wirtartna

REFERENCE NUMBER: **PA5/0100/01**

TURNKEY TENDER FOR THE RESTORATION AND CONSERVATION WORKS OF ST THOMAS TOWER IN MARSASCALA INCLUDING FINISHING AND RELATED MECHANICAL AND ELECTRICAL WORKS FOR THE CONVERSION OF THE TOWER INTO A MUSEUM

Date Published:	**11/10/2019**	
Deadline for Submission:	**22/11/ 2019**	**at 09:30am CET**
Tender Opening:	**22/11/ 2019**	**At 10:00am CET**

Operational Programme I – European Structural and Investment Funds 2014-2020 –
"Fostering a competitive and sustainable economy to meet our challenges"
Project part-financed by the European Regional Development Fund
Co-financing rate: 80% European Union; 20% National Funds

Bid Bond requirements for this tender: Tenderers are to ensure that the mandatory tender guarantee (bid bond) of €18,000 is to remain valid up to 22 February 2020.

IMPORTANT

Fondazzjoni Wirt Artna
Notre Dame Gate, St Edward's Steet, Vittoriosa, BRG9038

Tel.: (356) 21800992 / 21803091 Email: southerncoastalwatch@gmail.com
Website: http://www.wirtartna.org/tenders.html

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SECTION 1 – INSTRUCTIONS TO TENDERERS

1. General Instructions

1.1 In submitting a tender, the tenderer accepts in full and in its entirety, the content of this tender document, including subsequent Clarifications issued by the Non Governmental Organisation (NGO), whatever the economic operator's own corresponding conditions may be, which through the submission of the tender is waived. Tenderers are expected to examine carefully and comply with all instructions, forms, contract provisions and specifications contained in this tender document. These Instructions to Tenderers complement the General Rules Governing Tenders for NGOs Version 1.0.

No account can be taken of any reservation in the tender in respect of the procurement documents; any disagreement, contradiction, alteration or deviation shall lead to the tender offer not being considered any further.

Prospective tenderers must submit their offer by depositing it in the tender box, located at Fondazzjoni Wirt Artna, Notre Dame Gate, St Edward's Str, Vittorioa, BRG 9038. Any references in the tender document or tender forms to uploading of tender documentation and forms are to be ignored. **Tenderers must submit one original tender offer as well as a soft copy on a USB. Tender reference number and tender title must be clearly indicated on the sealed bid. Prospective tenders take full responsible to submit their offer by the set tender submission deadline.**

Note:
Where in this tender document a standard is quoted, it is to be understood that the Contracting Authority will accept equivalent standards. However, it will be the responsibility of the respective bidders to prove that the standards they quoted are equivalent to the standards requested by the Contracting Authority.

1.2 The subject of this tender is the restoration of the facades and the internal spaces of St Thomas Tower in Marsaskala and the conversion of St. Thomas Tower into a museum:

1.3 The place of acceptance of the works shall be St Thomas Tower, **Dawret it-Torri c/w Triq is-Salini c/w Triq Wignacourt in Marsakala,** the time-limits for the execution of the contract shall be 78 weeks, and the INCOTERM^{2010} applicable shall be **Delivery Duty Paid (DDP).**

1.4 This is a unit-price contract.

1.5 This call for tenders is being issued under an open procedure.

1.6 The beneficiary of this tender is **Fondazzjoni Wirt Artna**.

1.7 This tender is not a reserved contract.

2. Timetable

2.

	DATE	TIME
Clarification Meeting/Site Visit (Refer to Clause 6.1)	N/A	N/A
Deadline for request for any additional information from the NGO **Clarification requests should be addressed to:** southerncoastalwatch@gmail.com	30/10/2019	17.00 CET
Last date on which additional information can be issued by the NGO	08/11/2019	20.00 CET
Deadline for submission of tenders/Tender opening session (unless otherwise modified in terms of Clause 10.1 of the General Rules Governing Tendering for NGOs)	22/11/2019	09.30 CET
* All times Central European Time (CET) / Central European Summer Time (CEST) as applicable		

3. Lots

3.1 This tender is not divided into lots, and tenders must be for the whole of quantities indicated. Tenders will not be accepted for incomplete quantities.

4. Variant Solutions

4.1 Variant solutions are not permissible

5. Financing

5.1 The project is *co-financed* by the European Union/Government of Malta, in accordance with the rules of *Operational Programme I - European Structural and Investment Funds 2014-2020* programme.

5.2 The Contracting Authority of this tender is Fondazzjoni Wirt Artna.

6. Clarification Meeting/Site Visit/Workshop

6.1 No clarification meeting/site visit will be held.

Meetings between economic operators and the NGO during the tendering period are not permitted.

7. Selection and Award Requirements

In order to be considered eligible for the award of the contract, economic operators must provide evidence that they meet or exceed certain minimum criteria described hereunder.

(A) Eligibility Criteria

(i) A Tender Guarantee (Bid Bond) amounting to €18,000 is to be submitted and the tender guarantee must remain valid till 22 February 2020. The tender guarantee must be issued in favour of Fondazzjoni Wirt Artna. Bidders must submit the original tender guarantee together with their bid. The original tender guarantee must be sealed in an envelop clearly indicating on the envelop that the it contains the tender guarantee. The envelop must be placed inside the tender package containing the bid being submitted. (Note 1)

(ii) Declare agreement, conformity and compliance with the provisions of the Statement on Conditions of Employment by completing and submitting the form with title Statement on Conditions of Employment. Please also attach the minimum hourly workers' costs involving the provision of the employees' services. (Note 2A)

(iii) Power of Attorney (if applicable) (Note 2A)

(iv) Submission of the declaration form that stipulates that following signature of contract, the successful bidder, will provide evidence in respect of the requirements stipulated regarding Energy Efficiency through the Energy Efficiency Form (Note 2A)

(v) Information re Joint Venture/Consortium (Note 2A)

(B) Exclusion (including Blacklisting) and Selection Criteria – information to be submitted through the completion of the following declaration forms: (Note 2A)

(i) European Single Procurement Document (Note 2A)

(a) Data Concerning the economic operator to be submitted by filling Part II of the European Single Procurement Document (ESPD). Part II (2A.1 till 2A.13.1) of the ESPD seeks background information about the economic operator.

(b) Part II A Reference 2A.14 till 2A16.6 need only be filled in if the procurement is Reserved. (Note 2A) (Not applicable for this tender)

(c) Part II A Reference 2A.17 till 2A.17.3 need only be filled in when

the economic operator is part of a group, consortium, joint venture or similar. **Furthermore in the case of a Joint Venture/Consortium or group of economic operators the tender must include a preliminary agreement or letter of intent stating that all partners assume joint and several liability for the execution of the contract, that the lead partner is authorised to bind, and receive instructions for and on behalf of, all partners, individually and collectively**. (Note 2A)

(d) Part II A Reference 2A.18 need only be filled where the tender is divided into lots. (Note 2A) (Not applicable for this tender)

(e) Data concerning exclusion grounds to be submitted by filling Part III of the European Single Procurement Document (ESPD). (Note 2A)

(f) Economic Operators must declare that they meet the minimum criteria established hereunder by filling Part IV of the European Single Procurement Document (ESPD). If no Selection Criteria is requested by the Contracting Authority, the relevant part of the ESPD is to be left blank. (Note 2A)

(ii) Declaration concerning *Selection Criteria* (Note 2A)

(C) Technical Specifications

(i) Tenderer's Technical Offer in response to specifications. (Note 3)

Key Experts Form, the Statement of Exclusivity and Availability Form, the Self-declaration form for Key Experts (relating to public employees) and CVs (Note 2A)

The Technical Offer shall constitute the following:

1) Key Personnel(Note 2A) The Key Personnel that the Contractor must deploy are:
   i. A **Qualified Conservator- Restorer** (MQF level 6) in restoration works of a similar nature. This Key Expert must fill in the Statement of Exclusivity;

   ii. An **Architect and Civil Engineer** -***(A Warranted 'Perit' enabling him/her to practice locally as a Perit) (Kindly include Warrant No.)***;

   iii. **Resident Project Manager** (MQF Level 4 in a related area of study) S/he will be responsible for the works - to oversee and co-ordinate the works with the Project Manager of the Contracting Authority in charge of the project. He or she shall act as a single contact point for the duration of works. This Key Expert must fill in the Statement of Exclusivity;

   iv. **Archaeological Monitor** (MQF level 6) qualified and approved by the Superintendent of Cultural heritage;

v. A **Licensed Mason** with a valid building licence (Licence Number to be declared). This Key Expert must fill in the Statement of Exclusivity;

vi. A **Health and Safety Officer;**

vii. A **Land Surveyor** (MQF level 4) in Construction or Civil Engineering) responsible for the plotting/surveying in relation to any excavation/discoveries;

viii. Mechanical Engineer ***(Kindly include Warrant No.)***;

ix. Electrical Engineer ***(Kindly include Warrant No.)***; ***and***

x. Electrician in possession of Licence B (Kindly include Licence No.).

Persons who are engaged in the Public Administration being proposed as Key Experts must fill in the Declaration for Key Experts who are engaged in the Public Administration.

2) A detailed restoration method statement including information on the works to be carried out and on all proposed environmentally friendly products and materials (such as mortar mixes, etc.) which is to clearly illustrate how the tenderer expects to achieve the requirements set in the tender specifications and related bill of quantities. (Note 3)

3) A construction management plan clearly outlining access to the site, hoarding and protection, site storage, the use of machinery and equipment, and the human resources that the tenderer envisages to deploy for the completion of the works in question, in line with the provided Works Method Statement. The plan may include drawings or sketches illustrating site dynamics and logistics. (Note 3)

4) A preliminary risk assessment and outline of the health and safety procedures that the tenderer intends to implement for the duration of the works. These documents shall act as a basis for more detailed reports prior to commencement of works by the winning bidder. (Note 3)

5) A graphic works schedule (programme of works) illustrating detailed work phasing and interim milestones. This tool shall clearly show how the tenderer expects to complete the works within the timeframes set in this tender document The duration of the contract is 78 weeks from order to start works. (Note 3)

Bidders are to ensure that all of the above points are addressed in their submission.

(ii) **Literature** as per Form marked 'Literature List' to be submitted with the Technical offer at tendering stage. (Note 2B)

No changes to the information provided in the Literature submitted will be allowed. Literature submitted shall be rectifiable only in respect of any missing documents. (Note 2B)

Further to the Literature List requested in the tender package, at contract implementation stage, the Contractor awarded the contract will submit necessary literature requested by the Contracting Authority in relation to materials and/or equipment that needs to be purchased for the implementation of the contract. The Contractor shall submit such information prior to placing orders or purchasing materials and or equipment, for the approval of the Contracting Authority. The Contracting Authority has the right to reject proposed materials and/or equipment and will request the Contractor to submit literature of alternative material and/or equipment compliant with the tender specifications. Final approval rests with the Contracting Authority. All products/materials used are to be eco-friendly.

The materials and/or equipment may not be ordered and/or purchased without the prior approval of the Contracting Authority.

Bidders are to sign the technical offer form whereby the bidder confirms that all material and equipment purchased will be in accordance to the technical specifications outlined in Section 4 of the tender document and to the Bill of Quantities

Furthermore Bidders are the sign the GPP Declaration Form whereby the Bidders confirm that during implementation stage of the Contract, they will abide and provide the required literature and verification requirements as listed in the GPP form. Failure to meet these requirements will result in penalties being applied as indicated in the GPP Declaration Form and in Article 11.11 of the Special Conditions to the Contract.

(iii) Samples as per section in Form marked 'Literature/Sample List' maybe requested during the evaluation stage to supplement the technical offer submitted. If requested, the Samples must be submitted within 5 working days of being notified to do so - Not Applicable (Note 3)

(D) Financial Offer

(i) The Tender Form and Tenderer's Declaration are to be completed and submitted with the offer. (Note 3)

(ii) A financial offer is to be submitted by filling in the Bill of Quantities, and is to be calculated on the basis of **Delivered Duty Paid (DDP)[2010] (Grand**

Total) for the works tendered. (Note 3)

Notes to Clause 7:

1. Tenderers will be requested to clarify/rectify, within five (5) working days from notification, the tender guarantee only in the following four circumstances: incorrect validity date, and/or incorrect value, and/or incorrect addressee and incorrect name of the bidder. Rectification in respect of the Tender Guarantee (Bid Bond) is free of charge.

2. A) Tenderers will be requested to either clarify/rectify any incorrect and/or incomplete documentation, and/or submit any missing documents within five (5) working days from notification.

B) Tenderers will be requested to rectify/submit only missing documents within five (5) working days from notification. **No changes to the information provided in the Literature submitted will be allowed. Literature submitted shall be rectifiable only in respect of any missing information.**

All Rectifications are free of charge.

3. No rectification shall be allowed. Only clarifications on the submitted information may be requested.

8. Tender Guarantee (Bid bond)

8.1 A tender guarantee (bid bond) amounting to €18,000 is required. The tender guarantee must be issued in favour of Fondazzjoni Wirt Artna and must remain valid up to 22nd February 2020.

9. Criteria for Award

9.1 The sole award criterion will be the price. The contract will be awarded to the tenderer submitting the cheapest priced offer satisfying the administrative and technical criteria.

SECTION 2 – EXTRACTS FROM THE PUBLIC PROCUREMENT REGULATIONS

Part **X** of the Public Procurement Regulations

270. Any tenderer or candidate concerned, or any person, having or having had an interest or who has been harmed or risks being harmed by an alleged infringement or by any decision taken including a proposed award in obtaining a contract, a rejection of a tender or a cancellation of a call for tender after the lapse of the publication period, may file an appeal by means of an objection before the Review Board, which shall contain in a very clear manner the reasons for their complaints.

271. The objection shall be filed within ten calendar days following the date on which the NGO has by fax or other electronic means sent its proposed award decision or the rejection of a tender or the cancellation of the call for tenders after the lapse of the publication period.

272. The communication to each tenderer or candidate concerned of the proposed award or of the cancellation of the call for tenders shall be accompanied by a summary of the relevant reasons relating to the rejection of the tender as set out in regulation 242 or the reasons why the call for tenders is being cancelled after the lapse of the publication period, and by a precise statement of the exact standstill period.

273. The objection shall only be valid if accompanied by a deposit equivalent to 0.50 per cent of the estimated value set by the NGO of the whole tender or if the tender is divided into lots according to the estimated value of the tender set by the NGO for each lot submitted by the tenderer, provided that in no case shall the deposit be less than four hundred euro (€400) or more than fifty thousand euro (€50,000) which may be refunded as the Public Contracts Review Board may decide in its decision.

274. The Secretary of the Review Board shall immediately notify the Director and/or the NGO as the case maybe that an objection had been filed with his authority thereby immediately suspending the award procedure.

275. The NGO involved, as the case may be, shall be precluded from concluding the contract during the period of ten calendar days allowed for the submission of appeals. The award process shall be completely suspended if an appeal is eventually submitted.

276. The procedure to be followed in submitting and determining appeals as well as the conditions under which such appeals may be filed shall be the following:

(a) any decision by the General Contracts Committee or the Special Contracts Committee or by the NGO shall be made public by affixing it to the notice-board of the same NGO as the case may be or by uploading it on Government's e-procurement platform prior to the award of the contract if the call for tenders is administered by the NGO;
(b) the appeal of the complainant shall also be affixed to the notice-board of the Review Board and shall be communicated by fax or by other electronic means to all participating tenderers;

(c) the NGO and any interested party may, within ten calendar days from the day on which the appeal is affixed to the notice-board of the NGO and uploaded where applicable on the Government's e-procurement platform, file a written reply to the appeal. These replies shall also be affixed to the notice-board of the Review Board and where applicable it shall also be uploaded on the Government's e-procurement platform;

(d) within three working days of the publication of the replies, the Secretary of the Review Board shall prepare a report (the Analysis Report) analysing the appeal and any reply to it. This report shall be circulated to the persons who file an appeal and to all parties who submitted a reply to the appeal;

(e) after the preparatory process is duly completed, the Director or the Head of the NGO shall forward to the Chairman of the Review Board all documentation pertaining to the call for tenders in question including files, tenders submitted, copies of deposit receipts and any motivated letter;

(f) The secretary of the board shall inform all the participants of the call for tenders, the NGO of the date or dates as the case maybe when the appeal will be heard;

(g) When the oral hearing is concluded, the Public Contracts Review Board, if it does not deliver the decision on the same day, shall reserve decision for the earliest possible date to be fixed for the purpose, but not later than six weeks from the day of the oral hearing:
Provided that for serious and justified reasons expressed in writing by means of an order notified to all the parties, the Public Contracts Review board may postpone the judgment for a later period.

(h) The secretary of the board shall keep a record of the grounds of each adjournment and of everything done in each sitting;

(i) After evaluating all the evidence and after considering all submissions put forward by the parties, the Review Board shall decide whether to accede or reject the appeal.

SECTION 3 – SPECIAL CONDITIONS

These conditions amplify and supplement, if necessary, the General Conditions governing the contract. Unless the Special Conditions provide otherwise, those General Conditions remain fully applicable. The numbering of the Articles of the Special Conditions is not consecutive but follows the numbering of the Articles of the General Conditions. Other Special Conditions should be indicated afterwards.

For the purposes of contracts issued by NGOs, the term 'approval from the Central Government Authority' shall be substituted by the term 'approval by the Head responsible for that NGO'; Furthermore, any references to the Contracting Authority throughout the General Conditions shall be deemed to be referring to the NGO responsible for that procurement.

Article 2: Law and language of the contract

2.1 The Laws of Malta shall apply in all matters not covered by the provisions of the contract.

2.2 The language used shall be English.

Article 3: Order of precedence of contract documents

The contract is made up of the following documents, in order of precedence:

(a) the Contract,
(b) the Special Conditions,
(c) the General Conditions,
(d) the NGO's technical specifications and design documentation,
(e) the Contractor's technical offer, and the design documentation (drawings),
(f) the bill of quantities (after arithmetical corrections)/breakdown,
(g) the tender declarations in the Tender Response Format,
(h) any other documents forming part of the contract.

Addenda have the order of precedence of the document they are modifying.

Article 4: Communications

Fondazzjoni Wirt Artna,
Notre Dame Gate,
St. Edward's Street,
Vittoriosa,
BRG 9038
Tel: (356) 21 800992, 21 800992
Email Address: southerncoastalwatch@gmail.com

Communications between the Contracting Authority and/or the Supervisor on one hand, and the Contractor on the other, shall be exclusively in writing and in the English language. Specific and standard procedures of communication (templates of request for information,

contract submittal, site instructions, time of communication and for replies, frequency of meetings) shall be agreed among the Contracting Authority and the winning bidder within fifteen (15) days from the Commencement Date of the Contract, unless otherwise specified in these Special Conditions and in Section 4 – Technical Specifications.

Article 5: Supervisor and Supervisor's representative

5.6 The Contractor shall be responsible to provide all access necessary for verifying and inspecting the works carried out and the items being provided

Article 6: Assignment

Requests from the contractor for a change in assignment will not be allowed except in the case of force majeure which results in the Contractor being unable to carry out the tasks assigned in the contract.

Article 8: Supply of Documents

8.4 Any documents and drawings prepared by the Contractor are to be submitted for approval to the Contracting Authority and the Supervisor, the procedure being agreed to between the parties as indicated in Clause 4 of the Special Conditions.

Article 9: Access to Site

9.1 In addition to sub clause 9.1 of the General Conditions, contractors may be required to suspend all or part of the works being carried out in order not to disturb any official function or activity held as indicated by the Contracting Authority. The contractor will be notified of such suspension of works at least 48 hours in advance and will not be eligible for compensation, apart from an extension of time.

9.5 The contractor is to note that access to the public/private buildings shall be maintained at all times and shall maintain pedestrian and vehicular access (where applicable) at all times. To this effect, the contractor and his employees shall be required to abide by the instructions issued from time to time by personnel responsible for the security of the underlying/adjoining properties and shall ensure that all works are carried out without jeopardizing the security of the place.

Article 10: Assistance with Local Regulations

10.3 The contractor is responsible for complying with local regulations at his expense to ensure the project is compliant with all the relevant local regulations.

Article 11: The Contractor's Obligations

11.9 As per article 15.4 of the Special Conditions

11.11 The contractor shall draw up and submit any drawings as well as any literature, documents or items required for the execution of the works and submit them for approval to the Contracting Authority and Supervisor, the procedure being agreed to between the parties as indicated in Clause 4 of the Special Conditions. The Contractor shall provide the necessary literature as may be requested by the Contracting Authority in relation to materials and/or equipment for the approval of the Contracting Authority prior to order and/or purchasing said material and or equipment. Furthermore the Contractor shall provide the relevant documentation and means of verification as specified in the GPP Declaration Form which the Contractor signed at tender submission stage. Failure to abide by the requirements of the GPP Declaration Form will result in penalties of €5,000 per infringement up to a maximum of 5% of the Contract Value.

11.17 The Contracting Authority and the Supervisor shall make available the tender drawings (and any subsequent revisions to such drawings) to the Contractor at the latter's request and well as any drawings required to carry out the works as the need arises. Any such drawings will remain the property of the Contracting Authority and the Contractor may not reproduce or communicate them to third parties except with the Contracting Authority's agreement.

11.20 Further to Article 11.2 in the General Conditions, the contractor shall deploy the necessary resources so as to maintain a good progress of work on the site and shall also, where necessary, undertake to perform works outside normal working hours, and on public holidays and weekends at no additional cost to the Contracting Authority, so as to ensure the completion of the Works within the required time-frame, in accordance with the Technical Requirements and with the Period of Execution.
Furthermore, the contractor shall be expected to be co-operative and allow the use of his scaffolding and/ or other facilities available on site for the efficient execution of the above-mentioned works. Same contractor will not be entitled to any compensation (financial or otherwise) for these services, etc

11.21 The Contractor shall be obliged to follow any and all instructions issued by the Supervisor in relation to the Works in so far as these fall within the overall scope of the Contract.

11.22 The Contractor shall be obliged to ensure avoidance of disruption and inconvenience to the day to day business on and around the site, including the co-ordination with other contractors that may be engaged on or in the vicinity of the site, the free movement of traffic and pedestrians, except where this is absolutely unavoidable. In particular, the Contractor shall take all such precautions as may become necessary so as to avoid causing any damage to adjacent buildings or property, including public spaces, during the execution of the Works.

11.23 The Contractor shall also, in addition to the above, take any necessary action to ensure and maintain the health and safety of his employees, together with those of the employees of any other contractor engaged on or in the vicinity of the site, together with the general public and shall follow any relevant instructions and /or recommendations of the contractor's Health and Safety Offices and the Contracting Authority Project Supervisor to fulfill the obligations set out in the Legal Notice 281/2004 (SL 424.29)

11.24 In addition to other obligations arising under the Contract pertinent to the execution of the Works, the Contractor shall, following completion of same, fulfill all obligations during the Defects Liability Period as outlined in Article 58.6 of these Special conditions.

11.25 The Contractor shall not dismantle the scaffolding prior to the approval of the Contracting Authority's Supervisor in charge of the project. The contractor shall give the Contracting Authority's supervisor at least one week notice to allow for a final inspection and the measurement of works.

11.26 All lifting equipment used on site shall be certified by a warranted Mechanical Engineer every six (6) months, in accordance with the regulations issued by the Occupational Health and Safety Authority.

11.27 Copies of the certificates shall be sent to the Contracting Authority's Supervisor before commencement of work and as necessary should the six (6) month certification period elapse.

11.28 A suitable "housekeeping" programme shall be established before commencement of the project, and be continuously implemented on the Site.

11.29 The Contractor will be available to attend regular site, management and progress meetings as and when requested by the Contracting Authority.

11.30 A suitable "housekeeping" programme shall be established before commencement of the project, and be continuously implemented on the Site. During the execution of the works, the Contractor shall keep the site reasonably free from all unnecessary obstruction, and shall restore or dispose of any Contractor's equipment and surplus materials and clear away and remove from the site any wreckage, rubbish or temporary works no longer required.

11.31 On completion of the Works, the Contractor shall clear away and remove from site all Contractor's equipment, surplus material, rubbish and temporary works of every kind, and leave such part of the site and works clean and in a workmanlike condition to the Contracting Authority.

11.32 Where during his course of work, the Contractor causes any damage to the Contracting Authority's equipment or facilities, the Contractor must report the damage immediately to the Contracting Authority. The Contracting Authority shall rectify the damage in any way is deemed fit by the Contracting Authority, the cost and expense thereof shall be borne by the Contractor. The Contractor is required to replace/repair or makes good the loss suffered by the Contracting Authority due to any damage caused by the Contractor during the execution of the work.

11.33 The Contractor shall be obliged to follow any and all instructions issued by the Project Manager representing the Contracting Authority in relation to the Works insofar as these fall within the overall scope of the Contract. Regular site, management and progress meetings will be organised by the Project Manager representing the Contracting Authority to monitor both the progress and the quality of the works

Article 13: Performance Guarantee

13.1 The Contractor shall, within 15 days from the last signature on the contract, furnish the Contracting Authority with the original guarantee for the full and proper performance of the contract. It shall not exceed 10% where the amount of the total contract value is €500,000 or

above. The submission of a single bond is not allowed for this contract therefore the single bond schedule listed in the tender form is not applicable.

The performance guarantee must be provided in a timely manner as specified in Article 31.1 of the Special Conditions in order to avoid application of penalties specified in Article 31.1 of the Special Conditions.

13.3 The performance guarantee shall be in the format given in Section 5 and shall be provided in the form of a bank guarantee. It shall be issued by a bank in accordance with the eligibility criteria applicable for the award of the contract.

Furthermore, the Contracting Authority will not affect any payment to the Contractor until the performance guarantee has been submitted.

13.8 The performance guarantee shall be released within 30 days of the signing of the Provisional Acceptance Certificate including any snag lists

Article 14: Insurance

14.1.a Without any prejudice to Article 14.1 a, b, c of the General Conditions, the contractor is required to insure for the whole duration of the contract against risk of damage to the historic fabric of the building being restored through this contract for the amount of €235,000 per accident with the number of occurrences unlimited.

14.2 Without any prejudice to 14.1 a, b, c of the General Conditions, the contractor is required to insure for the whole duration of the contract for the amount of €1,500,000 per accident with the number of occurrences unlimited against each party's liability for any loss, damage, death or bodily harm, that may be caused to third parties, or to any person that is authorized to be on site at any given time, or any damages to property belonging to third parties, including loss of profits that may be sustained by third parties.

14.3 Amount per personal injury and unlimited occurrences as specified in Article 14.2 of the Special Conditions.

Insurance documentation must be provided in a timely manner as specified in Article 31.1 of the Special Conditions in order to avoid application of penalties specified in Article 31.1 of the Special Conditions.

Article 15: Performance Programme (Timetable)

15.1 The Contractor shall provide a detailed Programme of Works.

15.4 The Programme of Works shall be updated monthly or whenever required by the Supervisor, to be in line with the progress of the actual Works. The Programme of Works shall be accompanied by sufficient data and information together with all the necessary details of constructional plant, required labour force, etc. The Supervisor shall approve the Programme of Works within ten (10) working days from submission by the Contractor to the Supervisor. Should the Supervisor consider any alteration in or addition to the Programme of Works as submitted, the Contractor shall conform therewith without additional cost. Any changes to the Programme of Works shall be approved by the Contracting Authority.

Article 17: Contractor's Drawings

17.1 The Contractor shall submit to the Supervisor for approval any drawings, documents, programme of works, technical literature, samples and /or models that the Supervisor may reasonably require for the performance of the contract within 5 working days from written request by the Supervisor or from date when meeting where minutes are taken.

17.7 Further to the provisions of Article 17.7 of the General Conditions, the Contractor must submit a full set of the final drawings upon completion of the project and must do so within 50 days from issuing of the Partial Provisional Acceptance Certificate. Failure to do so will result in a daily penalty of fifty (50) euro up to a maximum of 1% of the contract value.

Article 18: Tender Prices

18.2 The contractor will ascertain that all the respective rates have included double handling, carting away and dumping fees

18.3 The Contractor shall be deemed to have taken into account in his tender price all works, fees and costs that are necessary to complete the project and to fully hand over in operational condition.

Article 19: Exceptional Risks

19.5 Further to the provisions of Article 19.5 of the General Conditions, if the Contractor is granted an extension of time in the implementation of the works, the Contractor cannot make a request for financial compensation for extension of time.

Article 20: Safety on Site

20.2 Further to the provisions of the General Conditions, it is the obligation of contractors to carry out a suitable, sufficient and systematic assessment of all the occupational health and safety hazards which may be present at the place of work and the resultant risks involved concerning all aspects of the work activity.

20.3 Further to the provisions of the General Conditions, it is also the duty of a contractor to cooperate with other employers, contractors and, or self-employed persons who share a common work place, on the implementation of Health and Safety provisions. The contractor or his designate shall co-ordinate necessary actions in matters which concern protective and preventive measures, and shall inform all on site as well as the Health and Safety Project Supervisor regarding any potential risks.

Article 21: Safeguarding Adjacent Properties

21.1 Further to clause 21.1 of the General Conditions, the contractor shall liaise and co-operate with the appropriate Authorities and occupiers of adjoining land and buildings likely to be affected by the works, for all matters regarding access, monitoring, third party rights, and similar.

Article 22: Interference With Traffic

22.3 The Contractor is responsible to obtain necessary permits that may be required if the works impact of traffic. Unauthorised impact on traffic management within the area will result in a penalty of €1,000 per incident up to a maximum of 2% of the contract value.

Article 23: Cables and Conduits

23.3 The contractor shall be responsible for locating existing drains and services, and underground cables and pipes, for seeking instruction from the appropriate authorities as to how to deal with such services, and for carrying out any necessary work relating to deviations or protection, or any other works deemed necessary by the respective Utility or authority. The Contractor is responsible to carry out necessary trenching works required for the laying of the electricity cable that needs to be provided from the nearest sub-station to St Thomas Tower. The Contractor is also responsible for the laying of the cable that will be provided by Enemalta.

Article 25: Demolished Materials

25.1 Demolition material unless indicated otherwise in the bills of quantities and by the supervisor in charge, become the property of the Contractor and the carting away and dumping charges are at the expense of the Contractor.

25.4 Further to article 25.4 of the General conditions, the contractor shall also take care to dispose of the waste material fully at his expenses and in an environmentally friendly manner.

Article 26: Discoveries

26.2 Further to provisions of Article 26.2 of the General Conditions, the Contractor shall observe the provisions set out in the Cultural Heritage Act 2002 (CAP 445) at all times

26.3 Further to the provisions of Article 26.3 of the General Conditions, any in filled fissures, caverns, reservoirs/cisterns, hollows, Quaternary deposits, or other features of geological, geomorphological, hydrological, palaeontological interest which are discovered must be reported immediately to the Superintendence of Cultural Heritage and to the on-site Archaeological Monitor. The contractor shall halt the works and follow all instructions given by the Supervisor and Site Archaeologist (Monitor) to protect or to investigate further the discovery.

The Contractor shall co-ordinate and co-operate with the archaeological monitor (appointed by the Contractor) and with the Local Authorities at all times.

Article 28: Soil Studies

28.1 As per General Conditions of the Contract.

Article 30: Patents and Licences

30.1 As per Article 30 of the General Conditions

Article 31: Commencement Date

31.1 The Commencement Date for this contract shall be 1 week from the Order to Start Works. The performance of the contract is to commence on order to start works. The order to start works will not be issued later than two (2) months from the last date of signature shown on contract.

No works however will be allowed to commence on site unless the Contractor has furnished the Contracting Authority with an original bank performance guarantee, a certified true copy of the Insurance Policy together with all documentation related to Health and Safety. Delay in submitting the performance guarantee within 15 days from the last date of signature of the contract will result in a daily penalty of €100 a day up to a maximum of 3% of the contract value. Submission of the insurance documentation and health and safety documentation following the elapse of 30 days from the last date of signature of the contract, will result in daily penalties of €100 a day up to a maximum 3% of the contract value.

Article 32: Period of Execution of Tasks

32.1 The period of performance of this contract shall be 78 weeks from the Commencement indicated in the Order to Start Works.

The contractor will be expected to commit sufficient resources to carry out works on more than one area at the same time, to guarantee the on time completion of all the Works as specified in this tender.

33.4

Article 33 Extension of the Period of Execution of Tasks

Further to the provisions of Article 33 of the General Conditions, should the Contractor be granted an extension of the period of execution of the tasks that are the subject of this contract, the Contractor cannot make a claim for financial compensation for such extension in the period of execution of the tasks of the contract.

Article 34: Delays in Execution

34.1 Any delay in performance from the approved programme of works for this contract, will be charged 0.1% of the contract value per calendar day of delay up to a maximum of 20% of the contract value.

Upon reaching the maximum penalty, the Contracting Authority reserves the right to terminate the contract and seek the services of a third party for the completion of works.

Article 35: Modifications to the Contract

35.8 The Contracting Authority has a right to increase or reduce works of a similar nature by a maximum of 15% of the contract value which have become necessary for the purpose of achieving the scope of the contract. These inter alia include the detection of unidentified works evident only once the interventions have commenced such as the repetition of cleaning interventions due to stubborn dirt, the repetition of the application of biocides and herbicides, the consolidation, pinning, repair, stone replacement and re-pointing of areas of the stone fabric, the repair of areas of the roof, plastering and additional mechanical and electrical works that may be required following uncovering of the existing exterior formation within the walls and flooring of the Tower both internally and externally. Such works would be resulting from close inspection of works accessible only upon erection of scaffolding or exposed during the course of works.

35.9 The Contracting Authority will have the right to instruct additional works up to a maximum of 15% of the contract value which have become necessary for the purpose of achieving the scope of the contract. Such works would be resulting from close inspection of works accessible only upon erection of scaffolding or exposed during the course of works. These inter alia include works evident only once the interventions have commenced such as the alternative cleaning & plastering interventions, the application of new roof systems, insertion of new reinforcing sections if necessary, changes in the consolidation, new features that are discovered during the works and which will require necessary restoration and even the possibility of encountering buried services which would need to be altered.

35.11 The provisions provided for in Article 35.11 of the General Conditions shall not be applicable to this contract

35.12 The provisions provided for in Article 35.12 of the General Conditions shall not be applicable to this contract

35.13 The provisions provided for in Article 35.13 of the General Conditions shall not be applicable to this contract.

Article 37: Work Register

37.1 The Contractor shall maintain a Work Register (Work Diary) on the site, containing detailed daily reports in the template specified and/or approved by the Contractor's representative (either the Construction/Project Manager or the Site Manager) and approved by the Supervisor, including at least the following information:

(a) weather conditions, interruptions of work owing to inclement weather, hours of work, number and type of workmen employed on the site, materials supplied, equipment in use, equipment not in working order, tests carried out in situ, samples dispatched, unforeseen circumstances, safety, health and welfare of persons and damage to property, progress of the Works, as well as progress of the Works orders given to the Contractor;

(b) detailed statements of all the quantitative and qualitative elements of the work done and the supplies delivered and used, capable of being checked on the site and relevant in calculating payments to be made to the Contractor.

(c) photographic records of the interventions as well as the state of the structures to be restored through this tender prior to the commencement of works. The photographs shall include records of any archaeological, historical, etc evidence discovered during the course of works; detailed mapping of all interventions carried out. The interventions shall be carefully mapped out in conformity to

approved standards and conventions as agreed with and approved by the Architect and Civil Engineer/ Supervisor in charge on drawings provided by the Architect and Civil Engineer/or Supervisor in charge as per convention detailed by the Architect and Civil Engineer in charge. This mapping shall be submitted to the Architect and Civil Engineer in charge/or Supervisor in digital format (Version ACAD 2009 or compliant) and 2 colour printed copies; copies of method statement reports, construction management plans and updated programmes of works as specified in this document and approved by the Architect and Civil Engineer/or Supervisor.

(d) Contractor's Key Expert Archaeological Monitor – The Contracting Authority shall inform the Superintendent of Cultural Heritage, and the Heritage Planning Unit (PA) in writing at least two weeks before any works are taken in hand. The qualified archaeologist (hereunder referred to as the monitor) registered with the Superintendence of Cultural Heritage shall carry out all the archaeological monitoring. Prior to the commencement of the works, the monitor will be provided with the project work schedule to the monitor (so that the monitor may plan ahead the monitoring of the works). The monitor shall liaise closely with, and report as required to the officers of the Heritage Planning Unit (PA) and Superintendence of Cultural Heritage responsible for supervising/monitoring the development through the Contracting Authority. The monitor shall produce and submit to the Heritage Planning Unit (PA) and the Superintendence of Cultural Heritage a written report (accompanied by relevant graphic documentation – photos, maps, illustrations and/or other drawings) as required.

This Work Register shall be made on daily basis and take the form of a bound document with an original and two copies for each day. The original shall be filled out by the Contractor, who shall sign it, then reviewed by the supervisor, who shall add his comments, if necessary, and countersign it. One copy shall be kept by the supervisor for its own record.

Entries made in the work register as work progresses shall be signed by the Contractor and countersigned by the Supervisor or his representative. When the Supervisor reviews each page, he shall add his comments if necessary, to draw attention to deficiencies in the Works or to give warning of difficulties that may arise from the Contractors method of working. He may also instruct in this Work Register that work shall stop in certain circumstances and the Contractor shall take appropriate action immediately. Such instructions shall be followed up by Administrative Orders. If the Contractor objects, he shall communicate his views to the Supervisor within 15 days following the date on which the entry or the statements objected to are recorded. Should he fail to countersign or to submit his views within the period allowed, the Contractor shall be deemed to agree with the notes shown in the register. The Supervisor may examine the work register at any time and may make or receive a copy of entries which he considers necessary for his own record.

Article 38: Origin

38.1 No derogation to the rules of origin is authorised.

Article 39: Quality of Works and Materials

39.2 All designs, components, materials, and restoration interventions/methodologies shall be submitted to the Supervisor (Architect and/or Civil Engineer in charge) for written preliminary technical approval, prior to their implementation or procurement. All requests and documentation must be submitted with 15 calendar days prior to execution of works on site.

Article 40: Inspection and Testing

40.2 As specified in General Conditions

Article 42: Ownership of Plants and Materials

42.2 All equipment, temporary works, plant and materials on site owned by the Contractor or by any company in which the Contractor has a controlling interest shall, for the duration of the execution of the works be:

a) Vested in the Contracting Authority.

Article 43: Payments: General Principles

43.1 Payments will be made in Euro.

Payments shall be authorized by the Contracting Authority, and paid by the Treasury Department

Payment Schedule		
Pre-financing Payment	As per 44.1 of Special Conditions	20% of contract value
Interim Payments	As per measured works	75% of contract value
Retention Monies	As per payment schedule in Clause 45.2 of the Special Conditions	5% of contract value

43.3 As per General Conditions.

Article 44: Pre-financing

44.1 Pre-financing to the Contractor of 20% of the contract value shall be obligatory.

44.2 Pre-financing amounting to 20 % of the contract value shall be granted to the Contractor against the provision of a bank guarantee by Contractor in favour of the Contracting Authority of the equivalent amount.

44.3 Further to Article 44.3 of the General Conditions, the Contractor shall present to the Contracting Authority, within forty five (45) days of the signing of the contract, a bank guarantee of the amount equivalent to 20% of the contract value for the Contracting Authority to release the pre-financing payment of the same amount.

44.8 The pre-financing payment shall be repaid through percentage deductions in payment

certificates as follows:

(a) Advance payment equivalent to 20% of the contract value:

▫ Deductions shall commence in the payment Certificate in which the total of all certified interim payments (excluding the advance payment and deductions and repayments of retention and materials on site) exceeds 10% of the Accepted Contract Amount less Provisional Sums; and

▫ Deductions shall be made at the amortisation rate of 20% of the cumulative amount of each payment certificate (excluding advance payment and deductions and repayments for retention and materials on order or on site) in the currency and proportions of the advance payment, until such time as the advance payment has been repaid in full; and

▫ With every 10% of the pre-financing amount being amortised, the Contracting Authority shall authorize the relevant financial institution to release the equivalent 10% from the pre-financing guarantee granted in terms of Article 44.3 of these Special Conditions. Thus, the pre-financing guarantee shall decrease proportionately throughout execution of the contract.

Article 45: Retention Monies

45.2 The sum of money retained from the interim payments shall be of 5%. This sum shall be paid upon submission of an equivalent retention bank guarantee (issued in the form provided in this tender document) by the Contractor to the Contracting Authority when issuing the Provisional Acceptance Certificate as specified in Article 57. The bank guarantee will be released upon issuing of the final acceptance of the works as per Article 58. The said retention guarantee shall be released only after the conditions requested under Art 58 are satisfied. The retention guarantee will be released within 45 days from when the Final Acceptance Certificate is issued.

Article 46: Price Revision

46.1 Tender prices are fixed and not subject to revision with the exception of that resulting from causes listed under Article 46.3 of the General Conditions.

46.3 As per General Conditions.

Article 47: Measurement

47.2 The works shall be measured as detailed in the Bill of Quantities, and as specified in the appropriate clauses in the Technical Specifications – Section 4. The appointed contractor shall satisfy the Supervisor that the materials are such as specified or equivalent.

Article 48: Interim Payments

48.1 Interim Payments of sums due for the executed and provisionally accepted works shall be authorized by the Contracting Authority and payment will be issued by the Treasury Department within the Ministry of Finance paid against a valid invoice after works in accordance to quality and progress of works. The retention shall be released in accordance to Clause 45.2 of these special conditions. The Contractor shall submit his claim for progress payments to the Contracting Authority in writing. Such claims are to

be supported by evaluation of the works executed and materials installed on site and show the value of the permanent works executed by him up to the end of the month. All claims shall be evaluated by the Contracting Authority in relation to the Bills of Quantities and Contract Rates and documentation produced by the Contractor and on the basis that such works have been executed in accordance with the Contract Documents and to the satisfaction of the Contracting Authority. Provided the Contracting Authority agrees with the statement, the relevant Payment Certificate will be issued.

48.1.1 Furthermore, the Supervisor shall deduct any penalties which may be applicable in each interim payment certificate.

48.2 Further to Article 48.2 of the General Conditions, materials which have been procured by the Contractor for the scope of this contract and which are not on site, shall be eligible for payment provided that the Contractor's Project Manager issues a formal declaration stating the location, quantity and price of these materials. The extrapolation of the price shall be included as part of this declaration and the Contractor's Project Manager shall provide further information upon the request of the Supervisor. The Supervisor shall have the right to revise the quantities and price being requested upon approval of the Contracting Authority. The Supervisor shall be allowed to inspect the premises of storage and keep a photographic record of the materials inspected.

48.2.1 Article 48 (Interim payments) of the General Conditions shall, subject to the following paragraphs of this Article, be applicable also in respect of materials intended for, but not yet incorporated in the permanent works, which are not stored on site, but at the Contractor's plant, so that the term 'site' in Article 48 (Interim payments) of the General Conditions shall, for the purpose of this Article, be construed to be extended to the Contractor's plant. For the purpose of this Article, the Contractor shall submit a plan indicating the locations, within its plant, where such materials will be stored, including the area specifically designated for the storage of each type of materials. The Contractor shall also indicate to the Contracting Authority, in a separate document, the materials, which will be stored at its plant and in respect of which the said Contractor intends to claim payment prior to incorporation in the permanent works.

48.2.2 In addition to the conditions stipulated in Article 48 (Interim payments) of the General Conditions and in the above paragraph, the following terms and conditions shall apply in respect of materials intended for, but not yet incorporated in the permanent works, which are not stored on site, but at the Contractor's plant. Unless expressly stipulated otherwise, the term 'site' in the following paragraphs shall refer to the works site:

a) For the purpose of Articles 48.2 of the General Conditions and in addition to the conditions stipulated therein and in Article 48.4 of the General Conditions, the Supervisor shall only authorise payment for such materials upon being satisfied that the risk of loss or damage to the said materials, from any cause, is covered by insurance taken out by the Contractor in both the Contractor's name and in the name of the Contracting Authority. Such insurance shall cover the entire value of the said materials for the full term of storage at the Contractor's plant, subsequent delivery to the site and offloading at the latter site.

b) For the purpose of and in addition to the Contractor's obligations in Article 48.4 of the General Conditions, the Contractor shall not merely assume the risk connected

with the storage at the Contractor's plant, but also the risk connected with the transport and offloading of the same on the site. All costs connected with the said storage, transport and offloading of such materials shall be entirely assumed by the Contractor.

c) For the purpose of Article 48.2(b) of the General Conditions, the Contractor shall care for and store the said materials with due diligence and as a bonus paterfamilias.

d) For the purpose of this Article, the term 'site' in Article 42.2 of the Special Conditions shall be deemed to include the Contractor's plant. Upon each payment by the Contracting Authority for the said materials, the Contractor shall sign a declaration in further evidence of the Contracting Authority's title of ownership over the same and shall, in the said declaration, guarantee, in favour of the Contracting Authority, the peaceful possession of the said materials. The Contractor shall also declare that there exist no pending warrants of prohibitory injunction or warrants of seizure or any other precautionary or executive warrants issued against the Contractor, which may affect the transfer of ownership of the said materials to the Contracting Authority and that the materials are not subject to any third parties' rights and/or claims of such rights.

e) In the event that the transfer of ownership of materials to the Contracting Authority is, for any reason, challenged by third parties, the Contractor shall fully indemnify the Contracting Authority and reimburse the price paid by the Contracting Authority for such materials, together with any expense, including reasonable legal fees and other expenses, that the Contracting Authority may incur in connection with any action taken by the said third parties as aforesaid and including also any payment made by the Contracting Authority to third parties to protect its title over the said materials and quiet possession of the same.

f) All materials shall be deemed to be exclusively intended for the execution of the works and the Contractor may not remove the same or any part thereof, except for the purpose of moving it to the site, without the consent of the Supervisor. Failure by the Contractor to use such materials in connection with the works shall entitle the Contracting Authority to demand from the Contractor, the reimbursement of the price paid for such materials and any expenses incurred by the Contracting Authority on account of such failure on the part of the Contractor.

g) In the event that materials are rejected by the Supervisor, prior to incorporation in the works, on account of not being of the quality specified or due to defects or faults in the said materials or for any other reason, the Contractor shall reimburse the Contracting Authority with the price of such materials, together with any expenses incurred by the Contracting Authority as a result of such rejection and in connection with the same. The Contractor shall be solely responsible to remove and replace such materials, at his own cost, and to take any action which he may deem appropriate against the supplier for the replacement of faulty or defective materials or for the reimbursement of the price of such materials.

h) For the purpose of the reimbursement mentioned in paragraphs (e), (f) and (g)

above, the Contracting Authority reserves the right to deduct the price of the said materials and expenses or payments mentioned in the said paragraphs, from any payments or monies due to the Contractor in connection with the execution of the works.

i) The price payable by the Contracting Authority to the Contractor for the said materials shall be the price paid by the Contractor to the supplier of the said materials, provided that the said price shall not exceed the price quoted by the Contractor, for the same materials, in the breakdown of prices included in the Contract. The Contracting Authority shall not bear any responsibility and shall not be bound to reimburse the Contractor in connection with any fluctuation in the price of materials following the purchase of the same by the Contractor.

j) The amounts paid by the Contracting Authority to the Contractor in respect of such materials shall be deducted from successive interim payments made to the Contractor on the basis of the actual measured works and in terms of Article 48 (Interim payments) of the General Conditions of the Contract. All the amounts paid to the Contractor in respect of such materials must be deducted in their entirety by the final payment to the said Contractor.

k) In the event of termination or in the event of any of the causes for termination listed in Article 61.1 of the General Conditions, before completion of the works, the Contractor shall hand over to the Contracting Authority any materials the ownership of which, has been transferred to the Contracting Authority in terms of this Article. If the Contractor fails to do so, the Contracting Authority may take such action as it may deem appropriate to obtain possession of such materials and to recover the costs of so doing from the Contractor, including any legal fees, which costs and fees, unless paid by the Contractor, shall be deducted from the Performance Guarantee provided in terms of Article 13 (Performance guarantees) of the General and the Special Conditions.

   Furthermore, the Contractor shall be liable to pay to the Contracting Authority a penalty equivalent to one percent (1%) per day, of the price paid by the Contracting Authority for any materials not handed over to the said Contracting Authority by the Contractor, which penalty shall be applied for mere delay as liquidated damages, and which amount shall for all intents and purposes of law, be deemed to be certain, liquidated and due and immediately exigible by the Contracting Authority after seven days from an intimation by the Contracting Authority to the Contractor to hand over any materials the ownership of which has been transferred to the Contracting Authority, as aforesaid. For the purpose of the said penalty, the balance of materials not handed over by the Contractor to the Contracting Authority, as aforesaid, shall be determined on the basis of the last interim payment processed by the Contracting Authority.

   Provided that the said penalty shall not exceed the total sum of the price paid for any materials not handed over to the Contracting Authority together with an additional ten percent (10%) of the said price.

Provided further that the said penalty shall not be applicable to materials which, although not physically handed over to the Contracting Authority, are made accessible exclusively to the said Contracting Authority.

Provided further that should the Contractor fail to hand over any materials the ownership of which has been transferred to the Contracting Authority, as aforesaid, within thirty (30) days from an intimation by the Contracting Authority to the Contractor to hand over the said materials, the Contracting Authority reserves the right to request the Contractor to reimburse the Contracting Authority with the full price paid to the Contractor by the said Authority for such materials.

l) Any dispute that may arise between the Parties in relation to this Article shall be settled in terms of Articles 65 (Amicable dispute settlement) and 66 (Dispute settlement by litigation) of the General Conditions and Article 66 of the Special Conditions of the Contract.

Provided that any such dispute shall be determined by three (3) arbitrators. Each party shall appoint one (1) arbitrator and the two (2) arbitrators so appointed shall select the third arbitrator who will act as the presiding arbitrator of the arbitral tribunal.

Notwithstanding a dispute between the Parties and the referral of such dispute to arbitration as aforesaid, the Parties agree that the works shall not be suspended but shall proceed in terms of the General and Special Conditions of the Contract.

50.1 The Contracting Authority shall pay the contractor sums due within 60 days of the date on which an admissible payment is registered, in accordance with Article 43 of these Special Conditions. This period shall begin to run from the approval of these documents by the competent department identified in Article 43.1 of these Special Conditions. These documents shall be approved either expressly or tacitly, in the absence if any written reaction in the 30 days following their receipt accompanied by the requisite documents.

50.2 Once the deadline laid down in Article 50.1 has expired, the Contractor may, within two months of late payment, claim late-payment interest:

- at the rediscount rate applied by the issuing institution of the country of the Contracting Authority;

on the first day of the month in which the deadline expired, plus two percentage points (2%). The late-payment interest shall apply to the time which elapses between the date of the payment deadline (exclusive) and the date on which the Contracting Authority's account is debited (inclusive).

Article 53: End Date

The contract will be co-financed through the European Regional Development Fund 2014-2020, therefore the payment obligations of this contract will be concluded by end December 2020.

Article 56: Partial Acceptance

56.2 The supervisor will issue partial provisional acceptance upon completion of full works on the structure envisioned within the contract and not upon completion of works on parts of the structure envisioned within the contract.

56.3 The 24 months maintenance period shall run from the date of the Provisional Acceptance Certificate issued as per Article 57. However, the Contractor has be responsible to carry out any maintenance required in the interim period from the date of issuing of the Partial Provisional Acceptance Certificate up to the date of issuing of the Provisional Acceptance Certificate. Any maintenance carried out in this period will be done at the exclusively expense of the Contractor and the Contractor cannot claim for compensation for such cost.

Article 57: Provisional Acceptance

57.6 Further to the provisions of Article 57 of the General Conditions, the Provisional Acceptance Certificate can only be issued once all pending snags included in the relevant snag list are appropriately addressed by the Contractor and to the satisfaction of the Supervisor.

Article 58: Maintenance Obligations

58.1 Further to the provisions of Article 58 of the general Conditions to the Contract, the Contractor shall be responsible for making good any defect in, or damage to, any part of the works which may appear or occur during the Defects Liability Period of 24 months from the issuing of the Provisional Acceptance Certificate.

58.6 Further to the provisions of Article 58 of the General Conditions to the Contract, the contractor shall guarantee that all the works carried out through works specified in this tender document are adequately maintained for a period of 24 months from issuing of the Provisional Acceptance Certificate. The Contractor shall be responsible for remedying, at his expense, defects and damages during this period as specified in the General Conditions. In particular, but not exclusively (all works carried out are included), the Contractor shall guarantee that:
a) Any water pipes, culverts, canals, etc and all other structures intended for the passage of rain and/or surface water are kept clean and functional at all times.
b) No rain and/or other surface water finds its way into, or otherwise percolate, the structure.
c) Mortar joints do not fail, that is, they do not loosen, crack, become detached, fall, or are otherwise damaged.
d) No vegetation grows from/on any part of the restored structure.
e) No black crust or other deleterious superficial deposits form on the restored building.
f) Plastic repair works show no signs of damage, particularly in the form of 18 detachment from the masonry fabric or cracking and are not otherwise damaged.
g) Any lime renders applied show no signs of damage in the form of detachment from the underlying masonry fabric, staining, powdering or otherwise.
h) Timber works and paint/varnish finishes show no signs of damage particularly in the form of warping or flaking, blistering, cracking or yellowing of the paint/varnish finish.

Any remedial works performed during the guarantee period (until 24 months from the date of issuing of the provisional acceptance certificate) shall be carried out as specified in this document and approved by the Contracting Authority. The contractor shall be responsible for providing all suitable means, for obtaining all permissions, and making all

the necessary arrangements with all authorities concerned to carry out all the remedial works (at any height levels) at no extra cost to the Contracting Authority.

58.9 The Guarantee Period for all items replaced or renewed as a result of the aforementioned diversion, shall recommence from the date on which the replacement or renewal is made to the satisfaction of the Contracting Authority and ends twenty four (24) months after this date.

If any damage occurs, during the Guarantee Period, the Contracting Authority or the Supervisor shall notify the Contractor. If the Contractor cannot be reached, or is unable to take the measure required or fails to remedy a defect or damage within the time limit stipulated in the notification, the Contracting Authority may carry out the works itself or employ someone else to carry them out at the Contractor's risk and cost, in which case the costs incurred by the Contracting Authority will be deducted from monies due to, or from guarantees held against, the Contractor, or from both.

Article 66: Dispute Settlement by Litigation

If no settlement is reached within 120 days of the start of the amicable dispute-settlement procedure, each Party may seek:

a) either a ruling from a national court, or

b) an arbitration ruling, in the case where the parties, that is the NGO and the Contractor, by agreement decide to refer the matter to arbitration.

Article 71: Further Additional Clauses

Not Applicable.

SECTION 4 -SPECIFICATIONS/TERMS OF REFERENCE (Note 3)

Note:
Where in this tender document a standard is quoted, it is to be understood that the NGO will accept equivalent standards. However, it will be the responsibility of the respective bidders to prove that the standards they quoted are equivalent to the standards requested by the NGO.

Specifications

A General Site Management Practice

Liaison

A.1 The contractor shall liaise and co-operate with the appropriate Authorities likely to be affected by the works, for all matters regarding access, monitoring, third party rights, and similar, as per Clause 21.1 of the Special Conditions.

Co-ordination of Services and Access Roads

A.2 The contractor shall be responsible for locating existing drains and services as per Clause 23.3 in the Special Conditions.

The contractor shall take all the necessary steps to ensure that the external areas and access roads are left clean and tidy during all stages of the work, to the satisfaction of the Architect and civil engineer in charge.

A.3 **Management, Administration Progress and Staff**

A.3.01 **Performance of Works**

The Contractor shall carry out the Works according to the contract conditions, to the relevant specifications, according to good work practice and as may be instructed by the Supervisor. The Contractor shall perform all works and provide all materials, plant and labour necessary for the proper execution of the works according to the true and obvious intent and meaning of the Specifications, whether such materials or works are specifically described, shown or not. No extra payment will be allowed for any work the need for which might reasonably have been foreseen or inferred by a competent contractor, including allowances for wastage.

A.3.02 **Key Experts**

The contractor shall provide the following Key Experts, who must be fluent in spoken and written English Language. Preferably they must be similarly competent in the Maltese Language.

A.3.02.1 A **Warranted 'Perit'** enabling him/her to practice locally as a Perit (as defined under Chapter 390 of the laws of Malta) and who will assume all the responsibility in terms of the legal obligations as arising under Maltese law. The role of the Perit is to also assist in the technical supervision and co-ordination as well as to ensure that the quality of the work is as requested by the Contracting Authority and the Supervisor.

A.3.02.2 **Archaeological Monitor (MQF level 6) qualified and approved by the Superintendent of Cultural heritage** having at least an MQF level 6 qualification (or equivalent).

The Monitor shall conduct archeological investigations for the cleared ditch and battery platform once the recently built embrasures are removed by the contractor. This shall be required so as to uncover the original battery platform and original embrasures foundations, and thus be able to construct faithfully as possible the embrasures. The archaeological monitor shall liaise closely with, and report on a weekly basis to, the Architect in Charge so that the Heritage Planning Unit (PA) and Superintendence of Cultural Heritage are informed of development. The monitor shall produce and submit to Architect in Charge and to the Heritage Planning Unit (PA) and the Superintendence

of Cultural Heritage a written report (accompanied by relevant graphic documentation – photos, maps, illustrations and/or other drawings) on a weekly basis to their satisfaction, as per Permit Conditions PA 3604/15.

A.3.02.3 A Licenced **Mason** with a valid local building license to carry out building works locally and will be responsible for any demolition, building and stone replacement interventions. He is expected to be entirely responsible for these activities to do with demolition, alterations, construction and stone replacement and sign the Planning Authority Commencement Notice.

A.3.02.4 A **Qualified Conservator/Restorer** (having at least a B.Cons (Hons) with MQF Level 6 (or equivalent qualification in restoration) in restoration works of a similar nature as long as the areas of study include stone. The conservator/restorer is to be familiar with the materials and restoration methodologies explained in the specifications, will provide assistance to the Supervisor and the Restoration Technician in more sensitive or specialized assessments and interventions. He/she shall be expected to be on the site of works regularly and to attend on-site weekly meetings with the Contracting Authority's representative with the intent of planning/managing/ supervising the execution of restoration interventions for the week ahead. He/ she shall moreover be expected to personally execute delicate/specialized restoration interventions including but not limited to the execution of tests, surface render colour sections and samples, cleaning trials, lime/ epoxy injections, stone fabric consolidation interventions etc..

The role of the Conservator shall be to oversee and direct the employees on the conservation and restoration aspects of the site, including control of materials and methods used, including work carried out by the Sub-contractors.

The following are the minimum responsibilities:

- Organisation, co-ordination, supervision and control of all the restoration works.
- Testing of restoration materials and equipment.
- Ensuring monitoring and control of restoration techniques in order to ensure no damage to the historic fabric.
- Keeping a restoration building file including all the documentation of existing situation and documentation of all the works and interventions being carried out

including all the materials used and daily log sheet with photos.

- The stone conservator/restorer shall assume full and sole responsibility for the execution of all restoration interventions.

A.3.02.5 A **Resident Project Manager** (at least MQF level 4 in related areas of study) responsible for the works - to oversee and co-ordinate the works with the architect in charge of the project. He or she shall act as a single point contact for the duration of works and shall be responsible for on-site works. The role of the Manager shall be the overall management and control of the work, including work carried out by the Sub-Contractors. The following are the minimum responsibilities:

- Organisation, co-ordination, supervision and control of the work.
- Management of foremen and leading hands.
- Ensure adherence to Work Methods, and Health and Safety, Security and Environmental plans, risk mitigation measures, procedures and instruction. Cooperates with contractor's HSSE Officer and the Supervisor as necessary and to rectify and prevent non-conformities.
- Ensure that works are carried out according to the Contractor's Quality Plan.
- **It is to be understood that the Site Manager shall be on the site of works <u>at all times until works completion.</u>**

A.3.02.6 A **Health and Safety coordinator/officer** registered in the list of competent persons as published by the Health and Safety Authority.

Representing and with the full authority of the Contractor, the HSSE Officer shall continuously inspect works on site and take action to ensure appropriate Health and Safety, Security and Environmental Protection in accordance with the respective plans, procedures and instructions. He shall be the primary liaison with the supervisor and with the Contracting Authority's PSCS. He shall maintain the contractor's HSSE documentation, respond to all HSSE correspondence and reports from the Contracting Authority's representatives.

The HSSE officer will provide regular and follow up induction/tool box meetings for all workers to oversee that the risks, proper work methods and risk mitigation measures are

understood and adopted. He will ensure that the relevant plans are enforced and will take preventive and corrective action to ensure compliance and rectify non-conformities. He is responsible for all accident investigation and reporting.

The Health and Safety coordinator shall have experience in carrying out works of a similar nature.

A.3.02.7 A **Land Surveyor** with at least MQF level 4 qualifications who shall be entrusted with any required surveys particularly in conjunction with the Battery Platform re-construction, and archeological investigation and Ditch works, providing surveys in conjunction with the Archeological Monitor requirements and to SCH satisfaction.

A.3.02.7 A warranted **Mechanical Engineer**. The role of the Engineer is to also assist in the technical supervision and co-ordination as well as to ensure that the quality of the work is as requested by the Contracting Authority and the Supervisor.

A.3.02.8 A warranted **Electrical Engineer**. The role of the Engineer is to also assist in the technical supervision and co-ordination as well as to ensure that the quality of the work is as requested by the Contracting Authority and the Supervisor.

A.4 Any other technical, administrative and supervisory staff required by the contractor to execute his responsibilities and obligations under the contract shall be provided at no extra cost to the Contracting Authority.

A.5 Once contract is awarded, a **detailed Programme of Works (Gantt chart)** has to be submitted and it shall identify each activity, indicating the dates when works in their various phases would be undertaken, for approval of the Contracting Authority's Architect and civil engineer in charge.

A.6 The **Programme of Works** shall be updated whenever required by the Contracting Authority's

Architect, to be in line with the progress of the actual Works. The Programme of Works shall be accompanied by sufficient data and information together with all the necessary details of constructional plant, required labour force, etc. Should the Contracting Authority's Architect consider any alteration in or addition to the Programme as

submitted, the Contractor shall conform therewith without additional cost to the contracting Authority), as indicated in Article 15.4 of Special Conditions.

A.7 The submission to and approval by the Architect of such Programme of Works or the furnishing of such particulars shall not relieve the Contractor of any of his/her duties or responsibilities under the Contract.

Housekeeping

A.8 Storage areas for materials, plant and construction waste shall be enclosed with secure hoarding; the different areas for materials, waste and staff facilities will also be fenced in for security, for the protection of the public, as well as to reduce, visual impact. Construction waste shall not be allowed to accumulate on site and should be removed periodically. The contractor shall endeavor to locate the storage and stockpile areas in the areas from where there will not be a significant visual impact.

A.9 Rainwater run-off shall be channeled to setting ponds that will allow the separation of the silt from the clear water. Sludge will be collected regularly using mobile suction pumps, and will be deposited at an approval dumping site.

A.10 The disposal of hazardous waste shall be carried out in accordance with procedures approved

by the Environment Resources Authority and the Planning Authority. Any hazardous material shall be notified to the Environment Protection Department, and shall be transported in accordance with the relevant Maltese Legislation. Relevant hazardous wastes include, but are not limited to, petroleum tank bottom sludge, waste acidic of alkaline solutions, wastes containing metals, waste hydraulic, engine, or bilge oils, degreasing agents or solvents, discarded equipment containing PCBs or asbestos. Waste explosives, batteries and accumulators, soil, stone or construction and demolition waste containing dangerous substances, and insulation material containing asbestos.

A.11 Sanitary waste during the construction phase shall be disposed of chemically.

A.12 Burning of waste plastics, wood or any other material on site shall not be allowed.

A.13 All activities producing dust shall be controlled, and measures such as spraying with water shall be used to ensure that the emitted dust is minimised. Dust-laden materials shall be removed from the site, and transported through public thoroughfares, only after thorough watering before leaving the site. Dust covers, of appropriate material, properly secured along all sides, shall be used on all open-topped vehicles used for the transportation of rubbish or debris from the site.

A.14 Wash-down facilities may need to be installed at the designated exit of the site of the works, to minimize any dust carried by construction vehicles on the public roads, unless it can be shown that the contractor can otherwise control the dust carried by his vehicles. Wash-down facilities shall normally consist of a power washer, surface gutters and a system of interconnected reservoirs underlying the washing area, so as to allow construction vehicles, leaving the site, to be washed-down. The water from the wash-down should flow through the gutters into the underground reservoirs, and clear water will overflow from one compartment into the next, depositing the silt load. A submersible pump will recycle the water form the last compartment and feed it to the power washer. Sludge will be collected regularly using mobile suction pump, mixed with the excavated debris to remove excess water, and disposed of with the same excavated material.

A.15 All plant shall be operated with any relevant doors closed, and shall be fitted with silencers and noise suppressors. All plant and site operations will be required to conform to local legislation, and in particular EN ISO 11690, EN 12096, EN 28662, EN ISO 10819, EN ISO 8662. The contractor shall select and utilise methods of working, and items of plant, so that the maximum measured ground vibrations do not exceed a peak particle velocity of 3mm per second at any occupied property, and 5mm per second at other properties, or any other values indicated by the relevant Authorities. Noise levels at the perimeter of the site shall not exceed 70dB, or the value indicated by the relevant Authorities.

A.16 Any chemical drums that may need to be on site shall be stored on impervious surfaces in designated bunded areas. Oil tanks shall be similarly stored. The bunds shall have a capacity equal to 110% of the volume of the largest drum. In view of the fact that the

bunds are meant to cater for operational leakages and spills, this is considered as sufficient. The bunds shall have no drains, and provision shall be made for pumping out rainwater. Filling and vent pipe-work shall be located inside the bund. The bunds shall be available for inspection. Empty drums shall be stored in a similar fashion, in separate areas, and shall be safely disposed of in accordance with the arrangements made with the Environment Protection Department.

A.17 Oil drip trays shall be used under small static plant, such as pumps and compressors. These trays shall be open to inspection and spent oil shall be disposed of in accordance with the arrangements made with the Environment Protection Department. Maintenance areas for the construction plant shall be indicated in the Contractor's Construction Management Plan. Disposal procedures shall be as instructed by the Environment Protection Department. The contractor shall be required to install settling ponds to stop oil-contaminated, or silt-laden, waste water, (including rain-water), from finding its way into the surrounding cultivated agricultural areas.

A.18 The contractor shall take all necessary procedures to control energy use on site. Site lighting

shall be, as much as possible, low energy, or energy-efficient, light fixtures, and shall be downward pointing and shielded to avoid unnecessary light loss and light pollution.

A.19 The Contractor shall comply with and fulfill all obligations imposed by Article 19 of the Police

Laws and shall give all notices, obtain all permits; pay all fees that may be lawfully demanded by Public Officers in respect of works and comply with all requirements of the Law and any Lawful Authority.

Notice to authorities

A.20 The contractor shall give all necessary notices to authorities concerned and shall allow them facilities for removing any fixtures, fittings, or services, which may belong to them.

Heavy vehicles

A.21 The use of heavy construction vehicles entering site in connection with this project shall be limited to the minimum and confined to specific routes, agreed upon beforehand with respective Authorities.

Materials

A.22 All materials and methods of construction shall be in the form and nature specified herein and/or as indicated in the drawings, to the satisfaction of the Contracting Authority's Architect-in-Charge. All materials and methods (except where otherwise stated) shall conform to the relevant British Standard Specification or its European equivalent.

Samples and tests

A.23 During the course of works, architect and civil engineer in charge reserves the right to take samples or carry out specialised tests on site. In specific cases, analysis/tests on samples elevated may take significant time to be completed, in which case, architect and civil engineer in charge may request suspension of all or part of the activities being carried out by the contractor. Unless such tests/ analysis are being carried out due to any negligence, bad workmanship, etc. from the contractor's side, the Contracting Authority or his/ her representative may opt to prolong the completion period as detailed in tender document. Should, however, the need for such tests arise due to any negligence, bad workmanship, etc. by the contractor, expenses incurred in the carrying of such tests will be deducted from payments due to the contractor. In the Period of Execution of the work the Contractor will have to factor in such tests.

Works to be carried out by other entities/or contractors

A.24 During the course of works, FWA may:

a) Assign other contractors/ personnel to contemporarily carry out works on other areas of the building not included in this tender document.

b) Appoint personnel to carry out trials, tests, etc. on cleaning methods, consolidation, etc. as so deemed necessary by the architect and civil engineer in charge, on sections of the building covered by this tender document.

c) In all cases, contractor will be expected to be co-operative and allow the use of his scaffolding and/ or other facilities available on site for the efficient execution of the

above-mentioned works. Same contractor will not be entitled to any compensation (financial or otherwise) for these services, etc.

Clearance of site

A.25 Each trade is to make good after itself and provision for such work shall be made in respective rates.

A.26 During the execution of the works, the Contractor shall keep the site reasonably free from all

unnecessary obstruction, and shall store or dispose of any Contractor's equipment and surplus materials and clear away and remove from the site any wreckage, rubbish or temporary works no longer required.

A.27 On completion of the Works, the Contractor shall clear away and remove from site all Contractor's equipment, surplus material, rubbish and temporary works of every kind, and leave such part of the site and works clean and in a workmanlike condition to the satisfaction of the Contracting Authority's Architect and civil engineer in charge.

Management Plan

A.28 The Management Plan shall be compiled to show how access to the site will be managed, how security and safety of the buildings will be guaranteed, and how building material and building waste will be handled to ensure minimum impact. It will also detail site logistics and plant locations, and equipment etc. to be used in the execution of works indicating the contractor's endeavours to carry out the works requested by the Contracting Authority's architect and civil engineer in charge.

A.29 The Contractor shall take into account the problems of access into the site, and the existing physical site constraints in particular the needs to maintain access open to the sites for both users as well as other contractors. It shall show in particular:

- The Access Plan - All site access points for workers, plant and machinery.
- Site Logistics - gates and routes for pedestrians and vehicles, security arrangements

and hoarding, first aid facilities, storage for materials and plant, storage area for waste, location of welfare and accommodation for the contractor and supervisor. Temporary works including scaffolding, hoarding, access platforms, protection, and propping.

- Setting out and mobilization.
- Storage areas for materials and plant.
- Adequate and suitable provision to reduce dust nuisance during all phases of the works.
- Method to collect and dispose of resultant debris.
- Protection measures for overlying and adjoining buildings, structures and landscapes.
- Measures for the safety and continued operation of underlying and overlying existing activities.
- The location of disposal sites for material from demolition and excavation, and the means and routing of transport to disposal sites.

The submission to and approval by the Contracting Authority's Architect and Civil Engineer in charge of such Programme or the furnishing of such particulars shall not relieve the Contractor of any of his/her duties or responsibilities under the Contract.

Health and Safety Provisions

Safety Officer

A. 30 The Contractor shall appoint his safety officer to ensure compliance with Legal Notice 281 /2004 (SL.424.29). The safety officer shall amongst other things implement all regulations and directions given in order to achieve the objectives of the Health and Safety Plan, as well as ensure the certification of scaffolding, hoists and any other equipment/machinery to be used on the site of works as fit for the intended works and immediately submit them to the Contracting Authority. The Contractor shall be obliged to immediately carry out any actions recommended by the Contracting Authority Project Supervisor.

The Contractor shall include inter alia for the following:

- All visitors are to be provided with appropriate personal protective equipment
- Provide appropriate induction and training to all visitors on site.
- Submit to the architect and civil engineer in charge, work methods and risk assessment for all works to be carried out. Such documents to be kept up to date throughout the works
- Prepare and submit to the architect in charge, weekly reports regarding health and safety on site, including actions plans to rectify non-conformities and prevent unsafe work practices and conditions.
- Maintain an occupational health and safety disciplinary system on site which is to include warning to personnel leading to dismissal for repeated offences.

The architect and civil engineer in charge may require the immediate removal from the Site of Works of any person who, in his opinion, fails to observe the provisions of this clause and such person shall not again be employed upon the Works without the permission of the architect and civil engineer in charge.

General Hazards

A.31 The following hazards have been identified:

a) Electrocution from buried/overhead electricity services and by electrically powered equipment/ machinery used on site of works;
b) Workers falling from scaffolding, or from heights on existing buildings;
c) Noise and dust production as a result of the works outlined in this document;
d) Workers crushed by collapse of structures and/ or scaffolding;
e) Inhalation of fumes resulting from restoration processes.
f) Full or partial collapse of scaffolding.
g) Third parties injured by material falling from scaffolding.

Risk Mitigation Measures

A.32 The following measures are recommended to minimise risks on site:

a) Clear delineation of plant movement areas;
b) Double checks on possible existence of buried services - clear delineation of known

services;

c) Provision of sturdy work platforms/ scaffolding, and guide rails at unprotected edges of existing buildings;

d) Use of plant with limited noise emission;

e) Periodic wetting of demolition area to reduce dust emission;

f) Establishing clear procedural rules during overhead material handling to;

g) Enforcement of hard hats.

Provisions for safe practice

A.33 The following provisions shall be made, without limiting, in any way, other provisions that the

Contractor may deem necessary in order to render the Site and the Work safe:

a) Where there is an imminent danger to the safety of workers, the Contractor shall take immediate steps to stop the operation and evacuate workers as appropriate;

b) Secure fencing, to prevent un-authorised access to the active work areas;

c) A Notice, giving information on the specific hazards, and on the availability of emergency assistance, shall be clearly displayed in a position such that those working on site can read it as well as those affected by the Site;

d) Routes for the movement of vehicular traffic around the place of work shall be clearly delineated. These routes shall be separated from the areas subject to overhead movements;

e) Escape routes and means of escape shall be kept clear at all times;

f) Existing services, both overhead and underground, within the work site and immediately surrounding the work site, shall be identified, the respective utility companies contacted for information and disconnected/made safe;

g) Special attention shall be given to lifting, slewing and overhead handling operations to avoid public access areas;

h) The Contractor shall take appropriate measures, or shall use the appropriate means, in particular mechanical equipment, in order to avoid the need for the manual handling of loads by workers

i) All openings through which workers are liable to fall shall be kept effectively covered or fenced and marked in the most appropriate manner;

j) Where natural lighting is not adequate to ensure safe working conditions, the Contractor shall provide adequate and suitable lighting, including portable lighting when appropriate, at the
Site of work;

k) Guard-rails and toe-boards shall be provided to protect workers from falling from elevated workplaces; alternatively, adequate safety nets or safety sheets shall be erected, made fast and maintained, or adequate safety harnesses shall be provided and used;

l) Hoist shafts shall be enclosed with rigid panels or adequate fencing at ground level on all sides;

m) The contractor shall be responsible for ensuring that all persons on the Site, whether the Contractor's employees or otherwise, wear the necessary personal protective clothing at all stages;

n) The Contracting Authority's Engineer shall have the right to send away any of the Contractor's employees, or of his Sub-Contractors, or otherwise doing work on the site, if they do not comply with these requirements.

Fire Outbreak

A.34 The Contractor shall take all appropriate measures to:

a) Avoid the risk of fire;

b) Control quickly and efficiently any outbreak of fire;

c) Bring about a quick and safe evacuation of persons.

Protective Clothing and Equipment

A.35 The Contractor shall provide the following:

a) Safety helmets or hard hats to protect the head from injury resulting from falling or flying objects, or from striking against objects or structures.

b) Goggles, a screen, a face shield or other suitable device when likely to be exposed to eye or face injury from airborne dusts or flying particles, dangerous substances, harmful heat, light or other radiation, and in particular during welding, flame cutting, or other hazardous work;

c) Protective gloves and suitable protective clothing to protect hands or the whole body when exposed to heat radiation or while handling hot, hazardous or other substances such as poultice packs which might cause injury to the skin;

d) Footwear of an appropriate type when employed at places where there is the likelihood of exposure to adverse conditions, or of injury from falling or crushing objects, hot or hazardous substances, sharp-edged tools or nails;

d) Respiratory protective equipment, suitable for the particular environment when workers cannot be protected against airborne dust, vapours or gases by ventilation or other means;

e) Safety harnesses with independently secured lifelines where protection against falls cannot be provided by other appropriate means.

f) Waterproof clothing and head coverings when working in adverse weather conditions.

Storage of Materials

A.36 The Contractor shall ensure:

a) A safe, sufficient and suitable storage for flammable liquids, solids and gases such as ethyl silicates and/ or fuels.

b) Storage areas for flammable liquids, solids and gases shall be rendered secure against trespassers.

c) Smoking shall be prohibited and "No Smoking" notices or appropriate design and shape shall be prominently displayed in all spaces containing readily combustible or flammable materials.

d) Combustible material such as scrap wood or plastics, oily/greasy waste, sawdust or packing material shall not be allowed to accumulate in places of work, but should be kept in closed metal containers in a safe place.

Lifting Equipment

A.37 The Contractor shall ensure:

a) Any lifting gear or equipment intended for lifting shall not be loaded beyond its safe working load or loads as specified by the manufacturer.

b) No person shall be raised, lowered or carried by a lifting appliance unless it is constructed, installed and used for that purpose, except in an emergency situation.

c) Every platform or receptacle used for hoisting any loose material shall be so enclosed as to prevent the fall of any of the material.

d) Any equipment with wheels, placed directly on a platform for raising or lowering, shall be so secured so that they cannot move, and the platform shall be enclosed as necessary

to prevent the fall of the contents.

'Housekeeping' Program

A.38 The Contractor shall ensure:

a) A suitable "housekeeping" programme shall be established, and be continuously implemented on the Site.

b) Areas within the Site, which are liable to become slippery, because of oil or other causes, shall be regularly cleaned up, or strewn with sand or sawdust.

c) It shall include provisions for the proper storage of materials and equipment, and for the removal of scrap, waste and debris at appropriate intervals.

d) Loose materials that are not required for use shall not be placed or allowed to accumulate on the site, so as to obstruct means of access to, and egress from, places of work and passageways.

A.39 The contractor is expected to have on site a Hoist capable of lifting at least 1000kg, a stone cutting machine, Water Reverse Osmosis /Demineralisers for the production of water having low conductivity of 60µS or Indication of sourcing of such water and Micro blasting Equipment.

The Contractor shall ensure:

a) All manual tools, pneumatic tools, electrical tools, etc. shall be suitable for the work to be carried out, shall conform to approved standards and regulations, shall be safe and such that they can be operated without risk to health.

b) They shall be provided with protective guards, shields or other devices as appropriate, which shall be maintained regularly, which shall be equipped, where applicable, with an extraction system which shall be as close as possible to any source of the dust, and which sucks away from the breathing zone, not through it, shall be fitted with shock absorbing materials, and be fitted with noise control protection devices at source to reduce as much as possible noise exposure.

c) Only insulated or non-conducting tools shall be used on or near live electrical installations if there is any risk of electrical shock. Only non-sparking tools shall be used near or in the presence of flammable or explosive dust or vapour.

d) Operating triggers on portable pneumatic tools shall be so placed as to minimize the risk of accidental starting of the machine, and so arranged as to close the air inlet valve automatically when the pressure of the operator's hand is removed. Hose and hose connections for compressed-air supply to portable pneumatic tools shall be designed for the pressure and service for which they are intended, fastened securely to the pipe outlet, and equipped with a safety chain, as appropriate. Pneumatic shock tools shall be equipped with safety clips or retainers to prevent dies and tools from being accidentally expelled from the barrel. Pneumatic tools shall be disconnected from power and the pressure in hose lines released before any adjustments or repairs are made.

e) Portable electric tools shall generally be used on reduced voltage to avoid as far as possible the risk of lethal shock. All electrical tools shall be earthed, unless they are "all insulated" or "double insulated" tools which do not require an earth. Earthing shall be incorporated in metallic cases, and as a safeguard against damaged cables, where wires enter the tool. Electric tools shall be fitted with protection guards that are regularly maintained for their effectiveness. Power cables to electrical tools shall be armoured and/or covered in thick flexible rubber, and socket outlets shall be of special design for outdoor use, and protected by a residual current circuit breaker.

f) All electrical tools shall receive inspection and maintenance on a regular basis by a competent electrician, and complete records kept.

g) The cables of portable electrical lighting equipment shall be of adequate size and characteristics for the power requirements and of adequate mechanical strength to withstand severe conditions in construction operations.

h) h) All vehicles shall be of good design and construction, taking into account established ergonomic principles, particularly with reference to the seat; they shall be maintained in good working order, shall be used with due regard to health and safety, by workers who have received appropriate training.

i) Where appropriate, earth-moving or materials-handling equipment shall be fitted with structures designed to protect the operator from being crushed should the machine overturn, and from falling material.

j) All vehicles and earth-moving or materials-handling equipment shall be fitted with a plate indicating the gross laden weight; the maximum axle weight or, in the case of caterpillar equipment, ground pressure.

k) Plant, machinery and equipment shall be switched off when not in use and isolated before any major adjustment, cleaning or maintenance is performed. Where trailing cables or hose pipes are used they shall be kept as short as practicable, be mechanically protected and not be allowed to create a safety hazard.

l) Mobile high pressure compressor plants and equipment shall be examined, tested and certified annually by a mechanical Engineer having a warrant to practice his profession.

m) Portable compressors shall be fitted with a double adjustable tow-bar and jockey wheel.

n) When the plant/equipment is in operation, wheel chocks shall be installed. The wheels must be fitted with brakes that are operated automatically via a handbrake for parking purposes

o) Only competent persons shall operate and maintain such plant and equipment.

Personnel

A.40 The Contractor shall ensure:

a) The Contractor shall assign workers only to employment for which they are suited by level of training, age, state of health and skill, and having ensured that the workers are fully aware of any risks to health or hazards connected with the work, and that they are trained in the precautions necessary to avoid accidents or injury to health. Such training shall be given in a language that is understandable to the workers. The training shall be sustained periodically and shall take into account any new or changed risks to the health and safety of the employees concerned.

b) When the use of equipment is likely to involve a specific risk to the health or safety of workers, the Contractor shall take the measures necessary to ensure that:

c) the use of equipment is restricted to those persons given the task of using it, and who have been adequately trained for the specific task;

d) in the case of repairs, modifications, maintenance or servicing, only competent workers are specifically designated to carry out such work all operators of construction equipment shall receive basic training as per Code of Practice provisions;

e) drivers of heavy machinery shall have followed an approved course in relation to the equipment to be used or driven and be in possession of a valid license.

Maintenance

A.41 All equipment/plant shall be certified to be in a proper working order, and shall be operated by trained personnel.

Noise Emissions

A.42 The Contractor shall ensure:

a) Noise emission levels from the plant/ equipment must conform to approved local standards, and in particular EN ISO 11690.

b) The exhaust system from any engine used on site must be fitted with a residual silencer.

Cranes

A.43 The Contractor shall ensure:

a) All lifting equipment used on site shall be certified by a warranted Mechanical Engineer every six (6) months, in accordance with the regulations issued by the Occupational Health and Safety Authority.

b) Copies of the certificates shall be sent to the Architect and civil engineer in charge/Project Manager before commencement of work and as necessary.

c) Failure to comply or to update these certificates will lead to an automatic penalty.

d) Further measures shall be taken to protect cranes against the effects of bad weather and lighting.

Temporary Electrical Installation

A.44 Any temporary electrical installation on the Site shall meet the requirements of Enemalta and/or local legislation and in particular legal notices/ regulations issued by the Malta Resources Authority.

A.45 Any temporary electrical installation shall be certified by an independent warranted electrical Engineer, every three (3) months, and the certificate shall be affixed in a prominent position next to the Main Temporary Switchboard.

Security and Protection

A.46 The Contractor shall fence off and maintain the external boundaries of the site handed over to him (which however may be shared with other contractors) at all times.

The Contractor shall erect and maintain temporary protective walls, hoarding, screens, guard rails, planked footways, gantries and the like as may be necessary for the protection of public and other, for protecting property, for the proper execution of Works and for meeting the requirements of the Contracting Authority.

The contractor shall provide continuous and adequate security gate control arrangements at each access point while in use, for the full duration for the contract. Elsewhere within the site, the contractor shall provide other hoarding or barriers to delineate work areas, to hive off storage areas and for health and safety reasons. The contractor shall ensure that the site boundary hoarding is to be kept clear from any object that may facilitate a person to climb over into the site.

The contractor shall provide or make appropriate arrangements and bear all costs for the planning and provision of security of the site, including manned or remotely operated access control during all hours of work.

The Contractor shall take all necessary precautions and adequately safeguard the Works, his staff, materials, products and plant from damage and theft.

B. Outline of Works

B.1 Main scope of works

Restoration

The main scope of the works includes restoration works of St Thomas Tower. The overall condition of the Tower, could be described as stable but in need of restoration. The structure is afflicted mainly by normal deterioration mechanisms, induced by natural and manmade phenomena, but some recent works on the external fabric have stabilized and restored parts of the lower external faces. The major works being considered refer to the dismantling of the recently constructed semi-circular battery, and the reconstruction of same after examination of the underlying foundation, reconstruction of the battery platform in flagstones and embrasures, the formation of the original ramp to this battery, the restoration of the external fabric including the tower roof platform and rooms at platform, restoration of turrets, the reconstruction of the timber bridge, restoration of the internal fabric and barrel vaults, and cleaning and clearing of the ditch.

Semi-Circular battery

The gun platform was partially rebuilt recently in today's normal sized masonry blocks, with the formation of a stepped entrance, not showing in the original sketches where a ramp entrance is shown. These recent works shall be dismantled, and a thorough investigation shall be carried out to identify the original parts. Works shall include the rebuilding of the battery platform and reconstruction of the original embrasures of the Battery, in the same methodology and materials of similar existing Embrasures, utilizing stone work of similar size. The inclination of the top parts of the Embrasures shall be also reconstructed following similar embrasures.

Drawbridge

FWA have done a thorough inspection of the existing original timber drawbridge and mechanism and it has been deduced that the timber is too rotten to be able to restore, and have the burnt part reproduced and affixed with the existing original part.

In this case it has been decided, that the existing remaining drawbridge part is removed from position and lowered. This shall be displayed within the same Museum, as an artefact.

A faithful reproduction shall be commissioned in red deal timber, as part of this project, as indicated in attached details, and installed within the existing openings.

Palisade

A timber palisade shall also be reproduced to match the original ones as indicated in the below photo. The Timber palisade shall be reproduced to match the iron tips shown in the below photos.

Creation of a Multi-sensory Museum

The contractor install lightweight intermediate floors and stairs, lightweight passageways and a panoramic lift to provide access to the tower upper platform as shown approved drawings. The intermediate floors shall include glazed audio visual rooms, and further museum space whilst allowing visitors to appreciate the internal fabric.

The panoramic lift shall give access to each intermediate floor, and to the roof top platform which shall be partially covered in timber decking to allow visitors a view over the parapet walls.

The works include the provision and installation of all Finishes including the following;

- Mechanical and Electrical Works,
- Sanitary Facilities
- Intermediate floors in steel and timber
- Glazed Audio Visual Rooms
- Panoramic Lift Installation
- Landscaping,

The Contractor shall be responsible to ensure all works are covered with an insurance policy, and that the works carried out are adequately maintained for a period of 24 months from completion. During the maintenance period, as specified in this document, the Contractor will be expected to maintain the completed works in good condition.

B.2 LIST OF RESTORATION WORKS

- **Cleaning of stone surface**
- **Removal of redundant metallic fixings and existing drain pipes**
- **Removal of old cement renders/ paints**
- **Replacement of deteriorated masonry fabric**
- **Removal of organic substance**
- **Consolidation of friable masonry fabric**
- **Pointing and Rendering**
- **Plastic Repairs & Re-Integration of losses**
- **Removal of badly done reconstruction of embrasures, investigation and rebuilding of battery platform and embrasures.**
- **Cleaning of Ditch**
- **Roof platform water tightness**

B.2.1 Erect hoarding around site to avoid third party entry into the area where the works are to be carried out.

B.2.2 Erect scaffolding against the monument to be restored and neatly cover with a tarpaulin. Given the nature of works, scaffolding may be erected in such a manner as to cover a minimum width of 20 (twenty) metres of the full height of the façade, however, always permitting the scaffolding to overlap at least 5.0 (five) metres over the already restored sections of the facade. Allowance to work at the corners should also be made.

B.2.3 Using methods approved by Contracting Authority's architect and civil engineer in charge, remove all vegetation and redundant cables, rain water pipes and all other ferrous and non-ferrous objects nailed/ fixed to structure. Given the friable nature of the deteriorated stone in particular areas, it is important that works be carried out sensitively such as not to dislodge any of the delaminated stone.

B.2.4 Carefully and using only hand tools (no power tools shall be used, unless specifically requested by Contracting Authority's architect and civil engineer in charge), remove loose pointing, superficial layers of whitewash identified by the architect and civil engineer in charge to be removed, and any cement mortar from all joints.

B.2.5 If applicable, carefully and using only hand tools (no power tools shall be used unless specifically requested by Contracting Authority's architect and civil engineer in charge), remove cement based renders applied to areas of the structure.

B.2.6 If applicable and using methods and materials approved by Contracting Authority's architect and civil engineer in charge, number existing unstable stone cladding/facing as directed by architect and civil engineer in charge, and to specifications listed below. The numbering methodology to be employed shall be determined by the Contracting Authority's architect and civil engineer in charge. Copies of drawings and photographic records shall be handed to architect and civil engineer in charge as part of the building file to be compiled by the contractor for this project as detailed in this document.

B.2.7 Carefully dismantle sections of outer leaf, previously numbered one area at a time, taking care to adequately prop surrounding stone work. Extents of masonry work to be dismantled shall be determined by the architect and civil engineer in charge.

B.2.8 Carefully, taking care not to damage the stonework by chipping etc., store dismantled outer leaf on timber palettes. Care should be taken to ensure that dismantled stonework is not damaged and original patina of the stone shall be respected. Expanded polystyrene sheets or any other similar material approved by Contracting Authority's architect and civil engineer in charge shall be used to pack dismantled stone work on timber pallets for future use.

B.2.9 Carefully, remove unstable stone, material, etc., from areas of wall exposed following the dismantling of the outer skin of wall, store on site for future use, or load and cart away as directed by architect and civil engineer in charge, and prepare surface for the re-instatement of the previously removed outer leaf.

B.2.10 Re-instate dismantled stone in original place as previously numbered, substituting deteriorated stonework with new stone having similar dimensions and configuration. Form joints at back of stone-work to be re-instated, where and as directed by Contracting Authority's architect and civil engineer in charge, ready to receive chemical anchors/ ties. An average of two ties/anchors per metre run shall be introduced on every course, or as otherwise directed by the architect and civil engineer in charge.

B.2.11 Carefully, taking care to propagate the minimum vibration possible, drill holes in the masonry fabric ready to receive chemical ties/ anchors. Ties/ anchors shall be sunk to a minimum of 150 mm or as specified by the manufacturer into sound fabric. Grout ties/anchors using a suitable epoxy resin, or any other material as directed by Contracting Authority's architect and civil engineer in charge. When inserting ties/anchors, care should be taken to ensure that these are fixed at a suitable inclination as directed by Contracting Authority's architect and civil engineer in charge to ensure that newly re-instated stonework is well anchored to fabric of wall.

B.2.12 Tie stone blocks together by forming joints as detailed by architect and civil engineer in charge, and grout using a suitable hydraulic lime-based mix, or otherwise, as directed by Contracting Authority's architect and civil engineer in charge.

B.2.13 Grout, using a hydraulic lime-based grout, any interstices resulting between newly re-instated leaf, and original fabric of wall. Grouting shall be carried out at course height intervals.

B.2.14 If applicable and taking care not to damage the original fabric of the façade, dismantle masonry and chisel concrete accretions as directed and approved by the Contracting Authority's architect and civil engineer in charge.

B.2.15 Using a stiff bristle/nylon brush (no wire brushes or power tools shall be used unless specifically requested by Contracting Authority's architect and civil engineer in charge), carefully dry brush, one section at a time, dirt from stonework and lime renders to be retained, including mouldings, marble plaques, sculptural elements etc. Care should be taken to ensure that no damage is caused to friable, delaminated stonework. If so deemed necessary, such areas shall be pre-consolidated adopting procedures outlined hereunder.

B.2.16 Using a stiff bristle/nylon brush (no wire brushes or power tools shall be used unless specifically specified by the architect and civil engineer in charge), and clean soft water free from salts having a conductivity inferior to 60µS wet brush, one section at a time, dirt from façade stonework and lime renders to be retained, mouldings, marble plaques, sculptural elements etc. Care should be taken to ensure that no damage is caused to friable, delaminated stonework. If so deemed necessary, such areas shall be pre-consolidated adopting procedures outlined hereunder.

B.2.17 Carefully, apply biocides as specified in this document, and in concentrations suggested by manufacturer, to areas of façade, including mouldings, sculptural elements, etc. affected by biological growth. Treated areas shall be brushed with a suitable nylon brush after a period of

seven (7) days, or as recommended by manufacturer, following the application of the biocide to remove the dead growth. Procedure shall be repeated to affected areas until biological growth has been removed. Where so deemed necessary, thick layers of biological growth shall be carefully removed using delicate manual methods and hand tools, primarily scalpels prior to the application of specified biocide.

B.2.18 Carefully, and using only delicate manual methods and appropriate hand tools, primarily scalpels, remove as much as is technically possible, layers of black crust (gypsum) from stone surfaces on façade, particularly mouldings, sculptural elements, aperture surrounds etc. where applicable. Care should be taken to ensure that no damage is caused to friable delaminated stonework. If so deemed necessary, such areas shall be pre-consolidated adopting procedures outlined hereunder.

B.2.19 Using methods as directed by Contracting Authority's architect and civil engineer in charge carry out poulticing to areas of walls, including lime renders to be retained, mouldings, marble plaques, sculptural elements etc. still affected by black crust (gypsum) formation. Poulticing shall be applied to specifications listed in this document. The procedure shall be repeated for as many times as so deemed necessary until the black crust formation has been removed, and a satisfactory level of cleaning is obtained. For payment reasons, this exercise will be considered an intrinsic part of the poulticing exercise, and in no case will the contractor be allowed to make claims for extra costs in relation to workmanship, and/ or material.

B.2.20 Carefully and where applicable, using only delicate manual methods and appropriate hand tools, primarily micro scalpels, remove, where and as directed by the Contracting Authority's architect and civil engineer in charge, layers of lime wash renders and water-based paints. Care should be taken to ensure that no damage is caused to friable, delaminated stonework. If so deemed necessary, such areas shall be pre-consolidated adopting procedures outlined hereunder.

B.2.21 Carefully and where applicable, using only delicate manual methods and appropriate hand tools, primarily micro scalpels, and where approved by the architect and civil engineer in charge a neutral paint remover as specified in this document, clean the masonry, including any mouldings, marble plaques, sculptural elements etc. Care should be taken to ensure that no damage is caused to friable, delaminated stonework. If so deemed necessary, such areas shall be pre-consolidated adopting procedures outlined hereunder.

B.2.22 From close, detailed analysis carried out during the progress of work, areas to be consolidated shall be identified, and tests carried out to identify and quantify the salts present in the building fabric. Where levels of salt are considered to exceed acceptable levels, poulticing of the stone shall be carried out to reduce the salt content of the fabric to acceptable levels ready to receive consolidant as directed by architect and civil engineer in charge. The poulticing procedure shall be repeated for as many times as so deemed necessary until level of salts within the structure is considered acceptable. For payment reasons, this exercise will be considered an intrinsic part

of the poulticing exercise, and in no case will the contractor be allowed to make claims for extra costs in relation to workmanship, and/ or material.

B.2.23 Using appropriate consolidants as specified in this tender document consolidate sections of deteriorated masonry work certified to contain acceptable salts level, and situated away from any rising damp or source of continuous water absorption, to include mouldings, sculptural elements etc. Consolidants used shall be as specified in this document, and shall be applied in such a way as to guarantee an acceptable penetration, exceeding 30mm. The consolidant shall be applied generously and uniformly to the stone surface, until the stone surface is saturated. If so considered necessary, the architect and civil engineer in charge may request that this exercise be repeated for as many times as so deemed necessary. For payment reasons, this exercise will be considered as an intrinsic part of the consolidation exercise, and in no case will the contractor be allowed to make claims for extra costs in relation to workmanship, and/or material.

B.2.24 Using a fluid lime based mortar, suitably prepared to specifications listed in this document, inject in interstices previously consolidated. When injecting, care shall be taken to ensure pressure exerted on delaminated stone sections does not cause the shearing of the same material. In cases where the extent of delamination is such that the layers of stone have become detached, the space resulting between the layers shall be suitably cleaned prior to the application of the injection mortar. Cleaning shall be carried out by low pressure air, conveyed through pipes adequately sized to reach within the interstices, followed by the liberal application of an approved volatile solvent, such as acetone. Using suitable methods designed to ensure a deep penetration, apply the injection mortar within the interstices and cure for a minimum of thirty (30) days, ready to receive lime injection. In cases where the detached material is of considerate dimension, carbon fibre rods, bridging the weaker layers with the stronger fabric, and grouted with the same fluid lime-based mortar shall be introduced. Glass reinforced polyester resin and/or carbon fibre rods shall be inserted such as to be least obtrusive.

B.2.25 Using epoxy resins as specified hereunder, having suitable characteristics and viscosity, inject, under pressure, cracked masonry sections previously consolidated. Epoxy injection will be resorted to only for areas where injected fluid lime mortar would be inadequate.

B.2.26 Using a lime-rich mortar as directed by Contracting Authority's architect and civil engineer in charge, and as detailed in this document, point all open joints on structure, particularly mouldings, marble plaques, sculptural elements etc. Deep crevices and joints shall be filled up in layers, permitting at least twenty-four hours between the applications of each layer. All pointing shall be left shy from the surface; however, all pointing shall be such as to inhibit any water used during the cleaning process from lodging into the structure.

B.2.27 Using clean, potable soft water free from salts having a conductivity inferior to 60µS, and an approved controlled nebulous pulsating water spray or micro-blasting system as specified in

this tender document, and as approved by architect and civil engineer in charge, clean dirt from stone surfaces on structure, particularly mouldings, marble plaques, sculptural elements etc. or as directed by architect and civil engineer in charge. The aim of this exercise should be to remove the dirt (soot, etc) from the limestone etc. rather than alter the original patina of the stonework. Any remaining dirt should be removed using approved micro-blasting techniques.

B.2.28 Using methods and materials as specified in this document carry out plastic repair to sections of deteriorated/damaged masonry work on any part of the structure, including mouldings, marble plaques, sculptural elements etc. The material used for the plastic repair shall be as specified in this document.

B.2.29 Using methods and materials as specified in this document carry out plastic repair to fill any alveoli formed on any part of the masonry structure, including mouldings, marble plaques, sculptural elements etc. The material used for the plastic repair shall be as specified in this document, and care shall be taken to ensure that each alveolus is filled in individually, taking care to keep the surface of the masonry clean and free from any mortar. All plastic repair shall be formed such as to match adjoining stonework and previous plastic repair, in colour, texture and final profile. The extent of filling of the alveoli shall be determined on site by the Contracting Authority's architect and civil engineer in charge and shall vary to reflect the physiognomy of the deteriorated masonry fabric.

B.2.30 Using methods and materials as specified in this document and as directed by architect and civil engineer in charge, reinstate using plastic repair techniques, the deteriorated sections of old plastic repair previously carried out, on any area of the face of the wall, to include cornices, openings, merlons, etc. All plastic repair shall be formed such as to match adjoining stonework and previous plastic repair, in colour, texture and final profile. Rate is to include for the addition of any admixture, additive or fibre strands etc. specified in the tender document and/or recommended by architect and civil engineer in charge. Rate is to include for the removal of loose, damaged or unsound areas of the original plastic repair as directed by Contracting Authority's architect and civil engineer in charge. The areas of the original repair removed, shall be kept to a strict minimum necessary to provide a sound base for the new plastic repair.

B.2.31 Replace any deteriorated masonry, including mouldings, sculptural elements etc. Carefully chisel away all deteriorated stonework to a depth as specified in this document or as directed by architect and civil engineer in charge, taking care, in the process, not to damage surrounding sound old stonework. All re-instated stone shall be of varying thickness and in no case less than 230mm in thickness or as directed by architect and civil engineer in charge, such as to ensure a good interlocking effect with the adjacent area of wall. All newly reinstated masonry shall be grouted to the original wall with an appropriate lime based grout. If requested, all newly re-instated masonry blocks shall be adequately hacked at the back and painted, at the back and sides, with a bituminous compound prior to grouting unless otherwise indicated by the Contracting Authority's architect and

civil engineer in charge. All replaced stonework shall be similar in size and configuration to original, and shall match with the existing course heights. Most of replaced stonework will be special sized stone. Where applicable, all new stonework shall be worked to templates to match the original prepared as specified in this document, and all exposed surfaces shall be finished by traditional mason's hand tools. No machine finish will be allowed.

B.2.32 Using hand tools, carefully remove all pointing loosened during the cleaning process, and re-point, together with all joints left shy. All pointing shall be carried out as neat as possible. The width of the pointing, should, as far as possible, be kept to the minimum possible. All pointing shall be carried out flush with the surface of the masonry, directing water away from facade.

B.2.33 Using appropriate waterproofing materials as specified in this document protect horizontal surfaces of projecting elements to direct rain water away from the structure and minimize water penetration into the fabric.

B.2.34 If requested, adopt a system specified hereunder, to fix/install anti-roosting bird spikes to all projecting cornices and ledges.

B.2.35 Using appropriate waterproofing materials as specified in this document replace and reinstate any damaged areas of the existing waterproofing membrane.

B.2.36 Apply a transparent finishing coat (velatura) to restored masonry where indicated by the architect and civil engineer in charge. The main aim of the velatura shall primarily be that of giving a unified appearance to the restored fabric. The mix of the velatura shall be prepared to the approval of the architect and civil engineer in charge.

B.2.37 Roof platform flagstones and water tightness Taking care not to damage the franka flagstones, concrete accretions shall be chiselled.

B.2.38 Using a stiff bristle/ nylon brush (no wire brushes or power tools shall be used), the flagstones shall be carefully dry brushed, one section at a time, from dirt. Care shall be taken to ensure that no damage is caused to friable, delaminated stonework. Any dismantled existing sound franka flagstones are to be numbered. Detailed Photogrammetric surveys of the platform terrace in digital format are being provided. The numbering methodology to be employed shall be determined by the Architect and Civil Engineer in charge. Carefully and taking care not to damage the original flagstones, pointing from joints shall be loosened and flagstones previously numbered taken up. Extents of masonry work to be dismantled shall be determined later on in a subsequent report.

B.2.39 Carefully, taking care not to damage the stonework by chipping, etc., the dismantled flagstones shall be stored on timber palettes. Care shall be taken to ensure that dismantled stonework is not damaged and original patina of the stone is respected.

Expanded polystyrene sheets or any other similar material shall be used to pack dismantled flagstones on timber pallets for future use.

B.2.40 A physically stable layer of polyurethane foam shall be applied over exiting base to render impermeable, and, a level sub-base using a suitable graded compacted hardcore (coralline limestone) fill shall be provided to attain previous original levels. This shall be compacted using adequate means and surface prepare for the re-instatement of the previously removed flagstones.

B.2.41 Dismantled flagstones shall be re-instated in original place as previously numbered, substituting any deteriorated flagstones with new flagstones having similar dimensions and configuration. All flagstones shall be re-laid on a bed of hydraulic lime-rich mortars and great care shall be taken to ensure that flagstones are laid such as to avoid any ponding. Any replacement of damaged flagstones which are beyond repair shall be done in same material and style.

B.2.42 Using a hydraulic lime base mix, franka flagstones shall be grouted. Care shall be taken to ensure that franka flagstones are kept clean and no damage is procured to the original fabric.

C.20 Demolition/Dismantling Works

C.20.1 Extent of works

The building or part of a building to be demolished is that shown on the drawings and described in the Bill of Quantities.

All demolition works shall be carried out in strict accordance with the drawings and Bill of Quantities and as directed by the architect and civil engineer in charge.

C.20.2 Avoidance of nuisance

Pulling down is to be carried out in such a manner as to cause as little inconvenience as possible to the users, any adjoining owners or the public and the contractor will be held responsible for any claims which may arise from the disregard of this clause.

Debris is to be sprinkled with water to prevent dust arising and all proper screens and protection provided to the satisfaction of the architect and civil engineer.

C.20.3 Artificial and temporary lighting and power

The contractor is to provide all artificial and temporary lighting and power required for the proper execution of the works (including safety-lights on any hoardings or gantries projecting on to or over the public road and/or footpath) and is to pay all charges in connection therewith.

C.20.4 Water

The contractor is to pay all charges for water required for the works and supply all tanks, temporary service pipes, stopcocks, connections, etc., as required and clear away on completion.

C.20.5 Reinstate and make good

All pulling down as hereafter described is to be carried out without damage to the remaining parts of the structure and if such damage shall occur in the carrying out of the demolition the contractor shall reinstate and make good the same at his own expense.

All making out and making good is to be executed with materials and workmanship to match in every respect the surrounding work and is to be properly bonded thereto.

C.20.6 Public footways

The contractor shall be responsible for maintaining and upholding the public roadway and footpaths and shall be responsible for and make good any damage to same.

C.20.7 Insurance

The contractor shall insure and indemnify the client against all claims by third parties, theft and all injury to workmen or others as stipulated in the Special Conditions.

C.20.8 Plant

The contractor is to provide at his own cost all requisite plant, scaffolding, drawing-in ways, gangways, planks, gantries, tarpaulins, etc., for the proper protection and execution of the works.

C.20.9 Give all notices

The contractor shall conform to the provisions of any Acts of Parliament relating to the works and to Police Laws and regulations and he shall give all notices required by the said Acts, Laws and Regulations and pay all fees in respect thereof.

The contractor shall give all notices to statutory authorities and shall allow them facilities for removing any fixtures, fittings, or services which may belong to them.

C.20.10 Possession

As soon as possession of the site is given to the contractor he shall proceed with the demolition and complete same as per agreed gantt chart.

It is essential that the whole of this work be completed at the earliest possible moment.

C.20.11 Advertising

The contractor under no circumstances will be allowed to use the hoarding or any part of the building for advertising purposes, but he will be allowed to exhibit the usual Construction Site Management Notices to the approval of the architect and civil engineer.

C.20.12 Shoring

The contractor shall provide, erect and maintain all necessary needles, dead and raking shores to the surrounding property to the entire satisfaction of the architect and civil engineer. The construction and efficiency of the shoring for the purpose for which it is erected shall be the entire responsibility of the contractor. Should any subsidence or any other damage occur due to the inefficiency of the shoring or any other support provided, the damage shall be made good by the contractor at his own expense.

The contractor shall alter, adapt and maintain all such temporary works as may be necessary

from time to time and finally clear away and make good all disturbed, he will be held solely responsible for the safety of existing buildings and the sufficiency of all temporary work, and provide all necessary tarpaulins and other means of covering up for the protection of new and existing works against inclement weather and make good all damage done.

C.20.13 Hoardings

The contractor shall obtain the necessary consent, pay all licence fees for and provide and erect vertical close-boarded hoardings to the whole of the street frontage 2m-2.5m high with necessary returns at ends. Necessary access doors shall be provided in the hoardings which shall be altered and adapted as may be necessary during the carrying out of the work.

C.20.14 Diversion of services

Before commencing of any works all services shall be disconnected or diverted so that they may be entirely self-contained with any portion of the premises which is to remain.

C.20.15 Demolition

Carefully pull down the whole of the structure as shown on the drawings and described in the

Bill of Quantities down to the level indicated by the architect and civil engineer in charge and cart away all materials and rubbish whatsoever.

C.20.16 Enclosing adjacent buildings

Adapt as necessary during the progress of the work, clear away when no longer required.

C.20.17 Materials arising from demolition

Serviceable materials arising from the demolition, such as timber beams, rolled steel joists, doors and windows etc., are to remain the property of the client and are to be cleaned and removed to a site/store as indicated by the architect and civil engineer.

The remainder of the materials arising from the demolition is to become the property of the contractor who is to cart it away from the site and the contractor is to make due allowance in his tender for the value of any sound materials so acquired or residual scrap value arising.

C.20.18 Making good

All making out and making good is to be executed with materials and workmanship to match in every respect the surrounding work and is to be properly bounded thereto, otherwise all new work is to be executed with materials and workmanship as hereafter described.

C.20.19 Re-use of old stone

Sound old stone arising from the pulling down may if cleaned, and approved by the architect and civil engineer be re-used in foundations and walls below ground level. No old stone may be reused for fair face work. Approved hard materials arising from the pulling down may be used in making up levels beneath floors, hard core beds, etc. All other materials not described to be re-fixed or stored and all rubbish and debris are to be basketed out if necessary and removed from the site.

C.20.20 Grub up old drains etc.

Grub up gulleys, break up manholes, etc., and fill in to voids with hard, dry stone as described and stop off all old disused drains at point of entry with cement concrete.

C.20.21 Work to expose old party walls

Where old party walls be exposed above level of roof or elsewhere by reason of new buildings, hack face and rake out joints and render and set in Portland cement and sand (1-3) trowelled smooth, and properly make good up to new and existing work (or alternatively, clean down face of stonework rake out joints and point in cement and sand (1-3) with a neat cut weathered joint), and generally make good all to the satisfaction of the architect and civil engineer and adjoining owners.

C.20.22 Labour

The workmen and supervision employed on demolition work must be experienced in this class of work.

C.20.23 Overloading of existing structures

Materials arising from the demolition must not be stacked or allowed to accumulate on existing structures in such a way as to endanger their stability. The contractor will be held entirely responsible for any damage arising from this cause.

Any sound old stone forming part of the building fabric, which needs to be temporarily removed to allow ease of work should be clearly marked and stored on site to be returned to its original place at the opportune time. Any unsound stone which need to be temporarily removed should be replaced by a new stone of similar dimensions and configuration. Soundness of stone is to be determined by architect and civil engineer in charge.

No separate payment shall be made for this work.

C.20.24 Disposal of resulting material

All materials which cannot be re-utilised for backfilling shall be hauled to spoil dumps outside the work area at any distance as approved by the architect and civil engineer in charge.

As a rule, unless otherwise specified, the depositing in spoil dumps shall be a minimum distance of 3 metres from the outside edge of any trench and 2m from any wall.

The materials shall, in any case, be disposed of in such a way as not to cause any disturbance to the flow of the water, and preferably into natural ground depression. The price for disposal of excavated material is deemed included in the priced bid

C.30 Shoring/Scaffolding

C.30.1 Scaffolding

All work shall be carried out in accordance with local Occupational Health and Safety Regulations and the statutory MSA EN regulations (in particular MSA EN 39, MSA EN 74, MSA EN 1139, MSA EN 12810 and MSA EN 12811) and BS 2482.

Adequate precautions shall be taken to protect persons from injury by the fall of materials, tools or equipment being raised or lowered. Such precautions will include fencing, barriers and the like. Safety nets or sheets should be tied at every intersection of the scaffolding tubing and able to withstand rupture from the above mentioned loads; otherwise barriers (in the form of inclined overhangs) will be introduced at a distance of 4 to 6m above ground level followed by ones at 12m intervals. Fencing, barriers, or the appropriate utilization of lookout men.

The contractor shall provide competent supervision to ensure that all scaffolds are used appropriately, and only for the purpose for which they are designed or erected. It shall be erected and maintained in accordance with the local Occupational Health and Safety Regulations and certified by a competent and recognised person. No personnel are to be allowed on the scaffolding until such certification has been deemed compliant by the architect and civil engineer in charge.

Where work at the face of a building or other structure is done from a working platform, the space between such face and the working platform shall be as small as practicable, provided that, where workmen sit at the edge of the platform to work, such space may be up to a maximum of 300mm.

In transferring heavy loads on to a scaffold, a sudden shock shall not be transmitted to the scaffold. When hoisting loads on to scaffolds, the loads shall be controlled by a hand rope (tag line), so that they cannot strike against the scaffold. The load on the scaffold shall be evenly distributed, as far as practicable, and in any case shall be so distributed as to avoid disturbance of the stability of the scaffold. Scaffolds shall not be used for the storage of material except that required for immediate use.

Workers shall not be employed on external scaffolds in weather conditions that threaten their safety.

Guys, stays or supports shall be used where required to prevent danger; alternatively other effective precautions shall be taken to prevent the collapse of structures or parts of structures that are being erected, maintained, repaired, dismantled or demolished.

No scaffold shall be partly dismantled and left so that it is capable of being used, unless it continues to be safe for use.

Working platforms, gangways and stairways of the scaffolds shall be provided with overhead
screens of adequate strength and dimensions to prevent danger from falling objects. Materials shall not be thrown from scaffolds; exceptions shall be made only where the landing
area has been designated, protected, appropriate notices displayed and are under supervision of a person at landing level.

Scaffolding materials shall not be thrown from scaffolds or from heights. Authorisation shall be sought before any other materials shall be thrown from scaffolds or heights and only where the landing area has been designated, protected, appropriate notices displayed and is under the supervision of a person on a landing level. In all circumstances, chutes shall be installed for the removal of materials from on the scaffolding.

Openings between the scaffolding and the structure, which exceed 20cm, should be adequately protected by the installation of handrails. Wherever the above hinders operations to be carried out, workers shall be provided with safety harnesses with independently secured lifelines.

Any timber used in the construction of scaffolds shall be straight-grained, sound and free
from large knots, dry rot, worm holes and other defects likely to affect its strength. Where
necessary, boards and planks used for scaffolds shall be protected against splitting. Ladders,
boards and planks used in scaffolds shall not be painted, so that any defects remain visible.
All tubes, couplers and fittings used in metal scaffolding shall be free from damage and distortion, and shall be maintained in a lubricated condition. Couplers shall not cause

deformation in tubes. Couplers shall be made of drop forged steel or equivalent material. Tubes shall be cut cleanly square with the tube axis. Alloy and steel tubing shall not be intermixed on the same scaffold.

Tower scaffolds shall be designed and built in such a manner that the ratio of height to the
base width is not more than 3.5:1, in the case of static towers used outdoors, and in a ratio of 4:1, in the case of static towers used indoors; in any case, the height of free-standing static towers should not exceed 12m. Mobile towers shall not be moved while persons or materials are on the top platform. The ratio of height to base width in the case of mobile towers used outdoors shall be of 3:1, but should not in any case exceed 9.6m in the case of free-standing mobile towers.

In the case of prefabricated scaffold systems, the manufacturers' instructions shall be strictly
adhered to. Prefabricated scaffolds shall have adequate arrangements for fixing bracing. Frames of different types shall not be intermingled in a single scaffold.
In addition to the requirements for scaffolds in general as regards soundness, stability and protection against the risk of falls, suspended scaffolds shall have a safe cabin, with full protection from weather and adverse climatic conditions, and designed and constructed in accordance with ergonomic principles, a clear and unrestricted view of the area of operation; safe access to, and egress, from the cabin, including for situations where the operator is taken ill.

The scaffolding shall be tied to the building at suitable vertical and horizontal distances without causing irreversible damage/ alterations to the fabric of the building being restored. Preferably, scaffolding shall be secured by utilising existing openings/ holes. If not possible, a predetermined minimum number of perforations for tying the scaffolding to the historic structures will be allowed. The latter will make use of a bolting system inserted in the joints between the blocks for minimum damage possible to the masonry.
Any scaffolding, when the work is divided in phases, shall overlap by at least 5m with the
previously concluded phase of the works. In all cases the scaffolding shall extend by at least
1m beyond the extent of area being intervened upon or beyond the corner/s.
Prior to the dismantling of any scaffolding, the Contractor shall give the architect and civil engineer in charge sufficient time (at least 48 hours) to inspect the works.

C.30.2 Methodology: Lifting equipment

Any lifting gear or equipment intended for lifting shall not be loaded beyond its safe working
load or loads as specified by the manufacturer. It shall be erected in accordance with the local Occupational Health and Safety Regulations and certified by a competent and recognised person. Regular inspections are to be carried out in accordance with the local regulations.

No person shall be raised, lowered or carried by a lifting appliance unless it is constructed, installed and used for that purpose.

Any lifting gear shall be erected and maintained in accordance with the local Occupational
Health and Safety Regulations and certified by a competent and recognised person. No personnel are to be allowed on such gear until such certification has been deemed compliant by the architect and civil engineer in charge.

Every platform or receptacle used for hoisting any loose material shall be so enclosed as to prevent the fall of any of the material.

Any equipment with wheels, placed directly on a platform for raising or lowering, shall be so secured so that they cannot move, and the platform shall be enclosed as necessary to prevent the fall of the contents.

C.40 Cleaning Masonry

C.40.1 Extent of Works

Prior to the commencement of works, the building shall be inspected by the contractor together with the architect and civil engineer in charge to confirm the extent of work and the restoration methodology to be employed.

C.40.2 Materials: Water

The water to be used shall have conductivity inferior to 60uS/cm. The use of chlorinated water shall not be permitted. It shall comply with MSA EN 1008. It shall be pH neutral.

C.40.3 Materials: Paper pulp

The paper pulp used in the work shall be chemically stable, having a cellulose content of 99 +/- 1% and a calcium content of 0.025 +/- 0.005%. Average fibre diameter should be 20 microns, while the average fibre length shall be of 300 microns.

C.40.4 Materials: Sepiolite clay

The sepiolite clay used shall be natural having a water absorption superior to 148% and an apparent density of around 555g/l. The sepiolite clay used shall be asbestos free with a specific surface area of 218 to 222sq.m./g. The pH value shall be 8.0 +/- 0.5.

C.40.5 Materials: Biocide

The application of mild biocides that have a long-term inhibiting effect on re-colonisation shall follow the initial removal of organic growth. C.40.5.2 Products to be used shall be neutral products belonging to the chemical class of compounds methoxy triazine, acting by being absorbed both through the roots and the leaves and have a wide spectrum of action; other products include quaternary-ammonium compounds, or as approved by the architect and civil engineer in charge.

C.40.6 Materials: Herbicide

The product to be used should result in the desiccation of the plant after it has been absorbed. The dead parts will then be easily removed by hand, without risking re-growth.

The following factors shall determine which chemicals will be used:

- chemicals which do not cause damage to the stone;
- chemicals which do not create any risk to man or other life forms, apart from the ones treated, taking into account their toxicity with respect to humans, earth fauna and sea fauna;
- their activity period and residual effects;
- do not contain harmful salts or other substance which can instigate or accelerate the deterioration of the stone.

C.40.7 Methodology: General

The contractor is to ensure that all the necessary measures are taken to ensure that masonry elements are not damaged, chipped, soiled stained or contaminated by salts and/or other deleterious substances during the works.

The contractor shall ensure that the stability of all of the structure is maintained throughout work. Any defects, including signs of movement that develop or become apparent during the course of works shall be immediately reported to the architect and civil engineer in charge.

The contractor shall protect works against damage by rain.

Necessary precautions shall be taken by the contractor to prevent the masonry bedding from drying out too rapidly in hot conditions and in drying winds.

All rejected work shall be removed and replaced using new materials at the contractor's expense. The contractor shall also be bound to replace any defective materials in all or parts of the existing works by proper materials and/or workmanship as directed by the architect and civil engineer in charge.

C.40.8 Methodology: Removal of vegetation

Every effort shall be made to remove all parts of plant including roots and stubs. Where growth cannot be removed completely without disturbing the masonry, the contractor shall seek instructions from the architect and civil engineer in charge.

Plants/weeds shall not be removed by cutting the plant at the base of the stem and then by the use of a biocide to kill off the remaining part of the plant unless explicitly told to do so by the architect and civil engineer in charge and if the contractor certifies that the herbicide/biocide being used is effective if applied in this manner.

The product to be used should result in the desiccation of the plant after it has been absorbed. The dead parts will then be easily removed by hand, without risking re-growth.

C.40.9 Methodology: Removal of higher forms of vegetation

The Contractor shall cut out a metre section of the main stem, around 300mm to 1m above ground level; care must be taken not to damage the adjacent masonry.

After the removal of almost all aerial parts of bushes and trees, chemical spot spraying shall be carried out on cut ends of stems and branches for perennial woody plants and on new buds and leaves in deciduous trees.

Systemic herbicides will be used with absorption through leaves or barks.

A procedure combining mechanical and cleaning means will follow to remove the plants completely.

C.40.10 Methodology: Removal of metal inserts etc.

The contractor shall ensure the careful removal of redundant cables and wires, light fixtures,

and other accretions from the facades of the building. The methodology employed for this removal shall be approved by the architect and civil engineer in charge prior to commencement of works.

Care shall be taken to remove all metallic inserts, (especially iron and steel fixings) from the stonework.

Corroding metal fixings shall be carefully cut by coring around them using small diameter bits

so as to cause the least possible disturbance to the surrounding masonry. The associated rust
debris shall also be carefully removed.
Resulting holes shall be filled-in using a suitable lime-based mortar when the break is small or by piecing-in stone, if the gap is large, as per specifications.

C.40.11 Methodology: Preservation of original masonry

The contractor shall ensure that original masonry work that shall be retained will be protected and left undisturbed during the course of works.
The contractor shall seek the approval of the architect and civil engineer in charge whenever existing masonry to be preserved will need to be cut or modified to accommodate new or reused units.
The contractor shall ensure that structure to be retained is adequately propped to prevent damage caused by movement or any other means as a result of the works.
The contractor shall ensure that retained masonry in the vicinity of repair works is disturbed as little as possible.

C.40.12 Methodology for Cleaning: General Considerations

The cleaning methods adopted should, as far as possible:

- Be effective in removing the deleterious substances from the stone surface;
- Not produce any substances which will encourage any future deterioration of the stone;
- Be slow enough such as to allow good control by the operator;
- Must not cause any micro-fractures or any other discontinuities of the stone surface, as these may initiate or encourage new deterioration processes.

Abrasives, chemicals or high pressure water jetting will not be permitted. A controlled nebulous pulsating water spray system should preferably be used. The process must ensure that no over saturation and softening of the stone occurs. In those areas where this system is not sufficient to reach the required level of cleanliness, controlled micro-blasting on plain, non-decorative areas may be considered. Systems adopting sand, gravel, or water blasting techniques will not be considered.
Micro-blasting systems used shall be such as to function effectively at low pressure and use low quantities of water. The abrasive material used shall be calcium carbonate having size and configuration which will not damage the surface texture of the stone fabric.

It is important that any water used throughout the cleaning operation be free from salts. No chemical agents will be permitted. The use of tap water will NOT be permitted. The water to be used shall have conductivity inferior to 60uS.
The contractor shall test the pH value of clean water used for rinsing, the wetted surface and all chemical agents to be used in the cleaning processes before application.
All solutions shall be thoroughly mixed before taking a sample for pH measurement.
All readings shall be carried out at the same temperature, or compensated for if taken at different temperatures. All data shall be submitted in writing to the architect and civil engineer in charge.
The aim of the cleaning exercise should primarily be that of cleaning the face of the stone and removing all accumulation of carbon, sulphurous compounds, and other contaminants, but should retain the patina of time. On completion of works, the stone is to be brought to its natural patina, texture and profile. All discoloration is to be removed from the face of the stone. No original carved relief arises or surface textures are to be damaged or altered.
The contractor shall ensure that all electrical supplies serving external equipment have been disconnected and that, unless specified otherwise, fittings and associated cable have been removed.

The contractor shall take all measures to prevent:

- Ingress of water, cleaning agents, debris and dust into the building via windows, doors, vents and other openings.
- Protection of ventilation grilles, airbricks, or other ventilation openings without sealing them.
- Damage to all components and finishes that can reasonably be protected during cleaning procedures, including lightning conductors, roof coverings, flashings, rainwater goods, glass, metal works, services equipment, signage and paving.
- Staining of surfaces from ferrous or other reactive metals.
- The contractor shall use approved protective boards, sheeting, films, sealants and sealing tapes that do not stain protected materials and that can be readily removed after cleaning without damaging or staining the protected material.
- The contractor shall seek approval from the architect and civil engineer in charge should it be necessary to take additional measures for cleaning.

C.40.13 Methodology for Cleaning: Tests to be conducted during the cleaning procedure

The contractor shall be responsible to carry out tests as outlined with this document to determine the extent of salts within the masonry fabric. These tests shall be carried out prior and repeated during and after the cleaning process has been completed. The

contractor shall furnish the architect and civil engineer in charge with the results of the tests

Putty moulds of stone surfaces indicated by the architect and civil engineer in charge shall be

prepared prior to the commencement of the cleaning works and repeated after final cleaning.

C.40.14 Methodology for Cleaning: Trial cleaning

The Contractor is to prepare trial samples for all cleaning methods in locations agreed with the architect and civil engineer in charge.

The Contractor shall inform the architect and civil engineer in charge before carrying out each trial cleaning method to enable the architect and civil engineer in charge to approve the selected testing area and be present during the preparation and execution of trial samples. The period of notice shall be agreed with the architect and civil engineer in charge.

The time, date, location, details of all the products and procedures for each sample area shall be submitted in writing to the architect and civil engineer in charge.

The contractor shall provide the architect and civil engineer in charge with a copy of all the trial sample records.

C.40.15 Methodology for Cleaning: Monitoring

The contractor shall regularly monitor effects of each cleaning procedure against the degree of cleaning established by approved trail sample/s.

The contractor shall seek instructions immediately wherever:

- Disruption to the surface occurs;
- Discoloration or stains are revealed by cleaning;
- Anticipated level of surface cleaning is not being achieved.

C.40.16 Methodology: Dry Brushing of surface

Prior to commencing any cleaning method, the contractor shall remove loosely adhered deposits and growths using suitable corrosion resistant brushes that do not damage the stone surface.

The use of brushes with steel bristles shall not be permitted. Nylon brushes will be preferred.

C.40.17 Methodology: Wet brushing of surface

General cleaning shall be carried out by means of low pressure washing (less than 2 bar) using water with a conductivity inferior to 60µS/cm and hand held mineral/nylon fibre brushes as directed and approved by the architect and civil engineer in charge. Garden type manual pump sprayers are to be used.

The spray shall be atomised from fine nozzles situation at least 300mm away from the masonry.
Stubborn deposits shall be removed first. Softened deposits shall be removed with suitable nylon brushes that do not damage the surface. Any debris shall be thoroughly rinsed.
The flows shall be directed from the top downwards so that the trickling of water softens the lower areas of dirt build-up.
In the process, care shall be taken to ensure no damage is caused to mortar joints and original plasters
The water spray technique shall not be allowed in severely deteriorated areas.

C.40.18 Methodology: Water spray cleaning

Water spray cleaning with mounted nozzles shall be used in areas which require a prolonged period of wetting, as approved by the architect and civil engineer in charge. The wetting shall last for a period sufficient to produce the swelling of the layer of dirt, shall be used in combination with small brushes to cut down the saturation period and shall be attached to a length of pipe connected to the approved water supply. Chlorinated mains water and water having a conductivity of more than 60uS/cm will not be allowed.

The spray shall be atomised from fine nozzles situated at least 300mm away from the masonry. Enough water pressure and small enough orifices shall be required to atomise the water.
The equipment shall be of a type which allows the position and direction of nozzles to be readily adjusted relative to existent surfaces and profiles.
For each surface, the nozzle positions and spraying cycles that enable deposits to be removed/softened whilst keeping the water running off the surface to a minimum shall be established.
The flows will be directed from the top downwards so that the trickling of water softens the lower areas of the dirt build up.
Regular monitoring and adjustment of the washing cycle and nozzle positions shall be ensured by the contractor as work proceeds. In addition, the water spray/mist shall be controlled by adequate sheeting which shall reduce the effect of draughts of air blowing away the water from the building, since the effectiveness depends on how successfully the mist can be contained.
The heaviest deposits shall be removed first. Softened deposits shall be removed withsuitable nylon brushes that do not abrade the surfaces. Any debris shall be thoroughly rinsed.
The water spray technique shall not be allowed in severely damaged areas.

C.40.19 Methodology: Use of Mora Pack

The principle behind poultice treatment is that once soiling is dissolved, dirt is held in contact with the pack, rather than dissolved and permitted to fill the pores. The intimate and extended contact of the cleaning materials means that smaller quantities and lower concentrations of chemicals need be used.

Unless otherwise instructed by the architect and civil engineer in charge, ammonia shall be used in the poultice to soften the crust.

The AB57 (Mora Pack) with paper pulp/cellulose and/or sepiolite clay is to be used only where specifically requested.

The Mora Pack is a mild chemical pack containing agents which facilitate the dissolution of calcium salts. The poultice shall be prepared by mixing into a consistent sticky paste the following:

- 60g sodium bicarbonate;
- 60g ammonium bicarbonate;
- 25g ethylene diamine tetra acetic acid (EDTA);
- 10g surfactant disinfectant (neutral);
- 60g sepiolite clay/ paper pulp/carboxymethylcellulose (CMC);
- De-ionised/distilled water as required (tap water or water containing salts will not be permitted);

The above-mentioned ratios may be revised/adapted by the architect and civil engineer in charge as so deemed necessary. In such eventuality, the contractor may not demand any adjustment to the rates submitted for this tender document.

The mix is then suitably ironed to a thickness of 4 to 5mm on the pre-wetted soiled surface, and covered with a polyethylene film to prevent the poultice from drying up. The poultice is left in place for a contact period as considered necessary by the architect and civil engineer in charge, after which it is gently removed and the treated area rinsed with de-ionised water and brushed with a suitable nylon brush.

Given the nature of the crust, this process shall be repeated for as many times as so deemed necessary, until the black crust formation has been removed and a satisfactory level of cleaning is obtained. <u>For payment reasons, this exercise will be considered as an intrinsic part of the poulticing exercise, and in no case will the contractor be allowed to make claims for extra costs in relation to workmanship and/ or material.</u>

C.40.20 Methodology: Chemical cleaning for the removal of iron stains

The clay pack for iron stains shall consist of sepiolite clay and/or paper pulp added to a solution of glycerine, generally sodium citrate. The paste shall then be applied to the stain surface and left to dry.

The paste shall then be removed with wooden or other non-metallic spatula.

Several coatings might be necessary to lighten the stain. For stubborn stains, the surfaces shall be wetted. When lifted off, the surface is washed with copious amounts of water.
Given the nature of the stain, this process shall be repeated for as many times as so deemed
necessary, until the stain has been removed, and a satisfactory level of cleaning is obtained. For payment reasons, this exercise will be considered as an intrinsic part of the poulticing exercise, and in no case will the contractor be allowed to make claims.

C.40.21 Methodology: Chemical cleaning for the removal of cuprous stains

The removal of cuprous stains shall be carried out by mixing one part of ammonium chloride with four parts powdered talc or sepiolite clay or paper pulp. A 10% solution of ammonia water shall be added to the mix.
The surfaces shall be wetted with clean water prior to the application of the paste and then be left to dry.
The paste shall then be removed with a wooden or other non-metallic spatula and shall then be rinsed thoroughly with clean water.
It may be necessary to reapply, remove and rinse off the paste to lift or satisfactorily lighten the stain, as instructed by the architect and civil engineer in charge.
Given the nature of the stain, this process shall be repeated for as many times as so deemed necessary, until the stain has been removed, and a satisfactory level of cleaning is obtained.
For payment reasons, this exercise will be considered as an intrinsic part of the poulticing exercise, and in no case will the contractor be allowed to make claims.

C.40.22 Methodology: Chemical cleaning for the removal of graffiti/aerosol paint stains

A pasteous, solvent-free remover for mineral surfaces shall be applied in a thick layer left in contact with the paint for long enough to cause softening and to enable scraping and brushing to take place successfully. The layer shall be covered by a thin layer of plastic (as per manufacturer's recommended procedure).
Following this application, the surface shall then be washed thoroughly with warm water and neutral pH soap.
Given the nature of the stains, this process shall be repeated for as many times as so deemed necessary, until the stain has been removed, and a satisfactory level of cleaning is obtained.
For payment reasons, this exercise will be considered as an intrinsic part of the poulticing exercise, and in no case will the contractor be allowed to make claims

C.40.23 Methodology: Chemical cleaning using soap/detergents

The contractor shall apply a non-foaming pH neutral soap blend for water rinsing and completion of the cleaning.

The lowest possible concentration of agent and the shortest dwell times shall be established for all areas and surfaces.

The contractor shall keep written records of concentrations, dwell times, thickness and number of applications.

Given the nature of the stain, this process shall be repeated for as many times as so deemed necessary, until the stain has been removed, and a satisfactory level of cleaning is obtained. For payment reasons, this exercise will be considered an intrinsic part of the poulticing exercise, and in no case will the contractor be allowed to make claims.

C.40.24 Methodology: Chemical Cleaning by liquid gels

For each area/surface, the lowest possible concentration of agent/s and the shortest dwell times are established. The contractor is to keep written records of concentrations, dwell times, number of applications, ambient temperatures and rinsing water temperatures.

The contractor shall ensure that the chemical agents and rinsing water/sprays are contained within each treatment area and agents or rinsing water/sprays do not come in contact with surfaces that are either excluded from the cleaning or that have already been cleaned. It is important to prevent wind drift.

Before each application of agent, the surface and adjacent areas are wetted using clean water applied by a low-pressure spray.

The wet surface is also tested for pH. The cleaning agent is then applied evenly over the surface and is not allowed to dry out.

The treated surfaces are then rinsed thoroughly and evenly with clean water working from the top of each area downwards. Water spray pressures that will drive the cleaning agent into, or cause disruption of the surface material and joints will not be used. pH testing and neutralization procedures will then follow.

C.40.25 Methodology: Use of surgical knives

Prior to commencing any cleaning method, the contractor shall remove loosely adhered deposits and growths using suitable corrosion resistant brushes and then use surgical knives should any dirt remain.

Surgical knives are to be such and are to be used in a way as not to cause scratches or damage the stone surface. They are to be used where indicated by the architect and civil engineer in charge.

C.40.26 Methodology: Micro-blasting

Low pressure micro blasting cleaning is to be used where explicitly indicated by the architect and civil engineer in charge with pressures not exceeding 3 bar. Any water used shall be free of salts and having a conductivity not exceeding 60uS/cm.

High pressure blasting or washing using pressures in excess of 3 Bar will not be allowed.

The contractor shall ensure that any water resulting from this cleaning process is not allowed to flow in the streets.

The contractor shall take all the masonry measures to ensure that any cleaning agent or residues are not allowed to stray onto adjacent or protected surfaces.

The contractor shall ensure that the grit used in the cleaning process is weaker than the stone being cleaning. No cleaning shall commence prior to the approval of the architect and civil engineer in charge.

The contractor shall clean, collect and safely dispose of all debris from scaffolding, ledges, etc at the end of each day.

The contractor shall prevent the marking of cleaned areas from dirt and debris splashing up from scaffold boards.

All cleaning shall commence at the uppermost section of the structure to avoid washing dirt onto previously cleaned surfaces.

Approved cleaning procedures or materials shall not be modified without the approval of the architect and civil engineer in charge.

The contractor shall seek approval from the architect and civil engineer in charge should it be necessary to take additional measures for cleaning.

C.40.27 Methodology: Application of biocide

Surface soiling by organic growth shall be initially removed by simple dry bristle brushes, surgical knife blades and spatulas, provided that the substrate is sound enough,

without damaging or abrading the surface and as approved by the architect and civil engineer in charge. If the surface below the growth is delicate or liable to be marked or scoured in any way, this preparation will be limited/modified as approved by the architect and civil engineer in charge.

The biocides shall be applied in strict accordance with the manufacturer's recommendations for the safety and protection of the workers and the environment.

The general removal of organic growth such as fungi, lichens and the like will be limited to places where these are possibly causing harm and as indicated by the architect and civil engineer in charge.

In an exceptionally dry period, and in areas where it is recommended to remove the organic growth, dormant dry lichens shall be revived with light water spraying prior to the application of the biocide. Application of biocidal treatments will not be undertaken during wet weather or when windy conditions lead to the excessive drift of spray.

The contractor shall protect all surfaces that are excluded from chemical cleaning. All chemical agents shall be contained within each treatment area.

Process shall be repeated until the growth has been removed or until instructed to stop by the architect and civil engineer in charge. For payment reasons, repeated applications to achieve this will be considered an intrinsic part of the exercise, and in no case will the contractor be allowed to make claims.

C.40.28 Methodology: Completion of works

No part of the scaffolding shall be dismantled prior to the approval of the architect and civil engineer in charge. The contractor shall give the architect and civil engineer in charge at least one week notice to allow for a final inspection and the measurement of works.

At his own cost, the contractor shall be responsible for the cleaning of all apertures, glazing, ledges, window sills etc from any material resulting from any of the processes outlined in this document.

The contractor shall ensure that all gutters, down pipes, gullies etc are clean and in a condition to function effectively.

C.41 Repairing/Renovating/Conserving Masonry

C.41.1 Extent of Works

Prior to the commencement of works, the building shall be inspected by the contractor together with the architect and civil engineer in charge to confirm the extent of work and the restoration methodology to be employed.

C.41.2 Materials: Water

The water to be used shall have conductivity inferior to 60uS/cm. The use of chlorinated water shall not be permitted. It shall comply with MSA EN 1008. It shall be pH neutral.

C.41.3 Materials: Consolidants

Stone consolidants are applied to the stone fabric as liquids, depositing a solid material within the pore structure of the material.

The main function of a stone consolidant should be that of restoring the cohesion, physical properties and appearance of the deteriorated stone. It is thus important that the choice of a suitable consolidant should be based on the following parameters:

- Consolidating value, whereby the treated deteriorated stone recovers its original properties, mainly strength, surface hardness and abrasion resistance;
- Durability;
- Depth of penetration, affected mainly by the viscosity and surface tension, rate of gel or precipitation formation, method and conditions of application, and rate of evaporation;
- Stone porosity. As the proportion of fine pores increases, the stone becomes more susceptible to salt attack. The consolidant should, ideally not alter the pore size distribution of the original material;
- Moisture transfer;
- Compatibility. Treated stone should have three-dimensional properties similar to that of the original stone. Consolidants should not form by-products containing harmful salts that can cause further damage to the stone;

- Appearance of the consolidated stone.

Ethyl silicate consolidants to be used shall be non-toxic and of a one component system, having a silicium organic compound base (70 to 80%). They shall be thin, and have a low viscosity of 3.3c ST at 25oC or better, certified to penetrate deep into fine capillaries. They shall not impair the breathability of the stone structure, be durable and resistant to local weather. The consolidant used shall be colourless, have a density in the region of 0.96 to 0.98 g/cm^3, or better, and cure without any salt formation and shall be catalysed by atmospheric humidity.

Ammonium oxalate consolidants to be used shall be ammonium oxalate monohydrate $(NH_4)2C_2O_4.H_2O$ 99% pure. It shall be mixed with deionised water in the ratio of 50g of oxalate and 950ml of water. It shall be thin, and have a low viscosity, be certified to penetrate deep into fine capillaries, shall not impair the breathability of the stone structure and be durable and resistant to local weather. The consolidant used shall be colourless, cure without any salt formation and shall be catalysed by atmospheric humidity.

C.41.4 Materials: Quicklime (airlime)

Unslaked Lime (quicklime - gir mhux imtaffi) shall be prepared from suitable, good quality upper coralline limestone. The quicklime should preferably be prepared in a wood-fired kiln in a temperature not exceeding 900ºC. The stone matter should be suitably cooked to prevent under burning, over burning, or sintering of the stone, keeping the contents of any inert residue to the minimum as permitted by established International standards.
The quicklime shall be crushed to a fine powder, sieved, packed, and delivered to site in dry conditions, and soon after baking. When testing samples of lime using hydrochloric acid, the CO_2 content of lime supplied shall be in the region of 3%. All lime shall conform to the statutory EN regulations and in particular MSA EN 459.

C.41.5 Materials: Slaked lime

Quicklime (unslaked lime) shall be slaked soon after it has been produced.
The slaking shall be carried out in a container of suitable shape and material which will not permit the material to overheat during the slaking process.
Soon after slaking, the lime shall be sieved through a 5mm gauge sieve to remove any un-reactive material.
The slaked lime putty shall be allowed to mature under water for a minimum period of 4 weeks before being used.

The slaked putty shall then be mixed with the aggregate specified above in ratio of 1 part lime to 3 parts sand or as indicated by the architect and civil engineer in charge.

C.41.6 Materials: Natural hydraulic lime

The natural hydraulic lime should be natural, free from any additions such as Portland cement, etc. or any other material which contains any quantity of deleterious salts such as sulphates, chlorides, nitrates, etc.
It is to conform to MSA EN 459 Part 1: 2010 Building Limes Definitions, Specifications and Conformity Criteria.

Supplier is to submit technical literature indicating conformity with this standard.

Unless otherwise indicated, the hydraulic lime used shall have a stone colour, and shall be certified to have been produced at a temperature inferior to 1100oC. The free water content shall be less than 2% and it shall be ground to a fine powder such that more than 85% passes through a 90µm sieve and more than 98% passes a 200µm sieve as indicated in Table 18 of MSA EN 459 Part 1: 2010. Penetration shall be greater than 10mm but less than 50mm and the air content 5% as indicated in Table 18 of MSA EN 459 Part 1: 2010.

If feebly hydraulic lime NHL 2 is specified, then the compressive strength at 28 days shall be more than 2.0MPa but less than 7.0MPa as indicated in Table 17 of MSA EN 459 Part 1: 2010. The composition shall be such that the proportion of Ca(OH)2 shall be greater than 35 while the SO3 less than 2 (mass fraction in percent as indicated in Table 16 of MSA EN 459 Part 1: 2010).
If moderately hydraulic lime NHL 3.5 is specified, then the compressive strength at 28 days shall be more than 3.5MPa but less than 10.0MPa as indicated in Table 17 of MSA EN 459 Part 1: 2010. The composition shall be such that the proportion of Ca(OH)2 shall be greater than 25 while the SO3 less than 2 (mass fraction in percent as indicated in Table 16 of MSA EN 459 Part 1: 2010).
The initial setting time shall be more than 60 minutes. Final setting time is to be within 40 hours.
The composition shall be such that the proportion of CaO and MgO shall be over 45%, while
SiO2, Al2O3, and Fe2O3 shall amount to approximately 12%-30%.
Unless otherwise indicated, the hydraulic lime used shall have a stone colour, and shall be certified to have been produced at a temperature inferior to 1100oC. It shall be ground to

a fine powder such that more than 85% passes through a 90µm sieve and more than 98% through a 0.2mm sieve.

C.41.7 Materials: Sand for lime mortars

Fine aggregate (sand) for mortars shall be crushed Lower Coralline Limestone. It shall be clean, sharp and gritted and free from loamy matter and other deleterious substance. The sand is to be washed and screened when so directed by the architect and civil engineer in charge at the expense of the contractor

It is to comply with MSA EN 13139 Grade 0/2 or 0/4 (as specified) Category 1 (less than 3% to pass the 0.063µm sieve) for repair and grouting mortars and Grade 0/2 or 0/4 (as specified) Category 2 (less than 5% to pass the 0.063µm sieve) for plasters.

Fine aggregate (sand) is to be well graded and conforming to the methods of sampling and testing and quality requirements of statutory EN regulations and in particular MSA EN 932 and MSA EN 933, unless specified otherwise.

C.41.8 Materials: Repair and pointing mortar

Portland cement mixes will not be permitted, unless otherwise instructed by the architect and civil engineer in charge.

All mixes shall be lime-based (the air or hydraulic lime being in conformity with these specifications) and compatible with the stonework in colour, strength and permeability. They will also be as close as possible in colour, composition and properties to the original mortars.
Lime mortars shall be free from cement and produced in conformity to standards set out in the statutory EN regulation and in particular MSA EN 998 and MSA EN 1015. Natural hydraulic lime mortars shall be in conformity with the relative section of these specifications
The density of the lime putty shall range between 1.3 and 1.4kg/l and shall not contain any salts (nitrates, chlorides, sulphates, etc) which contribute towards the deterioration of the stone.

Pozzolanic or similar additives shall be preferred alternatives to give strength and durability to a lime-based mix, unless instructed otherwise. Any pozzolanic additive shall be added to the mortar just before use.
The properties of the mix shall be improved if hydraulic lime is used instead of both hydrated lime and pozzolana. In such cases, only aggregate shall be added. No cement or other pozzolanic additives shall be necessary, although additives to match the colour may be required as instructed by the architect and civil engineer in charge.
Unless otherwise instructed the mix shall be 1:3 binder aggregate by volume with water just enough to achieve workability.
The use of pozzolanic additives (such as brick dust, pozzolana etc.) to enable air limes to set hydraulically will be permitted. However care shall be taken to ensure that pozzolanic additives (natural or artificial) added are not toxic and do not contribute towards the deterioration of stone. The use of pozzolanic additives such as pulverised fuel ash or others which contain salts detrimental to the stone will not be allowed.
The permeability of the mortar mix/es might be compared with that of the stone before their approval for application on the monument. The permeability of the mortar will be compared with that of the stone by placing samples in a dish with a few millimetres of water to compare the rate of water uptake.
In all cases the minimum amount of water just enough to enable adequate workability shall be used in the mixes.

C.41.9 Materials: Lime injection grouts

The premixed injection mortars used shall be suitably prepared from good quality and chemically stable hydraulic lime, free from salts, pozzolana and other inert additives, mixed into a consistent thixotropic, injectable putty.

The injection grout should be free from any additions such as Portland cement, etc. or any other material which contains any quantity of deleterious salts such as sulphates, chlorides, nitrates, etc.
Unless otherwise indicated, the injection grout used shall have a stone colour, and shall be certified to have been produced at a temperature inferior to 1100oC.

Mortar shall be injectable into the crevices using suitably sized syringes. Unless otherwise indicated, the hydraulic lime used shall have a stone colour, and shall be certified to have been produced at a temperature inferior to 1100oC. The free water content shall be less than 2% and it shall be ground to a fine powder such that more than 85% passes through a 90µm sieve and more than 98% passes a 200µm sieve as indicated in Table 18 of MSA EN 459 Part 1: 2010.
It is to conform to MSA EN 459 Part 1: 2010 Building Limes Definitions, Specifications and Conformity Criteria.

The compressive strength at 28 days shall be more than 5MPa but less than 15.0MPa when tested to MSA EN 1015 Part 11: 1999 Methods of test for mortar for masonry, Determination of flexural and compressive strength of hardened mortar.

The composition shall be such that the proportion of Ca(OH)2 shall be greater than 15 while the SO3 less than 2 (mass fraction in percent as indicated in Table 16 of MSA EN 459 Part 1: 2010).
The initial setting time shall be more than 60 minutes. Final setting time is to be within 15 hours.

Testing for their permeability might be carried out before their approval for application on the monument. The permeability of the grout will be compared with that of the stone by placing samples in a dish with a few millimetres of water to compare the rate of water uptake.

C.41.10 Materials: Epoxy resin injection grouts

The epoxy resin used shall be a solvent-free resin-based product supplied in two packs (resin and hardener), having a low viscosity, and certified by manufacturer to suitably fill cracks in the region of 1mm.

The resin shall be certified by manufacturer to have a suitable bonding to masonry, be colourless (or have a stone colour), be resistant to chemicals, and have an effective adhesion even on moist masonry surfaces.

The material shall be easily injected into the crack structure using proprietary methods and tools, including suitably sized non-return injection valves. It shall have a compressive strength greater than 60N/mm2 and a flexural tensile strength of more than 30N/mm2.

C.41.11 Materials: Filling mortar (grout) for large voids

Portland cement mixes will not be permitted, unless otherwise instructed by the architect and civil engineer in charge.

All mixes shall be lime-based (the air or hydraulic lime being in conformity with these specifications) and compatible with the stonework in colour, strength and permeability. They will also be as close as possible in colour, composition and properties to the original mortars
Lime mortars shall be free from cement and produced in conformity to standards set out in the statutory EN regulation and in particular EN 998 and EN 1015. Natural hydraulic lime mortars shall be in conformity with the relative section of these specifications.

The density of the lime putty shall range between 1.3 and 1.4kg/l and shall not contain any salts (nitrates, chlorides, sulphates, etc) which contribute towards the deterioration of the stone.
Pozzolanic or similar additives shall be preferred alternatives to give strength and durability to a lime-based mix, unless instructed otherwise.
The properties of the mix shall be improved if hydraulic lime is used instead of both hydrated lime and pozzolana. In such cases, only aggregate shall be added. No cement or other pozzolanic additives shall be necessary.
Unless otherwise instructed the mix shall be 1:3 binder to aggregate by volume with water just enough to achieve workability.
Unless otherwise indicated by the architect and civil engineer in charge, the use of larger size stone spalls is acceptable in voids in which the smallest dimension exceeds 150mm.
The proposed mix is to remain be approved by the architect and civil engineer in charge.

The use of pozzolanic additives (such as brick dust, pozzolana etc.) to enable air limes to set hydraulically will be permitted. However care shall be taken to ensure that pozzolanic additives (natural or artificial) added are not toxic and do not contribute towards the deterioration of stone. The use of pozzolanic additives such as pulverised fuel ash or others which contain salts detrimental to the stone will not be allowed. Any pozzolanic additive shall be added to the mortar just before use.

C.41.12 Materials: Globigerina Limestone

Unless otherwise specified by the architect and civil engineer in charge, limestone used in the

works shall be of the globigerina limestone (franka) type supplied from an approved source. The Contractor shall submit the name, location and licence number of the supply quarry from where the stone is being cut. The quarry shall be approved by the architect and civil engineer in charge and cannot be changed without prior approval.

Unless otherwise indicated stone to match the existing will be requested. The new stone work shall be worked carefully, and true to shape (ikkartabunat).

All stone blocks (unless otherwise requested) shall be cut as smooth as possible before delivery to site. All arises shall be true and all surfaces plane and truly perpendicular to each other sand to a finished uniform height. The stone blocks shall be delivered to site on pallets, clearly marked as to the type. All stone blocks shall be unloaded carefully to prevent damage and wastage.

Only best quality "franka" stone, free from all defects, shall be used. The stone shall have good and consistent aesthetic qualities, good durability and uniformity in appearance. It shall not have excessive quantities of red stains or hard shell fragments, but shall be fine-grained and free from spits and clay material. Any stone showing 'soll' traces or blue markings (swaba) and/or any other defects on the exposed face, or whose edges or corners have been chipped, shall be rejected.
Should any such stones be used, the architect and civil engineer in charge shall have the power to remove and replace such work at the contractor's expense. The Contractor shall also be bound to replace any defective materials in all or parts of the existing works by proper materials and/or workmanship as directed by the architect and civil engineer in charge.

The limestone blocks shall be faced and trimmed in a way that no chipped edges are visible, unless the architect and civil engineer in charge has requested the use of recycled masonry originating from the original construction itself.
The blocks shall be transported to site on pallets and handled in such a way as to minimise damage and waste.

C.41.13 Materials: Lower Coralline Limestone

Unless otherwise specified by the architect and civil engineer in charge, any Lower Coralline

limestone used shall be of first quality material without any blemishes and faults.
The colour of the limestone shall be uniform and shall be as free as possible from defects.
The limestone is to be of a compact nature and shall be free from defects and large pores
throughout. The properties of the material shall be as follows depending on the type
requested:

	Mara Member	Xlendi Member	Attard Member
Colour	Pale cream	Pale cream to light rown	White
Water absorption at atmospheric pressure (Note 1) (%):	Max 6%	Max 6%	Max 6%
Apparent density (Note 2) (Kg/m3):	2200 -2500	2200-2500	2200-2500
Total porosity (Note 2) (%):	Max 30%	Max 20%	Max 20%
Uni-axial compressive Strength (Note 3) (MPa):	Min 20	Min 25	Min 25

Note 1: Testing in accordance with MSA EN
13755. Note 2: Testing in accordance with MSA
EN 1936. Note 3: Testing in accordance with
MSA EN 1926.

C.41.14 Materials: Fibre strands

Fibre strands used to reinforce mortars shall be polymer-based, certified by the manufacturer
as suitable for the nature of the works described. They shall be such as to prevent shrinkage
crack formation, withstand corrosion and be resistant to alkalis and acids.

Fibre diameter shall be in the range of 17 to 20 microns, and having a specific density ranging
between 870 and 930kg/cu.m.
They shall have a tensile strength in the region of 390 to 500Mpa.
Max elongation at break point shall not exceed 14%.
When specified, a minimum of 0.85kg of these fibre strands or as recommended by manufacturer shall be mixed with one cu.m. of mortar mixed.

C.41.15 Materials: Stainless steel

All stainless steel used for this project shall, unless otherwise instructed by the architect and civil engineer in charge, be Grade 316 or better certified for use in marine environments as specified in EN 10088-1:2005 or its updated version.

C.41.16 Materials: Brick dust

Brick dust used shall be prepared from good quality red (terracotta) clay baked to a temperature between 850ºC and 900ºC. Clay baked at higher or lower temperatures shall not be used for the production of brick dust.
The brick dust used shall be clean and free from deleterious substances etc. The baked clay shall be crushed and adequately graded for use as specified in this document.
The use of glazed ware for the production of brick dust will not be permitted.

C.41.17 Materials: Anti-roosting bird spikes

Pigeon repelling systems adopted should be such as not to necessitate any irreversible intervention on the fabric of the building.
The dimensions of the system shall be suitable for the specific architectural elements, shall have an ultra-violet resistant polycarbonate base, and spikes fashioned from good quality stainless steel.
The system shall be resistant to UV (Ultra Violet) rays, salts, and the acidic nature of the
pigeon droppings.
System shall preferably be fixed with a neutral silicone having suitable bonding properties.
Mechanical fixing shall be with suitably sized stainless steel screws and shall only be used to
the approval of the architect and civil engineer in charge.

C.41.18 Materials: Liquid membrane

The liquid membrane shall consist of a thyrotrophic polymer based high resistance liquid, resistant to UV rays, to take foot traffic and with excellent adhesion to concrete and masonry surfaces.
The liquid membrane used shall be stone colour unless otherwise requested by the architect and civil engineer in charge.
Application shall comply strictly with manufacturer's instructions.

C.41.19 Methodology: General

The contractor is to ensure that all the necessary measures are taken to ensure that masonry
elements are not damaged, chipped, soiled stained or contaminated by salts and/or other deleterious substances during the works.

The contractor shall ensure that the stability of all of the structure is maintained throughout
work. Any defects, including signs of movement that develop or become apparent during the course of works shall be immediately reported to the architect and civil engineer in charge.
The contractor shall protect works against damage by rain.

Necessary precautions shall be taken by the contractor to prevent the masonry bedding from drying out too rapidly in hot conditions and in drying winds.

All rejected work shall be removed and replaced using new materials at the contractor's expense. The contractor shall also be bound to replace any defective materials in all or parts of the existing works by proper materials and/or workmanship as directed by the architect and civil engineer in charge.

C.41.20 Methodology: Opening of joints

The existing mortar shall be carefully removed without damaging the adjacent masonry or widening the joints using a bent spike or small hand-held chisels to a depth twice the width of the joint. Joints are to be opened to a minimum depth of 25mm and never to a depth less than their width

Impact tools shall not be used. Power tools such as rotary discs (chasers) will not be allowed. No chipping hammers shall be used.

Care is to be taken to avoid damages to the adjacent stone surfaces. If the jointing material proves to be very hard to remove, then the contractor is to seek instructions from the architect and civil engineer in charge. Any change in the methodology employed shall be approved by the architect and civil engineer in charge

If mortar has failed to such an extent that the joints are largely empty, then the joints will be deep tamped and, if necessary, hand grouted to fill the voids up to the distance required for pointing.
Power tools may not be used for the removal of renders, mortars and opening of joints unless explicitly requested by the architect and civil engineer in charge.

No filling/grouting/pointing shall be carried out before inspected by the architect and civil engineer in charge.

C.41.21 Methodology: Removal of plasters and cement renders

Where identified by the architect and civil engineer in charge, concrete/cement renders shall be carefully removed by hand tools using manual methods so as to contain damages to the underlying masonry work. Cement pointing and facing shall be removed manually taking care not damage the surrounding weakened stone. Chipping hammers shall not be used unless explicitly permitted by the architect and civil engineer in charge.
Old plasters and similar coatings should be removed by hand tools using manual methods and constant supervision so as not to damage the stone surface.
Electrical tools as well as tipped metallic instruments with sharp edges or corners, power tools (such as rotating disk cleaners) and sand blasting (dry or wet) shall not be permitted, unless instructed otherwise by the architect and civil engineer in charge.

C.41.22 Methodology: Removal of paints

Oil-based paints may be removed by a neutral paint-remover certified to contain no salts or any other deleterious agent. At no extra cost to the Contracting Authority, repeated applications in paste form may be necessary to remove persistent stains.
Mechanical means, especially involving the use of power tools (such as rotating-disc cleaners and dry or wet sand-blasters) or tipped metallic tools will not be permitted unless instructed otherwise by the architect and civil engineer in charge.

C.41.23 Methodology: Preservation of original masonry

The contractor shall ensure that original masonry work that shall be retained will be protected and left undisturbed during the course of works.
The contractor shall seek the approval of the architect and civil engineer in charge whenever existing masonry to be preserved will need to be cut or modified to accommodate new or reused units.
The contractor shall ensure that structure to be retained is adequately propped to prevent damage caused by movement or any other means as a result of the works.
The contractor shall ensure that retained masonry in the vicinity of repair works is disturbed as little as possible

C.41.24 Methodology: Dismantling Work

Any dismantled masonry units shall be stored clear of the ground, separated by suitable spacers and in a way such as to protect edges and surfaces. All masonry units shall be cleaned from old mortar, soil etc and stored in a manner such as not to cause any damage.
The units shall be protected from adverse weather and stored in dry conditions.
The contractor shall ensure that the stability of the masonry structure is maintained throughout work.
All dismantling of masonry sections for subsequent reconstruction shall be carried out carefully by experienced personnel. Care shall be taken to ensure that during the dismantling procedure each stone block is numbered and referenced to a drawing, specified image, photograph etc. as directed by the architect and civil engineer in charge.
The masonry blocks/sections shall be removed in their entirety. Each unit shall be identified
clearly and indelibly on concealed faces. The methodology to be employed shall be discussed with and approved by the architect and civil engineer in charge prior to the commencement of works.

C.41.25 Methodology: Reconstruction of previously dismantled structures

The architect and civil engineer in charge shall indicate and approve which of the original masonry units shall be replaced.

Reconstruction shall be carried out by experienced personnel who shall ensure that the original face and joint lines, joint widths etc. are respected to ensure that the final work matches the original in all respects. Care shall be taken to ensure adequate bonding at junctions with the retained original structure. The stone shall be cut and dressed so that the natural bed is horizontal in plain walling, vertical at right angles to wall face in projecting stones and copings, and at right angles to line of thrust in arches. The bedding surfaces of the masonry blocks shall be dampened with de-ionised water having conductivity inferior to 60µS to control suction. The masonry blocks shall be laid on an evenly buttered bed of mortar prepared from a mixture of suitably slaked air line or hydraulic lime and stone dust. Care shall be taken to ensure that the exposed surfaces of the masonry are kept clean

C.41.26 Methodology: Determination of Salt Levels

Salt levels, as well as the types of salts shall be determined before, during and after treatment.

Samples shall be taken at depths of 0-25mm, 50-75mm and 75-100mm within the deteriorated zone as established by the architect and civil engineer in charge.

Surface salt levels shall be determined using stone dust scraped off the surface to determine its conductivity.

C.41.27 Methodology: Desalination by poulticing

Where salt desalinisation is considered necessary, paper pulp and/or sepiolite clay packs will need to be adopted. Both clay and paper pulps should be free from soluble salts and any staining additive. The poultice shall be worked with de-ionised/distilled water into a thick, sticky cream, and carefully ironed onto the surface with suitable spatulas, and permitted to dry slowly, attracting salts away from the stone fabric. Chlorinated mains water and water having a conductivity of more than 60uS/cm will not be allowed. The dried material is to be disposed of away from the structure being restored and shall not be reused. This process may have to be repeated for as many times as so deemed necessary, until the level of salts within the stone fabric has been brought down to an acceptable level. For payment reasons, this exercise will be considered as an intrinsic part of the poulticing exercise, and in no case will the contractor be allowed to make claims for extra costs in relation to workmanship and/or material.

C.41.28 Methodology: Consolidation using ethyl silicates

The consolidant shall be applied to the specifications detailed by the manufacturer. It shall not be applied to stone subjected to high moisture content or characterised by an elevated salt content. The surface to be consolidated is to be cleaned from loose dirt and dust by dry brushing. Ideally, the stone is to be consolidated by flooding either by a coarse-droplet, or preferably by a long-bristled brush. The consolidant shall be applied generously and uniformly to the stone surface until the stone surface is saturated. If so considered necessary, the architect and civil engineer in charge may request that this exercise be repeated for as many times as deemed necessary. For payment reasons, this exercise will be considered as an intrinsic part of the consolidation exercise, and in no case will the contractor be allowed to make claims for extra costs in relation to workmanship and/ or material.
The consolidant shall not be applied in windy or elevated climatic temperature conditions which would impair the penetration of the same material. Consolidated areas should be protected from water, wind, and other natural/ man-invoked adverse conditions for a minimum of 30 days, or more if so specified by manufacturer.

C.41.29 Methodology: Consolidation using ammonium oxalates

The consolidant shall be applied to specifications detailed by the manufacturer, as well as adopting all the necessary safety provisions. The surface to be consolidated is to be cleaned from loose dirt and dust by dry brushing. It shall not be applied to stone subjected to high moisture content and shall be applied using a poultice. It is to be covered with cellophane for at least 24 hours.

The consolidant shall be applied generously and uniformly to the stone surface, until the stone surface is saturated. If so considered necessary, the architect and civil engineer in charge may request that this exercise be repeated for as many times as deemed necessary. For payment reasons, this exercise will be considered as an intrinsic part of the consolidation exercise, and in no case will the contractor be allowed to make claims for extra costs in relation to workmanship and/ or material.

The consolidant shall not be applied in windy or elevated climatic temperature conditions which would impair the penetration of the same material. Consolidated areas should be protected from water, wind, and other natural/ man-invoked adverse conditions for a minimum of period specified by manufacturer.

C.41.30 Methodology: Lime injection

Mortar injection of cracks shall be carried out with proprietary fluid lime based mortar as specified in this document.
Prior to injection, all stone surfaces should be desalinated, adequately consolidated, cleaned
from any accumulated dirt/dust and suitably wetted with de-ionised water. Cracks shall be
first flushed using alcohol.

Mortar shall be injected into the crevices using suitably sized syringes. Application should not
be permitted in ambient temperatures exceeding 30oC. When injecting, care shall be taken to ensure pressure exerted on delaminated stone sections does not cause the shearing of the same material.
In cases where the detached material is of considerate dimension, pins bridging the weaker layers with the stronger fabric, and grouted with the same fluid lime-based mortar shall be introduced. The stainless steel/carbon fibre/GRP rods shall be inserted such as to be least obtrusive. The inner ends of the rods shall be fixed using either a lime based or an epoxy resin based mortar, as indicated by the architect and civil engineer in charge

C.41.31 Methodology: Epoxy resin injection

Epoxy resins as specified in this document, having suitable characteristics and viscosity, shall be used for the injection, under pressure, of cracked masonry sections previously consolidated.
Epoxy injection will be resorted to only for areas where injected fluid lime mortar would be inadequate.
All masonry surfaces to be treated with epoxy resins shall be clean, free from any loose material, grease substances, etc. Cracks should be superficially sealed and proprietary injection nozzles fixed.
Prior to injection, all stone surfaces should be desalinated, adequately consolidated, cleaned from any accumulated dirt/dust and suitably wetted with de-ionised water. Cracks shall be first flushed using alcohol.
No resin is to stain the adjacent stonework.
Following the injection of the epoxy resin, and after allowing sufficient time to ensure that the structural stability of the delaminated or otherwise masonry structure is

restored, the masonry is carefully cleaned from the superficial mortar applied previously to seal cracks.

C.41.32 Methodology: Pinning of masonry

The contractor shall carefully drill holes in the fabric of the stone surface sloping downwards.
The holes shall be thoroughly cleaned to remove all drilling dust and debris and kept dry.
The correct lengths of dowels shall be cut prior to the filling the holes with resin. The pins shall be cut to size prior to the injection of the resin and shall not be closer than 6mm to the surface for small diameters and 12mm for large diameters.
The holes shall be filled with sufficient resin so that, when the dowel is inserted, the resin is dispersed to achieve an effective bonding.
The ends of the ties and the resin shall be kept back from the face of masonry and exposed faces shall be kept clean and free from resin stains. Temporary plugging material and/or isolating membranes shall be used as necessary.

C.41.33 Methodology: Pointing

The work shall commence at the top of the wall moving downwards.
If joints exhibit biological soiling, a biocide should be applied prior to flushing out. Any vegetation shall be removed in accordance with these specifications.
The contractor shall clean the joints. Dust and loose debris shall be removed. The joints shall then be dampened with clean de-ionised water as necessary to control suction.
Lime mixes shall be used for the pointing. Mixes shall approximate a 1:3 binder to aggregate ratio, unless otherwise agreed with the architect and civil engineer in charge.
Ready-mixed lime mortar shall only be used if approved by the architect and civil engineer in charge.
All pointing shall be carried out in moist, warm conditions. The contractor shall ensure that all pointing is built up in layers not exceeding 10mm in thickness or as recommended by the manufacturer in cases were the use of ready-mixed lime mortars is permitted
If mortar has failed to such an extent that the joints are largely empty, then the joints will be deep tamped and, if necessary, hand grouted to fill the voids up to the depth required for pointing.
The mortar shall be built up and firmly applied in layers until the specified thickness is reached. The contractor shall ensure good adhesion with no voids. A mechanical key

shall be formed to the undercoat/s by combing or scratching so as to produce evenly spaced lines.

Each layer shall be allowed to achieve an initial set prior to the application of subsequent coats. The fresh mortar shall be kept as humid as long as possible to slow down the setting rate and hence avoid cracking.

After the initial set has taken place, the contractor shall stipple the joints with a stiff brush to remove laitance/excess fines and achieve a coarse texture.

It shall be prevented from drying out too rapidly by dampening intermittently with clean water and covered immediately with damp hessian and plastic sheeting.

The contractor shall provide adequate protection from adverse weather until the mortar repairs have fully set.

The required finish shall be as per original surviving pointing and as approved by the architect

and civil engineer in charge.

If the stones have retained their sharp edges, the joints shall be filled flush unless the original

joint face was profiled in some other way.

In the case of weathered edges, or where the stone has spalled off, the face of the new mortar shall be kept back such that the apparent joint width does not increase. The mortar face shall be kept as far back as required to achieve the original joint width.

C.41.34 Methodology: Removal of deteriorated stone

Every effort shall be made to retain as much as possible of the original masonry structure. To this effect no stone shall be replaced without the prior approval of the architect and civil engineer in charge.

Stone replacement will be limited to individual badly deteriorated stone blocks and the total area of stone replaced shall be kept to the minimum possible.

The masonry areas earmarked for replacement shall be clearly marked with a mason's pencil for the prior approval of the architect and civil engineer in charge. Marking by spray or other indelible markers prior to approval will not be permitted.

The contractor shall take measurements from existing masonry units, identified by the architect and civil engineer in charge, to allow replacements to be matched accurately.

Profile gauges shall ideally be used to record existing profiles with site. Alternatively the contractor may opt to record profiles on site by tracing the existing profile on cardboard or any other suitable material. Where inserts are required to

record profiles in-situ, but there are no suitable joints, the contractor shall seek instructions from the architect on the method to carry out such operation.

The contractor shall prepare accurate drawings and templates as necessary, clearly and indelibly marked to identify their use and location.

The methodology employed for the cutting away of the deteriorated masonry sections may vary depending on the particularities of every individual case. Nonetheless, care shall be taken to ensure that only hand held tools and small power tools (jiggers) which do not cause damage to the structure and/or immediate stone blocks will be used. The methodology employed shall be discussed with and approved by the architect and civil engineer in charge prior to the commencement of works.

The cutting of perimeter joints may be carried out with a masonry saw. If the stone is to be retained, the cut shall be made by a purpose-made fine saw blade or with a plugging chisel in the case of a wide joint. Where the stone is to be replaced, the stone shall be chiselled away starting from the centre and moving towards the edges.

C.41.35 Methodology: Preparation of replacement stone

Only new stonework, machine cut to a true shape (ikkartabunat) and hand finished shall be used unless otherwise directed by the architect and civil engineer in charge.

All new stone work used shall be similar in material colour, size and configuration to the original and shall match with the existing course height

The architect and civil engineer in charge may request copies of templates produced by the contractor

The stone shall be cut and dressed so that the natural bed is horizontal in plain walling, vertical at right angles to wall face in projecting stones and copings, and at right angles to line of thrust in arches

Care shall be taken to ensure that new stonework is not chipped or otherwise damaged.

Each block/dressing is to be clearly marked on a concealed face to indicate the natural bed and its position in the finished work.

The contractor shall ensure to provide, erect and maintain for as long as necessary all struts, timber planks etc, required for the support of all new and old masonry.

The contractor shall be responsible to prepare all necessary formwork required for the replacement (in section or in whole), or the reconstruction, of arched elements such as arched

windows, vaults, arches etc. The formwork shall be faithful to the original profile of that specified by the architect and civil engineer in charge.

All newly replaced stonework shall have a minimum bedding of 230mm unless otherwise specified by the architect and civil engineer in charge. The contractor shall ensure that suitable allowances are made for any final finishing carried out in-situ.

C.41.36 Methodology: Laying of replacement stone

Joint surfaces shall be dampened to control suction as necessary. When laying new stonework, all vertical and horizontal joints shall be adequately buttered with mortar. The units shall be laid on a full bed of mortar and all joints filled.
Care shall be taken to ensure that no mortar/grout encroaches upon the exposed faces.
The new stone shall be dampened to avoid risk of de-watering the mortar. Existing joint widths are to be maintained. Care should be taken to ensure that sinkings for fixings and joggles are accurately aligned and positioned in relation with the existing masonry.
Non-hydraulic mortar shall be used unless otherwise specified by the architect and civil engineer in charge. The mortar bed shall not be less than 12mm thick.
All faces, angles and features shall be carefully aligned and set out to ensure satisfactory joint widths and relative positioning with the existing masonry. The exposed faces of new material shall be kept to the face lines as agreed with the architect and civil engineer in charge.
Joints around replacement masonry units shall be thoroughly grouted wherever joints cannot be fully filled with bedding mortar. Grout mix shall be based on lime, fine coralline and globigerina limestone sand (xahx).
The grout shall be kept back from the exposed face to allow for the depth of pointing specified; this shall be achieved using an approved temporary sealing material. The contractor will ensure that the grout does not stain the exposed face.
The contractor shall not point replacement masonry until all the work has settled-in. The pointing of the outer 25mm (as a minimum) shall be left until all bedding work has settled.
The pointing of the top joint is to be carried out using a stiff mortar mix, deep tamped and cures so as to minimise shrinkage.

C.41.37 Methodology: Bonding dowels for replacement stone

Suitably sized holes shall be drilled in the background and rear of the replacement/insert to receive dowels and adhesive. The contractor shall ensure that the holes are aligned to allow

accurate positioning of the replacement/insert and that enough depth is allowed for sound anchorage

The holes shall be cleaned, all dust removed and adequately flushed with water. Adequate drying time shall be allowed. Smaller holes may also be cleaned by blowing out with a small tube

The dowels shall be secured into clean, dry holes with adhesive. No adhesive shall be used to bond stones at joints unless agreed otherwise with architect and civil engineer.

The pins shall be cut to size prior to the injection of the resin and shall not be closer than 6mm to the surface for small diameters and 12mm for large diameters.

The resulting holes shall then be filled with matching mortar.

C.41.38 Methodology: Jointing of masonry works (piecing in)

Replacement stone shall be cut and shaped in such a manner as to ensure the minimum loss of the original material, yet provide a firm seating for the replacement.

The new stone work shall be left proud of the original to ensure adequate finishing on site.

All existing joint widths shall be respected and bridging of joints will not be permitted.

The pockets to receive inserts shall be accurately cut with small, sharp chisels and small saw blades to a neat, square profile. The sides of the pockets shall be undercut, where necessary, to provide space for specified bonding material.

Where so directed by the architect and civil engineer in charge, the contractor shall dove-tail the new insert with the original to ensure adequate bonding.

New shoulders shall be formed to receive any replacement cramps.

The pocket shall be cleaned out thoroughly and the inserts installed accurately and securely.

The contractor shall ensure that no bonding material encroaches upon the exposed faces.

Piecing-in may also be carried out in larger areas, in which a piece of stone is added to fill in a missing area or replace a part of a deteriorated stone by the insertion of an appropriately cut stone piece, attached using structural adhesives (e.g. epoxy or polyester adhesives), as approved by the architect and civil engineer in charge.

C.41.39 Methodology: Grouting

The architect and civil engineer in charge may request grouting of voids resulting between new and old masonry, displaced masonry, etc with an inorganic material such as hydrated

or hydraulic lime. The lime grout shall be prepared with or without filler depending on the size of the gap

Glass reinforced polyester, epoxy or stainless steel ties shall be used as and where directed by the architect and civil engineer in charge

Grouting holes shall be formed in joints at suitable horizontal and vertical centres to suit coursing and achieve an effective distribution of grout and fill all voids as per architect and civil engineer in charge's approval.

The maximum length of each lift between pours shall be established to prevent any disturbance of the masonry.

Unless re-pointing precedes grouting, the joint shall be sealed as necessary on either side of the grouting holes with an approved temporary material to prevent leaking of grout. The temporary seal shall be kept back from the face work to allow for specified re-pointing

Before grouting, the delivery holes shall be thoroughly flushed with clean water.

Site trials, in all areas indicated by the architect and civil engineer in charge, shall be carried out for the different methods of grouting so as to establish the parameters required to achieve uniform grouting

If done by hand, the grout material shall be poured under gravity into the interstices formed by the masonry structure

If done by pumped gravity injection, then the delivery pressure shall be established after site trials

If done by gravity injection, then:

a) the approved equipment shall include a control of grout flow at the head of the hose (plug) and at the delivery nozzle (stop valve).

b) the height of the pan above delivery nozzle (subject to site trials) shall be sufficient to ensure an adequate flow, usually around 4.50m.

C.41.40 Inspection of masonry units

All completed units shall be carefully inspected and checked by the manufacturer/supplier against the approved sample/s and compliance with drawings and the specification before dispatching to site. The contractor shall inform the architect and civil engineer in charge at appropriate stages during production to allow inspection of masonry units prior to delivery on site.

C.41.41 Methodology: Plastic repairs

Plastic repairs as specified in this document shall be used in areas indicated by the architect and civil engineer in charge.
The work shall commence at the top of the wall moving downwards.
If the surfaces exhibit biological soiling, a biocide should be applied prior to flushing out. Any vegetation shall be removed in accordance with these specifications.
Any deteriorated, flaking, powdering etc masonry shall be carefully removed to expose a sound background. In the process care shall be taken not to weaken the structure or damage the adjacent masonry
The top and vertical edges of the repair area shall be undercut to provide sufficient bonding and reduce the formation of visible shrinkage joints
All mortar repairs shall be varied out in moist, warm conditions. The contractor shall ensure that all repairs are built up in layers not exceeding 10mm in thickness or as recommended in cases where the use of ready-mixed lime mortars is permitted.
Suitable non-ferrous reinforcement approved by the architect and civil engineer in charge shall be used for all plastic repair interventions which have a projection of more than 40mm from the stone surface or an area which exceeds 50mm by 50mm
Pre-fabricated glass reinforced polyester or epoxy rods having a diameter of not less than 6mm shall be used. Holes shall be drilled with the background to form a grid of dowels fixed not more than 40mm apart. Dowels shall have a minimum anchorage in the stone of 60mm, and the architect and civil engineer in charge may request that this bedding depth be increased. All dowels shall be adequately bonded to the masonry fabric with an approved epoxy resin.
Adequately gauged stainless steel or nylon wire shall be used to form a mesh between the dowels. This mesh shall be secured to the resin dowels. This mesh shall be secured to the resin dowels by an approved epoxy resin.

When preparing the reinforcement, allowances shall be made to ensure a minimum cover of 20mm.
The plastic repair mortar shall be based on a lime binder with the addition of approved admixtures and micro fibre strands as specified in this document to enhance bonding and limit cracking.
Aggregates used shall vary from coralline sand, to marble and globigerina limestone sand (xahx) and to pozzolanic additives, as agreed with the architect and civil engineer in charge.
The mixes shall approximate a 1:3 binder to aggregate ratio, unless otherwise agreed with the architect and civil engineer in charge.

The contractor shall ensure that repair mortar is not stronger than the adjacent fabric.

In the mortar preparation, the contractor shall ensure that the grains of sand and stone dust are adequately coated with the binder paste.
Slaked lime may be used as a binder, with the putty mixed wet with the aggregate and stored in an airtight container as far in advance as possible.
In demanding exposure conditions, hydraulic additives (such as hydraulic lime, terracotta dust) may be added to the coarse stuff immediately before use.

Hydraulic lime may be used to substitute completely the slaked lime, as per architect's instructions.
Cement gauged mixes shall only be used if directed by the architect and civil engineer in charge.
The mortar shall be built up in layers where necessary, each layer not exceeding 12mm.

The contractor shall ensure good adhesion with no voids. A mechanical key shall be formed to the undercoat/s by combing or scratching so as to produce evenly spaced lines.
Each layer shall be allowed to achieve an initial set prior to the application of subsequent coats. The fresh mortar shall be kept as humid as long as possible to slow down the setting rate and hence avoid cracking.

After the initial set has taken place, the contractor shall stipple the joints with a stiff brush to remove laitance/excess fines and achieve a coarse texture.
It shall be prevented from drying out too rapidly by dampening intermittently with clean water and covering immediately with damp hessian and plastic sheeting.

The contractor shall provide adequate protection from adverse weather until the mortar repairs have fully set.
The required finish shall match the stone surface (in colour, texture, profile etc.) and as approved by the architect and civil engineer in charge.

C.41.42 Methodology: Repairs of concrete/cement renders

A modified polymer mortar shall be used to grout cracks and damages in concrete surfaces which shall be retained. The contractor is to submit proposed mortars for such repair works for approval by the architect and civil engineer in charge.

C.41.43 Methodology: Finishing (limewash)

Prior to the application of the limewash, the contractor shall wash the background to remove

dust and grime, then allow it to dry to a damp state. Any organic growth shall be treated with a suitable biocide as directed by architect and civil engineer in charge and dead material brushed off before applying limewash.

Limewash shall be produced from mature lime putty mixed mixed with water to a suitable

consistency. The contractor shall sieve the mix into a bucket, working through any lumps, but leaving any grit in the sieve. Colour is added as directed by the architect and civil engineer in charge, mixed in well and sieved again prior to use. As it is difficult to match lime colour batches, it is thus ideal that all lime wash provision required be prepared in one batch.

The contractor shall apply the limewash to the substrate with long-haired bristle brushes, using horizontal, vertical, and diagonal strokes, ensuring the lime wash is applied as thinly and evenly as possible and is burnished into the surface. Overly heavy coats will craze and crack when they harden and dry. If this occurs, the contractor is to wash off with hot water and a stiff bristle brush and ensure that the new covering is properly applied.

The contractor is to ensure even distribution of lime and pigment by constantly stirring the containers of limewash during application. He is to allow the first to dry fully before applying the second coat, and so on, lightly dampening the background before applying the next coat. Damping shall ideally be carried out by spraying water on an area of approximately 2sq.m. at a time. Protection from strong winds and direct sunlight during the drying out period shall be required.

C.41.44 Methodology: Completion of works

No part of the scaffolding shall be dismantled prior to the approval of the architect and civil engineer in charge. The contractor shall give the architect and civil engineer in charge at least one week notice to allow for a final inspection and the measurement of works. The contractor shall be responsible for the cleaning of all apertures, glazing, ledges, window sills etc from any material resulting from any of the processes outlined in this document. The contractor shall ensure that all gutters, down pipes, gullies etc are clean and in a condition to function effectively.

C50 REPARING/RENOVATING/CONSERVING METAL

GREEN PUBLIC PROCUREMENT (GPP) CRITERIA Exclusion of certain materials

Bidders must declare that the following materials/substances will not be used in the building:

- Products which contain sulphur hexafluoride (SF6).
- Indoor paints and varnishes with a content of solvents (volatile organic compounds (VOCs) with a boiling point of 250°C maximum) higher than:

a) For wall paints (according to EN 13300): 30 g/l (minus water).

b) For other paints with a spreading rate of at least 15 m2/l at a hiding power of 98% opacity: 250 g/l (minus water)

c) for all other products (including paints that are not wall paints and that have a spreading rate of less than 15m2/l, varnishes, wood stains, floor coatings and floor. paints, and related products): 180g/l (minus water).

Verification;

Bidders must sign the GPP Declaration Form that these products/substances will not be used on site or in the building.

C.50.01 WROUGHT IRON

Removal from site

Most work is ideally carried out in workshop conditions.

Paint Removal Grit Blasting:

Avoid and request approval of Supervisor if absolutely necessary

Paint stripping by chemical means:

Thoroughly remove chemical agents, preferably by steam cleaning to its original appearance as it was immediately prior to painting.

Removal of Rust Deposits

Application of heat until rust detaches from the metal.

Dismantling Of Components

Avoid the parting of frame joints

Where tenoned joints must be parted, replace the tenon with a screw or screwed tenon, to regain adequate strength.

Repairs And Replacements

The replication of components is to be carried out in a manner similar to that which was used for the original creation of the piece, and in similar materials.

For structural purposes, where part replacement is required, arc, mig or tig welding is to be used to join on the new part.

Welding must be carried out through the full depth of the section and a ferrous non-corrodible alloy must be used.

Brazing should be used, for the attachment of components when the original method of forge welding or riveting cannot be done.

Sections which are heavily pitted, or wasted, but which are still structurally sound, are to be repaired by the puddling in of new wrought iron, in the form of thin rods by the gas welding process.

Iron thus deposited has no laminar structure, and hence little tensile strength, but otherwise appears to exhibit the properties of the parent metal. Alternatively, these sections can be built up by electric welding, but again use must be made of a suitable alloy.

Care should be taken to avoid distortion of any section so treated.

Gain approval of the Supervisor for the replacing of sheet work, which is impossible to access.

REASSEMBLY

Care should be taken to ensure that visible and mating surfaces are protected by epoxy paint.

Suitable silicone mastic filler is to be applied before the work is assembled.

C.50.02 CAST IRON

WROUGHT IRON FIXINGS

To be released by mechanical means, i.e. drilling out of the wrought iron fixing. Drilling should be central to the bolt or stud.

REPAIR OF BROKEN CASTINGS

Brazing, using oxy-acetylene and a brass filler rod:

Surfaces to be brazed are to be tinned prior to filling the joint.

Excess brass is to be dressed by grinding or filing.

Bonding with an epoxy adhesive:

Stainless pins are to be located in holes drilled into the mating surfaces. If difficulty is experienced in getting alignment, one or both of the holes may be drilled oversize, and the gaps filled with the epoxy adhesive.

Plating with cast iron or non-ferrous plates or straps on the back of the broken casting:

Applicable to thin castings only where the backside is not going to be visible.

Plates may be attached with screws or copper rivets, and a bonding agent should be used between casting and plate.

Mild steel screws are not acceptable.

NEW CASTINGS AND COMPONENTS

New components are to be made by moulding from the original, consult with the Project Manager when different methods are to be adopted. Allow for shrinkage from the original mould.

FIXINGS

Use Stainless steel.

Non-ferrous materials, bronze or brass can be used upon approval from the Project Manager.

Water must be excluded

Joint surfaces should be painted prior to mating

Filling with non-setting bituminous mastic.

PROTECTION & FINISHING

Prime and black Coat with epoxy paint as per Section M60

C.51 Repairing/Renovating/Conserving Timber

GREEN PUBLIC PROCUREMENT (GPP) CRITERIA Exclusion of certain materials

Bidders must declare that the following materials/substances will not be used in the building:

- Products which contain sulphur hexafluoride (SF6).
- Indoor paints and varnishes with a content of solvents (volatile organic compounds (VOCs) with a boiling point of 250°C maximum) higher than:

a) For wall paints (according to EN 13300): 30 g/l (minus water).

b) For other paints with a spreading rate of at least 15 m2/l at a hiding power of 98% opacity: 250 g/l (minus water)

c) for all other products (including paints that are not wall paints and that have a spreading rate of less than 15m2/l, varnishes, wood stains, floor coatings and floor. paints, and related products): 180g/l (minus water).

Verification;

Bidders must sign the GPP Declaration form confirming that these products/substances will not be used on site or in the building.

C.51.1 General

The main aim of this intervention shall be to preserve as much as possible of the existing joinery and, where these are extensively damaged, to handcraft replacements which reflect the original design and workmanship of the existing joinery.

All work shall be carried out according to the best workmanship practices and in accordance with the latest local and EU-approved codes of practice.

Preliminary inspection for existing services

The contractor, subject to any instructions or contrary directions in accordance with the contract, shall inspect the site, take all actions necessary to establish and/or verify the presence or absence of existing services, pipes, drains, cabling and supplies and precisely identify and document such findings on detailed plans and cross-sectional drawings. These shall be presented to the architect and civil engineer in charge for review.

Assessment of existing joinery

The assessment of the actual state of the joinery is a complex undertaking based on both subjective and objective decisions. The main aim of this assessment shall primarily be that of enabling the contractor, in agreement with the architect and civil engineer in

charge to determine the best methodology to be employed to repair, wherever possible, and replace, in kind, where deterioration is such that maintenance as described in this document is not possible.
Assessment shall be carried out aperture by aperture and the contractor may be required to fill in a schedule for the approval of the architect and civil engineer in charge.

Inspection of paintwork

The paintwork shall be inspected to determine signs of deterioration in the form of cracking, peeling, blistering, etc. The inspection shall also determine the presence of any excessive build-up of paint layers and shall help the contractor, in agreement with the architect and civil engineer in charge to decide on the action to be followed.

Inspection of timber apertures

The timber apertures shall be inspected to determine operational soundness, dimensional changes due to seasonal temperature changes and water penetration, condition of joints, condition of ironmongery, soundness of timber, condition of glazing, and beading, etc. to help the contractor, in agreement with the architect and civil engineer in charge determine the course of action to be followed.

Other considerations

During the inspection procedure, the contractor shall examine the opening and ensure that the detailing of the masonry is such as to allow proper water runoff and no water is allowed to accumulate in contact with the timber apertures. Any poor design is to be brought to the attention of the architect and civil engineer in charge.

Paint removal – Health hazards

Old paints may contain lead or other harmful elements. To this effect care shall be taken to ensure that all personnel engaged in the cleaning of paint will wear the appropriate protective wear.

Paint removal – General

The contractor shall take all necessary precautions to ensure that the gentlest possible methodology for the removal of paint is employed. Particular care shall be taken to ensure that in the process no damage is caused to the timber fabric. Where technically possible care shall be taken to preserve as much as possible of the original paint layers.

Paint removal – Mechanical methods

Mechanical methods entailing the scraping or hand sanding of old paint layers shall be employed as specified and approved by the architect and civil engineer in charge.
All precautions shall be taken to ensure that no wood sections and/or surfaces are damaged in the process. All sanding shall be performed along the grain of the timber to avoid damage by going of the wood surface
The timber surface may be prepared by sanding using sand paper of a suitable gauge. The sandpaper should be mounted on a off support such as timber be rubber blocks, to avoid formation of depressions of the wood surface
Mechanical means other than rotary sanding equipment may be used for the cleaning of flat surfaces so approved by the architect and civil engineer in charge.

Paint removal – Pressurised jet

Cleaning systems employing the use of high-pressure water blasting will not be permitted.

Paint removal – Thermal methods

Thermal methods may be employed where complete paint removal is required provided:

a) Adequate care is taken to ensure that the timber fabric is not charred or burnt.

b) Adequate care is taken to ensure that any glazing is not damaged.

Paint removal – Paint remover methods

The use of paint removers will be permitted for the softening of the paint provided that the paint stripper used does not damage the timber or alter the surface pose structures of the wood.

Paint removal –Sand blasting

Cleaning / removal of paint using wet and / or dry sand blasting techniques will not be permitted.

Preparations of timber elements

Care shall be taken to ensure that all timber elements are adequately dry and free from fungus or other parasites which contribute towards the deterioration of the timber elements.

Joinery repairs

All effort shall be made to preserve as much as is technically possible of the original joinery work. Nonetheless extensively deteriorated timber sections shall be replaced. The replacements or new additions must retain character of the original joinery item.

When carrying out a replica of the original joinery replacement, the following criteria should be respected:

a) The size and characteristics of the opening leaves.
b) Proportions of the timber members used for the frame and leaf.
c) Configuration of the timber assembly.
d) Wood species.
e) Detailing and decorative features of the original joinery item.
f) Paint colour.
g) Ironmongery.

Surface finish

All timber work will be painted with an linseed oil paint system as directed and approved by the architect and civil engineer in charge. The paint system shall also include the application of oil-based undercoat/s and topcoat/s.

Nails and screws

The appearance of the nails and screws used in the repair of the joinery items is of great importance. To this effect where applicable all visible nails, screws etc used shall be hand-forged to match the originals in all respects.

Ironmongery

The contractor shall ensure that all effort is taken to preserve the original wrought ironmongery. The restoration of existing ironmongery shall be carried out as outlined in this document.

C.91 Rock Bolting

C.91.1 Scope of Works

It is proposed to undertake hazard reduction measures by bolting any loose or potentially hazardous areas of the rock face along the tower external fabric. The proposed works involve the installation of rock bolts in the rock face supporting the bastions indicated by the Contracting Authority's Architect and Civil Engineer in charge.

The rock face varies in height but is topped by a masonry bastion, which is a structure of special heritage interest. The rock face angle varies from about 75 to 90 degrees to the horizontal.

Any deteriorated, flaking, powdering, etc. sections of the rock face shall be treated as instructed by the Contracting Authority's Architect and Civil Engineer in charge. In the process, care shall be taken not to weaken the structure or damage the adjacent masonry.
Cores are to be drilled onto the rock face inclined downwards an angle of 10 degrees to the horizontal, dipping downwards into the rock. The cores shall be drilled into the background/rock face to form a grid of ties as indicated by the Contracting Authority's Architect and Civil Engineer. The ties shall have a minimum anchorage as specified and the Contracting Authority's Architect in Charge may request that this bedding depth be increased. Once the required depth has been reached the core is to be cleaned using compressed air.
Prefabricated glass reinforced polyester, epoxy rods or stainless steel ties having a diameter of not more than that specified by the Architect and Civil Engineer in charge are to be placed in the core. The ties are to be adequately anchored to the sound rock by epoxy resin such that a minimum of 50Nm torque can be sustained. The holes shall be filled with sufficient resin, so that when the tie is inserted, the resin is dispersed to achieve an effective bonding.
A fluid, lime-based mortar is to be used to grout the resulting space in the core around the tie. The holes shall be filled with sufficient grout, so that no voids remain and effective bonding is achieved. This lime-based mortar is to have a compressive strength of 50N/sqmm.
Adequate measures are to be undertaken to ensure that no staining of the adjoining surfaces or any part of the rock face or masonry occurs during these or any stage of the works.
Stainless steel end plates are to be fixed to the ends of the ties, the size of which are to be as specified, and secured by two nuts. Any widening of the core to accommodate the end plate is to be done so as to minimise the damage to the adjacent surfaces.
Allowances shall be made to ensure a minimum cover of 30mm.
The end of the core will be covered with a suitable plastic repair mortar as specified in these specifications. The mortar is to match the texture and colour of the adjacent surfaces.

C.91.2 Epoxy Resins

The epoxy resin used shall be a solvent-free resin-based product supplied in two packs (resin + hardener), having a low viscosity. The resin shall be certified by manufacturer to have a suitable bonding to masonry, be colourless (or have a stone colour), be resistant to chemicals, and have an effective adhesion even on moist masonry surfaces. The material shall be easily injected into the core using proprietary methods and tools, in compliance with the manufacturer's instructions.
Following the injection of the epoxy resin, sufficient curing time is to be allowed to ensure that the structural bonding of the tie.

C.91.3 Stainless Steel

All steel used for this project shall, unless otherwise instructed by the Contracting Authority's Architect and Civil Engineer in charge, be equivalent to Grade 316 or better certified for use in marine environments as specified in MSA EN 10088-1:2005 or its updated version.

C.91.4 Grouting Mortars

The injection mortars used shall be suitably prepared from good quality and chemically stable hydraulic lime, free from salts, pozzolans and other inert additives, mixed into a consistent thixotropic, injectable putty.

Prior to injection, all stone surfaces should be cleaned from any accumulated dirt/ dust and suitably wetted with de-ionised water. Mortar shall be injected into the crevices using suitably sized syringes. Application should not be permitted in ambient temperatures exceeding 30ºC.

The mortar used shall have a specific weight of 1200kg/m^3, an initial set of an average of six

(6) hours, and a final set of approximately ten (10) hours, attaining a mean compressive strength of 50N/mm^2, and an average flexural resistance of 7N/mm^2 after 28 days. The set mortar shall attain an elastic modulus of 15 (+/- 1.5) N/mm^2, and a change in dimension not exceeding 1.60µm.

C.91.5 Defects

The contractor shall make good any defects deemed necessary for the proper execution of

the works. The contractor shall furnish all labour, materials, tools and equipment required to complete the works at his own cost.

C.91.6 Tolerances

The following tolerances for the location of the cores must be respected:

Position: (+/- 25mm tolerance).

C.91.7 Cleaning

Remove any excess grout or other surface blemish as instructed by the Architect in charge.

Immediately prior to final inspection clean areas in accordance with instructions by Contracting Authority's Architect in charge. Remove any excess material from site.

C.91.8 Setting out

The contractor shall set out the work and make good any defects deemed necessary for the proper execution of the works. Setting out to insure levels and alignments shall be the responsibility of the contractor.

F10. BRICK/BLOCK WALLING and IN SITU CONCRETE

(Not for Restoration Works)

GREEN PUBLIC PROCURMENT (GPP) CRITERIA Volatile Organic Compounds (VOC)

The VOC emissions from the building products used must not exceed the respective values outlined in the European standard for the determination of emissions from building products EN ISO 16000-9 to -11, or equivalent.

Verification:

Test report based on the outlined method in EN ISO 16000-9 to -11 or equivalent

F.10.1 TYPE(S) OF WALLING CONCRETE FACING BLOCKWORK

Blocks: Dense aggregate to EN 771-3:2003: Part 1.
Manufacturer and reference: To be approved by Architect/Engineer
Minimum average compressive strength: 8 N/sq mm
Work size(s): 460 x 260 x 114, 153, 178, 229
Finish/colour: Fairfaced
Special shapes: Jumper blocks (to break up regular coursing), quoins, end blocks, sills, lintels
Mortar: As section Z21.
Mix: 1:0.5:4 Cement: lime: sand Group 2
Special colour: unless otherwise indicated use natural mortar - subject to approval of sample panel
Bond: Running
Joints: Flush pointed
Features: To be reinforced and/or filled with concrete where indicated

F.10.2 CONCRETE COMMON BLOCKWORK

Blocks: Dense aggregate to EN 771-3:2003.
Manufacturer and reference: To be approved by Architect/Engineer
Minimum average compressive strength: 8 N/sq mm
Thermal resistance: Not less than 2.35 sq m deg C/W at 3% moisture content for internal leaves of cavity walls and at a moisture content of 5% for the external leaf with a rendered coating.
Work size(s): 460 x 260 x 114, 153, 178, 229
Special shapes: Jumper blocks (to break up regular coursing), quoins, end blocks, sills, lintels

Mortar: As section Z21.
Mix: Group 2 Cement: lime: sand
Bond: Running bond

ACCURACY

Notwithstanding BS 8000: Part 3, clause 3.1.2 or technically equivalent, comply with preliminaries clause A33/340 and any required critical dimensions given in the specification or on the drawings.

CONDITIONING OF BRICKS/BLOCKS

Do not use clay bricks, calcium silicate bricks or autoclaved concrete blocks when still warm from the manufacturing process.
Do not use non-autoclaved concrete bricks/blocks until four weeks after casting.

MORTAR GROUPS – For non external work

Where mortar is specified by group number, select any mortar in that group as set out below. Use the same mortar throughout any one type of facing work.

	Group 1	Group 2	Group 3	Group 4
Cement: lime: sand	1:0-0.25:3	1:0.5:4-4.5	1:1:5-6	1:2:8-9
Cement: premixed lime & sand (proportion of lime to sand given in brackets)	1:3 (1:12)	1:4-4.5 (1:9)	1:5-6 (1:6)	1:8-9 (1:4.5)
Cement: sand & air entrainer		1:3-4	1:5-6	1:7-8
Masonry cement: Sand		1:2.5-3.5	1:4-5	1:5.5-6.5

TESTING - MORTAR STRENGTH

Have tests carried out to determine compressive strength of mortars listed below, in accordance with EC 6: Part 1, Appendix A.1. Tests to be carried out by an approved laboratory
A provisional sum for testing is included elsewhere.
Preliminary tests: Specimens to be prepared at least six weeks before walling commences, using materials from the sources from which the site will be supplied. Half of the specimens to be tested at seven days and the remainder at 28 days.

Site tests: During construction, specimens to be prepared for every 150 sq m of each walling type, or for every storey of the building, whichever is the more frequent.
Half of the specimens to be tested at seven days and the remainder at 28 days. Seven day test results to be not less than two thirds of strength specified for 28 days.
Submit results to Architect/Engineer immediately they are available.

Mean compressive strength of mortar at 28 days to be not less than, and not more than 1.5 times, the following:

Walling type	**Preliminary tests (N/sq mm)**	**Site tests (N/sq mm)**
1	16.0	11.0
2	6.5	4.5
3	3.6	2.5
4	1.5	1.0

TESTING - CEMENT CONTENT OF MORTAR

When instructed by Architect/Engineer, test mortar for walling type(s) F10/250 F10/350 before use, to determine cement content.
Carry out tests using the BREMORTEST method described in Building Research Establishment Information Paper 8/ 89, or other equivalent.
Cost for testing is to be borne by the Contractor.

OVERHAND LAYING

Must not be used without approval.

LEVELLING OF SEPARATE LEAVES

Bring both leaves of cavity walls to the same level at:

01. Every course containing vertical twist ties.
02. Every third tie course for double triangle/butterfly ties.
03. Courses in which lintels are to be bedded.

COURSING

Arrange brick courses to line up with existing work.

BOND NOT SPECIFIED

Build walls in stretching half lap bond when not specified otherwise.

SUPPORT OF EXISTING WORK

Where new lintels or walling are to support existing structure, completely fill top join with semidry mortar, hard packed and well rammed to ensure full load transfer after removal of temporary supports.

BLOCK BOND new walls to existing, unless specified otherwise by cutting pockets into existing walls, not less than 100 mm deep, the full thickness of the new wall, and vertically as follows:

1. Brick to brick: 4 courses high at 8 course centres.
2. Brick to block, block to brick or block to block: Every alternate block course.
3. Bond new walling into pockets with all voids filled solid with mortar.

BRICKWORK TO RECEIVE ASPHALT DPC

Finish flush with mortar to give a smooth level bed.

FIRE STOPPING

Ensure a tight fit between brickwork and cavity barriers to prevent fire and smoke penetration.

ADDITIONAL REQUIREMENTS FOR FACEWORK

THE TERM FACEWORK, where used in this specification, applies to all brick/block walls finished fair. Where any facework is to be painted, the only specification requirement to be waived is that relating to colour.

SAMPLES

Submit samples of Hollow concrete blocks representing the range of variation in appearance and obtain approval of appearance before placing orders with suppliers.

COLOUR MIXING

Agree with manufacturer and The Engineer methods for ensuring that the supply of facing bricks/blocks is of a consistent, even colour range, batch to batch and within batches.

Check each delivery for consistency of appearance with previous deliveries and do not use if variation is excessive.

Mix different packs and deliveries which vary in colour to avoid patches, horizontal stripes and racking back marks in the finished work.

APPEARANCE

Select bricks/blocks with unchipped arrises. Cut with a masonry saw where cut edges will be exposed to view.

Set out and lay bricks to match appearance of relevant approved reference panel(s).

Keep courses evenly spaced using gauge rods. Set out carefully to ensure satisfactory junctions and joints with adjoining or built-in elements and components.

Protect facework against damage and disfigurement during the course of the works, particularly arrises of openings and corners.

TOOTHED BOND

Except where a straight vertical joint is specified, new and existing facework in the same plane to be bonded together at every course to give a continuous appearance.

CRACKED JOINTS

In existing facework which is not to be repointed: joints with cracks wider than 1.5 mm to be cut out to form a square recess of 15-20 mm depth.

Remove dust, lightly wet and neatly point in 1:1:6 cement: lime: sand mortar to match existing work.

REPOINTING

Where specified carefully rake out existing joints by hand to form a square recess of 15-20 mm depth. Remove dust, lightly wet and neatly point in 1:1:6 cement: lime: sand mortar to a flush profile in a continuous operation.

F21. NATURAL STONE WALLING/DRESSINGS – for new WALLS ONLY
(Not for Restoration WORKS)

TYPE(S) OF WALLING/DRESSINGS ASHLAR WALLING

Stone: globigerina limestone ("franka stone") free from vents, cracks, fissures, discolouration, or other defects which may adversely affect strength, durability or appearance. Thoroughly seasoned, dressed and worked before delivery to site.

Finish: smooth on all exposed faces.

Bond: running bond unless otherwise stated

Joints: Flush.

GENERAL REQUIREMENTS/PRODUCTION OPERATIVES

Cutting, dressing, laying and jointing of stone to be carried out by skilled masons.

LAYING AND JOINTING

WORKMANSHIP GENERALLY

Dampen stones and lay on a full even bed of mortar with all joints filled and pointed approximately 6mm wide.

Keep courses level and in line, and accurately plumb all wall faces, angles and features

G.12 ISOLATED STRUCTURAL METAL MEMBERS

FABRICATION OF MEMBERS

Steel sections: To BS 4-1, BS EN 10055, BS EN 10056 or BS EN 10210, as appropriate.

Steel: To BS EN 10025, grade S275.

Surface condition: Free from heavy pitting and rust, burrs, sharp edges and flame cutting dross.

Cuts and holes: Form neatly and accurately.

Welding: Metal arc method to BS EN 1011-2.

Welded joints: Fully fused, with mechanical properties not less than those of the parent metal.

Site welding: Not allowed without permission.

SHOP PRIMING

Preparation: Remove loose scale and rust, burrs, fins, sharp edges and weld spatter. Clean out crevices. Thoroughly degrease and rinse with clean water. Allow to dry.

Primer: high build zinc phosphate

Application: Apply one full coat within 8 hours of cleaning surfaces, free from runs and sags.

NUTS, BOLTS & WASHERS

to be protected against corrosion:

galvanised to BS ISO 1461
sheradised to BS4921 class 1
zinc plated to BS3382

INSTALLATION

Accuracy: Position members true to line and level. If necessary, use steel packs of sufficient area to allow full transfer of loads to bearing surfaces.

Fixing: Use washers under bolt heads and nuts.

Tapered washers: Provide under bolt heads and nuts bearing on sloping surfaces. Match taper to slope angle and align correctly.

G30. METAL PROFILED SHEET DECKING

PERFORMANCE SPECIFIED ROOF/ FLOOR DECKING

The decking has been designed to take the normal museum floor loading as specified in the bill of quantities and occasional maintenance operations at intermediate floors

STRUCTURAL DESIGN OF ROOF DECKING

Refer to attached drawings.

FIXING DECKING

PAINTING STRUCTURE

Sequence: Before the decking is attached paint surfaces of supporting structure that will be subsequently inaccessible.

Note: Top flanges of composite beams to receive decking are to be left unpainted.

Paint: The paint shall be epoxy refer to M60

PREVENTION OF ELECTROLYTIC ACTION

Isolating tape: Neoprene.

Location: To contact surfaces of supports and sheets of dissimilar metals.

FIRE RESISTING PROFILE FILLERS

Supplier: Decking manufacturer.

Type/ shape: To match decking profile void.

Location: Refer to CA.

Fixing: Fit securely, as recommended by manufacturer, to form fire compartment.

FIXING DECKING GENERALLY

Cut sheets: Clean edges with true lines and no burrs.

Treatment of edges: Remove sharp edges.

Penetrations: Cut openings to the minimum size necessary.

Reinforce edges with: Refer to drawings fro any specific requirements.

Fixings: Drill all holes.

Cleanliness: Remove debris from within decking construction.

Installation: Seams and ribs of deck must be parallel, with no damage to deck coating.

ATTACHMENT OF DECKING AND ACCESSORIES

Scope of Contactor's design: Design fixings and accessories to comply with the requirements as stated on the drawings.

Requirement: To resist specified wind load.

Additional requirements: Refer to drawings.

Standard: In accordance with BS 6399-2, using appropriate location, exposure, height, building shape, size, and taking account existing and known future adjacent and attached buildings.

Design method: Detailed.

Shelter from upwind obstructions: Calculate.

Internal pressures (without dominant opening):

1. Pressure coefficient (Cpi): Calculate.
2. Size effect factor (Ca): Calculate.
3. Features: Refer to drawings.

K10. DRYLININGS/PARTITIONS/CEILINGS

GREEN PUBLIC PROCUREMENT (GPP) CRITERIA Requirement for Gypsum Wall Panels Section

National Green Public Procurement Guidelines

The paper used in the manufacture of gypsum wall panels must be either from 100% recycled wood/paper and/or paper made of wood, wood fibres or wood particles stemming from legally harvested forests.

Verification a:

Provision of appropriate documentation verifying that the paper or wood used is 100% recycled, i.e. from a national or EU certification scheme.

Verification b:

The legal origin of timber/wood fibres can be demonstrated with a chain of-custody tracing system being in place. These voluntary systems may be 3rd-party certified, often as part of ISO 9000 and/or ISO 14000 or EMAS management system.

Certificates of chain of custody for timber/wood fibres certified as FSC, PEFC or any other equivalent means of proof will also be accepted as proof of compliance. If timber/wood fibre stems from a country that has signed a Voluntary Partnership Agreement (VPA) with the EU, the FLEGT license may serve as proof of legality. Other means of proof that will be accepted includes a relevant and valid CITES certificate or other equivalent and verifiable means such as the application of a "due diligence" system.

For the non-certified virgin material bidders shall indicate the types (species), quantities and origins of the timber/wood fibres, together with a declaration of their legality. As such the timber/wood fibres shall be able to be traced throughout the whole production chain from the forest to the product.

The gypsum content must be at least 2% recycled gypsum board (by weight, based on an annual average, not including gypsum taken from FGD sites). Where higher percentages are possible these should be selected in preference.

Verification:

Appropriate proof must be provided that this criterion is met. For example, the supply of quality control or production documentation.

Information on wall covering materials, such as paint types, that will not hinder the recycling or diversion of gypsum plasterboard at end-of-life must be made available.

Verification:

Products holding a relevant Type 1 Ecolabel fulfilling the listed criteria will be deemed to comply. Other appropriate means of proof will also be accepted.

Appropriate and acceptable user information describing the handling, installation procedures, surface treatment applications, recycling and/or disposal methods shall be provided with the product or on the packaging or labels.

Verification:

Compliance with these requirements shall be demonstrated by providing examples of labels, packaging and point of sale information. Other appropriate means of proof will also be accepted.

The bidder must demonstrate that the contractor installing the wall panels has in place effective policies and procedures to ensure that waste arising from the installation, i.e.

off cuts, trimming losses, damaged boards etc. is properly dealt with in a sustainable manner, such as recovery, recycling or diverting from landfill where possible through an appropriate collection scheme.

Verification:

Possible means of proof include EMAS and ISO 14001 certificates or equivalent certificates issued by bodies conforming to Community law or the relevant European or international standards concerning certification based on environmental management standards. Other appropriate means of proof will also be accepted.

MOISTURE RESISTANT METAL STUD LININGS OF WALLS – NON-FIRE RATED

Location: as specified in drawings and/or the Bill of Quantities

Nominal thickness (excluding finishes): 80mm overall unless otherwise indicated in tender drawings

Nominal height: as specified in tender drawings and/or the Bill of Quantities

PERFORMANCE CRITERIA

Fire resistance of complete partition assembly: NA

Fire resistance- Integrity/insulation (minutes): NFR

STUDS

Type: 70mm or as per manufacturer's specifications

Centres: 600mm

Deflection allowance: 15mm deflection heads to manufacturer's recommendations.

Thickness: 50mm or as per manufacturer's specifications

LININGS

Type: To BS 1230: Part 1: 1985 Type 3 & 4

1 layer Wall Board 15mm backed with water repellent additives in the core, square ended and taped and jointed to receive generally a skim finish.

PRIMER/SEALER

- To manufacturer's recommendations.

ACCESSORIES

Extruded Aluminium Trims

Tape and jointing compound to suit boards

Plaster board and thin coat angle, edge and stop beads to manufacturer's recommendations where applicable.

MOISTURE RESISTANT METAL STUD LININGS OF WALL – FIRE RATED

Location: as specified in the drawings and Bill of Quantities

Nominal thickness (excluding finishes): 80mm overall unless otherwise indicated in tender drawings.

Nominal height: as specified in tender drawings and/or the Bill of Quantities

PERFORMANCE CRITERIA

Fire resistance of complete partition assembly to BS476: Parts 20&22

Fire resistance- Integrity/insulation (minutes): 60 minutes

Thermal conductivity: 0.25 W/Mk or better

STUDS

Type: 70mm or as per manufacturer's specifications

Centres: 600mm

Deflection allowance: 15mm deflection heads to manufacturer's recommendations.

Thickness: 50mm or as per manufacturer's specifications

LININGS

Type: To BS 1230: Part 1: 1985 Type 3, 4 & 5

1 layer Wall higher density core Board 12.5mm with water repellent additives in the core, square ended and taped and jointed to receive generally a skim finish.

PRIMER/SEALER

To manufacturer's recommendations.

ACCESSORIES

Extruded Aluminium Trims

Tape and jointing compound to suit boards

Plaster board and thin coat angle, edge and stop beads to manufacturer's recommendations where applicable.

CEMENT BOARDS

Water-resistant cement-based board shall be supplied shrink wrapped or with cardboard covers on pallets. Packs shall be lifted with a fork lift truck, the forks being set so there is an even weight distribution and no deformation of the pack. Handling equipment

shall be of adequate capacity, and personnel shall be advised of handling procedures and safety clothing. Care shall be taken at all times to avoid strain to the handlers. Boards shall not be lifted at the short edges or carried horizontally.

Water-resistant cement-based board shall be stored flat in a clean dry environment on a flat surface. If timber bearers are used to store boards on site, they shall be a minimum 40mm wide and placed at maximum 450mm centres.

Metal sections shall be supplied in small packs, strapped together to form larger packs for forklift truck off-loading. These packs shall be stacked in single packs, in a safe and stable manner on a flat surface. These bands or straps shall not be used for lifting, since metal sections may spring apart when banding is released.

Jointing compounds and plasters shall be stored in a dry location within the building, taking into account their shelf life.

BOARD SUSPENDED CEILING SYSTEM

Structural soffits: refer to the drawings.

Ceiling system manufacturer and product reference: submit technical literature to The Engineer.

- Ceiling type:

Grid form: non-interlocking. Grid exposure: Concealed.

- Suspension system:

Primary grid centres: as recommended by the manufacturer.

Hanger centres: as recommended by the manufacturer.

Secondary grid centres: as recommended by the manufacturer.

Access: access panels as indicated on the drawings.

Ceiling soffit above finished floor level: refer to the drawings.

Boards: as clause 'GYPSUM PLASTERBOARD (FIRE PROTECTION)'.

Accessories: as required, refer to the drawings.

Integrated services fittings: for air diffusers, luminaries, etc.

Other requirements: cut-outs for fittings.

METAL STUD PARTITION SYSTEM

LOW PARTITIONS

Partition type: double row studs

Partition height: 1.50m

Head condition: unrestrained

Structural performance: medium

Strength grade to BS 5234-2:

Fire resistance of complete partition assembly: as shown on drawings

Metal framing: Type recommended by board manufacturer to complete the partition assembly
and achieve specified performance.
Thickness: 12mm gypsum boards and an overall width of 100mm
Linings:
Finishing: skin coat plaster
Primer/ Sealer: For plastered areas it is not required.

FLOOR TO SUSPENDED CEILING HEIGHT PARTITIONS – FIRE RATED

GENERAL

1HR FIRE RATED
Location: Existing building in Audio Visual Room
Nominal thickness (excluding finishes):
122mm overall plus 9mm plaster finish with 3mm skim plaster
Nominal height: as per drawings

STUDS

Type: 70mm C-Studs unless otherwise specified in drawings
Centres: 600mm
Head condition: as per drawings
Deflection allowance: 15mm deflection heads to manufacturer's recommendations and with continuous line Firestrip.

FINISHING:

Plaster finish to match existing as Spec M20

PRIMER/SEALER

To manufacturers recommendations.

ACCESSORIES

Extruded aluminium trims: as per drawings
Tape and jointing compound to suit boards
Plaster board and thin coat angle, edge and stop beads to manufacturer's recommendations where applicable.

OTHER REQUIREMENTS

Fire stopping around all service penetrations.

To be locally reinforced as necessary - Details and locations as shown on drawings.
All cornices, existing walls and ceilings within the existing building affected by new inserted plasterboard walls, linings & ceilings to be made good and/or reinstated.

COMPONENTS

SAMPLES

General: Submit representative samples of the described materials.

GYPSUM PLASTERBOARD (IMPROVED FIRE PROTECTION)

Type: To BS 1230-1, type 5.
Core density (minimum): 800 kg/m³.
Core: Including fibres for improved cohesion.
Thickness: adequate for the clear span between the supports.
S i z e s : submit proposals.
Fillets/ cover strips: required at the movement joints.
Finish: smooth acrylic coating.
Colour: white.

GYPSUM PLASTERBOARD (FIRE PROTECTION)

Type: To BS 1230: Part 1: 1985 Type 5
Core density (minimum): 800 kg/m³.
Core: Including fibres for improved cohesion.
Thickness: adequate for the clear span between the supports.
Sizes: submit proposals.
Fillets/ cover strips: required at the movement joints.
F i n i s h: smooth plastic emulsion coating.
Colour: white or as approved

PERFORMANCE CRITERIA

Fire resistance of complete partition assembly to BS476: Parts 20&22 Fire resistance-Integrity/insulation (minutes): 60 minutes

INTEGRATED SERVICES

GENERAL

Position services accurately, support adequately. Align and level in relation to the ceiling and suspension system. Do not diminish performance of ceiling system.

SMALL FITTINGS

Support with rigid backing boards or other suitable means. Do not damage or distort the ceiling.

Surface spread of flame rating of additional supporting material: Match ceiling material.

SERVICE OUTLETS

Supported by ceiling system: Provide additional hangers. Independently supported: Provide flanges to support ceiling system.

MECHANICAL SERVICES

FAN COIL UNITS

Inlet and outlet grilles: Trim ceiling grid and infill units to suit.

Space beneath: Sufficient for ceiling system components.

Suspension and connections: Permit accurate setting out and levelling of fan coil units.

AIR GRILLES AND DIFFUSERS

- Setting out: Accurate and level.

LINEAR AIR DIFFUSERS

Provide flanges for support of grid and infill units.

Provide for displacement of ceiling grid.

Retain in place with lateral restraint.

Grille/ diffuser ceiling joints: Provide smudge rings and edge seals.

METAL FRAMING FOR PARTITIONS/ WALL LININGS

Setting out: Accurately aligned and plumb.

Frame/ Stud positions: Equal centres to suit specified linings, maintaining sequence across openings.

Additional studs: To support vertical edge of boards.

Fixing centres at perimeters (maximum): 600 mm.

Openings: Form accurately.

CAVITY FIRE BARRIERS WITHIN PARTITIONS/ WALL LININGS

Metal framed systems:

Material:

Installation: Form accurately and fix securely with no gaps to provide a complete barrier to smoke and flame.

ADHESIVE FIXED WALL LINING SYSTEM

Material: Adhesive compound.

Installation: Form in a continuous line with no gaps to provide a complete barrier to smoke and flame.

FIRE STOPPING AT PERIMETERS OF DRY LINING SYSTEMS

Material: Tightly packed mineral wool or intumescent mastic/ sealant.

Application: To perimeter abutments to provide a complete barrier to smoke and flame.

JOINTS BETWEEN BOARDS

Tapered edged plasterboards:

Bound edges: Lightly butted.

Cut/ unbound edges: 3 mm gap.

Square edged plasterboards: 3 mm gap.

Square edged fibre reinforced gypsum boards: 5 mm gap.

VERTICAL JOINTS

Joints: Centre on studs.

Partitions: Stagger joints on opposite sides of studs.

Two layer boarding: Stagger joints between layers.

HORIZONTAL JOINTS

Surfaces exposed to view: Horizontal joints not permitted. Seek instructions where height of partition/ lining exceeds maximum available length of board.

Two layer boarding: Stagger joints between layers by at least 600 mm.

Edges of boards: Support using additional framing.

Two layer boarding: Support edges of outer layer.K10.

INSULATION BACKED PLASTERBOARD

General: Do not damage or cut away insulation to accommodate services.

Installation at corners: Carefully cut back insulation or plasterboard as appropriate along edges of boards to give a continuous plasterboard face, with no gaps in insulation.

FIXING PLASTERBOARD TO METAL FRAMING

Partitions/ Wall linings: Fix securely and firmly at the following centres (maximum)

Position of screws from edges of boards (minimum): 10 mm.

Screw heads: Set in a depression. Do not break paper or gypsum core.

FINISHING

LEVEL OF DRY LINING ACROSS JOINTS

Sudden irregularities: Not permitted.

Joint deviations: Measure from faces of adjacent boards using methods and straightedges (450 mm long with feet/ pads) to BS 8212, clause 3.3.5.

Tapered edge joints: Permissible deviation (maximum) across joints when measured with feet resting on boards: 3 mm.
External angles: Permissible deviation (maximum) for both faces: 4 mm.
Internal angles: Permissible deviation (maximum) for both faces: 5 mm.

SKIM COAT PLASTER FINISH

Plaster type: as recommended by board manufacturer
Thickness: 2-3 mm
Joints: Fill and tape except where coincident with metal beads.
Finish: Tight, matt, smooth surface with no hollows, abrupt changes of level or trowel marks.

RIGID BEADS/STOPS

Type: Galvanized steel to BS 6452-1.

INSTALLING BEADS/ STOPS

Cutting: Neatly using mitres at return angles.
Fixing: Securely using longest possible lengths, plumb, square and true to line and level, ensuring full contact of wings with substrate.
Finishing: After joint compounds/ plasters have been applied, remove surplus material while still wet from surfaces of beads exposed to view.

K20. TIMBER BOARD LININGS

MARINE PLYOOD TIMBER BOARDS

Marine grade plywood to BS EN 314: Part 2, BS EN 635: Parts 1-3, BS EN 636 DD CEN/TS 1099 and BS 1088: Parts 1 and 2.

WORKMANSHIP

FIXING BOARDS

Protection during and after installation: Keep boards dry, clean and undamaged.

Boards to be used internally: Do not install until building is weathertight.

Fixing: Fix boards securely to each support to give flat, true surface free from undulations, lipping, splits and protruding fasteners. Reference is to be made to

Timber movement: Position boards and fixings to prevent cupping, springing, excessive opening of joints and other defects.

Heading joints: Tightly butted, central over supports and at least two boards widths apart on any one support.

Edges: Plane off proud edges.

K41. RAISED ACCESS FLOORS

Raw Material Selection All Flooring Products:

GREEN PUBLIC PROCUREMENT (GPP) CRITERIA Requirement for Tiling

No substances or preparations that are assigned any of the following phrases (or combinations thereof) as laid down in Council Directive 67/548/EEC and its subsequent amendments may be added to raw materials.

- R45 may cause cancer
- R46 may cause heritable genetic damage
- R49 may cause cancer by inhalation
- R50 very toxic to aquatic organisms
- R51 toxic to aquatic organisms
- R52 harmful to aquatic organisms
- R53 may cause long term adverse effects in the aquatic environment
- R54 toxic to flora
- R55 toxic to fauna
- R56 toxic to soil organisms
- R57 toxic to bees
- R58 may cause long-term adverse effects in the environment
- R59 dangerous for the ozone layer
- R60 may impair fertility
- R61 may cause harm to unborn child
- R62 possible risk of impaired fertility
- R63 possible risk of harm to the unborn child

Alternatively, classification may be considered according to Regulation (EC) No 1272/2008 of the European Parliament and of the Council. In this case no substances or preparations may be added to the raw materials that are assigned, or may be assigned at the time of application, with and of the following hazard statements (or combinations thereof): H350, H340, H350i, H400, H410, H411, H412, H413, EUH059, H360F, H360D, H361f, H361d, H360FD, H361fd,H360Fd, H360Df, and H341.

The above requirement does not apply to the quota of closed-loop recycled materials used by the process and defined as a material that is extracted from the production system and is returned to the same production system, eventually after a recycling treatment.

Where lead and cadmium (or any of their compounds) are used in the additives, their content shall not exceed the following limits:

Parameter	Limit (% in weight of the glazes)
Lead	0.5
Cadmium	0.1

Verification;

Possible means of proof include EMAS and ISO 14001 certificates or equivalent certificates issued by bodies conforming to Community law or the relevant European or international standards concerning certification based on environmental management standards. Other appropriate means of proof will also be accepted.

Energy Consumption Processed Products Only:

	Hurdle (MJ/kg)	Test Method
Agglomerated Stones	1.6	EU Ecolabel Technical Appendix A4
Terrazzo Tiles	1.3	EU Ecolabel Technical Appendix A4

The energy consumption shall be calculated as process energy requirements (PER) for agglomerated stones and terrazzo tiles or as energy requirement for firing (ERF) for ceramic tiles and clay tiles. Not applicable to concrete paving units.

PER Limit:

	Hurdle (MJ/kg)	Test Method
Ceramic and Clay Tiles	3.5	EU Ecolabel Technical Appendix A4

Verification;

Products holding a relevant Type 1 ecolabel fulfilling the listed criteria will be deemed to comply Other appropriate means of proof will also be accepted.

Water Use

Processed Products Only:

The wastewater produced by the process included in the production chain shall reach a recycling ratio of at least 90%. The recycling ratio shall be calculated as the ratio between the wastewater recycled or recovered by applying a combination of process optimisation measures and process waste treatment systems, internally or externally at the plant, and the total water that leaves the process, as defined in the EU Ecolabel Technical Appendix A3.

Verification;

Products holding a relevant Type 1 Ecolabel fulfilling the listed criteria will be deemed to comply. Other appropriate means of proof will also be accepted.

Waste

All Products:

All plants involved in the production of the product shall have a system for handling the waste and residual products deriving from the production of the product. It shall include the following:

Procedures for separating and using recyclable materials from the waste stream

Procedures for recycling materials for other uses

Procedures for handling and disposing of hazardous waste

Processed Products Only:

At least 85% (by weight) of the total waste generated by the process or the processes shall be recovered according to the terms and definition established by Council Directive 2008/98/EC, amending Directives 91/156/EC and 75/442/EEC on waste.

Possible means of proof include EMAS and ISO 14001 certificates or equivalent certificates issued by bodies conforming to Community law or the relevant European or

international standards concerning certification based on environmental management standards. Other means of evidence provided by the company that can prove the required technical capacity will also be accepted

SCOPE, SUBMITTALS, TESTING AND PERFORMANCE

SYSTEM TYPES – RAISED FLOORING

Mineral Core high density calcium sulphate, bonded with fibres heavy duty access panel with ceramic finish providing a fully accessible raised access floor.

SAMPLES, MOCK-UPS, PROTOTYPES AND QUALITY BENCHMARKS

Pre-contract Samples (if requested)

Sufficient samples of the following, including relevant trade literature and technical specifications, shall be provided:

a) 1 No. floor panel of each system.
b) Floor pedestal.
c) Perimeter plenum with floor grille.
d) 1 No. inset floor box

Post Contract Samples

Post contract samples of the following shall be provided (if requested):

a) 1 No. floor panel of each system.
b) Floor pedestal of each system.
c) Perimeter plenum with floor grille.
d) 1 No. inset floor box
e) Typical step with integral lighting and row number
f) Balustrade sample

Mock-ups Not Required.

Prototypes

Prototype shall be constructed to meet written specification and to include all associated fixings, finishes and inset services.

Internal - 5m² section of each raised flooring system including complete system build up, specified floor finishes, integrated floor boxes and ventilation grills. Each prototype to be tested for live loading criteria specified.

External - 5m² section of specialist raised floor / seating rake system including complete system build up, specified floor finishes, integrated floor boxes, ventilation grills swivel seats, steps to aisle and balustrade. Each prototype to be tested for live loading criteria specified.

SLIP RESISTANCE TESTING (Walkable Glass)

Testing for slip resistance shall comply with the following documents:
'The assessment of pedestrian slip risk' by The Health and Safety Executive (latest published version).
'The assessment of floor slip resistance, the UK Slip Resistance Group guidelines' by The UK Slip Resistance Group (latest published version).

Testing shall be performed at an independent UKAS accredited laboratory accredited to perform the specified test methods.
Pendulum Test: Internal flooring shall be evaluated in both dry and wet conditions using the TRL Pendulum Tester in accordance with BS 7976 and the recommendations of the UK Slip Resistance Group to obtain the pendulum test value (PTV) specified.
Roughness Test: Internal flooring shall be evaluated using a surface roughness meter, in accordance with the recommendations of the UK Slip Resistance Group, to obtain the surface roughness (Rz) value specified.

Samples shall be tested at the following stages of the project:
Approval.
Production.
Post-installation (in-situ).

Submit test results to the Project Manager for acceptance in due time, prior to each of the project stages or as agreed with the Architect.
Test samples must include any surface treatments to be applied to the glass.
Sealing of builders work in plenums utilised for pressurised supply air ventilation, particularly where other mechanical and electrical services pass through the plenum walls
Plenums shall be leakage tested and shall have a maximum allowable leakage of 1 L/ s per m² of plenum surface area, at 50 Pa. Leakage shall be conducted in the presence of the Services Engineer.

PERFORMANCE REQUIREMENTS

Comply with the general performance of the following specific performance requirements.

Comply generally with the MOB PF2 PSU/ SPU 'Performance Specification for Raised Access Floors', or acceptable equivalent European Standard.

STRUCTURAL GENERAL

The works shall be installed to withstand all deflections and tolerances of the building structure under all design loads or combination of loads without reduction in the performance or appearance of the works or applied finishes. Refer to the Engineers movement and tolerances report.

All fixings shall be capable of providing adequate adjustment to achieve a level floor.

The works shall accommodate all movement joints as necessary.

The works shall withstand static and dynamic design loads without causing deformation of components or the failure of members and shall transmit such loads safely to the points of support.

DEFLECTION

A calculated deflection of no more than 2.5x10 (-3) mm

FLOOR LOADS

The works shall take account of all loadings and deflections of the structure to which they are fixed. All assemblies, adjustment mechanisms, fixings and support systems shall be capable of achieving a firm and level floor.

Movement Noise: The works shall be installed such that movements over the floor or changes in temperature do not result in audible 'creaking', 'squeaking' or 'slip-stick' noise.

LIVE LOADS

A minimum vertical live load capacity of 2.4kN/m2 UDL and 4kN point load + finishes (point loads for raised flooring only)

Lateral live loading: 10% of the maximum vertical load with the vertical imposed simultaneously.

A natural frequency of not less than 12 Hz at 2.4KN/ m^2.

ENVIRONMENTAL MOISTURE REQUIREMENTS FOR TIMBER WITHIN FLOORING SYSTEMS

Areas for storage and installation shall be clean, dry, ventilated and free from excessive or rapid variations of temperature and humidity. Relative humidity shall not exceed 75%.

No part of the sub-floor or surrounding walls shall show readings of more than 75% RH when tested for moisture content using an accurately calibrated hygrometer in accordance with BS 8201.

The systems shall be designed and suited to the locations indicated on the Design Drawings in accordance with the environmental conditions specified in the requirements of MOB PF2 PS/ SPU 'Performance Specification for Raised Access Floors' or BS EN 12825.

Notwithstanding the above, delivery of materials and installation of the works shall be taken as the responsibility of the Contractor for the suitability of the environmental conditions.

RAISED FLOOR AIR LEAKAGE TESTS

Ensure the air tightness at all perimeter conditions including seals around services penetrations at core walls. Include for air testing the complete void of all areas of the building on a zone by zone basis.

Any failure of the raised floor or floor voids found on testing shall require retesting.

The underfloor fire/ smoke barriers shall also form an effective airtight seal to reduce the size of the area of each raised floor and raised floor void that is tested. The size of test rig and areas for testing shall be agreed with the Architect prior to ordering.

The tests shall be carried out by an independent testing laboratory accepted by the Project Manager.

The works shall not exceed the following leakage rates:

a) Floor surface 1.5 litres/ m^2/ second at 50N/ m^2 test pressure.
b) Floor void 0.9 litres/ m^2/ second at 50N/ m^2 test pressure.

ACOUSTIC

Specific Acoustic Requirements

1. Airborne sound insulation shall be to BS EN ISO 140: Part 3; measured in accordance with BS EN ISO 717: Part 1 and BS EN ISO 10848: Part 2.

FIRE

Cavity Barriers

All concealed spaces below the works shall have firebreaks. Firebreaks shall be located on the line of the required compartments as indicated on the plan area.

The firebreaks shall have a resistance of not less than 30 minutes as specified or meet the required level of resistance indicated on the Working Drawings and required by the Specification.

Material: PVC sleeved mineral wool or similar shall meet the performance criteria specified.

Fire resistance to BS 476: Part 20.

Integrity/ insulation: 60 minutes. Refer to the fire strategy and accompanying fire strategy drawings.

All openings into the void and through any cavity barriers shall be fire stopped to 30 minutes fire resistance and provide a complete barrier to smoke and flame.

Barriers shall subdivide floor voids into areas not exceeding 400m².

Barriers shall be fixed securely to the sub-floor at joints and as necessary to ensure permanent stability and continuity with no gaps, thus providing an effective barrier to smoke and flame.

Access panels above cavity barriers shall be screwed down or otherwise firmly secured.

Where systems incorporate insulation, these products should conform to the clients insurer's requirements; Roof and wall insulation to be either non-combustible or as approved by the Project Manager.

Spread of flame: Type RAF-02 Class 0 spread of flame acoustic foam to underside of plasterboard.

FIRE STOPPING

All gaps at junctions of the works with walls, cavity barriers, ducts, pipes, other floors at different levels, etc. shall be sealed with fireproof material to prevent penetration of smoke and flame.

SYSTEMS, MATERIALS AND FABRICATION SYSTEMS

Raised Access Floor Construction Generally;

1. The thickness and type of the panels shall be determined with due regard to the performance requirements of the Specification and the location within the building.
2. The joints between flooring panels shall be constant. These shall be sealed with a serrated compressible neoprene strip, or similar. The exact fixing detail shall be accommodated in the design and detailed on the Working Drawings.
3. Cut-outs in panels shall be carried out at the point of manufacture and not on Site. All exposed ends, cuts, etc. shall be suitably finished and sealed.
4. Panels shall be protected against corrosion after fabrication and prior to application of finishes. All exposed faces of metal, including ends, shall be treated to avoid

corrosion.

5. No panels shall have sharp edges.
6. The core of the panel shall be protected by metal encapsulation, foil or steel backing.
7. Cutting and drilling of flooring panels and associated works shall take place before the application of finishes.

Other Requirements:

1. Steps and ramps shall be provided where indicated on the Design Drawings. Steps shall include riser panels, vertical infill panels and flush nosings and general profiles as indicated on the Design Drawings.
2. Vertical closure panels where steps or floor systems are provided (by others) shall be fully sealed to achieve the specified pressurisation requirements.
3. Provide perimeter seal to cladding at perimeter conditions.
4. Provide all underfloor cavity barriers to comply with Building Regulations.
5. Structural movement joints, where visible, shall be to the acceptance of the Project Manager.
6. Earth bonding of the works to the Services Engineer's Specifications.
7. Seal all gaps at the junction of the works with the walls with fireproof material to prevent penetration of smoke and flame.
8. Seal all encapsulated tiles with sealant or welding material to prevent egress of water into the core material.
9. Systems to be installed to incorporate all floor-mounted / recessed services as identified on the design drawings and specified by the services engineer. Refer to services Engineers documentation.

RAISED FLOORING SYSTEMS

A mineral core high density calcium sulphate, bonded with fibres heavy duty access panel with ceramic finish providing a fully accessible raised access floor to suit a raised floor height (max 150mm void) as indicated on the Design Drawings.

Sub-floor: Stone Slabs or as indicated on the Design Drawings.

Panel type:

1. Loading capacity: Heavy duty.

2. System weight: 0.44KN/ m² max.
3. Panel size: 600mm x 600mm.
4. Floor zone: Refer to the Design Drawings.
5. Finish: Ceramic finish – coloured

Pedestals:

6. All mild steel base with threaded mild steel tube with threaded stud and locking nut **– No direct fixing or perforations to stone slabs. .**
7. Head of pedestal shall be 90mm diameter or as approved, capable of loose lay, screw down or stringer support.

Accessories:

8. Cut-out panels shall incorporate floor box electrical outlets/ air supply outlets services as indicated on the M&E Services Engineer's.

Documentation:

Allow for all associated trims and cavity barriers.

System to be designed to support internal MWEP wheel loading as identified within the cleaning and maintenance strategy documents and associated drawings.

System shall include all necessary integrated balustrade, handrails, steel treads as indicated on the Design Drawings and in accordance with the Building Regulations.

System to be designed to support dead load of fully fitted out museum.

System to include cavity barriers beneath mobile partitions to provide acoustic and fire separation to meet the performance requirements of the specification.

System to be installed generally onto existing hardstone floor. Allow for the raised access floor system to be installed in environmentally acceptable conditions in accordance with manufactures recommendations.

Other Requirements:

Cut-out panels shall incorporate floor box electrical outlets and all other services as indicated on the M&E Services Engineer's Documentation.

System to incorporate access ramps and steps as identified on the design drawings.

1. Balustrade assembly ramp perimeter to extend down to floor level

Finishes:

1. Steel frame: Polyester powder coated RAL colour 9011 black or as approved.
2. Finish: Ceramic Finish
3. All recessed floor boxes and access panels to receive match finished and to be fitted flush.

4. Steps and ramps to be visually identified with colour contrasting nosings

MATERIALS

GENERAL

The floor system and all its associated components shall be constructed of moisture resistant, vermin-proof and rot-proof material.

Renewable Sources: When selecting metal raised flooring systems, the contractor must provide written confirmation of all types of system proposed, including country of origin, before starting on Site to demonstrate all materials have been sustainable sourced and are supported by a full chain of custody.

MILD STEEL

All steel panels shall be fabricated from CR4 mild steel in accordance with BS 1449: Part 1 and BS EN 10132: Parts 1-3, unless otherwise accepted. All panel core materials shall be of stable, homogeneous and durable material, free from toxic and harmful products.

FABRICATION

Manufacturing Tolerances:

The pedestals shall be adjustable to provide a finished floor level within ±1.5mm over any 5m².

Panel Flatness: The concavity or convexity of any panel under no load conditions shall not exceed 0.75mm when measured across a 600mm module and parallel to any edge or diagonally across the module.

Panel Squareness: The panel deviation from square shall not exceed 0.06% of the diagonal length.

Panel Dimensions: The deviation from the specified size of the panel shall not exceed ±1.00mm.

SITE INSTALLATION PREPARATION

Before installation works commence, ensure that the cementitious surface to the sub-floor, including within the floor void up to the level of the platform floor, is completed.

Ensure that any mechanical fixings are clear of the reinforcement in the structural slab.

The existing floor to become the sub-floor shall be properly cleaned before the installation of the works commences. Cleaning shall continue during installation to prevent entrapment of dirt or rubbish.

Surfaces to be sealed shall be clean, dry and free from dust, grease and other contaminants.

Sealer shall be as recommended by the Raised Floors manufacturer, applied in two contrasting colour coats in accordance with the manufacturer's written instructions to all substrates within the floor void to prevent dusting throughout the life of the installation.

MARKING OUT

Pedestal positions shall be marked out using (using a marking system which can be removed without leaving trace after removal) in advance of the services installation. Ensure no conflict of location.

IRREGULAR SPACES

Where surrounding walls, or other building elements and features to which the works relate, are not square, straight or level, proposals shall be submitted to the Architect and Project Manager on setting out. Cutting of tiles shall be kept to a minimum and located in unobtrusive locations. Grid pattern shall be maintained wherever possible. All cut tiles adjacent to door thresholds, lift lobbies and other openings shall have an additional pedestal support at mid span.

Adhesives shall be those recommended by the floor tile manufacturer for the particular covering material and the panel substrate.

Coverings shall be bonded to a smooth and level panel substrate covering the entire top surface area of the panel. Joints in the material within one panel shall not be acceptable.

The bond shall remain effective for the design life of the covering materials.

Where the panels are to be lifted by means of a lifting device applying force to the covering, the adhesion between the covering and the panel shall be adequate for panels of up to 20kg to be lifted without causing any failure or weakening of the bond. The lifting device shall not cause damage to the covering material when used in accordance with the manufacturer's instructions.

Pedestals shall be bonded and remain rigid and firmly secured to the existing sub-floor. All pedestals shall be fixed plumb.

All pedestal fittings, stringers, bridging structures, perimeter support and cavity barriers shall be provided as necessary, including movement joints, steps, ramps and cut-outs for floor boxes, where indicated on the Design Drawings.

The floor system shall have a panel location system to securely locate each panel. It shall exhibit no rocking and the system shall not rely on the perimeter wall for lateral stability but provide resistance to rolling loads. The floor system shall remain stable when groups of panels are removed for access or maintenance or any other reason.

Ensure that all changes in level of substrates are accommodated and that the required finished floor datum level is achieved.

CO-ORDINATION WITH OTHERS

The correct location of pedestals and services shall be ensured and where considered necessary, positions of pedestals shall be indelibly marked in advance of services installations.

Related work shall be suitably coordinated and shall proceed without damage to the floor, which shall be protected as necessary.

Before commencing work, all fixtures around which panels are to be cut or over which supports are to bridge shall be checked to ensure that they are complete.

SETTING OUT

Refer to the Design Drawings for setting-out requirements.

The works shall be set out within the discipline of a dimensional framework based on BS 6750.

The setting out shall follow the planning grid and be coordinated with the setting out of ceilings, walls and partitions so as to achieve the dimensional requirements of MOB PF2

PS/ SPU 'Method of Building Performance Specification for Raised Access Floors' (clause P3.00).

Where not indicated otherwise, set out the works as specified above. Any conflict occurring between the operations of the above clauses shall be referred to the Architect and a setting-out method agreed.

Whenever possible, use oversize panels to ensure that cut panels are not less than half in width, particularly at doorways, thresholds, perimeters, etc. and provide suitable panel support arrangements which shall not create a hazard to pedestrians.

Co-ordinate pedestals/supports with the Working Drawings regarding all services requirements within the Raised Floors voids, particularly with respect to all requirements for bridging as necessary. Refer also to the Services Engineer's Specifications and Drawings.

Refer to the Structural Engineer's Drawings for requirements for raised structures/ beams, etc. and ensure that pedestals are suitably raised or bridged as necessary.

SEALING OF CUT PANELS

All exposed cut edges of panels shall be sealed with Class 0 rated aluminium foil self-adhesive tape.

PERIMITERS

The works shall have sufficient lateral stability to enable them to be independent of abutting elements.

A 10mm gap shall be provided at all abutments and shall be filled with a resilient closed cell filler before fixing skirting, cover strips, etc.

PROTECTION

No part of the works shall be used as a platform for storage of equipment and materials.

No part of the works shall be subjected to static or dynamic loads, which exceed those for which it is designed. Adequate precautions, including the use of spreader plates, shall be taken during installation of equipment and any work on other elements, e.g. ceilings.

No part of the works shall be walked on within 48 hours following the use of adhesives to fix pedestals to the sub-floor.

No part of the works shall be left unprotected prior to Practical Completion. A protective covering shall be supplied and fitted.

CHANGES OF LEVELS

Ramps and Steps: Construct to accepted details to achieve performance requirements specified for the associated works.

Ensure that air tightness is maintained at steps, ramps, etc. as specified and as indicated on the Design Drawings.

PANEL LIFTING DEVICES

Upon completion, two sets of lifting devices suitable for each of the floor finishes installed shall be provided. One set shall be used by others requiring access to the void and the other for handing over to the Architect at Practical Completion.

POST INSTALLATION EXAMINATION

After completion of the mechanical and electrical installation and other associated work:

Thoroughly inspect the floor installation for defects and prepare a schedule of outstanding defects for submittal to the Architect.

Thoroughly clean all accessible areas of the sub-floor and apply a further coat of sealer to all accessible areas.

MOVMENT JOINTS

The works shall accommodate all movement joints in the building structure without compromising the integrity, appearance or performance of the system.

Refer to the Structural Engineer's Specifications and Drawings for locations and types of movement joints and accommodate the works accordingly.

TOLERANCES

Installation Tolerances:

The pedestals shall be adjustable to provide a finished floor level within ±2.5mm deviation from the defined finished floor level; the defined finished floor level may be varied, when accepted by the Architect, to accept variations in levels due to construction tolerances and deviations in adjacent interfacing works.

Sudden irregularities shall not occur.
The variation in gap under a straightedge placed anywhere on the surface shall be not more than the following:

1. 5mm under a 3m straightedge.
2. 2mm under a 1m straightedge.

Ensure that the installed works remain free from undulations, steps, ridges, bumps, ripples, rocking and lipping.

1. The works shall be flat, flush and true at abutments with adjacent surfaces at the same relative level.
2. The works shall be installed such that finished surfaces shall be capable of being installed to achieve the design tolerances, providing a flush, true and flat interface with adjacent finishes, free from steps or flaws.
3. Bay divisions and movement joints shall be accommodated in the design and coordinate with wall joints and other elements indicated on the Design Drawings.
4. The difference in height between adjacent finished panels shall not exceed 1.0mm after the application of the specified load and shall not exceed 3.25mm between the edge of any panel being subjected to any of the static loadings specified for any adjacent unloaded panel.
5. The deviation due to twisting under no load conditions of any corner in relation to the other three shall not exceed 1.0mm over a 600mm module. The flatness shall be maintained when the panel is subjected to any environmental conditions and also after the removal of any concentrated or distributed loads.

On-Site Dimensions:

All dimensions to be checked on Site.
The final installation shall accommodate all specified tolerances and differences between actual Site dimensions and dimensions shown on the Working Drawings.

M20 PLASTERED/ RENDERED/ ROUGHCAST COATING

(Only for new walls and internal partitions)

GREEN PUBLIC PROCUREMENT (GPP) CRITERIA Requirement for Plastering Works

Bidders must declare that the following materials/substances will not be used in the building:

- Products which contain sulphur hexafluoride (SF6).
- Indoor paints and varnishes with a content of solvents (volatile organic compounds (VOCs) with a boiling point of 250°C maximum) higher than:

d) For wall paints (according to EN 13300): 30 g/l (minus water).

e) For other paints with a spreading rate of at least 15 m2/l at a hiding power of 98% opacity: 250 g/l (minus water)

f) for all other products (including paints that are not wall paints and that have a spreading rate of less than 15m2/l, varnishes, wood stains, floor coatings and floor. paints, and related products): 180g/l (minus water).

TYPES OF COATING CEMENT: LIME: SAND PLASTER TO WALLS AND CEILINGS

Substrate: in-situ slabs.
Preparation: stipple key
Cement: lime: sand mortar
Procurement: contractor's choice.
Pigment: not required.
Undercoats:
Mix (cement: lime: sand): 1:1.5-6.
Cement type: ordinary Portland.
Thickness (excluding dubbing out and keys): 8-12mm.
Final coat:
Mix (cement: lime: sand): 1:2:8-9.
Cement type: white
Other requirements: none.
Thickness: 6-10mm.
Finish: Plain.
Accessories: angle beads, bell cast stops, reinforcing mesh, and PVC cover strips over movement joints.

GYPSUM PLASTER ON CEMENT BASED UNDERCOAT(S)

Location: new walls and ceilings.
Background: HC blockwork and smooth dense concrete
Preparation: no special preparation to HC blockwork but add bonding agent to smooth dense concrete surfaces
Undercoat(s): The following mix using sand to BS 1199, type A:
Cement: lime: sand and plasticizer, using Portland cement and admixture
Mix designation: 2
Admixture: Rheomix 158, Sikalatex or similar product, approved by the Engineer.
Thickness (excluding dubbing out): 6 - 8 mm
Second coat: Gypsum plaster to BS 1191: Part 1, Class B.
Thickness: 4-6mm.
Final coat: Gypsum plaster to BS 1191: Part 1, Class B.
Proprietary reference: Thistle Multi-finish or equivalent

Thickness: 3-5mm
Finish: plain
Accessories: aluminium angle beads and bell cast stops; pvc cover strips over movement joints.
Sample: Before placing orders submit for approval a representative sample. Size of sample 3m x 3m minimum. Obtain approval before starting work.

MATERIALS AND MAKING OF MORTAR

READY-TO-USE CEMENT GAUGED MORTARS

Time and temperature limitations: Use within limits prescribed by mortar manufacturer.
Re-tempering: Restore workability with water only within prescribed time limits.

CEMENTS FOR MORTARS

Cement: To BS EN 197-1 and CE marked.
Types: Portland cement, CEM I.
Portland slag cement, CEM II/S.
Portland fly ash cement, CEM II/V or W.
Strength class: 32.5, 42.5 or 52.5.
White cement: To BS EN 197-1 and CE marked.
Type: Portland cement, CEM I.
Strength class: 52.5.
Sulphate resisting Portland cement: To BS 4027 and Kitemarked.
Strength class: 42.5.
Masonry cement: To BS 5224 and Kitemarked.
Class: MC 12.5 (with air entraining agent).

SAND FOR CEMENT GAUGED MORTARS

Standard: To BS EN 13139.
Grading: 0/2 or 0/4 (CP or MP); category 2 fines.
Colour and texture: Consistent. Obtain from one source.

LIME FOR CEMENT GAUGED MORTARS

Standard: To BS EN 459-1.
Type: CL 90S.

PIGMENT FOR COLOURED MORTARS

Standard: To BS EN 12878.

ADMIXTURES FOR CEMENT GAUGED MORTARS

Suitable admixtures: Select from:

Air entraining (plasticizing) admixtures: To BS 4887-1 and compatible with other mortar constituents.

Other admixtures: Submit proposals.

Prohibited admixtures: Calcium chloride and any admixture containing calcium chloride.

HYDRAULIC LIME

Standard: To BS EN 459-1.

Type: Natural hydraulic lime (NHL).

PREPARING SUBSTRATES

SUITABILITY OF SUBSTRATES

Soundness: Free from loose areas and significant cracks and gaps.

Cutting, chasing, making good, fixing of conduits and services outlets and the like: Completed.

Tolerances: Permitting specified flatness/ regularity of finished coatings.

Cleanliness: Free from dirt, dust, efflorescence and mould, and other contaminants incompatible with coatings.

STIPPLE KEY

Materials:

Cement: To BS EN 197-1 and CE marked.

Sand: Clean, coarse.

Admixture: SBR bonding agent.

Mix proportions (cement: sand): 1:1.5-2.

Consistency: Thick slurry, well stirred.

Application: Brushed and stippled to form deep, close textured key.

Curing: Controlled to achieve a firm bond to substrate

.

BONDING AGENT APPLICATION

General: Apply evenly to substrate to achieve effective bond of plaster/ render coat. Protect adjacent surfaces.

REMOVING DEFECTIVE EXISTING RENDER

Render for removal: Detached, hollow, soft, friable, badly cracked, affected by efflorescence or otherwise damaged.
Removing defective render: Cut out to regular rectangular areas with straight edges.
Horizontal and vertical edges: Square cut or slightly undercut.
Bottom edges to external render: Do not undercut.
Render with imitation joints: Cut back to joint lines.
Cracks:
Fine hairline cracking/ crazing: Leave.
Other cracks: cut out to a width of 75mm minimum.
Dust and loose material: Remove from exposed substrates and edges.

REMOVING DEFECTIVE EXISTING PLASTER

Plaster for removal: Detached, soft, friable, badly cracked, affected by efflorescence or otherwise damaged.
Hollow, detached areas: remove.
Stained plaster: remove.
Removing defective plaster. Cut back to a square, sound edge.
Faults in substrate (structural deficiencies, damp, etc.): Submit proposals.
Cracks:
Fine hairline cracking/ crazing: Leave.
Other cracks: cut out to a width of 75mm minimum.
Dust and loose material: Remove from exposed substrates and edges.

BACKINGS/ BEADS/ JOINTS BEADS/ STOPS FOR INTERNAL USE

Material: Aluminium

BEADS/ STOPS FOR EXTERNAL USE

Material: Aluminium

BEADS/ STOPS GENERALLY

Location: External angles and stop ends, except where specified otherwise.
Corners: Neat mitres at return angles.
Fixing: Secure, using longest possible lengths, plumb, square and true to line and level, ensuring full contact of wings with substrate.
Beads/ stops for external render: Fix mechanically.
Finishing: After coatings have been applied remove surplus material, while still wet, from surfaces of beads/ stops exposed to view.

CRACK CONTROL AT JUNCTIONS BETWEEN DISSIMILAR SOLID SUBSTRATES

Locations: Where defined movement joints are not required. Where dissimilar solid substrate materials are in same plane and rigidly bonded or tied together.

Crack control materials:

Isolating layer: Building paper to BS 1521.

Metal lathing: Aluminium internally; stainless steel externally.

Installation: Fix metal lathing over isolating layer. Stagger fixings along both edges of lathing.

Width of installation over single junctions:

Isolating layer: 150 mm.

Lathing: 300 mm.

Width of installation across face of dissimilar substrate material (column, beam, etc. with face width not greater than 450 mm):

Isolating layer: 25 mm (minimum) beyond junctions with adjacent substrate.

Lathing: 100 mm (minimum) beyond edges of isolating layer.

COVER STRIPS OVER CONSTRUCTION JOINTS-EXTERNALLY

Manufacturer and product reference: contractor's choice; submit technical literature to the

Engineer.

Material and finish: brushed stainless steel, grade 316.

Installation: as recommended by the manufacturer.

Fixing: stainless steel concealed clips.

Type: plain and corner types.

COVER STRIPS OVER CONSTRUCTION JOINTS-INTERNALLY

Manufacturer and product reference: contractor's choice; submit technical literature to the

Engineer.

Material and finish: PVC, white.

Installation: as recommended by the manufacturer.

Fixing: concealed clips.

Type: plain and corner type.

INTERNAL PLASTERING

APPLICATION GENERALLY

Application of coatings: Firmly and in one continuous operation between angles and joints.

Achieve good adhesion.
Appearance of finished surfaces: Even and consistent. Free from rippling, hollows, ridges, cracks and crazing.
Accuracy: Finish to a true plane, to correct line and level, with angles and corners to a right angle unless specified otherwise, and with walls and reveals plumb and square.
Drying out: Prevent excessively rapid or localised drying out.

FLATNESS/ SURFACE REGULARITY

Sudden irregularities: Not permitted.
Deviation of plaster surface: Measure from underside of a straight edge placed anywhere on surface.
Permissible deviation (maximum) for plaster not less than 13 mm thick: 3 mm in any consecutive length of 1800 mm.

DUBBING OUT

General: Correct substrate inaccuracies.
New smooth, dense concrete and similar surfaces: Dubbing out prohibited unless total plaster
thickness is within range recommended by plaster manufacturer.
Thickness of any one coat (maximum): 10 mm.
Mix: As undercoat.
Application: Achieve firm bond. Allow each coat to set sufficiently before the next is applied.
Cross scratch surface of each coat.

UNDERCOATS GENERALLY

General: Rule to an even surface. Cross scratch to provide a key for the next coat. Undercoats on metal lathing: Work well into interstices to obtain maximum key. Undercoats gauged with Portland cement: Do not apply next coat until drying shrinkage is substantially complete.

SMOOTH FINISH

Appearance: A tight, matt, smooth surface with no hollows, abrupt changes of level or trowel
marks. Avoid water brush, excessive trowelling and over polishing.

WOOD FLOAT FINISH

Appearance: An even overall texture. Finish with a dry wood float as soon as wet sheen has
disappeared.

EXTERNAL RENDERING

APPLICATION GENERALLY

Application of coatings: Firmly and in one continuous operation between angles and joints. Achieve good adhesion.

Appearance of finished surfaces: Even and consistent. Free from rippling, hollows, ridges, cracks and crazing.

Accuracy: Finish to a true plane, to correct line and level, with angles and corners to a right angle unless specified otherwise, and with walls and reveals plumb and square.

Drying: Prevent excessively rapid or localized drying out.

FLATNESS/ SURFACE REGULARITY OF RENDERING TO RECEIVE CERAMIC TILES

Sudden irregularities: Not permitted.

Deviation of render surface: Measure from underside of a 2 m straight edge placed anywhere on surface.

Permissible deviation (maximum): 3 mm.

DUBBING OUT FOR RENDERING

General: Correct substrate inaccuracies.

Thickness of any one coat (maximum): 16 mm.

Total thickness (maximum): 20 mm, otherwise obtain instructions.

Mix: As undercoat.

Application: Achieve firm bond. Allow each coat to set sufficiently before the next is applied. Comb surface of each coat.

UNDERCOATS GENERALLY

General: Rule to an even surface. Comb to provide a key for the next coat. Do not penetrate the coat.

Undercoats on metal lathing: Work well into interstices to obtain maximum key.

FINAL COAT - PLAIN FLOATED FINISH

Finish: Even, open texture free from laitance.

FINAL COAT - SCRAPED FINISH

Finish: Scraped to expose aggregate and achieve an even texture.

FINAL COAT - ROUGHCAST (HARLING) FINISH

Finish: Left as cast with an even thickness and texture.

CURING AND DRYING

General: Prevent premature setting and uneven drying of each coat.

Curing coatings: Keep each coat damp by covering with polyethylene sheet and/ or spraying with water.

Curing period (minimum): 4 days.

Final coat: Hang sheeting clear of the final coat.

Drying: Allow each coat to dry thoroughly, with drying shrinkage substantially complete before applying next coat.

Protection: Protect from frost and rain.

M40. QUARRY/ CERAMIC TILING

GREEN PUBLIC PROCUREMENT (GPP) CRITERIA for Tiling

Raw Material Selection All Flooring Products:

No substances or preparations that are assigned any of the following phrases (or combinations thereof) as laid down in Council Directive 67/548/EEC and its subsequent amendments may be added to raw materials.

- R45 may cause cancer
- R46 may cause heritable genetic damage
- R49 may cause cancer by inhalation
- R50 very toxic to aquatic organisms
- R51 toxic to aquatic organisms
- R52 harmful to aquatic organisms
- R53 may cause long term adverse effects in the aquatic environment
- R54 toxic to flora
- R55 toxic to fauna
- R56 toxic to soil organisms
- R57 toxic to bees
- R58 may cause long-term adverse effects in the environment
- R59 dangerous for the ozone layer
- R60 may impair fertility
- R61 may cause harm to unborn child
- R62 possible risk of impaired fertility
- R63 possible risk of harm to the unborn child

Alternatively, classification may be considered according to Regulation (EC) No 1272/2008 of the European Parliament and of the Council. In this case no substances or preparations may be added to the raw materials that are assigned, or may be assigned at the time of application, with and of the following hazard statements (or combinations thereof): H350, H340, H350i, H400, H410, H411, H412, H413, EUH059, H360F, H360D, H361f, H361d, H360FD, H361fd,H360Fd, H360Df, and H341.

The above requirement does not apply to the quota of closed-loop recycled materials used by the process and defined as a material that is extracted from the production system and is returned to the same production system, eventually after a recycling treatment.

Where lead and cadmium (or any of their compounds) are used in the additives, their content shall not exceed the following limits:

Parameter	Limit (% in weight of the glazes)
Lead	0.5
Cadmium	0.1

Verification;

Possible means of proof include EMAS and ISO 14001 certificates or equivalent certificates issued by bodies conforming to Community law or the relevant European or international standards concerning certification based on environmental management standards. Other appropriate means of proof will also be accepted.

Energy Consumption

Processed Products Only:

The energy consumption shall be calculated as process energy requirements (PER) for agglomerated stones and terrazzo tiles or as energy requirement for firing (ERF) for ceramic tiles and clay tiles. Not applicable to concrete paving units.

PER Limit:

	Hurdle (MJ/kg)	Test Method
Ceramic and Clay Tiles	3.5	EU Ecolabel Technical Appendix A4

Verification;

Products holding a relevant Type 1 ecolabel fulfilling the listed criteria will be deemed to comply Other appropriate means of proof will also be accepted.

Water Use

Processed Products Only:

The wastewater produced by the process included in the production chain shall reach a recycling ratio of at least 90%. The recycling ratio shall be calculated as the ratio between the wastewater recycled or recovered by applying a combination of process optimisation measures and process waste treatment systems, internally or externally at the plant, and the total water that leaves the process, as defined in the EU Ecolabel Technical Appendix A3.

	Hurdle (MJ/kg)	Test Method
Agglomerated Stones	1.6	EU Ecolabel Technical Appendix A4
Terrazzo Tiles	1.3	EU Ecolabel Technical Appendix A4

Verification;

Products holding a relevant Type 1 Ecolabel fulfilling the listed criteria will be deemed to comply. Other appropriate means of proof will also be accepted.

Waste

All Products:

All plants involved in the production of the product shall have a system for handling the waste and residual products deriving from the production of the product. It shall include the following:
Procedures for separating and using recyclable materials from the waste stream
Procedures for recycling materials for other uses
Procedures for handling and disposing of hazardous waste
Processed Products Only:
At least 85% (by weight) of the total waste generated by the process or the processes shall be recovered according to the terms and definition established by Council Directive 2008/98/EC, amending Directives 91/156/EC and 75/442/EEC on waste.
Possible means of proof include EMAS and ISO 14001 certificates or equivalent certificates issued by bodies conforming to Community law or the relevant European or international standards concerning certification based on environmental management standards. Other means of evidence provided by the company that can prove the required technical capacity will also be accepted

TYPES OF TILING

GRES CERAMIC TILING TO BATHROOM FLOOR – Sanitary Facilities

Tiles: dry-pressed vitrified gres tiles (B), group IIa, matt, to BS EN 14411
Manufacturer and product reference: submit a sample and technical literature for approval.
Moisture absorption: Less than 3%
Surface hardness: min. 5 -6 Mohs scale
Modulus of rapture: min 60N/mm2
Staining: (class 1 -stain removed by water, class 2 –stain removed by cleaning agent, class 3 – stain not removed)
Methylene blue – not exceeding class 2
Potassium permanganate – not exceeding class 2
Potassium permanganate – not exceeding class 2
Hydrogen Peroxide – not exceeding class 2
Colour: as submitted sample.
Finish: matt.
Size: 450mm x 450mm
Thickness: 8mm or as approved.
Slip resistance value (SRV): 60 dry, 40 wet
Surface Roughness(Rz) minimum to BS 1134: 20µm minimum
Technical requirements: to Annex J, BS EN 14411:2006

Background/ Base: as per existing.
Preparation: clean base thoroughly before spreading intermediate substrate.
Intermediate substrate: Concrete screed Grade C20, 75mm or as instructed by Project Manager
Bedding: cement/sand bedding as per relevant specification.
Joint width: 3mm.
Grout: cement-based grout. Submit technical literature for approval.
Colour: dark grey, sample to be approved.
Movement joints: as per relevant section.
Accessories: as per shop drawings
Grouting: as for wall tiles.
Adhesive: as per relevant specification.

GRES CERAMIC TILING TO BATHROOM WALLS – Sanitary Facilities

Tiles: dry-pressed vitrified gres tiles (B), group IIa, matt, to BS EN 14411
Manufacturer and product reference: submit a sample and technical literature for approval.
Moisture absorption: Less than 3%
Surface hardness: min. 5 -6 Mohs scale
Modulus of rapture: min 60N/mm2
Staining: (class 1 -stain removed by water, class 2 –stain removed by cleaning agent, class 3 – stain not removed)
Methylene blue – not exceeding class 2
Potassium permanganate – not exceeding class 2
Potassium permanganate – not exceeding class 2
Hydrogen Peroxide – not exceeding class 2
Colour: as submitted sample.
Finish: matt.
Size: 450mm x 450mm
Thickness: 8mm or as approved.
Slip resistance value (SRV): 60 dry, 40 wet
Surface Roughness(Rz) minimum to BS 1134: 1µm
Technical requirements: to Annex J, BS EN 14411:2006
Background/ Base: as required
Bedding: not applicable.
Joint width: 3mm.
Grout: cement-based grout. Submit technical literature for approval.
Colour: light grey, sample to be approved.

Movement joints: as per relevant section.
Accessories: as per shop drawings
Grouting: as for floor tiles.
Adhesive: as per relevant specification.

RESISTANCE TO ACID/ALKALINE

Citrus Acid (100g/l) – no stain/damage
Potassium Hydroxide – no stain/damage

SURFACE FINISH

as approved by architect in charge

PHYSICAL PROPERTIES

Straightness of edge – true
Squareness – true
Surface flatness – truly flat
Uniformity in size – equal throughout
Background/ Base: smooth-finished screed.

PREPARATION

Smoothing underlayment as per specification.
Intermediate substrate: not required.
Bedding: thick bed adhesive-solid, as per specification.
Adhesive: as recommended by the tile manufacturer.
Joint width: 3mm.
Grout: use proprietary grout with mould-inhibiting additive; colour to match tiles; submit technical literature for approval.
Dividing strips: as per specification.
Accessories: plain skirtings if not indicated otherwise on the drawings.

GRANITE/ MARBLE THRESHOLDS OR OTHER USES

Stone type: sample for the Engineer's approval.
Quality: Free from vents, cracks, fissures, discoloration, or other defects deleterious to strength/colour.
Colour: as per shop drawing
Size: door size or as indicated on drawings.
Thickness: 20 mm.
Background/Base: Concrete slab or as indicated on drawings

Preparation: smoothing underlayment or as instructed by Engineer
Bedding: semi-dry, or as instructed by Engineer.
Adhesive: as recommended by the tile/granite supplier.
Joint width: 3mm.
Grout: as per specification.

GENERALLY

SUITABILITY OF BACKGROUNDS/ BASES

Background/ base tolerances: To permit specified flatness/ regularity of finished surfaces given the permissible minimum and maximum thickness of bedding.
New background drying times (minimum):
Concrete walls: 6 weeks.
Brick/ block walls: 6 weeks.
Rendering: 2 weeks.
Gypsum plaster: 4 weeks.
New base drying times (minimum):
Concrete slabs: 6 weeks.
Cement: sand screeds: 3 weeks.

FALLS IN BASES

General: Give notice if falls are inadequate.

PREPARATION

EXISTING BACKGROUNDS/ BASES GENERALLY

Efflorescence, laitance, dirt and other loose material: Remove.
Deposits of oil, grease and other materials incompatible with the bedding: Remove.
Tile, paint and other nonporous surfaces: Clean.
Wet backgrounds: Dry before tiling.

EXISTING PLASTER

Plaster which is loose, soft, friable, badly cracked affected by efflorescence: Remove.
Cut back to straight horizontal and vertical edges.
Making good: Use plaster or non-shrinking filler.

EXISTING PAINT

Paint with unsatisfactory adhesion: Remove so as not to impair bedding adhesion.

NEW IN SITU CONCRETE

Mould oil, surface retarders and other materials incompatible with bedding: Remove.

NEW PLASTER

Plaster: Dry, solidly bedded, free from dust and friable matter. Plaster primer: Apply if recommended by adhesive manufacturer.

PREPARING CONCRETE BASES FOR UNBONDED BEDDING - WITHOUT SEPARATING LAYER

Surface finish: Smooth.

Surface preparation: Before laying mortar bed, dampen lightly.

SMOOTHING UNDERLAYMENT

Type: Recommended by adhesive manufacturer. Condition: Allow to dry before tiling.

FIXING

FIXING GENERALLY

Colour/ shade: Unintended variations within tiles for use in each area/ room are not permitted.

Variegated tiles: Mix thoroughly.

Adhesive: Compatible with background/ base. Prime if recommended by adhesive manufacturer.

Cut tiles: Neat and accurate.

Fixing: Provide adhesion over entire background/ base and tile backs.

Final appearance: Before bedding material sets, make adjustments necessary to give true, regular appearance to tiles and joints when viewed under final lighting conditions.

Surplus bedding material: Clean from joints and face of tiles without disturbing tiles.

SETTING OUT

Joints: True to line, continuous and without steps.

Joints on walls: Horizontal, vertical and aligned round corners.

Joints in floors: Parallel to the main axis of the space or specified features. -

Cut tiles: Minimize number, maximize size and locate unobtrusively.

Joints in adjoining floors and walls: Align.

Joints in adjoining floors and skirtings: Align.

Movement joints: If locations are not indicated, submit proposals.

FLATNESS/ REGULARITY OF TILING

Sudden irregularities: Not permitted.

Deviation of surface: Measure from underside of a 2 m straightedge placed anywhere on surface. The straightedge should not be obstructed by the tiles and no gap should be greater than 3 mm.

LEVEL OF TILING ACROSS JOINTS

Deviation (maximum) between tile surfaces either side of any type of joint:

1 mm for joints less than 6 mm wide.

2 mm for joints 6 mm or greater in width.

MORTAR BEDDING

Bedding mix:

Cement: Portland to BS EN 197-1 type CEM I/42.5.

Sand for walls: To BS 1199, type A, or technically equivalent.

Sand for floors: To BS 882, or technically equivalent.

Grading limit: To BS 8204-1, table 1, or technically equivalent.

Batching: Select from:

Batch by weight.

Batch by volume: Permitted on the basis of previously established weight: volume relationships of the particular materials. Use accurate gauge boxes. Allow for bulking of damp sand.

Mixing: Mix materials thoroughly to uniform consistence. Use a suitable forced action mechanical mixer. Do not use a free fall type mixer.

Application: At normal temperatures use within two hours. Do not use after initial set. Do not retemper.

CRACK CONTROL REINFORCEMENT

Type to BS 4483: D49, or technically equivalent.

Installation: Place centrally in depth of bed. Lap not less than 100 mm and securely tie together with steel wire.

Corners: Avoid a four layer build at corners.

SIT-ON TILE SKIRTINGS

Sequence: Bed solid to wall after laying floor tiles.

Bedding: cement based adhesive.

THIN BED ADHESIVE - SOLID (WALLS)

Application: Apply floated coat of adhesive to dry background in areas of about 1 m². Comb surface.
Tiling: Apply thin even coat of adhesive to backs of dry tiles. Press tiles firmly onto float coat.
Finished adhesive thickness (maximum): 3 mm.

THICK BED ADHESIVE - SOLID (WALLS)

Application: Apply floated coat of adhesive to dry background. Comb surface.
Tiling: Apply thin even coat of adhesive to backs of dry tiles. Press tiles firmly onto float coat.
Finished adhesive thickness: Within range recommended by manufacturer.

CEMENT: SAND (WALLS)

Preparation: Dampen background.
Application: Apply floated coat: 1:3-4 cement: sand mortar bedding.
Thickness (maximum): 10 mm.
Finish: Equivalent to wood float. Before tiling allow to stiffen slightly.
Tiling: Without delay, apply 2 mm thick coat of 1:2 cement: fine sand mortar to backs of tiles, filling keys. Press tiles firmly onto float coat. Tap firmly into position.

THICK BED ADHESIVE - SOLID (FLOORS)

Application: Apply floated coat of adhesive to dry base and comb surface.
Tiling: Apply coat of adhesive to backs of tiles, filling depressions or keys. Press tiles firmly onto position.
Finished adhesive thickness: Within range recommended by manufacturer.

SEMIDRY CEMENT: SAND BED (FLOORS)

Mortar bedding mix: 1:3.5-4 cement: sand.
Water content: A film of water must not form on surface of bed when fully compacted.
Preparation: Dampen base.
Laying: Lay suitably small working areas of screeded bed. Compact thoroughly to level.
Finished bed thickness (minimum): 40mm
Tiling: Within two hours and before bedding sets, evenly coat backs of tiles with a neat cement slurry. Beat tiles firmly into position.

MOVEMENT JOINTS/ GROUTING/ COMPLETION

DIVIDING STRIPS

Material: stainless steel.
Thickness: 4-6mm.
Colour: natural.
Installation: Set to exact finished level of floor.

CEMENT: SAND GROUTING MIX

Grout mix:
Cement: White Portland cement to BS EN 197-1 type CEM Í√42.5.
Sand: Joint widths of 6 mm or greater: To BS 1199, table 1, Type B, or technically equivalent. Joint widths of 3 - 6 mm: To BS 5385-5 table 2, or technically equivalent.
Mixing: Mix thoroughly. Use the minimum of clean water needed for workability.

GROUTING

Sequence: Grout when bed/ adhesive has set sufficiently to prevent disturbance of tiles.
Joints: 6 mm deep (or depth of tile if less). Free from dust and debris.
Grouting: Fill joints completely, tool to profile, clean off surface. Leave free from blemishes.
Profile: horizontal.
Polishing: When grout is hard, polish tiling with a dry cloth.

COLOURED GROUT

Staining of tiles: Not permitted.
Evaluating risk of staining: Apply grout to a few tiles in a small trial area. If discoloration occurs apply a protective sealer to tiles and repeat trial.
General: Give notice if falls are inadequate.

M60. PAINTING

GREEN PUBLIC PROCUREMENT (GPP) CRITERIA Exclusion of certain materials

Bidders must declare that the following materials/substances will not be used in the building:

- Products which contain sulphur hexafluoride (SF6).
- Indoor paints and varnishes with a content of solvents (volatile organic compounds (VOCs) with a boiling point of 250°C maximum) higher than:

g) For wall paints (according to EN 13300): 30 g/l (minus water).

h) For other paints with a spreading rate of at least 15 m2/l at a hiding power of 98% opacity: 250 g/l (minus water)

i) for all other products (including paints that are not wall paints and that have a spreading rate of less than 15m2/l, varnishes, wood stains, floor coatings and floor. paints, and related products): 180g/l (minus water).

Verification;

Bidders must sign the GPP Declaration Form confirming that these products/substances will not be used on site or in the building.

GENERAL

Generally, painting work shall comply with the recommendations of BS 6510 – Code of Practice for Painting of Buildings.

General workmanship and preparation of surfaces shall comply with BS 8000: Part 12.

The appropriate environmental category is to be considered as severe for exterior conditions as defined in BS 6150.

Application standard: To BS 6150, Section 5, or technically equivalent.

Conditions: Maintain suitable temperature, humidity and air quality during application and drying.

Colours and textures shall be approved by the Project Manager and provision must be made for the execution of trial areas on site as required.

No primer coats shall be applied until the surfaces have been approved by the Project Manager. Undercoats and finishing coats shall not be applied until the previous coats have been inspected and approved.

SURFACES

Clean and dry at time of application.

Thinning and intermixing of coatings: Not permitted unless recommended by manufacturer.

Over painting: Do not paint over intumescent strips or silicone mastics.

PRIMING COATS

Thickness: To suit surface porosity.

Application: As soon as possible on same day as preparation is completed.

FINISH

Even, smooth and of uniform colour.

Free from brush marks, sags, runs and other defects.

Cut in neatly.

COMPATIBILITY

Coating materials selected by contractor:

Recommended by their manufacturers for the particular surface and conditions of exposure.

Compatible with each other.

Compatible with and not inhibiting performance of preservative/ fire retardant pre-treatments.

PREPARATION

Standard: To BS 6150, Section 4, or technically equivalent.

Preparation materials: Types recommended by their manufacturers and the coating manufacturer for the situation and surfaces being prepared.

Substrates: Sufficiently dry in depth to suit coating.

Efflorescence salts: Remove.

Dirt, grease and oil: Remove.

Give notice if contamination of surfaces/ substrates has occurred.

Joints, cracks, holes and other depressions:
Fill with stoppers/ fillers. Work well in and finish off flush with surface.
Abrade to a smooth finish.
Water based stoppers and fillers:
Apply before priming unless recommended otherwise by manufacturer.
If applied after priming: Patch prime.

Oil based stoppers and fillers:

Apply after priming.
Surface irregularities: Abrade to a smooth finish.
Dust, particles and residues from abrasion: Remove.

Doors, opening windows and other moving parts:

Ease before coating.
Prime resulting bare areas.

HANDLING AND STORAGE

Coating materials: Deliver in sealed containers, labelled clearly with brand name, type of material and manufacturer's batch number.
Materials from more than one batch: Store separately. Allocate to distinct parts or areas of the work.

PROTECTION

'Wet paint' signs and barriers: Provide where necessary to protect other operatives and the general public, and to prevent damage to freshly applied coatings.

PAINT

Testing of paint may be requested by the Project Manager and the testing shall be done in accordance with BS 3900 or equivalent. Unless otherwise specified in this document the type of paint to be applied is to fall with the following limits:-

EMULSION FOR EXTERNAL USE

Fire protection	EuroClass a2-s1,d0
Fungal Resistance	Total absence from growth
Permeability to Aqueous Vapour	Medium (sd <1.5m)
Permeability to water	W2 in. (≤0.5,≥0.1kg/(m2.h0.5)
Resistance to Carbon dioxide penetration	Class C1 (sd.50m)
Gloss	matte
Wx sd (Kunzel Factor)	≤0.1kg/(m.h0.5)

Oil or Alkyd Based for External Use:

Film dry thickness	Min. 0.034mm
Fire protection	EuroClass a2-s1,d0
Fungal Resistance	Total absence from growth
Wet Abrasion	Class 1 or 2 (ISO 11998)
Power of Cover	Class 1 or 2 (ISO 6504 -3)

Gloss Levels

Gloss Level	Percentage incidence @ 60^0	Percentage incidence @ 85^0
Dead Matte		>5
Matte		>10
Mild Sheen	<60	≥10
Gloss	≥60	

The following are guidelines for the specified gloss levels as per EN ISO 2813:

EPOXY POWDER PAINT to galvanized steel internal and external.

- Fast cure epoxy spraying powder;

▪ Supply from	Fine powder below 104 microns
▪ Specific gravity	1.2-1.7 depending on colour
▪ Shelf life	6 months from date of despatch
▪ Storage	Cool and dry below 25°C

COMPOSITION

Fast cure epoxy powder consisting of epoxy resin and an amide type hardener blended with heat
resistant and light fast pigments.
To have very good chemical and UV resistance

COLOUR

As specified.

FILM PROPERTIES

Epoxy powders are to have excellent chemical resistance and mechanical properties.

MECHANICAL PROPERTIES

▪ Cross reference	BS3900E6-No loss of adhesion
▪ Mandrel bend test	BS3900E1-2 mm pass
▪ Impact resistance	ASTM D2794 100 in/lbs pass
▪ Scratch test	BS3900E2 4,500 grams
▪ Abrasion resistance	Excellent
▪ Erichson pencil hardness	4H
▪ Erichson indentation	6.0-8.0 mm

CORROSION RESISTANCE

CONTINUOUS HEAT RESISTANCE

Gradual yellowing at 120°C.

EPOXY ZINC PRIMER FOR STEEL WORKS

PRODUCT DESCRIPTION

A single pack epoxy shop primer or as approved by Project Manager with a high zinc content for the protection of steel elements against corrosion.

TECHNICAL PROPERTIES

-	Colour	Grey or as approved
-	Finish	Matt
-	Specific Gravity	2.25
-	Volume Solids	38%
-	Recommended Film Thickness	60-90µm WFT / 23-34µm DFT
-	Theoretical Spreading Rate	11-16 m2/litre
-	Application Method	Brush, Roller, Spray
-	Flash Point	<12°C
-	VOC	<200g/ltr
-	Drying Times	10ºC 20ºC 30ºC

* The surface should be dry and free from contaminants prior to overcoating. The best intercoat adhesion is achieved when the subsequent coat is applied before the preceding coat is fully cured. After prolonged exposure times it may be necessary to roughen the surface to ensure intercoat adhesion.

EPOXY FINISHING PAINT

GENERAL

Fast cure brush applied epoxy;

Specific gravity	1.2-1.7 depending on colour
Shelf life	6 months from date of despatch
Storage	Cool and dry below 25°C

COMPOSITION

Fast cure epoxy powder consisting of epoxy resin and an amide type hardener blended with heat resistant and light fast pigments. To have very good chemical and UV resistance

COLOUR

FILM PROPERTIES

Epoxy coats are to have excellent chemical resistance and mechanical properties.

MECHANICAL PROPERTIES

Cross reference	BS3900E6
No loss of adhesion	
Mandrel bend test	BS3900E1-2 mm pass
Impact resistance	ASTM D2794 100 in/lbs pass
Scratch test	BS3900E2 4,500 grams
Abrasion resistance	Excellent
Erichson pencil hardness 4H	
Erichson indentation	6.0-8.0 mm

CORROSION RESISTANCE

Salt spray	ASTM B117 500 hours Less than 1 mm creep
QUV exposure 50 hours	Slight chalking
Humidity	BS3900F2 1000 hours No blistering
Exterior exposure 6 months	Slight chalking, protective properties unimpaired

APPLICATION

Brush applied

WATER-BASED PRESEVATIVE (BASECOAT) FOR TIMBER

COLOUR

Light

COMPOSITION

Pigment: Fine Quality Transparent Iron Oxides.
Binder: Adhesion Promoted Acrylic Copolymer Emulsion with 2 separate Fungicides/Preservatives
Solvent: Water.

VOLUME SOLIDS

18% (nominal) or as approved by Project Manager. VOC Content: <200g/ltr

THINNING

As per manufacturer's specifications

APPLICATION

Single coat at standard thickness: As per manufacturer's specifications
Drying Times: As per manufacturer's specifications
Recoat: As per manufacturer's specifications
Remove and treat any mould, algae, lichen or moss with Fungicidal Wash.
Remove defective glazing material.
Clean the rebates and any loose or open joints.
Replace any rotten wood and troublesome knots with new preservative treated timber.
Thoroughly rub down all surfaces in the direction of the grain to remove any grey, weathered wood and then dust off.
Do not use direct from the can or return any unused basecoat to the container.
Excess basecoat should be wiped off surrounding paintwork before it dries.
Fill any surface defects, open joints etc. and replace any missing glazing material.
Do not use linseed oil putty for glazing (or making good) with natural wood finishes, use external beads set in an appropriate non-setting mastic or a special glazing compound.

WATER-BASED UNDERCOAT

STANDARD

BS 7956:2000

COLOUR

Light

COMPOSITION

Pigment: Non Lead Pigments.
Binder: Acrylic Copolymer.
Solvent: Water.

VOLUME SOLIDS

36% (nominal) or as approved by Project Manager.

VOC CONTENT

<130g/ltr (EU LIMIT 2010)

APPLICATION

Single coat at standard thickness: As per manufacturer's specifications
Drying Times: As per manufacturer's specifications

Recoat: 2 hours: As per manufacturer's specifications
Conventional spray application: As per manufacturer's specifications

THINNING

Airless spray application: As per manufacturer's specifications.

SPRAY RECCOMENDATIONS

Conventional Spray: Satisfactory through most equipment.
Airless Spray: A typical set up for airless spray application would be a minimum working pressure on paint of 133 bars with a spray tip size 0.43mm and a spray tip angle 60.

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WATER-BASED FINISHING COAT COLOUR

Stone Colour or as specified

COMPOSITION (NOMINAL)

Pigment: Lightfast Non Lead Pigments.
Binder: Adhesion-promoted Acrylic Copolymer Emulsion and a Fungicide.
Solvent: Water.

VOLUME SOLIDS

as approved by Project Manager

VOC CONTENT

<130g/l (EU limit 2010)

APPLICATION

Single coat at standard thickness: As per manufacturer's specifications
Drying Times: As per manufacturer's specifications
Recoat: 2 hours or as per manufacturer's specifications

SURFACE PREPARATION

STEEL

Ensure surfaces are clean, dry and free from dirt, grease and other contamination.
Remove weld spatter and smooth weld seams and sharp edges as applicable. Blast clean to a minimum SA2½ and prime within 2 hours.

REPAIR

Corroded areas should be power tooled cleaned to ST3 or blast cleaned to SA2 or better. Existing systems should be dry and free from loose paint, salt, grease and other contaminants prior to overcoating.

APPLICATION MIXING

Stir thoroughly before use.

THINNERS

Thinner No.5 or as manufacturer's specifications.

BRUSH

Use as per manufacturers specifications

ROLLER

Use as per manufacturers specifications

CONVENTIONAL SPRAY

Thin up to 10% Thinner No.5 Use 40-50 psi pressure and 1.8 mm diameter nozzle.

AIRLESS SPRAY

Use tip 0.38-0.53 mm, 40-80° angle and 2000-2500 psi pressure or as per manufacturer's
specifications.

AIR ASSISTED AIRLESS SPRAY

Thin up to 5% Thinner No.5 Use 1000-1500 psi pressure, 50-65° angle and 1.5-1.8 mm diameter
nozzle.

CLEANER

- As per manufacturer's specifications

HEALTH, SAFETY & ENVIRONMENTAL

This product must be used in accordance with the Material Safety Data Sheet supplied by the manufacturer.

The user must observe health, safety and environmental regulations when using this product.

Ensure water contamination is avoided.

PREPRIMED STEEL

Defective primer, corrosion and loose scale: Abrade back to bare metal.

Bare areas: Re-prime as soon as possible.

GALVANIZED STEEL

White rust: Remove.
Pre-treatment: Apply one of the following:
'T wash'/ mordant solution to blacken whole surface.
Etching primer recommended by coating system manufacturer.

CONCEALED METAL SURFACES

General: Apply additional coatings to surfaces that will be concealed when fixed in place.
Additional coatings: one finishing coat on a zinc phosphate primer.
Components: concealed brackets.

WATER REPELLENT

Application:

Liberally flood surface, giving complete and even coverage. Timber
Surfaces must be sound, clean and dry before treating.
Remove all loose and defective coatings, if necessary stripping back to bare wood.
Prime all bare wood with one coat of Primer including any new or bare replacement beading.
Excess primer should be wiped off surrounding paintwork.
Apply one coat of the appropriate coloured undercoat to all primed wood.
Apply a second coat of undercoat overall for non-primed wood,
Apply one coat of Exterior Quick Drying Paint.
Where a strong colour change is involved, 2 coats may be required.
Allow a minimum of 2 hours before overcoating Undercoat or as specified by the manufacturer
After use, remove as much paint as possible from brushes before cleaning with clean water.

N30. SANITARY APPLIANCES AND FITTINGS

GREEN PUBLIC PROCUREMENT (GPP) CRITERIA Water saving installations

All sanitary and kitchen water facilities must be equipped with the water-saving technologies available on the market such as, but not limited to:
Dual flush WCs should use a maximum of 6 litres for full flush and 3 litres for urine flush.
Water saving devices fitted into cisterns must demonstrate water saving of at least 30% for toilet flushing.
Tap inserts should save at least 50% of water compared to normal tap use.

Verification;

Bidders must provide technical data-sheets for the products to be installed that verify compliance with the specifications

PRODUCTS

WC AND CONCEALED CISTERN FOR BATHROOMS WC

Standard: to BS EN 997:2003, Class 2

TYPE

Back to wall, with concealed, dual flush, low-level cistern.

PAN

Standards: To BS EN 997 and BS EN 33.
Manufacturer: to be approved by the Engineer
Material: White vitreous china to BS 3402:1969.

SEAT AND COVER

Standard: To BS 1254.
Manufacturer: to be approved by the Engineer
Material: Plastic.

PAN CONNECTOR

Standard: To BS 5627.
Manufacturer: to be approved by the Engineer
Colour: to match pan.

CISTERN

Standard: to BS EN 997:2003.

Manufacturer: to be approved by the Engineer, but chosen product to ensure compatibility with chosen pan model.
Material: plastic
Colour and finish: any
Location: within service corridor at the back of the bathrooms.

FLUSHING ARRANGEMENT

Plastics body, diaphragm to BS 1212-3.
Manufacturer: be approved by the Engineer, but chosen product to ensure compatibility with chosen pan and cistern models.
Operating control: push button, chrome plated and complete with matching face plate, front mounted through tiles.
Water supply connection: side, to enable easy access from top of concealed space
Flush volume: Dual flush 6Litres or 4 Litres. Flush pipe: not required.

WC AND CISTERN FOR BATHROOM FOR PERSONS WITH SPECIAL NEEDS

WC standard: to BS EN 997:2003, Class 2
Type: Back to wall, with dual flush, low-level cistern.

PAN

Standards: To BS EN 997 and BS EN 33. Manufacturer: to be approved by the Engineer
Material: White vitreous china to BS 3402:1969.

SEAT AND COVER

Standard: To BS 1254.
Manufacturer: to be approved by the Engineer
Material: Plastic.

PAN CONNECTOR

Standard: To BS 5627.
Manufacturer: to be approved by the Engineer
Colour: to match pan.
Type: to connect to floor drain

CISTERN

Standard: to BS EN 997:2003.
Manufacturer: to be approved by the Engineer, but chosen product to ensure compatibility with chosen pan model.

Material: White vitreous china to BS 3402:1969
Colour and finish: White, to match pan
Location: wall hung

FLUSHING ARRANGEMENT

Plastics body, diaphragm to BS 1212-3.
Manufacturer: be approved by the Engineer, but chosen product to ensure compatibility with chosen pan and cistern models.
Operating control: push button, chrome plated and complete with matching face plate, front mounted through tiles.
Water supply connection: side, to enable easy access from top of concealed space
Flush volume: Dual flush 6 Litres or 4 Litres.
Flush pipe: not required.

WALL HUNG WASH BASINS FOR BATHROOMS

Manufacturer and product reference: submit technical literature to The Engineer.
Size: 500mm x 400mm.
Material: white vitreous china to BS 3402:1969.
Tap/ Chainstay/ Overflow holes: one tap hole, centre, no chainstay hole, overflow hole.
Water supply fittings: chrome plated, pillar, single lever joystick, basin mixer, ½" with mixing device.
Standards: To BS 5388, Nickel chromium electroplating to BS EN 248
Manufacturer & product: to be approved by the Engineer, design to be compatible with all other water supply fittings in the same bathroom.

WASTE FLUSH

Chrome plated, with pop-up plug operated via pillar mixer
Standards: To BS EN 274-1, -2 and -3.
Manufacturer: to be approved by the Engineer

TRAPS: BOTTLE-TYPE

Standards: To BS EN 274-1, -2 and -3.
Size: DN 30.
Material: plastic
Depth of seal (minimum): 75 mm.
Manufacturer: to be approved by the Engineer

ACCESSORIES

Pedestal: white vitreous china to BS 3402:1969, of same manufacturer and design suite as
washbasin.

HANDRAILS AND GRAB RAILS AS PER NCPD

Manufacturer and product reference: submit technical literature to The Engineer.
Type: Brushed stainless steel

Requirements:

pair of vertical handrails adjacent to wash hand basin, 600mm in length
Horizontal and vertical grab rails adjacent to WC, 600mm in length
Drop down rail, 750mm length next to WC

MIRRORS

Manufacturer and product reference: submit technical literature to The Engineer.
Size: 900mm wide by 1000mm high, 6mm mirror glass, chamfered edges (2mm by 2mm)
Fixing: stainless steel screws with nylon grommets/washers and brushed stainless steel screw-on cover cap

PAPER TOWEL DISPENSERS

Manufacturer and product reference: submit technical literature to The Engineer.
Material: Brushed stainless steel.

SANITARY TOWELS DISPOSAL BINS

Manufacturer and product reference: submit technical literature to The Engineer.
Material: Brushed stainless steel.

SOAP DISPENSERS

Manufacturer and product reference: submit technical literature to The Engineer.
Material: Polished stainless steel.

TOILET PAPER HOLDERS

Manufacturer and product reference: submit technical literature to The Engineer.
Material: Vitreous china with plastic axle Fixing: integral with wall tiles.

SEALANT POINTING

Sealant: anti-mould.
Colour: transparent.
Application: As section Z22.

EXECUTION

INSTALLATION GENERALLY

Assembly and fixing: Surfaces designed to falls to drain as intended.

Fasteners: Nonferrous or stainless steel.

Supply and discharge pipework: Fix before appliances.

Fixing: Fix appliances securely to structure. Do not support on pipework.

Jointing and bedding compounds: Recommended by manufacturers of appliances, accessories

and pipes being jointed or bedded.

Appliances: Do not use. Do not stand on appliances.

On completion: Components and accessories working correctly with no leaks.

Labels and stickers: Remove.

NOGGINGS AND BEARERS

Noggings, bearers, etc. to support sanitary appliances and fittings: Position accurately. Fix securely.

TILED BACKGROUNDS OTHER THAN SPLASHBACKS

Timing: Complete before fixing appliances. Fixing appliances: Do not overstress tiles.

INSTALLING CISTERNS

Cistern operating components: Obtain from cistern manufacturer.

Float operated valve: Matched to pressure of water supply.

Overflow pipe: Fixed to falls and located to give visible warning of discharge.

Location: Agreed, where not shown on drawings.

INSTALLING TAPS

Fixing: Secure against twisting.

Seal with appliance: Watertight.

Positioning: Hot tap to left of cold tap as viewed by user of appliance.

INSTALLING WASTES AND OVERFLOWS

Bedding: Waterproof jointing compound.

Fixing: With resilient washer between appliance and backnut.

P21. DOOR IRONMONGERY

GENERALLY

IRONMONGERY RANGE SELECTED BY CONTRACTOR

Source: Single coordinated range.

Notification: Submit details of selected range, manufacturer and/ or supplier.

Principal material/ finish: stainless steel satin finish.

Items unavailable within selected range: Submit proposals.

SAMPLES

General: Before placing orders with suppliers submit labelled samples of the following: refer to the list of samples to be submitted.

Conformity: Retain samples on site for the duration of the contract. Ensure conformity of ironmongery as delivered with labelled samples.

DOOR HANGING DEVICES

PERFORMANCE SPECIFICATION FOR SINGLE AXIS DOOR HINGES

Standard: To BS EN 1935.

Hinges to doors on escape routes and fire/ smoke control doors: CE marked.

Minimum classification grades:

Category of use: grade 3.

Durability: grade 7.

Test door mass: grade 5.

Suitability for use on fire/ smoke doors: grade 1.
Safety: 1.
Corrosion resistance: grade 4.
Security - Burglar resistance: grade 1.
Hinge grade: grade 2.
Type: double ball bearing butt.
Size: 100 x 75mm.
Material/ finish: stainless steel satin.

DOOR OPERATING DEVICES PERFORMANCE SPECIFICATION FOR OVERHEAD DOOR CLOSERS

Standard: To BS EN 1154.
Door closing devices to fire/ smoke control doors: CE marked.
Minimum classification grades:
Category of use: 4
Durability: 8.
Door closer power size: adjustable 3-6.
Suitability for use on fire/ smoke doors: 1.
Safety: 1.
Corrosion resistance: 4.
Type: face fixed.
Other functions: back check.
Casing finish: powder coated, colour as door furniture.
Operational adjustment:
Variable power: Matched to the sizes and weights of doors.
Latched doors: Override latches and/ or door seals when fitted.
Unlatched doors: Hold shut under normal working conditions.
Closing against smoke seals of fire doors: Positive. No gaps.

DOOR SECURING DEVICES

THIEF RESISTANT DOOR LOCKS

Standard: To BS 3621, or technically equivalent and Kitemarked.
Manufacturer: Contractor's choice.
Product reference: Contractor's choice.
Type: cylinder mortice lock: oval pattern cylinder to BS EN 1303 classification 16-1-14.
Backset: 57mm.

Material/ finish: stainless steel satin.
Keying: in master key suite.

DOOR LATCHES

Standard: To BS EN 12209.
Manufacturer: Contractor's choice.
Product reference: Contractor's choice.
Type: mortise latch.
Backset: 57mm.
Material/ finish: stainless steel satin faceplate.
Latch spring strength: Select to prevent unsprung lever handles drooping.

PANIC EXIT DEVICES

Standard: To BS EN 1125.
Panic exit devices for locked doors on escape routes: CE marked.
Manufacturer: Contractor's choice.
Product reference: Contractor's choice.
Type: push bar
Material/ finish: colour to match door furniture.
Additional requirements: security alarmed.

DOOR BOLTS

Standard: To BS EN 12051.
Manufacturer: Contractor's choice.
Product reference: Contractor's choice.
Type: slide action.
Size: 200mm.
Material/ finish: stainless steel satin.

DOOR FURNITURE

PULL HANDLES

Standard: To BS 8424, or technically equivalent. Manufacturer: Contractor's choice. Product reference: Contractor's choice. Shape: 'D'-shape handle. Diameter: 18-22mm. Distance between centres: 165mm. Material/ finish: stainless steel satin. Mounting: bolt through.

ESCUTCHEONS

Manufacturer: Contractor's choice.
Product reference: Contractor's choice.

Material/ finish: stainless steel satin.
Keyhole type: to suit the specified lock.

DOOR STOPS

Manufacturer: Contractor's choice.
Product reference: Contractor's choice.
Type: floor or wall-mounted; stainless steel satin finish..
Usage: to doors opening against walls other than those fitted with a back check facility.

DOOR HOLDERS

Manufacturer: Contractor's choice.
Product reference: Contractor's choice.
Type: foot operated
Size: range 150 to 200mm.
Material/ finish: stainless

R11. FOUL DRAINAGE ABOVE GROUND

TYPE(S) OF PIPEWORK

PLASTICS PIPEWORK FOR FOUL DRAINAGE

Pipes, fittings and accessories: MUPVC to BS 5255, Kitemark certified.
Manufacturer and reference: To be approved by The Engineer
Size(s): 50mm, 110mm diameter.
Method of fixing: Plastics clips (colour to match pipes)

FLOOR DRAINS

Floor construction: Smooth finished concrete paving on reinforced concrete floor slab or ceramic tiling on stone spalls.
Manufacturer and reference: To be approved by The Engineer
Body type/material: Deep sump in MUPVC plastic
Grating/Cover type/material: flat

Outlet: Type and direction to suit pipework with adaptors and connections recommended for the purpose by drain manufacturer.
Accessories: Sediment buckets, removable traps

FLOOR CHANNEL(S)

Floor construction: Smooth finished concrete screed on pc floor slab
Manufacturer and reference: TO be approved by The Engineer
Channel type/material: HEAVY DUTY TYPE
Grating/Cover type/material: Flat
Method of jointing: Silicone sealant and steel nuts and bolts supplied by channel manufacturer

RODDING EYES

Manufacturer and reference: Same as used in foul drainage stacks
Body material: MUPVC
Cover type/material: MUPVC

INSTALLATION

PERFORMANCE CRITERIA

Above ground foul drainage pipework has been designed to BS EN 12056-2:2002.
Install pipework, fittings and accessories to ensure that:
Appliances drain quickly, quietly and completely at all times without nuisance or risk to health.
Discharge is conveyed without crossflow, backfall, leakage or blockage.
Air from the drainage system does not enter the building.
Pressure fluctuations in pipework do not vary by more than +/- 38 mm water gauge and traps retain a water seal of not less than 25 mm.
The system can be adequately tested, cleaned and maintained.

INSTALLATION GENERALLY

Install pipes, fittings and accessories in accordance with BS 8000: Part 13, Section 3 and BS 5572.
Obtain all components for each type of pipework from the same manufacturer unless specified otherwise.
Form junctions using fittings intended for the purpose.
Fix pipes at centres not greater than those specified in BS 8000: Part 13. Provide additional supports as necessary at junctions and changes in direction. Fix every length of soil vent pipe at or close below the socket collar.

Where not specified otherwise use plated, sheradised, galvanized or nonferrous fastenings, suitable for the purpose and background, and compatible with the material being fixed or fixed to.

PIPE ROUTES

To be the shortest practical, with as few bends as possible and no bends in wet portion of soil stacks, unless specified otherwise. Pipe routes not shown on drawings to be approved before commencing work.

CONNECT PLASTICS PIPEWORK

To pipework of other materials using approved connectors and methods in accordance with plastics pipework manufacturer's recommendations, to form a watertight joint.

ELECTRICAL CONTINUITY

Use clips supplied for the purpose by pipework manufacturer to ensure electrical continuity at all joints in metal pipes with flexible couplings and which are to be earth bonded.

MASKING PLATES

Type: Heavy, split on the diameter
Material/Finish: Copper alloy
Fixing: Chrome raised head screws

IDENTIFICATION OF INTERNAL FOUL DRAINAGE PIPEWORK

To BS 1710 using self-adhesive bands or identification clips located at junctions, at both sides of each slab, bulkhead and wall penetration, and elsewhere as directed.

TESTING GENERALLY

Inform the Engineer sufficiently in advance to give him a reasonable opportunity to observe tests.

Check that all sections of installation are securely fixed and free from obstruction and debris.

Ensure that all traps are filled with clean water.

Carry out tests as specified. After testing, locate and remedy all defects without delay and retest as instructed. Do not use smoke to trace leaks.

Keep a record of all tests and provide a copy of each to The Engineer.

PIPEWORK TEST

Temporarily seal open ends of pipework with plugs.

Connect a 'U' tube water gauge and air pump to the pipework via a plug or through the trap of an appliance.

Pump air into pipework until gauge registers 38 mm.

Allow a period for temperature stabilisation, after which the pressure of 38 mm is to be maintained without loss for not less than 3 minutes.

SIPHONAGE AND BACK PRESSURE TESTS

Test WC pans by flushing and test other appliances by filling to overflow level, then removing the plug.

Carry out tests at least 3 times with traps recharged before each test.

Test each appliance individually for self siphonage, then test for induced siphonage and back pressure by discharging a number of appliances simultaneously on each stack.

R12. BELOW GROUND DRAINAGE SYSTEMS

GLOSSARY OF TERMS

GEOTEXTILE FILTER

Geotextile filter is a permeable sheet of synthetic material used like a granular filter for filtration and in-plane drainage.

FILTER PIPE

Filter pipe is a perforated or non-perforated pipe used for draining groundwater.

GRANULAR FILTER

Granular filter is a graded sand or gravel placed against a soil to prevent the migration of fine particles out of the soil caused by water flow, and graded such that free discharge of water flowing into the filter is allowed.

TRENCH DRAIN

Trench drain is a trench wholly or partly filled with granular material or clean crushed rock, with or without filter pipes and geotextile filter.

PRODUCTS

PIPES, BENDS AND JUNCTIONS – SUPPLY -

Pipes and fittings: From same manufacturer for each pipeline.

PIPES, BENDS AND JUNCTIONS - PVC-U - PLAIN WALL for surface water drainage.

Standard: BS EN 1401-1, class SN4, with flexible joints, Kitemark certified.
Manufacturer and product reference: submit proposals.
Sizes: 300mm, 350mm, 400mm and 450mm diameter, depending on the location.
Application area code: UD.

FLEXIBLE COUPLINGS

Standard: To BS EN 295-4 or WIS 04-41-01 and Kitemark certified, or Agrément certified.
Manufacturer and product reference: submit proposals.

GRANULAR MATERIAL

Standard: To BS EN 12620.
Size: Dependent on location - see Execution clauses in this section.

EXECUTION
EXCAVATED MATERIAL

Topsoil, hardcore, etc: Set aside for use in reinstatement.

SELECTED FILL FOR BACKFILLING

Selected fill: As-dug material, free from vegetable matter, rubbish, and material retained on a 40 mm sieve. Compaction: By hand in 100 mm layers.

FORMATION FOR BEDDINGS

Timing: Excavate to formation immediately before laying beddings or pipes.
Mud, rock projections, boulders and hard spots: Remove. Replace with consolidated bedding material.
Local soft spots: Harden by tamping in bedding material.
Inspection of excavated formations: Give notice.

LAYING PIPELINES

Laying pipes: To true line and regular gradient on even bed for full length of barrel with sockets (if any) facing up the gradient.
Ingress of debris: Seal exposed ends during construction.
Timing: Minimize time between laying and testing.

JOINTING PIPELINES

Connections: Durable, effective and free from leakage.
Junctions, including to differing pipework systems: With adaptors intended for the purpose.
Cut ends of pipes: Clean and square. Remove burrs and swarf. Chamfer pipe ends before inserting into ring seal sockets.
Jointing or mating surfaces: Clean and, where necessary, lubricate immediately before assembly.
Allowance for movement: Provide and maintain appropriate clearance at ends of spigots as fixing and jointing proceeds.
Jointing material: Do not allow to project into bore of pipes and fittings.

INSTALLING FLEXIBLE COUPLINGS

Ends of pipes to be joined: Cut cleanly and square.
Outer surfaces of pipes to be joined: Clean and smooth. Where necessary, e.g. on concrete or iron pipes, smooth out mould lines and/ or apply a cement grout over the sealing area.
Clamping bands: Tighten carefully to make gastight and watertight seals.

BACKFILLING TO PIPELINES

Backfilling above top of surround or protective cushion: Material excavated from trench, compacted in layers 300 mm (maximum) thick.
Heavy compactors: Do not use before there is 600 mm (total) of material over pipes.

BACKFILLING UNDER ROADS AND PAVINGS

Backfilling from top of surround or protective cushion up to formation level: Granular sub-base material, laid and compacted in 150 mm layers.

COMPLETION

REMOVAL OF DEBRIS AND CLEANING

Preparation: Lift covers and grilles to manholes, inspection chambers and access points.

Remove mortar droppings, debris and loose wrappings.

Timing: Before cleaning, final testing, CCTV inspection if specified, and immediately before handover.

Cleaning: Thoroughly flush pipelines with water to remove silt and check for blockages.

Rod pipelines between access points if there is any indication that they may be obstructed.

Washings and detritus: Do not discharge into sewers or watercourses.

Covers: Securely replace after cleaning and testing.

TESTING AND INSPECTION

Dates for testing and inspection: Give notice.

Period of notice: 5 days.

WATER TESTING OF MANHOLES AND INSPECTION CHAMBERS

Timing: Before backfilling.

Standard Exfiltration: To BS EN 1610.

Method: Testing with water (method W).

Infiltration: No identifiable flow of water penetrating the chamber

Y.10 Documentation

Y.10.1 Methodology: Documentation (drawings)

The contractor shall, on completion of works on each section, and prior to the certification of works, submit to the architect and civil engineer in charge a drawing accurately indicating all interventions carried out. This documentation shall form part of the building file to be submitted to the architect and civil engineer in charge on completion of works.

A digital copy of the photogrammetric survey as per tender drawings will be provided by the architect and civil engineer in charge in AUTOCAD 2008 compatible versions as indicated in the bill of quantities.

The contractor shall be responsible to map every intervention carried out so as to provide a detailed record of works for posterity. Distinct interventions (stone replacement, consolidation, desalination, etc) shall be mapped on a separate layer allowing the user to view each intervention separately. The mapping shall be carried on a stone-by-stone basis and the exact demarcation of each intervention shall be denoted by a closed polygon and hatched as detailed by the architect and civil engineer in charge.

Prior to the certification of works the contractor shall submit to the architect civil engineer in charge two printed copies (in colour) in scale 1:100 or as requested by the architect and civil engineer in charge and a digital copy (AUTOCAD 2008 compatible). The drawings and mapping indicated shall be certified by a warranted architect and civil engineer as exactly representing the works (type and extent) carried out.

Y.10.2 Methodology: Documentation (photographic record)

The contractor shall, on completion of works on each section, and prior to certification of works, submit to the architect and civil engineer in charge a set of photographs indicating all interventions carried out. This documentation shall form part of the building file to be submitted to the architect and civil engineer in charge on completion of works.

The photographs shall clearly illustrate the interventions carried out as well as the state of the structures to be restored through this tender prior to the commencement of works. Any archaeological, historical or similar evidence such as masons marks, particular construction details, etc discovered on site during the progress of works shall also be documented.

The photographs shall be submitted to the architect and civil engineer in charge prior to the certification of works. The photographs shall be submitted in digital format saved on a CD (Compact Disk) or DVD as directed and approved by the architect and civil engineer in charge.

The photographs shall be taken with a high resolution colour digital camera, saved in .jpg format and not less than 3.2Mb in size

All photographs shall be taken with adequate lighting (flash light should as far as practicable be avoided) and should be of a good quality free from blurs and colour bleeding.

Y.10.3 Methodology: Scientific testing

The contractor shall carry out of tests and scientific analysis, where indicated by the architect and civil engineer in charge of the project, of:

a) the existing mortar/plaster/washes in order to establish their composition and historicity,

b) the existing masonry,

c) the composition of the existing deterioration products.

In the case of the mortars, these tests shall help determine whether they merit to be preserved, renewed or removed.

All samples shall be gathered by personnel trained to take such samples in order to ensure that these are not contaminated.

The results of the testing shall be presented in the form of a detailed report supplemented by photographs and scientific analysis of the samples taken. The analysis shall be based on at least 2 (two) laboratory tests (X-ray Diffraction, Scanning Electron Microscope, Thermo Gravimetric Analyzer, Differential Scanning Calorimeter, Infrared Spectroscopy and Laser Induced Breakdown Spectroscopy etc as necessary). The report shall contain an interpretation of the results in order to assist the architect and civil engineer in charge to take the necessary decision on their conservation or otherwise.

Z.11 Metal Works

GREEN PUBLIC PROCUREMENT (GPP) CRITERIA Exclusion of certain materials

Bidders must declare that the following materials/substances will not be used in the building:

- Products which contain sulphur hexafluoride (SF6).
- Indoor paints and varnishes with a content of solvents (volatile organic compounds (VOCs) with a boiling point of 250°C maximum) higher than:

a) For wall paints (according to EN 13300): 30 g/l (minus water).

b) For other paints with a spreading rate of at least 15 m2/l at a hiding power of 98% opacity: 250 g/l (minus water)

c) for all other products (including paints that are not wall paints and that have a spreading rate of less than 15m2/l, varnishes, wood stains, floor coatings and floor. paints, and related products): 180g/l (minus water).

Verification;

Bidders must sign the GPP Declaration Form confirming that these products/substances will not be used on site or in the building.

Z.11.1 Extent of works

Prior to the commencement of works, the building shall be inspected by the contractor together with the architect and civil engineer in charge to confirm the extent of work and the methodology to be employed.

Z.11.2 Materials: General

Unless otherwise indicated, the metal to be used shall be grade 43 steel.

All materials shall be the best of their respective kinds, free from defects, and to be obtained from approved manufacturers.

All work shall be carried out in a workmanlike manner and strictly as directed by the architect and civil engineer.

The materials, in all stages of transportation, handling and storage, shall be kept clean, free from injury and breaking, bending and distortion

All smiths' work is to be forged clean, all screwed work is to have full internal and external threads.

Frames, etc., are to be well framed together, rigidly fixed, and all connections properly fitted, shouldered,

drilled tapped and screwed together with set screws countersunk flush with the surface where indicated

Welded joints are to be neatly made, filed smooth and left clean and adequate means shall be employed for temporarily fastening the parts to be welded together until the joints are welded.

When requested by the architect and civil engineer, shop drawings are to be provided by the

Contractor for approval prior to manufacture.

Z.11.3 Protective treatment

Steel shall be protected against corrosion by hot dip galvanising complying with MSA EN ISO 1461 or as directed by the architect and civil engineer.

All rust, loose scale, oil and dirt shall be removed from all surfaces before treatment.

Small areas of hot dip galvanised coating damaged by welding, cutting or by excessive rough treatment during transit and erection shall be renovated either by the use of low melting point zinc alloy repair rods or powders made specifically for this purpose, or by the use of at least two coats of good quality zinc-rich paint to BS 4652. Sufficient material shall be applied to provide a zinc coating at least equal in thickness to the original layer.

On all galvanised metal works, painting is to consist of one coat red oxide or calcium plumbate on hot dip galvanising and one undercoat and one enamel finishing coat. A sufficient period is to be allowed for the galvanising coat to set/dry out prior to the application of the finishing coat.

Painting is to be in the colour directed by the architect and civil engineer in charge.

Z31 POWDER COATINGS

GREEN PUBLIC PROCUREMENT (GPP) CRITERIA Exclusion of certain materials

Bidders must declare that the following materials/substances will not be used in the building:

- Products which contain sulphur hexafluoride (SF6).
- Indoor paints and varnishes with a content of solvents (volatile organic compounds (VOCs) with a boiling point of 250°C maximum) higher than:

a) For wall paints (according to EN 13300): 30 g/l (minus water).

b) For other paints with a spreading rate of at least 15 m2/l at a hiding power of 98% opacity: 250 g/l (minus water)

c) for all other products (including paints that are not wall paints and that have a spreading rate of less than 15m2/l, varnishes, wood stains, floor coatings and floor. paints, and related products): 180g/l (minus water).

Verification;

Bidders must sign the GPP Declaration Form confirming that these products/substances will not be used on site or in the building.

POWDER COATING MATERIALS

Selected manufacturer: Submit details at tendering stage.

WORKING PROCEDURES

Requirement: Comply with:

BS 6497 for galvanized steel backgrounds.

British Coatings Federation: Code of safe practice - Application of thermosetting powder coatings by electrostatic spraying.

Powder coating manufacturer's guarantee.

POWDER COATINGS APPLICATORS

Applicator requirements:

Approved by powder coating manufacturer.

Currently certified to BS EN ISO 9001.

Comply with quality procedures, guarantee conditions, standards and tests required by powder coating manufacturer.

Each applicator to use only one plant.

Selected applicator: Submit details before commencement of powder coating.

GUARANTEES

Powder coating manufacturer and applicator guarantees:

Submit sample copies before commencement of powder coating.

Submit signed project specific copies on completion of work.

PRETREATMENT

Condition of components to be powder coated:

Free from corrosion and damage.

Suitable for and compatible with the pre-treatment and powder coating process.

Process:

Clean, conversion coat, condition, rinse in demineralised water, drain and dry components in accordance with the powder coating manufacturer's requirements and the pre-treatment supplier's recommendations.

EXTENT OF POWDER COATINGS

Application:

To visible component surfaces, and concealed surfaces requiring protection.

Coated surfaces will be deemed 'significant surfaces' for relevant BS 6496/ BS 6497 performance requirements.

APPLICATION OF POWDER COATINGS

Surfaces to receive powder coatings: Free from dust or powder deposits.

Completion of powder coatings: Within 48 hours of pre-treatment of components.

Jig points: Not visible on coated components.

Curing: Controlled to attain metal temperatures and hold periods recommended by powder coating manufacturer.

Stripping and recoating of components: Only acceptable by prior agreement of powder coating manufacturer. Stripping, pre-treatment and powder coating are to be in accordance with manufacturer's requirements and must be carried out at applicator's plant.

Over-coating of components: Not acceptable.

PERFORMANCE AND APPEARANCE OF POWDER COATINGS

Standard: To BS 6496/ BS 6497.

STEEL FABRICATIONS

Unit assembly: Wherever practical, before powder coating.

Exposure of uncoated background metal: Not acceptable.

Assembly sealants: Compatible with powder coatings. Obtain approval of colour if sealants are visible after fabrication.

FIXINGS

Exposed metal fixings: Powder coat together with components, or coat with matching repair paint system applied in accordance with the powder coating manufacturer's recommendations.

FABRICATION DAMAGE REPAIR/ REPLACEMENT

Inspection: Check all components before delivery to site for damage to powder coatings. Submit proposals for repair or replacement.

PROTECTION

Powder coated surfaces of components:

Protect from damage during handling and installation, or by subsequent site operations.

Protective coverings: Must be:

Resistant to weather conditions.

Partially removable to suit building in and access to fixing points.

Protective tapes in contact with powder coatings: Must be:

Low tack, self adhesive and light in colour.

Applied and removed in accordance with tape and powder coating manufacturers' recommendations. Do not use solvents to remove residues.

Inspection of protection:

Promptly repair any deterioration or deficiency.

SITE DAMAGE REPAIR/ REPLACEMENT

Damage to powder coatings: Rectify immediately damage caused during handling and installation, or by subsequent site operations. Submit proposals for extensive repair or replacement.

DOCUMENTATION

Submit the following information for each batch of powder coated components:

Supplier.

Trade name.

Colour.

Type of powder.

Method of application.

Batch and reference number.

Statutory requirements.

COMPLETION

Cleaning and maintenance of powder coatings:

Carry out in accordance with procedures detailed in powder coating manufacturer and applicator guarantees.

Duration:

From removal of protection until Practical Completion.

COATING APPLICATION

SURFACE CLEANLINESS

No coating shall be applied to any surface containing traces of grit, grease, oil, loose rust, mill scale, surface contaminants (i.e. dust) or corrosive products of any kind.

The following requirements shall apply prior to coating:

All traces of oil, grease, and other contaminants shall be washed by a method acceptable to the coating manufacturer from the surface and the surface dried prior to painting.

All surfaces to which coating is applied shall be free of moisture and containments.

If the blasted surface changes colour or rust bloom begins to form, the surface shall be re-blasted.

The surface to be coated shall be free of soluble salts. The maximum allowable level of soluble salts is 120mg per square meter.

MIXING

All material shall be power mixed for a minimum period of 5 minutes.

Where relevant, two components shall then be combined and power mixed in accordance with the per the manufacturer's recommendations. Only the full quantities of dual component materials shall be mixed. There shall be no partial mixing of dual component materials.

The induction time recommended by the coating manufacture shall be observed.

During application, containers shall be agitated often enough to keep pigments in suspension.

COATING

All surfaces shall be coated as specified.

Surfaces, which do not require coating, shall be suitably protected.

Successive coats shall be of a distinctly different colour to the previous coat to ensure total obliteration.

Special attention shall be given to cracks, crevices and edges to ensure complete coverage and thickness

MECHANICAL & ELECTRICAL

M.E. 1 INTRUDER ALARM SYSTEM

Alarm Panel

The system which will be installed shall be microprocessor controlled and suitable to address a minimum of 32 detection devices and sensors, with one (1) keypad for arming / disarming the system. Panel shall comprise:

- Fully programmable functions
- Anti-temper contacts
- Non-volatile memory
- Part set facility
- Non-volatile event log
- Chime facility
- Final door set facility
- Built-in internal siren
- Integrated key pads

The system shall be programmable for a number of different functions. Additionally the keypad shall have an additional programmable output.

It shall cater for at least 12 different zones programmed in accordance with a number of sets of detection devices to allow for future extension of the system.

Individual inputs to the panel shall be capable of being assigned to 'areas' which have common security attributes and which can be identified by an 'area number' and 'area name', allowing multiple inputs/detectors to be set or unset simultaneously by a user.

It shall have a walk test with walk test log available on all alarm zones.

The unit shall have a 1000 event memory log giving time, date and an output (which will include all alarms and keypad entries) for printing.

The control panel shall allow for the possibility of connecting another remote keypad, in addition to the required keypad.

The enclosure shall be typically manufactured from 3mm polycarbonate with removable lid.

The Alarm Panel shall support IP connectivity options for broadband and/or GSM/GPRS communications, enabling remote full control and monitoring of the intruder alarm system over the internet via software on a PC/Tablet or mobile telephone application. The cost of the software, its installation and system configuration shall be included in the cost of the alarm panel.

The controller can be remote from the panel, which is to be located in the reception area. The former can be rackmount and therefore installed within the network cabinet. The panel can then be slaved to the controller via the appropriate cables.

Battery Backup

The Intruder Alarm System shall be powered via a dedicated circuit from the distribution board DB1 located at ground floor level; however it shall have its own power backup via a suitable battery and battery charger to provide autonomous operation of the whole system for a minimum of 72hours. The power supply transformers shall meet the requirements of IEC 742 and shall be provided with a cut-out.
If the controller is remote from the panel, this can be powered via a rackmount UPS that has been included with the network infrastructure.

Regulations and Standards

All material and works included in this tender shall comply with the following:

- IET Wiring Regulations (18th Edition)
- Electricity Supply Regulations (Enemalta Corporation)
- Standard Orders (Malta)
- Building Regulations (Malta)
- British Standards and British Standard Codes of Practice, or equivalent:
- BS EN 50131-1:2006+Amendment1:2009
- BS 8473:2006+ Amendment 1:2008
- BS 5979:2007
- BS EN 50131-5-3:2005+Amendment 1:2008
- BS EN 50130-4:2011

Electrical plant and equipment must not cause, or be unduly affected by, electromagnetic interference as per the EMC directive 89/336/EEC.

Motion Detectors

Motion detectors shall be of the dual technology type and be wall mounted, 15m range, 90° detection angle, or ceiling mounted, 15m radius 360° coverage, for curtain monitoring and detection all around the detector in closed, vertically aligned zone. The detector shall operate using both passive infra red as well as ultrasonic technology to reduce energy waste and improve occupant convenience.

Motion detectors shall be of the wired type and shall have high operating reliability and adjustable response sensitivity. These shall have compensation for ambient temperature influences through automatic readjustment for the alarm threshold and a high degree of protection against electromagnetic interference fields and transient noise voltages. These shall be complete with a remotely controllable walk through test indicator. The

optical system, the pyro electrical sensor and electronic circuitry shall be enclosed in tamper monitored housing.

The detector shall not give a false alarm with levels of thermal and illumination disturbances caused by heaters and air conditioners, hot and cold drafts, sunlight, lightning, and moving headlights. The sensitivity of technologies shall be adjusted to give best operation, even in high temperatures and high level of dust and sand particles.

Wireless Detectors may only be used where it is not possible to install wiring subject to written approval. Such detectors shall be equipped with a lithium battery to power it for a minimum of 5 years without replacement, and which shall include built-in wireless transmitter to communicate with the Intruder Alarm Panel (via wireless interface modules/receiver units). In addition to wired detectors, the wireless detectors shall also communicate the battery condition with the Control Panel. Cost of wireless PIR detectors shall include for their wireless receivers and communication requirements with the intruder control panel.

Sounder complete with Flasher

These shall be attractive and shall have low power consumption together with a high sound output. These shall have three tones, snap in housing, and tamper protection. These shall also have a minimum acoustic output of 113 dB at 1 metre and shall be housed in a strong red ABS box. The slashing alarm light shall generate two extremely intensive alarm flashes per second.

Wiring of System

Contractor shall submit a set of Working Drawings showing exact cable routes, in accordance with the latest architectural layouts, finishes and requirements for approval before the installation is started. The drawings are to be amended and corrected in accordance with the comments of the Engineer before installation.

Cables shall be installed in PVC conduit beneath the raised flooring, or on cable trays / baskets, around the life core area and as instructed by the project manager / Engineer of the Contracting Authority. Any deviations from this can only be undertaken after being given written consent by the contracting authority.

Cables shall be in unbroken continuous runs between system components, i.e. joints in cable are not permitted. Cabling for ceiling motion detectors shall pass from below the intermediate floor above.

Wiring shall be carried out in multi-pair cable as recommended by the manufacturer.

All cabling shall be as discreet and as unobtrusive as possible in a colour to match the backdrop, where it is not possible to be hidden.

Auto dialler

The auto dialler shall automatically dial up to 3 different telephone numbers and transmit a message over a telephone line and also to a GSM unit in the event of an alarm. The unit must also be supplied and installed, inclusive of the SIM card.

When the dialler connects to a dialled number it will repeat its recorded message before cutting out. It will then automatically route for the next number stored.

It shall additionally have the following features:

- Tone or pulse
- Up to 8 digits
- 3 different inputs
- Detection of off hook
- Detection of cut/shorted line
- Manual test call.

Technical Advice, Training and Documentation

Contractor shall offer technical assistance to enable the Client to derive maximum benefit in using the system, especially during the initial stage of operation. Contractor shall provide training in system operation, data retrieval and all applicable procedures to the employees of St. Thomas Tower, Marsascala. Contractor shall provide all keys, tools and software necessary for system operation as well as complete set of manuals in the English language and a complete set of "as fitted" drawings.

Testing and Commissioning

On completion of the installation the Contractor shall carry out a full inspection of the Intruder alarm system. Each PIR motion detector, magnetic surface contacts, sounders and other devices shall be labelled with the assigned unique reference number. The Contractor shall then carry out settings, testing and commissioning of the system, taking care to follow the manufacturers' instructions. The Contractor shall provide all test instruments, materials and labour for the testing and commissioning. Records of tests are to be submitted to the Engineer in hard and soft copies. The Contractor shall also issue a certificate of test to the Client.

Manuals and As Fitted Drawings

As part of commissioning of the Intruder Alarm System, the Contractor shall submit to the Client one set of Operation and Maintenance manuals for all the equipment. The manuals shall be in English and shall include operation and maintenance instructions, test and commissioning records, technical literature and wiring diagrams.
The Contractor shall provide as fitted drawings in the form of three sets of prints and one copy in ACAD on compact disk. The drawings shall include a schematic drawing of the Intruder Alarm system.

Warranty

The Intruder Alarm System including all equipment, materials and workmanship shall be covered by a minimum period of a three year guarantee from the date of commissioning of the System against defects in materials and bad workmanship. The Contractor shall guarantee the availability of spares for all equipment of the Intruder Alarm System for a period of ten (10) years from the date of commissioning.

Maintenance Agreement

Contractor may be engaged to maintain the system for a period of three (3) years from commissioning. A tentative maintenance agreement is to be submitted, indicating price and services included, including call-outs for faults as well as ordinary system and reader checks. Offer rates for ALL items shall be binding for the duration of the Agreement.

M.E. 2 CCTV SYSTEM

Scope of Work

These specifications detail the requirements for the supply; installation, connectivity, and commissioning of a CCTV System.
The system shall use the modem and internet provision which is already on site at St. Thomas tower Marsaskala.
If any permits and approvals are required for such CCTV system, these shall be obtained by the contractor, from the relevant authorities, as part of these works.

Description of Works

The cameras shall be installed to monitor the areas as per the drawings provided. The Contracting Authority may make changes to the design.
The systems are required to provide continuous surveillance of the premises and shall be used in conjunction with remote monitoring/recording equipment and colour monitors with adequate facilities to produce recorded images for use as identification and evidence as may be required.
Direct surveillance of third party property and dwelling facades shall be avoided at all costs. The cameras shall be set to give maximum surveillance for the premises of the St.Thomas Tower, both indoor and outdoor as per drawings. Surveillance shall avoid black spots unless it is permitted by the Contracting Authority. The works shall be carried out in full cooperation with the Engineer of the Contracting Authority.
All equipment shall be of a high manufacturing standard, reliable and easy to operate and maintain. Final positioning of the cameras shall be guided by the field of view in conformity with the operational requirements. Other factors e.g. illumination level shall also be taken into consideration. Different setups shall be considered as long as the outcome satisfies the scope. Infrared illuminators are considered to be included in the

cost of each camera (both internal and external), and they can be built-in or attached to the cameras.

The entire solution must have the least minimum running costs possible and including the connectivity between each camera and the respective control equipment.

The system shall complement existing and future security measures employed by the Contracting Authority in safeguarding its assets and operations. The system principally intended to act as deterrent but shall also provide sufficiently clear video to identify any wrongdoing and its perpetrator/s, as well as serve as evidence if required.

The installation shall be carried out in a professional manner and is to have maximum protection against vandalism and tampering. The cameras, together with their housing, when installed shall be easily removed from the mounting for maintenance and repairing purposes.

The CCTV system shall conform to all relevant regulations and standards, in particular EN55022 and EN550082/1. All equipment of the CCTV system shall carry the CE marking. The contractor shall be responsible to obtain all permits and approvals for importation, installation and use of the CCTV equipment.

Regulations and Standards

The CCTV system shall be ONVIF compliant.

The Electrical Works shall conform to the latest publications of the following regulations and standards:

- BS 7671 (IET Wiring Regulations), "Requirements for Electrical Installations"
- National "Electrical Supply Regulations"
- The specified and relevant MSA EN and BSI Standards or latest equivalent,
- Technical Guidance F issued by the Services Division, Building Regulations Office
- All relevant NHS Estates (UK) publications.

Electrical plant and equipment must not cause, or be unduly affected by, electromagnetic interference as per the EMC directive 89/336/EEC.

The CCTV system shall be permanently earthed in conformity with the Enemalta Electricity Supply Regulations, for which a certificate shall be submitted along with the as fitted drawings. Direct connections to prefabricated earth pits shall be used. All earthing cables shall be colour-coded green/yellow throughout their length.

Lightning protection shall include proper earthing wire as per latest IET standards.

Electromagnetic Compatibility

The CCTV equipment shall be designed and manufactured to such a standard that it shall not be unduly affected by magnetic interference and that it shall not cause excessive electromagnetic emissions.

IP Cameras

The CCTV system for St. Thomas Tower, Marsaskala is composed of a number of outdoor 5MP IP cameras (IP66) and multiple indoor 3.2 MP IP cameras to monitor the main entrances, reception areas and all the areas indicated on the drawing.
The outdoor IP Cameras shall be of the bullet type and shall be weather proof (IP66) and shall withstand outdoor marine conditions including sun shield protection. They shall have the following specifications as a minimum:

- 5MP Resolution (Colour)
- Day/Night, IR Distance 40m
- 2.5-9mm Vari-focus IR Lens (wide view)
- Noise reduction
- Smart Focus and Auto focusing when day / night transition
- Motion Adaptive Transmission
- Wall or ceiling mount
- IP66 housing
- Metal body housing
- Vandal Proof
- OSD Button for ease of configuration

The indoor cameras shall have the following specifications as a minimum:

- 3.2 MP Resolution (Colour)
- Day/Night, IR Distance 15m
- 2.5-9mm Vari-focus IR Lens
- Ceiling Mount Dome Type
- Aluminium casing
- OSD Button for ease of configuration

The CCTV cameras shall operate in temperatures from 0° to 50°C, and shall have a signal-to-noise ratio of 50 dB or higher, and shall operate in compliance with the Power over Ethernet standard.
The colour for IP cameras shall be RAL9002 or similar.
The CCTV cameras shall include embedded video analytics with pattern identification that is able to accurately recognize the difference between people, vehicles, and other moving objects, such as animals, birds, etc.
The cameras shall allow remote viewing capabilities and shall come with remote video management software that includes the ability for the system to digitally zoom in and track people and vehicles automatically and it shall simultaneously record the full scene, and the video management software will display this full scene for context at the same time as displaying the zoomed-in view.
Based on video analytics detection of events, it should be possible to automatically change recording quality and frame rate based upon what is happening in the scene. Each camera shall have dual encoding built-in, so that it is capable of recording continuously at lower resolution and frame rate, and can record at high resolution and frame rate whenever an important activity is detected by the analytics.
The system shall have the ability to send remote alerts with marked video clips of the detected event. This can be used for quick assessment of threats, and can also be used as a remote storage of critical events. (may not be utilized by the Contracting Authority, however the cameras should be with such capability to provide for the possibility) .
In addition, the system shall also have the ability to send email notifications alert messages to remote PCs or cell phones in case of camera failures, alarm inputs etc. and it shall allow live video and alarm video viewing via the supplied PC software, via web browser using Internet Explorer or through 3rd party software.

Camera Housing/Brackets

The outdoor camera housing and supporting bracket shall be weather proof (IP66) and shall withstand outdoor marine conditions.
Standard features shall include:

- IP66 weather proof protection
- Quality Aluminium castings and extrusions ensuring no rust and no leaks.
- Fixings shall be with marine grade 316L stainless steel bolts.
- Sunshield shall be preferably adjustable
- Opening Mechanism shall facilitate ease of maintenance.
- Complete with cable glands for cable entry requirements.

Network Video Recorder

The Network Video Recorder (NVR) shall have:

- 32 IP video channels input
- Supports up to 5MP recording resolution per IP channel
- Real-time recording
- H.264 compression format
- Achieve playback, recording & live viewing simultaneously
- **Supplied with at least 30 days of internal storage**
- Built in DVD-R writer and USB ports for external HDD backups
- 1Gbps Ethernet Interface
- Motion detection for all video inputs
- Rack mount 19”
- Compatibility with system management software

The installation shall include the labelling of the camera number / reference at the NVR termination.
The cost of the NVR shall include the cost of licences (if required) for at least 10 different users, who can access the system through the dedicated monitoring station or remotely over the internet.

16 Channel PoE Switch

The 16 channel PoE switch shall be designed to transmit power and data over single Ethernet cable to remote PoE capable devices, and operating in wide temperature range environments.
It shall be 19" rack mount, 802.3af compliant, supports SNMP, auto MDI adjustment, operating 0°C to 40°C, 90% humidity, web based graphic interface for management purposes and providing a high level of immunity against electromagnetic interference and heavy electrical surges.

Remote Monitoring software

The recording system shall be based on a professional Video Management System that shall be upgradeable through free internet downloads from the manufacturer’s website and features user-definable camera layouts in grids or on building plans, video searches, an alarm list, automatic camera detection, automated switching between cameras or entire layouts, integration of video storage with file servers, camera configuration and a user-friendly method for automatic configuration/updating of numerous camera profiles.

The remote monitoring software shall have the following features:

- Shall allow live viewing of up to 32 cameras simultaneously.
- Shall display clearly which alarm events have been acknowledged by an operator and which have not.
- Shall allow grouping of cameras for display and for configuration.
- Shall clearly display the local time of the alarm, the date of the alarm, along with the location of the camera, the name of the camera and the rule that was triggered on alarm event creation.
- Shall allow detection sensitivity to be set individually per rule and shall allow rules to be set by time of day, day of week, or triggered by external alarm signal.
- Shall allow customized video compression settings, to set resolution, frame rate and quality for both streaming and recorded video.
- Shall allow an operator to select a single object and track only that person or vehicle throughout the field of view.
- Shall be able to pause and repeat playback of alarm event clips to enable further review and shall stream and record live video from any camera during normal operation and whenever an alarm is triggered. The software shall also be able to automatically pop- up windows for cameras that go into alarm mode.
- Shall allow video clips to be saved to the client PC whenever an alarm is triggered. The software must enable configuration both for the saving of the clip to the central PC and also the actual timeframe of the clip; for example: 10 seconds before to 10 seconds after the alarm event.
- Shall require authorization passwords before accessing the system data or system controls and
- Shall have at least two levels of authorization: Operator level and Supervisor in Charge level, with the Operator level privileges being customizable by an authorized Supervisor in Charge.
- Shall include an incident log that retains a record of all alarm events and changes made to.

The system's rules or camera configurations, also, rules and configuration changes shall be logged along with the identification of the Operator or Supervisor in Charge that changed them.

Shall include the ability to configure the detection rules and actions of each camera individually, or by groups of cameras and shall include the ability to set up Regions of Interest (ROI), which are areas where detection of events creates an alarm condition.

Shall allow multiple users to zoom-in on and track different objects at the same time, by using different client PCs.

The software shall be accessible over a LAN and also remotely over the internet (on a computer in a separate building or on a smart phone).

TFT Monitors (Dedicated for CCTV System)

The CCTV dedicated monitors shall be one 19" TFT rack-mount Monitor and one 24" TFT Monitor (at the reception desk).

The NVR shall be capable of taking at least 4 colour monitors, to be viewed simultaneously at different locations. The monitors shall be capable of delivering the camera views and playback modes mentioned above. The monitors shall be placed: 1) in the server room (shall be rack mount); 2) in the reception area at ground floor;

Monitors must meet the latest ENERGY STAR standards for energy performance.

All products carrying the ENERGY STAR label will be deemed to comply. Any other appropriate means of proof, such as a technical dossier of the manufacturer or a test report from a recognized body demonstrating that the criteria are met will also be accepted.

Monitoring can be done through any computer over the network or through remote monitoring over an internet connection.

Cables

The IP cameras shall be connected to the NVR using F/FTP CAT6 cable. The test parameters for F/FTP CAT6 cables are defined in IEC11801 standard.

The test results shall be submitted to the Contracting Authority / Engineer on a CD and a signed printout.

Cable runs shall be kept at a sufficient distance from power cables in order to avoid signal interference. The prices for equipment and cabling shall include all the required connectors and network extenders. Cables must be installed in conduit beneath the raised flooring or laid in adequately sized and earthed baskets around the covered portions of the lift core. It should be emphasized that no chasing whatsoever is to be carried out without approval in writing by the Contracting Authority. If such a course of action is not possible, wiring can be routed along gypsum lining as long as it has sufficient mechanical protection and out of sight.

The installation shall include the labelling of the camera number / reference at the NVR termination respectively.

All cabling shall be as discreet and as unobtrusive as possible in a colour that matches the backdrop. No works shall be carried out at St. Thomas Tower, before the approval of the Contracting Authority / Engineer. No straight-through joints in cables of same type shall be allowed.

A rubber isolator is to be fitted between the CCTV camera fitting and walls to avoid corrosion. This applies for both external and internal walls. The Contractor may in

exceptional circumstances be required to carry out masonry work, including penetrations in thick wall to pass cables from one room to another or to outside. Adequate sealing shall be required to prevent from weather damage to the place.
The Contractor has to keep in mind that coring in walls has to be as appropriate and after approval from the Contracting Authority. The Contractor will be held liable for any unwanted damage incurred and to any stored items or any of its items by the direct or indirect action of his workers.

RJ45 Inline Lightning Protection

Each of the cameras (both indoor and outdoor) shall have lightning protection at both ends of the cable connecting it to the NVR (one lightning protection device on the camera side and one lightning protection device on the NVR side).
Each of the RJ5 Lightning Protectors with outdoor cameras, shall be installed in an IP66 termination box with proper earthing connection and response time line to earth shall be less than 100ns.

Power Supply

All the equipment forming the CCTV system shall be powered via a Single Phase (230V in/out) Line Interactive Uninterrupted Power Supply (UPS) with Network management Card, to provide 3 hours of autonomous power supply, including all cameras, NVR and hard disk drive.

CCTV Warning Signs

Contractor shall supply and fix CCTV warning signs of minimum dimensions 300x200mm, to be fixed as indicated by Client. Signs shall be in bright colour, indelible and weather-resistant. Signs may incorporate appropriate pictogram and shall generally read as follows:

YOU ARE ENTERING AREA MONITORED BY CCTV
YOU ARE BEING RECORDED FOR YOUR OWN SAFETY
THIS AREA IS MONITORED BY CCTV
THESE PREMISES ARE MONITORED BY CCTV

Warning signs may carry a small installer's logo at the edges or corners.

Technical Advice, Training and Documentation

Contractor shall offer technical assistance to enable the Client to derive maximum benefit in using the system, especially during the initial stage of operation. Contractor shall provide training in system operation, data retrieval and all applicable procedures to the employees at St. Thomas Tower. Contractor shall provide all keys, tools and software necessary for system operation as well as complete set of manuals in the English language and a complete set of "as fitted" drawings.

Testing and Commissioning

On completion of the installation the Contractor shall engage a warranted electrical engineer to carry out a full inspection of the CCTV system. The warranted electrical engineer shall then carry out testing and commissioning of the system. The Contractor shall provide all test instruments, materials and labour for the testing and commissioning. The tests shall include frequency response testing of cables if necessary or if required by the Contracting Authority. A hardcopy and a softcopy of the records of tests are to be submitted to the Contracting Authority. The Contractor shall provide the Contracting Authority with a certification from the warranted engineer.
The contractor shall pay for all costs required for any additional equipment and/or accessories required to achieve satisfactory performance of the CCTV system in compliance with the specifications and to the satisfaction of the engineer.

Manuals, As Fitted Drawings, Records and Training
As part of the commissioning of the CCTV system, the Contractor shall provide the Engineer with:

- Two sets of operation and maintenance manuals covering all the security equipment installed including commissioning records, detailed circuit diagrams, wiring diagrams and lists of spares.
- As fitted drawings in the form of three sets of prints and one copy on disk. The drawings shall include a layout of the equipment and wiring on plans and a general schematic drawing of the whole system
- all keys, tools and software necessary for system operation as Contractor shall provide training in system operation, data retrieval and all applicable procedures to at least five (5) employees.

All documentation must be provided in English.

Warranty

Warranty should cover the entire system and must be for a minimum period of 3 years against faulty workmanship and materials including consumables and on the operation of the system as a whole. If during this period any parts or equipment have to be replaced, the warranty on that part shall be renewed for another 3 years from date of replacement. The prospective contractor shall also guarantee the supply of spares and any consumables up to the next ten years following the award of the contract.

Maintenance

Contractor will be engaged to maintain the system for a period of three (3) years from commissioning. A tentative maintenance agreement is to be submitted, indicating price and services included, including call-outs for faults as well as ordinary system and reader checks. Offer rates for ALL items shall be binding for the duration of the Agreement.

In case of a fault in CCTV system or camera, the supplier is bound to replace camera or repair fault within two (2) working days. Offered rates for ALL items shall be binding for the duration of the Agreement.

Preambles

The Contracting Authority is not bound to take all the items/material indicated in the BOQ. Tenderer is to take into consideration that works are at the site of St. Thomas Tower, Marsascala and thus full cooperation with the Administrators and the Engineers of St. Thomas Tower is highly requested.

M.E. 3 FIRE DETECTION SYSTEM

System Description

The system shall be supplied complete with all necessary equipment, cabling, accessories and hardware and shall be installed and commissioned by Contractor. The system shall be easy to operate and maintain and shall consist of the following components:

- 2 loop addressable fire alarm panel
- Power supply with 72 hours' autonomy
- Wired/Wireless Photoelectric Smoke Detector and Heat Detectors
- Wired/Wireless Manually-operated alarm switches
- Audible and visual alarm units
- All necessary interconnections and cabling

Bidders shall include in their offer any other items which may be necessary for the system being proposed to function properly.

Regulations and Standards

All material and works included in this tender shall comply with the following:

- IET Wiring Regulations (18th Edition)
- BS EN 54, BS 5839, BS5445
- Electricity Supply Regulations (Enemalta Corporation)
- Standard Orders (Malta)
- Building Regulations (Malta)
- Equipment shall not cause excessive electromagnetic interference and shall be unduly affected by magnetic interference. The equipment shall comply with the electromagnetic compatibility directive 89/336/EEC as amended by directive 92/31/EEC. EMC Directive, EN55022EN
- Standards and EN Codes of Practice, or equivalent
- All equipment shall carry the CE mark.

Fire Alarm Panel

The Fire Alarm Panel (FAP) shall be housed in a sturdy, lockable, surface mounted metal enclosure having sufficient facility for wiring. It shall operate on a 230 V AC 50 Hz electrical supply and shall have a standby battery for 72 hours autonomy in event of power failure. As the central controller of the complete system, the Fire Alarm Panel (FAP) shall serve the following functions:

- Continuously receive and process analogue information from detection devices
- Provide audible/visual indication of alarm and other conditions to the user
- Automatically initiate alarm response sequences
- Provide the user interface for interrogation and programming of the system.

The panel shall be of the analogue addressable type, having 2 independent loops for connection of up to 125 input and/or output devices on each loop and shall have sufficient capacity to handle the high currents to drive multiple alarm devices simultaneously as well as any additional internal/external devices which may be reasonably connected to the panel.

The panel shall be easy to configure and program with different levels of password protection. It shall be equipped with a real-time clock, event history log, auxiliary contacts and interfaces for connection to similar systems or other electronic equipment, including computer connections for remote programming and monitoring of system status and operation.

The Fire Alarm Panel shall be suitable to include in the loop receiver units for two way communication with wireless detectors/devices, or otherwise to have built-in receiver

units to communicate with wireless detectors/devices. A GSM unit complete with SIM card is also to be provided for this purpose.

The panel shall also have the facility of automatically dialling at least 3 telephone numbers and transmitting a message over a telephone line in the event of an alarm. The panel shall be equipped with a 6-line alphanumeric LCD display with automatic backlight and at least the following indicators:

Visual Indicators

Power On (Green)
Fire Alarm (2xRed)
Fault (Yellow)
Disabled (Yellow)
Test (Yellow)
Sounders Silenced (Yellow)
Sounders Disabled (Yellow)
Sounder Fault (Yellow)
System Fault (Yellow)
Delayed (Yellow)
Spare programmable indicators (Red & Yellow)

Manual Controls

Silence Buzzer
Evacuate (Sound Alarms)
Silence / Resound Alarms
Reset
Cancel key
Menu selection key/s
Navigation (cursor) keys
A confirmation key
A numeric keypad,0-9,also providing for letter / character programming

Manual Call Points

Addressable manual call-points shall monitor and signal to the FAP the status of a switch operated by a push button or “break glass” assembly. Manual call points shall be capable of operating by means of thumb pressure and not require a hammer. They shall be capable of being tested using a special ‘key’ without the need for re-setting of the plastic element. The manual call points shall be in red thermoplastic and suitable for surface or flush mounting. The addressable call-points shall be provided with an integral red LED to indicate activation and shall be loop powered.

Call-points shall be surface mounted at approximately 1400mm from floor level and shall be clearly visible from the sides. Call-points shall be employed in conjunction with a rigid hinged transparent cover guard having an integral sounder to deter and prevent nuisance or accidental operation of call-points in public areas but shall not hinder the proper operation of the call-point in any way.

Alarm Devices

Alarm devices shall be addressable and loop-powered. There shall be audible warning devices (sounders) and visual (beacons). Addressable electronic sounders shall have a minimum sound output of 90dBA at 1m and selectable tone. Addressable Beacons shall have a flash rate of 30-130 flashes per minute and having RED coloured lens. Sounders and beacons used in the exterior shall be rated at IP66. If appropriate, bidders may offer combined sounder-beacon units and/or sounders or beacons mounted on standard detector bases.

Photoelectric Smoke Detectors

All photoelectric smoke detectors shall be mounted on surface-mounting bases. Bases shall be of a single type such that any type of smoke detector may be inter-changeable. Bases shall not contain any electronic circuitry to enable wiring checks by removing detector heads. Each detector can be locked onto its base by removing a plastic tab from the detector underside. All detectors shall be serviceable, having relatively easy access to the smoke chamber or sensing device.

Detectors shall offer high resistance to contamination, dust deposit and corrosion and shall include RFI screening to minimise the effect of EMI. Detectors shall be suitably selected and installed to minimize false alarms. All detectors shall be of the addressable type, loop powered, having adjustable sensitivity and LED indicators visible from 360°. Each detector shall be capable of transmitting Normal, Pre-Alarm, Fire and Fault conditions.

Wireless Detectors shall be equipped with a lithium battery to power it for a minimum of 5 years without replacement, and which shall include built-in wireless transmitter to communicate with the Fire Alarm Panel (via wireless interface modules/receiver units). In addition to wired detectors, the wireless detectors shall also communicate the battery condition with the FAP.

Heat Detector

The heat detector shall be capable of being configured as a medium to fast response or as a fixed temperature device. The detector shall provide reliability against false alarms caused by high humidity, insects, air draughts and dust. The detector shall be provided with a dust cover during the course of the installation to prevent any ingress of dirt or other material. The cover shall only be removed prior to the commissioning of the system. Heat detectors shall be of the addressable type, loop powered, having adjustable sensitivity and LED indicators visible from 360°.

Wireless Detectors are to be used where the routing of wiring is not possible (as marked on the drawings) and subject to approval from the contracting authority, should

the contractor be required to deviate from the drawings. These shall be equipped with a lithium battery to power it for a minimum of 5 years without replacement, and which shall include built-in wireless transmitter to communicate with the Fire Alarm Panel (via wireless interface modules/receiver units). In addition to wired detectors, the wireless detectors shall also communicate the battery condition with the FAP.

In case where unreliable operation of the wireless detectors is suspected, or were exposed wiring is deemed to present too great a visual impact, the contractor, subject to the approval of the contracting authority, can opt to swap wired or wireless detectors with infra red beam variants. The design objective must be met, regardless of the detection technology utilized.

Wireless Interface Module/ Receiver Unit

The receiver shall recognize alarm, status and keypad control messages from wireless transmitters (detectors) configured to operate at the same frequency. The receiver units shall be compatible with the Control Panel and installed in a location for un-interrupted secure communication with the wireless devices.

Cabling

Contractor shall submit a set of Working Drawings showing exact cable routes, in accordance with the latest architectural layouts, finishes and requirements for approval before the installation is started. The drawings are to be amended and corrected in accordance with the comments of the Engineer before installation.

Contractor shall supply, lay and connect all necessary wiring to all parts of the system. The cable shall be of the fire-resistant, flame retardant, moisture resistant, having low smoke and acid gas emission and complying with IEC331 and BS6387, Category CWZ. Cable shall be 2-core 1.5 mm^2 and fully screened against EMI. Cable shall be passed using a method approved by Contracting Authority. Cable used in the exterior shall be UV-stabilised. Any holes for passing cables from interior to exterior of building shall be filled in with approved sealing material. Cables shall be in unbroken continuous runs between system components, i.e. joints in cable are not permitted.
The cable runs are to be kept a sufficient distance from power cable runs in order to avoid signal interference. The prices for equipment and cabling are to include all the required connectors. Where possible, the cable route of the Fire Detection System shall avoid the roof and other areas which are directly exposed to the elements and lightning. Loop isolators shall be inserted at appropriate locations to contain short circuit faults as required by Standards.

Loop Isolators

Two loop isolators per floor shall be interspaced to contain short circuit faults. Isolators shall be installed on each loop in order that that only a minimal part of the system will be affected by a short circuit fault. The isolator shall automatically bring the disconnected section back in service when the short circuit is repaired. When an isolator has operated, an LED shall be continuously lit to indicate that the isolator is in the isolation mode.

Networking Software

Bidders shall include for a Windows-based software package to oversee the activity of the entire system. This may be either proprietary or a licence-free adaptation. This should allow multi-user monitoring of the system, with password protection, remotely over the internet.The software should incorporate mimic or scale plans of the premises.

Technical Advice, Training and Documentation

Contractor shall offer technical assistance to enable the Client to derive maximum benefit in using the system, especially during the initial stage of operation. This shall include an evacuation plan and assistance in the organisation of a fire drill. Contractor shall provide training in system operation, data retrieval and all applicable procedures to at least five (5) Government employees nominated by Client. Contractor shall provide all keys, tools and software necessary for system operation as well as complete set of manuals in the English language and a complete set of "as fitted" drawings.

Testing and Commissioning

On completion of the installation the Contractor shall carry out a full inspection of the fire detection and alarm system. Each detector, call point, sounder and other devices shall be labelled with the assigned unique reference number. The Contractor shall then carry out settings, testing and commissioning of the system, taking care to follow the manufacturers' instructions. The Contractor shall provide all test instruments, materials and labour for the testing and commissioning and shall give the Client five working days' notice of final commissioning tests. Records of tests are to be submitted to the Client in a soft-copy and by means of a print-out. As part of commissioning, the Contractor shall certify that all the equipment and the installation of the Fire Alarm System conform to the relevant parts of MSA EN 54. The Contractor shall also issue a certificate of test to the Client.

Manuals and As Fitted Drawings

As part of commissioning of the Fire Alarm System, the Contractor shall submit to the Client one set of Operation and Maintenance manuals for all the equipment. The manuals shall be in English and shall include operation and maintenance instructions, test and commissioning records, technical literature and wiring diagrams.

The Contractor shall provide as fitted drawings in the form of three sets of prints and one copy in ACAD on compact disk. The drawings shall include a schematic drawing of the Fire Alarm System

Warranty

The Fire Alarm System including all equipment, materials and workmanship shall be covered by a minimum period of a three (3) year guarantee from the date of commissioning of the System against defects in materials and bad workmanship. The Contractor shall guarantee the availability of spares for all equipment of the Fire Alarm System for a period of ten (10) years from the date of commissioning.

Maintenance Agreement

Contractor shall also offer to maintain the system for a period of three (3) years from commissioning. A tentative maintenance agreement is to be submitted, indicating price and proposed services, including call-outs for faults and alarms as well as ordinary system and detector checks. Tendered rates for ALL items shall be binding for the duration of the Agreement. This shall be over and above the normal commercial guarantee on equipment, material and workmanship as provided by law.

M.E. 4 FIRE FIGHTING EQUIPMENT

Fire extinguishers – General

Fire extinguishers shall be of the portable, stored pressure, controllable discharge type with a lever above the handle for operation. The lever shall include a tamper evident safety pin which must be pulled out before the lever can be depressed.

Fire extinguishers shall be complete with a pressure gauge which shall clearly indicate whether the extinguisher is fully charged, discharged or overcharged.

The fire extinguisher nameplate shall include clearly legible operating instructions. When installed, the nameplate on the extinguisher shall be facing outwards.

The fire extinguisher shall be mounted on an appropriate manufacturer supplied bracket, inside the fire point cabinet.

Fire extinguishers shall display the BS kite mark and shall conform to the requirements of BS EN 3 standards.

Dry Powder Fire Extinguishers

Dry powder fire extinguishers shall contain a class A, B and C fire fighting medium. The body shell of the extinguisher shall be of high grade steel. The extinguishers shall be to the following specifications:

Size:	6 kg
Test Pressure:	24 bar
Working Pressure:	12 bar
Discharge time:	not longer than 21 seconds
Finish:	Red epoxy powder coating with blue identification band or marking.

Carbon Dioxide Fire Extinguishers

Carbon Dioxide fire extinguishers shall be suitable for use on Class B fires. The body shell of the extinguisher shall be of high grade steel. They shall be equipped with a swivel hose and horn. The fire extinguisher shall be to the following specifications:

Size:	5kg
Working Pressure	60 bar
Discharge Time:	approx. 9 seconds
Minimum Range:	4m
Finish:	Red epoxy coating with black identification band or marking.

Fire Blankets

These shall be suitable for smothering a fire and shall be manufactured from textured glass fibre. It shall be suitable for use in confined spaces and shall have good insulating properties. It shall be to BS 476 Part 4. It shall be supplied complete with a Nylon wall mounting case with printed on instructions for use.

M.E. 5 VRV/VRF SYSTEMS

Scope of Work

The building shall be air-conditioned by means of TWO in number Variable Refrigerant Flow/Volume type systems. These shall consist of indoor and outdoor units connected with lagged copper pipes and shall be capable of absorbing the heat gains from the building structure, occupants and other sources present within the area in order to maintain the desired conditions. The nominal cooling capacities are based on indoor temperatures of 27 deg. C db, 50% Relative Humidity and an outdoor temperature of 40 deg. C db, 60% Relative Humidity. The compressor shall be Inverter Driven. Each indoor unit shall be branched off from the two main refrigerant pipes.

It is expected that these units be highly reliable and shall operate with minimum noise levels as well as to maintain the required conditions automatically. They shall be located as directed by the client/Engineer.

The outdoor unit shall have a galvanised or other heavy duty UV resistant and weather proof case and shall be suitably finished.

Works shall be for a complete working system and shall include amongst any other requirements the following :

a) The supply and installation of the air-conditioning units as detailed in the specifications.
b) Supply and installation of trunking/cable tray for the passage of copper pipes and drains as required.
c) The electrical connection between the equipment and the electrical supply point prepared by others.
d) Testing and commissioning.

The tenderer shall give a 5-year (60months) guarantee on parts and labour on all individual items of the installation and also on the operation of the units as a whole. This shall come into effect from the date of hand over of the equipment to the client. Should any parts be replaced within this period, the guarantee period on those parts shall be renewed for another five years.

Energy Efficiency

The energy label as regards Council Directive 92/75/EEC for each air conditioning unit shall be included with the technical literature.

Outdoor Units

Outdoor units shall be factory assembled housed in a galvanised sturdy steel casing coated in a baked enamel finish or acrylic paint. Equivalent heavy duty UV resistant and weather proof cases will also be acceptable. They shall be of the packaged direct expansion heat pump multi-system type. These units shall be of the top flow configuration, drawing air in from the sides and discharging hot air from the top. They shall include any sound absorbing material and vibration eliminators required to ensure that the overall noise level of the unit is within the specified limit and that no vibration is transmitted to the building structure.

It shall be possible to connect different types and capacity indoor units to one refrigerant circuit, all individually controlled. The outdoor unit shall be suitable to accommodate a mix-match combination of at least the following types of units:

- Ceiling suspended
- Wall mounted
- Concealed

The outdoor units shall be of the heat pump type providing both cooling and heating. The compressor shall be rendered soundproof by being mounted in a compartment or by

other means. Inspection panels shall be easily removable facilitating access to all electrical and mechanical components and controls.

The cooling fan shall be of the vertically mounted type. A protection grille shall cover it and this shall also be weather proof. Weatherproof protection grilles shall also be provided for the air intake and discharge. The motors shall be silent running and fitted with rubber anti-vibration mountings.

All motors shall have adequate soft starting equipment to reduce the starting current. Preferably this shall be installed within the enclosure and supplied by the manufacturer.

Cooling Capacity Each system shall consist of one or more units. If more than one unit is used, then they shall be connected to common risers. Risers are to be routed through the lift structure.

The system ONE supplying the **Ground and First Floor** shall have a total cooling capacity of not less than **62 kW.**

The system TWO supplying the **Second Floor (Meeting Rooms)** shall have a total cooling capacity of not less than **20 kW.**

All the above capacities are to be taken on an indoor temperature of 27 deg. C DB, 19.5 deg.C WB and outdoor temperature of 40 deg. CDB

Power Supply	: 415V 3-phase 50Hz
Refrigerant	: R410a
Compressors	: at least 2 per unit. .

The larger outdoor unit shall be equipped with at least 2 compressors shall be of the hermetic scroll type mounted on vibration absorbing material. They shall be equipped with a thermal protection device. The units shall be designed to operate utilising one compressor when the other is out of order. At least one of the compressors for each system shall be Inverter Driven.

The heat exchanger shall be constructed with seamless copper tubes mechanically bonded to aluminium fins. The entire assembly shall be treated with a suitable protective coating against saline environments.

Fan/s shall be direct driven propeller blade type with external protective wire guard. The fan motors shall include a thermal protection device. They shall be resiliently mounted to avoid vibration transmission.

The refrigerant circuits shall be of copper tubing and shall include an accumulator, liquid and gas shutoff valves and a solenoid valve. All necessary safety devices shall be

provided to ensure the safe operation of the system. The refrigerant system shall be factory charged with R410a and refrigerant oil and shall include a charging valve.

An Oil Recovery System shall be incorporated into each unit to ensure stable operation with long refrigerant piping.

The following **Safety Devices** shall be part of the outdoor unit:

- High-pressure switch.
- Fuse.
- Crank case Heater.
- Fusible Plug.
- Over current protector for the inverter.
- Short recycling guard timer.
- Phase failure protection.
- Over and under voltage protection.
- Phase reversal protection.
- a minimum of 9% voltage different between phases.

Refrigerant Circuit

Each unit shall operate using R410a as refrigerant (or any other refrigerant at the time which has a lower GWP).

The refrigerant circuit shall include the following:

a) At least one Compressor per unit shall be **Inverter Driven** and shall be equipped with thermal and electrical protection, linked to a hermetically sealed and brazed refrigerant circuit.

b) Pressure reducing device which shall be in adjustable and of the capillary type.

c) A built in filter for the refrigerant.

d) Inverting valve for cooling/heating cycle mode selection.

Indoor Units

The indoor units shall be of the **Vertical concealed unit** type as found in the BOQ. Their cooling capacity shall be quoted at medium fan setting. All units shall have a low profile and an attractive and aesthetically pleasing design. They shall be equipped with a three-speed fan possibility for low, medium and high speeds.

Automatic discharge deflection grilles shall be provided on the air outlet to allow for directional control. These shall swing automatically to ensure an even distribution or else they may be set in a fixed position. Inlet grilles shall be fixed direction. These shall be made of high temperature resistant thermoplastic and shall not warp with prolonged use.

Acoustic and thermal insulation shall be used throughout the indoor unit. The fans shall be mounted on self-aligning bearings. Motors shall be silent running, rubber mounted

and equipped with thermal overloads. Air filters shall be of the washable, cassette type, rapidly removed and accessible.

The unit shall have easy access to the following components without the necessity of removal or dismantling.

a wiring diagram and identification plate
b terminal strips and electrical connections
c valves and refrigerant pipe connections
d blower motor assembly
e air filter
f air intake and discharge grilles
g condensate tray

Each unit shall include an electronic control valve to regulate the flow of refrigerant to the unit according to the load variations of the room. The units shall include a multi-blade, centrifugal type fan, which shall be statically and dynamically balanced to ensure low noise and vibration-free operation.

Controllers

Individual controllers

All indoor units shall be equipped with a wired local remote controller, accessible from ground level. The temperature sensors for the units shall be housed within the remote controller for better control of temperature. On every floor there shall be a main controller for that floor through which the system main functions are varied.

Each local remote controller shall at least have the following functions:

- Unit start/stop.
- Mode selection.
- Fan speed regulation (at least three speeds).
- Temperature regulation for the unit,
- Timer setting.

Each unit local remote controller shall at least display the following information:

- The set temperature.
- The operating mode.
- The fan speed.
- Abnormal operation of the unit.
- Programmed time.

One of the units shall be the master controller for heating/cooling mode for the particular system. One of the controllers shall be set to be the ‘Master’. These units shall be the only controller capable to switch the system from heating to cooling mode and vice versa.

REFRIGERANT PIPES AND FITTINGS

If more than one outdoor unit is used in each of the TWO installations, there shall be a coupling arrangement so that only one set of risers or main pipes will be required to feed the indoor units for that particular system.

Pipes connecting the indoor and outdoor units shall be run in phosphorous de-oxidised copper and shall include all necessary branch joints, headers or any other items of equipment as required to connect the indoor units. All pipes and fittings shall be insulated using closed-cell insulation at least 12mm thick.

Piping design shall be such as to ensure proper operation of the system, even with long pipe lengths. Sizing of pipes shall be carried out by the tenderer, based on the manufacturer's recommendations, bearing in mind the number of indoor units connected to the same outdoor unit, the overall length of pipe and the difference in levels between the indoor and outdoor units. Allowance shall also be made for the addition of other indoor units at a later date so as to make use of the full potential of the outdoor unit cooling capacity. A copy of the design must be submitted to the contracting authority prior to installation.

Copper pipes and fittings shall have brazed joints. Tube ends shall be cut square and all burrs removed prior to cleaning ends for jointing. All pipes shall be blanked off during the course of the installation to prevent the ingress of dirt and other materials, which may otherwise block the pipes. The Contractor shall be responsible to comply with this provision under all circumstances.

In case of bending, the pipes shall not be subjected to radii smaller than 3.5 times the pipe diameter. Pipe insulation shall be stone coloured or white and shall have fire resistant properties. These shall be clearly and comprehensively explained in the quotation.

The copper pipes should be routed through cable trays fixed vertically in the shafts and on roof. The cable tray should be covered by galvanised sheet metal where the cable tray is routed on the roof. The insulated pipes should be fixed by appropriately isolated pipe brackets. Any control cables should also be routed with the refrigerant pipes on the cable trays.

PIPE INSULATION

All copper pipes and fittings shall be insulated and finished in a smooth, clean and workmanlike manner, with all joints tightly finished. Insulation shall be applied to all pipes located externally and internally to the building.

The insulation used on refrigerant pipes and on condensate drain pipes shall have a closed cell structure, which is a built-in vapour barrier with a very high resistance to water vapour transmission. The insulation shall be rated to Class 1 and shall comply with BS 476, Part 7: 1987. It shall have an operating range of between 0 and 100 deg. C. and shall be self-extinguishing.

The insulation means must ensure that the insulated pipes are not exposed to direct sunlight. Reliance on UV resistant tape alone is not acceptable. The insulation shall also be water resistant. Technical literature on the material proposed should be supplied at the tendering stage.

DRAIN PIPES

The individual drain line form each unit shall be run to the nearest point in the main existent drain lines. These shall be run in suitable, UPVC material. Branches shall be kept to a minimum to reduce the risk of blockage. Pipes and fittings shall be bonded together using the manufacturer's recommended adhesive. The necessary inspection and cleaning fittings shall be fitted to permit regular and easy maintenance of the system. All drain pipes shall be adequately insulated to prevent any formation of condensate.

NOISE AND VIBRATIONS

Particular attention shall be given to the internal and external noise generated by the equipment. The selected equipment offered shall observe the noise criteria listed below and any additional sound treatment shall be deemed to have been included in the tender price. The maximum permissible noise levels are detailed below.

Inside	45 db(A)
Outside	63 db(A)

The internal noise level shall be as measured within each space closest to the units. The external noise level shall be as measured 1m away from the unit. These are to be taken and certified by the contractor.
Vibration transmission from the equipment to the building shall be kept to an absolute minimum by means of anti-vibration mountings. All such mountings shall be deemed to have been included in the tender price.

ELECTRICAL REQUIREMENTS

All equipment shall operate on a 400V, 50 Hz Three Phase or on a 240V, 50Hz single phase supply. All electrical systems and wiring shall conform to the latest edition of the I.E.T. and to current Enemalta regulations. In this respect, all induction motors above 1.5kW shall be equipped with power factor correction equipment to operate at a power factor of not less than 0.9 lagging at maximum rated power. The main isolator presently supplying the chillers shall be used for the electrical supplies of the new VRV units.

All cabling required to interconnect indoor units to the respective outdoor unit shall be included as part of the works. The type and quantity of cable required shall be as recommended by the manufacturer, however all such cable must be UV protected, PVC sheathed type. Single core insulated but unsheathed cables in conduit are not acceptable.

AIR - COOLED CONDENSER

The unit shall be equipped with a remote air cooled condenser housed in a galvanised sheet steel enclosure and suitably treated for local weather protection. It shall be suitable for operation at temperatures between 0 and 45 deg. C. This shall be fitted with coils constructed from copper tubes having aluminium fins and shall be suitable for outdoor installations. Fans shall be of the direct driven type. It shall be equipped with a condensing pressure control system for year round operation.

DUCTING

The vertical concealed units shall be connected to the supply and return grills through phenolic ductwork. This shall be fixed to the wall by appropriate fixtures and care should be taken to reduce noise propagation through the ductwork. The supply and return ducts should be manufactured to the following specifications.

Solid type ducting shall be manufactured from factory produced pre-insulated aluminium panels. Density shall be greater than 40 kg/m^2. The thickness shall be at least 20mm. Thermal conductivity shall be at least 0.024 W/m^{2}K. The material shall be capable of withstanding pressures of 300kPa. Panels shall be certified class 'O' for fire rating and against toxic gas emissions in case of fire.

Fabrication of ductwork shall be carried out in accordance with DW144. All ductwork shall be appropriately sealed, glued and taped during manufacture to keep air loss at a minimum. It shall be arranged in a manner to drain any entrapped moisture and to ensure that the lapping of joints prevents moisture leakage. The whole ducting system hall be air tested for leaks as per recommended CIBSE ratings.

Ducts running on the outside of the building shall be made from panels that are meant for external use. The aluminium thickness for these panels shall be thicker than the normal internal aluminium thickness. Also, the panel overall thickness shall be greater than 20mm with a greater stiffness class than that used indoors. Outside ductwork shall be supported by galvanized brackets or proprietary brand, be protected with waterproofing resin and shall be guaranteed weather proof.

Bends and offsets shall have a minimum throat radius equal to the width of the duct at that section. Supports and hangers shall comply with DW 144. All supports and hangers shall be suitably treated for corrosion. Protruding ends of hanger rods and bolts shall be cut off close to the nuts. Supports and drop rods shall be clear of ducts and must not be enclosed in thermal insulation, as DW 144.

Flexible circular ducting may be used in the branch-off to the grilles. These shall be used with manufacturer's tap-in collar connections installed at the branches. This shall however be able to operate at temperatures of between -20 to 120 degrees centigrade and withstand a working pressure of 2.45kPa. The material used shall have zero surface spread of flame and shall be rated at class 1.

It shall be ensured that materials of accessories shall be compatible with ductwork and that finishes of accessories comply with any special requirements for ductwork. Proprietary hangers and supports shall be provided throughout in accordance with DW 144. Return ductwork shall be of the same standard as the supply ductwork. The sizes shown on the drawings shall be internal dimensions. The airflow shall be delivered through a number of diffusers with control dampers. Test holes shall be provided in ductwork to allow for complete testing and balancing of the system in accordance with CIBSE Commissioning Code Series.

ENERGY RECOVERY UNIT

Energy recovery units shall be capable of providing energy saving through energy recovery via a heat exchanger with high temperature and enthalpy recovery efficiency. The unit shall have high static pressure with high efficiency fans.

The units shall have a bypass mode such that free conditioning can be achieved in the shoulder months when ventilation only can sustain a comfortable temperature inside the premises.

Units shall have a notification on the control display to notify when the filter needs to be cleaned or replaced.

Upstream to the HRU a filter-box as having filters as detailed below shall incorporate a similar differential pressure alarm to indicate when the filters require replacement

The heat recovery unit shall be capable of temperature recovery efficiency of at least 70%, while an enthalpy recovery efficiency of at least 60%. Sound levels shall be less than 30dBA.

Ventilation energy recovery unit shall have enough fan power to overcome the pressure losses due to the length and duct fittings.

Units are to be installed as detailed in the drawings.

** The pressure loss across any filters depends on the supplier's specifications and therefore, the characteristics of such fans may need to be increased accordingly, however, the requirements specified are a good indication of the requirements. The engineer shall support documentation for this item.*

The filter media shall be fire-resistant synthetic material with a filtering efficiency as specified in the schedule below. Panel filters shall be in a V formation and mounted on slide channels for easy withdrawal.
Air speed crossing the active wall shall not be higher than 1m/s. Each filter section shall be provided with an externally mounted inclined manometer or Magnehelic gauge.

Filter housings must be manufactured to minimize the bypass of air. Separate self-adhesive gasket/weather-strip material is to be provided with the air-handling unit to be added if necessary to reduce leakage rates.

Filter media shall be rot resistant, vermin proof and fire resistant.

<u>Fresh Air Supply Fan Filter</u>

	Filter type	**Filter type**
Supply Air	**G4**	**F7**

AIR CURTAINS

The air curtains shall function as a heat barrier such that energy is not lost through open door ways. The air curtains shall be either one structure (depending on the size of the door) or multiple units connected together to form one unit. The efficiency of the unit shall be high with the least possible energy consumption. Sound levels shall be below the 60dBA.

The units shall be powered by a single phase power supply (point prepared by others).

INSTALLATION

General

Except where otherwise stated, workmanship shall comply with European Codes of Practice, where applicable. It shall be of the highest standard throughout. The contractor shall ensure that the standard of finish demanded by this contract is achieved. Branded materials shall be assembled, constructed and joined in accordance with the manufacturer's instructions and recommendations.

INSTALLATION OF EQUIPMENT/PIPES

The location of indoor and outdoor units shall be as instructed by the engineer or client or as shown on drawings. The support of the various items of equipment shall be the responsibility of the contractor. This shall include any necessary supports, cable trays if required, builders work and making good of anything that is broken during installation.

Copper pipes shall be installed above the false ceiling and passed through the soffit space to the outside. The cost of installing the systems shall include the passing of the refrigerant pipes through holes in the beams being used to support the ceiling. Any damage shall be made good at no extra cost to the contract.

Pipes shall be neatly routed though the beams and partition areas, given that all pipework will be visible. An approved method of bracketing shall be agreed upon before any works commence. All metal brackets used in the installation shall be galvanised. All pipes located outside the building shall be supported on galvanized steel cable tray and the tray shall be covered with a sheet metal cover for mechanical protection.

ELECTRICAL

Electrical works carried out in connection with the above detailed works shall be strictly in accordance with the latest edition of the I.E.T. and Enemalta regulations.

The electrical supply to the air-conditioning units shall be carried out by the contractor, his representative, or subcontractors. An adequate supply shall be located adjacent to each indoor/outdoor unit. All other electrical connections shall be the responsibility of the contractor.

COMMISSIONING AND TESTING

All commissioning and testing shall be carried out in accordance with the IHVE and British Standard guides to the full satisfaction of the Engineer.

The contractor shall be responsible to provide all test points, test instruments and any related equipment for carrying out such tests, even if such requirements are not detailed and specified elsewhere on these documents.

M.E. 6 ELECTRICAL POWER SYSTEM

General Notes

All installation components shall be of uniform design (similar parts interchangeable).
Materials compliant with standards other than BS (IEC, CENELEC, ISO, etc.) may be offered provided that the standard offered is equivalent to or more stringent than the corresponding British Standard.
All fittings and accessories fitted on the exterior of the building shall be weather-proof to IP66 and corrosion resistant.
Hardware and fasteners used in the exterior shall be in marine grade 316L stainless steel.
The installation shall conform to the current (18th) edition of the IET Regulations (BS7671) and the Electricity Supply Regulations.

Material used shall carry the CE mark and comply with the following standards:

Switchgear	EN 60439
Trunking	BS EN 50085
MCBs, MCCBs	BS EN 60898
RCDs	BS EN 61008
PVC cable	BS 6004
XLPE armoured cable	BS 5467, BS 6724
Plugs, sockets	BS 1363
Industrial plugs/sockets	BS EN 60309

MAIN DISTRIBUTION BOARD

The switchboard shall operate in service conditions of 0-45 °C (temperature range) and 50 - 90% relative humidity and shall be located in the main service room at ground floor level (level 0) as shown in the drawing.

The Contractor shall manufacture, supply, deliver and fix a galvanised steel mounting frame for fixing the switchboard thereon and shall separate the back of the switchboard from the wall by a distance of 100mm.

The switchboard shall be a modular wall-mounting 8-way MCCB panel-board, tested to BS5486, EN60439 or IEC439; consisting of outgoing MCCB section with integral busbars, modular incoming section, dedicated instrumentation section and modular cable passageways. All enclosure modules shall be of robust sheet steel construction, protected to IP40 or better and protected against rust and corrosion.

Cable entry shall be in single-core cables from the bottom of the switchboard and cable exit from the sides, top or bottom, each of which shall have a prefabricated metallic glanding plate. Alternative arrangements may be considered. The switchboard shall incorporate 250 A rated single copper busbars in high conductivity copper (with silver-plated joints). Suitable provision for earthing connection shall be included.

All components of the switchboard and switchgear shall be suitable for operation on a 400V, 50Hz 3-phase 4-wire system. The switchboard shall include gland plates, cable entry and exit boxes, glands and MCCBs for controlling the various outgoing circuits. All necessary hardware shall be included.

The switchboard shall incorporate a separate compartment module to accommodate a 250A main incoming moulded case circuit breaker with 50kA breaking capacity and adjustable overload current trip, with each terminal sufficiently large to take 95mm^2 cable. The switchboard shall also be able to accommodate 8 moulded case circuit breakers (MCCBs) of breaking capacity 25kA as described. All MCCBs are to comply with BSEN60947-2 and shall have a manual trip button and facility for locking in the OFF position. Protection is to be IP40. MCCBs shall accommodate the cable sizes specified in relevant drawings. Spare ways shall be blanked off with prefabricated blanking plates.

All incoming and outgoing MCCBs shall be fitted with a trip coil.

INSTRUMENTATION

The main distribution board shall incorporate instrumentation on the incoming supply for real-time reading of the following parameters:

Voltages between phases and phases to neutral
Phase current
Phase indication
Earth fault indicator
Real power, Apparent power and power factor
Energy consumption (kWh)
Total harmonic distortion (THD)

Instrumentation shall be flush mounted and situated at an easily readable level. Instrumentation shall be digital with data hold and peak hold function, backlit display with large characters and facility for data storage and transfer via USB or similar/equivalent connection.

Small wiring, minimum size 1.5mm2 to BS6004 or BS7211, shall be neatly bunched using cable ties and shall be run in slotted trunking. All instrumentation and control

components shall be protected with fuses of suitable rating, housed in DIN rail mounting carriers. A pack of spare fuses is to be supplied.

The main distribution board shall incorporate adjustable earth fault monitoring system consisting of adjustable earth fault sensor/indicator (30mA - 1A with time delay) and either one ovoid core balance transformer or 4 no. current transformers.

An indelible warning sign indicating the voltage and current rating of the switchboard shall be permanently fixed onto the front cover of the enclosure. MCCBs shall be individually, indelibly and clearly marked for quick identification according to phase and circuit reference. All circuit labelling shall be on engraved rectangular plastic plates having white text over black background. Alphanumeric wiring sleeves shall be used for identification of cables in accordance with the as fitted drawings.

The switchboard shall be tested with an insulation voltage of 1kV. Outgoing and auxiliary circuits shall be tested in accordance with the IET Regulations. The installation, switchboard and earthing shall be certified by the Contractor's electrical engineer.

SURGE SUPPRESSION DEVICE (SSD)

The Contractor shall also supply and install a 3-phase, IP54 surge suppression device to BS6651 which shall preferably be housed within the switchboard enclosure in one of the MCCB slots. Housing the SSD in a separate polycarbonate or metallic enclosure may be considered, provided that the enclosure is fitted with a transparent face-plate. The SSD shall be capable of handling surges of minimum magnitude 20kA occurring in the installation as rated, with a maximum response time of 10ns. The SSD shall incorporate line protection indicators and relay outputs for remote signalling. Units with surge counting facility will be preferred.

OVER AND UNDERVOLTAGE PROTECTION DEVICE

The main distribution board shall be protection by a 3 phase, 4 pole, adjustable over and undervoltage protection device (including tripping relay). The module is to be house within the main distribution board or externally. The device is to be rated at 400 V and is to have indication LEDs showing normal power status or abnormal conditions. The device is allow the use to configure the undervoltage, overvoltage and time delay (for both on and off cycles) settings. Relay tripping time is to be no more than 30 ms.

DISTRIBUTION BOARDS

Distribution boards shall comply with BS5486 and shall contain a main incoming circuit breaker, and RCBOs for controlling power and lighting circuits, or fully rated differential earth leakage circuit breaker/s (RCD) and MCBs for controlling circuits (as per DB schedule). MCBs/RCBOs in all of the above shall be individually, indelibly and clearly marked for quick identification according to phase and circuit reference. All circuit breakers shall be of an appropriate current rating. Distribution board enclosures shall be dust proof of metallic construction. An indelible voltage warning sign shall be permanently fixed onto the front cover of every distribution board. Each distribution board shall be clearly and indelibly marked with its voltage and current ratings and the equipment each component controls. Circuits shall be so distributed that the load is balanced to within 10% over the three phases. Distribution boards shall be surface-mounted.

Outgoing miniature circuit breakers (MCBs) shall be 4 pole, whereas RCBOs are to be 2 pole, complying with BS3871 and having a minimum breaking capacity of 6kA. Residual current devices (RCD) shall be DIN rail mounting, 4-pole differential type with a differential activating current of 30mA to BS4293. All protective devices shall be capable of accommodating the specified cable sizes.

Moulded-Case Circuit Breaker (MCCB)

Moulded-Case Circuit Breakers (MCCB) shall comply with IEC 60947-1 and 60947-2 standards and shall be of category A with a rated service breaking capacity (Ics) equal to the ultimate breaking capacity (Icu) as defined by IEC 60947 –1 and IEC 60947 -2, and IEC 60664-1.

MCCBs shall provide class II insulation (according to IEC 60664-1 standard) between the front and internal power circuits. For maximum safety, the power contacts shall be insulated in an enclosure made of a thermosetting material from other functions such as the operating mechanism, the case, the trip unit and auxiliaries.

All poles shall operate simultaneously for circuit breaker opening, closing and tripping. MCCBs shall be actuated by a toggle or handle that clearly indicates the three positions: ON, OFF and TRIPPED.

In order to ensure suitability for isolation complying with IEC 60947-2:
- the operating mechanism shall be designed such that the toggle or handle can only be in OFF position (O) if the power contacts are all actually separated,
- in OFF position, the toggle or handle shall indicate the isolation position.

Isolation shall be provided by a double break on the main circuit.

MCCBs shall be equipped with a “push to trip” button in front to test operation and the opening of the poles. MCCB rating, “push to trip” button, performances and contact position indication must be clearly visible and accessible from the front, through the front panel or the door of the switchboard.

MCCBs shall be capable of greatly limiting currents. For short-circuits, the maximum thermal stress I^2t shall be limited to:
- 106A2s for ratings up to 250 A,
These characteristics will allow high cascading performance with moulded-case or miniature circuit-breakers downstream.

MCCBs shall be equipped with a tripping unit independent of the thermo-magnet or electronic one. This unit will trip the circuit-breaker for high value short-circuit currents. The breaking will be carried out in less than 10ms for short-circuit currents above 25In.

MCCBs, the current ratings of which are identical with the ratings of their trip units, shall ensure discrimination for any fault current up to at least 35 kA rms, with any downstream circuit-breaker having a current rating less or equal to 0.4 times that of the upstream circuit-breaker.

The electrical durability of MCCBs, as defined by IEC 60947-2 standard, shall be at least equal to 3 times the minimum required by the standard.

MCCBs shall be equipped with a self-test of the connection between the electronic trip unit, the current transformers and the actuator, that will not cause the circuit-breaker to trip. The self-test will be of positive logic and visible through the flashing of a green LED in case the self-test occurred correctly and the extinction of the LED in case the self-test failed.

It shall be possible to assemble earth fault protection moulded-case circuit breakers by adding a residual current device (RCD) directly to the circuit breaker case. The resulting device shall:
- comply with appendix B of IEC 60947-2 standard,
- be immunised against nuisance tripping as per IEC 60255 and IEC 61000-4 standards,
- operate without an auxiliary power supply, i.e. it shall be capable of operating normally on any 2-phase or 3-phase power network with a voltage between 200V and 440V, and of tripping the circuit-breaker even in the event of voltage dips down to 8V.

It shall be possible to equip MCCBs with devices indicating faults without tripping the circuit breaker. MCCBs shall be equipped with fully interchangeable trip units in order

to ensure the protection against overcharge and short-circuit. The trip units shall be either of: thermal-magnetic; or electronic.

Electronic and thermal-magnetic trip units shall be adjustable and it shall be possible to fit lead seals to prevent unauthorised access to the settings. Electronic trip units shall comply with appendix F of IEC 60947-2 standard (measurement of RMS current values, electromagnetic compatibility, etc.). Protection settings shall apply to all circuit breaker poles. The trip units shall not augment overall circuit breaker volume. All electronic components shall withstand temperatures up to 125 °C.

MINIATURE CIRCUIT BREAKER (MCB)

Miniature circuit breakers shall comply with BS 3871 and are to provide short circuit and overcurrent protection. The MCB's shall be rated for operation with an electrical supply of 230/415 V, 50 Hz and shall be of the flip-on type.
Short circuit rating for incoming MCB's shall be 10kA minimum.
Short circuit rating for outgoing MCB's shall be 6kA minimum.

RESIDUAL CURRENT DEVICE (RCD)

All RCD's installed shall conform to BS EN 61008-1:1995 and shall provide leakage current protection. The RCDs shall be rated for operation with an electrical supply of 240/415 V, 50 Hz and shall be of the flip-on type. They shall have a minimum tripping current of 30mA unless otherwise specified. The RCDs shall include a zero current transformer (ZCT) and permanent electro-magnet or electronic tripping mechanism, having a high sensitivity for detecting and cutting off faulty current.

RCBOs

These shall be similar to the Residual Current Device described above but shall also include integral over-current protection. These shall have similar short circuit current characteristics as MCBs. RCBOs shall in general be of double pole (single module) or 4 pole type (4 module), as indicated on the electrical schematics. In case where 4 pole RCBOs are too bulky, the contractor is to ask the contracting authority and engineer for written permission to use a standard 4 pole MCB of suitable type, depending on the device the breaker will be protecting.

ISOLATORS

All electrical equipment is to be supplied with a means of isolation either fitted to the equipment, or mounted adjacent or within near proximity, to enable the electrical supply to be manually and readily disconnected, all in accordance with the latest edition of the IET. Wiring Regulations and be labelled accordingly.

All starter/isolators for motors shall have no-volt release coils incorporated, to prevent the motor restarting if switched off remotely and then re-energised (unless part of automatically controlled plant). Isolators to have facility for locking in the 'off' position if required.

CABLE MANAGEMENT, AND CONDUIT ROUTES

All the electrical wiring installation shall be carried out using the appropriate type and size of conduit and trunking or other approved cable containment system as approved by the Engineer. The trunking and conduit routes shall be shown on working drawings and approved by the Engineer prior to being carried out.

All PVC conduit and final wiring accessories including circular boxes, socket outlets, telephone outlets, switch boxes, switches, etc and shall comply with the requirements of BS4607 and BS6099 or any other equally approved standard. Unless otherwise specified, the conduit used shall be of a rigid, medium gauge, high impact PVC material, or similar plastic material having good bending properties and characteristics. The material shall have high resistance to impact and chemical damage and shall be easy to assemble on site.

All lighting, power and extra low voltage cables shall be installed in separate conduit runs and no circuit of any one system shall be installed in the same conduit of another system. Conduits having a size smaller than 20mm in diameter and the use of flexible conduit shall not be allowed. In general, conduit shall be sized according to the number of cables which shall need to be passed through.

All PVC insulated cables shall be protected throughout their length with trunking and conduit and associated loop-in, angle inspection and outlet boxes. The use of elbows and tees shall not be allowed in the works.

All cable conduits and accessories shall be routed beneath the raised flooring or around the protected lift core. If this is not possible, sheathed cables having the appropriate mechanical protection, are to be routed along routes as indicated by the contracting authority. Cables are also to be painted over so as to produce minimal visual impact. All trunking, conduit, accessories and equipment shall be fixed in position in accordance with manufacturer’s or suppliers recommendations and with the full and correct size of fixing bolts, screws and rawl plugs, saddles, brackets, rawl bolts, and other fixings as appropriate to the surface to which they are being fixed and at a spacing of not more than 1.5m apart.

Conduit shall be jointed and terminated utilising the appropriate components as supplied by the conduit manufacturer. No contractor manufactured fittings or joints shall be utilised. Precautions shall be taken to prevent cement, duct and dirt from entering the conduit and trunking. All conduit runs, especially horizontal run beneath raised flooring, shall be protected from damage by other tradesmen and machinery during the construction and finishing of the projects by appropriate means.

Conduit boxes carrying accessories including flush boxes for switches, socket outlets and lighting outlets shall be independently fixed to the building using appropriate number, size, length and type of screws.

All draw-in, junction and inspection boxes shall be easily accessible for wiring purposes. Draw-in boxes shall be so installed so that there are no more than two 90 degree bends between them. Conduit shall not be installed in runs of more than 10m without draw-in boxes. All conduit joints shall be soundly made. Conduits shall be connected to trunking with couplers and male bushes.

Chasing in wall is not permitted unless authorised by the Contracting Authority, in writing. Where permitted, chases and holes shall be made good.

A number of lighting points are to be installed in steel structure, and thus wiring to these points and similar ones has to be neatly done in galvanised steel.

All conduits and trunking shall be thoroughly de-burred and cleaned before cables or wiring drawn-in. The use of any type of liquid to assist in the drawing of wires in conduit shall not be allowed. Appropriate powder lubricant may be used for this purpose.

Galvanized steel conduit and fittings shall conform to BS 4607. Conduit shall be jointed and terminated using appropriate components as supplied by the conduit manufacturer. Saddle supports are to be at 1.5m intervals and outdoor installations shall be rendered watertight. Conduit lengths shall be mechanically and electrically continuous and bonded to the main earth terminal forming a completely bonded system. The use of conduit as a means of earthing a circuit shall not be acceptable. Steel conduit shall be bent us using appropriate bending machines, all bends being neatly made without restricting the bore. Steel conduit shall also be fitted with expansion couplers wherever the conduit crosses expansion joints.

LIGHTING POINTS AND POWER OUTLETS

Unless otherwise specified, socket outlets shall be moulded, white in colour, double-pole switched and shuttered to BS1363. Socket outlets in the kitchenettes area shall incorporate a neon indicator.

Given installation constraints, specifically associated with chasing in walls, which is not permitted, the contractor will be directed by the contracting authority to shift all points to a level that coincides with the raised flooring system and gpysum boards lining the structure. Therefore, all wiring shall be routed thorugh pipework and cable trays concealed by the gypsum lining, and all outlets shall be fixed with the gypsum lining.

Fused Connection Units

Fused connection units shall be of the 230V, 13A, double pole switched type. They shall be manufactured from white moulded PVC and shall have a red neon pilot light unless otherwise indicated. The fused connection units shall be supplied complete with a 13A fuse to BS1362 and all necessary fixing screws etc. for a complete installation. They shall be suitable for flush mounting unless otherwise indicated. Wherever applicable, the fused connection units shall be provided with a cable outlet. All connection units shall be mounted on 35mm deep boxes.

WIRING

The installation shall be wired with single-core PVC-insulated cables with conductors having a cross-sectional area of not less than 1.5 mm^2 in the case of radial lighting circuits and $4mm^2$ for power circuits. Single-core cables shall conform to BS6004 or BS7211. The use of single-stranded conductors is not permitted. All fuses, single-pole switches and single-pole circuit breakers shall be connected on the phase conductors only.

Loop connections shall only be made at the terminals of accessories. Only two cables may be loop-connected at any point. Joints in cables are strictly prohibited. The number of cables in a conduit shall conform to the relative limit as set in the IET Regulations. Cables shall be grouped together in circuits using cable ties. The use of adhesive insulating tape is prohibited. The use of 3-core sheathed cable clipped or fastened directly to walls or other stonework is also forbidden.

All cables shall be colour-coded (according to Harmonised System) for identification, in particular Green/Yellow for Earth. Cables in any other colour will not be allowed. Cables shall be fitted with marking sleeves at the terminations for further identification and in correspondence with the as fitted drawings.

EARTHING AND BONDING

The contractor shall be responsible for the bonding and earthing of all exposed metalwork, structural steel and gas, fire-fighting and water services metal pipework, trunking etc. via a CPC conductor and connected to the main earthing termination at the origin of installation in accordance with the IET regulations. Trunking installations shall include copper earth clips linking the different sections of the trunking.

The main earth conductor shall be properly earthed with an earth mat and shall be installed adjacent to the Enemalta supply intake point. The earth conductor shall also be connected to the Earth Termination supplied by Enemalta, as this will be provided direct from the substation. The earth electrodes shall consist of solid copper 2.4 metre long - 20mm diameter earth rod. The earth rod shall be installed in a purposely constructed earth hole which shall be backfilled with bentonite or marconite backfilling agent. An earth inspection pit shall also be installed and this shall have a marked cover and all test points necessary for a complete installation as per IET regulations. The maximum earth loop impedance of the earth rod and/or earth mat shall be 0.10 Ohms. The earthing and bonding installation shall be properly tested by the Contractor and a test certificate shall be provided.

Earthing conductors at the main earth bar shall be terminated using appropriate lugs and bolted to the earth bar. All electrodes are to be interconnected via single core 25 mm^2 cable.

LIGHTNING PROTECTION SYSTEM

The contractor is to provide for a Lightning Protection System for the safety of the building and occupants by eliminating damage to the structure caused by lightning. The materials, method of installation and testing and certification shall conform to BS EN 62305: 2006 - Protection against lightning

The system design shall be for a Lightning Protection System (LPS) for the structures designed to as per IEC 62305-3.

It shall include the labour, materials and services required for a functional and inconspicuous lightning protection system. It shall comprise the installation of an Early Streamer Emission terminal air rod or equivalent means, including the mounting of the ESE air rod on a galvanized mast, installation of copper tape measuring 25mm X 3mm, installation of a lightning strike counter plus the necessary earth electrodes and the connecting up of the copper tape down drops to the earth rod and testing.

The equipment supplied and the installation shall conform to BS EN 62305: 2006 - Protection against lightning

All items necessary to provide a complete functioning installation shall be included whether or not they are detailed within this specification.

After completion of the lightning protection system the contractor shall conduct all the necessary testing of the lightning protection system and the earth electrode in accordance with BS EN 62305:2006 and submit an official certification of the lightning protection system as part of the commissioning. The report is to be endorsed by the warranted engineer representing the contractor.

The lightning protection installation (all material and works) detailed in this specification and the above tests and compliance certificates shall comply with the following

- European and British Standards Institution documents MSA EN or BS EN or IEC standards or their equivalent
- lET Wiring Regulations " Requirements for Electrical Installations " 18th Edition including amendments
- Electricity Supply Regulations issued by Enemalta Corporation including amendments
- Standard Orders (Malta Board of Standards)
- Building Regulations (Malta)
- Health and Safety Regulations
- Good trade practices and other applicable regulations

AUTOMATIC POWER FACTOR CORRECTION UNIT

The automatic power factor correction unit shall be a durable, self-supporting, steel structured assembly as per international standards. It is intended for indoor applications on 400V 3 phase supply, in ambient temperatures up to +40 degrees C. The automatic PFC shall add or remove kvar in predetermined steps as required by the load. Fluctuating loads are tracked using a current signal from a current transformer which monitors the total system load and a voltage signal from a potential transformer mounted in the capacitor bank. The controller shall monitor the reactive power being drawn from the utility system and automatically switches capacitors (and / or reactors) on or off as required. The automatic system prevents over-correction at light load conditions and supplies essential kvar as the load increases to reduce voltage drop and improve the power factor of the system.

The automatic PFC shall be of appropriate size to cater for the entire load at St. Thomas Tower, Marsascala. Its cost shall include also for the required switchgear and current limiting fusing and current limiting devices to reduce inrush currents produced by back-to-back switching. It shall be equipped with capacitors (and reactors as necessary), contactors for switching and all the necessary accessories to form the automatic PFC.

The automatic PFC enclosure shall be free standing metal housing, supplied with vented doors to allow for ventilation and cooling of the control components.

Prior to the procurement of the PFC unit, a detailed energy analysis is to be carried out yielding continuous reading for at least one month. The data is to include line to line voltage, line to neutral voltage, current across each phase, neutral current, total harmonic distortion, power factor, real power and reactive power. Once the data is tabulated and a load profile for the property established, the contractor is to design and supply a PFC unit that is tailored to achieve as close to unity power factor as possible. It may be found necessary that the PFC unit might have to cater for both leading and lagging power factor, given the nature of the load.

FLOOR SERVICE BOXES

The Contractor shall install floor service boxes as part of raised flooring setup where indicated in drawings.

The contractor shall supply and install suitable floor service boxes of an area approximately 220mm x 220mm and 75mm deep, to take a double power socket outlet and double RJ45 CAT 6 outlet. The floor box shall be made of a strong anti-corrosive metal (stainless steel) for a robust construction, with metal compartments that separate data and power properly. Each service box shall include cable retainers to hold cables in place and prevent them being pulled out or damaged between the lid and trim, and various knockouts of different sizes per compartment for conduits. The lid shall be of strong material (brushed stainless steel) and shall be suitable flush and can be covered with flooring/tiling material.

Floor service boxes shall include all necessary plates and equipment to provide the necessary number of socket outlets, and shall include space or compartment to house the necessary protection if requested by the Engineer.

STANDALONE FEEDER UTILITY (WATER & ELECTRICITY) PILLARS

It is planned to provide 2, stand alone, feeder utility pillars in the ditch surrounding San Tumas fort. Each pillar will be able to provide electricity and water for use during

events or for maintenance purposes. Pillars are to have high ingress rating as well as good vandal protection. The location of each pillar is marked on drawing *MSC06-06-power*.

Each pillar is to meet the following minimum specifications :

- Approximate size of 400 mm x 300 mm x 1200 mm [w x l x h]
- Body made of coated, rubberized steel or hot dipper galvanized steel conforming to BS EN 1461
- Have hinged door with brass earth point and waterproof seal
- Have cable louvre in user compartment such that door can be closed without crushing or damaging the cables
- Lockable from two points at 2 corners
- Incorporate internal document holder for storage of manual and circuit diagram
- Distribution board within pillar having main switch rated and RCD both rated at 63 A
- 16 A MCB for each interlocked socket 1P+N+E
- 32 A MCB for each interlocked socket 3P+N+E
- 4, 16 A, interlocked socket outlets 1P+N+E having blue cover
- 2, 32 A, interlocked socket outlets 3P+N+E having red cover
- Low consumption indicator LEDs
- Provision for 1/2” water outlet including lockable bib tap
- Have ingress protection rating of IP66
- Have vandal resistance rating of IK 10
- Have a dedicated earth electrode rod of minimum cross sectional area 25 mm^2

The contractor is prepare a route, after consultation with the contracting authority, through which the supply cables and water pipes shall be laid and routed. The slit trench is to be dug by the contractor and shall be deep enough so that any landscaping operations undertaken will not harm the cable or pipe in any way. Inspection chambers are to fabricated every so often and wherever the trench changes route. The feeder pillars are to be affixed onto a concrete plinth, above an inspection chamber through which the cable and pipe will be routed and connected to the pillar itself. Each pillar is to have its own dedicated earth electrode.

LUMINAIRES

The Contractors shall supply and install luminaires as per ‘Lighting’ section.

The contractor is to submit the specs to the project engineer for approval at implementation stage but prior to purchasing any lightings

TESTING AND COMMISSIONING

The installation shall be inspected by the Engineer/Contracting Authority during the period of works and shall be tested according to the recommended IET procedure by the Contractor, in the presence of the Engineer/Contracting Authority, upon completion. Works shall be regarded as completed only when the installation satisfies the above tests. The Contractor shall certify, upon completion of works that the installation is safe and complies with IET and Enemalta Regulations. The safety, integrity and reliability of the installation shall be the responsibility of the Contractor only. The following tests shall be performed as a minimum:

- Continuity of ring final conductors and protective conductors
- Polarity
- Earth fault loop impedance
- Insulation resistance
- Operation of Residual Current Devices
- Phase Sequence
- Voltage tolerance
-

The Contractor shall also prepare and submit, on behalf of the Contracting Authority, an application form to Enemalta Corporation for the provision of up-rated electricity supply to the premises. A dedicated earth cable, direct from the substation, of minimum cross sectional area 70 mm^2, shall also be supplied. Application fees shall be paid by the Contracting Authority.

TECHNICAL ADVICE, TRAINING AND DOCUMENTATION

Contractor shall offer technical assistance to enable the Client to derive maximum benefit in using the electrical system, especially during the initial stage of operation. Contractor shall provide training in system operation, and all applicable procedures to the employees at St. Thomas Tower. Contractor shall provide all keys, tools and software necessary for system operation as well as complete set of manuals in the English language and a complete set of "as fitted" drawings.

MANUALS AND AS FITTED DRAWINGS

As part of commissioning of the Electrical System, the Contractor shall submit to the Client one set of Operation and Maintenance manuals for all the equipment. The manuals shall be in English and shall include operation and maintenance instructions, test and commissioning records, technical literature and wiring diagrams.
The Contractor shall provide as fitted drawings in the form of three sets of prints and one copy in ACAD on disk. The drawings shall include a schematic drawing of the Electrical System.

WARRANTY

The System including all equipment, materials and workmanship shall be covered by a minimum guarantee period of three years from the date of commissioning of the System against defects in materials and bad workmanship. The Contractor shall guarantee the availability of spares for all equipment of the Electrical System for a period of ten (10) years from the date of commissioning.

M.E. 7 LIGHTING

GENERAL

The contractor is to submit detailed and clear specifications to the project engineer for approval at implementation stage but prior to purchasing any light fittings. Each type of fitting is to be clearly marked so as to avoid confusion.

Unless otherwise specified, all luminaries are to be supplied complete with fixing brackets, lamps and control gear. All metallic luminaries are to be guaranteed to be resistant against corrosion.

All emergency lighting shall have factory fitted batteries (providing at least 3 hours of autonomy) and controllers. Fittings converted to emergency lights locally shall not be acceptable.

All lighting shall be of the LED type and shall guarantee a minimum of 80% of original lumen output after 25,000 hours. This guarantee is to be included as part of the technical literature submitted to the engineer.

All types of luminaries shall be approved by the Contracting Authority prior to installation. The installation and configuration of the intelligent lighting system shall be as described below and as shown on the drawings. The contractor shall submit a set of Working Drawings, in accordance with the latest architectural layouts, finishes and requirements for approval before the installation is started. The drawings are to be amended and corrected in accordance with the comments of the Engineer before installation.

TYPES OF LUMINAIRES

Type A

Indirect lighting for meeting rooms - 4000 lumens track spotlights with a colour temperature of around 3000 K and a CRI of 80. The lens shall be of the wide oval type to ensure good wall washing. These shall have polycarbonate housing in white colour and shall include a driver/power supply unit compatible with the lighting system controller.

Type B

Direct down lights for Levels 0, 1 & 2 – These shall be track spotlights with at least 1200 lumens, wide angle beam, with a honeycomb diffuser for reducing glare, 3000 K colour temperature and a CRI of 80. These shall be of polycarbonate housing in white colour, mounted on a compatible track and controlled through voltage trimming.

Type C

Reception Lights: Installed under second Intermediate Floor - These shall be track spot lights with 5000 lumens, medium beam angle with a honeycomb diffuser for reducing glare, 3000 K colour temperature and a CRI of 80. These shall be of polycarbonate housing in white colour, mounted on a compatible track and controlled through 240V trimming.

Type D

Uplighters on wall lined areas in ground floor (Hall 1) except entrance way - These shall be of the linear fixture type with a minimum 310 lumens per foot (0.3 m) and minimum CRI of 80. These modules shall be able to produce a continuous light pattern on the wall at 3000 K colour temperature. The housing shall be die-cast aluminium with white powder-coated finish, a polycarbonate lens and shall include a driver/power supply unit compatible with the lighting system controller.

Type E

Uplighters on wall lined areas in ground floor entrance and passage way – These shall be of the linear fixture type with a minimum 2000 lumens and minimum CRI of 80. These modules shall be able to produce a continuous light pattern on the wall at 3000 K colour temperature. The housing shall be die-cast aluminium with white powder-coated finish, a polycarbonate lens and shall include a driver/power supply unit compatible with the lighting system controller. These shall have ingress protection rated at IP66.

Type F

Uplighters on wall lined areas in ground floor Hall 2 – These shall be of the linear fixture type with a minimum 3000 lumens and minimum CRI of 80. These modules shall be able to beam light at an angle of 15 x 30° and be able to produce a continuous light pattern on the wall at 3000 K colour temperature. The housing shall be die-cast aluminium with white powder-coated finish, a polycarbonate lens and shall include a driver/power supply unit compatible with the lighting system controller.

Type G_1

Uplighters on wall lined areas in ground floor Hall 2 – These shall be of the linear fixture type with a minimum 3000 lumens and minimum CRI of 80. These modules shall be able to dissipate light at an angle of 60 x 30° and be able to produce a continuous light pattern on the wall at 2700K colour temperature. The housing shall be die-cast aluminium with white powder-coated finish, a polycarbonate lens and shall include a driver/power supply unit compatible with the lighting system controller.

Type G_2

Uplighters alongside exterior walls in ditch – These shall be of the linear fixture type with a minimum 12000 lumens and minimum CRI of 80. These modules shall be able to dissipate light at an angle of 60 x 90° and be able to produce a continuous light pattern on the wall at 3500K colour temperature. Fittings are to be angled slightly inward to achieved the maximum wash effect possible on the sloping walls. The housing shall be die-cast aluminium with white powder-coated finish, a polycarbonate lens and shall include a driver/power supply unit compatible with the lighting system controller. These units are to be rated at IP 66 and IK 10 respectively.

Type H

Lights highlighting the hanging artefacts in Hall 2 – Hanging artefact lights with a 15° beam angle. These shall have a lumen output of 1200 with a minimum of CRI of 80. These shall include a driver/power supply unit compatible with the lighting system controller.

Type I

Lights highlighting the hanging artefacts in Hall 2- Hanging artefact lights with a 25° beam angle. These shall have a lumen output of 1200 with a minimum of CRI of 80. These shall include a driver/power supply unit compatible with the lighting system controller.

Type J

Spots mounted on the lift canopy –1200 lumens spotlights with a colour temperature of 4300 K and a CRI of 80. These shall provide a narrow beam angle of 10°. The housing shall be die-cast aluminium with white powder-coated finish, with an ingress protection of IP66 and shall include a driver/power supply unit compatible with the lighting system controller.

Type K

Under canopy spots – At least 500 lumens, to give a 25° beam angle of 4000 K light and a CRI of 80, these recessed lights shall be made of sanded chromed brass and polymer body, with an ingress protection of IP68. These shall be of the walkover type with glass protection and water-proof cable gland.

Type L

Bollards to be mounted at the edge of the raised flooring to highlight the edge for safety reasons – These bollards shall have dimensions of approximately 160mm x 200mm x 700mm [l x w x h] and shall be made of die-cast aluminium with white powder-coated finish, with an ingress protection of IP65.

Type M

Spotlights to be mounted in roof decking – Giving a 4000K light and a CRI of 80, these recessed lights shall be made of sanded chromed brass and polymer body, with an ingress protection of IP67. These shall provide lateral emission of light through 2 exit slots at 90°, with glass protection.

Type N

Ceiling surface lights for all three remaining rooms on roof – These shall be surface-mounted giving a minimum 4000 lumens and minimum CRI of 80. These modules shall be of the linear type having 1200mm length and able to produce a continuous light pattern on the wall at 4300 K colour temperature. The housing shall be polycarbonate with grey finish. These shall have a ingress protection of IP65.

Type O

Ceiling surface Emergency lights for all three remaining rooms on roof - These shall be surface mounted and giving a minimum 4000 lumens, minimum CRI of 80, and able to produce a continuous light pattern on the wall at 4300 K colour temperature. The housing shall be polycarbonate with white finish. These shall have a ingress protection of IP65 and a battery back-up for at least 3 hour autonomy of emergency lighting.

Type P

Recessed lights for bridge walkway – These shall provide a minimum 250 lumens of 300 0K light and a CRI of 80 at a 45° medium beam angle and shall be made of sanded chromed brass, with an ingress protection of IP68 and mechanical protection of IK10 (vandal resistant). These shall be of the walkover type with glass protection and water-proof cable gland, and shall include a driver/power supply unit compatible with the lighting system controller.

Type Q

Led floodlights for all four sides of exterior walls – Providing a wide beam of minimum 9500 lumens of 3000 K light and a CRI of 80, these flood-lights shall have an aluminium housing of grey colour, with an ingress protection of IP66 and mechanical protection of IK10 (vandal resistant). It shall have clear glass and water-proof cable gland, and shall include a driver/power supply unit compatible with the lighting system controller.

Type R1

LED low level luminaires integrated in refurbished rubble wall – Having a colour temperature in the range of 4000 K and providing at least 1200 lumens, this circular or square recessed fitting is to be integrated into the rubble wall and provide directional downlight, thereby illuminating the footpath. A beam angle of 120° is requested. In addition, the fittings is to be rated at IP 66 and IK 10.

Type R2

LED low level luminaires integrated in basement walls – Having a colour temperature in the range of 3000 K and providing at least 1000 lumens, this circular or square recessed fitting is to be integrated into the staircase wall and provide directional downlight, thereby illuminating the steps. A beam angle of no less than 120° is requested.

Type S

Pole / ceiling mounted LED floodlights – Providing a minimum lighting efficacy of 6000 lumens and colour temperature of 4000 K to 4300 K. The luminaires shall be securely housed within an IP 65 rated enclosure having adjustable bracket that is also corrosion resistant, having a clear lens and a high transmittance reflector. The enclosure should be of zero maintenance type, have a lifetime of 50000 hours and a beam angle of 120°. Fixing to lamp post shall be achieved via robust 316 L stainless steel fixtures.

TRACK LIGHTING SYSTEM

Contractor shall supply, install and connect a modular track lighting system. The track shall be in white colour aluminium channel of uniform cross-section, having 3

independent 230Vac circuits (3-circuit track) and neutral tracks in copper as well as facility for earthing. The system shall be of modular construction and appropriate connecting elements shall be employed for coupling sections longitudinally, orthogonally and for taking feed from supply points at high level. The system shall be capable of taking a variety of luminaires with different lamp types using the same type of track connector. The track shall be suspended or surface mounted as directed by the Engineer/Contracting Authority.

CONTROL OF LIGHTING SYSTEM

The complete lighting system shall be of the intelligent type and shall be controlled via a fully scalable network of controllers. The controller shall control switching on/off of lighting points and shall save a minimum of 150 pre-set scenes. It shall provide also diagnostic features including (but not limited to): device online/offline status; ballast run-time tracking for each ballast; emergency test reporting; lamp and ballast failure reporting. It shall have a DIN Rail enclosure.

6-BUTTON KEYPAD

Users shall control the lighting in each area within St. Thomas Tower via a 6-button keypad of contemporary design. Each button shall be completely configurable such that it can either be used to switch on/off the lighting, or it can be programmed to switch a pre-set site-wide scenario with different light fittings at different settings, and can also be integrated with multiple sensors for automatic control. The keypad lights up to show the indicators/options and for user interaction. The keypad buttons and frame shall be of a white finish. One of the keypads shall have central LCD screen showing information such as temperature, time, channel level, and current scene, to be used for centralised control. The price of the keypads shall include the keypad communication module.

ETHERNET CONNECTION AND SOFTWARE

The Ethernet connection shall allow light control over the web or by using a mobile phone application. The software shall be compatible with the controller such that it allows full management of the lighting system.

360° PRESENCE AND LIGHT SENSOR

They shall be low profile, manufactured from durable compact material which is shock and impact protection. The unit shall have a slim profile design and shall have an anti-masking feature. The detector shall have adjustable PIR (Passive Infra-Red with ultrasonic sensor – motion detection), and lux sensor sensitivity and shall also have a time delay such that the lights are 'ON' for a defined period of time ranging from 1-20

minutes after the PIR has been triggered. The detector shall have an adjustable motion detection range between 3-12 metres. The main function of the Presence and Light detector shall be to detect presence, switch ON the lights and adjust the illuminance of the light fitting (via a dimmer LED driver) to keep the required pre-set lux level. The detectors shall be bypassed by the light controller.

TECHNICAL ADVICE, TRAINING AND DOCUMENTATION

Contractor shall offer technical assistance to enable the Client to derive maximum benefit in using the system, especially during the initial stage of operation. Contractor shall provide training in system operation, data retrieval and all applicable procedures to the employees at St. Thomas Tower. Contractor shall provide all keys, tools and software necessary for system operation as well as complete set of manuals in the English language and a complete set of "as fitted" drawings.

TESTING AND COMMISSIONING

On completion of the installation the Contractor shall engage a warranted electrical engineer to carry out a full inspection of the Lighting system. The warranted electrical engineer shall then carry out testing and commissioning of the system. The Contractor shall provide all test instruments, materials and labour for the testing and commissioning. The Contractor shall provide the Contracting Authority with a certification from the warranted engineer.

The contractor shall pay for all costs required for any additional equipment and/or accessories required to achieve satisfactory performance of the Lighting system in compliance with the specifications and to the satisfaction of the engineer.

MANUALS, AS FITTED DRAWINGS, RECORDS AND TRAINING

As part of the commissioning of the Lighting system, the Contractor shall provide the Engineer with:

- Two sets of operation and maintenance manuals covering all the security equipment installed including commissioning records, detailed circuit diagrams, wiring diagrams and lists of spares.
- As fitted drawings in the form of three sets of prints and one copy on disk. The drawings shall include a layout of the equipment and wiring on plans and a general schematic drawing of the whole system
- all keys, tools and software necessary for system operation as Contractor shall provide training in system operation, data retrieval and all applicable procedures to the employees.

All documentation must be provided in English.

WARRANTY

Warranty should cover the entire system and must be for a minimum period of 2 years against faulty workmanship and materials including consumables and on the operation of the system as a whole. If during this period any parts or equipment have to be replaced, the warranty on that part shall be renewed for another 3 years from date of replacement. The prospective contractor shall also guarantee the supply of spares and any consumables up to the next ten years following the award of the contract.

Maintenance

Contractor will be engaged to maintain the system for a period of three (3) years from commissioning. A tentative maintenance agreement is to be submitted, indicating price and services included, including call-outs for faults as well as ordinary system and reader checks. Offer rates for ALL items shall be binding for the duration of the Agreement.

In case of a fault in Lighting system/controller or light fitting, the supplier is bound to replace the light-fitting or repair fault within two (2) working days. Offered rates for ALL items shall be binding for the duration of the Agreement.

Preambles

The Contracting Authority is not bound to take all the items/material indicated in the BOQ. Tenderer is to take into consideration that works at St. Thomas Tower, Marsascala, are by their nature delicate and subject first and foremost to the conservation of the site. Therefore, full cooperation with the Administrators and the Engineers of St. Thomas Tower is highly requested.

M.E. 8 IT & TELEPHONY SYSTEMS

GENERAL

The Contractor shall carry out all aspects of supply, installation, setting to work, testing and handing over of the infrastructural networking equipment and telephone system for the St. Thomas Tower, Marsascala.

Network / Data and telephone outlets shall be RJ45 socket outlets respectively. The Contractor shall install the new network points as per drawings shall follow the Engineer's instructions.

STANDARDS

All installation components shall be of uniform design (similar parts interchangeable).

Materials compliant with standards other than BS (IEC, CENELEC, ISO, etc.) may be offered provided that the standard offered is equivalent to or more stringent than the corresponding British Standard.
Hardware and fasteners used in the exterior shall be in stainless steel.
The installation shall conform to the latest edition of the IET Regulations (BS7671) and the Electricity Supply Regulations.

All material and works included in this tender shall comply with the following:

- Latest IET Wiring Regulations
- Electricity Supply Regulations (Enemalta Corporation)
- Standard Orders (Malta)
- Building Regulations (Malta)
- British Standards and British Standard Codes of Practice, or equivalent:
- BS EN 62040-3
- BS ISO/IEC 27033
- EN50173-1

Electrical plant and equipment must not cause, or be unduly affected by, electromagnetic interference as per the EMC directive 89/336/EEC.
The active devices must be CE marked and comply, as minimum requirements, with ISO/IEC 14443 and ISO/IEC 18000-3.

Specifications for the Floor Standing 19" (Internal) Rack / Cabinet

Material	Steel
Dimensions	Minimum 1000mm deep x 800mm wide Minimum cabinet height floor standing – 24U
Standards	IEC 297-1 UNI 7142-(88) (Tempered glass standard)
Construction Features	Must allow for proper cooling airflow Complete protection against rust
Security Features	Removable and lockable side and rear panels Front door, single security glass panel, with handle and mounted key cylinder lock One set of keys per Cabinet to be provided
Power and Electrical Features	19" Switched Horizontal / Vertical power distribution unit (PDU) with 8 in quantity or more. Standard 13 Amp type sockets & 2.5 m power lead fitted with a 13Amp plug PDU Mains indicator Earth bar including set of earth leads for the

	earthing of side and rear panels
Mechanical Accessories	To cover with vented lid 19” rack mounting kit front and rear Set of 4 levelling feet IP ratings to be provided Plinths for cable entry side and rear
Accessories	One Unit of roof mountable 240V low noise 4 fans

Cabling System – Horizontal Cabling Installation

Recognized cables, associated connecting hardware, jumpers, patch cords, equipment cords, shall meet all applicable requirements specified in ANSI/TIA/EIA – 568-B.

The recognized media shall be:

- 100 Ω twisted pair cable, F/FTP Category 6
- Multimode optical fibre cable

The incoming cables shall have all 4-pairs terminated at patch panel and wall port outlets in accordance with the TIA/EIA 468B specification.
The horizontal cabling distance shall be the cable length from patch panel to wall port.

Network Outlets (Wall Ports) - RJ45 Cat6

Transmission Category Standard	ISO 11801 / EIA / TIA Category 6
Type	Spring loaded shutter
Cross Talk	Max. Cross Talk at 4Mhz with 258A Wiring should be better than -50dB
RJ 45 IDC Insert Dimensional Standard	Should be suitable for use with (3x3) plates – Low profile
RJ 45 IDC Insert Type	Spring loaded shutter, Wire Keyed, Krone IDC punch down; Accepts 22 to 26 AWG wires

Data Cable – Cat 6 F/FTP

Transmission Category Standard	Meets EIA/TIA 568 Premises Wire Standard. (to be approved by Engineer)
Cable Structure	4 pair UTP cables each pair twisted separately.

Shield	Aluminum / Polyester tape and continuity wire
Jacket Removal	Cable must include ripcord for ease of jacket removal
Insulation	Low Smoke Halogen Free type with minimum wall thickness of 0.25mm
Nominal Outer Diameter	Nominal 24 AWG, 5.1 sift plain copper conductor

Patch Panels (Punch Down Patch Panels RJ-45 – Cat6)

Type	24Way
Transmission Category Standard	Must meet the cable standards as specified under the data cabling section
Space	Occupies a space of 1U
Others	Identification tags or numbering for ease of identification of sockets

Fibre Optic Specifications - Fibre Optic cable

Type	Minimum 4 pair (8 core) 50/125um multimode strands Colour coded <1.25dB/km at 1300nm Flame retardant Halogen free Rodent resistant
Cabling Standard	EN50173 (or equivalent to be approved by Engineer)

Splice Trays

Rack Mounting	Adjustable mounting brackets – allowing a minimum depth of 220mm (Recessed slide-in unit type) Sliding tray to allow easy access

	Occupies not more than 1U 19" rack mount space
Pigtails	SC multimode coloured pigtails for splicing with cable
Adaptors	SC module adaptors
Accessories	Tray cover, splice trays, cable ties, fitting clips and all ancillary items for fibre splicing safety and security (Fully loaded) Front panel to include identification strip and space for proper labelling of each port.

Multimode Patch Cords

Operational wavelength	50/125 um
Mode of operation	Duplex
Connector Style	SC
Configuration	SC to LC standard

ELECTRO-MAGNETIC INTERFERENCE

All data cabling shall be separated from electrical power installations to avoid electro-magnetic interference (EMI). The Contractor is requested to install two separate routes (even in separate cable trays / trunking routes) for the data and the electrical distribution networks respectively.

All the data and telephony network routes should be physically separated from any electrical power sources. With respect to horizontal cabling, the minimum separation distance (without divider or non-metallic dividers in trunking) from unscreened power cables in parallel to CAT6 must be of 30cm or more. As with the rest of the installation, the contractor is reminded that routing of cables is to take place beneath the raised flooring or around the protected lift core. Should there be no other routes available other than to use exposed cable, CAT 6 FTP network shall be used that is also UV rated and painted to match the surroundings.

TELEPHONE SYSTEM

The contractor shall liaise with the telephone and internet providers for a complete provision of service, as per instructions from the Contracting Authority. The contractor shall carry out all aspects of supply, installation, setting to work and handing over to

designated maintainer of the telephone system. The contractor shall provide a structured telephone system in twisted pair cabling installed to the satisfaction of the responsible Engineer.

Telephone outlets shall be RJ45 socket outlets.

The telephone wiring shall be installed in the U-PVC trunking / cable basket system as part of the ELV works and drawn into PVC conduits to BS 4607. The contractor is reminded that routing of cables is to take place beneath the raised flooring or around the protected lift core.

The telephone outlets shall match all the other accessories used including the IT network outlets, electrical switches and socket outlets, etc.

The telephone system structure shall be powered from the main UPS.

FLOOR SERVICE BOXES

The Contractor shall install floor service boxes in the raised flooring where indicated in drawings.

The contractor shall supply and install suitable floor service boxes of an area approximately 220mm x 220mm and 75mm deep, to take a double power socket outlet and double RJ45 outlet. The floor box shall be made of a strong anti-corrosive metal (stainless steel) for a robust construction, with metal compartments that separate data and power properly. Any unused portions of the floorbox shall be covered with blank sockets. Each service box shall include cable retainers to hold cables in place and prevent them being pulled out or damaged between the lid and trim, and various knockouts of different sizes per compartment for conduits. The lid shall be of strong material (brushed stainless steel) and shall be suitable flush and can be covered with flooring/tiling material.

Floor service boxes shall include all necessary plates and equipment to provide the necessary number of socket outlets, and shall include space or compartment to house the necessary protection if requested by the Engineer.

LABELLING

Each cabinet, patch panel and wall / floor box port (both data and telephony) shall be labelled in an ordered manner and in a very understandable (easy to follow) way. The identification scheme for backbone cabling shall be in an organized and ordered way which will be easy to follow after the installation.

TWISTED PAIR CABLE CAT 6 TESTING

The Contractor must carry out Cable Testing and shall ensure that connectivity complies with the Category 6 standard. Testing may be performed with the tester at the distribution frame (patch panel) and the injector at the work area outlet (network wall port). The following field tests shall be performed on each network connection:

Wire Map: This test shall ensure that the two ends of the cable have been terminated pin for pin i.e. pin 1 at the patch panel goes to pin 1 at the wall port, pin 2 goes to pin 2 etc Basically this test shall ensure that the network connection is correctly wired up. The wire map also checks for continuity, shorts, crossed pairs, reversed pairs and split pairs.

Length Test: This test shall ensure that the length of the twisted pair cable-run is within the required limits between the central equipment cabinet and every individual network point. This shall also ensure that no abnormal termination/s (open-circuit, short-circuits or breaks) exist.

Near End Cross-Talk: This test shall analyse cable-pairs for any induced interference from proximity pairs due to eddy-currents generated by high speeds.

Attenuation: This test shall analyse signal-strength following passage through a complete circuit.

Attenuation to Cross-talk Ratio (ACR): This test shall compare the ratio between the decrease in strength, to the interference caused by signals in accompanying pairs.

Impedance: This test shall ensure that the impedance of the cable is constant across the normal operating bandwidth.

Capacitance: This test shall ensure that capacitance between any two pairs is within limits. This is done in order to avoid potential signal distortion.

Contractor shall provide the Contracting Authority with an electronic copy of the testing results of each wall / floor port on a CD. The test report shall include results tests listed above.

The Contractor must carry out relevant tests of optical fibre cabling where applicable.

UNINTERRUPTIBLE POWER SUPPLY (UPS) C/W BATTERIES

An online uninterruptible power supply shall be installed to power the IT network, and IT equipment, ELV and security systems and other loads considered as essential as per DB schedule, and to provide power backup in case of power failure.

The UPS shall be a 3kVA single phase double conversion online UPS system designed to provide regulated and conditioned sinusoidal power to both linear and non-linear type

loads. The UPS shall provide uninterruptible power during all modes of operation, at a nominal output Voltage of 230V. There shall be no interruption of power to the critical load when the UPS transfers to and from battery operation.

The UPS shall be:

- Online (Double Conversion)
- Rack mount
- Output of 230V
- Input Voltage Range of 205V – 250V
- Three Phase In/Out
- Output frequency of 50Hz ± 0.5% , or synchronized with mains frequency
- Autosensing Input frequency of range 40 - 60Hz.
- Automatic/manual Bypass
- Emergency Power Off
- Temperature: From 0 to 45 °C
- Remote On/off
- The UPS batteries shall provide autonomy of a minimum of 2 hours at full load, and shall allow for the connection of additional batteries.

The UPS shall include a multi-functional LCD Online UPS Panel showing:

- O/P Voltage
- O/P Load (%)
- Battery Charge (%)
- O/P Frequency
- O/P Wattage (W)
- Temperature (Degree Celsius)
- I/P Voltage (V)
- O/P VA
- I/P Frequency
- O/P Current (A)
- Rating (A)
- Battery Voltage
- Back up time (Min.)

The UPS LCD Panel may contain only some of the above, in which case the Engineer shall be consulted prior to installation.

The UPS shall provide the following features:

- Cold start function (DC power on)
- Lightning and surge protection
- Battery replacement warning
- Schedule shutdown & reboot
- Hot swappable battery by user
- Emergency Power Off function
- Battery remain time display
- LCD display front panel
- Optional SNMP Card Slot
- Wide Input Voltage range
- Power Factor Correction
- Manual Bypass setting
- EMI/RFI noise filter
- Support USB Communication
- Multiple languages LCD Display
- On line output voltage selected
- True on-line technology provides all power protection
- Pure sine-wave output with less than 3% THD
- Fully digitized microprocessor controlled
- Short Circuit and overload protection
- Advanced Battery Management (ABM)
- Automatic Battery charge in UPS off mode
- Automatic diagnostics & battery check
- RS-232 communication port with monitoring software
- Network/modem surge protection
- History record of power failure events
- Software monitoring
- Extended back up time with battery pack
- Optional Extension battery pack
- Load segmentation receptacles controllable
- High Efficiency mode selectable
- Fan speed auto control when load varies

The UPS LCD Panel may contain only some of the above, in which case the Engineer shall be consulted prior to installation.

BATTERY TYPE:

Sealed, maintenance free lead acid batteries

Management: self-test, adjustable battery transfer points and alarm settings

Battery Protection: cut off without draining any current when battery is low

Cold Start (DC Start)

Shall provide 2hours autonomy for the UPS at full load.

TESTING AND COMMISSIONING

The installation shall be inspected by the Engineer or his representative during the period of works and shall be tested according to the recommended IET procedure by the Contractor, in the presence of the Engineer, upon completion. Works shall be regarded as completed only when the installation satisfies the above tests. The Contractor shall

certify, upon completion of works that the installation is safe and complies with IET and Enemalta Regulations. The safety, integrity and reliability of the installation shall be the responsibility of the Contractor only.

Technical Advice, Training and Documentation

Contractor shall offer technical assistance to enable the Contracting Authority to derive maximum benefit in using the IT and telephone systems, especially during the initial stage of operation. Contractor shall provide training in system operation, and all applicable procedures to the employees of St. Thomas Tower. Contractor shall provide all keys, tools and software necessary for system operation as well as complete set of manuals in the English language and a complete set of "as fitted" drawings.

Manuals and As Fitted Drawings

As part of commissioning of the Electrical System, the Contractor shall submit to the Contracting Authority one set of Operation and Maintenance manuals for all the equipment. The manuals shall be in English and shall include operation and maintenance instructions, test and commissioning records, technical literature and wiring diagrams.

The Contractor shall provide as fitted drawings in the form of three sets of prints and one copy in ACAD on disk. The drawings shall include a schematic drawing of the Electrical System.

Warranty

The System including all equipment, materials and workmanship shall be covered by a minimum period of a two year guarantee from the date of commissioning of the System against defects in materials and bad workmanship. The Contractor shall guarantee the availability of spares for all equipment of the IT and telephone system for a period of ten (10) years from the date of commissioning.

M.E. 9 PLUMBING WORKS AND DRAINAGE

SCOPE OF WORK

These specifications detail the requirements for the supply, delivery, installation and commissioning of a complete Hot and Cold water Plumbing System.

The works involved include the following:

- Supply and installation of a new Hot and Cold Plumbing, sewerage, and irrigation systems as per attached technical specification.
- Connecting up of the system to the Government supply mains running outside the building.
- Connecting up of all the Water Heaters to an electrical supply.
- Supply and installation of booster pump.
- Supply and install of sewage drain set.
- Directional core drilling through building and related civil works for these services (to be carried out once approved by the contracting authority).

SUBMITTALS

Each Tenderer shall submit:

A. Description of the following items of equipment and their components as offered together with all relevant manufacturer's catalogues, illustrations and diagrams. All relevant technical and descriptive literature shall be in English.

i) Pipes up to and including 28mm diameter.
ii) Pipes larger than 28mm diameter.
iv) Ball Valves for Tank Inlets.
v) Bronze Ball Regulation Valves.
vi) Storage Tanks.
vii) Electric Water Storage Heaters.
viii) Drains
ix) Water Booster pumps.
x) Sewage dual drain pump set

B. A guarantee on all equipment being offered for a minimum period of 24 months against faulty workmanship and materials and on the operation of the system as

a whole. If during this period any parts or equipment have to be changed, the guarantee on that part is to be renewed for another year from the date of replacement in addition to the balance of the time from the original guarantee. The prospective tenderer shall also guarantee the supply of spares up to the next ten years following the award of the contract.

PIPES

All material used for plumbing shall be run in an approved plastic material suitable for potable water. The manufacturer and material of all pipe fittings shall be of the same type as that of the pipes. All proposed pipes shall be accompanied by comprehensive technical and descriptive literature which shall include details of their material properties and characteristics.

All valves, fittings and other accessories used in conjunction with the pipe system shall be of the same manufacture and fully compatible with the pipe system being used. No cheap alternatives will be allowed in the installation and pipes and fittings shall bear the manufacturer's stamp or markings. Pipes and/or fittings found not to adhere with this requirement shall be replaced at no additional cost to the contract.

All pipes and fittings used in the installation shall be guaranteed for 10 years against manufacturing defects.

PIPES UP TO 28 mm DIAMETER

The same type of pipes shall be used for the hot and cold water distribution. Pipes up to and including 28mm diameter shall be run in a polybutylene push fit plastic pipe system. The pipes shall be available in coil form and these shall be used as much as possible so as to reduce fittings and connections in the installation to a minimum. The system shall be compatible with other pipes systems and suitable fittings shall be available to connect the system to other types of different materials. The pipe material shall not be highly flammable.

The pipe material shall be suitable for potable water, non-toxic and does not support microbiological growth. In this respect it shall satisfy the requirements of BS6920 or EN equivalent. It shall be unaffected by both acidic or alkaline water and no build up shall result. The pipes and fittings will not waste nor impart taint, taste or odour to the water.

The pipes and fittings shall have conform to the following material properties:

- The pull-out resistance of pipe from the fittings shall be to BS 7291:Part2:2001 or European Equivalent.

- Pipes and fittings shall be hydrostatically tested for strength to BS 7291:Part 1:2001, Clause 6.3 or European Equivalent.
- The pipes shall have a life expectancy of at least 50 years when they normally operate at between 12bar, 20 deg.C and 6 bar, 90 deg.C.
- Short exposure to temperatures of up to 100 deg. C resulting from thermostat/system malfunction shall not cause failure.
- Testing to BS 7291: Part 1:2001 or European Equivalent shall also be carried out with regards to thermal cycling.
- Pipe material opacity shall conform to BS7291:Part 1:2001 Clause 6.7 or European Equivalent ensuring that insufficient light passes through the pipe walls to allow algae to grow. Pipes shall not conduct electricity.

PIPES LARGER THAN 28 mm DIAMETER.

All domestic cold-water service pipes having a diameter greater than 28mm shall be run in UPVC to BS3505 and BS3506 or European Equivalent. All pipes shall have an identifying mark when delivered and shall be supplied in the manufacturer's standard lengths. The ends of all pipes shall be protected against the ingress of foreign objects and against mechanical damage during transit. Where the pipes shall be installed in locations likely to be permanently exposed to direct sunlight, these shall be protected against UV rays by the application of gloss or emulsion paint, as recommended by the manufacturer.

The pipe system used shall be a safe system so that all materials should be non-toxic, do not support microbiological growth and should not be affected by rust or pitting. Pipe materials shall be suitable for potable water. The system shall be compatible with other materials and fittings shall be available so that the system may be joined to copper, galvanized steel or other plastic pipe systems. The jointing of pipes and fittings may be by any approved method. If solvent cement is used, this shall be to BS4346: Part 3.or European Equivalent. Preference shall be given to systems, which offer coils of pipe instead of standard lengths. The pipes shall be capable of 25-bar pressure at a temperature of 20 ^{o}C.

Other plastic systems may be considered if deemed suitable. Exhaustive technical and descriptive literature of the proposed pipes shall be submitted with the offer.

PIPE WORK ACCESSORIES

All accessories used in the system shall be of the same manufacture as the pipe unless the fitting required is not available in the manufacturer’s range of equipment to

compliment the pipes. In this case, any item used shall be fully compatible with the pipe system and literature shall be supplied with the offer to substantiate this claim.

BALL VALVES FOR TANK INLETS

The ball valves used shall be of the full-bore equilibrium type. They shall be of bronze construction complete with bronze lever and float. The float shall be of polythene connection and the valve shall be fitted with a silencing pipe. Unless otherwise specified, the ball valve shall be of the low-pressure pattern.

BRONZE BALL REGULATION VALVES

Valves shall be of the same manufacture as the pipes on which they are installed and fully compatible with the system being used. However, if these are unavailable from the pipe system manufacturer, they shall conform to the specifications detailed below.

The valves shall be manufactured to high quality standards conforming to BS 5159 and shall be suitable for hot and cold installations. They should be depended upon to close efficiently even after long periods of fully open service. Each valve must permit straight through flow with minimum disturbance to the fluid.

They shall have a polished ball and smooth seats to give 100% bubble-tight sealing. The valve body shall be made of bronze to BS 1400 LGZ. The ball shall be made of the following materials:
¼" to 2" diameter- Dezincification resistant brass to BS 2872 CZ 132or European Equivalent.
2 ½" to 4" diameter-Bronze to BS 1400 LG2 or European Equivalent.

The ball seat shall be made of P.T.F.E. The valve stem shall be made of dezincification resistant brass to BS 2874 CZ 132 or European Equivalent. The valve lever shall be made of zinc plated mild steel covered in P.V.C. Should a lock shield be required, the cover shall be made of brass to BS 2872 CZ 122 or European Equivalent and shall be complete with nylon cover.

STORAGE TANK

A water tank shall be used for storage of first class water. The location of this tank shall be as shown on drawings. It shall be manufactured in ultra violet stabilized reinforced plastic or any other approved material. The tank shall be suitable for potable water and the lining shall not include any substance, which may dissolve. The interior shall be treated against algae growth.

The tank shall have a minimum storage capacity of 1000 litres and shall be adequately braced and stiffened to prevent any distortion when in operation or when tested. All connections shall be full bore as the connected pipe. The tank shall be provided with a suitable cover or lid, which shall have means for closing such as clips. A screwed lid shall be preferred.

ELECTRIC WATER STORAGE HEATERS

The water heater shall be of the pressure type, electrically operated and thermostatically controlled. They shall be supplied from the cold-water storage tanks installed on the roof through a booster pump. The water vessels shall be provided with good thermal insulation for minimum heat loss. This water heater shall be covered with a weather protective canopy and installed on the roof for easy access and maintenance.

Internal vessels of water heaters shall be constructed of hot dipped galvanised steel with glass lining or be made out of an equally corrosion resistant material. All water heater vessels shall be suitable for a working pressure of min 5 bar. External casing shall be fire-enameled white finish. Water heaters shall be supplied complete with appropriate safety valve, adjustable thermostat, water inlet and outlet connections, 230V single phase heating element, temperature indicator, internal wiring, connections, neon indicator lamp and fixing brackets as to be ready for use.

DRAINS

UPVC or HDPE pipes shall be used for all drains as applicable, and these shall run from the sanitary fittings to the nearest gully trap in the adjacent shaft. They shall conform to the following specification:

- They shall be medium gauge pipes.
- Size of drains for wash hand basins and floor drains shall be 40mm diameter.
- The system shall include adequate inspection tees, caps and shall be adequately supported so that no eventual sagging occurs.
- The pipes used shall resist attack by chemical substances, details of which must be supplied with the tender.

All these pipes must be protected using cement sand hunching and installed with adequate gradient. Easy bends (45o) are to be used for changes in direction. Access for cleaning tees are to be installed at changes in direction, as necessary, to enable cleaning of blockages. These shall be installed at every change of direction and on straight runs at 20m intervals. It is important to ensure that all these would be easily accessible.

PIPE TERMINATIONS

All pipe runs shall be terminated at the angle valve or bib cock and shall include provision and installation of the respective angle valves and bib cocks.

BOOSTER PUMP

This pump shall be used to provide a suitable water pressure at all supply points in the building. It shall include flow/pressure switch which will operate the pump when water is drawn from the system and shall switch off the pump when demand ceases.

The pump shall be a horizontal end suction single stage direct drive pump. The pump casing shall be cast iron to BS 1452 Grade 180 or EN equivalent and impellers shall be made of bronze.
The pump shaft shall be in stainless steel to BS 970 431 S29 or EN equivalent.
Bearings shall be heavy-duty type, sealed and lubricated for life.
Mechanical seals shall be to EN standards.
All other pump parts shall be made from material compatible with pump basic materials and suitable for the liquid being pumped.
All pump castings shall be clean and without defect.

The pump motor is to be of the T.E.F.C. squirrel cage induction type matched to pump output.
Insulation is to be class F
Enclosure is to be to IP44
Motor is to be suitable for operation on 230V 50Hz
Pump to be supplied complete with starter.
All electrical specification for pump controls are to couple with the latest edition of the I.E.T. regulations.

The pressure controller shall be compatible with the pump.
It shall operate on 240V 50Hz, single-phase supply.
It shall handle a minimum inlet pressure of 6 Bar and shall supply a minimum outlet differential pressure of 3.5 Bars.

SEWAGE DUAL DRAINAGE SET

Suitable for lifting large amounts of sewage water in installations below sewage level. System shall have two pumps and will continue to work at half capacity during a pump failure.

- Tank made of polyethylene, shall be at least 500-litres in capacity and shall have a cover plate.
- The system shall have two single-phase pumps of equal capacity,
- Unit shall be complete with a complete control panel,
- Control panel shall manage the two pumps as follows:

1) Minimum level for switching of the pumps
2) Maximum level with switching of the second pump to manage the flow
3) Alternate switching of one of the two pumps

Connection for sewage pipe of at least HDPE, SDR 11, PE100, non-return valve and at least one air release of minimum Ø 50mm.

The submersible sewage pump set shall comprise of one pump running and one standby, suitable for pumping suspended solids found in normal sewage, and shall have as a minimum permissibility quantity of suspended sand 25g/m3

The casing, seal housing and sub frame shall be high grade cast iron to BS 1542. The shaft and impellor shall be AISI 316 with the motor stator in non-toxic dielectric oil for the lubrication of the ball bearings for improved cooling. The self-adjusting mechanical seal shall be protected by sand-proof labyrinth.
The motors shall be T.E.F.C. squirrel cage induction type matched to pump demand. Insulation shall be to Class F, three-phase and the enclosure shall be to IP68. The unit shall include a minimum of 20 m length of cable.

Pumps are to be complete with duck foot, guide rails and steel rope for easy lifting and lowering.

Pump P3 Minimum characteristics 100 l/min at 1.0 bar one pump running controlled by float switch and high level alarm.

Electrical
All electrical works shall be carried out in accordance with the latest edition of the I.E.T. and Enemalta regulations. To this effect, all items of the installation shall be fitted with power factor correction equipment so that the overall power factor with all equipment running is not less than 0.95 lagging.

INSTALLATION

WORKMANSHIP

Except where otherwise stated, workmanship shall comply with the latest European Standard Codes of Practice, where applicable. Workmanship shall be of a high standard

throughout. The contractor shall ensure that the standard of finish demanded by this contract is achieved. Branded materials shall be assembled, constructed and joined in accordance with the manufacturer's instructions and recommendations.

FIXING TO THE BUILDING STRUCTURE

Light fixings to brick, concrete or other masonry materials shall be by means of correctly sized screws fitted into plastic or metal expanding plugs located in correctly sized holes drilled in the structure. Light fittings to cavity constructions shall be by gravity or spring toggles, or expanding rubber sleeve fitted on to screws.

All holes shall be carefully drilled by slow speed rotary drills as recommended by the manufacturer of fixing device. Percussion type boring devices and shot fired fixings shall not be used without approval in writing by the Engineer.

In all cases the particular type and size of fixing device used shall be in accordance with the manufacturers' recommendations giving regard to the application and the load to be carried by the fixing device.

Any drilling and making of screwed or bolted fixings to the structure shall be included in the tender. Proposals for fixings shall be discussed with and approved by the Engineer and any possible restrictions shall be ascertained before submission of the tender.

PIPE INSTALLATION

Running pipes under the floor shall be avoided as much as possible and shall only be reverted to if absolutely necessary. Any pipes run under the floor shall be covered by a cement/sand mix to prevent damage to them by other trades. Supports and brackets shall be used at the base and top of risers, at each change in direction and at all dismounting points. Pipes running on the roof and risers in the shaft shall be run on galvanised steel cable tray complete with a sheet metal cover.

The correct tools shall be used in the installation of the pipes. The design and installation guide provided by the manufacturer shall be followed in order to ensure proper installation for the particular brand and material being used. Manufacturer's recommendations shall be followed for the correct pipe laying, fixing and support. When cutting pipes the recommended type of cutter shall be used. Before making joints, it is to be ensured that the pipe end is free from burrs.
All pipes run on the roof shall be laid on cable tray.

Where possible, the use of connectors should be avoided and continuous runs of pipe shall be used. Joints in walls, ceilings or floors shall not be allowed. It is the responsibility of the contractor to ensure that pipes and fittings are to be kept clean from inside and should take all the necessary precautions to avoid the ingress of dirt and other material that may cause problems in the future.

Pipes installed in exposed areas shall be protected from prolonged exposure to UV-radiation. In this respect, all pipes exposed to weather conditions shall be protected by a suitable cover or layers of paint as recommended by the manufacturer. Guarantee shall be provided for pipes installed outside especially against exposure to sunlight.

Care shall be taken to cater for pipe expansion. Manufacturer's instructions shall be followed for the correct installation of expansion loops and/or bellows. These shall be included in the BOQ as part of the pipe work rates including the appropriate sliding and fixed supports.

Where tubes pass through walls, floors and ceiling, they shall be able to move as a result of expansion or contraction. This can be arranged by passing the tube through a sleeve or length of larger diameter pipe fixed through the whole thickness of the wall, floor or ceiling, or by means of flexible joints on either side of the wall.

Pipes shall have a light rise to a cistern, vent pipe or an automatic air vent along their complete length and shall wherever possible fall to the drain-off points. Pipes shall be laid to avoid obstructions and across solid foundations to prevent local undulations causing air locks.

All pipes shall be arranged to set round piers and other obstructions and minor modifications shall be made as required by the Engineer to circumvent site difficulties. Details of modification required due to particular site conditions shall be forwarded to the Engineer for approval.

All bends shall be of the long radius pattern except where the use of these fittings would stand pipes too far from wall surfaces and make for unsightly appearance in which short sweep tees and elbows may be used provided the Engineer's approval is obtained beforehand.

DISCONNECTION OF EQUIPMENT

All items of equipment shall be capable of being disconnected from connecting pipes by means of unions, union valves, flanges or flanged valves. Pipes shall be so arranged to allow the item to be removed.

COLD WATER STORAGE TANK

Adequate protection from damage and ingress of foreign matter to the tank during storage, installation and commissioning shall be ensured. The tank shall be thoroughly cleaned prior to site testing and commissioning.

The tank shall be installed in the location indicated on drawings. The contractor shall ensure that the tank is properly installed so that the load is evenly distributed over the entire base unless they are supplied complete with load bearing legs or supports. The support of the tank shall be as recommended by the manufacturer and any supports shall be provided as part of the offer for the supply and installation of these tanks and as such included in the tender price.

VALVES

Valves shall be provided and installed as necessary for the purpose of circulation control and isolation. They shall be of full bore size to suit the mains onto which they are installed. Installation shall be such that the valves are in accessible positions with their stem horizontal or inclined above horizontal.

SEALING OF EXTERNAL WALL PENETRATIONS.

Any penetrations made in the external walls for the passage of pipes and ducts shall be made good and rendered weather proof by the contractor. These shall form part of the contract.

TESTING AND COMMISSIONING

General

All the works provided as part of the contract shall be inspected and commissioned in accordance with all relevant British Standard Specifications and Codes of Practice to the satisfaction of the Engineer. All installations shall be inspected and tested in sections as the work proceeds and on completion as complete systems and it shall be noted that the Engineer may require to inspect or test any equipment during erection.

All tests shall be arranged in co-operation with the Engineer and he shall be given prior notice of the time, location and nature of the test. No test shall be considered valid unless the Engineer is present. All necessary skilled and unskilled labour shall be provided for attendance duties before, during and after the test and the test media shall be provided and subsequently disposed of except where otherwise specified.

Defects occurring at any time during the test shall be made good and a complete re-test shall be carried out, all at no extra cost. Where failure during a test, inspection or commissioning process results in damage to the building fabric and/or services not provided as part of this contract, or requires subsequent builders' work then these items shall be made good at no extra cost.

All test points shall be provided which are necessary to carry out the specified tests and commissioning requirements. Such points shall be fitted with removable plugs, flanges or other approved devices. No section of the works shall be in any way concealed prior to testing and inspection and subsequent concealment where applicable shall only take place following written authority from the Engineer.

All necessary facilities, measuring and recording instruments including test pumps and gauges for inspection/testing and commissioning are to be calibrated as necessary before use. The Engineer reserves the right to call for a demonstration of the accuracy of any instrument used.

Cleaning and Flushing out of Systems

Prior to setting up the systems, these shall be thoroughly cleaned up and pipes shall be flushed out. Water installations shall be flushed out using cold water at maximum mains pressure. During the cleaning process, the flow shall be interrupted occasionally to dislodge debris and pipe walls rapped. Items which are prone to damage during the cleaning operations shall be isolated or removed and subsequently re-fitted.

Commissioning

All systems shall be filled with the working fluid, vented and brought to operating conditions and the flows then regulated to the design values. Following regulation and balancing procedures all plant and systems shall be put into operation and examined to ensure that the installations are operating correctly.

Record Drawings

The Contractor shall provide drawings to a scale not less than 1:100. These shall show plans and such sections as the Engineer may consider necessary. Final copies shall consist of two prints of each drawing together with an electronic copy of all the drawings. The final copies of the `As fitted' drawings shall be submitted to the Engineer within three months of the completion of the contract. The final certificate will not be authorised until the drawings are received by the Engineer to his satisfaction.

IRRIGATION

The scope of Works consists of supply, installation, commissioning and testing of irrigation systems.
The Irrigation Designs are based on a Flow Rate of 180l/min at a pressure of 5 Bar. It is the responsibility of the Irrigation Contractor to confirm that the Flow Rate is available on the site, prior to commencement of the installation. Should this not be the case, the Irrigation Contractor is to inform the Project Manager as soon as this is established.

PERSONNEL

All workmanship shall be of the highest standards and shall comply with the specifications of the manufacturer of the equipment used.
Only the highest grade of materials as specified shall be installed. It is the Irrigation Contractor's responsibility to ensure that materials conform at all times to the specifications and design.
Any deviation from the specified material in the Bill of Quantities shall require prior written permission from the Client's Representative. Changes without permission may void the design guarantee.
Notwithstanding any approvals provided by the Client's representatives, the contractor is to provide the respective certifications at commissioning stage in line with the tender specifications.
Three different Irrigation methods shall be installed being, 360 degrees spray head, In-line drip irrigation and deep root irrigation systems.
An automatic irrigation system shall be supplied from one reservoir to zone by zone area, and according to preset timer.
The contractor shall use the existing access to the well, in which to house the irrigation pump set, pump controls, as required.

MATERIAL AND EQUIPMENT-IRRIGATION PUMPS

The pump shall be of the submersible type suitable for pumping rain water. They shall be capable of delivering 180 l/min at a pressure of at least 5.5 bar. The pump's main components shall be in AISI 316 (DIN 1,430 1) stainless steel.

The pump casing, outer sleeve, lower cover cast iron, while the screws and tie-rods shall be in AISI 316 stainless steel.

Pump impeller/s shall be made of synthetic material suitable for the pumping of rain water.

- The pump shaft shall be in AISI 316 (DIN 1, 4005) stainless steel.
- Bearings shall be heavy duty type, sealed and lubricated for life.
- All other pump parts shall be made from material compatible with pump basic

materials and suitable for the liquid being pumped.

- Pump castings shall be clean and without defect.

The pump shall be equipped with the following:

- An inlet strainer to prevent larger particles from entering the pump.
- A reliable non-return valve. This shall have a very short closing time to reduce any water hammer effect to a minimum.
- Pre-assembled flow switch for automatic operation.

The pump motor shall be of the induction type matched to pump output.

- Insulation shall be to class B
- Enclosure shall be to IP68, suitable for continuous immersion.(for submersible)

- Motor shall be suitable for operation on 240V 50Hz.
- Built-in Capacitor
- Thermal overload protection to stop pump supply in case of overheating.
- Pump shall be equipped with at least 10m of cable. (for submersible)

Pump shall be supplied complete with an inverter starter controller. This shall include the following protection:

- Dry running
- High temperature
- Motor burn out.

All electrical specification for pump controls shall couple with the latest edition of the I.E.T. regulations.

Pump Control Panel

The pump shall have its own control panel. The enclosure shall be weatherproof to IP65. The panel shall include at least the following:

- Pump starter with inverter
- Overload Protection
- Run/Trip Indicator.
- Auto/Manual Selector Switch
- Flow Switch Connection
- Irrigation Timer.

SADDLES

Saddles or other suitable types of fittings shall be used to branch off the main pipe to the sub systems or drip irrigation pipe runs.

INLINE FILTERS

Each individual irrigation ring main supply pipe shall be equipped with an inline water 100 mesh disk type filter. This shall have a plastic body and made of non-corrodible parts. It shall be sized to fit the pipe onto which it is installed. It shall be so constructed that the filter itself may be removed from the housing without disconnecting the filter body. Isolating valves shall be installed before and after the filter to allow for cleaning, maintenance and filter replacement.

WIRELESS SOLENOID VALVES

Solenoid valves shall be to the following specifications:

- Connections shall be female at both ends.
- Valves shall be capable of flow control.
- Globe configuration.
- Heavy duty, corrosion and UV resistant construction.
- Rubber thermoplastic Diaphragm.
- Manual internal bleed.
- Slow closing design with flow-path designed to minimize pressure loss.
- Working pressure from at least 1.3 bars to at least 8 bars.
- Valve shall operate on a low voltage AC source.

A pressure regulator of the corresponding diameter shall reduce the pressure as required.

CONTROLLERS

The controllers shall comply with the following specification.
Dual program

- LCD display with simple icons
- Alarm symbols.
- Programming keypad
- Indicator lamps showing controller status, green for on and red for alarm.
- Program override for rainy weather shutoff.
- Automatic diagnosis indicating which station has a fault.
- Circuit including rechargeable battery pack for maintenance of program in case of power failure.
- Battery to maintain an emergency program for 4 days in case of
- Extended power failure.

Controller shall be housed in a plastic cabinet which shall either be lockable or else be equipped with a facility to accept a padlock. Cabinet shall be suitable for wall mounting and shall be weather proof.

The controller shall operate on a 240V, 50Hz electrical supply. It shall have the capacity to operate at least two (2) solenoid valves per station plus a master valve or pump start relay. Timing shall vary from 1 minute to 12 hours I intervals of 1 minute. Each program shall be capable of at least 8 automatic starts. The controller shall have inbuilt surge protection.

The controller shall be capable of having the following accessories connected to it:

- Automatic Rain shutoff device.
- Moisture sensor

QUICK COUPLING VALVE

These shall permit easy access to the water supply for manual use in the case of selected irrigation or washing of the surrounding areas. The valve shall consist of a housing which shall be connected to the supply main and this shall have an integrated automatically closed valve. This fitting shall be made of impact resistant plastic with UV inhibitors. All parts coming into contact with water shall be made of stainless steel or plastic. The housing shall have a snap closed cover to keep out debris and other material.
Connection to the main pipe shall be ¾" threaded. Water shall be accessed through a key or short length of pipe which connects to the main valve body in a 'turn and lock' way. This shall also have a threaded end and shall be long enough to protrude well above the valve housing. The valve shall withstand an operating pressure of at least 6 bars.

VALVE BOXES

Valve Boxes may be circular, square or rectangular. Size and shape shall be suitable for ease of use of the valves located within them. They shall be constricted from high density polyethylene structural foam. Openings shall be included for the installation of pipes through the box walls.
Valve box covers shall be lockable with a key. They shall come complete with HDPE covers and these shall withstand the load rating of at least 17kg/sq.cm. They shall withstand temperatures of up to 73 deg, C without deflection as per (ISO 75-1). HDPE density shall be to ISO 8962.

FLUSH VALVE

These shall permit easy draining of the irrigation system by means of a manual valve located at the lowest point of the pipework at a suitable location to allow draining without disrupting the soil surface. The valve shall be installed in a suitable chamber compete with a valve box. This fitting shall be made of impact resistant plastic with UV inhibitors. All parts coming into contact with water shall be made of stainless steel or plastic. The housing shall have a snap closed cover to keep out debris and other material.
Connection to the main pipe shall be at least 25mm. The valve shall withstand an operating pressure of at least 10 bars.

WATER METER

The flow meter shall be a propeller type to measure the total water flow consumption and the current flow rate. This shall be between flange mounted and shall be suitable for the pipe size and pressure used as well as the expected flow rates. Any upstream and downstream dimensions as required by the manufacturer shall be adhered to.

ROOT WATERING SYSTEMS FOR TREES AND SHRUBS

DEEP ROOT IRRIGATION

(½" bubbler) pressure compensating from 1,5 to 5,5 bar, 60 L/h flow, pre-installed in a perforated canister. The canister shall be installed flush to soil surface. 2 units minimum should be installed.

Anti-vandal: aesthetically pleasing with locking grate or snap-on cap
Water saving: root zone watering regardless of soil type
Fits urban conditions: prevents roots from rising to the surface.
Allows soil aeration
Stabilizes trees and its wind resistant
Easy installation: pre-assembled system
Construction: high grade polymer with UV-resistant inhibitors

Connected to low density Ø16 mm PE tubing
Canister: approx. Ø 10cm, Height: approx. 90cm

Sub surface inline emitters

The emitters shall be pressure compensating and built into 16mm tubing at a spacing of: 33 or 50cm. The unit flow shall be 2.3 L/h for an operating pressure range from 0.6 to 4 bar.

Emitter features:

- Cylindrical shape for a large filtration surface
- Dual outlet ports to eliminate risks of back-siphoning
- Protection from root intrusion
- Wide flow passage cross-section for clog-resistance
- Pressure compensation by lengthening the emitter flow path instead of reducing the cross-sectional area of the emitter flow path

- Features of dual wall tubing:
- Brown outside for aesthetic reasons. Reduces visibility
- Black inside for better U.V. resistance and resistance to algae growth
- Crush-resistant25, 50 or 100 m coil

Barbed fittings for 16mm tubing to be compatible with the 16mm tubing designed for low volume irrigation

Male adapters, manual valves, male and female adapters, end closure, manual valves,

POP-UP SPRINKLERS

The spray head shall be complete with shrub adapter and shall include a factory-installed Variable Arc Nozzle. The flow shall consist of large, uniform water droplets which will not mist and shall provide good coverage in windy conditions. Nozzles shall be side opening and protected against ingress from dust and debris. The nozzles shall provide and evenly distributed pattern to be suitable for turf watering.

Spray heads shall be made from a one-piece moulded body. They shall include a wiper seal to clean debris from the stem and reduce water flow by during pop-up. A heavy duty stainless steel retract spring shall be included for positive pop-down. Each head shall have a flow and throw adjustment screw. Nozzles shall be colour coded for radius identification. All parts which are be located above ground shall be UV treated. Shrub adapter shall be made of heavy-duty ABS.

Inlet shall be ½” female NPT threads.

- Sprinklers shall have a precipitation rate of between 35 and 55 mm/hr.
- Working pressure shall be 1.5 to 3 bars.

PIPES

Pipes shall be the same throughout and shall be used for the Irrigation System. Pipes shall be in High density polyethylene (HDPE), PPR or PP, rated at a working pressure

of 10 bar (PN10). They shall be available in coil form. Fittings shall be of the fusion welded type or compression type rated at 10bar. The contractor shall provide adequate pipe support or inside underground sleeves, to ensure that all pipes are run neatly and in straight lines. A fine mesh strainer shall be installed on each discharge pipe to protect the drippers from any solid particles which could clog them. The mesh shall be at least 150 micron. Fittings shall be of the same manufacture and brand as the pipes.

VALVES

Surface installed valves shall be located in valve boxes. These valves shall also be colour coded to match the pipe circuits.

Workmanship of the installation should be done in accordance to relevant standard recommendations and normal practice. Workers shall be qualified in the fusion welding process. Competence certificates to be endorsed with the tender. Tube ends shall be cut square and all burrs removed prior to cleaning ends for jointing in accordance with the manufacturer's instructions. Piping shall rise in the direction of flow to pre-determined high points, where provision shall be made for automatic air vents.

Vertical runs in shafts shall be surface while horizontal and vertical runs inside the building shall be chased in walls and plastered. Pipes shall be clean internally and externally, reamed and de-burred after cutting.

Connections to valves and other equipment shall be done by means of flanges, unions or couplings. Installation should be done in accordance to relevant standard recommendations and normal practice. Appropriate fire collars are to be installed to maintain the fire integrity of partition, wall or floor being penetrated.

All water fittings are to be terminated by means of an appropriate back plate fitting secured properly to wall and filled with concrete for a sound fixture.

All holes shall be carefully drilled by slow speed rotary drill and percussion type boring devices and shot fired fixing require approval from the Project Manager. Penetrations in walls and ceiling larger than 80mm diameter also require approval. The particular type and size of fixing device used shall be in accordance with the manufacturer's recommendation as suitably sized according to the static and dynamic loading, which shall be included in the price.

INSTRUCTION TO EMPLOYER'S STAFF

The employer's staff will be instructed in the operation and maintenance of the installations by qualified personnel, who shall be fully conversant with the operations

and maintenance procedures required for all related items of plant and composite systems, and where necessary specialist sub-contractor staff shall be made available to enable complete instructions to be given. The competence of the trainer and the quality of the presentation shall be to the satisfaction of the Architect-in-Charge or his representative.
All installations shall be demonstrated in full working order together with the procedures to be adopted in the event of plant or system malfunction and the manner in which plant outputs or control settings can be adjusted.

OPERATION AND MAINTENANCE MANUALS

On completion of all the works and prior to handing over, the Contractor, shall provide three (3) copies of the complete set of Operating and Maintenance Manuals comprising the details hereinafter mentioned. The manual shall include general description of the installation, indicting the manner of working of each system, forming part of the works.

It shall also detail full instructions for starting up, operating and shutting down each individual assembly of the equipment. Instructions as to the frequency and full requirements of routine and regular preventative maintenance necessary to maintain the equipment in a good working condition shall also be included. This information is to be supplemented by the Manufacturer's Maintenance Instructions for each assembly part of the equipment.

Attached to the manual there shall be a recommended list of spare parts, including manufacturer's address and local stockist/agent as well as wiring diagrams of the system and equipment.

PROVISIONAL ACCEPTANCE

Upon written notice from the Contractor, the Clients Representative shall review the work and make a determination if the work is to be considered as Provisionally Accepted.

The date of Provisional Acceptance shall be the date when the Client's Representative accepts that all work related to the Planting, Planting Soil, and Irrigation installation sections are complete, which date determines the commencement of the 5 year warrantee period.

IRRIGATION WARRANTY AND MAINTENANCE GUARANTEE

All installation and equipment shall be covered by a defect liability guarantee period of 5 years provisional Acceptance of the works as certified by the Project Architect.

The offer shall also include a 5 year service level agreement and preventive maintenance agreement consisting of 5 yearly visits during which all the equipment shall be checked, serviced and certified and any defective parts replaced at the contractor's expense (included in the maintenance item in the BoQ).

Attached to the manual there shall be a recommended list of spare parts, including manufacturer's address and local stockist/agent as well as wiring diagrams of the system and equipment.

TENDER DRAWINGS

The following drawings and documents are deemed to be an integral part of this document:

Drawing Title	**Drawing No**
Hot and Cold water Schematic	CW-X1-165-18
Drain water ground floor	DW-10-165-18
Drain water, level 3	DW-13-165-18
Irrigation Systems	IR-10-165-18

M.E. 10 MRL LIFT

TECHNICAL SPECIFICATIONS

Quality Assurance

Manufacturer's Qualifications: An approved manufacturer regularly engaged in manufacturing, installing, and servicing elevators of the type required for the project. The manufacturer shall have a documented, on-going quality assurance program.

Proof of recognition by the Lift brand mother company has to be submitted at tendering stage (i.e. that the mother company recognizes the company tendering for this lift as the company installing these lifts on its behalf).

Installer Qualifications: The manufacturer or an authorized agent of the manufacturer with not less than five (5) years of satisfactory experience installing elevators equal in character and performance to the project elevators.

Regulatory Requirements: The Lift System design and installation shall comply with the latest versions of:

- Lifts Regulations 2002 (Act No. V of 2001)
- MSA EN 81 – 20: 2014, MSA EN 81 – 50: 2014 & MSA EN 81-70 including the A3 Amendment
- European Parliament and Council Directive 95/16 EC
- I.E.T Wiring regulations
- Electricity Supply Regulations as issued by the Enemalta Corporation.
- Design Guidelines Access for All (Clause 7.5: Passenger Lifts)
- Legal Notice 370 of 2002, as amended by Legal Notice 232 of 2008
- Any other regulations, Directives and Legal Notices which may come into force during the tendering period or before works are completed. No extra payment shall be made for any modifications required to conform to the said changes.

Any deviations from the above standards must be clearly indicated by the contractor at tendering stage.

Fire-rated entrance assemblies:
Opening protective assemblies including frames, hardware and operation, shall be fire resistant for a minimum specified period of one hour.

Inspection and testing: Lift Installer shall:

- Obtain and pay for all required inspections, tests, permits and fees for the lift installation.
- Arrange for inspections and make required tests.
- Satisfy the requirements for CE conformity regarding the placement of the lift in service as per Lifts Regulations 2002.

PROJECT CONDITIONS

The lift shall not be used for any purpose during the construction period.

When the offers are evaluated, it shall be assumed that the respective Tenderers are well aware of the site conditions and have assured themselves of the necessary works required, verified all critical dimensions and examined supporting structures and all other conditions under which the lift work is to be installed.

On tender submission the Tenderer, unless notifying in writing any unsatisfactory site conditions to be corrected, is accepting the existing site conditions and the responsibility for satisfactory lift performance.

Any deviations from the specifications, as well as valid reasons, must be clearly indicated by the contractor at tendering stage.

EXAMINATION CERTIFICATE

A copy of the CE conformity certificate issued by a Notified Body shall be forwarded to the Client after the lift is commissioned and the guarantee period falls into effect as from the date of acceptance of such certificate. Six-monthly examination certificates shall then be submitted to the Client until the guarantee period expires.

BAD WORKMANSHIP

The Engineer in charge shall, during the progress of the works, have power to order the removal within such reasonable time or times as may be specified in the order, of any materials which in his opinion are not in accordance with the specifications or his instructions; the substitution by proper materials; and the removal and proper re-execution of any work executed with materials or workmanship not in accordance with drawings, specifications or instructions, and the Contractor shall forthwith carry out such order at his own cost.

In case of default on the part of the Contractor to carry out such order, the Engineer in charge shall have power to employ and pay other persons to carry out such work and all expenses consequent thereon or incidental thereto shall be borne by the Contractor and shall be recoverable from him or may be deducted from any moneys due or that may become due to him.

The Contractor shall replace at his expense any work, which is proved to be defective even after completion.

PRODUCT TECHNICAL SPECIFICATIONS

Any deviations from the specifications, as well as valid reasons, must be clearly indicated by the contractor at tendering stage. The lift shall be supplied and installed as per regulations, legal notices and directives listed above.

HOIST WAY EQUIPMENT FOR TRACTION ELEVATOR

The tender price shall include but is not necessarily limited to, the following in order to provide a complete installation for the lift:

1. Car Frame and accessories
2. Guide Rails: Steel, T solid section.
3. Guide Shoes.
4. Guide Rail Lubricators.
5. Buffers.
6. Gearless traction motor.
7. Ropes.
8. Automatic Terminal Limits

***Automatic Self-Levelling*:** The lift shall include a self-levelling feature to automatically bring the car to the floor landings and correct for over travel or under travel. Self-levelling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load. Tolerance to be maximum ± 5mm

***Wiring*:** All necessary hoist way wiring shall be included in the scope of the elevator system, in accordance with the Current Edition of the I.E.T Wiring Regulations.

***Emergency Terminal Stopping Device*:** Emergency terminal stopping devices shall be provided for speeds as per MSA EN 81-1: 2000.

Safety gear (Double acting progressive type).

The power unit for the lift must include but shall not limited to the following:

Power Unit: A self-contained unit consisting of the following items:

- VVVF drive traction motor. – Motor shall be of the regenerative drive (as option in BOQ).

- Traction sheave.

Power controller shall contain electrical contactors; electro-mechanical switches and thermal overload relays. All components shall be mounted in a minimum IP10 enclosure. Logic control system shall be microprocessor based and protected from environmental extremes and excessive vibrations.

Motor shall be power factor corrected.

HOIST WAY ENTRANCES

Doors and Frames: Complete hollow metal type hoist way entrances shall be provided at each hoist way opening.

Manufacturer's standard entrance design: consisting of 14-gauge frames with 50mm profile, 16-gauge doors, hangers, hanger supports, hanger covers, fascia plates, sight guards, and necessary hardware.

Lift wall interface with hoist way entrance assembly shall comply with elevator manufacturer's requirements.

Entrance and doors shall be fire rated for at least 1hour.

Doors shall be of flush construction with internal channel reinforcements.

Frames shall be of the formed construction type.

Interlocks: Each hoist way entrance shall be equipped with an approved type tested interlock as required by MSA EN81-1: 2000. Interlock shall be designed to prevent operation of the car away from the landing until the doors are locked in the closed position as defined by the specified standard and shall prevent opening the doors at any landing from the corridor side unless the car is at rest at that landing or is in the levelling zone and stopping at that landing.

Door Hanger and Tracks: Sheave type two point suspension hangers and tracks shall be provided for each hoist way sliding door.

Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.

Hangers: To include an adjustable slide to accommodate the up-thrust of the doors.

Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.

CAR ENCLOSURE

***Steel Cabin Finish*:** Cabin side walls shall be of 14-gauge sheet steel: Finish shall be **patterned scratchproof stainless steel. (Brushed steel finish will NOT be accepted)**

***Car roof*:** Capable to support two persons at any position without any permanent deformation.

***Car and Landing Doors Finish*:** Car front and door finish shall also be **panoramic (glazed 2 sides - doors and back) with patterned scratchproof stainless steel frames**. **(Brushed steel finish will NOT be accepted).**

Cabin trim: All cabin trim including rounded corners and control panel shall be in **patterned, scratchproof stainless steel. (Brushed steel finish will NOT be accepted)**

***Ceiling*:** Suspended type, including LED lighting.

***Emergency Car Lighting*:** An emergency power unit employing a 3 hour, sealed rechargeable battery and totally static circuits shall be provided to illuminate the elevator car and provide current to the two alarm bells in the event of building power failure.

***Ventilation*:** A force draught exhaust fan shall be mounted on the car top. The fan shall operate only when the lift is occupied.

***Doors*: Cabin and Landing doors shall be side opening and shall have a clear opening dimension of 900mm.** Horizontal sliding **panoramic car doors** with door frame finished in **patterned scratchproof stainless steel (Brushed steel finish will NOT be accepted)** and reinforced with steel for panel rigidity. Doors shall be hung on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic shoes sliding in a smooth threshold groove. Doors shall incorporate both electrical and mechanical locking devices.

***Handrail*:** 45 to 50mm diameter handrail shall be installed at 900mm height from floor on all wall sides.

***Kick plate*:** 100 mm high made of **patterned scratchproof stainless steel**

***Finished Floor*: Non Slip Black Heavy Duty Rubber**.

***Mirror*:** A half height mirror shall be provided opposite the cabin doors.

***Car Control Panel*:** This should be between 900mm and 1200mm above the floor and located inside the car on a side wall at least 400mm in from the door wall.

***Intercom set*:** Permanently installed, capable to communicate with the lift pit, machine room and on top of the cabin. Intercom is to contain inductive couplers to help hearing-aid users.

Warning Sign: An appropriate warning sign giving instructions on the use of the rescue service system via the auto-dialler shall be included in the cabin on or near the control panel.

DOOR OPERATION

A door operator with a VVVF motor shall be provided to operate the car and hoist way doors simultaneously. The microprocessor based door operator system should operate under closed loop, automatically correcting any variations in the command profile. Door movements shall be electrically cushioned at both limits of travel and the door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval (minimum 10 seconds) or when the car is dispatched to another landing.

No Unnecessary Door Operation: Car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as the next car up.

Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If the infrared door protection system detects a person or object while closing, the doors will stop and resume closing after the obstruction has been removed.

Limited Door Reversal: If the doors are closing and an infrared beam is interrupted, the doors will reverse and reopen partially. After the obstruction is cleared, the doors will begin to close.

Doors' Closing speed **:** This shall not be greater than 0.3m/s

A door protection system shall be included using full curtain type infrared light beams. The beams shall project across the car opening detecting the presence of a passenger or object. If door movement is obstructed, the doors shall immediately reopen.

CAR OPERATING STATION

General: A panel shall be provided which contains a bank of illuminated push buttons with tactile indication of each floor adjacent to the call button to correspond to the landings served, an emergency call button (clearly identified) and, door open and door close buttons, switches for lights and exhaust fan, key switches for inspection, and message indicators for lift operation. The emergency call button shall be connected to two bells that serve the emergency signal. The bells shall be situated in prominent locations as instructed by the Engineer. All buttons to have both raised markings and Braille markings. The controls shall be mounted on a panel located on a sidewall 400mm from the doorjamb. It shall be installed at a minimum height of 900mm and maximum height of 1200mm.

Position Indicator: A display car position indicator shall be integral to the car-operating panel. As the car travels, its position in the hoist way shall be indicated by the illumination of the alpha/numeric character corresponding to the landing, which the lift is stopped, or passing.

Voice and visual indicator: The voice and visual indicator will be included in the car-operating panel, indicating the weight present in the car, or any passenger overloads. The voice and visual indicator shall also give notification of the floor reached.

Emergency Light: An emergency light and capacity plate shall be integrated into a module. Emergency light shall illuminate automatically upon loss of the building's normal power supply.

Special Accessories shall include:

i. CE marking.
ii. Name and contact number of supplier.
iii. Identification number of lift.
iv. The operation of the call button from inside the cabin for Level 1 shall be activated by means of a separate key switch inside the cabin.

CONTROL SYSTEMS

Controller: The lifts control system shall be microprocessor based and operate on extra low voltage. Control of the lifts shall be automatic in operation by means of push buttons in the car numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings.

The cars shall be operated with a single set of vandal proof push Buttons, one for each floor served. Registration of a call by momentary pressure on a button shall cause the corresponding call to be entered and the button to illuminate.

Maintenance control gear. Up/Down/ close/open Emergency Stop/ Control and inspection buttons to be installed in machine room as well as top of car. An emergency lift control cut out shall also be provided in the pit.

The overload control device should prevent a start of a journey when the load exceeds the lifts rated loads. The cabin shall not move until the correct load is present in the car.

HALL STATIONS

General: Hall stations shall be provided with necessary vandal proof push buttons for lift operation. Buttons shall illuminate to indicate call has been registered at that floor for the indicated direction. Each hall station shall be installed at a minimum height of 900 mm and maximum height of 1200mm from floor.

Hall Lanterns: Install a hall lantern with an audible signal at each landing entrance for the lift. The lanterns, when illuminated, shall indicate the lift car which shall stop at the landing and in what direction the car is set to travel. When the car reaches a predetermined distance from the floor where it is going to stop, the corresponding hall

lantern shall illuminate and the signal shall sound. The hall lantern shall remain illuminated until the car doors close in preparation for leaving the floor.

MACHINE ROOM

The lift is a machine room-less (MRL) type lift and the controller is to be installed next to the landing door at the highest level (penthouse level).

When the offers are evaluated, it shall be assumed that the respective Tenderers are well aware of the site conditions. It is then the contractor's responsibility to put the lift in place without damaging the equipment, the surrounding areas or third party property.

MISCELLANEOUS LIFT COMPONENTS

Vibration Pads shall be mounted under the traction motor assembly to isolate the unit from the building structure.

Three phase motor protector is to be supplied and installed for each motor. The motor protector is to automatically isolate the power supply to the motor in event of: phase loss, phase reversal, 9% voltage difference between phases; voltage goes down below under voltage settings, the voltage goes over voltage settings.

Any deviations from the specifications, as well as valid reasons, must be clearly indicated by the contractor at tendering stage.

EXAMINATION

Before starting works, the contractor should verify all critical dimensions, and examine supporting structures and all other conditions under which the lift work shall be installed.

Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

INSTALLATION

The Contractor shall install the lift system components and co-ordinate installation.

i. Competent lift installation personnel in accordance with Lifts Regulations 2002 and MSA EN81-1: 2000, manufacturer's installation instructions and approved shop drawings shall perform all the installation work.
ii. All electrical installation work shall fully comply with the latest edition of the IET wiring regulations.

All work shall be performed by competent, skilled workmen under the direct control and supervision of the elevator manufacturer's experienced foreman. The contractor shall be fully responsible for the design, supply and mounting of the lift.

Works shall be performed in accordance with a submitted works program.

FIELD QUALITY CONTROL

Upon completion of each installation and before permitting use of lifts, acceptance tests shall be performed as required by the Lifts Regulations 2002.

The Engineer shall be notified in advance of dates and times tests are to be performed on the lifts.
Test certificates shall be handed over to the Engineer in charge.

ADJUSTING

Necessary adjustments shall be made to operating devices and equipment to ensure that each lift operates smoothly and accurately.

CLEANING

Before final acceptance, factory protection of the finished surfaces shall be removed. Surfaces shall be cleaned and polished in accordance with manufacturer's recommendations for type of material and finish provided.

At completion of lift work, all tools, equipment, and surplus materials shall be removed from the site. Equipment rooms and hoist way shall be cleaned. All trash and debris shall be removed from site.

PROTECTION

At time of Substantial Completion of lift work, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect lift work from damage or deterioration. Protective measures shall be maintained throughout the remainder of the installation period.

DEMONSTRATION

Instruct the Client’s identified personnel in proper use, operations, and daily maintenance of the lift. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies.

A final check of the operation of the lift shall be carried out with Engineer present, immediately before the date of the Test Certificates. During this test, it shall be determined that control systems and operating devices are functioning properly.

ELECTRICAL WORKS - Regulations and Standards

The Electrical Works shall conform to the latest issues of the following regulations and standards including amendments:

1. The IET Wiring Regulations (BS 7671: 2018)
2. Local Electricity Supply Regulations
3. Latest relevant MSA EN Standards and the standards specified.

ELECTRICAL SUPPLY

The electrical supply available on site shall be 400/230 Volt (+/- 10%), 50 Hz (+/- 1%), three phase, four wire. The main isolator will be installed by the lift control cabinet.

MAINTENANCE

Preventive maintenance and call back service shall be included in the offer for a period of 36 months for the lift from date of the initial Examination Certificate. Service shall consist of periodic examination of the equipment, adjustment, lubrication, cleaning, and supply of parts to keep the lift in proper operation.

Maintenance work, including emergency call back repair service, shall be performed by trained employees of the lift contractor during regular working hours. This service shall not be subcontracted and shall not cover adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents caused by persons other than the lift contractor. The maintenance work including servicing work shall be logged in a maintenance book purposely kept at the Client's Offices.

i) Only genuine parts and supplies as used in the manufacture and installation of the original equipment shall be provided. The supply of spare parts has to be guaranteed up to the next ten (10) years following the award of the contract.

ii) Lift manufacturer shall have a local representative service office and full-time service personnel.

The Tenderer shall include in his price for complete periodic preventive maintenance (minimum 3 bi-annual visits) during the guarantee and maintenance period.

WARRANTY AND MAINTENANCE

All items of equipment in this offer and the installation as a whole shall be covered by a 36 month full warranty on material, equipment and workmanship. The successful bidder is expected to fully maintain the equipment supplied and keep the system in perfect working order for a period of 36 months from the date of commissioning.

The tender price shall include regular periodic maintenance for the duration of the guarantee period (36 months). The Tenderer shall submit together with his offer a detailed maintenance schedule including the frequency of the visits and details of the works or checks to be carried out during these visits. Fees and instructions for emergency callouts shall also be included in the schedule.

CLIENT'S OBLIGATIONS

During the maintenance period, the Client shall:

i) Not make any modifications or carry out any maintenance or adjustments to the equipment without the Supplier's written consent.
ii) Not move the equipment from its location without the Supplier's written consent.
iii) Make available free of charge all facilities and services reasonably required by the Supplier to perform the services required under this agreement.

The services rendered under this contract exclude:

i. Any labour cost or parts required as a result of damages caused by accidents, fire, flood, lightning and other acts of God, neglect, misuse, malicious act, act of violence, environmental conditions outside those specified by the equipment manufacturer, electrical current fluctuations.
ii. Any maintenance work required due to the use of supplies not approved by the Supplier.
iii. Replacement of consumable items.

Instruction to operating personnel

The client shall appoint a responsible person who shall be instructed in the use of the equipment. He shall be thought how to operate the system, the basics of troubleshooting and daily care of the equipment including what action to be taken in emergency situations.

DOCUMENTATION

1. Full documentation as per Lifts Regulations 2002 shall be presented to the client on hand-over of the lift. This shall be in English and shall include but not be

limited to the following:

2. CE conformity declaration certificate.
3. General specifications of the lift installed.
4. Complete list of safety devices and circuits of the lift including respective part numbers/codes of the manufacturer.
5. Complete lift electrical circuits.
6. Complete maintenance manual.
7. User's manual for the lift.
8. Emergency procedures manual.
9. Installation manual.
10. Lift commissioning manual.
11. Installation drawings.

Lift well dimensions

Description	Dimensions
Well	Approx. 1600mm (w) x 1700mm (d) [Internal]
Pit depth	Not more than 400mm (minimum possible)
Head Room/Clear Overhead	Not more than 3m (minimum possible)

Additional lift technical data

Item	Description	Specification
1	Elevator type	MRL Traction elevator: Passenger
2	Transmission Type	2:1 or 1:1 (gearless)
3	Capacity	630 kg – 8 persons
4	Speed	Rated 0.85 – 1.0 m/s
5	Motor Starts per hour	180 motor starts per hour (A lift motor Manufacturer's certificate, confirming that the motor is suitable for 120 starts per

		hour, is to be submitted with the offer)
6	Voltage- Power Mains	3ph-400V (+&- 10%) 50 Hz
7	Voltage – light Mains	1 ph – 230V 50 Hz
8	Number of stops	4
9	Number of entrances	4 in-line
10	Total Elevator Travel Height (Rise)	Approx. 13 m
11	Car internal Dimensions (W x D)	1100mm x 1400mm minimum
12	Inside Cabin height	2100mm
13	Lift well	Lighting 2-pole switch with lamp indicator – from machine room
14		Permanent shaft lighting – Bulkhead fittings IP 54 fixed to structure.
15	Pit	Lowest pit possible – less than 400mm.
16	Control system	Full Collective
17		13A socket outlet on car roof
18	Car construction	Acoustic linings
19		Hand Rail / Balustrade to be install on car roof according to EN81
20	Car doors	Centre opening, (W x H) 900mm x 2000mm - panoramic
21	Landing doors	(W x H) 900mm x 2000mm – panoramic
22		Emergency lock key
23	Car Safety Gear	Emergency Passenger Evacuation Device; lowering car to exit level; Automatic with door opening.
24		Door closing force limiter
25		Emergency manual emergency lowering or raising
26		Electromechanical locks on all doors

27		Overweight protection device, Over speed device
28		Motor overload and phase failure protection device
29		Progressive type safety gear
30		Slack rope switch
31		Car roof handrail 700mm high
31		Emergency intercom between the lift control panel and maintenance access panel located at the top most floor level
33		Hands Free two way communication with rescue service
34		Curtain light for door closure protection

SECTION 5 – SUPPLEMENTARY DOCUMENTATION

5.1 – Draft Contract Form

5.2 – Glossary

5.3 – Specimen Tender Guarantee (Bid Bond)

5.4- Specimen Performance Guarantee

5.5 – Specimen Pre-financing Guarantee

5.6 – Specimen Retention Guarantee

5.7 – General Conditions of Contract

It is hereby construed that the tenderers have availed themselves of these general conditions, and have read and accepted in full and without reservation the conditions outlined therein, and are therefore waiving any standard terms and conditions which they may have.

These general conditions will form an integral part of the contract that will be signed with the successful tenderer/s.