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| MINISTRY FOR THE ENVIRONMENT, CLIMATE CHANGE AND PLANNING  |
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| **REFERENCE NUMBER:** | **ERDF.05.121 – Tender 008** |
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| **Tender for demolition works, construction works and other civil works, the Construction of an Aviary the Installation of Sun Pipes and Building Monitoring Sensors** **as part of ERDF Project ERDF.05.121 – Wildlife Rehabilitation Centre** |
| **Date Published:** | **Friday 19th June 2020** |  |
| **Deadline for Submission:** | **Tuesday 28th July 2020** | **at 12:00am CET/CEST** |
| **Tender Opening:** | **Tuesday 28th July 2020** | **At 12:00am CET/CEST** |
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|  | 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 FundCo-financing rate: 80% European Union; 20% National Funds |  |

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| **IMPORTANT** |
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| **Nature Trust Malta**Contact details (c/o Xrobb l-Għaġin Nature Park and Sustainable Development Centre, Triq Xrobb l-Għaġin, Marsaxlokk, Malta, (+356) 21313150, info@naturetrustmalta.org) |

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# SECTION 1 – INSTRUCTIONS TO TENDERERS

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|  | 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 *Xrobb l-Għaġin Nature Park and Sustainable Development Centre, Triq Xrobb l-Għaġin, Marsaxlokk, Malta*. 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 provision of the following works:* Lot 1
	+ Demolition works
	+ Earthworks
	+ Franka Stone and Hollow Concrete Blocks
	+ Laying of Concrete
	+ Repair and Strengthening materials
	+ Damp Proofing.
	+ Plumbing Works
	+ Installation of Thermal Insulation
	+ Installation of solar tubes for natural daylighting of interiors
* Lot 2
	+ Steel work forming part of the construction of an Aviary
	+ Installation of mesh as part of the said aviary
* Lot 3
	+ Installation of Building Monitoring Sensors, including data logging system, personal computer and data management system cum web interface.

related to the Wildlife Rehabilitation Centre to be established at Xrobb l-Għaġin, as part of ERDF.05.121 – WILDLIFE REHABILITATION CENTRE |
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| 1.3 | The place of acceptance of the services shall be **the still unrestored part of the ex-Deutsche Welle radio relay station at Xrobb l-Għaġin Natural Park**, the time-limits for the execution of the contract shall be **three years** **from last date of signature on contract**, and the INCOTERM2010 applicable shall be **Delivery Duty Paid (DDP).** |
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| 1.4 | This is a unit-price contract. |
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| 1.5 | This call for tenders is being issued under an open procedure. |
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| 1.6 | The beneficiary of this tender is *Nature Trust – FEE Malta*. |
| 1.7 | This tender is not a reserved contract. |
|  | 2. Timetable |
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|  | DATE | TIME |
| Clarification Meeting/Site Visit (Refer to Clause 6.1) | Friday 26th June 2020 | 12:00 hrs |
| Deadline for request for any additional information from the NGO**Clarification requests should be addressed to: *info@naturetrustmalta.org*** | Thursday 16th July 2020 | 12:00 hrs(noon) |
| Last date on which additional information can be issued by the NGO | Monday 20th July 2020 | 12:00 hrs(noon) |
| 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) | Tuesday 28th July 2020 | 12:00 hrs(noon) |
| \* All times Central European Time (CET) / Central European Summer Time (CEST) as applicable |

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|  | 3. Lots |
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| 3.1 | This tender **is divided into lots**. Tenderers may submit a tender for one lot only OR several lots (one or more lots) OR all of the lots. |
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| 3.2 | The tenderer must offer the whole of the quantity or quantities indicated for each lot. Under no circumstances will tenders for part of the quantities required be taken into consideration. Each lot may form a separate contract and the quantities indicated for different lots will be indivisible. |
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| 3.3 | Contracts will be awarded lot by lot, in accordance with the award criteria at Article 9. |
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| 4.1 | 4. Variant SolutionsVariant 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 European Regional Development Fund (ERDF) Operational Programme 1 - Co-financing rate: 80% European Union; 20% National Funds |
| 5.2  | The Contracting Authority of this tender is *Nature Trust Malta* |
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|  | 6. Clarification Meeting/Site Visit/Workshop |
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| 6.1 | A clarification meeting/site visit will be held on the date and time indicated in Clause 2, at Xrobb l-Għaġin Nature Park to answer any questions on the tender document which have been forwarded in writing, or are raised during the same meeting. Minutes will be taken during the meeting, and these (together with any clarifications in response to written requests which are not addressed during the meeting) shall be posted online on the NGOs website as a clarification note as per Clause 6.1 of the General Rules Governing Tendering for NGOs (version 1.0). Meetings between economic operators and the NGO, other than that provided in this clause during the tendering period are not permitted.  |
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|  | 7. Selection and Award Requirements |
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|  | 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. |
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|  | **(A) Eligibility Criteria** |
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|  | (i)(ii) | No Bid Bond is required.(Note 1)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.  |
|  | (iiii)(iv) | Power of Attorney (if applicable) (Note 2A)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: |
|  | (i) | 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. (Note 2A)**To be filled in by all bidders, including, if applicable, in respect of sub-contractors and independent third party bodies on whose capacity they rely** |
|  | (ii) | Part II A Reference 2A.14 till 2A16.6 need only be filled in if the procurement is Reserved. (Note 2A)**Not applicable for the present tender** |
|  | (iii) | 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. (Note 2A)**To be filled in if applicable** |
|  | (iv) | Part II A Reference 2A.18 need only be filled where the tender is divided into lots. (Note 2A)**To be filled in if applicable** |
|  | (v) | Data concerning exclusion grounds to be submitted by filling Part III of the European Single Procurement Document (ESPD). (Note 2A)**To be filled in by all bidders, with bidders indicating the lots they are participating in** |
|  |  | Economic Operators must declare that they meet the minimum criteria established hereunderby 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)a) Suitability (Note 2A)**Not applicable for the present tender**b) Financial and Economic Standing(Note 2A)**Not applicable for the present tender**c) Technical and Professional Ability(Note 2A)

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| 4A.1 | The economic operator should indicate whether it, or any sub-contractors, is/are enrolled in the relevant professional or trade registers kept in the Member State of its establishment as follows (Relevant Lots in brackets):* A mason in terms of the Building Regulations Act (Lot 1)
* Proof that the Economic Operator, an employee or a Sub-contractor is registered as a Demolition Contractor in terms of the Avoidance of Damage to Third Party Property Regulations (2019)

**NOT Applicable for Lots 2 and 3** |
| 4C.2.1 | Please provide details of the technicians or technical bodies the economic operator can call upon, especially those responsible for quality control in relation to this procurement exercise (Relevant Lots in brackets):* Testing of Concrete Quality (Lot 1)
* Health and Safety (Lot 1, Lot 2)

**NOT Applicable for Lot 3** |
| 4C.10 | Provide data concerning subcontractors and the percentage of works to be subcontracted. This information shall be included in the online ESPD form in Part IV: Selection criteria - Technical and professional ability (All lots).Any subcontractor proposed and disclosed at this stage shall be evaluated in line with the Exclusion and Blacklisting Criteria as per these Instructions to Tenderers. Furthermore, if the sub-contractor is relied upon by the Contractor to meet the standards established in the selection criteria, apart from submitting the relevant commitments in writing, such reliance will be evaluated to verify its correctness and whether in effect these criteria are satisfied.It is being understood that if the information being requested regarding sub-contracting is left empty, it will be assumed that no sub-contracting will take place (0% subcontracting). |

d) Quality Assurance Schemes and Environmental Management Standards(Note 2A)**Not applicable for the present tender** |
|  | (vii)  | Concluding statements to be submitted by filling Part VI of the European Single Procurement Document (ESPD). (Note 2A) **To be filled in by all bidders** |
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|  | **(C) Technical Specifications** |
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|  |  | 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)* a warranted Architect and Civil Engineer holding a warrant to practice as a Perit in Malta issued by the Periti Warranting Board (Lot 1, Lot 2, Lot 3)
* A qualified engineer having an MQF/EQF level 6 level qualification or higher in Engineering, with proven knowledge in the installation of Building Monitoring Sensor Systems (Lot 3).

**Literature** as per Form marked ‘Literature List’ to be submitted with the Technical offer at tendering stage (all lots as relevant per each lot). Alternatively, an Economic Operator can quote a reference number under which he/she has already supplied items so that there would be no need to submit literature. **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) |
|  | **(D) Financial Offer** |
|  |  |
|  | (i)(ii) | The Tender Form and Tenderer’s Declaration are to completed and submitted with the offer; a separate Tender Form is to be submitted for each option tendered, each form clearly marked ‘Option 1’, ‘Option 2’ etc.; (Note 3)A financial offer is to be submitted by filling in Financial Bid Form, and is to be calculated on the basis of **Delivered Duty Paid (DDP)2010 (Grand Total)** for the works tendered.(Note 3) |
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|  | **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.* |
| 8.1 | **8. Tender Guarantee (Bid bond)**No tender guarantee (bid bond) is required. |
|  | 9. Criteria for Award |
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| 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 for each lot. |
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# 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:

1. 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;
2. 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;
3. 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;
4. 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;
5. 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;
6. 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;
7. 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.

1. The secretary of the board shall keep a record of the grounds of each adjournment and of everything done in each sitting;
2. 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

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| **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 |
| The Laws of Malta shall apply in all matters not covered by the provisions of the contract. |
| 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 Contracting Authority’s technical specifications and design documentation;(e) the Contractor’s technical offer, and the design documentation (drawings); (f) the bill of quantities/financial bid (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 |
| Any communication shall be carried out with:Nature Trust Malta, c/o Xrobb l-Għaġin Nature Park and Sustainable Development Centre, Triq Xrobb l-Għaġin, Marsaxlokk, Malta Email: info@naturetrustmalta.orgCommunications shall preferably be carried out by email.Any requests for clarifications and the relevant reply shall be posted online on the website [www.naturetrustmalta.org](http://www.naturetrustmalta.org) in an anonymised form. |
| Article 5: Supervisor in charge and Supervisor's Representative |
| As per General conditionsWithout prejudice to the General Conditions, any reference to Supervisor in charge and Architect and Civil Engineer in Charge shall be construed to be interchangeable.  |
| Article 8: Supply of Documents |
| **FOR Lot 1 – Civil Works**Prior to the commencement of works, the Contractor shall provide the Contacting Authority with:1. For Lot 1 - A report detailing the **Health and Safety Assessment, including risk mitigation measures to be adopted,** for the carrying out of the necessary works for the tender implementation up to commissioning. vide Section 4, Sub/Section 4.1.3

For Lot 1, a **demolition** **method statement which takes into consideration, insofar as applicable, the requirements emanating from the Avoidance of Damage to Third Party Property Regulations** (2019) (L.N. 136 of 2019). It should include risk mitigating measures to address issues arising from the Risk Assessment. Vide Section 4, Sub/Section 4.2.2, Spec/1 Article 1.16.For Lot 1, during project implementation, the Contractor shall provide the Contracting Authority with documentation concerning the following:1. **Level Surveys** – If and where relevant, in connection with required trenching and laying of pipeworks as may be requestedby the Architect and Civil Engineer in charge. Vide Section 4, Sub/Section 4.2.2, Spec/2 Article 2.16.
2. **Documentation relating to concrete**
	1. Before placing orders for cement, the Contractor shall hand to the Architect and Civil Engineer in charge (Vide Section 4, Sub/Section 4.2.2, Spec/4 Article 4.11):
		1. The name of the proposed supplier.
		2. Cement manufacturer's certificates stating the Declaration of Conformity
	2. The Contractor shall keep, and upon request hand to the Architect and Civil Engineer in charge
		1. For each consignment of cement, a certificate showing the place of manufacture and the results of standard tests carried out on each day's production, included in the consignment, these to include physical and chemical tests (Vide Section 4, Sub/Section 4.2.2, Spec/4 Article 4.10).
		2. Accurate records shall be kept by the Contractor to identify the dates of delivery of cements. (Vide Section 4, Sub/Section 4.2.2, Spec/4 Article 4.10).
		3. Concrete mix delivery chits as per BS EN 206-01, clause 7.1, 7.2 and 7.3. (Vide Section 4, Sub/Section 4.2.2, Spec/4 Article 4.27).
		4. Documentation related to production control system, at least, the measures indicated in BS EN 206-1, clause 9 with particular reference to the recorded data and other documentation (See Tables 20, 21, 22, 23, 24)data and other documentation (Vide Section 4, Sub/Section 4.2.2, Spec/4 Article 4.23).
		5. the cast data-log to be presented with the concrete fresh and hardened properties test report. (Vide Section 4, Sub/Section 4.2.2, Spec/4 Article 4.37).
		6. Proposals for wet curing of concrete and for maintaining the curing regime to the standards and for the times specified herein, including full details of the materials to be used, their comparative efficiency with respect to the specified method of water curing. (Vide Section 4, Sub/Section 4.2.2, Spec/4 Article 4.27).
	3. In the eventuality of **Defective Concrete**, including defective concrete finishes, the Contractor shall provide, for approval by the Architect and Civil Engineer in charge, a proposed remedial treatment to concrete surfaces (vide Section 4, Sub/Section 4.2.2, Spec/5 Article 5.15).
3. **Other Documentation supporting certifications provided**
	1. Certification of testing carried out on the fresh concrete in accordance with BS EN 206, BS 8500 and BS EN 12350 plus supporting documentation as follows (Vide Section 4, Sub/Section 4.2.2, Spec/4 Article 4.63).
		1. Concrete designation;
		2. Sampling, site tests, and identification numbers of specimens tested in the laboratory;
		3. Location of the parts of the structure represented by each sample;
		4. Location in the structure of the batch from which each sample is taken.
	2. Seven-day test report (to be submitted within one day from availability) and 28-day test reports (to be submitted within one day from availability) (Vide Section 4, Sub/Section 4.2.2, Spec/4 Article 4.63).
	3. Concrete Mix Designs (Vide Section 4, Sub/Section 4.2.2, Spec/4 Article 4.22).
	4. Certification re Steel bars for the reinforcement of concrete as per Section 4, Sub/Section 4.2.2, Spec/4 Articles 6.2 – 6.4.
	5. Certification of the materials used for any repair and strengthening works as per Section 4, Sub/Section 4.2.2, Spec/4 Article 8.3
4. **Other Documentation** - The Contractor shall keep, and upon request hand to the Architect and Civil Engineer in charge:
	1. Certificationthat all **delivery trucks** are certified as complying with BS EN 206-1, clause 9.6.2.3 and registered as suitable for their purpose in a data schedule. This shall include the calibration data in respect of water gauges. (Vide Section 4, Sub/Section 4.2.2, Spec/4 Article 4.33).
	2. **Precast elements including prestressed slabs**: Certification of elements including safe loads certified by the manufacturer's warranted Perit structural engineer.
	3. For **precast construction** certification of all elements and installation procedure has to be provided to the Architect and Civil Engineer in Charge, and if deemed necessary and required by the Architect and Civil Engineer in charge, a report detailing all calculations and layout and detail drawings necessary for the manufacture and installation of the precast units and for the completion of each section of the Works to satisfy the original design requirements. All these calculations and drawings will have to be approved by the Architect and Civil Engineer in charge before any work is commenced on the manufacture of precast concrete units. (Vide Section 4, Sub/Section 4.2.2, Spec/5 Article 5.2).
5. **With respect to Expanded polystyrene (EPS) for insulation**, the Contractor shall provide information (if applicable) on (Vide Section 4, Sub/Section 4.2.2, Spec/11).
	1. Manufacturer and date of manufacture/ batch no.
	2. Product R-values and respective H phrases at time of manufacture.
	3. The material that the product is manufactured from.
	4. Weight and thickness.
	5. Percentage recycled content: for materials, the percentage of each material must be clearly labelled by mass and volume.
	6. Maximum storage time or install-by date.
	7. Time after installation at which the product will have re-lofted to its nominal thickness.
	8. Transportation and installation instructions.
	9. Written storage instructions.

 1. **With respect to Water proofing**, the Contractor shall provide information (if applicable) on:
	1. Test Certificates and Data Sheets (Vide Section 4, Sub/Section 4.2.2, Spec/10).
2. **With respect to Light pipes/sun pipes/sun tunnels**, the Contractor shall provide information (if applicable) on:
	1. Data Sheets (Vide Section 4, Sub/Section 4.2.2, Spec/12).

**FOR Lot 2 – Aviary**Prior to the commencement of works, the Contractor shall provide the Contacting Authority with:* For Lot 2 - A report detailing the **Health and Safety Assessment, including risk mitigation measures to be adopted,** for the carrying out of the necessary works for the tender implementation up to commissioning. (vide Section 4, Sub/Section 4.1.3)
* **Method Statement for Structural Steel Erection** (vide Section 4, Sub/Section 4.3.1, Articles 1.1, 1.6, 1.7, 1.8, 1.9, 1.14, 1.22).

For Lot 2, during project implementation, the Contractor shall provide the Contracting Authority with documentation concerning the following:1. **Certification that all steel has been specifically tested** in accordance with the appropriate material quality standard as indicated in Table 2.1, Material and Dimension Standards, National Structural Steelwork Specifications for Building Construction, 4th Edition, 2002.
2. On completion of the project, the Contractor shall provide the Architect and Civil Engineer in charge of Works with detailed “**As Erected”** drawings (including copies in electronic format).

**FOR Lot 3 – Building Monitoring System**NO documentation is required during tender implementation in respect of this Lot**NB: Any documentation identified above, and any Certification requested as part of the present tender document is to be provided by the Contractor at NO ADDITIONAL COST to the Contracting Authority** |
| Article 10: Assistance with Local Regulations |
| As per General Conditions. |
|  |
| Article 11: The Contractor’s Obligations |
| Without prejudice to the General Conditions, the Contractor shall be bound with the following obligations: * The contractor binds himself to adhere to the conditions imposed in the Planning Permit, that is, the approved drawings, document and conditions imposed in Planning Permit PA NO/1659/17 and PA No / 1660/17 as approved by the Planning Authority.
* Submission of the programme of performance of the contract as mentioned in Article 11.9 of the General Conditions.
* Provide any drawings identified in Article 8 of these Special Conditions.
* During the execution of the contract, any communication, including any documents and/or drawings shall be submitted to the Architect and Civil Engineer in charge by email. The Architect and Civil Engineer in charge shall review the relevant communication internally and reply in writing.
 |
|  |
| Article 13: Performance Guarantee |
| The Contractor shall, within 15 calendar days of receipt of the contract, sign and date the contract and return it together with a copy of the Performance Guarantee. The copy of the Performance Guarantee forwarded to the Central Government Authority is to be endorsed by the Contracting Authority prior to submission. The Contractor is therefore obliged to forward the original Performance Guarantee to the Contracting Authority. The amount of the guarantee shall be 4% where the amount of the total contract value is between €10,000 and €500,000 exclusive of VAT, and 10% where the amount of the total contract value is €500,000 or above. |
|  |
| 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. |
| The performance guarantee shall be released as per Article 13.9 of the General Conditions. |
| Article 14: Insurance |
| As per general conditions |
|  |
| Article 15: Performance Programme (Timetable) |
| The Contractor/s shall complete the relevant work as follows: |
| Lot 1* Submission of relevant Health and Safety report and Method Statements as Identified in Article 8 of these Special Conditions within one (1) week from Signature of Contract
* Demolition and dismantling works within one (1) month from Signature of Contract
* Completion of all Works within five (5) months from Signature of Contract

Lot 2* Submission of relevant Health and Safety report and Method Statements as Identified in Article 8 of these Special Conditions within one (1) week from Signature of Contract
* Completion of all Works within five (5) months from Signature of Contract

Lot 3* Completion of all Works within five (5) months from Signature of Contract
 |
| Article 17: Contractor’s Drawings/Diagrams |
| As per Article 8 of these Special Conditions |
|  |
| Article 18: Tender Prices |
| As per General Conditions |
|  |
| Article 22: Interference with Traffic |
| N/A |
|  |
| Article 25: Demolished Materials |
| As per General Conditions |
|  |
| Article 26: Discoveries |
| As per General Conditions  |
|  |
| Article 28: Soil Studies |
| N/A |
|  |
| Article 30: Patents and Licences |
| As per General Conditions |
|  |
| Article 31: Commencement Date |
| The commencement date for the performance of the contract shall be construed to read as the date of the Order to Start Works. |
|  |
| Article 32: Period of Execution of Tasks |
| Works under all lots shall be carried out within five (5) calendar months from signature of contract. |
|  |
| Article 34: Delays in Execution |
| A daily penalty of 1/1000 of the contract price per day’s delay up to a limit of 20% of the total contract price. |
|  |
| Article 35: Modification to the Contract |
| As per general Conditions |
|  |
| Article 37: Work Register |
| As per general Conditions |
|  |
| Without prejudice to the General conditions, statements shall be drawn in a timely manner and not later than 24 hours after the occurrence of an event/activity/work. |
| Article 38: Origin |
| As per general conditions |
|  |
| Article 39: Quality of Works and Materials |
| No preliminary technical acceptance is envisaged. Quality of works and materials shall be certified by the Contractor’s architect as being in line with the applicable standards as defined in Section 4 of the present Tender Document. Without prejudice, the Architect and Civil Engineer in charge may reject and/or approve the quality of works taking into consideration any certification provided, any results from tests mandated by the said specifications or requested by the Architect and Civil Engineer in charge, or any inspection carried out. The decision by the Architect and Civil Engineer in charge shall be final. |
|  |
| Article 40: Inspection and Testing |
| The Architect and Civil Engineer in charge has the right to request tests on concrete from an independent laboratory acceptable to the Contracting Authority so that 7-day and 28-day compressive strength tests can be made. These tests will be carried out at the expense of the contractor. |
|  |
| Article 42: Ownership of Plants and Materials |
| As per General Conditions |
|  |
| Article 43: Payments: General Principles |
| 1. Payments will be made in Euro.
 |
| 1. Payments shall be authorized by the Contracting Authority, and paid by the Treasury Department on the basis of work carried out, and certified as such by the Architect and Civil Engineer in charge of the present tender.
 |
| 1. Invoices are to be accompanied by the relevant certifications attesting quality of works done as per Tender Specifications. Specifically, in the case of works forming part of:
	1. Lot 1 these shall be accompanied by a report by the Contractor’s Architect confirming abidance with the different relevant standards/specifications as outlined in Section 4 of the Tender Document together with proof substantiating such claims, such as results of tests, certifications or otherwise.
	2. Lot 1 these shall be accompanied by a report by the Contractor’s Engineer confirming abidance with the different relevant standards/specifications as outlined in Section 4 of the Tender Document together with proof substantiating such claims, such as results of tests, certifications or otherwise.
 |
|  |
| As per General Conditions. |
| Article 44: Pre-financing |
| The Contractor must request a pre-financing for operations connected with the execution of the works, as a lump sum advance enabling him to meet expenditure resulting from the commencement of the contract. Such pre-financing shall be established at 20% of the contract award. The Contractor shall provide the Contracting Authority with a pre-financing guarantee for the value of the said pre-financing, within 30 days from the last signature of contract. Such a guarantee shall be issued by a bank as per template provided by the Contracting Authority.The pre-financing guarantee shall be released as per General Conditions. |
|  |
| Article 45: Retention Monies |
| Not applicable |
|  |
| Article 46: Price Revision |
| No price revision is possible. |
|  |
| Article 47: Measurement |
| Without prejudice to the General Conditions, the Architect and Civil Engineer in charge shall measure the works in the presence of the Contractor or his representative. The measurement of works shall be carried out on a date agreed by the Contractor and the Architect and Civil Engineer in charge using standard measuring equipment. The unit used shall be those specified in the Financial Bid Form/Bill of Quantities. |
|  |
| Article 48: Interim Payments |
| The Contactor may submit an application for interim payment. In such an event, without prejudice to the General Conditions, the application for the interim payment shall be submitted in the form of an invoice, compiled in line with the applicable legislation (VAT Act etc.) and shall specify each Bill of Quantity item (henceforth cost item) to which they relate. Nothing shall preclude the Contractor from submitting an invoice relative to more than one cost item, provided each cost item is uniquely identified, measured, and costed. |
|  |
| Article 50: Delayed Payments |
| 1. The Contracting Authority shall endeavour to 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 referred to 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.
 |
| 1. Without prejudice to the above, the Contracting Authority shall not be liable for any delays, and the Contractor shall NOT claim any late-payment interest or otherwise.
 |
|  |
| Article 53: End Date |
| 1. The Project ERDF 05.121 WILDLIFE REHABILITATION CENTRE is scheduled to be completed by on 31 March 2021.
2. Without prejudice, the Contractor is bound by the timeframes established in as per Article 15 of these Special Conditions.
 |
|  |
| Article 56: Partial Acceptance |
| Not Applicable |
|  |
| Article 57: Provisional Acceptance |
| Without prejudice to the General Conditions, the Contracting authority will:1. Issue a provisional acceptance certificate for each Lot or for each category of works (having a separate heading in Section 4 within each lot), following the certification of works for that category by the Architect in Charge responsible for the project
2. If applicable, the certification indicated in the above sub-clause 1 shall only be issued after the relevant tests have been carried out, and the Architect in Charge responsible for certification has deemed the results as satisfactory.
3. If applicable, the certification indicated in the above sub-clause 1 shall only be issued after the Contractor has provided the Contracting Authority with a properly documented report and the Project Manager and Architect in Charge have confirmed that items are in line with the technical specifications.
 |
|  |
| Article 58: Maintenance Obligations |
| Not applicable. |
|  |
| 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:1. either a ruling from a national court, or
2. an arbitration ruling, in the case where the parties, i.e. the Contracting Authority and the Contractor, by agreement decide to refer the matter to arbitration.
 |
|  |
| Article 70: Further Additional Clauses |
| The Contractor shall provide a warranty of five years for the following (lots indicated in brackets): 1. the Light pipes/sun pipes/sun tunnels forming part (Lot 1)
2. the Building Monitoring Sensors (Lot 3)
3. Computer forming part of Building Monitoring sensors system (Lot 3)
 |

# SECTION 4 –SPECIFICATIONS/TERMS OF REFERENCE (Note 3)

**Terms of Reference**

|  |
| --- |
| **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.** |

# 4.1 General (all Lots)

## 4.1.1 Background Information

**The information in this section is being provided by way of background, and for the information of potential bidders.**

The aim of the ERDF PROJECT ERDF.05.121 – WILDLIFE REHABILITATION CENTRE is primarily to set up a Wildlife Rehabilitation Centre to provide ex-situ rehabilitation of wildlife from across Malta and surrounding seas: marine (turtles and cetaceans), terrestrial (such as hedgehogs, shrews, lizards, snakes and bats) and avian fauna. Following rehabilitation, if possible, they will be released into their natural habitat. It should be a unique, all year round visitor attraction visitors with the opportunity to interact with the rehabilitating wildlife.

The Contracting Authority, in partnership with the Ministry for the Environment, Climate Change and Planning was successful in its submission for ERDF funds to fund the setting-up of this Centre. In this regard, any work on the project has to be carried out within the parameters defined by the Grant Agreement entered into by NTM and the Managing Authority for ERDF funds. The Planning and Priorities Coordination Division (PPCD) within the Parliamentary Secretariat for EU Funds within the Ministry of Foreign and European Affairs. is the designated Managing Authority (MA) responsible for the overall coordination and management of the European Regional Development Fund (ERDF) and the Cohesion Fund (CF) under Operational Programme I (2014-2020). The MA issues calls for proposals for ERDF and CF at different intervals of the Programme’s lifetime. The project was successful under one such call.

The present infrastructure for ex-situ conservation in Malta is, to say the least, quite limited and to date the rehabilitation of such species has been carried out in a piecemeal manner, mainly by NTM, through its Wildlife Rescue Team which provides rescue services for both marine and terrestrial fauna on a 24/7 basis. The team is composed of a group of volunteers, made up of divers, biologists and marine mammal medics who are covered by permits from the Environment and Resource Authority (ERA) to respond to calls for the handling of local protected wildlife. Injured turtles and cetaceans are taken to San Lucjan’s Rehabilitation Centre and/or a veterinarian’s clinic where they are treated by or under the supervision of a qualified veterinarian. Other animals (including hedgehogs, lizards, chameleons, shrews, bats, wild rabbits, and weasels), after being examined by a veterinarian, are taken, under ERA permit to the volunteer’s homes where they are treated, medicated and taken care of until they may be released once more into the wild. Turtles are released during dedicated events in the presence of the media and distinguished guests, amongst others, as part of an effort to raise awareness about risks to biodiversity and rehabilitation efforts. Other species are released by the volunteers at the place of rescue or in a nearby protected area.

The project will also cater for CITES animals which are presently hosted at the Small Animal Quarantine facilities in Luqa, which is managed by the Ministry for Sustainable Development, Environment and Climate Change. The site was designed to host small animals and pets (dogs, cats and ferrets) who do not meet all the requirements for entry into Malta under the Pet Passport scheme, for a short period of time in quarantine to minimise the risk of disease being brought into the islands. However, CITES species that are found in Malta illegally, are also kept there until their position is regularised and/or they may be returned to their country of origin or released into the wild.

The Wildlife Rehabilitation Centre will be hosted in part of the ex-Deutsche Welle radio relay station at Xrobb l-Għaġin Natural Park. It will compliment a first project in the area carried out between 2007 and 2011 through a grant from Iceland, Liechtenstein and Norway though the EEA financial mechanism and the Norwegian financial mechanism, which project saw the rehabilitation of a hitherto degraded area and some of the derelict buildings in the area into a natural park and a Sustainable Development Centre. That project had left some buildings unutilised, and thus still in a derelict state. The present project is proposing the rehabilitation of those buildings and their use as parts of the proposed Wildlife Rehabilitation Centre.

## 4.1.2 Lots forming part of this tender

This tender is split lots. As per Section 1, Article 3.1, Tenderers may submit a tender for one lot only OR several lots (one or more lots) OR all of the lots.

The lots are as follows, and relevant technical specifications will be discussed hereunder

|  |  |  |
| --- | --- | --- |
| Lot Number | Subject Matter | Sub-Section in these technical Specifications |
| Lot 1 | Civil Works | Sub-Section 4.2 |
| Lot 2 | Works on the Aviary | Sub-Section 4.3 |
| Lot 3 | Installation of Building Monitoring System | Sub-Section 4.4 |

## 4.1.3 Onus to comply with existing legislation

The contractor shall respect all laws and regulations in Malta, including but not limited to occupational health and safety regulations, and environmental regulations. The contractor shall operate in a manner that does not cause any damage to adjacent properties and areas, including the existing Sustainable Development Centre and all structures forming part of the complex.

The contractor shall operate in a manner that does not disrupt the normal operations of the Sustainable Development Centre. In case of extraordinary works, agreement is to be reached on the method and period of activity in advance between Nature Trust Malta and the Contractor so as to cause the least disruption possible.

Without prejudice to the generality of this section, the Contractor/s for Lot 1 and Lot 2 shall have prepared, by a Competent Person in Health and Safety as per OHSA Act, an assessment of Health and Safety risks and mitigation measures to be adopted during the works to be carried out.

## 4.1.3 Onus to Work Together and Provide Access

Whereas three different contractors may be responsible for the works forming part of this tender, one for each lot, Bidders are reminded of the onus to work together, allow access to the respective sites, and not hinder the work of the other contractors working on this tender, as well as any other contractor working on any other works-supplies on site.

Further to the above, the Contractor responsible for the works in Lot 1, shall coordinate with the Contractors responsible for the other works as follows:

* With the Contractor responsible for Lot 2 ‘ Works on the Aviary’ insofar as the Contractor responsible for Lot 1 shall be responsible for the clearing works, the laying of the concrete platform and the masonry wall, whereas the Contractor responsible for Lot 2 shall be responsible for the erection of the steel structure and installation of mesh. The steel structures foundations shall be laid in the concrete of the platform.
* With the Contractor responsible for Lot 3 ‘Installation of Building Monitoring System’ insofar as the Contractor responsible for Lot 1 shall provide access to the Contractor responsible for Lot 3, and facilitate the installation by the latter of the different sensors and cabling as directed by the Architect and Civil Engineer in Charge.

Bidders shall be held liable for any loss of funds or delays incurred by the Contracting Authority due to any non-collaboration between each other.

# 4.2 Lot 1 – Civil Works

## 4.2.1 Scope of works

* Mobilisation on site
* Demolition of a number of existing structures
* Clearing works
* Repair works on existing concrete structures
* Structural strengthening of existing concrete structures
* Construction of walls and suspended beams and slabs
* Laying of services
* De-mobilisation and cleaning of site.

## 4.2.2 Specifications forming part of the present Lot:

Specs/01

Specs/02

Specs/03

Specs/04

Specs/05

Specs/06

Specs/07

Specs/08

Specs/09

Specs/10

Specs/11

Specs/12

Demolition

Earthworks

Franka Stone and Hollow Concrete Blocks

Concrete

Formwork for Concrete

Reinforcement for Concrete

Precast Concrete

Repair and Strengthening materials

Plumbing

Damp Proofing

Thermal Insulation

Natural roof light fixtures

#### Demolition

* 1. **General – Safe Working Conditions**
1. This specification does not replace the Contractor’s legal responsibility to provide and maintain safe working conditions in accordance with current Maltese Occupational Health and Safety legislation, namely LN 36 of 2003, LN 281 of 2004 and other subsidiary legislation and regulations.
2. All worksite access gates and entry points should be strictly controlled to give the minimum amount of time open for passage of vehicles, in order to minimise the impact of plant vehicle noise on the local environment.
	1. **Crane Locations**
3. Every effort shall be made to confine crane arcs to within the site periphery. Should crane rotation arcs extend beyond the site perimeter, approval shall be sought from the Architect and Civil Engineer in charge. When the erection of cranes is located in areas under the jurisdiction of public authorities and entities, the Contractor shall ensure that all necessary permits, fees, protection and safety provisions are in place and at no additional expense to the Contracting Authority.
4. At the completion of works, the Contractor will leave the site free from plant, rubble and any unwanted materials.
5. The security of neighbouring property/buildings should be considered. Care should be taken not to leave scaffolding and ladders or any conditions, which facilitate access to neighbouring property and/or buildings including those pertaining to the Contracting Authority.
6. The Contractor shall follow a "good housekeeping" policy at all times. This will include, but not necessarily be limited to, the disposal of rubbish and waste at adequate intervals.
	1. **Hours of Working**
7. Construction operation will be restricted to those periods recognized and permitted by local regulations and legislation.
8. Any works outside the permitted hours are to be by prior approval of the Architect and Civil Engineer in charge.
	1. **Dust and Air Pollution**
9. The Contractor shall take all precautionary measures necessary to minimise dust pollution during demolition works, including through the watering of the area should where and when necessary to minimise dust transference into neighbouring premises and/or areas. Whenever possible dust suppressed tools should be used.
10. Stockpiles shall aim to minimise the effects of attrition and wind action. They shall be sited and shaped to minimise the potential for dust generation. Handling operations shall be kept to a minimum and materials must be deposited onto the stockpile from the minimum practicable height without causing obstruction to lighting to adjacent property. The surface of long-term stockpiles shall be stabilised.
11. The Contractor shall take necessary measures to prevent any transfer of mud into roads.
12. The Contractor should take all necessary precautions to prevent the occurrence of smoke emissions or fumes from site plant or stored fuel oils for safety reasons and to prevent such emissions or fumes drifting into residential areas. In particular, plant should be well maintained and measures taken to ensure that they are not left running for long periods when not in use.
	1. **Demolition - Preliminary Considerations**
13. The Contractor shall ensure that an Architect and Civil Engineer in charge shall be continuously in charge of the works. Demolition operations shall generally comply with BS 6187:2011 - Code of Practice for Demolition.
	1. **Demolition - General Site Provisions**
14. Plant and equipment must only be operated by skilled operators and must be regularly serviced.
15. Protective clothing and shoes shall be worn at all times by all personnel working on site and any third party visitors.
16. Projecting nails, pieces of metal, etc. resulting from demolition can cause accidents.
	1. **Demolition - Technique**
17. The Contractor shall comply with the recommendations set out in BS 5228-1:2009+A12014, Code of Practice for Noise Control on Construction and Demolition sites
18. The demolition technique and choice of equipment should be dependent on the nature of the structure, the surrounding buildings and the environment.
	1. **Shoring and Underpinning**
19. When removing sections of the building which could leave other parts unsafe, the Contractor shall provide adequate temporary supports and shoring.
	1. **Working Areas**
20. These will need to be well signposted and clear warnings given that demolition work is in progress. This shall include the necessity for adequate illumination during the night.
	1. **Debris**
21. Sections of the building must not be overloaded with debris either on suspended floors or against walls.
	1. **Weather Conditions**
22. All walls and slabs shall be propped to protect against strong winds.
	1. **Overhead Cables**
23. Crane heights must be checked against the height of any surrounding overhead cables to avoid damage and cutting off supplies etc.
	1. **Scaffolding and Hoarding**
24. These must be constructed and illuminated to the relevant building regulations.
	1. **Demolition Processes**
25. The demolition method shall take into account the method of construction used for the original building and its proximity to other buildings, structures and the general public.
	1. **Building Information**
26. If information on the building in terms of "As Built" drawings and structural details, are not available. Adequate site investigations are necessary, both to ascertain the way in which the building was originally constructed, and to identify the stresses and strains which exist within it. Consideration should be given to conducting a site and building survey, with a structural bias.
	1. **Demolition Method Statement - General**
	2.
27. The Contractor shall provide the Architect and Civil Engineer in Charge a method statement which takes into consideration, insofar as applicable, the requirements emanating from the Avoidance of Damage to Third Party Property Regulations (2019) (L.N. 136 of 2019). It should, amongst others, assess risks, make recommendations about risk mitigating measures and form a reference for the site supervision.
28. The method statement should be easy to understand, agreed by and known to all levels of management and supervision.
29. If only parts/sections of the building is to be demolished the Method statement shall contain details of how to isolate the part/s to be demolished from the remaining structure. This shall normally be through vertical cuts in masonry walls and horizontal stitch drilling in concrete floor slabs using hand held tools.
30. The Method Statement shall clearly define:
	1. The sequence and method of demolition or dismantling of the building or structure with details of personnel access, working and protective platforms and machinery requirements;
	2. Details and design of any temporary supporting structures to be used during the demolition process;
	3. Specific details of any pre-weakening on structures which are to be pulled down or demolished;
	4. Arrangements for the protection of personnel and the public and the exclusion of unauthorized persons, with details of areas outside the site boundaries that may occasionally need to be controlled to improve safety during critical aspects of the work;
	5. Details of the removal or making safe of electrical, and other services and drains;
	6. Details of temporary services available or required for the contractor's use;
	7. Arrangements for the control of site transport used for the removal of demolition debris.
	8. **Demolition Methods**
31. Generally buildings and structures should be demolished in the reverse order to their erection, although where partial demolition is involved a more careful evaluation of the nature of the effects of the demolition is necessary.
32. Normally, the Demolition Contractor is able to adopt a method of work which gradually reduces the height of the building; Controlled collapse of the building or structure is strictly NOT PERMITTED.
33. Only piecemeal demolition, using hand-held tools or machines, to reduce the height of the building or structure gradually shall be permitted.
34. Demolition of buildings or structure by hand-held tools such as electric or pneumatic breakers, sometimes as a preliminary to using other methods, should be carried out, where practicable, in the reverse order to the original construction sequence. Lifting appliances may be necessary to hold larger structural members during cutting and for lowering severed structural members and other debris. Chutes may be used to discharge debris into a vehicle or hopper. Note - Foundations would normally be grubbed up by excavation machines.
35. Where a building that is to be demolished by machine is bonded to another structure, the two should be separated by the use of hand methods before the main demolition process begins.
36. No machinery shall be supported directly on the structure that is being demolished.
37. No demolition personnel shall be supported directly on the structure that is being demolished.
38. When any part of a building is being demolished only the machine operator and assistant should be allowed close to the working area. The cabs of all machines should be strong enough to protect the operator against the fall of debris. In particular, the windscreen and rooflight should be of shatterproof material and guarded by a grille of steel bars or a substantial mesh.
39. Balling machines comprising a drag-line type crawler chassis fitted with a demolition ball are not allowed.
40. Impact hammers and nibblers are permitted but in either case, material should be removed from the top of walls or columns in courses not greater than 600mm in depth whilst steel reinforcement should be cut separately as necessary.

#### Earthworks

* 1. **General**
1. Earthworks shall generally comply with BS EN 6031:2015 – Code of Practice for Earthworks.
	1. **Compliance – Sample Size and Frequency of Sampling (Where Applicable)**
2. Where applicable, sample size and frequency of sampling for compliance shall be established on the basis of standard statistical guidelines.
	1. **Compliance – Testing and Certification**
3. Compliance shall be demonstrated through testing and/or certification of products and/or processes as outlined in the ensuing clauses.
	1. **Preliminary inspection for Existing Services**
4. 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.
	1. **Works to commence only on Instructions**
5. The Contractor shall commence or proceed with excavations only on instructions from the Architect and Civil Engineer in charge or designate.
	1. **Caution**
6. The Contractor, subject to any instructions or contrary directions in accordance with the Contract, shall take all actions, measures and precautions required by any recognised public entity or owners of privately owned services or supplies, for rendering safe, disconnecting and properly sealing off of all pipes, drains, cabling, services and supplies.
	1. **Excavations**
7. All excavation shall be carried out in any extractable materials encountered to the lines and levels shown on the Drawings or as directed by the Architect and Civil Engineer in charge.
8. Excavation shall be carried out by hand or machine as found expedient for the work to be executed, including grading and trimming the bottom of the excavations to the precise levels required. The Contractor shall take all precautions necessary to avoid damage to existing services.
9. The sides of excavations in open cut shall be trimmed and made safe to the satisfaction of the Architect and Civil Engineer in charge.
	1. **Organic Topsoil**
10. Topsoil which is stripped from the natural ground surface and which contains sufficient organic matter for the germination of grass seed shall be stockpiled in a distinct and separate stockpile and under no circumstance shall it be used for fill operations. Disposal shall be subject to the local regulations.
	1. **Soft Areas**
11. Soft areas which, in the opinion of the Architect and Civil Engineer in charge, are unsuitable for bearing the overlying construction and applied loadings, shall be removed to such depths and widths as directed. Insofar as possible, all material excavated will be retained on site for re-use. The excavation shall be backfilled with fill material approved by the Architect and Civil Engineer in charge.
	1. **Stability of Existing Structures**
12. All excavation shall be carried out in such a way as not to endanger the stability or safety of any existing structure or any part of the permanent or temporary works. Any temporary measures necessary in order to comply with this requirement shall be agreed with the Architect and Civil Engineer in charge. The Contractor is to allow in his rates for excavation, all the necessary planking and strutting. The Contractor is at all times responsible for the safety of the excavations; and shall provide all necessary planking and strutting to ensure this. Should any damage result to the excavations or works, the Contractor will be held entirely responsible and any extra work required by virtue of this will be entirely at his own expense.
	1. **Control of Water**
13. Excavation for foundations of structures, if necessary, shall be carried out, generally, "in the dry". Water shall not be allowed to accumulate in the excavations and the Contractor shall install and maintain such pumping or other water control measures as are necessary, due regard being paid to the stability of adjacent structures. Any subsidiary water run-off systems shall be approved by the Architect and Civil Engineer in charge and must be of a temporary nature. Any damage caused by inadequacy of these water control measures shall be made good at the Contractor's own expense.
	1. **Over- Excavation**
14. In the event of the Contractor over excavating below the appropriate levels or beyond the alignments shown on the Drawings or directed by the Architect and Civil Engineer in charge, the Contractor shall, at his own expense, fill the excavation to the proper level specified with concrete of the same quality used in the foundation.
	1. **Earthworks Fill Material over Subgrade**
15. Earthworks fill material shall comply with Table 6/1 of the TM Specification for Roadworks. The general requirements as indicated in clause 602, 603, 608, 610, 611 and 612 of the TM Specification for Roadworks shall also apply.
16. Earthworks material testing shall be carried out in accordance with BS EN 1377:1997, Parts 1 to 9.
17. The requirements for grading shall comply with Table 6/2 of the TM Specification for Roadworks.
18. The Contractor shall adopt either the Method or End product procedure for compaction as indicated in the TM Specification for Roadworks, clause 612.
	1. **Subbase Material**
19. Granular Subbase Type 1 material shall comply with TM Specification for Roadworks, Volume 1, Series 800, clause 803.Granular Subbase Type 2 material shall comply with TM Specification for Roadworks, Volume 1, Series 800, clause 804.
20. Granular Subbase Type 4 material shall comply with TM Specification for Roadworks, Volume 1, Series 800, clause 806.
21. The material shall be placed and compacted as indicated in TM Specification for Roadworks, Volume 1, Series 800, clause 801 with particular reference to Table 8/1.
22. Compaction shall be carried out at the optimum moisture content (+/- 2%). Segregation of material shall be avoided.
23. The finished surface levels of subbase material shall have a tolerance of +/-20mm.
	1. **Aggregates**
24. Aggregates for unbound and hydraulically bound layers shall comply with Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC (henceforth EU 305/2011).
25. The technical characteristics shall comply with EN 13383-1.
	1. **Level Surveys**
26. Where relevant, in connection with required trenching and laying of pipeworks, level surveys may be requested by the the Architect and Civil Engineer in charge. Inter alia, such surveys may be required prior to and/or on completion of excavations and fill operations.
	1. **Contractor’s Responsibility**
27. Cultivated trees, shrubs, and grass in rights-of-way or easements, but outside the specified limits for excavation, shall be protected and preserved during the entire period of construction. Site preparation shall be considered incidental to the construction work and no specific payment will be made for any such costs incurred.
28. The Contractor shall be responsible for all notifications for inspections and testing as outlined in the specifications.
29. The Contractor is responsible for the disposal of all debris resulting from clearing, grubbing, and demolition work in a manner and location satisfactory to the Architect and Civil Engineer in charge. If stockpiling is done adjacent to excavations, the Contractor is responsible for ensuring they are placed in such a manner that no damage will result to the work or property in the event of rain.
	1. **Site Work**
30. All large roots and stumps shall be removed to a depth of at least 600mm below the original surface. Pits or cavities resulting from the grubbing which extend beyond the excavation limits shall be backfilled as specified herein.
31. In the presence of underground services, utilities or structures the Contractor shall use a high degree of caution. The Contractor shall bear all costs of repairing underground utilities or structures damaged in the work and shall be fully responsible for all damage to other property and persons resulting from damage to the underground utilities and structures. All damages shall be repaired within a reasonable time.
	1. **Areas outside the Construction Limits**
32. Areas outside the designated construction limits shall not be disturbed.
	1. **Types of Excavations**
33. The sites for structures shall be excavated large enough to permit proper erection of the forms, de-watering, and placement of concrete, but the excavation shall not be excessively large.
34. Banks shall be sloped to a safe angle except where such sloping would endanger or damage existing or proposed facilities. The bottom of the excavation shall be true to the required shape and elevations shown on the drawings. Backfilling with excavated material under structures will not be permitted.
	1. **Trenching**
35. Trenches shall be cut to the lines and grades shown on the drawings or established by the Architect and Civil Engineer in charge. The banks of trenches shall be cut in vertical, parallel planes equidistant from the centerline of the pipe, except where conditions will not permit vertical banks.
36. Where it is not practical to cut vertical banks, or where unprotected vertical banks would create dangerous conditions, the banks may be sloped to any width providing existing and proposed facilities will not be damaged or endangered. Sloped surfaces shall terminate at a level that will permit the achievement of the required surround depths shown on the drawings.
37. Where trench excavation may damage roadways, utility poles, pipelines, conduits, or private property or create conditions dangerous to workmen, the Contractor shall install suitable shoring for their protection. No specific payment will be made for shoring.
38. The bottom of all trenches shall be cut level in cross section and shaped to conform to the bottom of the pipe so as to afford full bearing on the pipe barrel, except where concrete cradles and surrounds, foundation material, or embedment material is to be installed. Bell holes shall be excavated so as to relieve pipe bells of all load, but small enough to ensure that support is provided throughout the length of the pipe barrel.
39. Trenches shall not be excavated excessively in advance of pipe laying. The work shall be performed so as to prevent any serious interruption of travel by the public and also to afford necessary access to public and private premises. Temporary bridges or cross walks shall be built where necessary to maintain traffic in a safe manner.
40. The sides of all trenches and excavations for pipelines and structures shall be securely held in place by stay bracing or by skeleton or solid shoring and bracing, as necessary to prevent slides, settlement, or movement of the unexcavated material. Wood or sheet steel piling shall have sufficient strength and rigidity to withstand the pressures and maintain the walls of the excavation and protect all persons and property from injury or damage.
41. Where excavations are made adjacent to buildings or other structures, or in paved street, the Contractor shall take particular care to sheet and brace the sides of the excavation adequately so as to prevent any settlement beneath the structures or pavement. The Contractor shall be solely responsible for any damage to any structure or injury to any person that results from his operations.

1. Bracing and sheeting may be removed in units when the level of the backfilling has reached the elevation necessary to protect the pipe work and adjacent property. When, in the opinion of the Architect and Civil Engineer in charge, sheeting or shoring above this level cannot be safely remove, it shall be left in place and the Contractor will be paid for the material left in place. Sheeting so ordered to be left in place shall be cut off at least 300mm below the surface.
	1. **Rock**
2. Rock shall be defined as any material, not of a granular nature, which occurs in its original position in ledges or bedded deposits of such hardness or texture that cannot be loosened, broken, or removed without the use of special equipment.
3. The rock shall be completely stripped of all overburden. The Architect and Civil Engineer in charge or his representative will then make the necessary measurements and take elevations on the rock to determine the volume of rock to be removed.
4. In trenches for pipelines, rock shall be removed for the overall width of the trench, which shall be as shown on the drawings, and to a minimum depth of 150mm below the bottom of the pipe for pipes smaller than 600mm in diameter.
	1. **Blasting with Explosives**
5. Blasting with explosives is strictly PROHIBITED.
	1. **Backfilling Trenches**
6. The backfilling of trenches shall commence immediately after any pipes have been installed, inspected and approved by the Architect and Civil Engineer in charge. In general, trenches shall be backfilled as shown on the Drawings for and mechanically compacted to the specified requirements as the material is placed in layers.
7. The Contractor shall replace all surface materials and restore all paving, kerbing, sidewalks, fences, shrubs, and grass damaged or removed in the work, to a condition equal to that before the excavations.
	1. **Disposal of Materials**
8. On completion of any part of the work disposal shall be made of all surplus or unused material within the construction limits of such work and the surface of the work left in a neat and workmanlike condition.
9. Disposal of excavated materials shall be considered an integral part of the excavation work.
	1. **Maintenance**
10. All excavated areas, backfill, embankments, trenches, access roads, and ditches shall be maintained by the Contractor in good condition at all times until final takeover by the Contracting Authority.

#### Franka Stone and Hollow Concrete Blocks Masonry

* 1. **Compliance – Sample Size and Frequency of Sampling (Where Applicable)**
1. Where applicable, sample size and frequency of sampling for compliance shall be established on the basis of standard statistical guidelines.
	1. **Compliance – Testing and Certification**
2. Compliance shall be demonstrated through testing and/or certification of products and/or processes as outlined in the ensuing clauses.
	1. **Quality of the stone**
3. The Contractor shall ensure the supply of good quality franka stone, free from defects which needs to be approved by the Architect and Civil Engineer in Charge of Works.
4. Natural stone (Globigerina limestone blocks - “franka”) shall be totally free of any “soll” traces and blue markings (“swaba kohol”). The stone shall have good and consistent aesthetic qualities, good durability, and uniformity of appearance. The stone has to be fine-grained and free from spits and clayey material. It shall not contain excessive quantities of red stains or hard shell fragments. There shall be two types of blocks, one for all external walls, which shall be white and from the top part of the quarry, and one for internal walls and foundations, which shall be from the lower face of the quarry
5. Blocks with excessively chipped edges and corners shall be removed.
	1. **Compressive Strength**
6. The Contractor may be requested to furnish test certification stating the cylinder compressive strength of the material.
	1. **Stone Sizes**
7. All stone blocks shall be cut as smooth as possible before delivery to the site of works. All arises shall be true, and all surfaces plane and truly perpendicular to each other, and to a finished uniform height. The stone blocks shall be delivered to the site on suitable pallets, clearly marked as to the type. All stone blocks shall be unloaded carefully to prevent damage and wastage.
8. The finished size of stone blocks shall be in accordance with the Building Stone Order, Legal Notice 47 of 1976.
	1. **Workmanship**
9. Stone blocks shall be laid in a stretcher bond course pattern.
10. All stone blocks shall be dressed to accurate planes and shall be neatly fine-tooled on the face.
11. The “spika” and any arrises shall be dressed square.
12. Stone blocks above DPC level shall be rendered smooth either manually or mechanically.
13. Mechanical planers, band and rotary saws are permitted but dust control measures are required and operators shall use protection for nostrils and eyes.
14. “Fuq il-fil” courses shall be placed to form a consistent pattern with perpends in strict alternate distributive vertical alignment including joints, curved and flat arches, jambs and ornaments.
15. The finished walls shall normally have a course height (including mortar) of 270mm.
16. Jointing of blocks in horizontal courses shall be by the “inkulmar” method. Jointing shall only proceed at the end of full course placement. Vertical joints are to be broken at not less than 150mm.
17. Courses shall be laid true to lines and levels and with corners straight and plumb. Jambs shall be square and plumb. In double wall construction they shall extend the whole width in an alternate manner.
18. Double wall shall have adequate bond stones, properly damp proofed.
19. Quoins of all openings shall be protected during construction.
20. Stone Block lintels shall not be centrally loaded.
21. Voussoirs shall be to the exact curvature having all blocks of the same curved length including the key block.
22. Alternate corner lock blocks shall be interlocked the full width using a suitable toothing technique.

1. Dressing templates (mollijiet) shall be approved by the Architect.
2. Flat arches shall have all blocks of the same width including the key block. Flat arches shall be jointed with a mix of 1:1 cement/water grout placed in vertical insets cut along the vertical jointing plane.
3. Drip channels shall be provided or formed at exposed window sills, projecting mouldings and edges.
4. Coping stones to concrete shall have flexible movement inserts.
	1. **Hollow Concrete Blocks**
5. Hollow concrete blocks shall comply with EC Directive EC 97/740.
6. The technical characteristics shall comply with BS EN 771-3, Group 1.
7. The binder shall be Portland Cement Type CEM1, strength class 42.5N complying with BS EN 197-1.
8. Aggregate for use in concrete shall comply with BS EN 12620: Aggregates for concrete when tested to BS EN 812:2012.
	1. **Dimensions – Hollow Concrete Blocks**
9. Sizes shall be as follows:

Length 460mm

Height 255mm

Thickness 115mm, 150mm, 178mm, 230mm

* 1. **Dimensional Tolerances - HCB**
1. The maximum dimensional deviation shall be as follows:

Length +3mm, -5mm;

Height +3mm, -5mm;

Thickness +/-2mm with an average of +/-4mm at any

individual point.

1. The faces and ends of blocks shall be perpendicular and to the tolerances as stated above.
	1. **Compressive Strength - HCB**
2. Blocks having a thickness of 75mm and greater shall be tested for compressive strength as per BS EN 772-1.
3. The compressive strength shall be ≥ 7.0 N/mm2.
4. Blocks of thickness less than 75mm shall be tested for transverse strength as per BS EN 772-6. The average transverse strength of 5 blocks shall be ≥ 0.65 N/mm2.
	1. **Curing - HCB**
5. Blocks supplied for the Works shall be allowed to cure for at least 30 days from the date of manufacture before being delivered on site.
	1. **Mortar - General**
6. Horizontal mortar beds shall be between 9mm to 13mm thick. Fresh mortar shall be distributed evenly over the whole bedding plane. Vertical joints shall be between 5mm to 8mm thick. Pointing of both the horizontal and vertical joints shall be flush.
7. Mortar shall normally comprise of OPC cement, sand and limestone dust (xahx) adequately mixed with clean water to achieve good workability. It shall normally correspond strength class M4 mortar as denoted in BS EN 998-2.
8. The bedding plane shall be cleared of dust and the stone wetted before mortar is applied.

#### Concrete

* 1. **General**
1. The performance and production of concrete shall generally comply with BS EN 206-1: Concrete. Specification, Performance, Production and Conformity.
	1. **Compliance - Sample Size and Frequency of Sampling (Where Applicable)**
2. Where applicable, sample size and frequency of sampling for compliance shall be established on the basis of standard statistical guidelines.
	1. **Compliance – Testing and Certification**
3. Compliance shall be demonstrated through testing and/or certification of products and/or processes as outlined in the ensuing clauses.
	1. **Classification - Exposure**
4. The exposure classes of concrete related to environmental shall be as classified in BS EN 206-1, Table 1 – Exposure Classes and Table 2 – Limiting Values for Exposure Classes for Chemical attack from natural soil and ground Water.
5. The concrete shall be designed for an exposure class XS1, for a working life of 50 years.
	1. **Classification - Consistency**
6. The classification of consistency shall be as indicated in Table 3 – Slump Classes. The consistence suitable for different uses of in-situ concrete is indicated in BS 8500-1:2015+A2:2019: Complementary British Standard to BS EN 206-01, Method of Specifying and Guidance for the Specifier, Table A.19.
7. Any addition of water and admixture at delivery is forbidden unless under the direct responsibility of the producer. Any additions at delivery are subject to the condition that any limiting values incorporated in the specification are not exceeded. All additions shall be recorded on the delivery chits.
	1. **Classification – Compressive Strength**
8. The classification of compressive strength shall be as indicated in BS EN 206-01, Table 7, Column 3 – Minimum Compressive cube strength for normal-weight and heavy-weight concrete.
9. In general, the concrete strength shall be grade C35/45, unless otherwise indicated on the drawings.
	1. **Limiting Values**
10. The recommended limiting values for the composition and properties of concrete shall be as indicated in BS EN 206-01, Table F.1
	1. **Site Mixed Concrete**
11. The production of site-mixed concrete shall be limited to non-structural use and in quantities smaller than 2m3.
	1. **Cement**
12. Cement for use in concrete shall comply with EU Regulation No. 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonized conditions for the marketing of construction products and repealing Council Directive 89/106/EEC.
13. Technical characteristics shall comply with BS EN 197-1: Cement. Composition, Specifications and Conformity Criteria for Common Cements. The cement shall be Portland Cement, Type CEM1 or CEM IIA, strength class 42.5N. CE marking is mandatory for all cement supplied for use in the concrete mix.
	1. **Cement Temperature**
14. The temperature of the cement shall not exceed 65 Degrees Celsius at the time of incorporation into a concrete mix.
15. The cement shall be used as soon as possible after delivery, each consignment being used in correct rotation so as to prevent cement lying for long periods in storage. Accurate records shall be kept by the Contractor to identify the dates of delivery of cements.
16. Each consignment of cement delivered to the batching plant shall be accompanied by a certificate showing the place of manufacture and the results of standard tests carried out on each day's production, included in the consignment, these to include physical and chemical tests.
	1. **Cement - Supplier**
17. Before placing orders for cement, the Contractor shall submit :
18. The Name of the proposed supplier.
19. Cement manufacturer's certificates stating the Declaration of Conformity
	1. **Cement – Minimum Content in Mix**
20. The minimum cement for the specified maximum water cement (w/c) ratio and maximum aggregate size shall be as indicated in BS 8500-1:2015+A2:2019: Complementary British Standard to BS EN 206-01, Method of Specifying and Guidance for the Specifier, Table A.18.
21. The minimum amount of cement content is 380 kg/m3, for a maximum water cement ratio of 0.35.
	1. **Aggregate**
22. Aggregate for use in concrete shall comply with EU Regulation No. 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonized conditions for the marketing of construction products and repealing Council Directive 89/106/EEC.
23. Technical characteristics shall comply with BS EN 12620, Aggregates for Concrete.
	1. **Aggregate – Test methods**
24. Test methods for aggregates shall comply with EN 933, EN 1744 and EN 13179, EN 1367 and EN 1097.
25. Differing sizes of aggregate shall be stored on site in separate bins constructed in such a manner as to avoid cross-contamination of the individual aggregates.
26. Bins should have concrete floors to prevent ground contamination of aggregates. Adequate provision for drainage shall be made and all aggregates are to be stored and handled so as to avoid segregation.
27. During hot weather the aggregates should be covered or shaded in order to reduce the mixing temperature. A water sprinkler system shall be installed to wet the aggregates in the storage bins.
28. A sufficient separate stockpile of the tested and approved aggregates shall be maintained on site to ensure that no delays occur during construction.
29. The maximum nominal upper aggregate size shall be 20mm unless indicated otherwise.
30. Aggregate recovered from wash water or fresh concrete may be used as aggregate for concrete.
31. Aggregate recovered from hardened concrete may be used if the material is not contaminated and complies with the requirements of BS 8500-1:2015+A2:2019:
32. Complementary British Standard to BS EN 206-01, Method of Specifying and Guidance for the Specifier, Table 2. The limitations in Table 3 shall apply.
33. The Los Angeles Coefficient of the combined coarse aggregate shall not exceed LA40.
	1. **Marine Sand - Prohibition**
34. The use of marine and beach sand is prohibited.
	1. **Mixing Water**
35. Mixing water for concrete shall comply with EU Regulation No. 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonized conditions for the marketing of construction products and repealing Council Directive 89/106/EEC. The technical characteristics shall comply with BS EN 1008 - Specification for Sampling, Testing and Assessing the suitability of Water, including Water recovered from processes in the concrete industry, as Mixing Water for Concrete.
36. Only drinking quality water free from slats and harmful substances shall be used for concrete, including concrete curing. Water with impurities including salts, sea water or any other impurities shall not be used at any stage including the production or curing of concrete.
	1. **Standby Water Supply**
37. The Contractor shall install a standby water source of sufficient capacity to ensure continuation of concreting for sections of work being cast should water supplies be disrupted.
	1. **Admixtures**
38. Admixtures shall not be used without the written approval of the Architect and Civil Engineer in charge.
39. Admixtures for incorporation in concrete shall comply with EU Regulation No. 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonized conditions for the marketing of construction products and repealing Council Directive 89/106/EEC.EU directive 89/106/EEC as implemented in the relevant decision. The technical characteristics shall comply with BS EN 934-6: Admixtures for concrete, Mortar and Grout, Sampling, conformity control and evaluation of conformity. Test methods shall be as indicated in BS EN 480, Parts 1 to 14.
40. The total amount of admixtures, if any, shall not exceed the maximum dosage recommended by the admixture producer subject to a maximum dose not exceeding 50g of admixture per kg of cement. Admixtures used in quantities of less than 2g/kg of cement are only permitted if they are dispersed in part of the mixing water. If the total quantity of liquid admixtures exceeds 3 l/m3 of concrete, its water content shall be taken into account when calculating the water/cement ratio.
41. Where more than one admixture is proposed for incorporation in the concrete mix, the compatibility shall be certified.
42. Calcium chloride and chloride based admixtures shall not be added to concrete containing steel reinforcement, prestressing steel reinforcement or other embedded metal.
	1. **Additions**
43. Additions (filler, pigments, fly ash, silica fume) shall not be used without the written approval of the Architect and Civil Engineer in charge.
	1. **Chloride Content**
44. The chloride content of a concrete, expressed as a percentage of chloride ions by mass of cement, shall not exceed the values given in BS EN 206-1, Table 10.
	1. **Designed Concrete**
45. Concrete for structural use shall be designed concrete.
	1. **Designed Concrete - Trial Mixes**
46. Designed concrete shall conform to the requirements specified in BS 8500-1:2015+A2:2019: Complementary British Standard to BS EN 206-01, Method of Specifying and Guidance for the Specifier, Table 9.
47. Initial trial mixes shall be carried out on all mix designs prior to their use in the works. Trial mixes shall be produced using the plant and transport intended for use in the works, unless otherwise agreed by the Architect and Civil Engineer in charge.
48. The mandatory trial mixes of each concrete grade shall be executed as per D.O.E (UK) method or approved equivalent.
49. The trail mixes shall be sampled and tested according to the requirements of BS EN 12350 and BS EN 12390. Accelerated curing techniques that predict 28 day cube crushing strengths with acceptable accuracy may be used.
	1. **Production Control**
50. All concrete shall be subject to a production control system under the direct responsibility of the producer. The production control system shall cover, at least, the measures indicated in BS EN 206-1, clause 9 with particular reference to the recorded data and other documentation (See Tables 20, 21, 22, 23, 24).
	1. **Conformity Control and Conformity Criteria**
51. The producer is responsible for evaluation of conformity. The tasks to be carried out by the producer shall be as indicated in BS EN 206-1, clause 10 with particular reference to Annex A.
	1. **Evaluation of Conformity**
52. All concrete shall be subject to a conformity control system under the direct responsibility of the producer. The control system shall cover, at least, the measures indicated in BS EN 206-1, clause 8 with particular reference to clause 8.2.1.2 (Sampling and Testing Plan) and Tables 13, 14, 15, 17, 18, 19a, 19b).
	1. **Action in Event of non-compliance**
53. In the event of non-conformity with the specified standards, the producer shall take the actions prescribed in BS EN 206-1, clause 8. The Contractor shall remove concrete elements made out of non-compliant concrete already placed which is rejected by the Architect and Civil Engineer in Charge.
54. The Architect and Civil Engineer in charge may order further tests to be carried out on the hardened concrete which may include cored samples and non-destructive testing. The cost of such action and testing shall be at the Contractor’s expense.
	1. **Concrete Mix – Information from the Producer and Delivery Chits.**
55. The information from the Contractor to the producer shall be as indicated in BS EN 206-01, clause 7.1.
56. The information from the producer to the user shall be as indicated in BS EN 206-01, clause 7.2.
57. Delivery chits shall contain the minimum information contained in BS EN 206-01, clause 7.3.
	1. **Notification of Concrete Pours**
58. The Contractor shall give the Architect and Civil Engineer in charge 24 hours written notice of any intended concrete pour.
	1. **Concrete Pumps (Where Applicable)**
59. Should the Contractor opt for the use of Concrete Pumps in placing operations the approval of the Architect and Civil Engineer in charge shall be sought.
	1. **Concrete Profilers (Where Applicable)**
60. The use of Mobile Concrete Slipform Profilers is permissible. The plant, methodology, mix design, curing, alignment, levelling, joints and tolerances provisions shall be to the approval of the Architect and Civil Engineer in charge.
	1. **Placing**
61. Concrete shall not be placed unless the Architect and Civil Engineer in charge or his representative is present and has previously examined and approved the positioning, fixing and condition of reinforcement, any other embedded items and the cleanliness, alignment and suitability of the formwork or other containing surfaces.
62. Concrete shall be deposited as early as possible in its final position and shall be placed in such a manner as to avoid segregation of the materials and displacement of formwork, reinforcement and other embedded items. The manner of placing shall be to the approval of the Architect and Civil Engineer in charge.
63. Placing shall be continuous between specified or approved construction joints. The concrete shall be compacted and in its final position within two hours of the introduction of cement in the mix. Fresh concrete shall not be placed adjacent to concrete that has been already placed and compacted in excess of 45 minutes.
64. If, for any reason, the placing of concrete is discontinued, the Contractor shall
immediately inform the Architect and Civil Engineer in charge's representative. All works involved in any remedial measures shall be carried out at the Contractor's expense.
65. Concrete shall not be placed in running water and any water standing on areas to receive concrete shall be removed before concrete is deposited.
	1. **Batching of Concrete**
66. Batching of constituent materials shall be as provided in BS EN 206-1, clause 9.7.
	1. **Delivery Trucks and Cleaning**
67. All delivery trucks shall be certified as complying with BS EN 206-1, clause 9.6.2.3 and registered as suitable for their purpose in a data schedule. This shall include the calibration data in respect of water gauges. Arrangements will be made to designate an area where all concrete delivery trucks can wash out. This area will be situated well away from any concreting activities.
	1. **Workability**
68. The workability of the concrete being placed shall be checked by means of the slump test with every concrete truck delivery. When the measured slump is outside the specified limits, the concrete shall not be used in the works.
	1. **Execution - General**
69. The execution concreting operations shall generally follow the provisions and requirements of BS 8110, Part 1:1997: Structural use of Concrete and ENV 13670-1: Execution of concrete structures.
	1. **Protection against rainfall**
70. The Contractor shall provide adequate cover as necessary to protect concrete pours in progress against damage from rainfall.
	1. **Placing in High Temperature**
71. Freshly placed concrete is to be given adequate protection to resist the combined evaporative effect of direct sunlight, air temperature, relative humidity and drying winds on the surface of the placed concrete, particularly for concrete placed in horizontal areas.
72. The Contractor shall take measures to control the maximum concrete temperature after placing and the temperature gradient within any concrete pour. The maximum concrete temperature after placing should not exceed 65 Degrees Celsius.
73. The Contractor shall supply suitable maximum/ minimum thermometers and record the shade and ambient temperatures at locations where concrete is being placed. The temperature should be recorded every hour. The shade and ambient temperature together with the temperature of the concrete, shall be reported in the cast data-log to be presented with the concrete fresh and hardened properties test report. The report shall include also the cast location reference and delivery note details.
	1. **Compaction**
74. The concrete shall be fully compacted throughout the full extent of the layer. It shall be thoroughly worked against formwork and around reinforcement or embedded items without displacing them. Compaction is to be in such a way that it does not promote a) segregation; b) formwork and reinforcement displacement.
75. Successive layers of the same lift shall be thoroughly worked together.
76. Care shall be taken to prevent the formation of air bubbles against vertical or sloping formwork.
77. Unless otherwise directed by the Architect and Civil Engineer in charge, approved power-driven vibrators shall be used to ensure that the concrete is satisfactorily and uniformly compacted.
78. Surface vibrators of approved type, capacity and frequency shall be used to compact thin slabs, pavements and road slabs as directed by the Architect and Civil Engineer in charge.
79. The position and arrangements of construction joints will be as shown on the Drawings or as approved by the Architect and Civil Engineer in charge.
80. The surface of concrete already cast which is to receive further concrete is to have the laitance removed either when green by compressed air and/or water jetting or, if hardened, by micro hacking with light air picks. Care shall be taken not to crack concrete or loosen the aggregate. Before placing fresh concrete, the surface shall be clean, having no loose or foreign materials, and shall be wetted thoroughly.
	1. **Construction Joints**
81. Fresh concrete after deposition shall be thoroughly compacted against all joint surfaces. Particular care shall be taken to prevent the leakage of grout at joints by use of adequate seals such as a foamed plastic strip compressed between the inner face of the formwork and the previously placed concrete.
	1. **Water Bars**
82. Where ordered, water bars or water stops shall be inserted in joints and care shall be taken to ensure that the concrete is well compacted against them and that they are not damaged or displaced during placing operations. A half width of the water bars shall be inserted in one pouring of the concrete and the other half encased by a subsequent pouring. Joints in water bars shall be made as directed by the manufacturers.
83. Water bars shall include means, such as reinforced flanges to facilitate accurate and rigid fixing in the joint.
	1. **Expansion Joints**
84. Expansion joints shall be formed in positions as shown on the Drawings or as directed by the Architect and Civil Engineer in charge. Expansion joints shall be formed with joint material of the dimensions shown on the Drawings.
	1. **Sealing of Joints**
85. The cavity for the joint sealer shall be of the dimensions shown on the Drawings and the surfaces shall be thoroughly cleaned and primed or de-bonded in accordance with the manufacturer's instructions before placing the sealant. The sealing compound in all joints shall be to the approval of the Architect and Civil Engineer in charge and shall be applied as per manufacturers’ instructions.
	1. **Curing and Protection - General Requirements**
86. The Contractor shall ensure that curing is carried out in such a way that thermal and plastic cracking of the concrete does not occur.
87. For a minimum period of 7 days after placing the concrete, it shall be kept protected against loss of moisture, rapid temperature change, rain and flowing water, mechanical injury, contamination by airborne dust and sand, drying winds and surface heating by the sun's rays. The Architect and Civil Engineer in charge may require that the Contractor increases this minimum period as may be deemed necessary.
88. Following the completion of the above period a further period of controlled drying out will be required as directed by the Architect and Civil Engineer in charge. This may require that covers, sand layers and the like be kept in place for longer than the 7-day minimum curing period otherwise specified.
89. The Contractor's attention is particularly drawn to the importance of starting curing as early as possible after placing concrete and maintaining full curing procedures throughout, as specified and directed herein.
90. Any concrete which exhibits plastic settlement, or plastic early thermal contraction, or early drying shrinkage cracking, or which has not been properly cured, shall be rejected by the Architect and Civil Engineer in charge. The Contractor shall be required to remove such concrete and re-lay it at no additional expense.
	1. **Curing Methods**
91. The Contractor shall prepare and submit his proposals for wet curing of concrete and for maintaining the curing regime to the standards and for the times specified herein. The method proposals shall be to the satisfaction of the Architect and Civil Engineer in charge and the approved methods shall be strictly enforced. Purpose-made curing frames are to be provided by the Contractor for the vertical faces of the deck and quay walls. Methods for other areas shall include the use of curing membranes, watering, covers, shades and any other precautions that are required for the Contractor to ensure satisfactory curing of the concrete. Where necessary, the Architect and Civil Engineer in charge may insist on the use of thorough and continuous wetting of concrete surfaces.
92. The Contractor's attention is drawn to the recommendations of the American Concrete Institute (ACI) Standard 308 -71, 'Recommended Practice for Curing Concrete'. These or similar methods will be required to satisfy the Architect and Civil Engineer in charge in respect of the adequacy of curing methods.
93. The Contractor shall provide the necessary climate measuring equipment and check for conditions in which plastic cracking is likely to occur.
	1. **Curing Membrane**
94. Curing membranes shall only be used where approved by the Architect and Civil Engineer in charge. The Contractor shall submit full details of the materials which are to be used including their comparative efficiency with respect to the specified method of water curing.
95. Where used, curing membranes shall be of the ‘resin based, white reflective type’ and shall be sprayed on the surface of the concrete as soon as all free water has evaporated from the surface, except where provided for below.
96. It shall be of a film type which fully degrades by exposure to UV light without leaving detrimental residue on the surface.
97. Curing membranes shall not in any case be applied until at least 7 days curing with water has been applied.
98. Where a surface treatment is to be applied to the concrete (eg. a surface hardener) a curing membrane shall only be used if it is compatible with the surface treatment.
	1. **Water Curing**
99. Only drinking quality water free from slats and harmful substances shall be used for concrete, including concrete curing. Water with impurities including salts, sea water or any other impurities shall not be used at any stage including the production or curing of concrete.
100. The concrete shall be covered with sacking, hessian, or other absorbent material, or a 75mm layer of sand, kept constantly wet for 7 days and, where directed by the Architect and Civil Engineer in charge, also covered with plastic sheeting to reduce loss by evaporation. Care shall be taken to ensure that the temperature of the water used during all stages of the curing process is as close as possible to that of the concrete being cured.
	1. **Use of Curing Covers**
101. Curing of concrete surfaces may be carried out by sealing with opaque, reflective plastic sheeting held in close contact with the surface of the concrete and forming an airtight fit around the element to be cured. The sheeting shall form a continuous seal and be without tears or holes.
102. If necessary the Contractor shall provide frames for the plastic sheeting so that the covers can be placed over deck slab pours immediately after the concrete has been floated off and before the brush finish is applied.
	1. **Wetting of Formed Surfaces**
103. To compensate for any surface drying that has occurred and as soon as the forms are removed, formed surfaces shall be sprayed with water and allowed to reach a uniformly damp appearance before continuing with curing.
	1. **Curing of Concrete - Procedure**
104. Curing of concrete shall proceed as follows:-
105. Large Flat Areas, e.g. Slabs (Preferred Method)
	* Immediately after trowel finish, cover the concrete surface with polythene/wooden frames to minimise evaporation. All gaps at sides and ends must be filled in to avoid wind-tunnel effects.
	* When the surface can carry weight, replace the frames by a layer of damp hessian covered by polythene sheet. The hessian must be kept continuously damp for 7 days (ie not wet/dry cycles), and suitable weights must be used to keep the polythene in place. If appropriate, surfaces may be ponded.
	* After 7 days wet curing, apply white-pigmented resin based curing compound in accordance with the manufacturer's instructions.
	* Cover with dry hessian for 14 days.
106. Flat Surfaces with Starter Bars
	* Shade the whole area from sunshine before concreting commences, leaving enough room for personnel/placing access, and ensuring that no gaps are left in the sides/ends which would allow wind-tunnel effects.
	* As soon as concreting is complete, cover the top surface with damp hessian (which is to be kept continuously damp for 7 days) and a layer of polythene.
	* Maintain cover-only curing from the 7th to the 14th day.
107. Vertical Surfaces
	* Leave formwork in place for at least 24 hours and keep continuously wet and then, after removing the forms, immediately wet the surface and cover the sides by damp hessian (which is to be kept continuously damp for 7 days) covered by white polythene.
	* ii) Maintain cover-only curing from the 7th to the 14th day.
108. Any necessary repairs or finishing processes shall be carried out as soon and as quickly as possible, only exposing small areas at any one time.
	1. **Use of Covers**
109. Polythene sheeting shall be continuous without tears or holes and shall be white, opaque and reflective.
	1. **Thick Sections**
110. The Contractor's attention is drawn to the need to take special precautions, such as careful planning of construction joint locations, to limit the build-up of heat in thick sections of concrete, particularly during hot weather.
	1. **Protection of Joints**
111. Rebates formed to receive sealants and the surfaces of construction joints shall be protected from curing membrane by wet Hessian, maintained continuously damp, to ensure proper curing of the joint surface and the adjacent concrete. The wet hessian shall be maintained in place until the sealant is placed.
	1. **Curing Notices**
112. Curing notices shall be exhibited for each concrete pour, stating the time and date when the concrete was placed, date for last wet curing and the date for completion of cover curing.
	1. **Curing of Repairs**
113. All concrete repairs shall be cured in accordance with the above provisions.
	1. **Damaged Concrete**
114. Any concrete found to have been damaged by weather effects shall be cut out and replaced with concrete as specified in this Specification, by the Contractor at own expense.
	1. **Mass Concrete**
115. The requirements for quality control, placing, compacting, testing and compliance for reinforced concrete shall apply equally to mass concrete.
	1. **Blinding Concrete**
116. Wherever structural reinforcement is shown on the Drawings and is in contact with the Ground (and is to be constructed 'in the dry'), a layer of concrete shall be provided.
	1. **Early Loading**
117. At no time will concrete be subjected to any loading, including its own weight, which will induce a compressive strength in it exceeding 0.4 of its compressive strength at the time of loading, nor shall the induced stress exceed 0.33 of the specified characteristic strength.
118. For the purpose of this clause, the assessment of the strength of concrete and stresses produced by the loading shall be subject to the agreement of the Architect and Civil Engineer in charge.
	1. **Surface hardener**
119. The proprietary surface hardener and dust inhibitor shall be applied on internal exposed concrete floor surfaces, mainly in the main hall.
120. The surface hardener shall consist of natural mineral aggregate (quartz) aggregate dry shake surface hardener, applied at an approximate rate of 5 to 7 kg/m2, or as otherwise recommended by the manufacturer, monolithically on the green concrete, during the power ground finishing, so as to produce a surface with increased resistance to penetration of oils and grease, with increased slip resistance, and which can be easily cleaned.
121. Prior to the application, the substrate shall be cured, clean and free from surface contaminants.
122. The surface hardener shall be applied evenly to dry surfaces. After absorption, the surface shall be washed immediately with clean water. Additional applications shall be as per manufacturer’s recommendations.
123. Any solutions and wash water shall not be discharged to drains but the Contractor shall store and dispose of them safely.
	1. **Power ground finish for wearing surfaces**
124. The surface of a power ground finish for wearing surfaces shall be achieved by grinding, namely the removal of 1 to 2mm from the surface. This process shall be carried out when the concrete is sufficiently hard for fine aggregate surface particles not to be dislodged. The surface shall then be cleaned by removing dust and washing it down. The surface on completion shall consist of an even glass-paper texture, free from blemishes and trowel marks.
	1. **Screeds**
125. Screeds shall comply with EU Regulation No. 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonized conditions for the marketing of construction products and repealing Council Directive 89/106/EEC.
126. The performance characteristics of screeds shall comply with EN 13813, Screed material, properties and requirements.
127. The following test methodologies shall pertain:

|  |  |  |
| --- | --- | --- |
| a. | Flexural and Compressive Strength: | EN 13892-2 |
| b. | Wear Resistance – Bohme or BCA: | EN 13892-3 |
| c. | Determination of Surface Hardness: | EN 13892-6 |
| d. | Bond Strength: | EN 13892-8 |

* 1. **Lightweight Aggregates**
1. The use of lightweight aggregates shall be subject to the approval by the Architect and Civil Engineer in charge.
2. Lightweight aggregates shall comply with EU Regulation No. 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonized conditions for the marketing of construction products and repealing Council Directive 89/106/EEC.
3. The performance characteristics of screeds shall comply with EN 13055-1.
	1. **Quality Control Testing and certification**
4. The contractor shall provide certification of testing carried out on the fresh concrete in accordance wth BS EN 206, BS 8500 and BS EN 12350.
5. The sampling rate of fresh concrete testing shall be 1 (one) sample per truck load delivered on site. Every element cast is to have a concrete test referenced to its poured location. The Architect and Civil Engineer in charge shall request any other specific testing as is required for any particular critical elements.
6. The contractor is to maintain complete correlated records underpinning certification provided, for any verification that may be required. It shall provide access to such records to the Contracting Authority or any entity carrying out checks on the implementation of the Project. Such records shall include:
	1. Concrete designation;
	2. Sampling, site tests, and identification numbers of specimens tested in the laboratory;
	3. Location of the parts of the structure represented by each sample;
	4. Location in the structure of the batch from which each sample is taken.
7. The sampling shall consist of a minimum of 4 cubes per sample, with 2 cubes each tested at 7 and 28 days from date of casting.
8. The Contractor shall submit the certification (being a seven day test report) not later than one day from completion of each test. A copy of the relevant 28 day test reports is to be submitted with each claim for payment.
9. In the event of non-conformity with the specified specifications and standards, the Contractor shall take the actions prescribed in BS EN 206-1, clause 8. The Architect and Civil Engineer shall dis/approve the Contractor’s proposal for action to be taken with regards to concrete already placed. This may range from rejection and removal of the suspect concrete to qualified acceptance, depending on the degree of non-compliance and the type of member involved.
10. The Architect and Civil Engineer may order further tests to be carried out on the hardened concrete, in line with BS EN 12390:2009 which may include cored samples and non-destructive testing.
11. The testing laboratory shall be accredited by the relevant local Authority. The Contractor shall submit the name and MSA or NAB reference number/certificates of the testing laboratory well in advance of making trial mixes or concrete for use in the works.
12. The cost of any action and testing, including but not limited to the additional tests / certificates that may be required in line with Clause 4.63.7 above, shall be at the Contractor’s expense.

#### Formwork for Concrete

* 1. **Formwork – General**
1. The requirements for formwork shall generally follow the provisions and requirements of BS 5975 Code of Practice for Falsework and BS 8110, Part 1:1997: Structural use of Concrete with particular reference to clause 6.9, Formwork.
2. Formwork shall be so designed and constructed that the concrete can be properly placed and thoroughly compacted and that the hardened concrete, whilst still supported by the formwork, shall comply with the required shape, position and levels subject to the tolerances and the standards of finish required by this Specification.
3. Fabrication drawings of all formwork shall be provided by the Contractor and submitted to the Architect and Civil Engineer in charge when requested.
4. Formwork or shuttering shall not be re-used without the prior approval of the Architect and Civil Engineer in charge.
	1. **Contractor's Option to Precast**
5. In addition to those sections of the Works where the Drawings indicate the use of precast construction, and provided that his proposals meet the Architect and Civil Engineer in charge's approval, the Contractor may opt to precast any sections which are shown on the Drawings as in situ concrete.
6. If the Contractor wishes to exercise this option, then, certification of all elements and installation procedure has to be provided to the Architect and Civil Engineer in Charge, and if deemed necessary and required by the Architect and Civil Engineer in charge, a report detailing all calculations and layout and detail drawings necessary for the manufacture and installation of the precast units and for the completion of each section of the Works to satisfy the original design requirements. All these calculations and drawings will have to be approved by the Architect and Civil Engineer in charge before any work is commenced on the manufacture of precast concrete units.
	1. **Sufficiency of Formwork**
7. The Contractor shall be responsible for the sufficiency of all formwork. Guidance on the loads and worst combination scenarios is given in CIRIA Report No. 13 and BS 5975:1996: Code of practice for Falsework.
	1. **Cleanliness of Formwork**
8. Special care shall be taken to ensure the cleanliness of formwork prior to deposition of concrete. Temporary openings shall be provided in stop-ends for the removal of water and debris.
9. All re-usable formwork shall be thoroughly scraped, cleaned and, if necessary, repaired before being raised.
	1. **Ties**
10. The material and positioning of any ties passing through the concrete shall be approved by the Architect and Civil Engineer in charge. The whole, or part of the tie shall be capable of being removed so that no part remaining embedded in the concrete shall be nearer the surface than the specified cover to reinforcement. Any holes left after the removal of ties shall be plugged immediately with a cement mortar of the same richness using non-shrink materials.
	1. **Surface Treatment of Forms**
11. The faces of the formwork in contact with the concrete shall be coated with non-staining shuttering oil or other approved material to prevent adhesion. Care shall be taken that the coating material is kept out of contact with reinforcement or embedded steelwork.
	1. **Inspection and Approval**
12. All shuttering shall be inspected and approved by the Architect and Civil Engineer in charge before concrete is placed within it.
	1. **Striking of Formwork**
13. Minimum striking times shall be in accordance with BS 8110, Part 1, clause 6.9.3 with special reference to Table 6.6. or as otherwise agreed with the Architect and Civil Engineer in charge. Notwithstanding any approval given by the Architect and Civil Engineer in charge, the Contractor shall remain responsible for any damage arising from the removal of formwork.
14. All formwork shall be designed so that it can be removed without shock or vibration.
	1. **Retarders**
15. The use of retarders on formwork shall not be permitted except with the written permission of the Architect and Civil Engineer in charge.
	1. **Tolerances**
16. Except where detailed elsewhere in this Specification, the tolerances on all concrete works shall be as indicated in BS 8110, Part 1, clause 6.11.2.
	1. **Quality of Finishes**
17. The classes of the finishes required shall be as indicated on the Drawings, if applicable.
	1. **Classes of Surface Finish Where Cast Against Formwork**
18. Class F1
	1. Finish for surfaces against which backfill or other concrete is to be placed. Formwork shall consist of sawn boards, sheet metal or any other suitable material which will prevent the loss of grout when the concrete is vibrated.
19. Class F2
20. Finish for permanently exposed surfaces but where special finishes are not required. Formwork shall be faced with sound and plain plywood, steel panels or other suitable materials arranged in a uniform pattern. Joints in facing shall be horizontal and vertical unless otherwise directed.
21. On striking the formwork the surface shall be plain and smooth and shall not be treated in any way. The Architect and Civil Engineer in charge may order rubbing down of any minor surface blemishes at the Contractor's expense.
22. Class F3
23. Finish which is required for permanently exposed surfaces where a high standard is of particular importance.
24. The formwork shall be faced with plywood or equivalent suitable material in large sheets arranged to the approval of the Architect and Civil Engineer in charge in a uniform pattern. Metal panels shall not be used for F3 finishes.
25. Where possible, joints in sheets shall be arranged to coincide with particular features or changes in the direction of the surface. All joints shall be vertical and horizontal unless otherwise directed.
26. Permanent formwork of precast slabs, natural stone, brickwork and the like shall have surface finishes of the quality shown on the Drawings. They shall be fixed to the structure by approved means and joints shall be made tight with mortar or other means of preventing grout leakage.
	1. **Classes of Surface Finish When Not Cast Against Form Work**
27. Class U1
	1. Finishing operations shall consist of compacting and tamping the concrete to the required lines and producing a uniform lightly ridged surface.
28. Class U2
	1. Finishing operations shall consist of the above requirements for Class U1 and, after allowing the concrete surface to harden sufficiently floating the surface by hand with a wood float to produce a uniform surface free of screed marks. Care shall be taken not to work the surface more than is necessary.
29. Class U3
	1. Finishing operations shall consist of the above requirements for Class U2, after allowing the concrete surface to harden sufficiently then floating the surface by power tool to produce a uniform surface free of screed marks. Care shall be taken not to work the surface more than is necessary.
30. Class U4
	1. Non-skid surface. Finishing operations shall consist of the above requirements for class U2 using a plain wood float finish and evenly dusting the surface with carborundum grains graded between 500 microns and 3mm at the rate of 1.0 kg/sq.m of surface area before the surface of the concrete has set. The carborundum shall then be trowelled lightly into the surface.
	2. **Chamfers to Arises**
31. Unless otherwise indicated on the drawings, all exposed arises shall be chamfered 25 x 25 mm.
	1. **Defective Concrete Finishes**
32. Any defective concrete finish shall be rejected and the Architect and Civil Engineer in charge may order the defect(s) to be cut out and made good, all at the Contractor's expense.
33. Any proposed remedial treatment to concrete surfaces shall be submitted to the Architect and Civil Engineer in charge for approval and no work shall be carried out until the approval has been obtained. This remedial treatment will be at the Contractor's expense.
34. Any concrete, the surface of which has been repaired before being inspected by the Architect and Civil Engineer in charge shall be liable to rejection.

#### Reinforcement for Concrete

* 1. **Compliance – Sample Size and Frequency of Sampling (Where Applicable)**
1. Where applicable, sample size and frequency of sampling for compliance shall be established on the basis of standard statistical guidelines.
	1. **Compliance – Testing and Certification**
2. Compliance shall be demonstrated through testing and/or certification of products and/or processes as outlined in the ensuing clauses.
	1. **General Note on European Eurocodes**
3. This specification is primarily based on the provisions of BS 8110 – Design of Concrete Structures. Alternative provisions as indicated in Eurocode 2, EN 1992, parts 1 to 3, are acceptable.
	1. **Reinforcing Steel – Material**
4. Steel bars for the reinforcement of concrete shall comply EU 305/2011.
5. Welded Steel fabric for the reinforcement of concrete shall comply with EU 305/2011.
6. Technical characteristics of steel bars for the reinforcement of concrete shall comply with BS EN 4449:2005, Grade 460A or B. Steel shall preferably also be CE marked in compliance with ENV 10080, Steel for the Reinforcement of Concrete, Weldable Ribbed Reinforcement.
7. Technical characteristics of Welded Steel fabric for the reinforcement of concrete shall comply with BS 4483, Grade 460A or B. Steel Fabric shall preferably also be CE marked in compliance with ENV 10080, Steel for the Reinforcement of Concrete, Weldable Ribbed Reinforcement.
8. Technical characteristics of pre-stressing steels shall comply with EN 10138.
9. Testing of reinforcement shall comply with BS EN ISO 15630 Parts 1 to 3: Steel for the Reinforcement and Pre-stressing of Concrete, Test Methods.
10. The manufacturer's milling identification tags are to be supplied with each consignment bundle of reinforcing steel.
11. Reinforcement which is found to have developed brittleness, cracks or other imperfections shall be rejected and removed from the site.
12. Testing of reinforcing steel shall be carried out with every lot delivered and a minimum of 3 samples shall be taken for every lot tested.
	1. **Reinforcing Steel Grade**
13. The grade of bar reinforcement and the mesh reference shall be as indicated in the Drawings.
	1. **Reinforcement to be Clean**
14. All reinforcement shall be clean and free from loose mill scale, dust, loose rust and coatings such as paint, oil etc.
15. Grit blasting may be used to remove rust, oil, grease, salt or other deleterious matter. Repeated grit blasting may be necessary where reinforcement is in final position, but found on inspection to be contaminated.
	1. **Bending and Cutting**
16. Bending and cutting of reinforcement shall comply with BS EN ISO 8666:2018. The provision in BS 8110: Part 1, clause 7.2 shall also apply.
	1. **Fixing of Reinforcement**
17. Reinforcement shall be wired together, or otherwise effectively secured, to prevent displacement during concreting. The provisions in BS 8110: Part 1, clause 7.3 shall also apply.
18. Wire for binding shall be 1.63 mm +/- 0.05mm annealed soft iron and the binding shall be done tightly with proper tools. Alternative methods of fixing reinforcement shall be submitted to the Architect and Civil Engineer in charge for his approval. Laps and joints shall be in strict accordance to those specified in the Drawings. Any relocation and additional laps shall be approved by the Architect and Civil Engineer in charge.
	1. **Cover to Reinforcement**
19. Reinforcement shall, in all cases, be covered with the thickness of concrete shown on the Drawings. Accurate cover shall be secured by the use of plastic distant pieces of the correct size or other approved means.
	1. **Spacers and Chairs**
20. Spacers and chairs for reinforcement shall be as shown on the Drawings and complying with BS EN ISO 7973:2015, Parts 1 and 2: Spacers and Chairs for Steel Reinforcement and their Specification.
	1. **Welding Reinforcement**
21. Welding of reinforcement will not generally be permitted. If, in exceptional circumstances, the Contractor particularly wishes to weld reinforcement, details of the method and location shall be submitted to the Architect and Civil Engineer in charge for his consideration and approval. The provisions in BS 8110, Part 1, clause 7.6 shall apply.
22. The design of all items such as tack-welded reinforcement assemblies shall take into account any requirements in respect of transportation including the location and fixing of lifting points to ensure safe handling.
23. The Contractor may add lengths of austenitic stainless steel reinforcement which is to be conventionally wire tied to the detailed reinforcement, and to which one may weld for the purposes of providing adequate support for fixings during the placing of concrete. The details of such additional reinforcement must be submitted to the Architect and Civil Engineer in charge for approval prior to carrying out the work.
24. In all cases, the Architect and Civil Engineer in charge may require an electrically insulated material, such as plastic, to be inserted between the additional reinforcement and the detailed reinforcement in order to minimise corrosion due to stray electrical currents.

#### Precast Concrete

* 1. **Contractor's Option to Pre-Cast**
1. In addition to those sections of the Works where the Drawings indicate the use of precast construction, and provided that his proposals meet the Architect and Civil Engineer in charge's approval, the Contractor may opt to precast any sections which are shown on the Drawings as in situ concrete.
2. If the Contractor wishes to exercise this option, then, following approval in principle as required above, all calculations, layouts and detailed drawings necessary for the manufacture and installation of the precast units and for the completion of each section when these depart from the original designs, shall be submited to the Architect and Civil Engineer in charge. These shall be approved by the Architect and Civil Engineer in charge before any work is commenced on the manufacture of precast concrete units.
3. Without prejudice to Point ii above, the bidder is to provide certification of elements including safe loads certified by the manufacturer's warranted Structural Engineer (Architect and Civil Engineer).
	1. **Conformity**
4. Pre-cast units shall comply with EU Regulation No. 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonized conditions for the marketing of construction products and repealing Council Directive 89/106/EEC.
5. Technical characteristics shall comply as follows:

|  |  |
| --- | --- |
| 1. For foundation piles (where applicable)
 | EN 1168 |
| 1. For linear structural elements
 | EN 12843 |

* 1. **Drawings and Schedule of Weights**
1. Detailed drawings shall also be prepared for each type of unit showing, in detail, the grade of concrete, finishes to concrete, joint details, reinforcement, joggles, mortices for dowels, clamps, cramps, lifting hooks and the like.
	1. **Approval of Plant and Methods of Working**
2. The Contractor shall also supply to the Architect and Civil Engineer in charge, as soon as possible after the start of the Contract, a schedule of weights for each type of unit.
3. Full details of the plant and equipment to be used and method and location of precast concrete manufacture, handling, storage, transportation and installation in the Works shall be submitted to the Architect and Civil Engineer in charge for approval before any work is commenced on the manufacture.
	1. **Provisions for Handling**
4. Except where these are already detailed on the Drawings, the Contractor shall make provision for all lifting hooks, etc. where required for handling, lifting and erecting the units in position.
5. All such lifting and fastening devices shall be subject to the prior approval of the Architect and Civil Engineer in charge and shall be shown on the drawings prepared by the Contractor for the Architect and Civil Engineer in charge's approval. In designing and locating such devices, the Contractor should note the requirements of this Specification for avoiding damage due to handling, maintaining concrete cover to embedded metal and providing the required standard of finish, particularly on exposed faces. Every attempt should therefore be made to incorporate any such devices on faces which will not be exposed in the finished works.
6. The Contractor shall provide such reinforcement as necessary to prevent damage due to cracking whilst loading, transporting, off-loading and erecting in position in addition to the reinforcement required for structural stability of the completed works. Such additional reinforcement shall also be shown on the drawings prepared for the Architect and Civil Engineer in charge's approval.
	1. **Precasting Moulds**
7. All moulds shall be of adequate strength and stiffness to withstand without deformation the loads and pressures of wet concrete during the casting and compaction operations. Moulds shall be sufficiently tight to prevent leakage of the concrete and shall be adequately supported, braced and maintained so as to produce units within the tolerances specified. Details of materials to be used in the manufacture of the moulds or formwork must be submitted to the Architect and Civil Engineer in charge for his approval before commencing work.
8. The assembled moulds shall be checked for accuracy immediately prior to the first casting of each type of unit, and thereafter prior to every fourth casting or at such closer intervals as the Architect and Civil Engineer in charge may require.
9. The Contractor must allow for a sufficient number of moulds to enable oneself to maintain the required progress of the Works and no extras will be allowed in the event of additional moulds being required to achieve the stated programme.
10. Each mould shall be allocated a code number and all units cast in that mould shall have the mould code number and date of casting marked on.
	1. **Manufacturing Tolerances**
11. Unless otherwise detailed on the Drawings or directed by the Architect and Civil Engineer in charge, manufacturing of precast units shall be strictly within the tolerances specified indicated below:
	1. Length

 Up to 3m ± 6mm

 3 to 4.5m ± 9mm

 4.5 to 6m ± 12mm

 > 6m ± 6mm additional for every subsequent 6m

For beam-type sections the length shall be the major dimension of the unit. For slab-type sections the above tolerances for length shall apply to the two major dimensions (that is side length).

* 1. Cross Section

Up to 500 mm ± 3mm

500 to 750 mm ± 5mm

> 750 mm ± 2mm for each additional 250mm with a maximum tolerance of ± 15mm

These tolerances shall apply to the two minor dimensions of beam-type sections and to the thickness only for slab type sections.

* 1. Straightness or Bow (deviation from Intended Line)

|  |  |  |
| --- | --- | --- |
| Up to 3m | + 6mm |  |
| 3 to 6m |  |  |  |
| + 9mm |  |
| 6 to 12m |  |  |  |
| + 12mm |  |
| > 6m |  |  |  |
| + 12mm for every subsequent 6m |  |

* 1. Squareness

When considering the squareness of a corner, the longer of the two adjacent sides being checked should be taken as the base line for a perpendicular parallel with the adjacent shorter side. The shorter side should not vary in its distance from the perpendicular by more than the following tolerances:

Length of shorter sides

Up to and including 1.2m ± 3mm

> 1.2m but < 1.8m ± 5mm

1.8m and over ± 6mm

For the purpose of this requirement any error due to lack of straightness should be ignored; squareness should be measured with respect to the straight lines which are most nearly parallel with the features being checked. When the nominal angle is other than 90 degrees the included angle between check lines should be varied accordingly.

* 1. Twist

Any corner should not be more than the tolerance stated from the plane containing the other three corners:

Up to 600 mm wide and up to 6m length + 6mm

Over 600 mm wide and for any length + 12mm

* 1. Flatness

The maximum deviation from 1.5m straight edge placed in any position on a nominally plane surface should not exceed 5mm.

* 1. Reinforcement

The tolerances for the positioning of reinforcement shall be + 5mm for bars up to and including 12mm diameter + 10mm / -5mm for bars over 12mm diameter.

In addition, certain precast elements require a higher than usual degree of accuracy and these shall be identified on the Drawings.

* 1. Position of Connecting Bolts and Other Devices

The position of individual connecting bolts, bolt holes, projecting steel or other devices in any associated group should be within 6mm of its true position in the group in which they are cast. The longitudinal location of any such group or of any individual device should be within 6mm of its true position in the unit in which it is cast, provided that such tolerance does not adversely affect the proper assembly of the whole structure.

Notwithstanding the above requirements for tolerance, the overall dimensions and shape of any precast unit shall not be such as to prevent the proper erection of that unit in conjunction with any other unit, steelwork or in situ construction.

* 1. **Curing**
1. All proposals for *accelerated curing* shall be fully detailed including all arrangements for ensuring the effectiveness of curing under all possible climatic conditions.
	1. **Surface Finish**
2. Surface finish of precast units shall comply with the requirements for finishes given in on the Drawings or as directed.
3. In general only Class F2 finish shall be used except where reinforcement is left projecting from a unit for casting into in situ concrete.
4. In general no construction joints will be permitted within any precast unit.
5. All finished units, whether erected in position or not, which do not comply with the Drawings and Specifications shall be removed and replaced with new items to the Architect and Civil Engineer in charge's satisfaction.
	1. **Rejection of Units**
6. Reasons for rejection of units shall include the following:
7. Cracked or repaired units.
8. Units with broken edges whether reinforcement is exposed or not.
9. Reinforced units with concrete cover not complying with this Specification.
10. Units outside the dimensional tolerances.
	1. **Sampling and Testing**
11. Where precast concrete units are manufactured, unless specifically provided for herein, all costs involved in sampling and testing required by the Specification shall be borne by the contractor.
	1. **Certificate of Manufacture**
12. For precast concrete units which are manufactured off site, the Contractor shall supply to the Architect and Civil Engineer in charge, prior to any unit being delivered to site, a certificate stating that the unit complies in all respects with the approved Drawings and Specification.
	1. **Erection Programme**
13. Prior to erection of precast concrete units, the Contractor shall submit to the Architect and Civil Engineer in charge for his approval a detailed erection programme giving full descriptions of the methods and plant to be employed for lifting, assembling and fixing the units and safeguarding the structure during erection. No erection shall be carried out until the Architect and Civil Engineer in charge has approved the methods to be used.
	1. **Safety**
14. The Contractor shall be responsible for the safety of the structure and operatives at all stages during the handling and erection of precast concrete units and shall provide all necessary frames, guys, wedges and other temporary supports.
	1. **Handling of Precast Units**
15. All units shall be handled, lifted and transported in a manner which does not cause damage or cracking. When units are lifted by tackle or crane the weight shall be taken up gradually without snatch. When units are being lowered they shall not be dropped but shall be let down gently into position without impact. Any units damaged during handling, storage, installation, etc. shall be replaced by the Contractor at his expense.
16. When the positions for sling and lifting holes or lifting eye bolts are shown on the drawings or otherwise indicated they shall not be departed from without the permission of the Architect and Civil Engineer in charge.
17. The Contractor shall not introduce any holes, cavities, lifting loops, bolts or other features for his own convenience without the written approval of the Architect and Civil Engineer in charge.
18. Where no particular fixings or holes are built in for lifting any unit, the unit shall be supported on blocks firmly bedded and adjusted to align in a true plane in order to avoid twisting. The points of support shall be as indicated on the Drawings or as directed. Similar supporting blocks shall be used when storing precast units.
	1. **Storage of Precast Units**
19. All precast units shall be stored off the ground in a manner and in the positions which will prevent damage or cracking of any kind and permit erection with a minimum of preliminary handling and transportation.
20. If the Architect and Civil Engineer in charge permits precast units to be stacked in storage, they shall be arranged so that the supporting timber packs for any unit coincide with the supporting packs for all the units below. Under no circumstances shall any element be supported on a point on any other unit which is not itself supported.
21. Bolt hole recesses and other cavities, shall be plugged to prevent entry of rain or other water unless such water can freely drain away.
	1. **Installation of Precast Units**
22. The Contractor shall set out the work accurately within tolerances specified. The various faces of the completed structure shall comply with the tolerance requirements for the classes of finish specified for such faces. The Contractor shall ensure that all precast concrete units come together without strain in their correct relative positions as shown on the Drawings.
23. If due to inaccuracies in position or level or in the dimensions of the units it is found impossible to assemble the units without straining them into position, no such straining shall be done without the permission of the Architect and Civil Engineer in charge and when so directed the Contractor shall dismantle the work and re-erect and make good to the satisfaction of the Architect and Civil Engineer in charge.
24. No cutting of units, enlarging of holes for fixing bolts or other operations for the correction of lack of fit of units shall be carried out except with the permission of the Architect and Civil Engineer in charge.
25. Unless otherwise specified or shown on the drawings approved bearing or washer pads shall be inserted at all joints and seating to prevent direct contact of concrete to concrete or concrete to metal.
26. The use of expanding agents or other additives to the mortar or insitu concrete for the fixing of precast units shall be subject to the approval of the Architect and Civil Engineer in charge.
27. During the installation of precast units or the casting of associated insitu concrete the Contractor shall not impose any abnormal loads on foundation, pile caps, piers or abutments without the written permission of the Architect and Civil Engineer in charge in each and every case.
	1. **Bearings**
28. Bearings for all units shall be 20mm thickness (nominal) of approved non-shrink grout or otherwise as shown on the Drawings. Suitable foam rubber strips shall be attached along edges of bearings to prevent grout loss.

#### Repair Material

* 1. **Steel fibre mesh strengthening reinforcement**
1. The material shall consist of extra-high strength galvanized steel fibre in a unidirectional sheet orientation. The application of this material is to follow the manufacturer’s instructions and methodology according to the data sheets submitted and approved by the Architect and Civil Engineer in charge . The material specified to be used shall be suitable for structural strengthening of existing structural elements.
2. The contractor shall ensure that the substrate is suitable for the application of the material. The steel mesh shall be applied in conjunction with a bonding mortar and applied in layers as necessary. The bonding mortar shall be of the same manufacturer as the steel mesh and must be certified to be used together with the steel mesh. Lapping between the different meshes is to be as specified by the manufacturer in order to achieve full continuation for transfer of stresses and strains.
3. The application of mortar is to make good any irregular or uneven surfaces from the existing concrete elements.
4. The steel fibre mesh is to utilized as column jacketing for structural strengthening and shall also be used in order to improve the tensile properties of the cantilevered elements on the façade.
5. The application for the different purposes is to be done as manufacturer’s instructions and the Architect and Civil Engineer in charge requirements.
6. The Engineer may ask the contractor to make use of carbon fibre strips (of equivalent tensile strength and structural performance) to that of the steel fibre mesh reinforcement. Any repair application is to be in line with EN 1504.
	1. **Epoxy injection in cracks**
7. An epoxy injection material for adequate penetration and sealing of cracks in various elements of the present structure. The material is to be of a thixotropic nature in order to enter into fine cracks and seal any imperfections. The material is to be certified to bond the existing detached concrete surfaces.
	1. **Approval of materials**
8. The materials and products to be used for the repair of the existing structure shall be approved by the Architect and Civil Engineer in charge.
9. The Contracting Authority reserves the right to refuse the utilization of any material for any reason, including aesthetic properties. Any such material shall be replaced by the Contractor, following consultation with the Architect and Civil Engineer in charge, and subject to the Architect and Civil Engineer in charge’s approval.
10. The contractor shall provide certification of materials as established by the Laws of Malta and any additional documentation as may be requested by the Architect and Civil Engineer in charge.
	1. **Storage of materials**
11. All material including chemicals and concrete additives shall be stores in a safe place and the material data sheet requirements shall be respected throughout.
	1. **Methodology**
12. The repair methodologies shall follow the relative Eurocode standard EN 1504.
13. A scaffolding and/or support system is to be erected in order to support the suspended concrete elements prior to any remediation work. The support system must be designed and constructed to support the load imposed by the whole structure, including any imposed loads during demolition and dismantling. The system shall also allow for the erection of formwork as suitable for different components in different locations of the structure.
14. Prior to any removal of loose and damaged concrete, the concrete elements is to be assessed for their structural strength by sampling concrete cores to determine concrete compressive strength and carbonation, without cutting through any steel reinforcement. This is to be carried out in order to determine the affected concrete cover by carbonation, whilst also verifying the substrate minimum strength present for the repair mortar.
15. The test results are to be forwarded to the Architect and Civil Engineer in charge prior to commencement of repair. These test results will form part of the repair methodology.
16. The concrete structural elements are to be scanned prior to any drilling by means of a ground penetrating radar (GPR) in order to determine the number, sizing and positioning of the steel reinforcement. Any findings need to be documented and presented to the Architect and Civil Engineer in charge.
17. Any loose, damaged concrete and steel reinforcement shall be removed, whilst the remaining of the structure shall need to be adequately supported to prevent damage to the whole elements during removal of damaged concrete and steel.
18. Only handheld small tools which do not exert excessive pressures on the concrete components shall be used and in a manner that does not compromise the integrity of the parts of the structures which are to be retained.
19. If high pressure water jetting is proposed, this should be assessed in terms of the present state of the components of the structure and the structure as a whole in order to prevent any damage to the structure components through this technique. High pressure water jetting can be applied to remove small thicknesses cm of deteriorated concrete and must be carried out carefully so that the removal of specified thickness is maintained under control. In this case, it is recommended that marks must be set at regular intervals in order to measure the required concrete thickness to be removed.
20. The repair shall primarily consist in the protection of steel reinforcement using epoxy based material, the treatment of the exposed concrete surface by a primer and the application of a polymer based repair mortar, which ensures that it bonds well with the existing concrete and is designated to be used for the specific use of structural concrete repair.
21. The finished surface shall retain the original appearance as the existing concrete elements, including the shape and form of the existing elements.
22. Any defects arising in the intervention and the finish, during the repair intervention shall be repaired by the contractor, at his expense, as directed by the Architect and Civil Engineer in charge.

#### Plumbing Works

* 1. **General**
1. Work covered under this section consists of the supply and installation of all necessary pipes and fitting and dimensions of pipework as specified and shown in the drawings. All drainage is to be designed and installed in accordance with BS 5572 and BS 8301.
	1. **Types of Drainage**
2. The scope of works for the drain’s installation, is to provide drainpipes from the sanitary ware and floor drains to nearest gulley, leading to the sewage treatment plant across the street. Drainpipes shall be properly joined in accordance with the manufacturer's recommendations. After the completion of the drain system, this shall be checked for any leaks and that water flows freely. Under no circumstances shall joints in pipes be made in the thickness of walls, floors or ceilings. Pipes shall not be embedded in walls or floors unless specifically directed.
3. Unless gradients are specified on the drawings, main foul drains shall be laid at a gradient not less than 80% of their diameter in millimetres, and branch drains with low flow rates shall be laid at a gradient not less than 50% of their diameter in millimetres. Spacing between pipe supports for uPVC shall not exceed 0.5 metres when suspended, and 1.2m when hung vertically, for diameters up to and including 50mm. Spacing between pipe supports for uPVC shall not exceed 0.9 meters when suspended and 1.8 metres when hung vertically, for diameters over 50mm. Further brackets are to be installed adjacent to any fitting as required, without impairing the function of that fitting.
4. The U-PVC piping shall be used for the drainage system installation. All rainwater pipes, gutters, fixings and accessories shall comply with the relevant provisions of BS4576: part 1 (uPVC). All soil, waste and ventilating pipes, fittings and accessories shall comply with the relevant provisions BS 4514 (uPVC).
5. Floor drains are to be manufactured in uPVC body and stainless AISI 304 face plate / grating with horizontal / side or bottom outlet in 50mm diameter. The floor drain is to be of the Siphoned type (also called gully or sump) and is to include a removable filter basket, manually accessible for inspection, located inside the outlet pipe for the main use for cleaning and also as an insect and rat-proof function. The holes of the basket must have a diameter of 8mm. The siphon must be welded directly under the cover, which has also to be removable. The thickness of the stainless-steel plate is to be suitable for a minimum of class A15, areas which can be used by pedestrians.
6. Rain water drains are to be installed vertically to the existing position of the water spouts and lead rain water to the ground floor level for surface water runoff along the surrounding road. Any necessary fittings are to be installed to divert the drain pipe from the bottom hole within the water spout for a flush-mounted installation to the façade.
	1. **Trenching and pipe laying**
7. Trenches in rock for pipes up to 100mm nominal bore shall be excavated to provide a minimum clearance of 100mm around the outside of the pipe barrels and joints. For pipes with nominal bores exceeding 100mm, the minimum clearance shall be increased to 150mm for flexible pipeline and to 200mm for rigid pipeline.
8. Trenches shall be excavated in a straight line, to the required depths and falls, true to line and profile, as specified. The Contractor shall note that all site levels refer to the invert level and hence the Contractor is to make an allowance for the bedding around the outside of the pipe barrels and joints. If the contractor excavates the trench to a greater depth or widths other than the ones specified, such excavations shall not be paid for and the Contractor shall make good for such extra excavations with concrete at his expense.
9. Trenches for pipes carrying sewage are to be excavated to a sufficient depth to ensure a minimum cover of 900mm to the top of the pipes. The sides of the excavations shall be adequately supported at all times, and except where described in or permitted in this Contract, shall not be battered.
10. Trenching in roads shall comply with the provision of LN 29 of 2010 – New roads and road works regulations 2010 and ADT/TM Manual of Contract Documents for Road Works (MCRW), Volume 1-3.
11. Care shall be taken when loading, unloading, handling and transporting pipes to the site to avoid breakage, distortion flattening, denting or any other damages to pipes. Pipes on site shall be stacked clear off the ground on timber to prevent damage to the pipes and successive layers shall be separated by timbers of similar dimensions. Wooden wedges shall be fixed to the timber to prevent the pipes from rolling.
12. The bedding material should extend to 150mm above the crown of the pipe. Compaction of this layer of material above the pipe should be carried out at the sides of the pipe and not directly over the pipe.
	1. **Testing**
13. All works shall be inspected during erection/laying and upon completion by the Contracting Authority and shall be subjected to its approval. All systems shall be thoroughly cleaned from all debris, both internally and externally before tests (water/air or smoke test) are performed and no underground pipework shall be covered until after the system has been tested and passed. No part of the pipe network shall be considered as laid, unless it passes the tests specified, and any leakage or repair required, is remedied.
14. Pressure head testing is to be carried out to the drain systems relating to drainage water, before any permanent covering is applied to the pipe. Sufficient blanked connections are to be provided during installation for the purpose of pressure testing. The test shall be carried out by filling the drain system with water up to a head of 1m from the highest invert level of the drain system and reading are logged at the start of the test and after 24 hours.
15. Adequate records are to be kept for all tests, which shall include the date the test was carried out, section of pipe tested on drawings, duration and result of test.
	1. **Water mains Pipework**
16. The material shall consist of PP-R fusion welded pipework suitable for hot and cold-water applications. Pipes shall be certified from the manufacturer to be suitable for the lifetimes according to the following schedules:

|  |  |  |  |
| --- | --- | --- | --- |
| **Application** | **Lifetime (Years)** | **Temp (°C)** | **Pressure (Bar)** |
| Cold / mains | 50 | 40 | 12 |

1. Furthermore, the following shall apply:
2. All pipework installed above ground externally, shall be covered/painted for UV-protection.
3. Pipe sized shown in drawings are clear bore internal diameter.
4. The entire system is to be tested for 4 hours at 1.5 times working pressure. A Services Engineer (warranted in terms of the Engineering Profession Act (Chapter 321)) shall be engaged by the Contractor at the Contractor’s expense is to certify such a test.
5. Proprietary pipe support systems shall be used, at the distances/frequency specified by manufacturers. One must take note of the reaction static and dynamic forces, including dead weight load. It is to be ensured that joints are not under bending stress. Fixings provided by manufacturer only shall be used.
6. Coordinate routes with other services and pipe lines are to be installed in parallel and neatly together.
7. Label identification shall be as follows:
* MW for mains water supply
1. The contractor is to liaise with the Architect and Civil Engineer regarding floor finishes to determine the exact location of the floor drains required.
2. All pipe work and equipment are to be installed in accordance with manufacturer's recommendations.
3. Installation is to be in accordance with BS 6891.

#### Damp Proofing

* 1. **General Guidance**
1. The installation of damp proofing shall comply with the recommendations in BS 8215, 1991, Code of Practice for the Design and Installation of Damp Proof Courses in Masonry Construction, BS ISO 5628:2012, Code of Practice for use of masonry. Materials and Components, Design and Workmanship and recommendations in the Building Regulations (Draft), August 2003, Building Construction Industry Department, Malta, Section 18.00.
	1. **Natural Stone and HCB Walls**
2. Walls shall have a damp-proof course of bituminous, polymeric, plastic, rubber or polyethylene material that will prevent the passage of moisture.
3. The damp proof course shall not extrude under the load and shall not adversely affect the ability of the wall to sustain and transmit compression loadings.
4. In the case of an external wall, unless otherwise indicated in the drawings, the damp proof course shall be at least 100mm above the finished level of adjoining ground or paving.
5. In the case of external walls with a cavity, the cavity shall be taken down at least 100mm below the level of the lowest damp proof course or a damp proof tray be provided so as to prevent moisture passing to the inner leaf.
6. Any wall between two rooms, on the ground floor level or between an external space and an internal space, which are not on the same level, shall have a damp-proof course at the level of the floor finishes of the upper and lower room. Additionally, the vertical face of the wall shall also be protected against moisture penetration by having vertical damp proofing membrane (continuous with the horizontal damp proofing course) or a drained cavity.
	1. **Horizontal Damp Proofing - Bituminous**
7. Bituminous damp proof courses shall comply with BS 6398, Specification for Bitumen Damp Proof courses for masonry or Government Notice (Malta) 110 of 1934 (Cap. 10 Sec. 97(1)(a).
	1. **Horizontal Damp Proofing – Plastic, Rubber and Polymeric**
8. Plastic, rubber and polymeric damp proof courses shall comply with EN 13967.
9. Flexible Co- Polymer Thermoplastic (CPT) rolls shall comply with BS 6398, Specification for bitumen damp proof courses for masonry.
	1. **Horizontal Damp Proof Course - Polyethylene**
10. Polyethylene damp proof courses shall comply with BS 6515, Specification for polyethylene damp proof courses for masonry.
	1. **Vertical Damp Proofing – Liquid**
11. This shall consist of a bitumen based solvent free emulsion. The emulsion shall have a minimum solids content of 55%.
	1. **Roof Waterproofing Membrane**
12. The membrane shall be laid and installed strictly as per manufacturer’s instructions. The Contractor shall submit a copy (in English) of such instructions before the start of the Works. Technical properties shall comply with EN 13707.
13. Performance characteristics shall be as follows:

|  |  |  |
| --- | --- | --- |
| **PROPERTY** | **TEST METHOD** | **TYPICAL VALUE** |
| Reinforcement | NA | Polyester/Fibreglass or Fibreglass |
| Weight (kg/m2) | NA | 4 (min.) |
| Flow resistance at 100°C | EN 1110 | Stable |
| Tensile Strength at Break (Long. / Transverse) | EN 12311-1  | >400 N /50mm |

1. Polyester reinforced waterproofing membrane laid horizontally over concrete screeds that shall remain exposed is to incorporate a mineral chippings surface of approved colour and quality.
2. The membrane shall extend over any cement/sand fillets and up all upstands and sides of parapet walls to a height of not less than 230mm above finished roof level. The membrane shall be lapped and heat welded at all joints so as to give a continuously unbroken, impermeable surface. Lapping length must not be less than 100mm.
3. The Contractor shall make good at his expense any damage which results in the waterproof membrane as well as any damage to the building and/or finishes and fixtures which results from failure of the waterproofing membranes.
4. The Contractor shall verify the site conditions by inspecting the surface to be treated prior to the execution of the works. The Contractor shall also be responsible for the provision of any additional technical expert assistance, if this is required.
5. The surface to receive the membrane should be dry, free from standing water, sharp protrusions and hollows. The surface shall be primed with 2 coats of bituminous primer (min. 55% penetration grade bitumen residue) before applying the membrane.
6. All cracks, expansion and construction joints and blisters shall be raked out, thoroughly swept, washed, cleaned and made good with an approved joint sealer before the application of the waterproofing treatment by the Contractor.
7. Parapet wall to roof slab junctions shall be filleted with a sand/cement in order to eliminate right angled corners

#### Thermal Insulation

#### 11.1 Expanded Polystyrene (EPS)

1. Expanded polystyrene (EPS) shall comply with the following:
2. Standard: to MSA EN 13163;
3. Proprietary EPS boards for general use;
4. Grade: EPS 150, flame retardant;
5. Recycled content: Contractor to submit proposals;
6. Edges: square;
7. Thickness: 50mm;
8. Facing: unlined.
9. The thermal conductivity of the thermal insulation product must be less than 0.044W/mK.
10. The product will not release or leach out any substances above existing limit values set in the following regulations.
11. Substances regulated in the EU through the Regulation 842/2006/EC on fluorinated gases.
12. Any substances or preparations that are classified according to Directive 1999/45/EC and 67/548/CEE as carcinogenic (R40, R45, R49), harmful to the reproductive system (R60, R61, R62, R63), mutagenic (R46, R68), toxic (R23, R24, R25, R26, R27, R28,R51), allergenic when inhaled (R42),cause heritable genetic damage (R46), danger of serious damage to health by prolonged exposure (R48), possible risks of irreversible effects (R68) shall not be released.
13. Any substances or preparations that are classified according to CLP Regulation (EC)1272/20082 as carcinogenic (H350-351), harmful to the reproductive system (H360-361), mutagenic (H340-341), toxic (H300- H301, H310-H311, H330-H331, H411),allergenic when inhaled (H334), cause heritable genetic damage (H340), danger of serious damage to health by prolonged exposure (H372-373), possible risks of irreversible effects (H371) shall not be released.
14. During implementation stage, the Contractor shall provide information (if applicable) on:
15. Manufacturer and date of manufacture/batch no.
16. Product R-values and respective H phrases at time of manufacture
17. The material that the product is manufactured from
18. Weight and thickness
19. Percentage recycled content: for materials, the percentage of each material must be clearly labelled by mass and volume.
20. Maximum storage time or install-by date.
21. Time after installation at which the product will have re-lofted to its nominal thickness.
22. Transportation and installation instructions.
23. Written storage instructions
24. Where the listed criteria for a product are included in a relevant harmonised European standard, under the Construction Products Directive (89/10/EEC), for CE marking, the supplier must provide the information accompanying the required CE marking to demonstrate compliance with the listed criteria. Where the listed criteria for a product are not included in the accompanying information to CE marking under the Construction Products Directive (89/10/EEC), products holding a relevant Type 1 ecolabel fulfilling the listed criteria will be deemed to comply. Other appropriate means of proof or a signed declaration will also be accepted.

#### Natural Roof Light Fixtures

* 1. **Light pipes/sun pipes/sun tunnels**
1. The contractor is to include a technical data sheet by a supplier for the supply and installation of a flat roof light pipe (or sun pipe, sun tunnel) to be installed in the ceiling of the main hall in order to provide natural light to the floor space below.
2. The light pipe is to consist of a complete installation kit with all the necessary components for both exterior and interior connections. The exterior module is to consist of either a polycarbonate dome or a toughened glass panel encased in an aluminium or PVC frame. The outer module is to have the necessary flashing in order to seal with the waterproofing membrane. The pipe is to be flexible enough to allow minor movements through a sleeve and to be made of either fiberglass yarn or aluminium with reflective coating. The interior module is to be made of a polycarbonate interior light diffuser encased in a plastic ceiling ring in order to fit neatly to the ceiling.
3. The diameter of the tunnel can vary in size according to the manufacturer and light intensity considerations required in the floor space below. Care must be taken so that any hole within the roof structure for the purpose of the light pipe is to be carried out with consideration of the structural elements and positioned carefully so as not to affect the structural integrity of the said element. Any submission shall be subject to the approval of the Architect and Civil Engineer in charge.
4. The light pipes shall be warranted to be free from defects in material and workmanship for a minimum period of five (5) years. The installation should also be covered by a five (5) year warranty on its good workmanship. The Contractor shall provide a declaration to this effect with the tender submission.

#### Other Specifications

Apart from the above specifications the following standards and specifications must be employed:

**Standards**:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Material** |  | **Standard** |  |  |  |
|  Concrete | MSA EN 206 Part 1 & UK National |  |
| Structural Concrete Specifications for |  |
| Buildings, Section 8 |  |  |
| Excavations |  | BS EN 6031:2015 |  |  |
| Reinforcement |  |  |  |  |  |
| Bars |  | MSA EN 10080 & BS 4483:2005 | Grade 500 |
| Reinforcement |  |  |  |  |  |
| Mesh |  | MSA EN 10080 & BS EN 4449:2005 | Grade 500 |
| Bricks |  | MSA EN 771 & 772 |  |  |
| Kerbs |  | MSA EN 1340 |  |  |  |
| Type | 1 |  |  |  |  |  |
| Subbase |  | Transport Malta Series 800 |  |  |
| Type | 1A |  |  |  |  |  |
| Subbase |  | Transport Malta Series 600 |  |  |
| Prestressed |  |  |  |  |  |  |
| Precast |  |  |  |  |  |  |
| Concrete Slabs | UK | National | Structural | Concrete |  |
| (planki) |  | Specifications for Buildings, Section 7 |  |
|  DPC |  | UK | Building | Regulations | Approved |  |
|  |  | Document C & BS 8215 |  |  |
| Waterproofing |  |  |  |  |  |
| Sheets |  | MSA EN 13707 5mm thick |  |  |
|  |  | UK ICE Specification for piling and |  |
| Concrete Piles | embedded retaining walls |  |  |
| Manholes | Transport Malta Series 500 |  |  |
| Trenches | Transport Malta Series 500 |  |  |
|  |  | MSA EN 1452-2, MSA EN 1452-3 and ISO |  |
| uPVC Pipes |  | 161/1 |  |  |  |

**The Contactor is to abide by other requirements specified in Malta Legal Notice 29/2010**

# 4.3 Lot 2 – Works on the Aviary

## 4.3.1 Scope of works

* Structural Steelwork
* Installation of aviary mesh

## 4.3.2 Specifications forming part of the present Lot:

|  |  |
| --- | --- |
| Specs/01 | Structural Steelwork  |
| Specs/02 | Aviary Mesh |

#### Structural Steelwork

* 1. **General Requirements**
1. Steel structural works shall generally comply with the provisions contained in the UK National Structural Steelwork Specifications for Building Construction, 4th Edition, 2002 - <http://www.engineeringsurveyor.com/software/NSSS%204th%20edition.pdf>
2. As part of the Method Statement for Structural Steel Erection, the Contractor shall carry out and submit to the Contracting Authority
3. detailing of the steelwork and design and detailing of connections, based on the member design prepared by the Architect and Civil Engineer in charge, together with the information indicated in Table 1.2A, Design Checklist, Section 1, National Structural Steelwork Specifications for Building Construction, 4th Edition, 2002.
4. design and detailing of the steelwork, commencing with the design of the members after the conceptual layout has been prepared by the Architect and Civil Engineer in charge, together with the information indicated in Table 1.2B, Design Checklist, Section 1, National Structural Steelwork Specifications for Building Construction, 4th Edition, 2002.
5. design and detailing of the steelwork, commencing with arranging the layout of the members, together with the information indicated in Table 1.2C, Design Checklist, Section 1, National Structural Steelwork Specifications for Building Construction, 4th Edition, 2002.
6. Information, as per indicated tables from Section 1, National Structural Steelwork Specifications for Building Construction, 4th Edition, 2002, related to the following:

|  |  |
| --- | --- |
| * Workmanship
 | Table 1.3\* |
| * Erection
 | Table 1.4\* |
| * Protective Treatment
 | Table 1.5\* |
| * Inspection and Tests
 | Table 1.6\* |
| \*Tables refer to Section 1, National Structural Steelwork Specifications for Building Construction, 4th Edition, 2002 |

* 1. **Materials**
1. Material shall be steel in rolled sections, structural hollow sections, plates and bars and shall comply with the appropriate standard as indicated in Table 2.1, Material and Dimension Standards, National Structural Steelwork Specifications for Building Construction, 4th Edition, 2002.
2. All steel shall have been specifically tested in accordance with the appropriate material quality standard as indicated in Table 2.1, Material and Dimension Standards, National Structural Steelwork Specifications for Building Construction, 4th Edition, 2002. The Contractor shall provide certification thereof to the Contracting Authority.
3. Steel surfaces when used shall not be more heavily pitted or rusted than Grade C of BS EN ISO 8501-1.
4. Surface defects in hot rolled sections, plates and wide flats revealed during surface preparation which are not in accordance with the requirements of BS EN 10163 shall be rectified accordingly.
5. Surface defects in hot rolled hollow sections revealed during surface preparation which are not in accordance with the requirements of BS EN 10210-2 shall be rectified accordingly.
6. Consumables for use in metal arc welding shall comply with BS EN 499, BS EN 440, BS EN 756 or BS EN 758 as appropriate.
7. Ordinary Bolt Assemblies - Ordinary Bolt and nut (and washer if used) assemblies shall be as European Standards given in Table 2.2 or the British Standards given in Table 2.3, National Structural Steelwork Specifications for Building Construction, 4th Edition, 2002.
8. Pre-loadable Bolt Assemblies - Pre-loadable HSFG bolt assemblies shall be as given in Table 2.4, National Structural Steelwork Specifications for Building Construction, 4th Edition, 2002.
9. Foundation Bolts Assemblies - Holding down bolt assemblies shall be as given in Table 2.5, National Structural Steelwork Specifications for Building Construction, 4th Edition, 2002.
10. Cup and Countersunk Bolts - Cup and countersunk bolts shall be as given in Table 2.6, National Structural Steelwork Specifications for Building Construction, 4th Edition, 2002.
11. Lock Nuts for Bolt Assemblies - Lock nuts shall be in accordance with BS 4190.
12. Coatings for Bolt Assemblies - Where specific coatings are required, they shall be provided by the fastener manufacturer and shall comply with the appropriate part of BS 7371.
13. Proprietary studs used in composite construction shall be the headed type with the following properties after being formed:
	1. Minimum yield strength - 350 N/mm2
	2. Minimum ultimate tensile strength - 450 N/mm2
	3. Elongation of 15% on a gauge length of 5.65 √A, where A is the area of the test specimen.
	4. **Protective Treatment Materials**
14. Metallic Blast Cleaning Abrasives - Chilled iron grit shall be in accordance with BS EN ISO 11124–2, and .cast steel grit shall be in accordance with BS 11124–3.
15. Surface Coatings - Paint materials and other coatings supplied shall be in accordance with the appropriate British Standard or European Standard for the materials.
16. Sherardized Coatings - Sherardized coatings shall be in accordance with BS 4921.
17. Galvanizing Materials - The composition of zinc in galvanizing baths shall be in accordance with BS EN ISO 1461, Hot-dip galvanizing, Galvanizing, Metal coatings, Coatings, Zinc, Iron, Steels, Weight (mass), Homogeneity, Thickness, Adhesion tests.
	1. **Proprietary Items**
18. All proprietary items shall be used in accordance with the manufacturer’s recommendations and instructions.
	1. **Substitution of Material or Form**
19. Material quality or form of components may, with the agreement of the Architect and Civil Engineer in charge of Works, be substituted where it can be demonstrated that the structural properties are not less suitable than the designed component and that compatibility with the intention of the design is maintained.
	1. **Information to be provided by the Contractor**
20. Marking System - Every component which is to be individually assembled or erected shall be allocated an erection mark.
21. Members which are identical in all respects may have the same erection mark.
22. General Arrangement Drawings (Marking Plans) - Drawings shall be prepared, as part of the Method Statement for Structural Steel Erection, by the Contractor showing plans and elevations at a scale such that the erection marks for all members can be shown on them. The preferred scales are 1:100 or larger. The drawings shall identify member size, material quality, location relative to other members and the grid, and the specified surface treatment. They may include a reference system to connections.
23. Details at an enlarged scale should also be made if these are necessary to show the assembly of members.
	1. **Foundation and Wall Interface Information**
24. Information showing holding down bolts and the interface of steelwork components to foundations shall include a Foundation Plan, to be submitted as part of the Method Statement for Structural Steel Erection, showing the base location, position and orientation of columns, the marks of all columns, any other members in direct contact with the foundations, their base location and level, and the datum level.
25. Similar information shall also be provided for components connecting to walls and other concrete surfaces.
26. Complete details of fixing steel and bolts to the foundations or walls, method of adjustment and packing space shall be provided.
	1. **Attachment to facilitate Erection of steel structure**
27. Details of holes and fittings in components necessary for safety or to provide lifting and erection aids shall be included in the drawings provided by the Contractor as part of its Method Statement for Structural Steel Erection.
28. Unless specified otherwise by the Project Specification, such holes and fittings may remain on the permanent structure. Account shall be taken of this detailing the welding of temporary attachments.
	1. **Welding**
29. Any requirements for edge preparations for welds shall be indicated in the drawings as part of the Method Statement for Structural Steel Erection.
	1. **Packings, Clearances and Camber**
30. The Contractor shall make provision for packings which may be necessary to ensure proper fit-up of joints, the need for clearances between the fabricated components so that the permitted deviations in fabrication and erection are not exceeded and/or the design requirements for pre-set or cambers.
	1. **Hole Sizes**
31. Holes in components shall be shown in the sizes indicated in clause 3.4.5 of the National Structural Steelwork Specifications for Building Construction, 4th Edition, 2002.
	1. **Holding Down Bolt Cover Plates**
32. Holding down bolt details shall include provision of loose cover plates or washers with hole diameter 3mm greater than the holding down bolts.
	1. **Connections to allow movement**
33. Where the connection is designed to allow movement, the bolt assembly used shall remain secure without impeding the movement.
	1. **Steel-Structure Erection Drawings**
34. When necessary to amplify the information given in his Method Statement for Structural Steel Erection the Contractor shall prepare Erection Drawings.
35. On completion of the project, the Contractor shall provide the Architect and Civil Engineer in charge of Works with detailed “As Erected” drawings (including copies in electronic format).
36. Details and arrangements of temporary steelwork necessary for erection purposes shall be shown with the erection information.
	1. **Traceability of Steel**
37. All steel to be used in the Works shall have a test certificate reference so that its properties are known and can be verified.
38. The material grade shall be identifiable within the manufacturing system.
39. Individual pieces shall be capable of positive identification at all stages of fabrication.
40. Completed components shall be marked with a durable and distinguishing erection mark in such a way as not to damage the material. Hard stamping may be used, except where otherwise specified in the Project Specification.
41. Where areas of steelwork are indicated on the drawings, or fabrication information, as being unmarked, they shall be left free of all markings and hard stamping.
	1. **Handling**
42. Steelwork shall be bundled, packed, handled and transported in a safe manner so that permanent distortion does not occur and surface damage is minimised.
	1. **Cutting and Shaping**
43. Cutting and shaping of steel may be carried out by sawing, shearing, cropping, plasma cutting, laser cutting, nibbling, flame cutting, planing or machining. Hand-held cutting shall only be used where it is impractical to use machine flame cutting.
44. Flame-cut edges which are free from significant irregularities shall be accepted without further treatment except for the removal of dross, otherwise cut edges shall be dressed to remove irregularities.
	1. **Machining, Dressing, Holing, Punching and Reaming**
45. Thickness of Machined Parts - The thickness of elements shown on the drawings as requiring machining shall mean the minimum thickness after the machining operations.
46. Removal of Burrs - Cut edges shall be dressed to remove dross, burrs, and irregularities. Holes shall be dressed as required to remove burrs and protruding edges.
47. Dressing of Edges - Sharp edges shall be dressed, but a 90° rolled, cut, sheared or machined edge is acceptable without further treatment.
48. Holes - Round holes for fasteners or pins shall be drilled, punched or plasma cut.
49. Matching holes for fasteners or pins shall register with each other so that fasteners can be inserted freely through the assembled members in a direction at right angles to the faces in contact. Drifts may be used but holes shall not be distorted.
50. Drilling Through More Than One Thickness - Where the separate parts are tightly clamped together drilling shall be permitted through more than one thickness. The parts shall be separated after drilling and any burrs removed.
51. Punching full size - Full size punching of holes shall be permitted when all the following conditions are satisfied:
	1. The tolerance on distortion of the punched hole does not exceed that shown in Section 7, National Structural Steelwork Specifications for Building Construction, 4th Edition, 2002.
	2. The holes are free of burrs which would prevent solid seating of the parts when tightened;
	3. The thickness of the material is not greater than 30mm, nor greater than the diameter of the hole being punched;
	4. In spliced connections when the holes in mating surfaces are punched in the same direction and the splice plates marked to show the assembly faces, if packed separately.
52. Punching is permitted without the conditions in vii, provided that the holes are punched at least 2mm less in diameter than the required size and the hole is reamed to the full diameter after assembly.
53. Slotted holes shall be punched, plasma cut or formed by drilling two holes and completed by cutting.
	1. **Assembly**
54. Connected components shall be drawn together such that they achieve firm contact consistent with the requirements for fit-up or direct bearing.
55. Drifting of holes to align the components shall be permitted, but must not cause damage or distortion to the final assembly.
	1. **Curving and Straightening**
56. Curving or straightening components during fabrication, shall be performed by one of the following methods:
	1. mechanical means, taking care to minimise indentations, or change of cross-section;
	2. the local application of heat, ensuring that the temperature of the metal is carefully controlled, and does not exceed 650°C;
	3. the induction bending process when the procedure used includes careful temperature control;
	4. **Storage**
57. Stacking - Fabricated components which are stored prior to being transported or erected shall be stacked clear of the ground, and arranged if possible so that water cannot accumulate. They shall be kept clean and supported in such a manner as to avoid permanent distortion.
58. Individual components shall be stacked and marked in such a way as to ensure that they can be identified.
	1. **Workmanship**
59. Welding methods shall comply with Section 6, National Structural Steelwork Specifications for Building Construction, 4th Edition, 2002.
60. Bolts and bolt assemblies, including pre-loaded bolt assemblies shall comply with Section 7, National Structural Steelwork Specifications for Building Construction, 4th Edition, 2002.
61. Permitted deviations in cross section, length, straightness, flatness, cutting, holing and position of fittings shall be as specified in 7.2 to 7.5 of Section 7, National Structural Steelwork Specifications for Building Construction, 4th Edition, 2002.
62. The Contractor shall prepare a written detailed method statement. The Contractor shall submit the Method Statement for Structural Steel Erection, signed by a Architect and Civil Engineer engaged by the Contractor, to the Architect and Civil Engineer in charge for acceptance at least two weeks before erection commences. Erection shall not commence before the method statement has been accepted by the Architect and Civil Engineer in charge.
63. Erection of steelwork shall comply with the requirements of Section 8, National Structural Steelwork Specifications for Building Construction, 4th Edition, 2002.
64. Permitted deviations in erected steelwork shall be as specified in 9.1 to 9.6 of Section 9, National Structural Steelwork Specifications for Building Construction, 4th Edition, 2002.
	1. **Corrosion**
65. All steel elements shall be protected against corrosion in accordance with EN ISO 12944, Part 2, corrosion category C5-M.
66. The categories of rust shall be as indicated in ISO 8501-1, ranging from Class A to class D.
	1. **Protective Treatment – Surface Preparation**
67. Surface Cleanliness - At the time of coating the surface cleanliness of the steelwork to be coated shall be in accordance with BS EN ISO 8501-1, preparation grade SA 2 ½.
68. The preparation of steel surfaces using power tool cleaning shall be as indicated in EN ISO 8504-3.
69. Surface Profile - The surface profile of the steelwork to be coated shall be compatible with the coating to be applied in accordance with BS EN ISO 8503-2.
70. Measurement of Surface Profile - Measurement of the surface profile of steelwork to be coated shall be made using the methods given in BS EN ISO 8503-2.
71. Surface Defects - Surface defects revealed during surface preparation shall be dealt with in accordance with Section 2.5, Section 2, National Structural Steelwork Specifications for Building Construction, 4th Edition, 2002.
	1. **Protective Treatment – Metallic Coatings**
72. Hot dip galvanizing shall be carried out in accordance with EN ISO 1461. The typical coating thickness shall be 85 microns for sections not less than 6mm.
73. The Steelwork Contractor shall agree with the Engineer the position of vent and drainage holes in hollow members as laid down in BS EN ISO 14713, and any requirements for subsequent sealing.
74. Thermal (metal) spraying with either zinc or aluminium shall comply with EN 22063. Typical coating thickness is 150 – 200 microns for aluminium and 100 – 150 microns for zinc.
	1. **Protective Treatment – Paint Coatings**
75. Surface Preparation Prior to Painting - Steelwork shall be prepared for coating in accordance with clause 10.2, Section 10, National Structural Steelwork Specifications for Building Construction, 4th Edition, 2002.
76. Painting of Site Weld Areas and Fasteners - Site weld areas and fasteners which are not suitably protected shall be painted with an approved paint system to ensure similar properties, performance and compatibility with the protective treatment system being used on the surrounding surfaces.
77. Fasteners and bolt assemblies which are supplied with a protective treatment which is equivalent to the protective treatment on the steelwork need not be painted.
78. The paint coating shall normally consist of 3 in number layers:

|  |  |  |
| --- | --- | --- |
| Primer Coat  | Zinc rich Epoxy | 40 μm |
| Undercoat | High build Epoxy MIO | 100 μm |
| Finish | Recoutable polyurethane finish | 60 μm |

* 1. **Coating of Surfaces to be encased in Concrete**
1. Structural steel surfaces to be encased in concrete may be left unpainted and need not be blast-cleaned unless instructed otherwise by the Architect and Civil Engineer in Charge.

#### Aviary Mesh

* 1. **General Guidance**
1. The mesh for the long rehabilitation flight aviary shall consist of polyester material with a mesh spacing of 30mm, with strands not thicker than 1.5mm and with holes of a roundish nature.
2. The mesh for the small holding aviaries shall consist of galvanized steel material with a mesh spacing of 25mm.
3. Both mesh types are required to be bracketed to the steel structure members and must be able to withstand bird impacts and wind speeds of 32 m/s.

#### Other Specifications

Apart from the above specifications the following standards and specifications must be employed:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Material** |  | **Standard** |  |  |  |
| Reinforcement |  |  |  |  |  |
| Bars |  | MSA EN 10080 & BS 4483:2005 | Grade 500 |
| Reinforcement |  |  |  |  |  |
| Mesh |  | MSA EN 10080 & BS EN 4449:2005 | Grade 500 |

# 4.4 Lot 3 – Installation of Building Monitoring System

## 4.4.1 Scope of works

1. This equipment will be used to monitor and study any changes in the structure by measuring stress and strain by means of positioning various types of sensors in strategic locations as instructed by the Architect and Civil Engineer in charge. The system should provide a monitoring system where the data can be monitored online remotely through the Internet or cloud. A computer system with a large display should also be provided at the location. Data loggers should be enclosed in rack-mounted cabinets

## 4.4.2 General

1. The system should include data acquisition equipment, data loggers including software and any ancillary equipment required for the full operation of the system. Ideally the data acquisition equipment should be connected to all sensors so that data from all sensors can be stored periodically.

## 4.4.2 Sensor Categories and Specifications

1. The following Sensor Categories shall be installed, meeting the specifications below

|  |  |  |
| --- | --- | --- |
| Label\* | Sensor Type | Item in BOQ |
| A | Strain and Stress | Strain Gauges – Item 2.1 |
| B | Vibration | Accelerometer – Item 2.2 |
| C | Temperature  | Temperature Sensor – Item 3.1 |
| D | Durability Sensors | Galvanic Sensors installed within Cores E – Item 1.1Resistive Sensors installed within Cores E – Item 1.2Embeddable electrodes E – Item 1.3 |

\* The Label code is reflected in the technical specs below.

#### A1: Vibrating Wire Strain Gauges (Quantity 5)

1. Vibrating Wire Strain Gauges are to be installed in strategic locations in the structure as instructed by the Architect and Civil Engineer in charge to monitor any change in strain in the structure. The minimum specifications required are listed in the table below:

|  |
| --- |
| A1: Vibrating Wire Strain Gauge |
| Quantity | 16 |
| Range (Full Scale) | ≥ 2000 με |
| Resolution | ≤ 2.0 με |
| Thermal Coefficient | ±20 με/℃ or better (closer to 0) |
| Temperature Range | 0 ℃ to 80 ℃ or wider |
| Annual allowable change to Zero Stability | ±0.1με or better (closer to 0) |
| Accuracy of Readings | ±1% of Full Scale or better (closer to 0) |
| Linearity of Readings | ±1% of Full Scale or better (closer to 0) |
| *All wiring required for its full and correct operation should be included* |
| *All anchors and ancillary equipment required for its correct installation should be included* |
| *Installation should be carried out by certified installers* |
| *All testing of the installed sensor as instructed by the installation manual should be carried out to confirm correct installation and test measurements are to be recorded for future reference.* |
| *Any replacement required due to incorrect installation or faulty devices need to be done at the supplier’s expense.* |

1. A quantity of 5 vibrating wire temperature sensing devices are to be installed in strategic locations in the water storage to monitor ambient temperatures around the structure. The minimum specifications required are listed in the table below.

|  |
| --- |
| A1: Temperature Sensor using vibrating wire technology |
| Quantity | 5 |
| Range (Full Scale) | 0 ℃ to 80 ℃ or wider |
| Resolution | ≤ 0.05 ℃ |
| Accuracy of Readings | ± 0.8 ℃ or better (closer to 0) |
| *All wiring required for its full and correct operation should be included* |
| *All anchors and ancillary equipment required for its correct installation should be included* |
| *Installation should be carried out by certified installers* |
| *All testing of the installed sensor as instructed by the installation manual should be carried out to confirm correct installation and test measurements are to be recorded for future reference.* |
| *Any replacement required due to incorrect installation or faulty devices need to be done at the supplier’s expense.* |

#### B1: Accelerometer (Quantity 2):

1. The Accelerometer shall meet the following specifications:
* Bandwidth: DC to 200Hz
* Calibration coil: Standard Full-scale range:
* User selectable at ± 0.25g, ± 0.5g, ± 1g, ± 2g or ± 4g

#### C1: Temperature sensing devices (Quantity 5):

1. A quantity of 5 temperature sensing device is to be installed in strategic locations in the water storage to monitor ambient temperature and ambient relative humidity around the structure. The minimum specifications required are listed in the table below:

|  |
| --- |
| C1 Temperature Sensor  |
| Quantity | 1 |
| Temperature Range (Full Scale) | 0 ℃ to 50 ℃ or wider |
| Temperature Resolution | ≤ 0.05 ℃ |
| Temperature Accuracy of Readings | ± 0.8 ℃ or better (closer to 0) |
| Humidity Resolution | ≤ 0.05 %RH |
| *All wiring required for its full and correct operation should be included* |
| *All anchors and ancillary equipment required for its correct installation should be included* |
| *Installation should be carried out by certified installers* |
| *All testing of the installed sensor as instructed by the installation manual should be carried out to confirm correct installation and test measurements are to be recorded for future reference.* |
| *Any replacement required due to incorrect installation or faulty devices need to be done at the supplier’s expense.* |

#### D1: Reference (Embeddable) Electrodes (Quantity 2)

1. This is a half-cell that is embedded in concrete and can be used to:
* Monitor the reinforcement potentials in critical areas for corrosion such as construction joints, splash zones in marine structures, bridge decks, and bottoms of bridge columns exposed to ingress of chlorides
* Monitor the efficiency of cathodic protection
* Monitor the ingress of the depassivation front, due to chloride penetration or carbonation

#### D2: Galvanic Sensors (Quantity 5):

1. Galvanic Sensors should be provided. These sensors consist of two pairs of electrodes, rebars, each of which consisting of a working electrode made of carbon steel and a stainless steel counter electrode. These types of sensors can be embedded in concrete to monitor the entrance of aggressive and risk to initiate corrosion of remained reinforcement by measuring the Galvanic current between the stainless steel and carbon steel rods.

#### D3:Resistivity (Quantity 5)

1. Electrical resistance sensors measure in concrete in terms which varies with moisture. In this methodology, the moisture content is calculated by determining how the relative permittivity of the material under investigation varies with moisture content.

#### Data Acquisition and Data Logging

1. There are several options how data acquisition and data logging could be achieved such as data acquisition boards which save recorded data themselves into storage cards or data acquisition boards which save recorded data onto a dedicated PC. In either of the possible ways the following specifications need to be met:

|  |  |
| --- | --- |
| Number of input channels | All outputs from all sensors need to be measured and logged |
| Sampling Rate | ≥ 1 Hz |
| Input Voltage/Current RangeA | To be compatible with the full scale voltage/current output of all sensors |
| Internal Battery Backup or UPS runtime duration | ≥ 1 hour |
| All power supplies, cables and ancillary equipment required for the full operation of the system should be included |

## 4.4.3 Computer System

1. A computer system having the following specs or better should be provided:
* CPU – Core I3 8th generation or equivalent
* RAM – 16 GB
* Operating System - Windows 10
* 256 GB solid-state drive
* With keyboard, mouse and 21 inch HD monitor

## 4.4.4 Data Management and Setting up of Web-Interface

1. The dataloggers should provide a web-server to connect to the internet connection which will be provided on-site and will be capable to upload to the cloud so that the data can be viewed remotely via mobile and PC browsers.

## 4.4.5 Installation

1. For every sensor type, the Contractor shall follow the manufacturer’s direction as to the stage or stages of the structure reinforcement exercise, at which the sensors or part thereof should be installed. This will enable the Project Manager to better plan logistics, timeframes and timelines for this project.
2. All sensors installations should conform to the IET wiring regulations and the bid should include all relevant wiring and any covers required to protect external sensors.
3. The sensors, and wiring should be designed for outdoor exposure to weather and UV irradiation for a minimum of 25 years, in a temperature range of 0ºC to 50ºC and high wind velocities that can reach Force 12 in the Maltese islands.

## 4.4.6 Warranties

1. The sensors, metering equipment, wiring and ancillary equipment shall be warranted to be free from defects in material and workmanship for a minimum period of five (5) years. The Contractor shall provide the manufacturer’s warranty as part of the literature submitted with the tender document.
2. The Computer shall be covered with a five year warranty covering BOTH parts and labour. The Contractor shall provide a declaration to this effect with the tender submission.
3. The installation should also be covered by a five (5) year warranty on its good workmanship, quality of connectors used and that comforts to IET regulations. The Contractor shall provide a declaration to this effect with the tender submission.

# SECTION 5 – SUPPLEMENTARY DOCUMENTATION

## 5.1 – Draft Contract Form

## 5.2 – Glossary

## 5.3 – Specimen Performance Guarantee

## 5.4 – Specimen Tender Guarantee

These are available to view and download from the ‘Resources Section’ at:

[www.etenders.gov.mt](http://www.etenders.gov.mt)

## 5.4 – General Conditions of Contract

The full set of General Conditions for Works Contracts, for Supplies Contracts and for Services Contracts (latest version as applicable on the date of the publication of this tender) can be viewed/downloaded from the ‘Resources Section’ at:

[www.etenders.gov.mt](http://www.etenders.gov.mt)

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.