ON A "PER CAMERA" BASIS.

THE DIGITAL VIDEO MANAGEMENT SYSTEM MUST INCLUDE THE ABILITY TO SEND AN EMAIL VIA AN EMAIL SERVER TO ANYONE, OR ANY GROUP, BASED UPON AN

EVENT. THE EVENTS MUST INCLUDE, BUT NOT NECESSARILY LIMITED TO, THE FOLLOWING:

- SYSTEM EVENT
- VIDEO LOSS
- GENERATED ALARM
- ANY FILTER ALARM
- ANY INPUT ALARM
- INDIVIDUAL CAMERA ALARM

THE DIGITAL VIDEO MANAGEMENT SYSTEM'S RECORDING FORMAT MUST GIVE EACH IMAGE A UNIQUE IDENTIFICATION "STAMP". EVEN THOUGH THE FILE STRUCTURE IS PC COMPATIBLE, THE ORIGINAL VIDEO IMAGES CAN NOT BE ALTERED OR MODIFIED, ENABLING A SOLID CHAIN OF EVIDENCE.

THE REMOTE MANAGEMENT SOFTWARE MUST ALLOW FOR UP TO 64 LIVE VIDEO SESSIONS, ALLOWING THE OPERATOR TO VIEW UP TO SIXTY FOUR DIFFERENT CAMERAS, FROM UP TO 64 DIFFERENT REMOTE SITES, SIMULTANEOUSLY.

THE DIGITAL VIDEO MANAGEMENT SYSTEM SHALL EASILY INTEGRATE WITH THIRD PARTY SOFTWARE APPLICATION USING AN APPLICATION PROGRAMMER'S INTERFACE (API). THE MANUFACTURER OF THE UNIT SHALL OFFER A SOFTWARE DEVELOPERS KIT (SDK) TO SELECT THIRD PARTY MANUFACTURES, IN ADDITION TO SAMPLE MODULAR PROGRAMS WITH THEIR SOURCE CODES IN BOTH VISUAL BASIC AND VISUAL C++, ALLOWING PROGRAMMERS TO DEVELOP THEIR OWN SOFTWARE TO CONTROL THE UNIT'S FUNCTIONS.

THE DIGITAL VIDEO MANAGEMENT SYSTEM'S API MUST ALWAYS BE BACKWARDS COMPATIBLE WITH PREVIOUS VERSIONS OF THE SOFTWARE EQUAL TO OR GREATER THAN V2.6.

IN ORDER TO INSTANTLY RETRIEVE RECORDED VIDEO OF ANY EVENT, THE DIGITAL VIDEO MANAGEMENT SYSTEM SHALL USE A PATENTED SEARCH FEATURE TO FILTER THROUGH HOURS OF VIDEO TO FIND ONLY THE ESSENTIAL EVENTS. THE OPERATOR MUST HAVE THE ABILITY TO ISOLATE VIDEO CONTAINING MOTION, AND FIND VIDEO WHERE PERIMETERS WERE CROSSED, LIGHTS WERE TURNED ON OR OFF, ALARMS WERE TRIGGERED, AND NUMEROUS ADDITIONAL SCENARIOS.

THE OPERATOR SHALL HAVE THE ABILITY TO EXPORT THE ENTIRE LOG FILE, EXPORT THE DISPLAYED LOG FILE, PRINT THE LOG FILE, OR PRINT THE DISPLAYED LOG FILE LOCALLY AND REMOTELY THROUGH NETWORK CLIENT.

THE DIGITAL VIDEO MANAGEMENT SYSTEM SHALL BE COMPATIBLE WITH THE LEADING BRANDS OF ANTI-VIRUS SOFTWARE IN ORDER TO DETECT AND DEACTIVATE MALICIOUS SOFTWARE THAT MAY ATTEMPT TO ATTACK THE SYSTEM. THE DIGITAL VIDEO MANAGEMENT SYSTEM SHALL BE ABLE TO MANAGE STORAGE OF VIDEO, AUDIO AND TEXT BY EXPORTING UP TO THREE EXTENDED STORAGE

MODULES (ESM) . SYSTEM ARCHIVE MANAGER SHALL MANAGE STORAGE OF VIDEO, AUDIO OR TEXT TO NETWORK ATTACHED STORAGE (NAS), STORAGE AREA NETWORK (SAN) AND DIRECT ATTACHED STORAGE (DAS) DEVICES .

Optional External Storage Modules (ESMs) shall be available through IEEE 1394 “FireWire” connector

THE DIGITAL VIDEO MANAGEMENT SYSTEM SHALL USE AUTO RATE MODE TO SET EQUAL FRAME RATES FOR EACH CAMERA OR ADJUST THE RECORDING FRAME RATE PER CAMERA TO GIVE GREATER CONTINUITY IN CRITICAL AREAS.

THE DIGITAL VIDEO MANAGEMENT SYSTEM IN ADVANCED SECURITY MODE SHALL ENABLE BOTH IT AND SECURITY MANAGERS TO COLLECTIVELY INTEGRATE THE UNIT INTO EXISTING MICROSOFT WINDOWS NETWORKS WITHOUT COMPROMISING THE EXISTING SECURITY PROTOCOLS.

THE DIGITAL VIDEO MANAGEMENT SYSTEM MUST INCLUDE SUPPORT FOR REMOTE CONFIGURATION AND MANAGEMENT SOFTWARE TO ALLOW A USER TO REMOTELY CONFIGURE THE UNIT, VIEW LIVE VIDEO, OR SELECT VIDEO SEGMENTS BY TIME, DATE, ALARM, OR SEARCH RESULTS. THE OPERATOR MUST HAVE THE ABILITY TO SAVE, ANNOTATE, AND ORGANIZE COPIED VIDEO INTO “INCIDENT FOLDERS” TO AID WITH INVESTIGATIONS.

THE REMOTE MANAGEMENT SOFTWARE SHALL ALSO ALLOW THE EXPORTING OF VIDEO CLIPS TO AN .AVI FILE (CD-RW) TO PLAY ON ANY MICROSOFT WINDOWS BASED PC. THE SOFTWARE SHALL HAVE THE ABILITY TO ENHANCE, PRINT, OR CONVERT THE INDIVIDUAL IMAGES TO STANDARD FORMATS.

THE REMOTE MANAGEMENT SOFTWARE SHALL ALLOW AN OPERATOR TO SELECT UNITS, CAMERAS, AND TIMEFRAMES FOR AUTOMATIC RETRIEVAL OF VIDEO CLIPS TO AN OPERATORS PC. THIS ALLOWS FOR DOWNLOADS TO BE SCHEDULED DURING TIMES THAT NETWORK TRAFFIC RESTRICTIONS ARE NOT AN ISSUE.

THE DIGITAL VIDEO MANAGEMENT SYSTEM SHALL INCORPORATE PLAYBACK (NO MULTI-SCREEN PLAYBACK) FUNCTIONALITY TO ALLOW THE USER TO LOCATE AND SELECT A SINGLE STORED IMAGE TO BE ENHANCED USING TOOLS. THE TOOLS SHALL INCLUDE, BUT NOT NECESSARILY BE LIMITED TO, THE FOLLOWING:

- BRIGHTNESS
- CONTRAST
- HUE
- SATURATION
- LIGHTNESS
- BALANCE LIGHT
- EDGE DETECT
- ENHANCE LIGHT
- NOISE REDUCTION

- SHARPEN
- SHARPEN MORE
- SMOOTH
- SMOOTH MORE
- BRIGHTNESS CHART

A BROWSER-BASED VIEWER (BROWSER CLIENT) MUST ALSO BE AVAILABLE FREE OF CHARGE, ENABLING USERS TO HOST AND CUSTOMIZE THEIR OWN WEBSITE TO PROVIDE LIVE VIEWING OF THE DIGITAL VIDEO MANAGEMENT SYSTEM THROUGH A STANDARD BROWSER INTERFACE. MULTIPLE VIEWERS SHALL HAVE THE ABILITY TO ACCESS VIDEO AND CONTROL DOMES REMOTELY.

American Dynamic (USA) or equivalent

6.3. Outdoor High Resolution Day/Night Fixed Camera

6.3.1. Description

One third inch high-resolution color digital CCD camera with 0.7 lux (Color) low light sensitivity and at least 470 TV lines of resolution.

6.3.2. Performance Specifications

The camera must incorporate a 1/3-inch CCD array with interline transfer and Digital Signal Processing (DSP) to produce no less than 470 TV lines of resolution. The CCD array active pixel count must be no less than 768 (H) x 494 (V) for NTSC and 752 (H) x 582 (V) for PAL.

The camera must produce usable video at 0.7 lux (f1.2 lens) and provide an automatic electronic shutter (AES) and automatic gain control (AGC) to assure it will operate in a wide range of lighting conditions using manual iris lenses. For more extreme lighting conditions, the camera must have an auto detection circuit for both DC-type and EE-type auto iris lenses. The camera must accept either C or CS mount lenses without the use of an adapter ring.

The camera must provide internal synchronization or external 360°, phase adjustable line-lock synchronization for “roll-free” switching.

The camera must provide a selectable color/monochrome Night-Saver mode that automatically enhances images under extreme low light conditions.

The camera must provide a selectable DVR-Saver mode capable of preserving hard drive file size on digital video recorders by up to 30% depending scene content, motion and lighting conditions.

The camera must provide seven selectable zones for Back Light Compensation (BLC), and a White Balance that can be set to either Auto, or adjusted manually for color temperatures of at least 2500°K to 9500°K. The camera must also offer dynamic Aperture Correction.

The camera must have a signal to noise ratio of 50dB or better.

Automatic White Balance (AWB):Auto/Manual

White Balance/Phase Adjust:.....WHT BAL/PHASE

Back Focus:.....Adjustment ring, with lock

DC Iris: Level control

Connectors

Input Power:.....Screw terminal block

Composite Video:BNC

Video Iris:4 pin square connector

DC Iris:.....4 pin square connector

Electrical

AC Voltage:24 VAC (+33%, -15%), 50/60 Hz

DC Voltage:12 VDC (+15%, -10%)

Power:4.2 Watts maximum

Mechanical

Lens Mount:C or CS type

Camera Mount:1/4-inch – 20 embedded (top or bottom)

Dimensions (H x W x L):.....52 x 60 x 123 mm (2.05 x 2.36 x 4.84 in)

Unit Weight:.....350 g (0.77 lb)

Color:Light gray (body), dark gray (accents)

Environmental

Operational Temperature:-10° to 50°C (14° to 122°F)

Storage Temperature:.....-20° to 60°C (-4° to 140°F)

Relative Humidity:.....90% (non-condensing)

Regulatory

Emissions:FCC: Part 15, Class A
CE: EN55022, Class B
ICES-003

Immunity:.....CE: EN50130-4

Safety: UL2044

6.3.5-8mm Varifocal auto iris lens

- Focal length 3.5-8mm
- 1:1.4 Max relative aperture

- Manual Zoom 93.5-8mm)
- Manual Focus
- IG (Auto-close system) iris
- CS mount (Adjustable lens position)

6.3.4 Weatherproof Housing

- Environmental camera housing with 8 inch wall mount
- Automatic regulating heater for condensation
- Cover open with 180° for easy camera access
- Tough ,High-impact ,Polycarbonate construction
- IP4/NEMA-3R Protection

6.4 Vandal Resistance Dome Camera

6.4.1 Description

The dome high-resolution color fixed camera with choice of 2.5-6 mm, 3.8-9.5 mm and 9-22 mm (as per consultant approved) variable focal auto iris lens mounted in a high impact vandal resistant housing.

6.4.2 Performance Specifications

The assembly shall be a low profile housing which is made from polycarbonate and composite materials with a polycarbonate viewing bubble.

- Within the housing there shall be a mounting bracket with a gimbal arrangement to allow adjustment of the camera in the x, y and z axis. The gimbals shall have locking screws to resist movement once the camera is adjusted.
- The housing shall include tamper resistant fasteners to prevent entry without a special tool. Tamper resistant fasteners shall be pin-in Torx Type.
- Installed within shall be a high-resolution fixed camera with choice of 2.5-6 mm, 3.8-9.5 mm and 9-22 mm (as per consultant approved) variable focal auto iris lens.
- The housing shall be mountable in two base configurations: surface mount dome and flush mount dome.
- The housing shall include a threaded hole for ¾” conduit in the back, as well as a ½” side entry.
- The housing shall meet the requirements of NEMA4X (IP66) for weather resistance.
- The housing cover shall include a gasket and retain the fasteners for easier installation. A lanyard shall retain the housing cover to aid installation.

The bubble shall meet impact resistance equivalent to 120 pounds (54.4 kg) of force with repeated strikes. The bubble shall have a thickness of 2.5mm (±0.1mm).

The high resolution camera shall be a high-resolution color 1/3-inch CCD type with 540 lines of resolution and light sensitivity of 0.65 lux at F1.2.

- The camera shall be available in PAL formats.

- Dip switch settings shall control Night-Saver, White Balance (Normal, Extended), line lock, flickerless mode, backlight compensation and automatic gain control.
Three lens options shall include a 2.5-6 mm (F-stop 1.3) variable focal, 3.8-9.5 (F-stop 1.2) variable focal and 9-22 mm (F-stop 1.3) variable focal lens. Each shall feature DC auto iris with level control.

The camera shall operate from 12Vdc or 24Vac (60 Hz NTSC or 50 Hz PAL) and draw a maximum of 3 watts.

Minimum Performance Specifications

Vandal resistant housing/camera must meet the following operating requirements:

Operational

Imager	1/3-inch CCD
Video output.....	1.0 Vp-p/75 ohm
Horizontal resolution	540 TV lines
Active pixel count:	
NTSC	768 (H) x 494 (V)
PAL.....	752 (H) x 582 (V)
Minimum scene illumination	.0.65 lux
Sync system	Line-lock, adjustable or internal
S/N ratio	50 dB
White balance.....	Automatic White Balance
AWB range (normal)	2700 K – 11000 K
AWB range (extended)	2000 K – 18000 K
Backlight compensation.....	Center weighted On/Off
Night-saver.....	Selectable On/Off
Auto iris drive	dc
Composite video	BNC

6.5. PTZ Out door Speed Dome Camera

6.5.1. Description

High-speed programmable dome with high resolution DSP color camera and a zoom capability of 242x.

6.5.2. Performance Specifications

The dome assembly must be comprised of a high-speed pan/tilt assembly, high resolution color camera with 22× optical zoom and 11× digital zoom, allowing for 242× total zoom. The camera/lens assembly must provide for continuous, full-time autofocus.

The pan/tilt mechanism must incorporate a sealed precision slip-ring to provide 360 degrees of continuous rotation. Precise manual panning and tilting must be achievable through a combination of variable speed operator control (speed ranges) and automatic adjustment of these speed ranges dependent upon zoom factor. Pan speeds must range from 1 to 50 degrees per second. Tilt operating speeds must be from 1 to 50 degrees per second. The same amount of picture shall appear to move across a monitor regardless of the zoom factor. The design shall use stepper motors to ensure long-term reliable operation and maintain high torque through the entire operating range.

The dome assembly must provide video transmission via unshielded twisted pair (UTP) as standard.

The design of the dome shall support the option of a clear or smoked bubble.

The dome assembly shall contain a built-in multi-protocol receiver/driver for use with matrix switching systems using one of the following protocols: AD Manchester control code and a single 18 AWG shielded twisted pair (STP) to support up to three daisy chained domes a maximum of 1500 m (5000 feet), Sensor Net control code and a single 22 AWG unshielded twisted pair (UTP) to support up to 32 daisy chained domes a maximum of 1000 m (3280 feet), or RS422/RS485 control code and two pairs of 22 AWG shielded twisted pair (STP) cabling to support up to 10 daisy chained domes a maximum of 1000 m (3280 feet). The receiver/driver will provide all voltages for camera controls, pan and tilt functions and all motorized lens functions.

The dome shall support 96 Presets and three Patterns. The dome shall support a selectable home position to which the dome returns to after a period of no activity.

The dome assembly shall contain a single alarm input and be field programmable to receive “normally open” or “normally closed” contacts. If operating on a bi-directional network (e.g., Sensor Net or RS422/RS485), the dome shall be capable of receiving the alarm and transmitting the alarm back to the switching system.

The dome assembly shall contain a single auxiliary output. The open collector output must respond as momentary or latching (depending on system capability). The open collector of each auxiliary shall be required to handle +12 VDC at a maximum of 40 milliamps.

The complete dome assembly must be capable of operating to full specification with an applied voltage of 24 VAC to 30 VAC at a frequency of 50 or 60 Hertz and meet Class 2 standards. The power consumption cannot exceed 21 watts with all functions operating for indoor domes. The power consumption cannot exceed 80 watts with all functions operating for outdoor domes. The dome assembly shall have surge protection for the video, communications and power connections.

The camera shall be a ¼-inch CCD interline transfer device and must provide a minimum horizontal resolution of 470 lines with a usable video signal with a scene illumination better than 1.5 Lux (20 IRE, AGC on).

The video output synchronization shall be 2:1 interlace and will observe the NTSC or PAL standards. Line-lock with an adjustable vertical phase must also be provided.

The lens must be a color corrected, 4–88 mm, F1.6 and must have continuous auto focus with manual override. The lens must also have auto-iris with manual iris override.

The dome shall incorporate a removable chassis for ease of installation and service. Each dome will include diagnostic LED's to indicate power and proper communications to and from the matrix.

The dome shall incorporate adjustable swing-out mounting clips that allow for indoor installation in a drop ceiling without the use of additional mounting hardware.

An outdoor housing must also be available and shall provide for the same ease of installation and service.

Upon initial power up and after dome resets, diagnostic tests must be run, including communication loop back, camera loop back, and motor circuit tests. The results of these tests must be communicated via diagnostic LEDs. After initialization, the dome shall automatically pan, tilt and zoom to its previous position.

6.8.5.3. Minimum Performance Specifications

The dome must meet the following operating requirements:

Operational

Manual Pan/Tilt Speed:.....1° to 50° per second (based on zoom position)

Preset Pan/Tilt Speed:100° per second, maximum

Pan Travel:360° continuous

Tilt Travel:>90°

Pan/Tilt Accuracy:±0.5°

Zoom/Focus Accuracy:±0.5%

Optical Zoom:22×

Digital Zoom:11×

Total Zoom:242×

Bubble Density:Clear(f0.0) Smoked (f1.0)

Presets:96 max, system capability dependent

.....Microstep control provides precise pan and tilt position

Programmable Patterns:3
 Auto Synchronization:
 Line-LockedRemote V-phase adjustment
 InternalBuilt-in sync generator
 Address Range:
 RS-422/RS-485:1 to 99
 Manchester:1 to 64
 SensorNet:1 to 255
 Alarm Inputs:1
 Auxiliary Relay Outputs:1

Mechanical

Dimensions (H × D):
 In-Ceiling Model
 Total301 × 190.5 mm (11.9 × 7.5 in)
 Above Ceiling207.4 × 190.5 mm (8.2 × 7.5 in)
 Below Ceiling92.7 × 178 mm (3.65 × 7.0 in)
 Integral Housing Model303 × 243.5 mm (11.9 × 9.6 in)
 Weight:2.5 kg (5.5 lbs) In-Ceiling Model
 Integral Housing Model:2.7 kg (6.1 lbs) Indoor 3.0 kg (6.6 lbs) Outdoor
 Mounting Options:Ceiling, wall, corner, pendant mounts and Top Hat;
 outdoor housing options available

Integral Receiver/Driver

Control Code:AD Manchester, SensorNet or RS422/RS485
 Maximum Daisy Chain Devices:
 AD Manchester:3 Domes, up to 1500 m (5000 feet)
 SensorNet:32 Devices up to 1000 m (3280 feet)
 RS422/RS485:10 Domes up to 1000 m (3280 feet)
 Controllable Functions:Pan, Tilt, Zoom, Focus (Manual/Auto), Iris
 (Manual/Auto)

Electrical

Input Voltage:24–30 VAC, Class 2 LPS
 Design Tolerance:16–36 VAC
 Line Frequency:50/60 Hz

Power Consumption:

Indoor.....21 watts maximum

Outdoor80 watts maximum

Power-on In-rush current:3 amps

Allowable Drop-out:33 ms

Surge Protection:

Video.....Low-capacitance Zener suppressor of 6.5 V, 1500 watts

SensorNet/ManchesterIsolation transformer coupled, 2000 Vrms; PTC resettable fuse protects transformer; TVS rated at 5.6 V, 40 A, 0.1 joules; 10 kA impulse rated gas tube, 8/20 µsec impulse

RS-422/RS-485Series resistors of 33 ½; TVS rated at 5.6 V, 40 A, 0.1 joules

Alarm InputSeries resistors of 33 ½; TVS rated at 5.6 V, 40 A, 0.1 joules

Auxiliary Output100 V isolation form 1-C relay

Power LineTVS rated at 60 V, 250 A, 1.5 joules; 10 kA impulse rated gas tube, 8/20 µsec impulse

Camera

Imager:Interline transfer 1/4 inch CCD array

Scanning System:.....2:1 interlace

Video Output:.....1.0 Vp-p, 75 Ω composite

S/N Ratio:.....48 dB (typical)

Horizontal Resolution:470 lines at center

Minimum Illumination:.....1.5 lux (20 IRE, AGC on)

Gain Control:Automatic (AGC)

White Balance:.....Through the Lens (TTL)
Automatic Tracing White Balance (ATW)

NTSC:

Pickup Device768 (H) × 494 (V) pixels

Scanning.....525 lines, 60 fields, 30 frames

Horizontal15.734 kHz

Vertical.....59.9 Hz

PAL:

Pickup Devices.....752 (H) × 582 (V) pixels

Scanning.....625 lines, 50 fields, 25 frames

Horizontal15.625 kHz
Vertical.....50 Hz

Lens

DesignAspherical
Aperturef1.6
4 mm47.0° (H) × 35.2° (V)
88 mm4.0° (H) × 3.0° (V)

Focal Length4–88 mm

Field of View Formulas:

Horizontal View = $(.8 \times A)/B$

Vertical View = $(.6 \times A)/B$

A = distance from camera in meters or feet

B = zoom power (e.g. 1-88×)

Features

Maximum Zoom242× (22× optical, 11× digital)
Automatic Gain Control:.....On
White Balance:.....On
Line Lock:.....On
Alarm Processing:External (by controller)
Alarm Input States:Normally Open or Normally Closed
Diagnostic LEDs:.....for power, communication, network type and failure mode
Alarm Input:.....1 Normally Open (NO) or Normally Closed
Auxiliary Output:1 Normally Open (NO) or Normally Closed

Environmental

Weatherproof StandardIP66/NEMA4 (outdoor models only)
Operating Temperature
Indoor.....-10 °C to 50 °C (14 °F to 122 °F)
Outdoor-40 °C to 50 °C (-40 °F to 122 °F)
Humidity0–95% RH (non-condensing)
Storage Temperature.....-20 °C to 65 °C (-4 °F to 149 °F)

Wind Loading Sustain winds of 240 kph (150 mph) when properly installed and mounted (wall, pole, ceiling, and over the roof mount with proper support).

Regulatory

Emissions	FCC: 47 CFR Part 15, Subpart B Class A CE: EN55022 Class B CE: EN61000-3-2 CE: EN61000-3-3 AS/NZS 3548, Class A CISPR22 ICES-003
Immunity.....	CE: EN50130-4
Safety	UL: UL1950 CUL: CSA 22.2 No. 950 CE: EN60950 IEC950

6.6. Outdoor Motorized Camera Housing

6.6.1. Description

Compact, attractive dome housing suitable for use in outdoor locations subject to extreme temperatures and wet conditions. The housing will incorporate a “twist-lock” mounting base to facilitate quick connection and disconnection of the dome housing/eyeball assembly, and a standard 1-½” NPT fitting to accommodate a wide variety of mounts.

6.6.2. Performance Specifications

The outdoor dome housing will protect against water and dust intrusion and meet a minimum of NEMA-4 and IP66 ratings.

The housing must include an outer sunshade and an inner aluminum housing with thermostat, heater, and fans to ensure protection and safe operation of the dome in temperatures of -40 °C to 50 °C (-40 °F to 122 °F) with a humidity range of 0–95% (non-condensing). The housing shall be constructed of reinforced fiberglass high impact polycarbonate material along with a UV stabilized sun shade trim ring and top cover.

The housing must prevent the buildup of ice on the exterior bubble and be able to melt ice that has formed on the bubble during a power outage or other event within one hour of power being restored. The heater must be controllable via auxiliary outputs to aid in the clearing of moisture accumulation. The heater must be of a modular design, easily removable for servicing.

The housing shall operate in sustained winds of up to 240 kph (150 mph) when properly mounted and installed (wall, pendant, corner, pole, and over-the-roof mount with guidewires).

The housing and bubble shall have an Effective Projected Area (EPA) of approximately 125 square inches.

The entire dome and housing will operate from a Class 2 power source requiring no more than 80 VA of power. The dome and housing shall be tolerant of 24 VAC supply voltages from 20 VAC to 36 VAC at 50/60Hz and be installed in accordance with Class 2 requirements.

The housing must include an integral twist-lock I/O board to facilitate quick connect/disconnect of the dome from the housing. The housing shall incorporate “Euro-style” terminal screw connectors for ease of connection, and internal LEDs to verify proper power and communication status. The housing must provide four alarm inputs for use as alarm contacts and a Form C output rated at 30 volts AC or DC, 1 amp. The housing must provide for lightning and surge protection of the video, power, and communication lines.

The housing must offer a choice of either a clear bubble with no light loss or a tinted bubble with a light loss of $f1.0$ or less. The bubble must be sealed with a gasket and secured with tamperproof screws. The appropriate security screwdriver bit must be provided with the housing.

6.6.3. Minimum Performance Specifications

The dome housing shall meet the following minimum operating requirements:

Mechanical:

Construction:

Enclosure.....Aluminum

Sun Shade/

Trim Ring/Top CoverUV stabilized, polycarbonate

ColorLight gray

Height:.....321 mm (12.64 in)

Diameter:.....244 mm (9.61 in)

Bubble:.....Acrylic

Bubble Diameter:.....75.3 mm (6.93 in)

Weight:

Without Dome2.6 kg (5.72 lbs)

With Dome3.8 kg (8.36 lbs)

Shipping Weight:3.3 kg (7.26 lbs)

Mechanical Connection1.5 in NPT

Mounting Options:Outdoor Pendant Mount

Outdoor Pole Mount

Outdoor Over-the-Roof Mount

Outdoor Wall Mount

Corner Mount

Electrical:

Voltage	20–36 VAC, 50/60 Hz
Power	80 watts, maximum
Power-on In-rush Current	3 A
Surge Protection:	
Video.....	Series resistor of 3.9 Ω ; low-capacitance Zener suppressor of 6.5 V, 1500 watts, 500 watts, 8/20 μ sec impulse, 500 watts, 10 kA impulse rated gas tube
Manchester/SensorNet	Isolation transformer coupled, 2000 Vrms; PTC resettable fuse protects transformer; TVS rated at 5.6 V, 40 A, 0.1 joules, 8/20 μ sec impulse, 500 watts, 10 kA impulse rated gas tube
RS-422	Series resistors of 33 Ω ; TVS rated at 5.6 V, 40 A, 0.1 joules, 8/20 μ sec impulse, 500 watts, 10 kA impulse rated gas tube
Alarm Inputs (4).....	series resistors of 33 Ω ; TVS rated at 5.6 V, 40 A, 0.1 joules, 8/20 μ sec impulse, 500 watts, 10 kA impulse rated gas tube
Power Line	TVS rated at 60 V, 250 A, 1.5 joules, 8/20 μ sec impulse, 500 watts, 10 kA impulse rated gas tube
Auxiliary Output	1000 V isolation Form 1-C relay
Allowable drop out:	150 ms

Environmental:

Weatherproof Standard	NEMA 4/IP66
Operating Temperature	-40 °C to 50 °C (-40 °F to 122 °F)
Humidity	0–95% RH (non-condensing)
Storage Temperature	-10 °C to 50 °C (14 °F to 122 °F)
Wind Loading	Sustained winds of 240 km/hour (150 miles/hour) when properly installed and mounted (wall, pole, ceiling, and over-the-roof mount with proper support)
Effective Projected Area (EPA)...	~125 square in (~317.5 square cm)

Regulatory:

Emissions	FCC: 47 CFR Part 15, Subpart B Class A CE: EN55022 Class B CE: EN61000-3-2
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CE: EN61000-3-3
AS/NZS 3548, Class A
CISPR22
ICES-003

Immunity.....CE: EN50130-4

SafetyUL:UL1950
cUL:CSA 22.2 No. 950
CE: EN60950
IEC950

6.7. Speed Dome Camera Controller

6.7.1. Description

Microprocessor-based controller for complete control and programming of up to 64 cs Speed Dome and supports advanced features of the Quest triplex series of multiplexers.

6.7.2. Performance Specifications

The controller shall provide all control parameters and system programming required for the Speed Dome. The controller must be ergonomically designed and suitable for use on a desktop or laptop.

The controller must provide a variable speed track ball for controlling variable speed pan and tilt movements of domes. A back lit LCD display areas shall be provided for controller and dome programming and operation.

The controller shall provide for the ability to program and control up to 64 Speed Dome series domes. The code for the control shall be American Dynamics Sensor Net and shall be connected to domes via an EIM module. The Sensor Net code shall be transmitted over a single, 22 AWG unshielded-twisted pair of wires for a maximum of 1000 meters (3300 feet). The maximum number of devices that can be connected within a network link within the 1000 meters (3300 feet) shall be 16. Network links shall consist of a daisy chain, a backbone, or a star topology.

At a minimum, the controller shall provide the following programming and/or control functions: video input or camera selection, pan/tilt or dome control; pan, tilt, view (preset) set and call, pattern set, call and repeat, apple peel (default Speed Dome pattern), flip; lens control; zoom, focus, iris, Auto focus/iris return; sequence control; alarm control and dome programming for suitably equipped domes.

The controller shall provide for a 16-event camera sequence, which may include presets, patterns, and fixed cameras. Each event shall allow for individual dwell times between 1 and 90 seconds.

The controller shall be capable of handling four simultaneous dome alarms. If more than four simultaneous alarms should occur, the controller shall automatically remove the oldest alarm from the queue. The controller shall allow for automatic alarm acknowledgement or manual alarm acknowledgement.

The controller shall allow for the programming and recall of up to 96 dome presets and three dome patterns for each installed dome.

The controller shall provide the ability to interface to a second controller for control of common domes.

The controller shall provide RS-232 communication via an EIM module for integrating to AD and Robot series of compatible quad splitters and multiplexers. The integrating shall also include the AD series of compatible Digital Video Recorders.

The controller shall provide access to front panel functions for the Quest triplex series of AD multiplexers. These functions include programming of the multiplexer sequence, freeze frame/freeze field functions, and control of the digital zoom.

The controller shall provide three modes of password protection: administrator, programmer, and user. When no password is used, the controller shall provide the same level of use as administrator mode. Each installed controller shall have the ability to implement passwords independently.

The controller shall provide for customizable settings for LCD backlighting brightness and key click volume. The controller shall provide the ability to turn the key click sound on or off.

The controller shall have the ability to support multiple languages via the LCD display and controller overlay. The display of information, messages and control keys shall be provided in the following languages: English, French, Spanish, German, Italian, and Portuguese.

A self-test mode must also be provided to verify hardware and software operation of the LCD display, communications port for dome control, track ball calibration and memory.

6.7.3. Minimum Performance Specifications

The controller shall meet the following requirements.

General

The controller shall provide complete control and programming for up to 64 Speed Dome series domes. The controller shall have the ability to interface to a second controller and/or integrate to a compatible quad splitter, multiplexer or digital video recorder.

Keyboard Control

Camera Control:

- Pan/Tilt.....Variable speed tracker ball to control pan and tilt speed movement of domes
- CameraCalls a specified camera for control
- DisplaySelects full screen, quad, 3×3, or a 4×4 display when the primary controller is interfaced to a compatible multiplexer
- IrisOpen/Close, Return to Auto Focus/Auto Iris
- Zoom control.....Wide/Telephoto

Focus control.....	Near/Far
View	Selects presets for a specified video input
Pattern	Selects patterns for a specified video input
Repeat Pattern	Repeats patterns for a specified video input
Peel.....	Activates Apple Peel pattern (default SpeedDome pattern) for a specified video input

Utility Buttons:

A, B, C and D.....	Function keys for various operations; provides access to the Quest triplex multiplexer front panel functions
Numeric Keypad	Enters numbers associated, Cameras (video inputs), Views, Patterns, and alarms
Clear.....	Clears the last keyboard entry or active alarm
Sequence	Initiates the controller sequence
Next.....	Displays video from the next input in a sequence
Previous.....	Displays video from the previous input in a sequence
Menu	Invokes the controller menu
Output	On/Off: Toggles the state of the dome output
Info.....	Used to toggle display of the DirectSet menu for SpeedDome Ultra VII series and newer domes. When used with the DirectSet menu number, provides direct access to the designated dome function.

Language Support

English, French, Spanish, German, Italian, Portuguese

Connections

SensorNet RS-485.....	Control code for up to 64 domes
RS-232	Interface to AD/Robot quad, multiplexers and digital video recorders

Electrical

Input Voltage	16–32 VAC, 50/60 Hz
Power Consumption	10.8 watts
Current	450 mA

Mechanical

Mounting.....	Desktop or laptop
Dimensions (H × W × D).....	130 × 194 × 260 mm (5.12 × 7.63 × 10.24 inches)
Weight.....	1.0 kg (2.2 lbs)
Color	Black shell with gray appliqué

Environmental

Environment.....	Indoor
Operating Temperature	0–50 °C (32–122° F)
Humidity	5-95% RH (non-condensing)
Storage Temperature.....	-20 °C to 65 °C (-4 °C to 149 °F)

Regulatory Approvals

Emissions	FCC: 47 CFR Part 15 Subpart B, Class A CE: EN55022 Class B CE: EN61000-3-2 CE: EN61000-3-3 AS/NZS 3548, Class A CISPR22 ICES-003
Immunity.....	CE: EN50130-4
Safety	UL: UL1950 cUL: CSA 22.2 No. 950 IEC950 CE: EN60950

Product Compatibility

Domes	All SpeedDome Optima and SpeedDome Ultra Series domes
J-Boxes.....	All versions of Indoor and Outdoor SensorNet J-Boxes
Quads	All Sensormatic, Robot and American Dynamics Quads
Multiplexers	Robot/Sensormatic Simplex and Duplex models, including the Multivision Pro series Multivision Quest series triplex models (requires ADTT16E software version 0701-2834-0201 and later)

6.8. 22" SVGA Monitor

- 22" CRT monitro.
- 248X1536/75 Hz maximum resolution.

- Brightness and contrast control.
- 90-260 VAC power supply.
- UL, CSA, TUV-GS, SEMCO safety regulation.

6.9. 15" CCTV Monitor(Optional)

- 400 TV lines resolution
- Pure flat and square screen display
- Front panel On Screen Display (OSD) controls in six languages
- 3 channel switchable inputs: A/B/VCR (auto or manual)
- Auto termination
- NTSC or PAL auto detect
- Looping Video BNC and Y/C input/output
- Compatible with 100-240 VAC 50 Hz/60 Hz
- Rugged metal cabinet
- Three types of reputable and well known CCTV products shall be submitted for approval.

7. SECURITY SYSTEM

General:-

The contractor shall supply and install in the project a hold-up alarm system complete with all accessories and connection as shown on the drawings and describe in the specification.

The contractor shall co-ordinate with the engineer to define, in accordance with project furniture layout, the exact location of hold-up alarm initiating devices.

7.1. Main control panel:-

A. 12 Zones control panel, all are capable of being insulated (Shunted)

The zones may be used for door contacts, which have to be isolated during business hours to avoid false Alarm.

The user's control should be key operated giving setting for (Day – Night – Test – Reset) conditions. Visual indications should be green indications for shuntable zones and red for 24 hours zones.

An indicator test button should also be included. Power supply should be 230 VAC with 12 VAC integral standby battery.

The main panel shall be equipped with many telephone number automatic dialer.

B. operation:

Setting the key to day position shunts or isolated the 2 green zones, leaving the 2-24 hours red zones still active.

Setting the key to night activates all circuits to live condition.

To enable the panel to set inside the building and still permit the use to leave without raising and alarm, a time delay circuit giving the operator time to leave and lock the main entrance door. The main door key should be wired to the setting circuit on the panel, so that locking the front door immediately makes all circuit live and active until the panel is switched back to day setting.

7.2. Trip Devices:-

A. Magnetic Door Contacts:

A magnetic reed door contacts which will activated the alarm if the door opened by unauthorized person during night.

B. Manual Call Point:

To activate the alarm, the manual call point shall be pressed by thumb and forefinger, to avoid accidental false alarm.

C. Siren:

Outside siren or bell shall be self contained with battery.

D. Acoustic detector:

It shall detect in “Omni-directional the passive sonic glass break produced by the breaking of most type of glass. It will analyze three sound dimensions, frequency, amplitude and rate of change. It will operate up to 60 ft. of the unit in an open area.

It shall discriminate against airplanes, trucks, trains.....etc., where a sound may build up over a given time period.

It shall eliminate false alarm.

7.3. Wiring:

All wiring shall be run through P.V.C. conduits, imbedded or through P.V.C trucking.

The color shall be decided be the engineer according to the site any cut in the wires shall activate the alarm.

7.4.Auto Dialler:

An auto dialer shall be connected to security system and installed in building, which can be connected with (4) out telephone numbers.

7.5. Three types of approved reputable manufacturers shall be submitted for approval

8 . UNINTERRUPTIBLE POWER SUPPLY (UPS)

Contract calls for supply, install, connect, commission and maintain (U.P.S.) of
1- 12 KVA 3 phase in / 3 phase out for Distribution Board (UDB).

Of the following characteristics:

- a. Full automatic electronic circuitry, on line system suitable for computer use.
- b. Input Voltage Three phase 400V \pm 10% Three phase, frequency 50 Hz \pm 5% .
- c. Output Voltage Three phase 400V \pm 1%, frequency 50 Hz \pm 0.1% .
- d. Load power factor 0.8 – 0.7 lag .
- e. It can work 125% - 150% over load for minimum 20 seconds .
- f. It contains mimic panel with indicating lamps to show status of the equipment. (Full status Indicators) .
- g. Sealed lead – acid Batteries .
- h. Battery stand by period at full load for 15 minutes.
- i. Solid state equipment not servomechanism .
- j. Any changes in the voltage such as sags, Surges, Spikes transients and various noise should be eliminated .
- k. Fast response time (A 10% supply variation will be corrected within less that 0.3 sec.) .
- l. Over load protection .
- m. High and low voltage shut off and Auto-reset .
- n. Short circuit protection – Auto shut – off and Auto Recovery .
- o. Low & High Voltage – Cut off + Auto Recovery .
- p. Wave form sin wave .
- q. Temp. range 0 – 40° C.
- r. Maintenance for Two years after commissioning Including spare parts.
- s. Low noise level equipment [\leq 65 dB (A)] at 1^{mt} .
- t. Original Catalogues in English Language to be supplied with the offer, Two sets.
- u. Weight & Dimensions to be mentioned .
- v. Manufacturing origin and country to be mentioned .
- w. Supply and install a shutdown software (Under UNIX) .
- x. Automatic / Manual Bypass is included .
- y. Maintenance Bypass with all accessories needed is included ..
- z. Three types of reputable and well known manufactures shall be submitted for approval.
- aa. The contractor shall remove the whole of the system and re-install anew similar one if an unsolvable problem occurred in the system.

MECHANICAL WORKS
Special specifications

Mechanical Works

1 General

1.1 Extent of the Work

The work shall include unless otherwise specified, the supply, installation, commissioning, testing and handing over in a clean, and working order, the mechanical installations shown on the drawings as specified.

The contractor shall furnish all the materials, labor, tools, instruments ...etc., necessary to execute the work in a first class manner.

1.2 Material

The contractor shall obtain the approval by the owner / Engineer before ordering any material for installation, all material submittals should be **within the first month** of the project.

Upon completion of the work, the contractor shall submit **two sets** of catalogues and operation / maintenance manuals of all equipment installed in the project to the owner filed in a hard folder for his future reference, containing the following information:

1.2.1 - Brief description of each system and equipment with basic operation features.

1.2.2 - Descriptive literature of equipment and components with manufacturer's name, model number, capacity rating and operating characteristics.

1.2.3 - Service manual prepared by the manufacturer for every major piece of equipment giving operating and maintenance instructions, starting and shut down instruction's, lubrication instructions and list of possible breakaway and repair's.

1.2.4 -manufacturers list of general spare parts for every piece of equipment.

1.2.5 -manufacturers list of recommended spare parts for every piece of equipment.

1.2.6 - Detailed and simplified one line, color coded flow diagram of each system with tag number, location and function of each valve and instrument.

1.2.7 – Detailed and simplified color coded as-installed wiring diagrams of motor controller and automatic controls with tag number, location of each instrument and electrical device with description of sequence of operation and inter locks.

1.3 Drawings

The contractor shall submit three workshop-drawing prints for approval before installation commences and **within the first month** of the project. Full co-ordination shall be made between mechanical and electrical works by the contractor in the workshop – drawings before starting the work these drawings shall include:

a) detailed manufacturers' drawings for all equipment & materials, descriptive literature showing the type, dimensions, performance characteristics, installation and operation clearances, capacity, electrical characteristics and power consumption.

b) Detailed workshop installation drawings showing, to scales, all dimensions of equipment, pipes, ducts ... on the plans & elevations with clearances and relation of same to space assigned. At the end of the work and before commissioning, the contractor shall submit to the owner three prints of as built drawings with the original tracing and two sets of compact disks CD compatible with ACAD 14 software

1.4 Training:

The contractor should instruct and train not less than five persons of the owner's staff in the operation and maintenance of every system, device and piece of equipment in the systems, with emphasis on proper start-up and shut down procedure, preventive maintenance and lubrication procedure with recommended lubricants, overhaul and maintenance methods, adjustment and calibration of equipment, instrument and control, the use of tools and safe practice.

Initial operation of systems:

- a. The contractor must submit full Recording Tablet for system testing, balancing and adjusting for approval before completion of the installation.
- b. After installation is complete, operate system for time required to complete tests specified under cleaning, testing, Balancing and adjusting to demonstrate performance in accordance with design equipment and to provide instruction and training to Employer's designated personal.

1.5 Mechanical Maintenance

The contractor shall provide the necessary skills and labor to assure the proper operation and to provide all required current and preventative maintenance for all equipment and controls of his mechanical works provided under this Division for a period of **two years** after substantial completion of the contract .

1.6 Design Site Conditions:

- Location: Amman.

- Outside air dry bulb temperature is 38°C in summer and 0.0°C in winter.

Inside design conditions: Dry-bulb temperature is 23°C in summer and 21°C in winter Relative humidity is 40% in summer and 60% in winter.

2 Pipes

2.1 General

Pipes shall be fixed and installed in accordance with the associated latest edition of codes and standards in a first class manner.

Pipes and Fittings shall be the product of a manufacturer currently practicing the production of these items.

The fittings shall have the same or higher characteristics of pipes

All piping shall be grouped where ever practical and properly aligned in straight parallel lines.

Pipes shall be spaced to allow full insulation and to permit access for operation and servicing of valves.

All pipes fixed to walls shall be supported to prevent strain and distortion.

Pipes run above false ceiling shall be grouped together and supported to the slab by trapeze support.

Pipes run above false ceiling shall in no way run above light fixtures.

All piping to equipment and valves shall be connected with either flanges or unions for dismantling and removal.

The fitting shall be of the screw type for diameters up to 2” and flanged for diameters greater than 2”.

Insulation shield shall be used to protect the insulation on all insulated pipes.

All pipes fittings such as unions, tees, nipples, elbows, etc., shall be galvanized.

All embedded pipes shall be protected with 2 layers of bituminized cloth wrapped around with minimum of 10mm overlaps.

All exposed pipes shall be thermally insulated using Arm flex and wrapped by 50mm wide adhesive tape with at least 10mm overlapping and gladded with 0.6mm thick aluminum sheet metal.

2.2 Pipe Supports

All piping shall be supported to prevent strains or distortions in the connected equipment, valves, branches or the pipe itself.

Piping shall be supported to allow for removal of equipment, valves and accessories with a minimum of dismantling and without requiring additional supports after these items are removed.

Vertical piping shall have heavy wrought iron or steel clamps securely bolted on the pipe with the end extensions bearing on the building construction.

Piping shall be anchored where required to localize expansions or to prevent undue strain on piping and branches.

Anchors shall be entirely separate from hangers and shall be heavy forged or welded construction of approved design

Hangers for insulated and protected piping shall support the pipe without piercing the insulation or protection.

2.3 Pipe Sleeves and Wall and Slab Penetrations

All pipe openings through walls, partitions and slabs shall have sleeves having an internal diameter at least 2" larger than the outside diameter of the pipe and its applied insulation.

Pipes passing through masonry, concrete floor or concrete interior walls shall be provided with sleeves of galvanized standard weight steel flush with walls and ceilings and extending one inch above finished floors.

Where the wall or slab penetration occurs in an exposed area, the annular volume between the pipe and the sleeve shall be filled with plaster or mastic and finished and covered with a suitable escutcheon.

2.4 Pressure Tests

In general, pressure tests shall be applied for piping only before connection of equipment and appliances.

In no case shall piping, equipment, or appliances be subjected to pressures 1.5 of their maximum rating working pressure, but not less than 7 bars.

Tests shall be completed and approved before any insulation is applied.

Pressure test procedures shall be submitted to the owner for approval before one week of the test commences.

After tests have been completed, the system shall be drained and cleaned of all dust and foreign material. All strainers, valves and fittings shall be cleaned of all dirt, fillings, and debris.

In the case a pressure test failed, the tested network shall be repaired and retested.

The prescribed pressure shall be maintained for (24) hours.

3 Drainage System

3.1 Drainage and Storm Water Pipes

All digging, refilling and removing excess sand and other associated builders works shall be included.

The storm water and drainage pipes shall be made of UPVC (6 bar)

All fittings and accessories such as Tees, Elbows, Bends, Sockets, Crosses, and Caps ... etc. shall be included with the pipes.

3.2 External Drainage Pipes

External drainage pipes between manholes shall be laid at least 60cm underground.

Pipes shall be laid on a bed of gravel 20cm thick.

An orange nylon strip, 30cm wide, shall be laid 20cm above underground drainage pipes and shall run along with them.

External pipes shall run with an appropriate slope to ensure the smooth flow of soil and waste.

The internal drainage system shall be tested for tightness at a pressure of 1.5 meter head before connecting it to the fixtures.

Any defects found in material or workmanship shall be replaced or corrected and retested at no cost to the owner.

3.3 General for Sanitary Appliances

The Sanitary appliances and water mixers shall be American or West European – made of first class quality.

The glazing to ceramic and fire clay shall be hard, smooth and without scratches or spots etc.

All appliances shall be of white color.

Appliances include but are not limited to a. wall-mounted Western type W.C.; b. Hand wash basin, c. Wall-mounted Bidets, d. Sinks...

The appliances shall be fixed in the positions shown on the drawings or as directed by the owner / engineer.

The necessary number of supports, brackets, plugs, screws, washers, jointing materials, etc., shall be provided as per the manufacturers recommendations and/or owner's / Engineer's instructions.

Upon the completion of work, all appliances shall be cleaned from plaster, paint, etc. and carefully examined.

An accessory such as the soap holders, towel holders, paper holders, handles, shelves and mirrors shall be included with the fixtures.

Angle valves (Grohe) or equivalent and flexible connections or stainless steel tubes shall be included with the fixtures.

3.4 Wash Basins

Shall have one center hole, waste hole and overflow hole.

Shall be either counter-top or wall-mounted (half column) as shown on drawings.

Wash basins shall include chrome plated supply fittings, hot and cold chrome-Infrared-electronic battery water supply with volume limiter mousseur chrome mixers.

Basins with cold water only shall have chrome plated taps.

Waste fittings shall be 32 mm chrome plated.

Trap shall be high-quality bottle white plastic trap according to BS3943 or equivalent with 32 mm dia. waste connection and 32mm dia overflow connection with rubber proper sealing fitting (west European made) .

Chrome plated angle valves and flexible pipes of the first quality should be provided.

Counter-top wash basins should be oval, self rimming and packed with a template.

3.5 WC

Shall be made of white ceramic.

Western W.C. shall be wall-mounted.

Shall be efficient in operation, hygienic and easy to clean.

Thump- operated flushing mechanism of first quality shall be used for W.C.

Basin shall be fixed with wood screws and bedded with mastic.

Concealed flushing cistern for W.C shall be adjustable from 3 to 9 liter, with low noise dual flush discharge valve, pneumatic removable lid for an easy inlet water connection with large maintenance access and with 15mm flush pipe adjustable in length and with push button actuation (chrome or ABS).

3.6 Bidet

Shall be wall-mounted.

Shall be rim supply and have a trap.

Shall have a hot and cold water supply and mixers of single lever and volume limiter ball joint mousseur.

3.7

Rain Drain

The rain drains (roof and balcony outlets shall drain the water from flat roofs and balconies efficiently. They shall be suitable for the type of roof they are installed on such as hot applied asphalt or mineral felt.

Roof outlets shall be of the domed type, while the outlets used in balconies or any other surface with traffic shall be flat.

Rain drains shall be of UPVC and according to BS 4576.

3.8 Floor Clean Out

Shall include easily removable tile and a cover screwed at two opposite points.

Shall be manufactured of heavy gauge stainless steel.

3.9 Floor Traps

Shall provide up to three simple connections from waste appliances to the soil and waste stack or drainage system.

Shall incorporate a 25mm water seal.

Shall include a lock ring seal on outlet connections.

Shall include a screwed 25mm access point.

Shall include an easily removable tile and grid to complement the surrounding decor.

Shall be manufactured of unplasticized polyvinyl chloride (UPVC) while the cover and mesh shall be made of heavy gauge stainless steel.

Shall have an efficient measure to prevent back draft of odors.

3.10 Kitchen Sink

These specifications apply for both single and double bowl kitchen sinks.

Shall be made completely of stainless steel.

Shall have sides slopping towards the bowls.

Shall be silenced by non-vibrating plates.

Shall have waste holes and overflow holes.

Shall be installable on 20 to 40mm thick working surfaces.

Shall be fitted with a single hole mixer with a single handle lever and cast swivel. spout with stop mousseur.

The surrounding edges shall be filled with anti fungus mastic.

Trap shall be high-quality of bottle white plastic with 40mm dia. waste connection and 32mm dia. overflow connection with rubber proper sealing fitting (west European made).

4 Domestic Water System

4.1

Galvanized Steel Water Tanks

Shall be made of 2mm thick galvanized steel sheets.

shall comprise 40mm dia. enforcement steel pipes inside.

Tanks shall include an overflow and a drain opening with a ball valve.

Tanks shall include a 40x40cm manhole and a suitable cover with a frame of angle steel. The cover shall close tightly.

Tanks shall include a good quality float valve.

Tanks shall sit on 40cm high base fabricated of 5cm angle steel supplied with the tanks.

The base shall be painted with two coats of anti rust paint and two coats of oil paint the color of which shall be agreed upon by the owner / engineer.

4.2 Domestic Water Pipes

Domestic water pipes shall be of class B galvanized steel.

Water pipes shall be insulated with 10mm thick sectional type Arm-flex and wrapped by 50mm wide adhesive tape with at least 10mm overlapping. Exposed pipes shall be further glazed by using 0.5 mm thick galvanized steel sheet metal.

Embedded pipes shall be wrapped with butuminized cloth with at least 10mm overlapping.

4.3 Polyethylene Pipes for Domestic Water

Shall be cross-linked polyethylene (PEX) tubing for hot and cold potable water service distribution.

Pipe shall be 2mm thick or more.

Shall be run in non-corrugated plastic sleeves of suitable diameters (32 mm for pipes of 16 mm, 38 mm for pipes of 20 mm or 25 mm, 50 mm for pipes 32 mm).

Shall have the property of thermal memory.

Shall be manufactured and listed to ASTM F876 and ASTM F877 or Equivalent.

Tubing shall be rated at temperature and pressure of 180°F and 100psi.

4.4 Cabinets for Water Collectors

Shall include bronze or brass collectors, main ball valves and mini valves on each branch.

Shall be equipped with an automatic air vent on each collector.

All components in the cabinet have to be manufactured by the same company.

The cabinet shall be of enamel painted sheet metal of at least 1.5mm thickness and similar to that used for electrical cabinets.

The cabinet's doors shall open and close completely and smoothly.

In case the cabinet was exposed, pipes penetrating the cabinet shall be surrounded with rubber annular escutcheons at the penetration point.

4.5 Electric Water Heater:

Shall be completely factory assembled.

Shall have automatic controls.

Shall be approved by underwriters Laboratories, Inc.

Shall have provisions for access to all controls and heating elements.

Shall be copper sheathed immersion type element installed with a thermostat, water trap and a cold water inlet baffle.

The inside of the heater shall be coated with enamel in order to prevent corrosion and maintain water purity.

Shall be equipped with a magnesium anode to offer additional protection against corrosion.

The water inlet and outlet pipes shall be made of high quality stainless steel.

Two high quality pressure relief valves shall be provided to offer maximum safety.

The heater shall be insulated using 5cm thick high quality polyurethane foam.

An opening shall be provided at the bottom to facilitate inspection and maintenance if needed.

An external knob shall be provided to control the water temperature up to 90°C

The heater body shall be equipped with an earth connection.

The outer body of the water heater shall be coated with epoxy powder and oven baked at 230°C to offer maximum protection against corrosion and ensure a long lasting and perfect looking surface at all times.

Shall withstand a pressure of 15 bars and shall have an operating pressure of 3 bars.

Hot and cold-water hoses and fixing screws shall be provided free of charge.

5 Fire Fighting System

5.1 General

The contractor must get all necessary approvals by the local Civil Defense Department for suppliers, work shop drawings, submittals and all equipment needed for all kind of fire fighting system.

It is the responsibility of the contractor to provide the services of the engineers to test and commission all the system once installed.

The contractor shall be responsible to instruct the client's personnel on the proper use and correct operation of the system.

Operation and maintenance instructions in Arabic and English language shall be submitted to the client.

5.2 Portable Fire Extinguisher

Shall be wall hung, powder type or CO₂.

Shall be according to the specifications of the Civil Defense Department.

Shall have a rugged all brass and operating valve.

Shall have a large size-operating lever.

Shall have a full vision pressure gauge.

Shall be manufactured of heavy-duty drawn steel cylinder.

Shall have full identification and instructions for refill operation.

6 Ventilation, Heating and Air Conditioning

6.1 Roof Mounted Exhaust Fans

Shall be centrifugal, manufactured and assembled in USA.

High life bearings (more than 100,000 hour)

Shall be supplied with aluminum, backward – inclined and non- over landing wheel.

Aluminum motor cover fan shroud, curb cap with mounting holes and wind-band.

Supplied with vibration isolators.

Shall be licensed to bear AMCA certified sound and Air performance seals or tested according to UL standards.

Shall be completely factory assembled.

Fan motor shall be rated for continuous running in ambient temperature of up to 50 °c.

Exhaust air fans for the parking areas shall be operated automatically by (CO) controller and can be also operated manually.

6.2 Window/Wall and Ceiling-mounted Fans

Shall be silent.

Shall be completely factory assembled.

Air flow rate and sound level shall be tested according to UL standard 507 or equivalent.
Shall have flexible canvas connections when connected to ducts.
Shall be water and air tight.
Shall be made of the best quality plastic for fans less than 150 L/sec.
Shall be made of Aluminum for fans larger than 150 L/sec.
Shall incorporate automatic shutters.
Shall be mounted as instructed by the manufacturer.

6.3 Duct Work

All sheet metal ductwork shown on the drawings, specified or required shall be of standard construction, fabricated and erected in a first class workmanlike manner as per ASHRAE and SMACNA standards.

The ductwork shall be constructed of galvanized steel sheet material of suitable thickness but not less than 0.9 mm.

Ducts shall conform accurately to the dimensions indicated on the drawings.

Ducts shall be straight and smooth on the inside, with joints neatly finished.

Sheet metal ducts shall be properly braced and reinforced with steel angles.

Rectangular ducts shall be constructed by breaking the corners and grooving the longitudinal seam.

Elbows and Transformation sections many are formed with Pittsburgh corner seams.

All equipments connected to duct should have a flexible canvas connection .

Complicated fittings shall be constricted with double seams.

Duct with dimensions greater than 1000mm (width or height) shall be reinforced with steel angles.

Duct for heating and cooling should be thermally insulated using 5cm thickness rock-wool , tapes and steel belts around the insulation. Exposed ducts should be further gladded by using 0.7 mm thick galvanized steel sheet metal.

Volume dampers shall be used for each branch duct and as shown on drawings .

Fire and smoke dampers shall be used according to the instructions of Local Civil Defense Department.

6.4 Air Inlets and Outlets and Air Louvers

All grilles and diffusers shall be of extruded aluminum; details and sizes of which are as shown on drawings.

Grills and diffusers shall be supplied with built-in dampers.

They shall have sponge caskets around the frames.

Color and finish shall match the surrounding and shall be approved by the architect.

Air louvers designed for use as air intakes or exhaust for air conditioning system should be approved by the architect to meet requirements. Produced from heavy gauge

extruded anodized finish aluminum bars .Blades and frame are mechanically fastened to provide rigid of mitered joints.

Louvers are completely weather proof and rain proof blade lips. Dimensions as in drawings

6.5 Variable Refrigerant Flow (VRF System Specifications):

Heat pump system, with rapid response time. R410 A refrigerant agent. All the indoor units will be operated from a single outdoor unit without the need for an additional PCB (Printed Circuit Board).

System is modular and outdoors can be combined to have the required capacity. Each module contains an inverter compressor in order to modulate according to the demand of the indoor units. Each module can be operated independently of the total combination in case of a failure of a module or compressor. The combination ratio between indoor units is 100 %.

The system should have the ability to run with the following conditions:

Outdoor Unit:

Modular design enables the units to be joint together in rows. Light weight and vibration free so no additional reinforcement is needed for the location of the unit slab. High-capacity condenser/evaporator optimized for R410 A refrigerant. Less refrigerant charge through compact construction with HI-X Cu piping in counter-flow design. Specially profiled aluminum vanes, achromatized and plastic coated for surface protection against corrosive air, acid rain and saline air each module should contain an inverter compressor in order to modulate capacity according to the demand of the indoor units. Each module can be operated independently of the total combination in case of a failure of a module or compressor.

Unit construction:

Rugged, integral unit module with base frame and sturdy feet. Weatherproof, galvanized steel plate, primed and powder coated for outdoor or indoor installation. Easy access from the front, for operation and servicing. From size 20, combination of two modules, from size 38, combination of three modules. The modules are combined using the connection piping provided. All units are the same height and depth; they can be installed neatly in rows. Unit color finish is ivory white.

Compressor:

Either scroll type compressor with at least one moving component (inverter scroll) or twin rotary compressors of inverter type or digital scroll compressors; optimized for R410 A refrigerant in a hermetically sealed, pressurized gas cooled, sound insulated casing with integrated drive motor. Modules for small capacity less than 18 hp each include an inverter compressor with DC motor (digitally commutated brushless DC motor), which is frequency controlled.

For module sizes 10 - 12, the inverter compressor is operated in conjunction with a fixed-speed compressor (for module sizes 14 - 18, with two fixed-speed compressors). All compressors are fitted within the unit on anti-noise mountings. To prevent a large surface area oil separator is installed on the outlet side. In addition, an automatic oil return cycle for the whole of the system network is periodically activated by the MICRO-PROCESSOR system controller. The installation of oil lifters in the system is thus no longer necessary. The compressor, the electrical and thermal motor protection and the oil sump heating are all controlled by the MICRO-PROCESSOR system controller.

Cooling circuit:

Optimized for the use of R 410 A refrigerant. Cooling circuit comprising refrigerant collector, filter and oil separator. Four-way changeover valve for switching between cooling/heating and dynamic defrost circuit by reversing the circulation flow. Optimum level of fill for the evaporator and overheating control for the heating mode by way of an electronic injection valve (EEXV) with 2000 servo steps, controlled by the Micro-processor system controller.

Fan:

Propeller. Quiet operation, slow running, propeller fans with characteristic curve optimized for partial load for large volume of air at low noise level.

Aero Fitting Grill, swirl optimized, protective grill, for vertical air discharge.

DC fan motors (digitally commutated brushless DC motor). Optimum pressure flow in the heat exchanger through quasi-permanent fan speed control by the micro-processor system.

External Static pressure > 60 Pa.

Control & safety devices:

Control sensors are provided for low pressure, high pressure, refrigerant suction temperature, oil temperature, heat exchanger temperature and outside temperature.

Safety pressure switches are provided for low and high pressure (manual reset on the remote control). The unit is equipped with shut-off valves for suction and liquid pipes and service connections with Schrader valves. The refrigerant circulation is dried, evacuated and charged with the required refrigerant. The size 8 -16 outdoor unit modules are designed for expansion. The result of this is 19 possible modular combinations, which, as an overall system, can have a cooling capacity of between 50.4 and 133.5 kW with 2 or 3 modules respectively.

Functions:

- **Low-Noise Operation:** Noise-reduced Operation, night time operation.
- **i-Demand:** electrical peak load limiting and compressor sequence run-up.
- **Sequence start:** automatic run-time compensation between compressors, several modules.
- **Self-diagnosis function:** for outdoor and indoor units over the data bus with operator access via the local manual operating level and/or via the diagnosis tool: Computer - presentation and storage of all process parameters for effective system maintenance. Including maintenance protocols print out.

Backup function:

If a compressor failure occurs in single module systems the remaining compressor ensures a 50% system capacity. This function is activated at the outdoor unit. If a compressor fails in a module in a two or three module systems, this module can be de-activated. The remaining module or modules then keep up hold the basic supply. The operator can use the remote control to activate this function.

Auto Restart:

Built in auto restart capability to ensure automatic system start after power failure.

Auto initialization:

Automatic detection and addressing of the indoor units on the system.

Automatic charge up :

Refrigerant charging is done automatically via the outdoor unit. Charging refrigerant stops automatic when the appropriate volume of refrigerant has been transferred.

Leak check function:

Refrigerant containment detection.

Operation Range:

Heating 15.5 °C WB to -20 °C WB.

Cooling 43 °C DB to -5°C DB.

CE Conformity

The Low Voltage Directive LVD73/23/EEC, EMC Directive EMV89/336/EEC and Machine Directive MSD89/392/EEC are supplied with the unit. The CE symbol verifies the PED conformity of the unit (every single pressure unit within the module is conformity assessed).

Expansion Valve:

Electronic injection valve with 2000 servo steps, controlled by the Micro-processor system controller.

Defrost:

Short, direct defrost function by reversing the circulation flow.

Connection ratio:

From 50% up to 200%

Piping Limitations

Max. Piping length: actual 165 m (190 m equivalent).

Total system piping length: 1000 m.

Height difference between outdoor and indoor: 50m

Distance after the first branch: 90 m.

Indoor Unit:

Modern style, extremely quiet in operation, long-life washable filters, vibration free, large surface area with HI-X Cu piping R410 A C counter-flow design with profiled aluminum fins. Electronic expansion valve with stepping motor, 2000 steps for precise cooling unit adjustment between 0%-100%.

Concealed:

False ceiling duct connection unit.

More than 80 Pa external static pressure.

Microprocessor temperature control.

Height not more than 300 mm.

Radial fan, vibration-free and quiet running. Protected by a thermal contact.

Standard drain pump up to 500 mm.

Fresh-air admixing can be admixed via a punched aperture. Sound pressure not more than 40 dBA @ high speed.

Ducted:

False ceiling duct connection unit.

More than 150 Pa external static pressure.

Microprocessor temperature control.

Radial fan, vibration-free and quiet running. Protected by a thermal contact.

Optional drain pump up to 500 mm.

Sound pressure not more than 48 dBA @ high speed.

Wall / Floor mounted:

White, impact-resistant washable casing.

Casing with sound-absorbing, thermal insulation of PE foam.

Front air intake through a large surface area, washable, long-life filter.

The air is discharged via an outlet with motorized, horizontally adjustable flaps.

Flaps close automatically, when the unit comes to a standstill.

Auto swing mechanism.

Microprocessor temperature control.

Cross flow fan, multiple steps, vibration-free and quiet running. Protected by a thermal contact.

Optional drain pump up to 1000 mm. Sound pressure not more than 45 dBA @ high speed.

Ceiling mounted:

White, impact-resistant washable casing.

Casing with sound-absorbing, thermal insulation of PE foam.

Bottom air intake through a large surface area, washable, long-life filter.

The air is discharged via an outlet with motorized, horizontally adjustable flaps.

Microprocessor temperature control.

Cross flow fan, multiple steps, vibration-free and quiet running. Protected by a thermal contact.

Optional drain pump up to 600 mm.

Sound pressure not more than 45 dBA @ high speed.

Cassette:

Elegant, ceiling-mounted, ivory white, impact-resistant, washable decoration panel.

Air suction through the panel below, which has an integrated, long-life air filter.

The air is discharged via four outlets with motorized, air vanes, which can be Horizontally and vertically adjusted between 0 -90 °.

Two sides can be closed off to facilitate corner installation.

Turbo fan, phase controlled multiple steps, vibration-free and quiet running.

Protected by a thermal contact.

Fresh-air admixing can be admixed via a punched aperture.

Microprocessor temperature control.

Height not more than 300 mm.

Fan motor thermal protection.

Standard drain pump up to 750 mm.

Sound pressure not more than 45 dBA @ high speed.

Control wiring:

A simple 2-wire non-shielded multiplex transmission system links each outdoor unit to multiple indoor units using one 2-wire, non-polar to simplify the wiring operation.

Pipes Connection:

Possibility of use either joints or headers.

Connection sizes must be selected according to the system supplier recommendation.

Control:

Individual control for each indoor unit to be synchronized with the out door unit.

Wired remote controller with digital display and function buttons.

Equipped with real time clock to enable weekly and daily schedules.

Possibility to be connected to a centralized controller or to a BMS system.

Pipes:C1220 type copper tube for refrigerant piping.

Units in mm

Pipe Outside Diameter	Pipe Wall Thickness
6.4	0.8
9.5	0.8
12.7	0.8
15.9	1
19.1	1

22.2	1
25.4	1
28.6	1
34.9	1.3
41.3	1.7

Pipes Connection:

Possibility of use either joints or headers, connection sizes must be selected according to the system supplier recommendation.

Installation

Installation must be according to the system supplier recommendation.

Refrigerant R410 A

Origin: Europe – Japan – Korea.

6.6 Roof-Top Packaged Air – Conditioning Units :

Shall have multi– stage hermetic Scroll compressors using friendly -ozone refrigerant : such as R410A, R134a, R410c.

Shall be double skin and suitable for outdoors installation.

A high-quality paint finish shall protect the pre painted steel panels.

The units shall be designed for extremely quiet operation.

Shall have fans to offer a uniform air distribution and maximize coil output.

The units shall offer exceptional installation flexibility.

Units shall have a low noise centrifugal supply and return fans that permit ducted installation with suitable static pressure.

Units shall include factory-mounted valves and controls.

The units connection side shall easily be changed form right to left or vice versa.

A high precision, electronic unit control with accuracy of $\pm 0.5K$ shall be mounted on. The right or left of the unit or on the wall.

The electric connections shall be in a separate control box in a protected location.

A positioning template shall be supplied with the unit to facilitate installation.

Routine maintenance shall be limited to filter cleaning.

The filter shall be installed to be easily accessible for cleaning and maintenance purposes.

Units shall comply with UL tests.

Each unit should have a variable speed switch controller and a pro-dialog plus control system which allows programming its operation.

It shall be provided with a mixing box and fresh air, exhaust and return automatic volume dampers and fans to get free cooling (**equipped with Economizer**. It shall have flat filters (1 inch)

It is operating at 3 phase, 400V and 50Hz. The supply and return fan speed should not exceed 900 RPM.

It is including all instruments and accessories are included such as valves, dampers, fan speed controller, bracket, hanger's controls, bases **and all necessary works as per drawings and as approved by the Engineer.**

The unit shall stand with the cooling and heating loads and the air flow rate at the design conditions.

The supply fan should be off during the defrost process when the unit is working for heating. Each compressor and fan motor should have a circuit breaker, contractor and internal thermal protection.

Each unit should have high and low pressure switches, a differential oil pressure switch, a filter drier, hot gas muffler, a sight glass indicator, solenoid valves, a thermostatic expansion valve, a low ambient controller, a main disconnect switch, a heat pump with suction accumulator.

6.7 Computer room split air-conditioning unit:

It is a special design to control the temperature, humidity and filtered air in the computer room continuously. The supply air is from the bottom through the raised floor while the return air is from the unit to of the indoor unit. The indoor and outdoor units should have a decorative casing of heavy gauge galvanized steel with electro-static polyester powder paint oven baked and internally lined with 25mm thick fiberglass insulation. The indoor cabinet has decorative front access doors and side panels. The compressor is heavy duty hermetic reciprocating low noise with internal overloads protection. It has an internal relief valve, crank case heater and a rubber vibration absorber. Coils of evaporater and condenser should be manufactured of seamless copper tubes expanded into aluminum fins. The evaporator fans are double inlet double width forward curved centrifugal totally enclosed induction type mounted on its base where there are bubber vibration isolators to eliminate the noise and vibration. The motors should have IP55 protection with class "F" insulation. The coils have an insulated stainless steel drain pan. The air filter should be 50mm thick washable aluminum filter.

6.8 Air Curtain:

Air curtain without heating or cooling elements. It Shall be European made and CE marked of low noise cross flow fan and a heavy duty type, corrosion-proof hot-dip galvanized powder coated coated sheet steel casting. It should be of high efficinecy and equiped with a control box and overheat thermostat on the fan motor. the air flow other information should be taken from plans and tables. The Air curtain shall be horizontal, fixed installation, and it should not be mounted closer than 50mm from the top of the door. It can also recessed in false cielings. The control box is mounted inside the unit or put on the wallbeneath the unit. The air flow velocity by the floor should be approx. 2m/s.The air curtains has an options to have heating elements and often installed in connection with refrigerated rooms and reach-in dairy and florist cases. When the air curtain equipped with heating element the unit shall equipped with overheat thermostat both on fan motor and for the electric heating elements.

BILL OF QUANTITIES:

- CIVIL AND ARCHITECTURAL WORKS

- MECHANICAL WORKS

- ELECTRICAL WORKS

Preamble

1. Generally :

Clauses contained herein should be read as complementary to each other and rules of measurement and rate prevalence should be according to the General Technical Specifications Volume I, II and III issued by the Ministry of Public Works, 1996, unless stated otherwise in the Specifications.

2. Bills of Quantities:

The Bills of Quantities define the items which are measurable and the units of measurement represent the entire work to be carried out in accordance with the Specifications and Drawings.

The measurement items in the Bills of Quantities are to be accepted as the full interpretation of the requirements of the specifications and Drawings. "Descriptions" are given in outline only and the Contractor is to refer to the Specifications and Drawings for the full information required. No additional measured items will be allowed to interpret further the information so given.

Requirements which are not measurable in terms of quantity of labour and materials (eg specialist supervision, shop drawings, as built drawings, samples, tests, mock-ups, maintenance, materials, guarantees and the like) and which are not given as specific items in the Bills of Quantities, are to be included in the measured items.

The method of measurement for the Contract is thus established by the measured items and units of the measurement in the Bills of Quantities.

The same method of measurement and no other will be used in re measuring the executed work.

The Contractor shall satisfy himself as to the meaning of every item in the Bills of Quantities and the rates and prices inserted by him will be deemed to cover all his obligations under the Contract and all matters and things necessary for the proper construction, completion and maintenance of the works.

3. Items in Bills of Quantities:

Such items are the subject of re measurement on completion in accordance with clause 12/2 of the General Conditions of Contract.

Quantities given in the Bills are based upon measurement from the Contract Drawings and Specifications.

4. Measurement:

Metric measurements and weights have been used throughout the Bills of Quantities.

Work is measured net as fixed in position and each measurement is taken to the nearest centimeter. Fractions of a centimeter less than half are disregarded and all other fractions are regarded as whole centimeters. This principle shall not apply to dimensions stated in item descriptions.

Where minimum deductions of voids are dealt with they refer only to openings or voids which are wholly within the boundaries of measured areas. Openings or voids which are at the boundaries of measured areas are always the subject of deduction irrespective of size.

5. Descriptions:

The order of stating dimensions in descriptions is generally in the sequence of length, Width and height.

Unless otherwise stated in the bills of Quantities or herein, all measured item are deemed to include supply and fix in place complete, thus all measured items shall include all incidentals to complete the work in a proper manner such as but not limited to the following:

- (a) Labour.
- (b) Materials, including all costs in connection herewith (e.g. conveyance, delivery, unloading, storing, handling, hoisting, and lowering into position and the like).
- (c) Customs and import duties as applicable, insurances, levies and the like.
- (d) All shop treatment of materials (e.g. preservation of timbers, galvanizing, priming, chrome plating, stove enameling, anodizing and the like, pipe wrapping, coatings, etc.).
- (e) Fitting and fixing materials in position.
- (f) Use of Plant.
- (g) Waste of material.
- (h) Square, raking or curved cutting.
- (i) Work in volumes, areas and length of any size, no separate items being measured for isolated work or work in small quantities, short lengths, narrow widths, etc. . . .
- (j) Sampling and Shop drawings charges.
- (k) Establishment charges, on-costs, overhead charges and profits.

Junctions between straight, raking and curved work are in all cases included with the work in which they occur.

Certain items are referenced directly to detail drawings to eliminate detailed description. All such references include all work to execute the detail.

Where Specification clauses and/or detail drawing numbers are referred to in a description such information is provided for convenience only and the Contractor is to note that all other relevant Specification requirements and relevant drawings and details are to be taken into account.

6. Abbreviations:

The following abbreviations are used throughout the Bills of Quantities:

Linear Meter	LM
Square meter.	M²
Cubic meter.	M³
Number.	No.
Kilogram.	Kg.
Lump Sum	. LS
Reference	Ref.

7. Definitions:

The terms “include”, “is included”, “including”, and similar, are used herein to indicate that the items in question are not measurable as separate items and are not specifically mentioned in the measured items.

Such references are not comprehensive and are for convenience only and the contractor is to note that all relevant requirements of the Specifications and Drawings are to be taken into account in the measured items.

The word “site” used in the Bills of Quantities means the whole of the areas within the Contract limit lines for this Contract as shown on the Contract Drawings. With reference to the clearance of debris, rubbish, trash, excavated material and the like the definition is extended to include the whole of the site.

The word “ditto” used in the Bills of Quantities means the repetition of all or part of the preceding item as applicable to complete the sense of the item.

The word “extra” used in the Bills of Quantities means the additional cost of the item of work in question over and above the cost of work already measured.

8. Protection:

All rates in the Bills of Quantities shall include for protection as required and deemed necessary.

9. Shop Drawings:

All rates shall include where required for producing shop drawings and supporting calculation.

10. As built Drawings:

All rates shall include where required for producing as-built drawings and supporting calculations.

11. Cutting and Patching:

The Contractor shall be responsible for all cutting, patching and making good for all trades for all work and his prices will be deemed to include for all such cutting and patching and making good.