

**Request for Quotation (RFQ) for
Construction of Safe Room + Renovation Work
Reference No. 004-2018**

This is not an order

09 August 2018

Dear Sir/Madam,

Subject: Request for Quotation (RFQ) for **Construction of Safe Room + Renovation Work.**

1. The United Nations Entity for Gender Equality and the Empowerment of Women (UN Women) is seeking quotation(s) for the procurement of Construction of Safe Room + Renovation Work as described in the Annex I to this request for quotation.
2. In order to prepare a responsive quotation, you must carefully review, and understand the contents of the following documents:
 - a. This Invitation letter and Quotation Instruction Sheet (QIS)
 - b. [Terms of Reference \(TOR\) \(Annex 1\)](#)
 - c. [Quotation Submission Form and Quotation Format \(Annex 2\)](#)
 - d. [UN Women General Conditions of Contract \(Annex 3\)](#)
 - e. [Voluntary Agreement \(Annex 4\)](#)
 - f. [Model Form of Contract \(Annex 5\)](#)
 - g. [Eligibility Criteria \(Annex 6\)](#)
 - h. [BoQ \(Bill of Quantities\)](#)
 - i. [Technical Specifications](#)
 - j. [Scope of Work](#)
 - k. [Technical Drawing](#)
3. Quotations submitted by email must be limited to a maximum of 5 MB, virus-free or corrupted contents to avoid rejection, and no more than one email transmissions.
4. A contract may be awarded to the supplier having submitted a quotation representing the best value for money, i.e. lowest-priced technically-compliant of the proposed offers.
5. The following aspects will be considered for the evaluation;
 - i. Suitability of the approach and methodology including firm's capacity to undertake the services.
 - ii. Qualifications and experience of proposed staff/personnel.
6. It is UN Women's intention to issue the contract as presented herein the RFQ documents. Therefore, offerors should ensure any due diligence regarding the legal review and ability to be compliant to all

contract terms and conditions is undertaken prior to the submission of your quotation. Submission of a quotation will be confirmation of accepting UN Women contract included herein.

7. In the case two (2) quotations are evaluated and found to be the same ranking in terms of technical qualification and price, UN Women will award contract to the company that is either women-owned or has a majority women employed. This is in support of UN Women's core mandate. In the case that both companies are women-owned or have a majority women employed, UN Women will request best and final offer from both suppliers and shall make a final comparison of the competing suppliers.
8. UN Women reserves the right to accept or reject any quotation, and to cancel the process and reject all quotations at any time prior to the award of contract without thereby incurring any liability to the suppliers or any obligation to inform the suppliers of the grounds for such action.
9. At any time prior to the deadline for the submission of quotations, UN Women may, for any reason, whether at its own initiative or in response to a clarification requested by a supplier, modify the RFQ by way of a written amendment. All suppliers that have received the RFQ shall be notified in writing of any such amendments. In order to offer suppliers reasonable time to take any such amendments into account in preparing their quotations, UN Women may, at its discretion, extend the deadline for the submission.
10. The Quotation Instruction Sheet (QIS) below provides the requisite information for the supplier as guide to respond to this request.

QUOTATION INSTRUCTION SHEET (QIS)

Instruction to Suppliers	Specific Requirements
Deadline for Submission of Quotation	<p>Date and Time : August 16, 2018 12:00 PM</p> <p>Kabul, Afghanistan (for local time reference, see www.greenwichmeantime.com)</p> <p>This is an absolute deadline, Quotation received after this date and time will be disqualified.</p>
Method of Submission	<p><input checked="" type="checkbox"/> Personal Delivery/ Courier mail/ Registered Mail</p> <p><input checked="" type="checkbox"/> Electronic submission of Quotation</p>
Address for Quotation Submission	<p><input checked="" type="checkbox"/> Personal Delivery/ Courier mail/ Registered Mail:</p> <p>UN Women UNOCA Compound Jalalabad Road Kabul Afghanistan: Attn: Procurement Unit</p> <p><input checked="" type="checkbox"/> Electronic submission of Quotations: procurement.af@unwomen.org</p> <p>Quotations should be submitted to the designated address by the date and time of the deadline given.</p>
Language of the Quotation	<p><input checked="" type="checkbox"/> English <input type="checkbox"/> French <input type="checkbox"/> Spanish</p> <p><input type="checkbox"/> Other (pls. specify) _____</p>
Quotation Currencies	Any freely convertible currency: <i>USD</i>
Quotation Validity Period commencing after closing date of RFQ	<p>90 days</p> <p>UN Women may exceptionally request vendor to extend quotation validity beyond the initial period indicated in the RFQ. Request will be communicated in writing.</p>
Payment Terms	<input checked="" type="checkbox"/> 100% upon completion and satisfactory receipt of service(s)

<p>Expected Delivery Date and Time.</p> <p>Quotations can be rejected if the delivery date and time exceeds the stipulated date and time described in the TOR</p>	<p><input checked="" type="checkbox"/> As per Service Delivery Schedule attached</p>
<p>Value Added Tax on Proceed Quotation</p>	<p><input checked="" type="checkbox"/> Must be inclusive of VAT and other applicable indirect taxes</p> <p><input type="checkbox"/> Must be exclusive of VAT and other applicable indirect taxes</p>
<p>Performance Security</p>	<p>Required</p> <p>Amount: 10% of the total contract value</p> <p>Form: Within 7 days of receipt of the letter of Intent, and before contract signature, the successful Bidder shall furnish a Performance Security to UN WOMEN in the amount of 10% of the contract Value. Performance security of 10% of the estimated price of the contract will be returned to the contractor, upon completing of all the works under the contract and issuance of Certificate of Substantial Completion and provision of bank guarantee in the amount of 5% of the contract value to cover the Defect Liability Period of 12 months, returnable upon issuance of Certificate of Final Completion. During the 12 (twelve) months of Defect Liability Period, the contractor is obligated to correct, repair and / or reconstruct any faults as may arise or any items listed in the Certificate of Substantial Completion by UN WOMEN, at the Contractors own cost and within 14 (fourteen) calendar days of notification by UN WOMEN. This will be submitted by the successful contractor.</p>
<p>Evaluation Criteria</p>	<p>Standard Eligibility Criteria are detailed in Annex 6.</p> <p><input checked="" type="checkbox"/> Technical responsiveness/Full compliance to minimum requirements under Annex I</p> <p><input checked="" type="checkbox"/> Qualifications and experience of proposed staff/personnel</p> <p><input checked="" type="checkbox"/> Lowest price offer</p> <p><input checked="" type="checkbox"/> Comprehensiveness of after-sales services</p> <p><input checked="" type="checkbox"/> Full acceptance of the PO/Contract General Terms and Conditions</p> <p><input checked="" type="checkbox"/> Earliest Delivery / Shortest Lead Time</p>

Type of Contract to be Signed	<input checked="" type="checkbox"/> Purchase Order <input checked="" type="checkbox"/> Professional Service Contract
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11. UN Women's [vendor protest procedure](#) provides an opportunity for appeal to supplier(s) who believe that they were not treated fairly. This [link](#) provides further details regarding UN Women's vendor protest procedures.

Suppliers, their subsidiaries, agents, intermediaries and principals must cooperate with the Office of Internal Oversight Services (OIOS) of the United Nations, UN Women Internal Audit and Investigations Group (IAIG) as well as with other investigations authorized by the Executive Director and with the UN Women Ethics Office as and when required. Such cooperation shall include, but not be limited to the following: access to all employees, representatives, agents and assignees of the supplier; as well as production of all documents requested, including financial records.

Failure to fully cooperate with investigations will be considered sufficient grounds to allow UN Women to repudiate and terminate the contract, and to debar and remove the supplier from UN Women's list of registered suppliers.

12. UN Women implements a zero tolerance on fraud and other proscribed practices, and is committed to identifying and addressing all such acts and practices against UN Women, as well as third parties involved in UN Women activities. UN Women expects its suppliers to adhere to the UN Supplier Code of Conduct found in this link:
http://www.un.org/depts/ptd/pdf/conduct_english.pdf.

13. This letter is not to be construed in any way as an offer to contract with your organization.

Yours sincerely,


Aleta Faye Miller

Country Representative

UN Women Afghanistan

ANNEX 1

TERMS OF REFERENCE (TOR)

Introduction – UN WOMEN intends to construct a Safe Room and do minor renovations in the office and accommodation buildings within UNOCA compound. The implementation of the works referred to in the Bills of Quantities, technical specifications and set of architectural, structural & services drawings.

Scope of Work : The work in this contract shall include but not limited to the furnishing of all necessary tools, materials, equipment, skilled manpower, transportation, machineries, accessories, site engineers and supervisors to carry out all work as described below and as outlined on the drawings as well as Bill of Quantities.

Project Activities :

The contractor should provide labor, material and equipment to complete the project per the technical drawings, specification and bill of quantities. The following main activities should be considered for the construction of female dressing room and toilet projects.

1. Before mobilization to the site the contractor should consult with UN WOMEN and take access permission, and should follow up UNOCA compound administration and security requirement throughout the construction period.
2. Contractor is responsible to provide skill /unskilled labors, equipment's, and other required items and proceed with the safety roll and regulation in the project site.
3. Contractor should submit their revised project work plan, QC plan, safety plan and other required submittals.
4. Contractor should clean the site from trash, debris and other materials.
5. Demobilization and removing of all unusable materials out compounds, and clean the project site properly as per UN WOMEN engineer's instruction.

SCHEDULE OF REQUIREMENTS

Performance Period : The Contractor shall provide a detailed schedule for the project completion. This schedule shall provide dates for all material deliveries and a construction timeline for the major construction milestones. The timeline shall include the completion dates of the project.

The contractor will have maximum 3 months (Upon Signing of the Contract) to complete all sets of activities in the SoW. The Contractor shall begin work and complete each phase of the project, including final inspection and project acceptance within the mentioned performance period. No deviation from the approved schedule shall be permitted except as otherwise in this Statement of Work. Failure to complete work within the scheduled period shall be grounds for liquated of damages and/or termination for cause as provided in this Statement of Work.

General Conditions : The Contractor is required to cover general requirements to include but not limited to the following :

- ✓ Mobilization and demobilization
- ✓ Temporary facilities including power & water supplies, toilets etc. enclosures to the working premises, temporary storage etc.
- ✓ Qualified Site Supervision and Management.
- ✓ Watch & ward of his works, material & equipment until handing over the site

Other Preliminaries : Provisions for all other preliminary items such as standard construction safety and security, day markings, protection of existing utilities and adjacent properties that may be affected, submission of samples, reports, quality tests, shop drawings and as-built plans, disposal and clean-up.

Work Supervision : The Contractor shall assign a competent project manager who shall be a registered civil engineer to be present on each site always for the duration of the contract. The supervisor should be able to communicate effectively in the local and English languages.

Materials and Workmanship : The Contractor shall seek approval of the UN WOMEN engineering department for all the materials, and whenever commencing other work items. All materials and workmanship used in the execution of the works shall be of the best quality and high quality workmanship and approved in advance.

Samples : The Contractor shall furnish at his own cost any samples of materials and/or related technical data required for the works that may be called for by the UN WOMEN engineer for approval and any further samples in the case of rejection. The engineers in charge may reject any materials not meeting the approved standards/specifications and contract requirement.

Existing Property : The Contractor shall take every precaution to avoid damage to the existing utilities or adjacent structures during the works. Care must be taken to avoid interference with or damage to existing services, except where such services are required to be removed or altered by virtue of the works. The Contractor will be held responsible for and shall make good all damages arising from the execution of this contract at its own expense.

Notes :

- ✓ The contractor should be aware that the proposed work will be carried out in the existing functioning building and that the daily activity shall not interrupt others ongoing daily activities.
- ✓ All construction materials to be approved by the Engineer before construction, fabrication or installation.
- ✓ All concrete and mortar QC testing to be applied as per specification

DELIVERABLES

Deliverable	Timeframe
<i>Substantial completion of both construction and renovations</i>	<i>15 November 2018</i>

MINIMUM REQUIREMENT

UN Women Minimum Requirement	Offerors Response
<ul style="list-style-type: none"> Team composition 	
<p>Construction Supervisor – overall planning, coordination, and control of the project from beginning to completion, aimed at meeting the contract agreement and schedules and delivery of the project products in accordance with construction programme, technical drawings, specifications, schedules, budgets and specified quality standards, including contractor's construction staff and resources, sub-lots site health, safety and environmental management, communications with UN WOMEN project site team and other project stakeholders to ensure smooth implementation of site activities in accordance with approved schedules, shared responsibility and adequate site security in the field.</p>	<p><input checked="" type="checkbox"/> Yes (<i>Provide curriculum vita using the format available in Annex 2, Section C "Sample CV template"</i>)</p> <p><input type="checkbox"/> No</p>
<p><u>Project team members</u></p>	<p><input checked="" type="checkbox"/> Yes (<i>Provide curriculum vita using the format available in Annex 2, Section C "Sample CV template"</i>)</p> <p><input type="checkbox"/> No</p>
<p><u>Subcontractors (if any):</u> The offeror shall not sub-contract > 50% of the work.</p>	<p><input checked="" type="checkbox"/> Yes (<i>Specify the % of work, scope of work and deliverables that will be subcontracted to other firms/entities</i>)</p> <p><input type="checkbox"/> No</p>
<ul style="list-style-type: none"> Relevant Experience of the Firm 	

<p>1. Statement of Satisfactory Performance (Completion Certificates, if any) during the past 5 years ;</p> <p>2. Evidence of being a prime contractor in at least one (1) similar project (of vertical structure construction projects) that was successfully executed during the last 5 years with a value of equal to or greater than USD 50,000;</p>	<p><input checked="" type="checkbox"/> Yes (<i>Provide details of all the previous and on-going assignment in Annex 2, Section A, 1.1 "Relevant Experience"</i>)</p> <p><input type="checkbox"/> No</p>
<p>• Reference</p>	
	<p><input checked="" type="checkbox"/> Yes, a minium of three (3) references available</p> <p><i>Fill in below:</i></p> <p>1.</p> <ul style="list-style-type: none"> – <i>Employer's name (company/entity):</i> – <i>Nature of contract (service for xxx):</i> – <i>Contract #:</i> – <i>Contract start and end date:</i> – <i>Contract value:</i> – <i>Contact person: (email, phone and name)</i> <p>2.</p> <ul style="list-style-type: none"> – <i>Employer's name (company/entity):</i> – <i>Nature of contract (service for xxx):</i> – <i>Contract #:</i> – <i>Contract start and end date:</i> – <i>Contract value:</i> – <i>Contact person: (email, phone and name)</i> <p>3.</p> <ul style="list-style-type: none"> – <i>Employer's name (company/entity):</i> – <i>Nature of contract (service for xxx):</i> – <i>Contract #:</i> – <i>Contract start and end date:</i> – <i>Contract value:</i>

	<p>– <i>Contact person: (email, phone and name)</i></p> <p><input type="checkbox"/> No, a minimum of three (3) references are not available.</p>
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ANNEX 2

QUOTATION SUBMISSION FORMS

INTENT TO RESPOND FORM

Solicitation no: *[insert solicitation reference no.]*

Title: *[Insert Title]*

Deadline Date/Local time: *[insert date and time with time zone indicator of deadline]*

Please complete (A), (B), or (C) and return to *[insert email of procurement mailbox or practitioner and/or postal mailbox and/or fax number]* by *[insert deadline date/time/time zone]*.

<p>(A) We intend to submit our proposal by: _____ (date/time)</p>	<p>Company Name: _____ Contact Name: _____ Email: _____ Telephone: _____</p>
<p>(B) We may submit our proposal and will confirm our intent by: _____ (date/time)</p>	<p>Company Name: _____ Contact Name: _____ Email: _____ Telephone: _____</p>
<p>(C) We do not intend to submit a proposal for the following reason(s):</p>	<div data-bbox="847 1400 1406 1765"> <ul style="list-style-type: none"> <input type="checkbox"/> Our current workload does not permit us to take on additional work at this time <input type="checkbox"/> We do not have the required expertise <input type="checkbox"/> There is insufficient time to prepare a proper submission in response to this solicitation <input type="checkbox"/> Our funds or other resources are insufficient to carry out the work required <input type="checkbox"/> We choose not to participate due to a conflict of interest involving: _____ <input type="checkbox"/> Other (please specify): _____ </div> <div data-bbox="799 1805 1382 1955"> <p>Company Name: _____ Contact Name: _____ Email: _____ Telephone: _____</p> </div>

STATEMENT OF CONFIRMATION

[The supplier shall fill in this form with no alterations or substitutions to its format and content]

To: *[insert UN Women
Address, City, Country]*

Date: *[insert date of Quotation Submission]*

We, the undersigned, declare that:

- (a) We (representatives of this company, inclusive of any associated legal representatives) have examined the minimum requirements, terms and clauses and have no reservations to the RFQ including all annexes;
- (b) We agree to abide by this RFQ and in accordance with the UN Women General Conditions of Contract (Annex 4) and will not request any changes to the existing terms, conditions and clauses;
- (c) We offer to supply in conformity with the RFQ, the following **[Title of Services]** and undertake, if our offer is accepted, to commence and complete delivery of all services specified in the contract within the time frame stipulated.
- (d) We offer to execute the services for the sum as may be ascertained in accordance with the quotation submitted and with the instructions under the Quotation Instruction Sheet;
- (e) Our offer shall be valid for a period of [] days from the date fixed for opening the RFQ, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;
- (f) We understand that UN Women is not bound to accept the lowest evaluated quotation or any other quotation that you may receive.

SIGNATURE AND CONFIRMATION OF THE RFQ

PROVIDED THAT A CONTRACT IS ISSUED BY UN WOMEN **WITHIN THE QUOTATION VALIDITY PERIOD STATED ABOVE**, THE UNDERSIGNED HEREBY COMMITS, SUBJECT TO THE TERMS OF SUCH CONTRACT DOCUMENT, TO EXECUTE THE SERVICE(S) REQUESTED AT THE PRICES OFFERED AND TO DELIVER SAME TO THE DESIGNATED POINT(S) WITHIN THE DELIVERY TIME STATED ABOVE. THE UNDERSIGNED HEREBY SIGNS IN CONFIRMATION THAT THEY HAVE REVIEWED THE RFQ AND AGREE TO ITS GENERAL CONDITIONS OF CONTRACT AND THE CONTRACT MODEL.

Exact name and address of company

COMPANY NAME: _____

ADDRESS: _____

PHONE NO.: _____

E-MAIL ADDRESS: _____

AUTHORIZED SIGNATURE: _____

DATE: _____

NAME: (TYPE OR PRINT) _____

FUNCTIONAL TITLE OF AUTHORIZED SIGNATORY: _____

This quotation submission form MUST be duly completed and returned with the QUOTATION, along with confirmation that the products/services are in accordance with Terms of Reference and requirements of UN Women. The quotation "MUST" be submitted in the vendor's business letterhead stationery. Failure to do so may result in disqualification of your QUOTATION.

Technical Information

[Note to procurement practitioner: this form should be changed and adapted to best reflect the TOR and is best completed in coordination with or by the requester]

Section A: Expertise and Capability of Supplier

1.1 The organization

- Background: Provide a brief account of the organization, including the year and country of incorporation, types of activities undertaken, and approximate annual billings.
- Outline General Organizational Capability which is likely to affect implementation (i.e. size of the organization, strength of project management support e.g. project management controls, global networking, financial stability).
- Financial capacity: Include latest Audited Financial Statement duly certified by a public accountant *[Request for financial statement should depend on the nature/complexity of the service, as per TOR]*
- Provide certificate(s) for any accreditation of processes, policy (e.g. ISO).
- Include a description of your present and ongoing contracts that have a direct relationship to this requirement. Include relevant collaborative efforts your organization may have participated in.

1.2 Adverse judgments or awards

- The supplier is in sound financial condition with no financial concerns, such as negative net worth, bankruptcy proceedings, insolvency, receivership, major litigation, liens, judgments or bad credit or payment;
- The supplier has not declared bankruptcy, are not involved in bankruptcy or receivership proceedings, and there is no judgment or pending legal action against them that could impair their operations in the foreseeable future.

1.3 Subcontracting and partnerships

- Explain reasons for, scope and rationale for any subcontracting. Include relevant contact information and experience for all subcontractors. The role of the Supplier as well as that of any sub-contractors shall be clear and unequivocal.
- Explain any partnerships that are planned for the implementation of this project. The role of each entity shall be clear. Information on past collaborative experience should be included.

1.4 Relevance of Specialized Knowledge and Experience on Similar Projects

- Provide details of specialized knowledge to be utilized for this RFQ as well as recent relevant experiences on projects of a similar nature and/or with other UN organizations.
- References and/or samples of work must be provided upon request

Section B: Proposed Work Plan and Approach

2.1 Analysis approach, methodology

- Provide a description of the Supplier's approach, methodology, and timeline for how the organization will achieve the Terms of Reference (TOR) of the project while meeting or exceeding the stipulations of the TOR.
- Explain your organization's understanding of UN Women's needs for the services or works.
- Describe how your organization will adhere to UN Women's procurement principles in acquiring services on behalf of UN Women. UN Women's general procurement principles:

- a) Best Value for money
- b) Fairness, integrity and transparency
- c) Effective competition
- d) The best interests of UN Women

Section C: Resource Plan, Key Personnel

3.1 Composition of the team proposed to provide, and the work tasks (including supervisory)

Describe the availability of resources in terms of personnel and facilities needed for this RFQ. Describe the structure of the team which you would propose to provide, and the work tasks (including supervisory) which would be assigned to each.

3.2 Gender profile

- Supplier is strongly encouraged to include information regarding the percentage of women employed in Supplier's organization, women in leadership positions, and percentage of women shareholders.
- Note: this will *not* be a factor in the evaluation criteria *unless* where there are two identical quotations (i.e. exact total points in the case of cumulative evaluation methodology and/or same price in the case of most technically compliant/acceptable quotation) UN Women will award the contract to the organization owned by women by 50% or more, in support of UN Women's core mandate.

Provide Curriculum vitae of the proposed team that will be involved either full time or part time (if applicable or as per the TOR)

Highlight the relevant academic qualifications, specialized trainings and pertinent work experience.

No substitution of key personnel will be tolerated once the contract has been awarded except in extreme circumstances and with the approval of the UN Women. If substitution is unavoidable it will be with a person who, in the opinion of the UN Women, is at least as experienced as the person being replaced. No increase in costs will be considered as a result of any substitution.

Sample CV template: *(Adjust according to needs)*

CV's may follow the below sample template and should include as a minimum biographical data, education/degree and relevant employment record.

Name:	
Position for this Assignment:	
Nationality:	
Language Skills:	
Educational and other Qualifications	

Employment Record: [Insert details of as many other appropriate records as necessary] From [Year]: _____ To [Year]: _____ Employer: _____ Positions held: _____		
Relevant Experience (From most recent; Among the assignments in which the staff has been involved, indicate the following information for those assignments that best illustrate staff capability to handle the tasks listed under the TOR) [Insert details of as many other appropriate assignments as necessary]		
Period: From - To	Name of project/organization:	Job Title, main project features, and Activities undertaken
References (minimum 3)	(Name/Title/Organization/Contact Information – Phone; Email)	

Financial Quotation

The components comprising the total price must provide sufficient detail to allow UN Women to determine compliance of quotation with requirements as per TOR of this RFQ. The supplier shall include a complete breakdown of the cost elements associated with each line item and those costs associated with any proposed subcontract/sub-awards (separate breakdown) for the duration of the contract. Provide separate figures for each functional grouping or category.

Estimates for cost-reimbursable items, if any, such as travel, and out of pocket expenses should be listed separately.

In case of an equipment component to the service provided, the Financial Quotation should include figures for both purchase and lease/rent options. UN Women reserves the option to either lease/rent or purchase outright the equipment through the contractor.

All prices/rates quoted must be exclusive of all taxes, since the United Nations, including its subsidiary organs, is exempt from taxes as detailed in Clause 18 of the UN Women General Conditions of Contract.

[Note to procurement practitioner: select either option A or B below, based on the TOR and project requirements]

A. Cost Breakdown per Deliverables

	Deliverables	Percentage of Total Price	Price

			(Lump Sum, All Inclusive)
1	Deliverable 1		
2	Deliverable 2...		
	Total	100%	USD

[OR]

B. Cost Breakdown by Resources

Description	Quantity	Number of Unit	Unit Cost (USD)	Total Cost (USD)
Team Leader	1 person	Day/week/month		
Team Member	XX person	Day/week/month		
Operational cost, Please detail the following: 1. Estimated return tickets for travel (if any) 2. Accommodation and other expenses away from home (if any) 3. Local transportation 4. Any relevant overhead costs (report preparation, communication, stationary, etc.)	1 lump sum 1 lump sum 1 lump sum 1 lump sum			
Technical assistance and capability building (training, working group meeting, workshop)	1 lump sum			
Publication (seminar/launching of the report, printing, etc.)				
TOTAL				

All other information that we have not provided automatically implies our full compliance with the requirements, terms and conditions of the RFQ.

End of Annex 2

ANNEX 3

UN WOMEN GENERAL CONDITIONS OF CONTRACT

The GCs can be accessed by supplier from UN W website (<http://www.unwomen.org/en/about-us/procurement>) or directly by clicking on the below link:

[GCCs for Complex Goods or Works](#)

<http://www.unwomen.org/~media/commoncontent/procurement/unwomen-generalconditionsofcontract-goods-en.pdf>

ANNEX 4

VOLUNTARY AGREEMENT TO PROMOTE GENDER EQUALITY

Voluntary Agreement to Promote Gender Equality and Women's Empowerment

Between

_____ (Name of the Contractor)

And

The United Nations Entity for Gender Equality and the Empowerment of Women

The United Nations Entity for Gender Equality and the Empowerment of Women, a composite entity of the United Nations established by the United Nations General Assembly by its resolution 64/289 of 2 July 2010 (hereinafter referred to as "UN Women") strongly encourages (_____) (hereinafter referred to as the "Contractor") to partake in achieving the following objectives:

- ☐ Acknowledge values & principles of [gender equality \(http://www.unwomen.org/en/about-us/guiding-documents\)](http://www.unwomen.org/en/about-us/guiding-documents) and [women's empowerment \(http://weprinciples.org/Site/PrincipleOverview/\)](http://weprinciples.org/Site/PrincipleOverview/);
- ☐ Provide information and statistical data (that relates to policies and initiatives that promote gender equality and women empowerment), upon request;
- ☐ Participate in dialogue with UN Women to promote gender equality and women's empowerment in their location, industry and organization;
- ☐ Establish high-level corporate leadership for gender equality;
- ☐ Treat women and men fairly at work and respect and support human rights and nondiscrimination, including through equal pay policies;
- ☐ Ensure health, safety and wellbeing of all women and men workers;
- ☐ Promote education, training and professional development for women;
- ☐ Hold gender-specific trainings or courses for staff;
- ☐ Implement enterprise development, supply chain and marketing practices that empower women;
- ☐ Promote equality through community initiatives and advocacy;
- ☐ Measure and publicly report on progress to achieve gender equality.

On behalf of the Contractor: _____

Name, Title: _____,

Address: _____

Signature: _____

Date: ____/____/____

DD

MM

YYYY

ANNEX 5

MODEL FORM OF CONTRACT

CONTRACT – INSTITUTIONAL OR PROFESSIONAL SERVICES

Contract No.

Business Unit:

Organisational Unit/Section/Division/Office/Country:

This Contract is made between the UNITED NATIONS ENTITY FOR GENDER EQUALITY AND THE EMPOWERMENT OF WOMEN (“UN Women”), and [insert official name of company in full], with its registered offices at [address] (“Contractor”) (Both hereinafter separately and jointly referred to as the “Party” or the “Parties”).

1. CONTRACT DOCUMENTS

The following documents constitute the entire agreement between the Parties with regard to the subject matter hereof (“Contract”), superseding all prior representations, agreements, contracts and proposals, whether written or oral, by and between the Parties on this subject, and in case of ambiguities, discrepancies or inconsistencies between or among them, shall apply in the following order of precedence:

- (a) This document;
- (b) UN Women General Conditions of Contract—Contracts for the Provision of Services, annexed hereto as Annex A (“General Conditions”);
- (c) Terms of Reference, annexed hereto as Annex B (“TOR”);
- (d) [other annexes that may be relevant]

2. SCOPE

The Contractor shall perform services (“Services”) as specified in the TOR. Except as expressly provided in this Contract and in particular the TOR, (i) UN Women shall have no obligation to provide any assistance to the Contractor in performing the Services; (ii) UN Women makes no representations as to the availability of any facilities or equipment which may be helpful or useful for performing the Services (iii) The Contractor shall be responsible at its sole cost for providing all the necessary personnel, equipment, material and supplies and for making all arrangements necessary for the performance and completion of the Services.

3. DURATION

This Contract shall take effect on the date of the latest signature (the “Effective Date”) and shall remain in effect until [insert date], unless earlier terminated (“Initial Term”). UN Women may, at its sole option, extend the Contract, under the same terms and conditions as set forth in this Contract.

4. PRICE & PAYMENT ¹

(Select one option and delete the other)

OPTION 1 (FIXED FEE) ²

(Delete title immediately above after selecting option)

In full consideration for the complete and satisfactory performance of the Services under this Contract, UN Women shall pay the Contractor a total fixed fee of [*insert currency & amount in figures and words*]. This fee shall remain firm and fixed during the term of the Contract. The Contractor shall submit invoices only upon achievement of the corresponding milestones and for the following amounts:

<u>MILESTONE</u>	<u>AMOUNT</u>	<u>TARGET DATE</u>
Upon....././....
....././....

OR

OPTION 2 (TIME-BASED CONTRACTS) ³

(Delete title immediately above after selecting option)

In full consideration for the complete and satisfactory performance of the Services under this Contract, UN Women shall pay the Contractor a price not to exceed [*insert currency & amount in figures and words*] (“the Maximum Total Amount”). The Maximum Total Amount is not a guaranteed amount. The Fee Schedule in Annex [*insert annex number*] contains the maximum amounts per cost category that are reimbursable under this Contract; such maximum amounts are not guaranteed amounts. The Contractor shall reflect in its invoices the amount of the actual reimbursable costs incurred in the performance of the Services. The Contractor shall not do any work, provide any equipment, materials and supplies, or perform any other services which may result in any costs in excess of the Maximum Total Amount or of any of the amounts specified in the Fee Schedule for each cost category without the prior written agreement of UN Women. The Contractor shall submit itemized invoices for the work done every [*insert period of time or milestones*].

5. INVOICES

¹ Advance payments should not be made using this template. Please use the Model Institutional Services Contract or Professional Services Contract for services valued at USD \$30,000 or above or for procurement actions for services valued below USD \$30,000, where the nature of services or terms and conditions are novel or complex. Please note that advance payments should be granted only in exceptional cases, and that they must comply with UN Women policies and procedures.

² This option is to be used for fixed fee contracts. Fixed price contracts should normally be used when it is possible to estimate with reasonable accuracy the costs of the activities which are the subject of the Contract. Compensation for services is usually referred to as the fee. In a fixed fee contract, there are no “rates”; the amount of the fee is fixed.

³ This option should be used for time and materials contracts. Normally, such contracts should be used where the compensation of the contractor is based on time spent in performing the services, and possibly with reimbursement of expenses incurred by the contractor. Cost reimbursable contracts are not normally used for the provision of services. Instead, where the contractor’s compensation is based on time spent in performing the services (and possibly reimbursement of expenses for materials), a time and materials contract should be used; see POM, sec. 11.2.

The Contractor shall submit to UN Women an original copy of its invoices, as is required in the preceding Article, specifying, at a minimum, a description of the Services performed, the unit prices in accordance with the Fee Schedule (if relevant), and the total price of the Services, together with such supporting documentation as UN Women may require, as follows:

[Insert address and contact details for submission of invoices].

6. PAYMENT

Payments shall be made to the Contractor thirty (30) days from receipt of the Contractor's invoice and supporting documentation and certification by UN Women that the Services represented by the invoice have been provided and that the Contractor has otherwise performed in conformity with the terms and conditions of this Contract, unless UN Women disputes the invoice or a portion thereof. All payments to the Contractor shall be made by electronic funds transfer to the Contractor's bank account, as follows:

Name of Bank:

Bank Address:

Bank ID:

Account No:

Title/name:

UN Women may withhold payment in respect of any invoice if it considers that the Contractor has not performed in accordance with the terms and conditions of this Contract or has not provided sufficient documentation in support of the invoice. Where an invoice is disputed in part, UN Women shall pay the Contractor any undisputed portion and the Parties shall consult in good faith to promptly resolve outstanding issues. Once the dispute has been resolved, UN Women shall pay the Contractor the relevant amount within thirty (30) days. The Contractor shall not be entitled to interest on any late payment or any sums payable under this Contract or any accrued interest on payments withheld by UN Women in connection with a dispute.

7. NOTIFICATIONS

All notices and other communications between the Parties required or contemplated under this Contract shall be in writing and shall be transmitted to the following:

For UN Women:

[Insert Name, Address, Phone and Email]

For the Contractor:

[Insert Name, Address, Phone and Email]

IN WITNESS WHEREOF, the Parties have, through their authorized representatives, executed this Contract on the date herein below written.

For and on behalf of UN Women:

For and on behalf of the Contractor:

Signature	_____	_____
Name	_____	_____
Title	_____	_____
Date	_____	_____

CONTRACTOR RETAINS 1 ORIGINAL CONTRACT AND RETURNS TO UN WOMEN 1 DULY SIGNED AND DATED ORIGINAL.

ANNEX 6

ELIGIBILITY CRITERIA

The standard eligibility criteria for suppliers wishing to engage in a contract are laid out below. Further information on doing business with UN Women/ how to become UN Women vendor can be found on [UN Women's website](#).

Legal Capacity: Bidders may be a private, public or government-owned legal entity or any association with legal capacity to enter into a binding Contract with the United Nations Entity for Gender Equality and the Empowerment of Women (UN Women).

Conflict of Interest: Bidders must disclose any actual or potential conflict of interest and they shall be deemed ineligible for this procurement process unless such conflict of interest is resolved in a manner acceptable to UN Women. Conflict of interest is present when:

- a. A Bidder has a close business or family relationship with a UN Women personnel who: (i) are directly or indirectly involved in the preparation of the bidding documents or specifications of the contract, and/or the bid evaluation process of such contract; or (ii) would be involved in the implementation or supervision of such contract;
- b. A Bidder is associated, or has been associated in the past, directly or indirectly, with a firm or any of its affiliates which have been engaged by UN Women to provide consulting services for the preparation of the design, specifications, Terms of Reference, and other documents to be used for the procurement of the goods, services or works required in the present procurement process;
- c. A Bidder has an interest in other bidders, including when they have common ownership and/or management. Bidders shall not submit more than one bid, except for alternative offers, if permitted. This will result in the disqualification of all bids in which the Bidder is involved. This includes situations where a firm is the Bidder in one bid and a sub-contractor on another; however, this does not limit the inclusion of a firm as a sub-contractor in more than one bid.

Failure to disclose any actual or potential conflict of interest may lead to the Bidder being sanctioned further by UN Women.

Ineligibility Lists: A Bidder shall not be eligible to submit an offer if and when at the time of submission, the Bidder:

- d. is included in the Ineligibility List, hosted by [UNGM](#), that aggregates information disclosed by Agencies, Funds or Programs of the UN System;
- e. is included in the [Consolidated United Nations Security Council Sanctions List](#), including the [UN Security Council Resolution 1267/1989 list](#);
- f. is included in any other Ineligibility List from a UN Women partner and if so listed in the RFQ Instructions.
- g. is currently suspended from doing business with UN Women and removed from its vendor database(s).

Code of Conduct: All Bidders are expected to embrace the principles of the [United Nations Supplier Code of Conduct](#), reflecting the core values of the Charter of the United Nations. UN Women also expects all its suppliers to adhere to the principles of the [United Nations Global Compact and recommends signing up to the Womes Empowerment Principles](#).

Construction of Safe Room + Renovation Work

Currency: **US Dollars**

Project No:

Project Title:

Location:

Construction of Safe Room + Renovation Work

Kabul , Afghanistan

Pos.	Description of Work/Items	Unit	Quantity	Unit Cost	Total Cost
1. General					
<u>1.1 Preliminaries</u>					
a	Mobilization and Demobilization: Supplying all resources, equipment, vehicles, etc.... necessary for the execution and completion of the works; preliminary site survey visits, site offices, stores and all other facilities required for the completion of the works under this Contract. This also includes removing all above stated equipment and facilities at the end of the contract period or when requested by the Supervisor and returning the site to its original conditions all as shown on the drawings, required by the specifications and / or deemed necessary by the Supervisor.	LS	1.00		-
<u>1.2 General Requirements</u>					
a	Testing and Operation/Maintenance Manuals.	LS	1.00		-
Subtotal General					-
2. Site					
<u>2.1 Earthwork</u>					
a	Excavation (any soil type) for foundation. This item includes all excavations, disposal and temporary support or shoring if needed. See drawing for details. The volume given here is the net volume of excavated space based on dimensions shown on the drawing, NOT the bulk volume of disposing materials.	CU.M	70.00		-
b	Soil backfilling : foundation around and in between the RCC columns up to ground level. This includes supplying of needed materials. See drawings for levels/dimensions and details.	CU.M	85.00		-
c	Gravel backfilling as the subbase under the PCC LAYER of the floor, side walk . This includes supplying of needed materials and compaction.	CU.M	10.00		-
Subtotal Site					-
3. Structure					
<u>3.1 Concrete-General</u>					
NOTE: Cost for concrete items in this section includes the concrete, reinforcement, shuttering, curing and all as required to the complete job.					

Currency:

US Dollars

Project No:

Project Title:

Construction of Safe Room + Renovation Work

Location:

Kabul , Afghanistan

Pos.	Description of Work/Items	Unit	Quantity	Unit Cost	Total Cost
a	<p>PCC lean concrete under foundation. blidning layer with the thickness of 100mm This includes any work to do the job.Plain Lean Concrete (1:3:6) Location: under all foundations Colour: Natural Tolerance: Class C Final Finish: Wood trowel finish</p> <p>Concrete must be shall be in accordance with the specifications and approved by the Engineer See drawings for location, size and details.</p>	CU.M	3.50		-
b	<p>RCC foundation. The unit cost includes expansion joints and joints filler in foundation as shown and also includes complexity of future connections of column/ tie beams etc.Reinforced Concrete (M-25) Colour: Natural Tolerance: Class B Final Finish: Off form finish</p> <p>Concrete must be sourced from an approved batching plant. Mix design must be in accordance with the specifications and approved by the Engineer.</p> <p>Reinforcement: 'Ø' denoted bars: Steel grade 40 (ASTM A615), plain bars. 'N' denoted bars: Steel grade 60 (ASTM A615), deformed bars. See drawings and schedule for location, size and details.</p>	CU.M	9.50		-
c	RCC Walls: Supply and cast ready mix reinforced concrete M250 for walls as per specifications and drawings	CU.M	26.50		-
d	RCC Slab at +3.25m: Supply and cast ready mix reinforced concrete M250 for columns as per specifications and drawings. This also includes applying Aquamat - Elastic water proofing material (Isomat brand or equivalent) as per technical specification of material.	CU.M	9.50		-
e	RCC Parapet Wall: Supply and cast ready mix reinforced concrete M200 for columns as per specifications and drawings	CU.M	3.00		-
f	PCC Pavement (t=10cm), for all side walks around the building with broom finishing. This includes needed work for complete construction as per detailed drawings and details.	SQ.m	12.00		-
3.2 Brickwork					
<p>NOTE: Refer to specification section '3.5 Brickwork' Cement sand (1:6) mortar with natural colour. Mortar should be mixed using batch plant. Clean and sorted sand should be mixed with given ratio for mortar. No additives allowed unless otherwise approved by engineer. Wall insulations shall be paid separately. items in this section includes the marerial, labor, curing and all as required to the complete job.</p>					

Currency:

US Dollars

Project No:

Project Title:

Construction of Safe Room + Renovation Work

Location:

Kabul , Afghanistan

Pos.	Description of Work/Items	Unit	Quantity	Unit Cost	Total Cost
a	Brick Masonry,full Brick and half brick. Solid wall.for Ground floor and toilet area approx. thickness: 250 mm, and 150mm incl. mortar Surface finish not included.	CU.M	12.00		-
b	Brick Veneer tile wall facing: Providing and laying first quality ceramic Brick Veneer tiles, backing of cement mortar (1 cement : 3 course sand) , including pointing the joints with cement.	SQ.m	8.00		-
c	Natural stone exterior wall facing Approx. Thickness: 5cm This includes wall preparation, grout (1:6), pointing, and polish.	SQ.m	60.00		-
3.3 Light Steelwork					
NOTE: The following steel work items include gussets, fasteners, welding and all needed accessories and work for the complete installation of structures. Following items also include one coat anti-rust followed by 2 other coats of oil painting according to the specifications for steel member painting and site engineer instruction.					
a	Column for outdoor terrace shade structure: Installation of steel hollow section (200x200x2mm) using 300x300x6mm baseplate as column for outdoor terrace shade structure.	line.m	15.00		-
b	Beams for outdoor terrace shade structure: Installation of steel hollow section (200x200x2mm) over the columns as beams for outdoor terrace shade structure.	line.m	35.00		-
c	Grid-Beams for outdoor terrace shade structure: Installation of steel hollow section (100x50x2mm) over the columns as grid beams for outdoor terrace shade structure.	line.m	155.00		-
Subtotal structure					-

4. Enclosure

4.1 Waterproofing					
a	Damp proof course (ISOGAM 4mm thick or equivalent ,Double layer bitumen membrane for roof and parapet wall and all box gutters as shown on the drawing. This includes base preparation if required. Refer to details.	SQ.M	70.00		-
4.2 Roofing					
a	PCC reinforced with (steel lath/Wire mesh) on top of roof polystyrene.	Cu.m	6.50		-
b	Polystyrene (High density 30 kg/m3) , 100mm thick: including supply and it laying.	SQ.M	55.00		-
c	Capping to the top edges of parapet wall. This includes any needed work for complete installation. See drawing for locations and details.	Lin M	23.50		-

Currency:

US Dollars

Project No:

Project Title:

Construction of Safe Room + Renovation Work

Location:

Kabul , Afghanistan

Pos.	Description of Work/Items	Unit	Quantity	Unit Cost	Total Cost
d	Down pipes. This includes all accessories and work required for complete job including connection to the open channel collector as per drawing .	Lin M	12.00		-
	4.3 Doors and Door Hardware				
	NOTE: Following doors are prefabricated doors. The work includes making, transportation, installation, hardware, stopper, closer, glazing, painting and finishes and other accessories required for complete installation as per drawings and schedule.				
a	Heavy Duty Security Door-1: Supply and installation of heavy duty security (bullet proof protection level) (1x 2.2 m) steel door thickness not less than 5 cm, including framework and with heavy duty locks and automatic door closer. And all accessories to finish work as per design, and engineer instruction.	No	2.00		-
b	Access control locks for security doors : Supply and installation of first quality door lock with numeric keypad, and fingerprint access controls as per approval of engineer in charge.	No	1.00		-
c	Wooden cover for security doors: This include providing, carpentry work and installation of season dry and steam Russian wood (thickness=15 - 20mm) cover on the security door with approved adhesives & underlying to give it civilian and classic design, polish and finishing .	SQ.m	8.00		-
d	Wooden color laminated PVC Door D2 (0.8x2.15m), This is a prefabricated door. The work includes making, transportation, installation, hardware and other accessories required for complete installation as per drawings.	No	2.00		-
	Subtotal enclosure				-

5. Interior

	5.1 Carpentry and metal work				
a	Kitchen table: (Height= 80cm, width = 60 cm) This includes top quality hardware's (Turkish or equivalent quality) including but not limited to hinges, doors and drawer pulls, drawer slides, locks, standard and shelf. The casework shall be fabricated in accordance with the drawings. Adjust casework dimensions as per site condition.	Lin M	6.00		-
b	Kitchen Table Counter top: Supply and install granite 2cm thick, for kitchen table counter tops, depth up to 60cm. Job includes angle beads and drop parapet (skirting). Supply and installation of water mixer, and Inbuilt first quality stainless steel sink is also included in this item.	Lin M	6.00		-
c	Wooden frame, MDF finish (Turkish or equivalent quality) cabinate (40cm depth, 2.2m Hieght, 3m width): The work includes making, transportation, installation, and top quality hardware's including but not limited to glasses, hinges, doors, locks, nickel corner beads and shelf. The casework shall be fabricated in accordance with the drawings. Adjust casework dimensions as per site condition and engineer instruction.	No	1.00		-

Currency:

US Dollars

Project No:

Project Title:

Location:

Construction of Safe Room + Renovation Work

Kabul , Afghanistan

Pos.	Description of Work/Items	Unit	Quantity	Unit Cost	Total Cost
d	Wooden Wall mount cabins: (Height= 50cm, width = 40 cm) This includes top quality hardware's (Turkish or equivalent quality) including but not limited to hinges, doors and drawer pulls, drawer slides, locks, standard and shelf. The casework shall be fabricated in accordance with the drawings. Adjust casework dimensions as per site condition.	Lin M	6.00		-
<u>5.2 Fire Extinguishers and Blankets</u>					
a	Extinguishers powder-type (9kg). This includes security cabinet 700x700x300mm with lock and all other accessories needed for complete installation. See drawing and schedule for details.	No	1.00		-
b	Fire Blanket 2x2m.	No	1.00		-
<i>Subtotal Interior</i>					-
6. Finish					
<u>6.1 Plastering</u>					
<p>Note: All works must be according to drawings, specification and engineer instructions. Rates shall include: Supply of all needed materials, including galvanized angles for the corners, windows and external decoration as well as the use of galvanized wire mesh between concrete and block work. Preparation works by covering all conduits of electricity, water supplies, etc, with a galvanized wire mesh at least 20cm width coated by mortar (1:1) cement: sand and the work includes removal of wires and nails and cleaning of surfaces to be ready for Contractor shall take into consideration that all – direct and indirect works and expenses required for the completion of the coming items are included in the unit price. Curing with water for at least seven days for each coat.</p>					
a	Internal walls Cement plaster 15mm thick.	SQ.M	125.00		-
b	External walls Cement plaster 15mm thick.	SQ.M	175.00		-
c	Ceiling Cement plaster 15mm thick.	SQ.M	60.00		-
d	Wall & Ceiling Plastic based Painting: This includes painting with two coats of plastic (100% or weather shield) emulsion paint over a coat of primer of approved color and shade to give an even finish, including putty and all materials, labor, scaffoldings, brushes, tools, equipment etc.	SQ.M	360.00		-
<u>6.2 Floor finishing</u>					
a	Wooden Floor Finishing , This include providing ,carpentary work and installation of season dry and steam Russian wood (Lenght=50cm Width=12.5cm thickness=25mm), poshish & paint flooring, laid on the levelled floor with approved adhesives & underly. As per UNDP approved sample	SQ.M	45.00		-
<u>6.3 Tiling</u>					
a	Floor Ceramic Tiles: Providing and laying first quality (Laser Cut) ceramic non-slip tiles 300x300mm, backing of cement mortar (1 cement : 3 course sand). White cement should be placed properly at every joint of floor tiles.	SQ.M	15.00		-

Currency:

US Dollars

Project No:

Project Title:

Construction of Safe Room + Renovation Work

Location:

Kabul , Afghanistan

Pos.	Description of Work/Items	Unit	Quantity	Unit Cost	Total Cost
b	Wall Ceramic Tiles: Providing and laying first quality ceramic glazed wall tiles 300x600mm, backing of cement mortar (1 cement : 3 course sand) , including Plastic angle beads for ceramic wall tiles at the corners and top and sides of ceramic edges and pointing the joints with white cement.	SQ.M	30.00		-
Subtotal of Finishes					-

7. Water Services**7.1 Water supply piping**

NOTE: The cost given for all PPRC and PVC pipes with diameter less than 60mm includes all required fittings, accessories and work for complete system installation.

a	PPRC water supply pipe D=32mm, including fittings and installation.	Lin M	25.00		-
b	PPRC water supply pipe D=20mm, including fittings and installation.	Lin M	30.00		-
c	PPRC water supply pipe D=15mm, including fittings and installation.	Lin M	15.00		-
d	Water supply bronze Valve D=32mm, including fittings and installation.	No	1.00		-
e	Water supply bronze Valve D=20mm, including fittings and installation.	No	2.00		-

7.2 Sanitation Piping

a	PVC pipe D=150mm, including fittings and installation.	Lin M	15.00		-
b	PVC pipe D=100mm, including fittings and installation.	Lin M	20.00		-
c	PVC pipe D=50mm, including fittings and installation.	Lin M	20.00		-
d	Ventilation PVC pipes D=50mm (from toilets to roof). This also includes supplying and installation of PVC screen at the pipe inlets inside the toilets.	Lin M	12.00		-
e	PVC Clean out, including supply and installation.	No	2.00		-
f	Sanitation pit less than 1200mm deep. This includes excavation and any needed work to make the manhole according to the drawings.	No	2.00		-

7.3 Sanitary and other fixtures

a	Supply and installation of first quality western toilet, including supply, installation and accessories.	No	1.00		-
b	Supply and installation of first quality ceramic sink(face basin) at toilets, including stainless steel mixer (With Lever Arm) and all accessories.	No	1.00		-
c	Supply and installation of first quality single bowel sink for kitchen.	No	1.00		-
d	Supply and installation of first quality Bidet shower, including all accessories.	No	1.00		-
e	Supply and installation of first quality Floor trap D=50mm.	No	3.00		-
f	Toilet roll holders. This also includes installation.	No	1.00		-
g	Towel rack. This also includes installation.	No	1.00		-
h	Soap dishes. This also includes installation.	No	1.00		-
i	Hand sanitizer: Supply and installation of wall mount hand sanitizer dispenser (Purrel or equivalent).	No	1.00		-

Currency:

US Dollars

Project No:

Project Title:

Construction of Safe Room + Renovation Work

Location:

Kabul , Afghanistan

Pos.	Description of Work/Items	Unit	Quantity	Unit Cost	Total Cost
j	Supply and installation of electronic hand dryer (2500 Watt) with stainless steel body and of approved quality.	No	1.00		-
k	Mirrors (40x60cm) at common toilets. This includes complete installation.	No	1.00		-
l	Electrical water boiler with capacity of 80 Liter, including supply and installation.	No	1.00		-
Subtotal Water Services					-
8. Electrical Services					
<u>8.1 Switchboard and sub boards</u>					
a	Fuse Box (40x30 cm), surface mount. ALL wiring and outlets/receptacles to conform to BS Standards for 220 V AC electrical installation.	LS	1.00		-
b	Circuit breaker, MCB, 1x20Amps, Type-C	No	3.00		-
c	Circuit breaker, MCB, 1x16Amps, Type-C	No	3.00		-
d	Circuit breaker, molded case, 3x100Amps.	No	1.00		-
<u>8.2 Distribution cabling</u>					
a	Cable PVC/PVC Insulated, 3x10mm ² , pulled in PVC conduit.	Lin M	25.00		-
b	3X6mm ² wire pulled in PVC Conduit, assorted colors as per phase requirement RST/UVW	Lin M	50.00		-
c	3X4mm ² wire pulled in PVC Conduit, assorted colors as per phase requirement RST/UVW	Lin M	40.00		-
d	3X2.5mm ² wire pulled in PVC Conduit, assorted colors as per phase requirement RST/UVW	Lin M	75.00		-
<u>8.3 Fittings</u>					
a	Single pole/double pole or two way light switch	No	8.00		-
b	Supply and installation of Emergency lights with 4 hours duration.	No	4.00		-
c	Supply and installation of Fluorescent pendant light 1x 40W of approved quality.	No	10.00		-
d	Above mirror light, Largo LED tube, Water proof light fixture. 2 x 9W, 220 V, single phase, 50/60HZ, PF>95, CRI>80%, Dimensions (670x125x85mm) .	No	1.00		-
e	Surface mounted slim LED panel light fixture. 36W, 220 V, single phase, 50/60HZ, PF>95, CRI>80%, Dimensions (600x600x12mm) .	No	2.00		-
f	16 Amp single electrical outlet/socket, recessed mount	No	10.00		-
g	Water proof sockets for bathrooms.	No	2.00		-
h	Electrical grounding system: Supply and erect an earthing and lightning protection system complete with Air terminal and base, Earth rod with inspection pit, Lightning protection installation and control gear point.	No	1.00		-
i	Supply and installation of Wall/roof mounted stainless steel exhaust fan with steel louvers, 50CFM, 220VAC, 40watt.	No	4.00		-
j	Wall mount electrical A/C split unit 18000 BTU (Samsung or equivalent), complete with electrical connections, insulated PVC drained pipe, indoor/ outdoor hanging supports and insulated copper pipes, remote control holder, opening in wall, closing holes with sika sealant with necessary accessories.	No	2.00		-
<u>8.4 CCTV and communication systems:</u>					

Currency:

US Dollars

Project No:

Project Title:

Construction of Safe Room + Renovation Work

Location:

Kabul , Afghanistan

Pos.	Description of Work/Items	Unit	Quantity	Unit Cost	Total Cost
a	CCTVs (Closed Circuit Television Cameras): This includes supply and installation color CCTV dome cameras to cover all RRL with below minimum specifications: - 10-megapixel resolution or above - True day night clear vision - Should have small light Cost should include all required cabling and other necessary equipment to complete the task of the installation and to conduct full functionality tests.	No	4.00		-
b	Monitor: Supply and installation of LED/LCD 30-inch color monitor (Samsung or equivalent) for the office room. Cost should include all required cabling and other necessary equipment to complete the task of the installation and to conduct full functionality tests.	No	1.00		-
c	Digital Video Recorder with MPEG-4 video format, 500 GB hard drive. Cost should include all required cabling and other necessary equipment to complete the task of the installation and to conduct full functionality tests.	No	1.00		-
d	Supply and installation of wired video door phone doorbell with below specifications: • 1 piece outdoor HD camera (night vision) through which you can see clearly who rings the bell even at night. Waterproofing and oxidation-proof for the durable alloy outdoor unit. • 2 pieces of indoor 4.3 inch wired audio/video doorbell answering kit, collocation telephone set panel, monitoring and unlock, dual-way intercom Mute door intercom.	No	1.00		-
Subtotal Electrical Services					-
Total of Safe Room					-
9. Chain-Link Fence Wall					
a	Chain-Link Fence Wall: This include supply and installation of chain Link Fence made from galvanized /or anticorrosion iron pipe 4" dia. 2mm thick pressed at the end. and 3m clear height every 3 meter length , The chain-link 50mmx50mm opening and 2.7mm dim and with all requirement as per the design drawing and instruction of site engineer.	Lin M	70.00		-
b	Full Height Turnstile Gate. Supply and Installation of Turnstile Gate in MS Steel structure in Epoxy Paint or Powder Coated finish for outdoor use having following features; • SS Steel Construction in SWG 16 to handle intensive duty cycle. • Heavy duty mechanical lock and release system of turnstile rotor with option to unlock/manual mode in case of system failure. • One-way entry and Anti-backup function to prevent reverse rotation. • Passage width shall not be less than 755mm (30"). • Passage height shall not be less than 2130mm (84").	No	1.00		-
c	Access control door locks: Supply and installation of first quality door lock with numeric keypad, and fingerprint access controls as per approval of engineer in charge.	No	1.00		-
Total of Chain-Link Fence Wall					

Currency:

US Dollars

Project No:

Project Title:

Construction of Safe Room + Renovation Work

Location:

Kabul , Afghanistan

Pos.	Description of Work/Items	Unit	Quantity	Unit Cost	Total Cost
10. Accomodation Building Refurbishment					
a	Carefully dismantling of existing Gypsum Board partition walls (2.8m x 14.5m). All precaution shall be taken not to damage existing electricity and network cables. The replaced electrical fixtures shall be placed on the adjacent wall and made functional.	No	1.00		-
b	Window for hall (1.3 x 1.8 m), PVC double glazing windows; This is a prefabricated windows. The work includes making, transportation, cutting hole in shipping container, fixing steel frame of box sections, installation, hardware, double glazing filled with Argon gas, insect screen, and other accessories required for complete installation as per site engineer instruction.	No	3.00		-
c	Window for Kitchen (1m x 1.3 m), PVC double glazing windows; This is a prefabricated windows. The work includes making, transportation, cutting hole in shipping container, fixing steel frame of box sections, installation, hardware, double glazing filled with Argon gas, insect screen, and other accessories required for complete installation as per site engineer instruction.	No	1.00		-
d	Removal of existing PVC windows and blocking the whole with similar shipping containers steel materials, fixing insulation and gypsum board from inside (1.3m x 1.3m).	No	3.00		-
e	Removal of existing PVC door and blocking the whole with similar shipping containers steel materials, fixing insulation and gypsum board from inside (1m x 2.15m).	No	1.00		-
f	Windows catchment/protection system: This include welding angle iron (50x30x3mm) at four external sides of existing windows to the body of shipment container and welding steel box section (50x15x2mm) at the mullion or vertical element of windows to protect it from falling down at emergency cases (blast), anti-rust painting and two coats of oil based painting as per instruction of site engineer. Note: line meter of either angle iron or box section will be measured for payment purpose after completion.	Lin M	210.00		-
g	Hollow Steel Entrance Door (2.10m x2.15m), This is a prefabricated door. The work includes making, transportation, installation, glass blokcs, door closers, high quality hardwares, Gasket, high density polystrene (25Kg/m3) applying car paint and other accessories required for complete installation as per drawings.	No	1.00		-
h	Hollow Steel Door (1m x2.15m), This is a prefabricated door. The work includes making, transportation, installation, door closer, high quality hardwares, peephole veiwer, Gasket, high density polystrene (25Kg/m3) applying car paint and other accessories required for complete installation as per drawings.	No	1.00		-
i	Access control locks for Entrance door : Supply and installation of first quality door lock with numeric keypad, and fingerprint access controls as per approval of engineer in charge.	No	1.00		-

Currency:

US Dollars

Project No:

Project Title:

Construction of Safe Room + Renovation Work

Location:

Kabul , Afghanistan

Pos.	Description of Work/Items	Unit	Quantity	Unit Cost	Total Cost
j	Sliding Aluminum Door for toilets (0.9m x 2.15m): This is White Powder coated prefabricated door. The work includes making, transportation, installation, hardware, uninstalling of existing doors, and other accessories required for complete installation as per site engineer instruction.	No	8.00		-
k	Supply and install internal Formica Laminate wooden doors (Turkish or equivalent quality) size (100x215) cm.) 45mm thick complete with frame, cover mould, architrave, hardware, fixing two stainless steel kick plates 0.6mm thick. 20cm at bottom the both sides, uninstalling of existing doors, and other accessories required for complete installation as per site engineer instruction.	No	24.00		-
l	Glass Block Wall: This include supply and installation of approved quality glass block including all required work.	Sq.m	10.00		-
m	Wallpaper: Providing and fixing of approved quality wall paper including all required work.	Sq.m	135.00		-
o	Oil based Painting of containers: This includes painting with two coats of oil emulsion paint over a coat of primer of approved color and shade to give an even finish, including putty and all materials, labor, scaffoldings, brushes, tools, equipment etc.	Sq.m	315.00		-
o	Plastic based Painting of containers: This includes painting with two coats of emulsion paint over a coat of primer of approved color and shade to give an even finish, including putty and all materials, labor, scaffoldings, brushes, tools, equipment etc.	Sq.m	475.00		-
p	Provide fixed steel access staircase: This includes 50mm and 25mm steel pipes for handrail, 100x50x3mm purline at 50cm, 3mm non slip steel sheet welding, oil based painting and all required work to complete the work.	Lin M	2.00		-
q	Carefully disassembling of existing kitchen table with inbuilt sink and its reinstallation in its new location within 3-4m distance, including all needed work to complete the task.	Lin M	3.00		-
r	Providing and laying sand filled bags on top of 40' shipping containers. The bags shall be Kenaf material, size 14" X 26", 50 Pound Capacity, 10.00 Ounce Material Weight. The sand bags shall be chemically treated to prevent rot and mildew and shall be 100% biodegradable. String shall be attached for easy closing. The rate shall include cost of labour, scaffoldings, sand bags, sand and staking/laying the sand filled bags on top of containers (Height = 5m).	Sq.m	175.00		-
Total of Accomodation Building Refurbishment					
11. Office Building					
a	Windows catchment/protection system: This include welding angle iron (50x30x3mm) at four external sides of existing windows to the body of shipment container and welding steel box section (50x15x2mm) at the mullion or vertical element of windows to protect it from falling down at emergency cases (blast), anti-rust painting and two coats of oil based painting as per instruction of site engineer. Note: line meter of either angle iron or box section will be measured for payment purpose after completion.	Lin M	227.00		-

Currency:

US Dollars

Project No:

Project Title:

Location:

Construction of Safe Room + Renovation Work

Kabul , Afghanistan

Pos.	Description of Work/Items	Unit	Quantity	Unit Cost	Total Cost
b	Wall Plastic based Painting: This includes painting with one coat of plastic (100% or weather shield) emulsion paint of approved color and shade to give an even finish, including putty and all materials, labor, scaffoldings, brushes, tools, equipment etc.	Sq.m	1,000.00		-
c	Supply and install internal Formica Laminate wooden doors (Turkish or equivalent quality) size (100×215) cm.) 45mm thick complete with frame, cover mould, architrave, hardware, fixing two stainless steel kick plates 0.6mm thick. 20cm at bottom the both sides, uninstalling of existing doors, and other accessories required for complete installation as per site engineer instruction. Note: the vendor should provide shopdrawing and sample of doors before their supply to the site.	No	35.00		-
Total of office building					



UN WOMEN

PROJECT SPECIFICATION

CONSTRUCTION OF SAFE ROOM + RENOVATION WORKS

Kabul - Afghanistan

JULY 31, 2018

1.1 PRELIMINARIES**1.1.1 GENERAL****1.1.1.1 Pre-Construction Work**

Notice to Proceed will be issued within 3 days after signing the contract. The contract period begins on the day the Notice to Proceed is issued.

The Engineer and Contractor will carry out a joint condition-in survey using video or digital photographs to record the condition of the site upon handover to the Contractor. This will determine the state of the site that the Contractor must hand back upon completion of the works.

The Contractor will carry out a detailed site set out survey for the works.

The contractor may not proceed with on-site mobilization or construction works before the Engineer approves the following documentation that shall be covered in Program:

- Condition-in Survey
- Site Survey
- Work Method Statement
- Program
- Quality Assurance / Quality Control Plan (QA/QC) as per minimum requirement 1.3 Contractor's Quality Control Plan specification.
- Health and Safety Plan (H&S) as per minimum requirement Health and Safety Specification no. 1.4.
- Environmental Protection Plan as per minimum requirement ...
- Dust and Noise Protection Plan
- Schedule of Materials and Installed Equipment

A Pre-Construction Meeting will be held between the Engineer and the Contractor to review the above documentation. If the documentation is incomplete, the Contractor will have 3 calendar days to revise and resubmit the documentation for approval.

Site restrictions

Site security limitations: Comply with any restrictions on site area, access or working times advised by the Engineer.

Access: Access on to and within the site, use of the site for temporary works and constructional plant, including working and storage areas, location of offices, workshops, sheds, roads and parking, is restricted to the areas shown on the drawings or as agreed with the Engineer.

Occupied Areas of Site or Buildings

For the parts of the site designated as occupied areas in the **Occupied Areas** schedule:

Allow occupants to continue using the area for the required period.

Make available safe access for occupants.

Arrange work to minimise nuisance to occupants and ensure their safety.

Protect occupants against weather, dust, dirt, water or other nuisance, by such means as temporary screens.

Protection of persons and property

Temporary works: Provide and maintain required barricades, guards, fencing, shoring, temporary roadways, footpaths, signs, lighting and traffic flagging.

Accessways, services: Do not obstruct or damage roadways and footpaths, drains and watercourses and other existing services in use on or adjacent to the site. Determine the location of such services. If damage occurs, immediately repair it at the Contractors cost.

Property: Do not damage property which is to remain on or adjacent to the site, including adjoining property encroaching onto the site. If damage occurs, immediately repair it at the Contractors cost.

Existing services

Attend to existing services as follows:

If the service is to be continued, repair, divert or relocate as required.

If the service is to be abandoned, cut and seal or disconnect, and make safe.

Submit proposals to the Engineer for action for existing services before starting this work. Minimise the number and duration of interruptions.

Adjoining Property

Records: For properties described in the **Adjoining Properties to be Recorded** schedule:

The Contractor is to inspect the properties with the Engineer and owners and occupants of the properties, before start of work.

Make detailed records of conditions existing within the properties, especially structural defects and other damage or defacement.

Arrange for at least 2 copies of each record, including drawings, written descriptions, and photographs, to be endorsed by the owners and occupants, or their representatives, as evidence of conditions existing before commencement of work.

Submit one endorsed copy of each record to the Engineer. The Contractor is to keep the other endorsed copy.

1.1.1.2 Construction Plant

Access

Access route and site access point are as shown on the drawings or as agreed with the Engineer.

Use of Existing Services

Existing services may be used as temporary services for the performance of the contract subject to conditions stated in the **Existing Services** schedule.

Contractors Facilities and Work Practices

The Contractor is required to provide adequate toilet and washroom facilities for his staff. These facilities shall be kept clean and serviceable at all times.

The Contractor is required to provide adequate first aid equipment on-site, failure of the Contractor to ensure the availability of first aid equipment on-site will result in an immediate 'stop work' order being issued. All costs and time delays resulting from any such 'stop work' order are entirely the Contractors responsibility.

A site office will be established by the Contractor at the work site. The location of the site office will be identified by the Engineer to the Contractor. The office will have a complete set of the contract documents.

The Contractor is to maintain a safe, healthy and tidy worksite at all times and all work activities are to be performed with protective and safety equipment appropriate for the task. The Contractor is entirely

responsible for workplace safety and unsafe work practices will be identified and recommendations made for revised work methods as appropriate.

The Contractor will be required to comply to the approved Health and Safety Plan.

Project Signboards

Provide project-specific signboards and the following:

- Location, size and wording as directed by Engineer.
- Maintain in good condition for duration of the work.
- Remove on completion.

Obtain approval before display of advertisements or provision of other signboards.

1.1.1.3 Building the Works

Surveys

Setting out: Set out the works from the dimensioned drawings

Check surveys: Check the setout regularly on site

Final survey: Confirm final setout of roads, services and buildings on the as constructed drawings after Practical Completion

Survey marks

Definition: The term "survey mark" means a survey peg, bench mark, reference mark, signal, alignment, level mark or any other mark used or intended to be used for the purpose of setting out, checking or measuring the work.

Care of survey marks: Preserve and maintain the survey marks in their true positions. The Contractor shall check survey marks for consistency and if there are inconsistencies, the Contractor shall give written information to the Engineer with his proposed corrections. If the survey marks are damaged, the Contractor shall immediately advise the Engineer and rectify the damage.

Contractor's Representative

The contractor must employ a suitably experienced engineer as the Site Manager. This person must be on site during working hours, and fluent in English and technical terminology. The Contractor's Site Manager will have the authority to make all decisions concerning the project on behalf of the Contractor.

Program of Work

The Contractor is to provide a construction baseline program with MS Project which has the following information:

Sequence of Work. (Work Breakdown Structure)

Activity inter-relationships. (Should be closed loop)

Activity durations with start and finish dates

Periods within which various stages or parts of the work are to be executed.

Time scale: Calendar Days

Line items in program are to be based on UN WOMEN Bill of Quantities numbering system (see index). Update the program weekly. Submit hardcopy and softcopy. Identify changes since the previous version, and show the actual starts and finishes, actual percentage of completion for each item of work.

Site Meetings

Hold and attend weekly site meetings throughout the contract and ensure attendance of appropriate subcontractors, the Site Manager and Engineer. The meeting schedule may be modified by the Engineer.

The meeting will consider the following items:

- Technical issues.
- Commercial issues.
- Program.
- Quality of work.

Items Supplied by Owner

Materials and other items identified in the **Items to be Supplied** schedule will be supplied free of charge to the Contractor for installation in the execution of the works. Unload and take delivery of them, inspect them for defects and then take care of them. If defects are found, advise. Return unused items to the owner.

1.1.1.4 Completion of the Works

Final Cleaning

Before Practical Completion, clean throughout, including interior and exterior surfaces exposed to view. Clean carpeted and soft surfaces. Clean debris from the site, roofs, gutters, downpipes and drainage systems. Remove waste and surplus materials.

Reinstatement

Before practical completion, clean and repair damage caused by installation or use of temporary work and restore existing facilities used during construction to original condition.

Adjoining Property

At practical completion, for properties described in the **Adjoining Properties to be Recorded** schedule inspect the properties with the Engineer and owners and occupants of the properties, recording any damage that has occurred since the pre-commencement inspection.

Post Construction Works

The Contractor will provide the following documentation after all site construction has been completed:

- Warranty Statement
- Material Test Certificates
- As-Built Drawings
- List of the suppliers with their contact information
- Spare materials, where applicable

A condition-out survey will be conducted with the Contractor and Engineer at which damages caused by the Contractor will be identified. The Engineer will determine if the Contractor is to make repairs or if the damage will be deducted from the Contractor's final invoice.

Removal of plant

Within 10 working days after practical completion, remove temporary works and construction plant no longer required. Remove the balance before the end of the defects liability period.

1.1.1.5 Payment for the worksAnticipated Progress Claims Schedule

The method of measurement and payment will be SMM7 – Standard Method of Measurement for Building Works (latest version).

The Contractor is to submit a schedule of anticipated progress claims which will be made throughout the contract. Submit a revised schedule with each progress claim.

1.1.1.6 MiscellaneousCompliance with the Law

The Contractor is responsible for compliance with all requirements of authorities. The owner, before entering into the contract, has given the notices, paid the fees, and obtained the permits, approvals and other authorisations stated in the **Prior Applications and Approvals** schedule.

1.2 GENERAL REQUIREMENTS**1.2.1 GENERAL****1.2.1.1 CONTRACT DOCUMENTS**Drawings

Large scale drawings take precedence over small scale drawings. Written or calculatable dimensions take precedence over scaled dimensions.

If there are any errors in dimensions, set out or size, immediately notify the Engineer.

Schedule

The schedule forms part of the specification. Information in the schedule will take precedence over information in the specification.

Bill Of Quantities

If there are any errors in description of items or omissions in the BOQ, immediately notify the Engineer.

If there are any items which are unclear or are not available within the project program, immediately notify the Engineer.

Services diagrammatic layouts

Layouts of service lines, plant and equipment shown on the drawings are diagrammatic only, except where figured dimensions are provided or calculable.

Before commencing work:

- Obtain measurements and other necessary information.

- Coordinate the design and installation in conjunction with all trades.

Site Levels

Spot levels and identified levels on drawings take precedence over contour lines and ground profile lines.

1.2.1.2 INSPECTIONInspection Notification Schedule

The Contractor is to notify the Engineer when the items identified in the **Inspection notification schedule** are ready for inspection.

Written Notice

Minimum notice for inspections to be made on site is 24 hours for off site personnel, 4 hours for onsite personnel.

If notice of inspection is required in respect of parts of the works that are to be concealed, advise when the inspection can be made before concealment.

1.2.1.3 SUBMISSIONSSamples

The Engineer must approve the laboratory used for testing.

Submit nominated samples for approval of the Engineer.

If it is intended to incorporate samples into the works, submit proposals for approval. Only incorporate samples in the works which have been approved. Do not incorporate other samples.

Keep endorsed samples in good condition on site, until practical completion.

Shop Drawings

General: If required, submit dimensioned drawings showing details of the fabrication and installation of services and equipment, including relationship to building structure and other services, cable type and size, and marking details.

Diagrammatic layouts: Coordinate work shown diagrammatically in the contract documents, and submit dimensioned set-out drawings.

1.2.2 PRODUCTS

1.2.2.1 TESTS

Notice

Give notice of time and place of nominated tests.

Attendance

The Contractor is to carry out and attend all tests where nominated in this specification.

The independent approved testing laboratory shall perform the required tests and report results of all tests noting if the tested material passed or failed such tests and shall furnish copies to the Engineer.

1.2.2.2 MATERIALS AND COMPONENTS

Consistency

For the whole quantity of each material or product use the same approved manufacturer or source and provide consistent type, size, quality and appearance.

Manufacturers' or Suppliers' Recommendations

Proprietary items: Select, if no selection is given, and transport, deliver, store, handle, protect, finish, adjust, prepare for use, and provide manufactured items in accordance with the current written recommendations and instructions of the manufacturer or supplier.

Proprietary systems/assemblies: Assemble, install or fix in accordance with the current written recommendations and instructions of the manufacturer or supplier.

Project modifications: Advise of activities that supplement, or are contrary to, manufacturer's or suppliers' written recommendations and instructions.

Proprietary Items

Identification of a proprietary item does not necessarily imply exclusive preference for the item so identified, but indicates the necessary properties of the item.

Alternatives: If alternatives are proposed, submit proposed alternatives and include samples, available technical information, reasons for proposed substitutions and cost. If necessary, provide an English translation. State if provision of proposed alternatives will necessitate alteration to other parts of the works and advise consequent costs.

1.2.3 EXECUTION

Use of explosives will not be permitted.

1.2.3.1 COMPLETIONWarranties

Name the owner as warrantee in conformance with the **Warranty** schedule. Register with manufacturers as necessary. Retain copies delivered with components and equipment.

Commencement: Commence warranty periods at practical completion or at acceptance of installation, if acceptance is not concurrent with practical completion.

1.2.3.2 OPERATION AND MAINTENANCE MANUALSGeneral

General: Submit operation and maintenance manuals for installations.

Format – hard copy

These will be A4 size loose leaf, in commercial quality files with hard covers, each indexed, divided and titled. Include the following features:

- Cover: Identify each binder with typed or printed title "*OPERATION AND MAINTENANCE MANUAL*", to spine. Identify title of project and date of issue.
- Drawings: Fold drawings to A4 size and accommodate them in the files so that they may be unfolded without being detached from the rings.
- Text: Manufacturers' printed data, including associated diagrams, or typewritten, single-sided on paper, in clear concise English.

Number of copies: 3.

Format – soft copy

- In PDF, AutoCad or Microsoft Word, Excel format.
- On compact disk properly identified as above

Number of copies: 3.

1.3 CONTRACTOR QUALITY CONTROL PROGRAM

1.3.1 GENERAL

When the specification requires a Contractor Quality Control Program, the Contractor shall establish, provide, and maintain an effective Quality Control Program that details the methods and procedures that will be taken to assure that all materials and completed construction required by this contract conform to contract plans, technical specifications and other requirements, whether manufactured by the Contractor, or procured from subcontractors or vendors. Although guidelines are established and certain minimum requirements are specified herein and elsewhere in the contract technical specifications, the Contractor shall assume full responsibility for accomplishing the stated purpose.

The intent of this section is to enable the Contractor to establish a necessary level of control that will:

- a. Adequately provide for the production of acceptable quality materials.
- b. Provide sufficient information to assure both the Contractor and the Engineer that the specification requirements can be met.
- c. Allow the Contractor as much latitude as possible to develop his or her own standard of control.

The Contractor shall be prepared to discuss and present, at the preconstruction conference, his/her understanding of the quality control requirements. **The Contractor shall not begin any construction or production of materials to be incorporated into the completed work until the Quality Control Program has been reviewed by the Engineer.** No partial payment will be made for materials subject to specific quality control requirements until the Quality Control Program has been reviewed.

The quality control requirements contained in this section and elsewhere in the contract technical specifications are in addition to and separate from the acceptance testing requirements. Acceptance testing requirements are the responsibility of the Engineer.

1.3.2 DESCRIPTION OF PROGRAM.

General Description

The Contractor shall establish a Quality Control Program to perform inspection and testing of all items of work required by the technical specifications, including those performed by subcontractors. This Quality Control Program shall ensure conformance to applicable specifications and plans with respect to materials, workmanship, construction, finish, and functional performance. The Quality Control Program shall be effective for control of all construction work performed under this Contract and shall specifically include surveillance and tests required by the technical specifications, in addition to other requirements of this section and any other activities deemed necessary by the Contractor to establish an effective level of quality control.

Quality Control Program

The Contractor shall describe the Quality Control Program in a written document that shall be reviewed by the Engineer prior to the start of any production, construction, or off-site fabrication.

The Engineer will choose an adequate period for review. A minimum of 5 days before the preconstruction conference or the start of work is recommended.

Submittal of the written Quality Control Program prior to the preconstruction conference will allow the Engineer to review the contents and make suggestions at the preconstruction meeting.

Submittal of the written Quality Control Program prior to the start of work will allow for detailed discussion of the requirements at the preconstruction meeting. This will give the Contractor a better understanding of the requirements before developing the Quality Control Program.

When selecting the required days for the contractor to submit the Quality Control program, adequate time should be allowed for the Quality Control Program to be a supplement to the Owner's Construction Management Plan.

The Quality Control Program shall be organized to address, as a minimum, the following items:

- a. Quality control organization;
- b. Project progress schedule;
- c. Submittals schedule;
- d. Inspection requirements;
- e. Quality control testing plan;
- f. Documentation of quality control activities; and
- g. Requirements for corrective action when quality control and/or acceptance criteria are not met.

The Contractor is encouraged to add any additional elements to the Quality Control Program that he/she deems necessary to adequately control all production and/or construction processes required by this contract.

1.3.3 QUALITY CONTROL ORGANIZATION

The Contractor Quality Control Program shall be implemented by the establishment of a separate quality control organization. An organizational chart shall be developed to show all quality control personnel and how these personnel integrate with other management/production and construction functions and personnel.

The organizational chart shall identify all quality control staff by name and function, and shall indicate the total staff required to implement all elements of the Quality Control Program, including inspection and testing for each item of work. If necessary, different technicians can be utilized for specific inspection and testing functions for different items of work. If an outside organization or independent testing laboratory is used for implementation of all or part of the Quality Control Program, the personnel assigned shall be subject to the qualification requirements of paragraph 100-03a and 100-03b. The organizational chart shall indicate which personnel are Contractor employees and which are provided by an outside organization.

The quality control organization shall consist of the following minimum personnel:

a. Program Administrator: The Program Administrator shall be a full-time employee of the Contractor, or a consultant engaged by the Contractor. The Program Administrator shall have a minimum of 5 years of experience in building construction and shall have had prior quality control experience on a project of comparable size and scope as the contract.

Additional qualifications for the Program Administrator shall include at least 1 of the following requirements:

- (1) Professional engineer with 1 year of building construction acceptable to the Engineer.
- (2) Engineer-in-training with 2 years of building construction experience acceptable to the Engineer.
- (3) An individual with 3 years of building construction experience acceptable to the Engineer, with a Bachelor of Science Degree in Civil Engineering, Civil Engineering Technology or Construction.
- (4) Certified Construction materials technician

The Program Administrator shall have full authority to institute any and all actions necessary for the successful implementation of the Quality Control Program to ensure compliance with the contract plans

and technical specifications. The Program Administrator shall report directly to a responsible officer of the construction firm.

The Engineer may require a full time, on-site Program Administrator, should the project be of sufficient scope and size.

b. Quality Control Technicians. A sufficient number of quality control technicians necessary to adequately implement the Quality Control Program shall be provided. These personnel shall be either engineers, engineering technicians, or experienced craftsman with qualifications in the appropriate field higher construction materials technician and shall have a minimum of 2 years of experience in their area of expertise.

The quality control technicians shall report directly to the Program Administrator and shall perform the following functions:

- (1) Inspection of all materials, construction, plant, and equipment for conformance to the technical specifications, and as required by Section 1.3.6
- (2) Performance of all quality control tests as required by the technical specifications and Section 100-07.

c. Staffing Levels. The Contractor shall provide sufficient qualified quality control personnel to monitor each work activity at all times. Where material is being produced in a plant for incorporation into the work, separate plant and field technicians shall be provided at each plant and field placement location. The scheduling and coordinating of all inspection and testing must match the type and pace of work activity. The Quality Control Program shall state where different technicians will be required for different work elements.

1.3.4 PROJECT PROGRESS SCHEDULE

The Contractor shall submit a coordinated construction schedule for all work activities. The schedule shall be prepared as a network diagram in Critical Path Method (CPM), PERT, or other format, or as otherwise specified in the contract. As a minimum, it shall provide information on the sequence of work activities, milestone dates, and activity duration. Ms Project and soft copy has to be submitted.

The Contractor shall maintain the work schedule and provide an update and analysis of the progress schedule on a twice monthly basis, or as otherwise specified in the contract. Submission of the work schedule shall not relieve the Contractor of overall responsibility for scheduling, sequencing, and coordinating all work to comply with the requirements of the contract.

1.3.5 SUBMITTALS SCHEDULE

The Contractor shall submit a detailed listing of all submittals (e.g., mix designs, material certifications) and shop drawings required by the technical specifications. The listing can be developed in a spreadsheet format and shall include:

- a. Specification item number;
- b. Item description;
- c. Description of submittal;
- d. Specification paragraph requiring submittal; and
- e. Scheduled date of submittal.

1.3.6 INSPECTION REQUIREMENTS

Quality control inspection functions shall be organized to provide inspections for all definable features of work, as detailed below. All inspections shall be documented by the Contractor as specified by Section 1.3.7.

Inspections shall be performed daily to ensure continuing compliance with contract requirements until completion of the particular feature of work. These shall include the following minimum requirements:

- a. During plant operation for material production, quality control test results and periodic inspections shall be utilized to ensure the quality of aggregates and other mix components, and to adjust and control mix proportioning to meet the approved mix design and other requirements of the technical specifications. All equipment utilized in proportioning and mixing shall be inspected to ensure its proper operating condition. The Quality Control Program shall detail how these and other quality control functions will be accomplished and utilized.
- b. During field operations, quality control test results and periodic inspections shall be utilized to ensure the quality of all materials and workmanship. All equipment utilized in placing, finishing, and compacting shall be inspected to ensure its proper operating condition and to ensure that all such operations are in conformance to the technical specifications and are within the plan dimensions, lines, grades, and tolerances specified. The Program shall document how these and other quality control functions will be accomplished and utilized.

1.3.7 QUALITY CONTROL TESTING PLAN

As a part of the overall Quality Control Program, the Contractor shall implement a quality control testing plan, as required by the technical specifications. The testing plan shall include the minimum tests and test frequencies required by each technical specification Item, as well as any additional quality control tests that the Contractor deems necessary to adequately control production and/or construction processes.

The testing plan can be developed in a spreadsheet fashion and shall, as a minimum, include the following:

- a. Specification item number (e.g., P-401);
- b. Item description (e.g., Plant Mix Bituminous Pavements);
- c. Test type (e.g., gradation, grade, asphalt content);
- d. Test standard (e.g., ASTM or AASHTO test number, as applicable);
- e. Test frequency (e.g., as required by technical specifications or minimum frequency when requirements are not stated);
- f. Responsibility (e.g., plant technician); and
- g. Control requirements (e.g., target, permissible deviations).

The testing plan shall contain a statistically-based procedure of random sampling for acquiring test samples in accordance with ASTM D 3665. The Engineer shall be provided the opportunity to witness quality control sampling and testing.

All quality control test results shall be documented by the Contractor as required by Section 1.3.8.

1.3.8 DOCUMENTATION

The Contractor shall maintain current quality control records of all inspections and tests performed. These records shall include factual evidence that the required inspections or tests have been performed, including type and number of inspections or tests involved; results of inspections or tests; nature of defects, deviations, causes for rejection, etc.; proposed remedial action; and corrective actions taken.

These records must cover both conforming and defective or deficient features, and must include a statement that all supplies and materials incorporated in the work are in full compliance with the terms of the contract. Legible copies of these records shall be furnished to the Engineer daily. The records shall cover all work placed subsequent to the previously furnished records and shall be verified and signed by the Contractor's Program Administrator.

Specific Contractor quality control records required for the contract shall include, but are not necessarily limited to, the following records:

a. Daily Inspection Reports. Each Contractor quality control technician shall maintain a daily log of all inspections performed for both Contractor and subcontractor operations on a form acceptable to the Engineer. These technician's daily reports shall provide factual evidence that continuous quality control inspections have been performed and shall, as a minimum, include the following:

- (1) Technical specification item number and description;
- (2) Compliance with approved submittals;
- (3) Proper storage of materials and equipment;
- (4) Proper operation of all equipment;
- (5) Adherence to plans and technical specifications;
- (6) Review of quality control tests; and
- (7) Safety inspection.

The daily inspection reports shall identify inspections conducted, results of inspections, location and nature of defects found, causes for rejection, and remedial or corrective actions taken or proposed.

The daily inspection reports shall be signed by the responsible quality control technician and the Program Administrator. The Engineer shall be provided at least one copy of each daily inspection report on the work day following the day of record.

b. Daily Test Reports. The Contractor shall be responsible for establishing a system that will record all quality control test results. Daily test reports shall document the following information:

- (1) Technical specification item number and description;
- (2) Test designation;
- (3) Location;
- (4) Date of test;
- (5) Control requirements;
- (6) Test results;
- (7) Causes for rejection;
- (8) Recommended remedial actions; and
- (9) Retests.

Test results from each day's work period shall be submitted to the Engineer prior to the start of the next day's work period. When required by the technical specifications, the Contractor shall maintain statistical quality control charts. The daily test reports shall be signed by the responsible quality control technician and the Program Administrator.

1.3.9 CORRECTIVE ACTION REQUIREMENTS

The Quality Control Program shall indicate the appropriate action to be taken when a process is deemed, or believed, to be out of control (out of tolerance) and detail what action will be taken to bring the process

into control. The requirements for corrective action shall include both general requirements for operation of the Quality Control Program as a whole, and for individual items of work contained in the technical specifications.

The Quality Control Program shall detail how the results of quality control inspections and tests will be used for determining the need for corrective action and shall contain clear sets of rules to gauge when a process is out of control and the type of correction to be taken to regain process control.

When applicable or required by the technical specifications, the Contractor shall establish and utilize statistical quality control charts for individual quality control tests. The requirements for corrective action shall be linked to the control charts.

1.3.10 SURVEILLANCE BY THE ENGINEER

All items of material and equipment shall be subject to surveillance by the Engineer at the point of production, manufacture or shipment to determine if the Contractor, producer, manufacturer or shipper maintains an adequate quality control system in conformance with the requirements detailed herein and the applicable technical specifications and plans. In addition, all items of materials, equipment and work in place shall be subject to surveillance by the Engineer at the site for the same purpose.

Surveillance by the Engineer does not relieve the Contractor of performing quality control inspections of either on-site or off-site Contractor's or subcontractor's work.

1.3.11 NONCOMPLIANCE.

The Engineer will notify the Contractor of any noncompliance with any of the foregoing requirements. The Contractor shall, after receipt of such notice, immediately take corrective action. Any notice, when delivered by the Engineer or his/her authorized representative to the Contractor or his/her authorized representative at the site of the work, shall be considered sufficient notice.

In cases where quality control activities do not comply with either the Contractor Quality Control Program or the contract provisions, or where the Contractor fails to properly operate and maintain an effective Quality Control Program, as determined by the Engineer, the Engineer may:

- (1) Order the Contractor to replace ineffective or unqualified quality control personnel or subcontractors.
- (2) Order the Contractor to stop operations until appropriate corrective actions are taken.

1.4 HEALTH AND SAFETY**1.4.1 GENERAL****1.4.1.1 1.1 Responsibility for Safety**

The contractor shall be responsible for the safety of all operations in connection with the Contract and shall take all necessary actions and precautions to ensure the safety of all persons who may be in, on or adjacent to the Site.

1.4.1.2 Compliance with UN WOMEN Workplace Safety and Health Policy & Procedures

The Contractor shall comply with the compliance with the UN WOMEN Workplace Safety and Health Policy & Procedures for the purposes of this clause including all sub clauses under it) and any amendment or re-enactment thereto and including but not limited to:

Any other rules and regulations, Standards and Codes of Practices related and relevant to the promotion of safe practices and conduct at the worksite.

It shall be the duty of the Contractor to comply with all such requirements of the Workplace Safety and Health Policy & Procedures, as affect him or any person or persons employed by him, and as related to any work, act or operation performed or about to be performed by him. The Contractor shall not permit any person to do anything not in accordance with the generally accepted principles of safe and sound practices.

The Contractor shall ensure a safe environment on the site at all times. All safety provisions shall be properly maintained and shall not be removed. The Contractor shall ensure that necessary and sufficient precautions are taken by his workmen when safety provisions are used. The Contractor shall not allow any of the safety provisions to be used unless he has satisfied himself that the provisions are safe.

Where UN WOMEN Project Manager appoints an engineer to carry out any work for any temporary works specified below, the engineer shall comply with any duties imposed on him under those regulations:

- 1) Cantilevered platforms erected more than 3m above ground;
- 2) Formwork structure;
- 3) Runway and ramp for use of motor trucks or heavy vehicles;
- 4) Stability of structure adjacent to excavation;
- 5) Shoring and bracing for trench excavation > 4m; and

Duties on engineers undertaking temporary works regulated by UN WOMEN Health & Safety Policy & Procedures:

- a) Design it to acceptable codes and standards and in accordance with good engineering practices;
- b) Ensure that it is constructed accordance with his design;
- c) When it is constructed, satisfy himself that it is safe for its intended use and if so, issue a certificate stating that it is safe for its intended use;
- d) The engineer shall exercise due diligence when carrying out his duties; and

The Contractor shall ensure that the requirements of Health & Safety Policy & Procedures and the requirements specified hereunder are strictly complied with at all times.

1.4.1.3 Undertaking by Contractor

The Contractor shall undertake to ensure that the provisions of the Health & Safety Policy and Procedures are complied with. The attached safety provisions undertaking form for the Occupier/Contractor in “**Appendix I**” shall be complied by a Managing Director or other duly authorized representative of the company/firm awarded the Contract.

1.4.1.4 Site Safety Programme

The Contractor shall not begin any construction or production of materials to be incorporated into the completed work until the Contractor's Health and Safety Plan has been reviewed by UN WOMEN. The relevant safety equipment and safe method of work employed at each stage of construction shall be described in detail. Special risks involving specialized equipment shall also be highlighted. The programme shall also include company safety policy, risk assessment, safety rules and regulations, small group activities, safety promotion programme (safety slogans, safety campaign, slide shows etc), safety training, emergency procedures and other such activities. The safety programme must be displayed outside the site office. The Contractor shall display safety posters at the site office, site canteen, exit/entry points of buildings and passenger cum material hoist area.

1.4.1.5 Monthly Safety Review

The Contractor shall carry out monthly safety review of the measures contained within the Safety Programme to demonstrate that the required level of safety are being achieved and maintained and make a full report to UN WOMEN on each such review. UN WOMEN will review the Safety Programme from time to time and will advise the Contractor of any matter with which he is not satisfied and the Contractor shall take such steps as are necessary to satisfy UN WOMEN. UN WOMEN will carry out such safety studies or audits, as considered necessary. The Contractor shall make available, specialist personnel as the UN WOMEN may consider necessary for the performance of such safety studies or audits.

1.4.1.6 Risk Management

The contractor shall conduct a risk assessment in relation to the safety and health risks posed to any person who may be affected by his undertaking prior to the commencement of work in accordance to UN WOMEN Health and Safety Policy & Procedures

The contractor shall take all reasonably practicable steps to eliminate any foreseeable risk to any person who may be affected by his undertaking.

The contractor shall maintain a record of risk assessments conducted, including any control measures taken or to be taken and any safe work procedures.

The contractor shall ensure that his employees are informed of the nature of the risk involved, the measures implemented to control the risk and applicable safe work procedures. Whenever the assessment of a risk is revised, or where control measures or safe work procedures are changed, employer shall inform employees of such changes.

1.4.2 SITE SAFETY MEASURES**1.4.2.1 Physical Measures**

The contractor must develop procedures in a fall protection plan for the construction site if his worker at the work site may fall 3 metres or more and the worker is not protected by guardrails.

The contractor must have a fall protection system in place and available at the construction site before work with a risk of falling begins.

The contractor must have the following devices and system in place prior to start of the work:

- (i) fall arresting devices such as rope grabs, guard rails etc
- (ii) safety belts, body harness, lanyards consisting of carabiners, D-rings, O-Rings, ovals rings, self locking connectors and snap hooks

1.4.2.2 Metal Access Scaffold And Working Platforms

The Contractor shall provide, erect and maintain metal access scaffold for all building blocks of 2 storey and above or 3.0 m in height and above.

The scaffold shall be erected ahead of the structural work from the second storey and supported by cantilevered platforms erected according to the reasonable safety standards. The cantilevered platforms

shall project about 1.1m from the edge of the building or any other distance. The scaffold shall be erected within 300mm from the building edge. Where the structure does not allow the scaffold to be erected from the second storey or where the building is less than 12.0m in height, the Contractor may erect the scaffold from the first storey subject to review by UN WOMEN.

The Contractor and his Engineer shall ensure that the building structure can resist the load imposed by the scaffold. The scaffold shall be designed to carry metal working platforms and two working levels in use concurrently. The maximum average loading per working level per bay is 220 kg per m². Signboards showing the maximum loading allowed on the scaffold may be displayed on the scaffold.

The Contractor shall provide, erect and maintain continuous metal work platforms or other types of work platforms at every alternate lift starting from the 2nd lift of the scaffold, the immediate level below the top most level and the roof level of the building block under construction.

Where the height between the work platform at the roof level and the platform directly below is two lifts or less, the latter work platform may not be necessary. No omission from the Contract Sum shall be made in the event that such a work platform is not necessary.

The material used for the metal work platform shall be steel. Work platforms shall be adequately secured to scaffolding frames at the required levels. The connections between work platform and scaffolding frame, and between the work platforms shall be subject to review by UN WOMEN.

For any portion of the work platform where the use of metal is not suitable, the Contractor may use timber platform subject to the review by the SO. The platform shall be complete with at least 90 mm high coloured toeboards and metal guardrails at least 1.0 m above the work platform.

The work platform shall be at least 500mm in width. The platform shall be used for:

- (i) Erecting and dismantling of formwork of structural elements;
- (ii) Transferring of formwork or other materials from one working level to another; and
- (iii) External finishing works.

The Contractor shall provide, erect and maintain an overlying screening net to cover the entire external face of the scaffold. The installation of the net shall follow the erection of the scaffold closely. A 90mm high coloured toeboard shall be provided at the base of the net. After installation, there shall be no opening between separate sets of the net and any torn net shall be replaced or repaired immediately. The scaffold shall be effectively tied to the building structure by means of tie-backs. All tie-backs shall be painted with bright colour for easy identification.

For buildings next to areas less than 30m away from the Site boundary, the Contractor shall provide special mid-height platform supporting metal access scaffold at the building elevation directly facing public areas, walkways, children playgrounds, schools and other locations with public traffic.

The special mid-height work platform shall be installed from the floor level at the mid height of the building and shall project 6m from the edge of the floor. They shall be supported at the floor level below by diagonal members. Tension tie backs to upper floors shall not be used.

Around the edges of the 6m platform, guardrails and toe boards shall be provided. Guardrail shall have sufficient strength and rigidity to withstand, without permanent deformation or failure, a 50 kg loads applied in any direction at right angles to the guardrail.

The work platform and its supports shall be designed by an Engineer to a uniformly distributed live load of 1.5 kg per m² and the loading from the scaffold. Supports for platform shall be spaced at not more than 1.8m centre to centre.

1.4.2.3 Personal Protective Equipment

The Contractor shall provide and maintain suitable personal protective equipment for all workmen employed on the Site.

- The Personal Protective Equipment consists of the following:

- Hearing protection equipment such as ear defenders, ear plugs etc. (where required)
- Eye protection such as safety eye wear, welding goggles and shields etc.
- Foot protection such as safety shoes/boots etc.
- Head protection such as hard hats
- Limb and body protection such as gloves, reflective vests etc.
- Respirators, as necessary and adequate

The Contractor shall ensure that such personal protective equipment comply with the requirements of UN WOMEN.

The Contractor shall also ensure that all equipment is properly used by his workmen during the course of their work. The Contractor shall record the issuance of all equipment to his workmen in the prescribed forms and such forms shall be kept in the site office and made available for inspection at all times.

1.4.2.4 Overhead Shelters

The Contractor shall provide, erect and maintain overhead shelters at every point of entry/exit of buildings two or more storey in height. The overhead shelters shall be constructed immediately below the second storey. The overhead shelters shall project at least 3.0m from the building edge and shall be at least 1.5m wide. The overhead shelters shall be made of curved metal roofing with a diameter of at least 1.5m or pitched metal roofing with a slope greater than one in two, with timber boarding below supported by steel pipes resting on rigid bases.

The access to, along and egress from the entry/exit points shall be kept free from obstructions and accumulation of oil, grease, water and other substances that may cause slipping and tripping.

Overhead shelters shall also be provided for person(s) exposed to falling objects.

1.4.2.5 Peripheral Overhead Shelters

The Contractor shall provide peripheral overhead shelters for buildings of 15.0m or more in height. It shall be erected in place when the construction reaches the third storey slab. The overhead shelter shall be at least 2.0m wide, and inclined so that the outer edge is at least 150mm higher than the inner edge. The overhead shelter shall be sufficiently strong to support a weight of at least 75 kg point load.

1.4.2.6 Barricades To Lift Openings, Voids, Open Sides Of Buildings And Excavations

The Contractor shall barricade all lift openings, internal voids, open sides of buildings and excavations where a person is liable to fall. The barricade shall be at least 1.1m high and shall have sufficient strength and rigidity to withstand a lateral point load of 50 kg.

1.4.2.7 Suspended Scaffolds

A suspended scaffold system shall only be used for touching up, repair and redecoration and minor work. Where suspended scaffold system is to be used, the Contractor shall notify UN WOMEN prior to its installation and usage. The safe working load will be prominently displayed. The Contractor shall ensure that there are weekly checks and additional check after inclement weather by his supervisor and monthly check by an Engineer (Civil). Where the use of access scaffolding is not stipulated, suspended scaffold may be used for finishing works. Independent lifelines shall be provided for suspended scaffold riggers and users to anchor their safety harness attached with shock absorbing device.

1.4.2.8 Ladders

The Contractor must ensure that ladders are in an acceptable sound condition and submit a written inspection report to UN WOMEN.

If the ladder is made of a material other than steel, the contractor must ensure that the ladder is in sound condition.

If the ladder is constructed of lumber/timber, the contractor must ensure that the timber is free of loose knots or knot holes, must not have a split and must be strong and sturdy.

The contractor's worker must ensure that:

- the ladder is secured against movement and placed on a base that is stable
- the base of an inclined ladder is no further from the base of the wall or structure than 1.4 of the height to where the ladder contacts the wall or structure.

1.4.2.9 Mobile Cranes

No person shall install, repair, alter or dismantle a mobile crane unless he is an approved mechanic. The contractor/mechanic shall ensure, so far as is reasonably practicable, that the mobile crane is erected, installed or modified in such a manner that it is safe, and without risk to health, when properly used.

The Contractor shall ensure that the crane access is properly constructed and weekly check by supervisor is carried out. The boom of the mobile crane with hoisted load shall not be allowed to swing outside the contract boundary without the review by UN WOMEN. All hoisting areas must be effectively barricaded.

The Contractor shall ensure there is installation of barriers to warn the crane operator of depressions, excavated areas and other obstructions.

The Contractor shall station a lifting supervisor on the Site to oversee and guide the crane operator during positioning, hoisting and slewing. The Contractor shall ensure daily checks are carried out by the crane operator. The cranes must have overhaul checks before being used on the Site.

1.4.2.10 Temporary Chute For The Removal Of Construction Debris

The Contractor shall provide adequate number of temporary chutes to dispose construction debris from the upper storey of all building blocks 2 storey and above. It shall be erected to follow the structural work. A large bin at the lower end of each chute shall be provided and emptied regularly. **"DANGER - KEEP OUT"** in the official languages shall be posted at the bin area.

1.4.2.11 Warning Signs And Lights

The Contractor shall display warning signs of sizes 900 mm x 600 mm at strategic points around the periphery of the Site where trespassing is likely to occur. Such signs shall have the words **"DANGER - KEEP OUT"** in the two languages (Dari & English) painted in red on a white background in gloss finishing paint. Warning lights shall be placed at similar positions at night to serve as warnings.

1.4.2.12 Housekeeping

The Contractor shall maintain and ensure a safe working environment by keeping the Site neat and tidy, and free from hazards and debris. Materials shall be stacked up safely. All work areas and access thereto shall be kept free from hazards and debris.

Housekeeping shall be carried out in such a manner and at such times so as not to cause any inconvenience to either the adjoining occupiers or the public. Debris shall be wetted to minimize the risk of dust. Containers for debris and rubbish are to be provided at the designated places.

1.4.2.13 Temporary Staircases

The Contractor shall provide and maintain a minimum 0.8m wide temporary metal staircase from one working floor to another. The staircase shall be placed against the adjacent staircase wall or formwork of the staircase walls that are under construction. The outer sides of the staircases shall be provided with metal handrails 1.1m above the outer staircase strings. The bottom of the staircase shall be covered fully with metal plate.

1.4.2.14 Safety Information Signboard And Assembly Stage

The Contractor shall erect and maintain a Safety Information Signboard and Assembly Stage. The signboard shall be 6.0m x 3.0m, made of timber plywood and fixed at a steel frame. The signboard shall

consist of safety posters, safety theme and pictures, safety news, photos of good safety measures, one 600mm x 1500mm mirror. The safety posters, news and photos shall be protected from weather.

The arrangement and size of display of all items referred herein shall be submitted to the UN WOMEN. The stage shall be constructed in front of the signboard and made of concrete. The stage shall consist of a raised platform of 4.5m x 1.0m with at least one step.

The location of the signboard and stage shall be review by UN WOMEN. As and when instructed by UN WOMEN, the Contractor shall remove or relocate and reconstruct the signboard and stage, and reinstate all the affected ground to the satisfaction of UN WOMEN, all at the cost and expense of the Contractor. On Substantial Completion of the Works, the signboard and stage shall be cleared away upon the review of UN WOMEN.

1.4.2.15 Gas Cylinders And Related Equipment

The Contractor shall use gas cylinders, each fitted with a low pressure gauge, a high pressure gauge, a reducing valve with pressure regulator, and a safety relief device. The gas cylinders shall not be kept in the same room where welding, cutting or heating is being carried out or placed within five metres of any source of heat. The gas cylinders must always be kept upright in a wheeled-trolley. When lifted by crane, hoist or derrick, cylinders must be placed in cradles or skip box design. Protective valve caps shall also be in place.

The hose connecting a gas cylinder to an apparatus for cutting, welding, heating or other related works shall be of good construction and sound material, free from defect, properly maintained, and not entangled or kinked. Valves and fittings shall be tested for leak with "soap water" everyday before use.

1.4.2.16 Safety Reflective Apparel (Traffic Control)

A worker designated to control traffic shall wear approved type of reflective apparel during all hours of the day when so engaged.

1.4.2.17 Health Measures

Noise Management

The contractor shall as far as practicable, ensure that all processes, machines and equipment used, do not cause workers to be exposed to excessive noise, i.e. above an equivalent sound level of 85 dBA for 8 hour workday. This can be done by implementing one or more of the following measures:

- Engineering noise control, e.g., modifying noisy processes, machines and equipment, relocating noisy processes or isolating them within enclosures, erecting sound barriers, reducing kinetic or potential energy and regularly maintaining machines and equipment;
- Administrative noise control, e.g., rotating noisy jobs among workers so that they are not exposed to noise above the permissible exposure limit;
- Using quiet machines and equipment when such machines and equipment are available in the market. Examples are generators, compressors and concrete breakers. The contractor shall provide hearing protectors for workers who are exposed to excessive noise and ensure that they are worn at all times. Warning signs to remind workers that hearing protectors must be worn shall be put up at areas with excessive noise.
- Contract workers should be trained and educated on the hazards of noise, noise control and the prevention.

First-Aid

All workplaces as specified within the class or description shall establish and implement a first-aid programme to provide emergency treatment to victims of accidents, chemical poisoning or excessive exposure to toxic substances.

The programme shall include: -

- First-aid facilities;
- First-aid boxes;
- First-aid room, where there are 500 or more workers at site;
- First-aid treatment procedures;
- First aid for exposure to toxic or corrosive substances
- Standard procedures;
- Maintenance of first-aid facilities.

All first-aid provisions shall comply with the UN WOMEN Health & Safety (First-Aid) Regulations.

1.4.2.18 Electrical Works

Where work to be carried out involves electricity/power, installing temporary wiring, usage of power tools and equipment, no worker shall connect, maintain or modify electrical tools, equipment or installation unless the worker is a qualified electrician.

The contractor shall take every reasonable precaution to prevent hazards to workers from energized electrical equipment, installations and conductors

No person, other than a person authorized to do so by the contractor of the project, shall enter or be permitted to enter a room or other enclosure containing exposed energized electrical parts.

The entrance to a room or other enclosure containing exposed energized electrical parts shall be marked by conspicuous warning signs stating that entry by unauthorized persons is prohibited.

All electrical equipment, installations, conductors and insulating materials shall be suitable for their intended use and shall be installed, maintained, modified and operated so as not to pose a hazard to a worker.

Contractor shall use mats, shields or other protective devices or equipment, including personal protective equipment, adequate to protect the worker from electrical shock and burns.

1.4.2.19 Work in Confined Space

Where work is to be carried out in any confined space as defined in UN WOMEN, code of practice for entry into and safe working in confined spaces shall be followed.

1.4.2.20 Excavations and Tunnels

No person shall enter or be permitted to enter an excavation that does not comply with this Part.

Work shall not be performed in a trench unless another worker is working above ground in close proximity to the trench or to the means of access to it.

The type of soil in which an excavation is made shall be determined by visual and physical examination of the soil,

- (a) at the walls of the excavation; and
- (b) within a horizontal distance from each wall equal to the depth of the excavation measured away from the excavation.

Before an excavation is begun,

- (a) gas, electrical and other services in and near the area to be excavated shall be accurately located and marked; and
- (b) if a service may pose a hazard, the service shall be shut off and disconnected.

An excavation in which a worker may work shall have a clear work space of at least 450 mm between the wall of the excavation and any formwork or masonry or similar wall.

The walls of an excavation shall be stripped of loose rock or other material that may slide, roll or fall upon a worker.

A level area extending at least one metre from the upper edge of each wall of an excavation shall be kept clear of equipment, excavated soil, rock and construction material.

The stability of a wall of an excavation shall be maintained where it may be affected by stockpiling excavated soil or rock or construction materials.

No person shall operate a vehicle or other machine and no vehicle or other machine shall be located in such a way as to affect the stability of a wall of an excavation.

If a person could fall into an excavation that is more than 2.4 metres deep, a barrier at least 1.1 metres high shall be provided at the top of every wall of the excavation that is not sloped.

Where the excavation is a trench and the depth exceeds six metres or the width exceeds 3.6 metres, a support system shall consisting of either timber or of an engineered support system designed for the specific location and project shall be installed.

1.4.2.21 Control of Traffic

If vehicle traffic at the construction site is dangerous to workers, pedestrians, school children on foot, the contractor and his workers must ensure that the traffic movement is controlled to protect against accident related injuries and fatalities.

The contractor must designate a worker to control traffic on the construction site, the contractor must ensure that the designated traffic controller wears a reflective vest, safety footwear and hard hat.

The passage of vehicles across a footpath shall be supervised to remove danger to the school children and the public.

The contractor and his workers must be vigilant at all times and must ensure that pedestrians and school children **DO NOT** cross the safety barriers and enter the construction site.

1.4.2.22 Others

The Contractor shall provide and maintain guards, fences or barriers around the construction site, excavations, lift pits or other similar potential places of danger to prevent accidents. The guards, fences and barriers shall be of sound material, good construction and possess adequate strength.

1.4.3 NON-COMPLIANCE WITH CONTRACT SAFETY SPECIFICATIONS

In the event of contravention or non-compliance with the safety specifications, UN WOMEN shall suspend the progress of works or any part of them if necessary for the safety of the works or if he is of the opinion that the working environment or procedure is unsafe for the works to continue. In such event, the Contractor shall not be entitled to any claims for compensation or extension of time for completion.

Appendix I

Form For Undertaking Safety Provision By Contractor

Project Manager

United Nations Office for Project Services

Kabul Schools Project

Copy: UN WOMEN Health & Safety Officer

RE : SAFETY PROVISIONS AT

I, _____ of _____
(Name of Managing Director) (Name of Company)

I/C No: _____ understand that as the Contractor of /for the above worksite / work area or order, it is my duty and responsibility to ensure that the provisions of UN WOMEN Health & Safety Policy & Procedures, and any amendments or re-enactments thereto are complied with.

(Managing Director) (Signature)

(Name of Company / Company Stamp)

(Date)

1.5 ENVIRONMENTAL IMPACTS AND RECOMMENDED MITIGATION MEASURES

1.5.1 GENERAL

Project works are to be assessed by UN WOMEN to identify any significant impacts on environmental or social characteristics of the project area. This notwithstanding, some impact can be expected to occur during the course of construction activities. These impacts can be appropriately managed or mitigated by the measures contained in the following environmental mitigation list.

1.5.2 CLIMATE AND AIR QUALITY

Impacts to local air quality during construction can be anticipated due to fugitive dust generation in and around the construction area. Mitigation measures shall be implemented to avoid any significant impact.

Construction activities will also result in the generation of diesel exhaust from heavy equipment and generators. Following mitigation measures shall be implemented to avoid any significant impact:

1.5.2.1 Mitigation 1

The generation of dust during construction shall be mitigated through avoidance strategies as follow:

- Subcontractor shall be required to spray water during windy conditions.
- Trucks carrying earth, sand or stone shall be covered to avoid spilling.
- Open burning shall be prohibited on the construction sites.

1.5.2.2 Mitigation 2

The generation of diesel exhaust emissions during construction shall be mitigated through avoidance strategies as follows:

- All equipment shall be in good operating condition.
- Machinery shall not be left idling unless necessary during winter operations.

1.5.3 SURFACE WATER

Construction activities can result in increased turbidity of runoff water due to soil erosion. Mitigation measures shall be implemented to avoid any significant impact.

Construction activities can also result in contamination of runoff due to leaking fuel or lubricants from construction equipment. Mitigation measures shall be implemented to avoid any significant impact.

Construction of the facilities will result in an increase in hardscaping, with a resulting incremental increase in surface water runoff. If minor paving is planned, then little runoff will leave the construction site and may not impact on surrounding drainages.

To avoid significant impacts following mitigations shall be implemented:

1.5.3.1 Mitigation 1

Impacts due to soil erosion shall be mitigated by careful grading of the construction site such that significant amounts of water is not allowed run off of the construction site into adjacent drainages.

Where excavated soils are stored on site, adequate measures shall be implemented to control runoff, including covering exposed soils, construction of settling basins, or erection of physical barriers.

1.5.3.2 Mitigation 2

Machinery and equipment shall be maintained in good working condition and shall be regularly inspected for leaks. Any maintenance of equipment or machinery onsite could only occur over non-permeable areas with adequate containment measures to capture spills.

Fuel storage shall be provided with adequate containment measures to capture spills.

1.5.4 GROUNDWATER

Construction activities can result in contamination of runoff due to leaking fuel or lubricants from construction equipment. *1.5.3.2 Mitigation 2* will also prevent groundwater contamination.

Construction of the facilities will result in an increase in hardscaping resulting in a incremental decrease in groundwater percolation. If minor paving is planned, it may not decrease and will not impact on groundwater supplies. In most cases *1.5.3.1 Mitigation 1* will prevent groundwater contamination.

1.5.5 TERRESTRIAL ECOLOGY

If the project site is urban site and is with no natural habitats or significant natural flora or fauna, then no impacts are anticipated and no mitigation measures will be required. Otherwise the subcontractor shall contact UN WOMEN for mitigation measures requirement policy and guidance prior to commencing site works.

1.5.6 SOCIOECONOMICS

Construction of projects, depending to the type of the project, will result in a significant number of construction jobs. Employment will result in multiplier effects by generating commerce with benefits provided throughout the local economy.

If the program includes capacity building component, which will promote on-the-job skills training in construction methods, quality control, and/or construction safety, the skill transfer will result in improved capacity of local contractors to successful undertake future construction projects.

Improved and expanded educational facilities will result in improved learning opportunities and provide long-term benefits to the local economy.

In such cases, the following mitigations shall be implemented:

1.5.6.1 Mitigation 1

The program shall include capacity building, including classroom and on-the-job training, in construction methods, quality control, and construction safety.

1.5.6.2 Mitigation 2

The use of local subcontractors shall be encouraged wherever possible.

1.5.7 TRAFFIC AND TRANSPORTATION

Construction activities will result in additional truck traffic and potential traffic congestion on local streets, depending on the site location. The truck traffic will also result in potential threats to pedestrian safety. Following mitigation measures shall be implemented to avoid any significant impact if the project site is in urban:

Note: Operational impacts may need to be assessed should construction activities alter the current usage of the sites or traffic flow patterns.

1.5.7.1 Mitigation 1

Delivery of materials and equipment to the site shall be scheduled during periods of light traffic (e.g. early morning or late afternoon).

1.5.7.2 Mitigation 2

Where necessary, pedestrian access-way improvements shall be provided prior to commencing construction activities. These improvements could include sidewalks, fencing, or alternate routes.

1.5.7.3 Mitigation 3

The construction contractor shall provide flag men and other traffic control measures to avoid conflicts between construction traffic and other vehicles and /or pedestrians.

1.5.8 VISUAL QUALITY

Construction activities may result in a short-term impact to the visual quality of buildings. In particular, buildings in progress are generally stark in appearance. Additionally, construction material and wastes may result in a cluttered site. Following mitigation measures shall be implemented to avoid any significant impact on this issue:

1.5.8.1 Mitigation 1

The subcontractor shall be required to maintain a site free from rubbish. The contractor shall be required to conduct regular housekeeping to include removal of rubbish, construction waste, and proper storage of construction material.

1.5.9 RECREATION

As per architectural principles, new buildings are usually sited to minimize the impact on available recreational fields. Although no mitigation is practically required, sufficient space shall be maintained for the existing recreational fields.

1.5.10 CULTURAL

Depending to the location of the project, if buried cultural or archaeological resources may be uncovered during construction activities, following mitigation measures shall be implemented to avoid any significant impact:

1.5.10.1 Mitigation 1

If potential cultural or archaeological resources are unearthed during construction, activities in that area shall immediately cease. The appropriate government office shall be contacted until such time as the government office provides authorization.

1.5.11 NOISE

Construction activities will result in noise impacts resulting from the use of heavy equipment and machinery. Noise levels will be typical for construction sites and no significantly loud equipment should be avoided if possible (i.e., pile drivers, crushers, etc.). Following mitigation measures shall be implemented to avoid significant impact:

1.5.11.1 Mitigation 1

The contractor shall as far as practicable, ensure that all processes, machines and equipment used implement one or more of the following measures:

- Engineering noise control, e.g., modifying noisy processes, machines and equipment, relocating noisy processes or isolating them within enclosures, erecting sound barriers, reducing kinetic or potential energy and regularly maintain machines and equipment.
- Using quiet machines and equipment when such machines and equipment are available in the market. Examples are generators, compressors and concrete breakers. The contractor shall provide hearing protectors for workers who are exposed to excessive noise and ensure that they are worn at all times. Warning signs to remind workers that hearing protectors must be worn shall be put at areas with excessive noise.

1.5.11.2 Mitigation 2

To the extent practicable, construction activities shall occur during normal working times. Where necessary to conduct operations in late evening or early morning, these operations shall be short in duration and shall be coordinated in advance with the project team and nearby inhabitants.

1.5.11.3 Mitigation 3

A community outreach program shall be implemented to ensure that local residents are aware of the purpose of the construction activities and have the opportunity to report any impacts.

1.5.12 SOLID, HAZARDOUS AND SPECIAL WASTES

Construction activities, including demolition and excavation, will result in solid wastes requiring disposal. There could also be evidence of hazardous or special wastes on the project sites that may result in contamination through spillage or unearthing.

Construction activities may result in the generation of hazardous wastes, including oils and lubricants. Accidental release of these wastes may result in impacts. To avoid such impact following mitigation measures shall be considered:

1.5.12.1 Mitigation 1

Solid wastes shall be transported off the site and disposed of in a disposal site previously approved by the relevant authority and/ or Ministry of Urban Development.

1.5.12.2 Mitigation 2

In the event buried hazardous wastes are uncovered during excavation, all construction activities shall cease.

1.5.13 GEOLOGIC AND SEISMIC HAZARDS

In areas considered as high seismic risk zones, infrastructure will be designed in accordance with approved seismic codes. Therefore, impacts related to geologic and seismic hazards are considered unlikely and no mitigation measure seems required.

1.5.14 UNEXPLODED ORDINANCE

Construction sites have mostly been surface survey and cleared of UXO in urban areas. However, heavy rains, frost heaves, or other factors in urban areas and at any case in rural areas can result in UXOs being uncovered. Disturbance or handling of UXOs can result in loss of life or limb.

To avoid significant impacts on this issue following mitigation measures shall be considered:

1.5.14.1 Mitigation 1

If a potential UXO is identified, the area shall be immediately vacated and secured. UNMACA or other qualified and authorized disposal organization shall be immediately notified and arrangements made to dispose of the potential UXO.

1.5.14.2 Mitigation 2

If excavation is required below the depth which has already been cleared, or if excavation is required outside the area that is not known as a clear zone, a certified demining organization shall be employed to survey and clear the area prior to any works.

1.5.14.3 Mitigation 3

UXO safety training shall be provided onsite to all workers. Training shall incorporate how to identify potential UXO and the appropriate response as described in 1.5.14.1 *Mitigation 1*.

2.1 DEMOLITION**2.1.1 GENERAL****2.1.1.1 Interpretation**Demolished materials classes

Salvaged for re-use: Demolished materials scheduled for re-use in the works.

Salvaged for disposal: Demolished materials scheduled for re-use elsewhere.

Demolished for re-use: Non-scheduled demolished materials proposed by contractor for re-use in the works.

Demolished for removal: Other demolished materials.

2.1.1.2 InspectionNotice

Give sufficient notice so that inspection may be made of the following:

Adjacent structures before commencement of demolition.

Propping of structures prior to demolition works.

Structure after stripping and removal of roof coverings and other external cladding.

Underground structures after demolition above them.

2.1.2 PRODUCTS**2.1.2.1 Demolished Materials**Demolished Materials

Ownership: Ownership of demolished materials is described in the **Demolished Materials Classes** table.

Demolished Materials Classes Table

Class	Ownership
Salvaged for reuse	Principal/Proprietor
Salvaged for disposal	Principal/Proprietor
Demolished for re-use	Principal/Proprietor
Demolished for removal	Contractor

Reuse: If it is proposed to reuse demolished materials in the works, submit proposals.

Salvage: Recover without damage materials to be salvaged, for reuse in conformance with the **Salvaged Materials for Reuse Schedule** or for disposal in conformance with the **Salvaged Materials for Disposal Schedule**.

Removal: Remove from the site demolished materials which are the property of the contractor. Do not burn or bury on site.

Transit: Prevent spillage of demolishing materials in transit.

2.1.3 EXECUTION

2.1.3.1 Support

Temporary Support

If temporary support is required, certification for its design and installation is required from a professional engineer engaged by the contractor.

Until permanent support is provided, provide temporary support for sections of existing buildings which are to be altered and which normally rely for support on work to be demolished.

Support excavations for demolition of underground structures. Provide supports to adjacent structures where necessary, sufficient to prevent damage resulting from the works.

Permanent Supports

If permanent supports for adjacent structures are necessary and are not described, give notice and obtain instructions.

2.1.3.2 Protection

Encroachment

Prevent the encroachment of demolished materials onto adjoining property, including public places.

Weather Protection

If walls or roofs are opened for alterations and additions or the surfaces of adjoining buildings are exposed, provide temporary covers to prevent water penetration. Provide covers to protect existing plant and equipment and materials intended for re-use.

Dust Protection

Provide dust-proof screens, bulkheads and covers to protect existing finishes and the immediate environment from dust and debris.

Security

If a wall or roof is opened for alterations and additions, provide security against unauthorised entry to the building.

2.1.3.3 Demolition

Explosives

Do not use explosives in the demolition process.

2.1.3.4 Hazardous Materials

General

General: Hazardous materials that have already been identified are set out in the **Identified Hazardous Materials Schedule**.

Hazardous Materials

General: Give notice immediately hazardous materials or conditions are found, including the following:

Asbestos or material containing asbestos.

Flammable or explosive liquids or gases.

Toxic, infective or contaminated materials.

Radiation or radioactive materials.

Noxious or explosive chemicals.

Tanks or other containers which have been used for storage of explosive, toxic, infective or contaminated substances.

2.1.3.5 Completion

Notice of Completion

Give at least 3 working days' notice of completion of demolition so that adjacent structures may be inspected following completion of demolition.

Make good any damage arising out of demolition work. Obtain written acceptance from the owner of each adjoining property of completeness and standard of making good.

Temporary Support

General: Clear away at completion of demolition.

2.3 EARTHWORK**2.3.1 GENERAL****2.3.1.1 Interpretation**Description

Perform earthwork necessary to complete site clearing, excavating, filling, and grading, including preparation of sub-grade for building and structures, and in accordance with Contract Documents.

Definitions

For the purposes of this work section the definitions given below apply.

A. Unauthorized Excavation: Removal of materials beyond indicated sub-grade elevations or dimensions without Engineer's authorization. No payment will be made for unauthorized excavation or remedial work.

B. Authorized Additional Excavation: Removal of material authorized by Engineer based on determination by Testing Agency that the material is soil not capable of supporting design load, or otherwise unsuitable material.

C. Bad ground: Ground unsuitable for the purposes of the works, including fill liable to subsidence, ground containing cavities, faults or fissures, ground contaminated by harmful substances and ground which is or becomes soft, wet or unstable.

D. Line of influence: A line extending downward and outward from the bottom edge of a footing, slab or pavement and defining the extent of foundation material having influence on the stability or support of the footings, slab or pavement.

Project Conditions

Examine site, drawings, records of existing utilities and construction, record of test borings, and subsurface exploration report available. Records of test borings are for information only and are not guaranteed to represent all conditions that will be encountered.

2.3.1.2 Records of MeasurementExcavation and Backfilling

Do not commence backfilling or place permanent works in the excavation until the following have been agreed and recorded:

- Depths of excavations related to the datum.
- Final plan dimensions of excavations.

Method of measurement: The volume excavated material will be calculated from the measurements given on the drawing. No allowance will be made for bulking.

Excavate the ground as found. No additional payment will be made for rock excavation, or over excavation. Over-excavation at footings shall be filled with concrete during footing placement.

2.3.1.3 Inspection

Notice

Give sufficient written notice so that inspection may be made of the following:

- Excavation completed to contract levels or founding material.
- Filling completed to contract levels.

2.3.1.4 Tolerances

Tolerances

Finish the surface to the required level, grade and shape within the following tolerances:

- Under building slabs and load bearing elements: + 0, -40 mm.
- Pavement sub grades; + 0, - 60 mm.
- Other ground surfaces: ± 50 mm, provided the area will drain and matches adjacent construction where required.

2.3.2 PRODUCTS

2.3.2.1 Fill materials

General

Fill material is to be inorganic, non-perishable material.

Excluded materials:

- Organic soils.
- Materials contaminated through past site usage.
- Silts or silt-like materials.
- Fill containing wood, metal, plastic, boulders or other deleterious material.

Classifications for structural fill are based on the intended use of the fill, and defined as follows:(all subject to approval)

Class I structural fill - used as support for shallow foundations, paved areas, and slabs each with loadings of 3660 kgf/m² or more, for storage tanks, truck turnarounds, and base course and sub-base course. The fill must not contain more than 15% clay (non plastic).

Class II structural fill - used as support for shallow foundations, paved areas, and slabs each with a minimum loading of 2000 kgf/m² and for parking areas, backfill around foundations, the construction of embankments, and for roadways pavement sub grades.

Class III non-structural fill - used in areas where installation of structures or equipment is not planned and in open areas where grading is only required to reach levels noted on the drawings.

Re-use of Material Recovered from Excavation

Re-use excavated material elsewhere on site if approved by the Engineer.

Additional filling layers: (Geotextile)

Quality – Geotextiles shall conform to the requirements mentioned at the given project schedules. Besides, Geotextiles shall only be used after the Engineer approves its quality.

2.3.3 EXECUTION

2.3.3.1 Preparation

A. Reference Points: Provide and maintain throughout construction, benchmarks and other reference points on and off site.

B. Site Preparation: Clean areas within Contract Limit Lines as required. Remove trees (except trees indicated to remain or to be relocated), shrubs and vegetation. Prior to removal of trees or other existing items, verify removal with Engineer in writing.

1. Remove existing concrete, masonry, rubble, and paving to a depth of at least 60 centimeters below sub-grade in paved and graded areas. In areas to be paved, spread leveling courses of crushed material acceptable to Engineer over surface of remaining rubble and compact with vibrating compactors. Provide additional crushed material and compact as required to produce a dense uniform surface. Lift thickness, measured before compaction, shall not exceed 20 centimeters. Refer to paragraphs FILLING for material and compaction requirements of the sub grade.

2. Remove rubble beneath areas where building slabs are to be supported on grade. Remove abandoned slabs, footings, foundation walls, pits, manholes, conduit, pipes and other existing below-grade construction that may obstruct new work. Demolish and remove such obstructions as required to provide at least 60 centimeters horizontal and vertical clearance from new construction, including

excavation and placement of engineered fill beneath footing and slabs-on-grade.

3. Beneath areas where building slabs, walks and paving are supported on grade, excavate existing fill soils and loose, soft, or disturbed natural soils and replace with properly compacted fill per the recommendations of the Geotechnical Report.

C. Fill above described areas to sub-grade with acceptable material as specified in the Geotechnical Report.

2.3.3.2 Removal of topsoil

General

Topsoil is the upper portion of a soil, usually dark colored and rich in organic material.

Where applicable, remove topsoil to all areas to be cut, areas to be filled, areas to be occupied by structures, pavements, embankments and the like.

The depth specified should be varied to suit the recommendations of the geotechnical report.

Re-use of removed topsoil

Re-use removed topsoil elsewhere on site as directed by the Engineer.

2.3.3.3 Excavation

Extent

Excavate over the site to give correct levels for construction, pavements, filling and landscaping.

Excavate for footings, pits and shafts, to the required sizes and depths. Confirm that bearing capacity is adequate.

Proof Rolling

Proof roll excavations for pavements, filling and non-spanning slabs on ground to determine the extent of any bad ground.

Disposal of Excess Excavated Material

Remove the following material from site and dispose of legally:

1. Unsuitable excavated materials.
2. Excess excavated material.
3. Stripped topsoil which is not being stockpiled for future work, unless disposition on site is directed by Engineer.

B. Do not burn material resulting from clearing and grubbing operations on site.

2.3.3.4 Bearing surfacesGeneral

Provide flat bearing surfaces for load bearing elements including footings. Step to suit changes in levels. Make the steps to the appropriate courses if supporting masonry.

2.3.3.5 Reinstatement of excavationGeneral

Where excavation is deeper than the required depth, fill and consolidate to the correct depth.

2.3.3.6 Supporting ExcavationsProvision of Supports

Provide temporary supports to all excavations greater than 1.8m deep. Confirm type of supports and level of protection required with the Engineer.

Removal of Supports

Remove temporary supports progressively as backfilling proceeds.

2.3.3.7 Adjacent StructuresTemporary Supports

Provide supports to adjacent structures where necessary, sufficient to prevent damage arising from the works. This applies to all structures where the line of influence is interfered with by the proposed excavation works.

Lateral supports: Provide lateral support using shoring.

Vertical supports: Provide vertical support where necessary using piling or underpinning or both.

Permanent supports

If permanent supports for adjacent structures are necessary and are not described, give notice and obtain instructions.

2.3.3.8 Preparation for fillingGeneral

Materials for fills shall be approved by Engineer.

Prepare the ground surface before placing fill (including topsoil fill), ground slabs or load bearing elements. Shape to assist drainage. Compact the ground exposed after stripping or excavation.

2.3.3.9 Placing Fill

General

Layers: Place fill in maximum 15cm horizontal layers across the fill area.

Mix: Place fill in a uniform mixture.

Protection: Protect the works from damage due to compaction operations. Where necessary, limit the size of compaction equipment or compact by hand. Commence compacting each layer at the structure and proceed away from it.

Execution of Geotextile layer:

If geotextile is one of the layers shown among the filling layers, following specification shall be considered in specific to the geotextile material execution:

Quality: Geotextiles shall conform to the requirements mentioned at the given project schedules. Besides, Geotextiles shall only be used after the Engineer approves its quality.

Storage: Before use, the geotextile shall be stored in a clean, dry location out of direct sunlight, not subject to extremes of either hot or cold temperatures, and with the manufacturer's protective cover undisturbed. Receiving, storage, and handling at the job site shall be in accordance with the requirements listed in ASTM D 4873.

Surface preparation: The surface on which the geotextile is to be placed shall be graded to the neat lines and grades as shown on the drawings. It shall be reasonably smooth and free of loose rock and clods, holes, depressions, projections, muddy conditions, and standing or flowing water (unless otherwise specified anywhere in given documents).

Placement: Before the geotextile is placed, the soil surface will be reviewed for quality assurance of the design and construction. The geotextile shall be placed on the approved prepared surface at the locations and in accordance with the details shown on the drawings and specified in the given project schedules. It shall be unrolled along the placement area and loosely laid, without stretching, in such a manner that it conforms to the surface irregularities when material are placed on or against it. The geotextile may be folded and overlapped to permit proper placement in designated area(s).

The geotextile shall be joined by overlapping a minimum of 18 inches (unless otherwise specified) and secured against the underlying foundation material. Securing pins, approved and provided by the geotextile manufacturer, shall be placed along the edge of the panel or roll material to adequately hold it in place during installation. Pins shall be steel or fiberglass formed as a U, L, or T shape or contain "ears" to prevent total penetration through the geotextile. Steel washers shall be provided on all but

the U-shaped pins. The upstream or upslope geotextile shall overlap the abutting downslope geotextile. At vertical laps, securing pins shall be inserted through the bottom layers along a line through approximately the mid-point of the overlap. At horizontal laps and across slope laps, securing shall be inserted through the bottom layer only. Securing pins shall be placed along a line about 2 inches in from the edge of the placed geotextile at intervals not to exceed 12 feet unless otherwise specified. Additional pins shall be installed as necessary and where appropriate to prevent any undue slippage or movement of the geotextile. The use of securing pins will be held to the minimum necessary. Pins are to remain in place unless otherwise specified. The geotextile shall be furnished in rolls not less than 12 ft. in width.

Should the geotextile be torn or punctured, or the overlaps or sewn joint disturbed, as evidenced by visible geotextile damage, subgrade pumping, intrusion, or grade distortion, the backfill around the damaged or displaced area shall be removed and restored to the original approved condition. The repair shall consist of a patch of the same type of geotextile being used and overlaying the existing geotextile. When the geotextile seams are required to be sewn, the overlay patch shall extend a minimum of 1 foot beyond the edge of any damaged area and joined by sewing as required for the original geotextile except that the sewing shall be a minimum of 6 inches from the edge of the damaged geotextile. Geotextile panels joined by overlap shall have the patch extend a minimum of 2 feet from the edge of any damaged area.

The geotextile shall not be placed until it can be anchored and protected with the specified covering within 48 hours or protected from exposure to ultraviolet light. In no case shall material be dropped on uncovered geotextile from a height of more than 3 feet.

2.3.3.10 Compaction Requirements for Fill and Subgrade

Compaction

Compact each layer of fill with acceptable equipment to achieve the following minimum percentages of maximum dry density at the moisture content specified in these Specifications. Class II and III fill shall be compacted to a minimum of 90% relative compaction (ASTM D1557); Class I fill must contain less than 15% clay (finer than 0.005 mm) and shall be compacted to 95% relative compaction (ASTM D1557). Compaction or consolidations by soaking or jetting with water are not acceptable alternative methods to **utilization of mechanical equipment**.

Moisture Control for Fill and Sub-grade

1. Maintain moisture content by wetting or drying manipulation. Suspend compacting operations when satisfactory results cannot be obtained because of rain or other unsatisfactory conditions.
2. Fill and sub-grade material to be compacted in accordance with requirements of Specifications, which does not contain sufficient moisture shall be sprinkled with water.

3. Reduce moisture content of fill and sub-grade material containing excess moisture prior to or during compaction to moisture content not greater than three percentage points (3%) above optimum.
4. Reduce moisture content of material which displays pronounced elasticity or deformation under action of loaded rubber tired conveyances to optimum if necessary to secure stability.
5. For sub-grade material, these requirements for maximum moisture apply at time of compaction of sub-grade. Subgrade and fill soils shall not be allowed to dry/or crack and shall be kept moist (between optimum and three percent above optimum moisture content) until covered with subsequent construction.

Density

Compact the subgrade exposed by excavation to a minimum depth of 15cm. Compact each layer of fill to the required depth and density, as a systematic construction operation. Shape surfaces to provide drainage and prevent ponding.

Density of all layers of filling are to be approved by the Engineer before subsequent layers are placed.

Maximum rock and lump size in layer after compaction: 2/3 compacted layer thickness.

Tests

Soils Testing Laboratory will perform tests herein specified and additional tests required, and submit test reports to Engineer including the following:

1. Optimum Moisture-Maximum Density curve shall be supplied by the Soils Testing Laboratory. Determine maximum densities by ASTM D1557.
2. Import material shall be tested and approved prior to importing to the job site. Up to three days of testing are required before approval of soils.

2.4 SERVICE TRENCHING**2.4.1 GENERAL****2.4.1.1 Inspection**Notice

Give sufficient notice so that inspection may be made at the following stages:

- Service trenches excavated before laying the service.
- Services laid in trenches and ready for backfilling.

2.4.2 EXECUTION**2.4.2.1 Excavating**Excavation

Excavate for underground services, to required levels and grades. Generally make the trenches straight between inspection points and junctions, with vertical sides and uniform grades.

Trench Widths

General: Keep trench widths to the minimum required for laying and bedding of the relevant service and construction of pits.

Trench Depths

If excavation is necessary below the zone of influence of the underside of adjacent footings, give notice, and provide support for the footings as instructed.

Obstructions

Clear trenches of sharp projections. Cut back roots encountered in trenches to at least 600 mm clear of services. Remove other obstructions including stumps and boulders which may interfere with services or bedding.

Dewatering

Keep trenches free of water. Place bedding material, services and backfilling on firm ground free of surface water.

Excess Excavation

If trench excavation exceeds the correct depth, reinstate to the correct depth and bearing value using compacted bedding material or sand stabilised with 1 part of cement to 20 parts of sand by weight.

2.4.2.2 BackfillingGeneral

Do not install backfill until required inspections and testing are completed.

Backfill service trenches as soon as possible after the service has been laid and bedded, if possible on the same working day.

Backfill Material

Install backfill materials in layers not exceeding 15 centimeters in thickness and compact to 95 percent of the maximum density. Install and compact sand bedding to provide a uniform full length bearing under piping and conduits.

Where portions of existing structures, walks, paving, or other improvements are removed or cut for piping or conduit installation, replace the material with equal quality, finished to match adjoining existing improvements.

General fill with no stones greater than 25 mm occurring within 150 mm of the service, or other materials as required for particular services or locations.

Under roads and paved areas and within 4 m of building: Coarse sand, controlled low strength material or fine crushed rock.

In topsoil areas: Complete the backfilling with topsoil for at least the top 100 mm.

Use appropriate marking tape to identify services.

2.4.2.3 Reinstatement of Surfaces**General**

Reinstate existing surfaces removed or disturbed by trench excavations to match existing and adjacent work.

2.5 LANDSCAPE – WALLS AND FENCES**2.5.1 GENERAL****2.5.1.1 Inspection**Notice

Give sufficient notice so inspection may be made of the following:

Setting out before commencement of construction.

Filter fabric and subsurface drainage in place before backfilling.

2.5.2 PRODUCTS**2.5.2.1 Timber**Hardwood

All hardwood in timber fences is to be without any rot, significant knots, twists, or other defects which may affect its strength and to be as per Engineer's approval.

Preservative treatment: Provide only timbers with preservative treatment painted on the timbers surface where the timber is in the ground, or ensure that all timber is highly resistant to rot.

2.5.2.2 SteelSteel Tubes and Channels

All steel tubes and channels used for posts, rails, stays are to be painted or galvanised to ensure the maximum lifetime for the item without significant maintenance.

2.5.2.3 Wire

Chainwire, cable wire, tie wire and barbed wire are to be galvanised or other suitable metallic finish for maximum lifetime.

2.5.2.4 Concrete WallsGeneral

Concrete walls and concrete foundations are to be constructed as shown on the drawings.

2.5.2.5 Stone WallsWalling Stone

Natural stone: Stone of uniform quality, sound and free from defects liable to affect its strength, appearance or durability.

Field stone: Local weathered uncut random sized natural stones.

Quarried stone: Cut or uncut random or regular size stone.

2.5.2.6 Crib WallsGeneral

Type: Proprietary system of interlocking precast concrete units with selected backfill placed and compacted progressively to form a retaining wall.

2.5.2.7 Gabion WallsGeneral

Type: Proprietary system of rock filled wire baskets.

2.5.2.8 Brick WallsGeneral

Brick walls on stone or concrete foundations are to be constructed as shown on the drawings.

2.5.2.9 Earth Block WallsGeneral

Earth block walls on stone or concrete foundations are to be constructed as shown on the drawings.

2.5.2.10 Filter FabricGeneral

Type: Polymeric fabric formed from a plastic yarn composed of at least 85% by weight of propylene, ethylene, amide or vinylidenechloride and containing stabilisers or inhibitors to make the filaments resistant to deterioration due to ultraviolet light.

Protection

Provide heavy duty protective covering. Store clear of the ground and out of direct sunlight. During installation do not expose the filter fabric to sunlight for more than 14 days.

2.5.3 EXECUTION

2.5.3.1 GeneralSet out

General: Set out the wall and fence lines and mark the positions of posts, gates and bracing panels.

Clearing

Extent: Except trees or shrubs to be retained, clear vegetation within 1 m of the landscape walls. Grub out stumps and roots of removed trees or shrubs and trim the grass to ground level, but do not remove the topsoil.

Excavation

Excavate for foundations and footings.

Earth Footings

Backfill with earth around posts, compacting firmly by hand or machine in 150 mm deep layers.

Concrete Footings

In ground: Place mass concrete around posts and finish with a weathered top falling 25 mm from the post to ground level.

On slabs: Provide welded and drilled post flanges and fix with 3 masonry anchors per post.

Strip footings: Place mass concrete or reinforced concrete footings for walls. Refer to drawings for details.

2.5.3.2 Gates

Types

Gates are to be constructed with minimum 30 x 30mm steel tube frames for rigidity. Infill panels can be steel sheet, steel mesh, timber boards or other material as identified on the drawings.

Hardware

Provide the following:

- Drop bolt and ferrule to each leaf of double gates.

- Latch to one leaf of double gates.

- Provision for locking by padlock.

- Holding lugs for security bars to inside face of double gates with vehicle access.

- Minimum of 2 hinges for gates 1.2m high. 3 hinges for gates 1.2 to 2.1m high. 4 hinges for gates greater than 2.1m high.

Hand Access

General: Where required, provide hand holes to give access from outside to reach locking provision.

2.5.3.3 Timber Fencing

Timber Picket Fence

Height (mm): As shown on drawings

Maximum post spacing: 2400 mm.

Member sizes (dressed):

- Posts: 90 x 90 mm.

- Rails: 70 x 40 mm.

- Pickets: 70 x 19 mm.

Picket spacing: 125 mm maximum.

Footing type: Earth.

Footing size: 200 mm diameter x 600 mm depth.

Installation

General: Mortice posts, taper splice rails and nail twice in mortices. Set pickets and palings clear of the ground.

Picket fence: Nail twice to each rail.

2.5.3.4 Chainwire Barriers

Fence Dimensions

Maximum post spacing: 3000 mm.

Component Sizes

Intermediate posts: 42.4 mm diameter, 2.6 mm wall thickness.

End, corner and gate posts: 60.3 mm diameter, 2.9 mm wall thickness.

Chainwire: 3.15 mm diameter wire woven to form uniform mesh.

Mesh generally: 50 mm.

Tie wire: 2 mm diameter.

Post and rail barriers:

Rails and gooseneck stay: 33.7 mm diameter, 2.6 mm wall thickness.

Railless barriers:

Struts: 42.4 mm diameter, 2.6 mm wall thickness.

Cable wires:

Two strands: 3.15 mm diameter wire.

One strand: 4 mm helicoil wire.

Security barriers:

Chainwire selvages: Twisted and barbed.

Barbed wire to security fencing post extensions: Barbs at 95 mm maximum centres.

Installation

Posts: Do not splice members except in posts when splice is embedded at least 150 mm into concrete. Fit tightly fitting steel caps to posts, except where fixed to overhead structure.

Chainwire: Lace chainwire to end and gate posts. Tie chainwire twice around members at 250 mm maximum intervals. Twist ends twice and cut off neatly.

Cable wire: Tension cable wire(s) to support chainwire after at least 24 hour curing of concrete footings.

Footing type: Concrete.

Footing size:

Intermediate and end posts: 225 mm diameter x 600 mm depth.

Corner posts and gate: 225 mm diameter x 900 mm depth.

Post and rail barriers:

Rails: Connect rail(s) to posts using bolted split pipe fittings and purpose-made caps and brackets with rail apertures.

Continuous rail type fences: Join the rails together in long lengths using purpose-made sleeves or socketed connections, and pass them through the apertures of caps and brackets on intermediate posts.

Railless barriers:

Struts: Provide struts at ends, corners and gates.

Security barriers:

Security fencing: Strain barbed wire between post extensions.

Gates

Frame tubes: 33.7 mm diameter, 2 mm wall thickness.

Chainwire: Match fence.

Maximum width: 3600 mm.

Security barriers:

Barbed wire security gate extension supports: 26.9 mm diameter, 2 mm wall thickness.

Barbed wire: Match fence.

2.5.3.5 Stone Walls

Construction

Select the stones for their locations and lay them in the wall with the minimum of stonecutting.

Footings: Select the largest, flattest and most regular stones for footings, and set them in concrete blinding in accordance with drawings.

Copings: Select stones of reasonably uniform size and finish the top of the wall to a level line or cap with precast concrete sections.

Retaining Walls

Construction: Where dry stone walls act as retaining walls, construct the stonework to be free draining through the wall. Batter back the wall face 50 – 70 mm for every 300 mm in height. Cap the top of the wall. Backfill progressively, with a layer at least 300 mm thick of porous material, such as coarse aggregate or crushed rock in the size range 20 – 40 mm. Install filter fabric to stop movement of silt into porous material.

Minimum thickness: 450 mm.

Where stone walls are mortared, batter back the wall face 50 – 70 mm for every 300 mm in height. Cap the top of the wall. Backfill progressively, with a layer at least 300 mm thick of porous material, such as coarse aggregate or crushed rock in the size range 20 – 40 mm. Install filter fabric to stop movement of silt into porous material. Install a slotted pipe drain at the bottom of the wall backfill to ensure all water is drained away from the wall face.

Minimum thickness: 450 mm.

2.5.3.6 Crib Walls

Construction

Construct walls in conformance with the manufacturer's written requirements or specific design included in the drawings.

2.5.3.7 Gabion Walls

Assembly

Construction: Assemble the baskets and join them together by wiring along edges both horizontally and vertically before placing the rock fill. Fix the top of the basket by wiring to both the sides and the diaphragms.

2.5.3.8 Brick, Earth Block Walls

Construction

Construct walls in conformance with the specific design included in the drawings. Construction of brickwork and earth blockwork to be in accordance with the relevant specification sections.

3.1 CONCRETE – GENERAL**3.1.1 GENERAL****3.1.1.1 Inspection**Notice

Give sufficient notice so that inspection may be made of the following:

Base or subgrade before covering.

Membrane or film underlay installed on the base.

Completed formwork, and reinforcement, cores, fixings and embedded items fixed in place.

Surfaces or elements to be concealed in the final work before covering.

Commencement of concrete placing.

REFERENCES

ASTM – C33 Concrete

ASTM – C150 Portland Cement

ACI 318 - Building Code Requirements for Structural Concrete

ASTM C494 - Chemical Admixtures for Concrete

ASTM C94 - Ready-Mixed Concrete

ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

ACI 305 - Recommended Practice for Hot Weather Concreting.

ACI 306 - Recommended Practice for Cold Weather Concreting.

ACI 301 - Specifications for Structural Concrete for Buildings.

3.1.1.2 Submissions

Submit mix designs for each concrete strength identifying all admixtures, mix ingredients and properties.

Products – Proposals

Curing compounds: If it is proposed to use a liquid membrane-forming curing compound submit certified test results for water retention.

Curing by the covering sheet method: Submit details of the proposed covering material.

Repair materials: Submit proposals for epoxy resin/grout and elastomeric sealant.

3.1.1.3 TestsGeneral

Perform tests of the type and frequency necessary to adequately control the materials and processes used in the construction of the works and in conformance with the **Concrete Tests Table**.

Compliance Assessment Tests

Timing: Obtain materials samples at the time of delivery to the site.

Location: Sample from selected sample sites within designated uniform test lots, consisting of an area placed, or compacted or both in one day. Test lots must be uniform in terms of material properties and density.

Flatness and Levelness of Floors

Floors shall be measured for levelness and flatness as indicated below. Measurements shall be made within 24 hrs after placement of the slab and shall be reported to the Engineer as soon as possible and not later than 72 hrs after installation. All tests are to be performed prior to removing shoring. Proposed sectional boundaries for taking measurements shall be submitted to the Engineer for review and approval prior to pouring the slabs. In general, use one-half bay spacings, control and cold joint locations for sectional boundaries.

Where these tolerances are not met it shall be immediately be brought to the Engineer's attention.

Remedial measures can be conducted with approval of the Engineer but should remedial measures not be possible, the contractor shall remove and replace the portions of the slab that are not in conformance at the contractor's expense.

Testing of Concrete

Contractor's Independent Testing/Inspection Laboratory shall perform following tests. Samples for testing shall be obtained in accordance with ASTM C172, and shall be taken from as close to point of placement as possible.

The specimens within each set shall be tested at the following ages in conformance with the **Concrete Tests** table.

1. Compressive Strength Tests: Specimen type: A set of compression test specimens shall consist of six 200 x 200 x 200 mm cubes or six 150mm diameter x 300 mm high cylinders. Cast at least 1 set from each day's placing. Cast an additional set for each 38 m³, or fraction thereof, or not less than one set for each 185 m² of surface area for slabs and walls, of each strength of structural concrete. Date cylinders, assign record number, and tag showing the location from which sample was taken. Also record slump test result of sample. Do not make more than 2 series of tests from any 1 location or batch of concrete.

2. Test Cylinders: Samples will be made in accordance with ASTM C172. Cast cylinders according to ASTM C31; 24 hours later, store cylinders under moist curing conditions at about 21°C. Test according to ASTM C39 at 7 and 28 day ages. The remaining cylinder shall be kept in reserve in case tests are unsatisfactory.

3. Control Test Cylinders: Cast a set of two or more cylinders for each day's placing of concrete for slabs supported on shoring. Place test cylinders on slabs represented by cylinders and cure the same as slabs. Test cylinders to determine proper times for removal of shores and re-shoring. A strength test shall be the average of the compressive strengths of 2 cylinders made from the same sample of concrete and tested at 28 days.

4. Core Tests: If tests show the compressive strength of any concrete falls below the required minimum, additional testing of concrete which unsatisfactory tests represent may be required. Make core tests at approved locations according to ASTM C42. Fill core holes with drypack concrete of strength required for concrete. Contractor shall bear cost of tests for below-strength concrete even if such tests indicate concrete has attained required minimum compressive strength, and all costs for required corrections.

5. Discharge Slump Tests: Carry out slump tests at approximately one quarter and three quarter points of the load during discharge.

See section 3.1.2.7 for slump and water/cement ratios.

Concrete Tests Table:

Samples	ASTM C172
Curing of Samples	ASTM C31

Cylinder or Cube Testing (see below)	ASTM C39,
Slump Determination	ASTM C143
Air Content (for mix design – test by concrete supplier)	ASTM C231 or C173

Conversion between Cube and Cylinder Strengths

The following matching values of cylinder and cube strengths convert between cylinder and cube strengths, employing linear interpolation for intermediate values and linear extrapolation for values outside the range.

Cylinder Strength		Cube Strength	
MPa	Psi	MPa	Psi
12	1740	15	2175
16	2320	20	2900
20	2900	25	3625
25	3625	30	4350
30	4350	37	5365
35	5075	45	6525
50	7250	60	8700

3.1.2 PRODUCTS

3.1.2.1 Reinforcement

a. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A185, in flat sheets, not rolls. Welded wire fabric used in concrete paving shall have lapped splices made so that the overlap between the outermost cross wires of each fabric sheet is at least 50 mm.

b. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 60.

c. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Provide each dowel in one piece, straight, cut accurately to length with ends square and free from burrs. Fix in locations as shown on the design drawings

All reinforcing shall be supported and wired together to prevent displacement by construction loads, or the placing of concrete, beyond the tolerances specified in ACI 301. Any tack or spot welding of reinforcement shall not be performed without approval from the Engineer.

Reinforcement shall be free of loose rust and of any other coating which may adversely affect the bond.

Splices in bar reinforcement shall be located and lapped as shown on the design drawings. Bars in lapped splices shall be in contact unless otherwise shown on the design drawings. Additional splices, if required, shall be made only at locations, and in a manner approved by the Engineer. Welded splices shall not be used. All lap splices in bar reinforcement shall be fully in compliance with ACI 318-05.

Unless specifically indicated on the design drawings, splicing by means of proprietary mechanical splices shall not be used.

Concrete spacers, metal or plastic bar spacers i.e. chairs, shall be used for obtaining proper spacing of reinforcement from the bottom and sides of formwork.

3.1.2.2 Formwork

Construct forms according to ACI 347 "Recommended Practice for Concrete Formwork", and conforming to tolerances specified in ACI 301, "Specifications for Structural Concrete for Buildings"

Construct formwork to support concrete for full duration of critical curing period. Construct in a durable manner with sufficient props and fixings to ensure that the formwork remains in position at all times.

Metal formwork shall not be used in cold weather use (see below).

Formwork plans and details to be submitted to Engineer for approval.

Materials: Use a formwork system and material so that there will not be any additional plastering required on concrete surfaces. Wooden planks shall not be used as formwork.

Workmanship: Rigidly construct forms to prevent mortar leakage, sagging, displacement or bulging between studs. Use clean, sound, approved form material, coated with specified materials only, not oil. Provide backing on all plywood joints.

Formwork Erection and Removal: Conform to ACI 301 and ACI 347.

Cleanouts and Cleaning: Provide temporary openings in all wall forms and other vertical forms for cleaning and inspection. Clean forms and surfaces to receive concrete prior to placing.

Re-Use: Clean and recondition form material before re-use.

Form Removal: Do not remove concrete forms until concrete attains sufficient strength to support its own weight and all superimposed loads as determined by testing field cured concrete cylinders, but not sooner than specified in ACI 347, paragraph 3.6.2.3. Load supporting forms may be removed when concrete has attained 75% of required 28 day compressive strength, but no sooner than 10 days provided construction is re-shored.

1. Re-shore structural members as specified below because of design requirements or construction conditions to permit successive construction.
2. Remove formwork progressively so unbalanced loads are not imposed on the structure.
3. Avoid damage concrete surfaces during form removal.
4. Store reusable forms for exposed architectural concrete to prevent damage to contact surfaces.
5. Remove formwork in same sequence as concrete placement to achieve similar concrete surface coloration.
6. Re-shoring loads to the lower floors shall be consistent with the design loads specified on the construction documents and with the acquired strength of the lower floors based on the time they have been allowed to cure before being loaded.

Re-shoring

1. Minimum re-shoring shall consist of not less than half the full required shoring added under last placed floor over which full shoring is to be placed for the next floor above. Leave re-shoring in place for at least 10 days after the floor above is placed, but in no case remove re-shoring until next concrete placing has attained a compressive strength equal to 75% of that required for the 28 day age as determined by control test cylinders specified hereinafter.
2. Record: Maintain a form and shoring removal record.

Survey and Adjustment

Check forms before and during placement of concrete, using an instrument, and make corrections as work proceeds.

3.1.2.3 Cores, fixings and embedded items

A. Where work of other sections require openings for passage of pipes, conduits, ducts, and other inserts in the concrete, obtain all dimensions and other information. All necessary pipe sleeves, anchors, or other required inserts shall be accurately installed as part of the work of other sections, according to following requirements

B. Conduits or Pipes: Locate so as not to reduce strength of concrete. In no case place pipes, other than conduits, in a slab 108 mm thick or less. Conduit buried in a concrete slab shall not have an outside diameter greater than 1/3 the slab thickness nor be placed below the bottom reinforcing steel or over top reinforcing steel.

C. Sleeves: Pipe sleeves may pass through slabs or walls if not exposed to rusting or other deterioration and are of uncoated or galvanized iron or steel. Provide sleeves of diameter large enough to pass any hub or coupling on pipe, including any insulation.

D. Conduits: Conduits may be embedded in walls only if the outside diameter does not exceed 1/3 the wall thickness, are spaced no closer than 3 diameters on centers, and do not impair the strength of the structure.

Inspection: Obtain inspection and approval of forms before placing structural concrete.

Adjoining elements

For adjoining elements to be fixed to or supported on the concrete, provide for the required fixings. If required, provide for temporary support of adjoining elements during construction of the concrete.

Protection

Grease threads. Protect embedded items against damage.

Compatibility: Ensure inserts, fixings and embedded items are compatible with each other, with the reinforcement and with the concrete mix to be used.

Corrosion: If in external or exposed locations, galvanize anchor bolts and embedded fixings.

Structural Integrity

Fix cores and embedded items to prevent movement during concrete placing. In locating cores, fixings and embedded items, reposition but do not cut reinforcement, and maintain cover to reinforcement.

Tolerances

Maximum deviation from correct positions:

 Cores and embedded items generally: 10 mm.

 Other fixing bolts: 3 mm.

3.1.2.4 Polymeric Film Underlay

Location

Provide a vapour barrier under slabs on ground including integral ground beams and footings.

Installation

Lay over the base, lap joints at least 200 mm and seal the laps and penetrations with waterproof adhesive tape. Face the laps away from the direction of concrete pour. Patch or seal punctures or tears before pouring concrete. Cut back as required after concrete has gained strength and forms have been removed.

Base preparation

According to base type, as follows:

- Concrete working base: Remove projections above the plane surface, and loose material.
- Graded prepared subgrade: Blind with sufficient sand to create a smooth surface free from hard projections. Wet the sand just before laying the underlay.

3.1.2.5 Curing Products

Curing compounds: Liquid-Membrane Forming and Sealing Curing Compound: Comply with ASTM C 309, Type I, Class A unless other type acceptable to Engineer. Moisture loss no more than

0.055 gr./sq. cm. when applied at 5 m²/liters. Obtain approval from the Engineer for all curing compounds prior to use.

Covering sheet materials: To be opaque polyethylene film, or burlap-polyethylene sheet, or equivalent material.

3.1.2.6 Concrete

Furnish ready-mixed concrete from an approved concrete batch plant. Conform to ASTM C94, except materials, testing, and mix designs as specified herein. Use transit mixer trucks equipped with automatic devices for recording number of revolutions of drum. Design mix to produce normal-weight concrete consisting of Portland cement, aggregate, water-reducing or high-range water-reducing admixture (super-plasticizer), air-entraining admixture, and water to produce the following properties:

1. Compressive Strength: All concrete shall be C30 with a minimum cylindrical compressive strength of 25 N/mm² (3625 psi) at 28 days.
2. Slump: Adjust quantity of water so concrete at point and time of placing does not exceed the following slumps when tested according to ASTM C143. Use the minimum water necessary for workability required by part of structure being cast.

Slump Limit

Slump and Water/Cement Ratios		
Part of Structure	Maximum Slump	Maximum Water Cement Ratio
Footings, foundation walls, and mass concrete, not reinforced	100 mm	0.5
Slabs on grade, reinforced and non-reinforced	100 mm	0.45
Reinforced concrete over 200 mm thick	100 mm	0.5
Reinforced concrete 200 mm or less thick	100 mm	0.5
All other concrete	100 mm	0.5

If super-plastizers are used, slumps may be 180 mm for all concrete, with water-cement ratio unchanged or lower than slumps without admixture.

3. Air Content: 5 to 8 percent.

Source Quality Control

Refer to the following paragraphs for specific procedures. Concrete materials which, by previous tests or actual service, have shown conformance may be used without testing when so approved by the Engineer. Approved testing Laboratory performs following conformance tests:

1. Portland Cement: Furnish Mill Certificates, acceptable to the Engineer, showing conformance with requirements specified; otherwise, the Contractor's approved independent testing/inspection laboratory shall test cement in accordance with ASTM C150.
2. Aggregate For Normal Weight Concrete: Test the aggregate before and after concrete mix is designed and whenever character of aggregate varies or source of material is changed. Include a sieve analysis. Obtain samples of aggregates at the dry batching or ready-mix concrete plant in accordance with ASTM D75 and perform tests for the following properties:

3. Lightweight Aggregates: Test the lightweight aggregates before mix is designed and whenever the character of aggregate varies or source is changed in accordance with ASTM C330. Include a sieve analysis and report on unit weights, deleterious substances, unburned or under-burned lumps, loss on ignition, soundness, and staining materials.

Materials

A. Portland cement: Cement shall conform to the requirements of ASTM specification C-150 Type 1 or similar approved standard for normal Portland cement as approved by Engineer.

Cement shall be free from any hardened lumps and foreign matter. It shall have a minimum of 90% of particles by weight passing the 75-micron sieve, an initial setting time in excess of 30 minutes and a final setting time of less than 7 hours.

Cement shall be stored in a waterproof shaded area. The cement stacks shall be placed at a minimum distance of 300mm from the walls. The damp proof floor shall be constructed by raising it minimum 300mm above the ground.

B. Aggregates:

1. Normal weight aggregates: ASTM C33.

2. Lightweight aggregates: ASTM C330, expanded shale type coarse aggregate, dry loose weight maximum 38 lbs. per cubic foot, maximum 9/16" size; all aggregate vacuum or thermally fully saturated for pumped concrete.

C. Admixtures

1. Chemical (Water Reducing) Admixture: ASTM C494, Type A, D, or E. Only one brand. When used, are subject to approval of the ENGINEER, and must reduce the mixing water at least 10% without entraining air in excess of 2% by volume. If the water reducing agent entrains more than 2% air, the water reduction shall be at least 12 %, but in no case shall the water reducing agent entrain air in excess of 4 %.

2. Air-entraining admix: ASTM C260.

3. Super-Plasticizers (High Range Water Reducers): ASTM C494, Type F or G. Master Builders "Rheobuild", Euclid "Eucon 37" or equal, capable of producing concrete which can be placed at 8-11" slump without segregation, capable of maintaining slump within 50 mm of that initially mixed for 2 hours, and of maintaining concrete temperature within 2° F. from time of batching for 2 hours minimum.

4. Concrete Waterproofing Admixture: Xypex Concentrate Admix C-1000 (standard set time) or C-2000 (extended set time), or approved equal that shall be of the cementitious crystalline type that chemically controls and permanently fixes a non-soluble crystalline structure throughout the capillary voids of the concrete. Use of waterproofing admixture shall be at locations specified per the Architectural drawings or schedules and shall follow all manufacturer recommendations for quantity and preparation.

D. Water: From potable domestic source. Water must be tested in an approved laboratory and deemed suitable for concrete, plaster, etc.

E. Curing Materials:

1. Liquid Curing compound: ASTM C309, Type I, Class B, W.R. Meadows 1100 Series, Master Builders "Mastercure W", or equal,

2. Curing sheet: ASTM C171, non-staining white types.

3. Evaporation retardant and finishing aid: Master Builders "Confilm", Euclid "Eucobar", or equal.

F. Vapor barrier: At typical locations use under slab vapor/methane membrane barrier as specified in Section 03106.

G. Non-shrink grout:

1. Pre-package, non-metallic, non-gaseous when tested in accordance with ASTM C117, Grade C at fluid (flow cone) consistency of 20- to 30- seconds. Grout shall attain 530 kg/m² compressive strength

in 28-days at specified flow and shall not bleed. [Master Builders "Masterflow 928", Euclid Chemical Co. "Euco Hi-Flow Grout", L&M Construction Chemicals "Crystex"]

2. Epoxy grout where indicated: Multi-component, premeasured, fastcuring combination of thermosetting resins and inert fillers, [Master Builders "Ceilcote 648", Sikadur 42 Industrial Group-Pak by Sika Chemical Corporation, or Euclid "Euco High Strength Grout"].

H. Drypack: Field mixture of 1 part Portland cement to 2 parts fine aggregate mixed to a damp consistency such that a ball molded in the hands will stick together and hold its shape. At Contractor's option, the specified admixture may be added for increased workability at lower water/cement ratio. In lieu of field mixing, Contractor may use factory mixed drypack material, such as [Master Builders "SetGrout" or Euclid "Euco Dry Pack Grout"].

I. Expansion Joint Filler: Asphalt impregnated fiber or non-extruding foam type, conforming to ASTM D994 and D1751, or D1752.

J. Construction Joint Materials: "[Key-Kold]" or "[Kwik-Joint]", of profiles indicated.

K. Bonding Agent: "[Weld-Crete]", manufactured by , Master Builders "Concresive]", or equal.

L. Integral Color Concrete: As specified in Section [03331]

Concrete Mix Designs

Contractor's approved independent testing/inspection laboratory shall design concrete mixes for concrete requiring 28-day cylindrical compressive strength exceeding 25N/mm² (3625 psi). Mix designs shall be stamped and signed by the approved laboratory. Contractor shall bear all costs for concrete mix designs.

1. Strength Requirements: Design mixes for structural concrete for minimum 28-day compressive strengths required by Drawings and Specifications. All mix designs for structural concrete shall be proportioned in accordance with Section 3.9 of ACI 301. If trial batches are used, the mix design shall be prepared by an independent testing laboratory and shall achieve an average compressive strength 85 kg/cm² higher than the specified strength. This over-design shall be increased to 100 kg/cm² when concrete strengths over 350 kg/cm² are used.

Physical Properties, Units	Test Method	Minimum Values
Sieve Analysis	ASTM C136	
Organic Impurities	ASTM C40	Fine Aggregate not darker than reference standard colour
Soundness	ASTM C88	Loss after 5 cycles not more than 8% of coarse aggregate, nor more than 10% of fine aggregate
Abrasion	ASTM C131	Weight loss not more than 10.5% after 100 revolutions, 42% after 500 revolutions
Deleterious materials	ASTM C33	
Materials finer than No. 200 sieve	ASTM C117	Not over 1% for gravel, 1.5% for crushed aggregate
Reactivity potential	ASTM C227, C289, C342	Ratio of silica released to reduction in alkalinity not to exceed 1.0
Sand equivalent	ASTM D2419	California sand equivalent values operating range not below 71%

2. Basis of Mix Designs: Design all mixes for workability and durability of concrete. Control mixes in accordance with ACI 301. Make adjustments in water/cement ratios as necessary for required concrete

strengths at the Contractor's expense. Calcium chloride, thiocyanates or admixtures containing more than 0.05% chloride ions are not permitted.

3. Maximum Aggregate Sizes: Not exceeding 3/4 of minimum clear space between bars and between bars and forms, nor larger than 1/5 of least dimensions between the forms. Design the mixes with 1" maximum size, except maximum 38 mm size for foundations and maximum 10 mm size at congested reinforcing or thin sections, when approved by the Owner's Representative.

4. Lightweight Structural Concrete: Design for air-dry density of 1794 kg/m³ maximum. With each mix design, include test reports showing that concrete covered by the mix design meets shrinkage test requirements specified under Article "Field Quality Control" herein, or include certified test reports showing conformance as furnished by ready-mix concrete manufacturer.

Delivery, Storage, and Handling

A. Deliver all materials in timely manner to ensure uninterrupted progress of the Work.

B. Store materials by methods that prevent damage and permit ready access for inspection and identification.

Project Site Conditions

Do not place concrete during rain or adverse weather conditions without means to prevent all damage. Conform to requirements specified hereinafter whenever concrete placement is required during cold or hot weather.

On-Site Batch Mixed Concrete

On site batch mixed concrete shall be used only where designated and shall have characteristics and proportions of concrete ingredients conforming to those specified above.

Mixing time: Measure the mixing time after solid materials are in the mixer, provided that mixing water is introduced before a quarter of the mixing time has elapsed. Increase mixing time if necessary to obtain the required uniformity and consistence of concrete. Do not overmix such that additions of water are needed.

3.1.2.7 Transport

Transport and discharge the concrete without segregation.

Elapsed delivery time: Discharge truck mixed concrete within a time (t hours) determined as follows, where T is the temperature of the concrete in degrees Celsius:

$$t = 2 - 0.05T.$$

3.1.3 EXECUTION

3.1.3.1 Preparation For Concrete Placing

A. Remove all free water from forms before concrete is deposited. Remove hardened concrete, debris, and foreign materials from interior surfaces of forms, exposed reinforcing, and from surfaces of mixing and conveying equipment.

B. Wet materials sufficiently to reduce adsorption and to help maintain concrete workability.

C. Earth Subgrade: Dampen 24 hours before placing concrete, but do not muddy. Re-roll where necessary for smoothness and remove loose material.

D. Gravel Fill: Recompact disturbed gravel and bring to correct elevation.

E. Sand Beds or Subslab Drainage Fill: Re-compact disturbed material and bring to correct elevation

F. Vapor Barrier: Install under interior floor slabs on grade. Lap joints 200 mm in the direction of concrete spreading and tape seal. Seal the joints at walls and around penetrations with tape.

G. Screeds: Set screeds at walls and maximum 2.4 m centers between. Set to provide level floor. Check with an instrument level, transit, or laser during placing operation to maintain level floor.

H. Screeds Over Vapor Barrier: Use weighted pad or cradle type screeds and do not drive stakes through the vapor barrier. Check with an instrument level, transit, or laser.

I. Metal Floor Decking: Verify that decking joints are sealed and there are no openings or voids that will permit concrete leakage.

J. Expansion Joint Filler: Install where slabs abut buildings and elsewhere as indicated. Install full depth of concrete with top level with finished surface of concrete.

3.1.3.2 Conveying and Placing

Do not place concrete until subbase and forms have been checked for line and grade. Moisten subbase if required to provide a uniform dampened condition at time concrete is placed. Use placing methods which avoid segregation and loss of concrete, and which minimise plastic settlement. Maintain a generally vertical and plastic concrete edge at faces of a pour. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

Place concrete by methods that prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading. Do not use rakes. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.

Do not place concrete until the reinforcing steel, forms, or metal decking have been approved. Do not use aluminum tubes or any aluminum equipment for pumping concrete, nor allow concrete to free fall from its point of release at mixer, hoppers, tremies, or conveying equipment more than 1.5 m for concealed concrete and 1 m for exposed concrete. Deposit concrete so that the surface is kept level throughout, a minimum being permitted to flow from one portion to another. Place concrete in horizontal layers not more than 450 mm thick within 45 minutes after water is first added to the batch. Place concrete by methods that prevent segregation of materials.

Exception: When using super-plasticizers, the free fall, horizontal layer thickness and time limitations may be doubled.

Where new concrete is placed against or on old or existing concrete, apply bonding agent to properly prepared surface of old concrete prior to placement of new concrete.

3.1.3.3 Joints In Concrete

Locate joints only where approved, and obtain prior approval for points of stoppage of any pour. Clean and roughen the surface of construction joints by removing the entire surface and exposing 6.5 mm amplitude of clean aggregate solidly embedded in mortar matrix by chipping, use of an approved surface retarder, or equal. Water and keep hardened concrete wet for not less than 24 hours and slush with portland cement slurry just before placing joining concrete. Cover horizontal surfaces of existing or previously placed and hardened concrete with a 50 mm thick layer of fresh concrete less 50% of coarse aggregate just before balance of concrete is placed.

Construction Joints

Location: Do not relocate or eliminate construction joints, or make construction joints not shown on the drawings. If emergency construction joints are made necessary by unforeseen interruptions to the concrete pour, consult Engineer and submit a report on the action taken.

Joint preparation: Roughen and clean the hardened concrete joint surface. Remove loose or soft material, free water, and foreign matter. Dampen the surface just before placing the fresh concrete and coat with a neat cement slurry.

Expansion joints

Conform to details and approved submittal.

Preparation: Before filling, dry and clean the joint surfaces, and prime.

Joint filling: Fill with jointing materials. Finish visible jointing material neatly flush with adjoining surfaces except for those joints shown to be sealed with sealant.

Watertightness: Apply the jointing material so that joints subject to ingress of water are made watertight.

Control Joints

Provide for concrete slabs as indicated. At Contractor's option, "Soff-Cut" saw may be used to depth of 32 mm (1-1/4") immediately providing spalling or undercutting of the concrete does not occur, and in no case shall slab reinforcement be cut or damaged. Conventional saws shall be used as soon as possible without dislodging aggregate to 1/4 slab thickness. Complete sawing of joints within 12 hours after finishing is completed. If early sawing causes undercutting or washing of the concrete, delay the sawing operation and repair the damaged areas. The saw cut shall not vary more than 13mm (1/2") from the true joint alignment. Discontinue sawing if a crack develops ahead of a saw cut. Immediately after each joint is sawed, thoroughly clean the saw cut and adjacent concrete surface. Respray surfaces treated with curing compound which are damaged during the sawing operations as soon as the water disappears. Protect joints in a manner to prevent the curing compound from entering the joints. Conform to approved submittal.

3.1.3.4 Compaction

Compact each layer of the concrete as placed with mechanical vibrators or equivalent equipment. Transmit vibration directly to concrete and in no case through the forms unless approved. Accomplish thorough compaction. Supplement by rodding or spading by hand adjacent to forms. Compact concrete into corners and angles of forms and around reinforcement and embedded fixtures. Re-compact deep sections with congestion due to reinforcing steel as required.

Layers: Place concrete in layers ≤ 300 mm thick, such that each succeeding layer is compacted before previous layer has taken initial set.

Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

Deposit and spread concrete in a continuous operation between transverse joints as far as possible.

Compact concrete using internal mechanical vibration of sufficient amplitude to produce noticeable vibrations at 300 mm radius. Insert vibrators into the concrete to the depth which will provide the best compaction, but not deeper than 50 mm above the surface of the subbase, and for a duration sufficient to produce satisfactory compaction, but not longer than 30 seconds in any one location.

Operation of Vibrators

Do not horizontally transport concrete in forms with vibrators nor allow vibrators to contact forms or reinforcing. Push vibrators vertically into the preceding layers that are still plastic and slowly withdraw, producing maximum obtainable density in concrete without creating voids or segregation. In no case disturb concrete that has partially set. Vibrate at intervals not exceeding two-thirds the effective visible vibration diameter of the submerged vibrator. Avoid excessive vibration that causes segregation. Use and type of vibrators shall conform to ACI 309 "Recommended Practice for Consolidation of Concrete".

Do not allow vibrators to come into contact with partially hardened concrete, reinforcement or items including pipes and conduits embedded in concrete. Do not use vibrators to move concrete along the forms. Avoid over-vibration that may cause segregation.

Vertical elements: In vertical elements, limit the free fall of concrete to 1500 mm per 100 mm element thickness, up to a maximum free fall of 3000 mm, using enclosed vertical chutes or access hatches in forms.

Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

Deposit and spread concrete in a continuous operation between transverse joints as far as possible. If interrupted for more than 1/2 hour, place a construction joint.

Correction of Segregation

Before placing next layer of concrete, and at the top of last placement for vertical elements, remove concrete containing excess water or fine aggregate or showing deficiency of coarse aggregate and fill the space with compacted concrete of correct proportions.

3.1.3.5 Waterproof Membranes

Perform work adjacent to waterproof membranes to prevent damage to membranes. Arrange work so that membrane is left unprotected for minimum period of time, as approved. Prior to placing concrete, inspect the membrane and arrange for repair to all damage which may have occurred.

3.1.3.6 Rain

Do not expose concrete to rain before it has been placed and set.

3.1.3.7 Slabs

1. Float Finish: Place, consolidate, strike off and level concrete slab to proper elevation. Use highway straightedge, bull float or darby. Remove all bleed water. After the concrete has stiffened sufficiently to permit the operation, and water sheen has disappeared, the surface shall be floated, at least twice, to a uniform sandy texture.
2. On-Grade Slabs: Generally locate joints on column lines, exact locations as directed or approved. Submit joint locations and pour sequence for review and approval.
3. On-Grade Slab Construction and Contraction Joints: Use types as indicated at column lines intermediate locations.

3.1.3.8 Cold Weather Provisions

A. The guidelines of ACI 306R shall be followed when the Forecasted Mean Daily Temperature drops below 4°C for three consecutive days. The minimum concrete temperature when delivered at the site shall be in accordance with ACI 306R.

B. Normal Concrete: When the temperature is below 4°C, the temperature of the concrete placed in the forms shall be at least 10°C. When the temperature is below -1°C, the temperature of the concrete as mixed shall be 18°C. In all cases, when the daily average temperature is below 4°C, the concrete shall be kept at 10°C. for the 72 hours and then allowed to drop uniformly to the air temperature over the next 24 hours.

Concrete temperature shall be measured by placing a thermometer 50 mm below the top of the concrete being placed.

C. Air-entrained concrete shall be kept at the above temperature for 27 hours and above freezing for an additional 72 hours.

D. No calcium chloride shall be used to accelerate hardening of concrete. Contractor to certify that any additive used does not contain calcium chloride.

E. If low temperature accelerating admixture is proposed, adjust concrete mix as required and obtain approval of Engineer.

F. All concrete materials, reinforcement, forming materials and ground with which concrete is to come in contact shall be free of frost.

G. The covering or other protection used in connection with the curing shall remain in place and intact for at least 24 hours.

H. The work shall be protected from the elements, flowing water, and defacements of any nature during the construction operations.

I. Conform to the provisions of ACI 306, Recommended Practice for Cold Weather Concreting, except as modified herein.

J. Subbase: Ensure that the subbase surface is free of frost.

K. If water or aggregate is heated above 38°C, the water shall be combined with the aggregate in the mixer before cement is added. Cement shall not be mixed with water or with mixtures of water and aggregate having a temperature greater than 38°C.

L. Hot water may be added to the concrete on-site. A minimum of 70% mix-design water must be added at the batching plant. The water temperature may not exceed 60°C. Mixing must conform to ASTM C94 Section 11.

M. Concrete shall only be poured when the ambient temperature is rising.

N. All concrete shall be insulated from freezing for the greater of following:

1. 3 days
2. Until the concrete reaches an in-place compressive strength of 35 kg/cm²,

O. Metal formwork shall not be used in cold weather concrete.

P. All materials shall be free from frost.

3.1.3.9 Hot Weather Provisions

Conform to ACI 305R and the following requirements:

Take extra care to reduce the temperature of the concrete being placed, and to prevent rapid drying of newly placed concrete. When the outdoor ambient temperature is more than 32°C, shade the fresh concrete as soon as possible after placing, and start curing as soon as the surface of the fresh concrete is sufficiently hard to permit it without damage. Concrete placement temperatures shall be controlled by the Contractor and shall not be limited to:

1. Shading and cooling the aggregate;
2. Avoiding use of hot cement;
3. Cooling mixing water by additions of ice;
4. Insulating water supply lines and tanks; and
5. Insulating mixer drums or cooling them with sprays or wet burlap.
6. For mass concrete, i.e., concrete sections having a minimum dimension of 750mm or greater, the maximum acceptable concrete temperature is 21°C at time of discharge.
7. For other concrete structures, the maximum acceptable concrete temperature is 32°C at time of discharge.
8. Avoid premature stiffening of the mix and reduce water absorption and evaporation losses. If the temperature of the surrounding air is higher than 32°C:
 - Mix, transport, place and compact the concrete as rapidly as possible, and cover with an impervious membrane or hessian kept wet until moist curing begins.
 - Hold the concrete to a temperature < 32°C when placed.
9. If ice is used as part of the mixing water, mixing should be continued until the ice is completely melted.
10. Retempering shall not increase the water content above that in the mix design.

3.1.3.10 Curing Formed Concrete

Protect fresh concrete from premature drying and from excessively hot or cold temperatures. Maintain the concrete at a reasonably constant temperature with minimum moisture loss for the curing period.

Temperature: Maintain the concrete at a temperature above 5°C and below 32°C for at least 7 days.

Curing compound method: Spray the entire surface including edges using a mechanical sprayer, at a uniform application rate as per manufacturer's specifications. Respray defective areas within 30 minutes. Respray within 3 hours after heavy rain. Apply as a continuous coating without visible breaks or pinholes.

Covering sheet method: Immediately after finishing operations cover concrete using damp hessian or cotton mats overlapped at least 150 mm and anchored against displacement by wind or other

interference. Keep the mats continuously damp until covered by the covering sheet material. Repair tears and the like immediately.

Joint sawing: Sheet materials may be removed for the minimum distance and period to permit joint sawing, provided the concrete is kept moist by other means.

Moist curing method: Immediately after finishing operations keep the concrete surface continuously damp by spraying constantly with water, fog, or mist, using suitable spraying equipment. In cold weather, only steam is allowed for curing.

Do not use any type of finishing or curing materials or methods that interfere with the correct application or bonding of subsequent materials; verify exact requirements as they apply to all applicable materials.

3.1.3.11 Patching Formed Concrete

A. Remove fins, projections, and offsets. Cut out rock pockets, honeycomb, and all other defects to sound concrete, with edges of cuts straight and back-beveled. Dampen cut-outs and edges, and scrub with neat Portland cement slurry just before patching, or apply an approved epoxy concrete adhesive.

B. Saturate form tie holes with water and fill voids and patches with flush smooth finished mortar of same mix as concrete (less coarse aggregate), cure, and dry.

3.1.3.12 Grouting and Drypacking

A. Install as indicated or required. Where grouting and drypacking is part of the work of other sections, it shall conform to the following requirements, as applicable.

B. Drypacking: Mix materials thoroughly with minimum amount of water. Install drypack by forcing and rodding to fill voids and provide complete bearing under plates. Finish exposed surfaces smooth and cure with damp burlap or liquid curing compound.

C. Non-Shrink Grouting:

Mixing: Mix the approved non-shrink grout material with sufficient water per manufacturers recommendations.

Application: Surfaces to receive the non-shrink grout shall be clean, and shall be moistened thoroughly immediately before placing the mortar. Before grouting, surfaces to be in contact shall be roughened and cleaned thoroughly, all loose particles shall be removed and the surface flushed thoroughly with neat cement grout immediately before the grouting mortar is placed. Place fluid grout from one side only and puddle, chain, or pump for complete filling of voids; do not remove the dams or forms until grout attains initial set. Finish exposed surfaces smooth, and cure as recommended by grout manufacturer.

3.1.3.13 Elapsed delivery time

General: Ensure that the elapsed time between the wetting of the mix and the discharge of the mix at the site is in conformance with the Elapsed delivery time table. Do not discharge below 10°C or above 32°C.

Elapsed Delivery Time Table (without admixtures)

Concrete temperature at time of discharge (°C)	Maximum elapsed time (hours)
10 – 24	2.00
24 – 27	1.50
27 – 30	1.00
30 – 32	0.75

3.1.3.14 Finishing

Immediately after placement and spreading and compaction of the plastic concrete, start finishing operations to achieve finish shown on the drawings.

3.1.3.15 Finishing Exposed Formed Concrete

Sack and patch as required to remove fins and correct errors.

3.1.3.16 Tolerances

Allowable Tolerances: Construct concrete conforming to the tolerances specified in ACI 117 "Recommended Tolerances for Concrete Construction and Materials", as applicable, unless exceeded by requirements of regulatory agencies or otherwise indicated or specified. In exceptional cases, where corrections can be met by a subsequent sequence of work, the method must be approved by the Engineer prior to commencing work.

3.1.4 COMPLETION

3.1.4.1 Protection

Keep traffic, including construction plant, off the pavement entirely during curing, and thereafter permit access only to necessary constructional plant vehicles until the pavement is at least 14 days old.

3.1.4.2 Traffic on pavement

General: Give notice before opening the pavement to traffic before the work is completed. Provide adequate means of protection.

3.2 CONCRETE- FINISHES**3.2.1 GENERAL****3.2.1.1 Tolerances**General

Allowable Tolerances: Construct concrete conforming to the tolerances specified in ACI 117 "Recommended Tolerances for Concrete Construction and Materials", as applicable, unless otherwise indicated by these contract documents. In exceptional cases, where corrections can be met by a subsequent sequence of work, the method must be approved by the Engineer prior to commencing work.

Unformed surfaces: Confirm conformance with the **Tolerance classes table** for the class of finish nominated using a straight edge placed anywhere on the surface in any direction.

Tolerances Class Table

Class	Measurement	Maximum deviation (mm)
A	3 m straight edge	3
B	3 m straight edge	6
C	600 mm straight edge	6

3.2.2 PRODUCTS**3.2.2.1 Materials**Surface Hardeners, Sealers and Protectors

Supply: If required by the project documentation, provide proprietary products in accordance with the manufacturer's written requirements.

3.2.3 EXECUTION**3.2.3.1 Surface modifiers**General

Application: Apply to clean surfaces in accordance with the manufacturer's requirements.

3.2.3.2 Unformed SurfacesGeneral

Screed and level slab surfaces to finished levels, to tolerance class C.

Finishing Methods

Broom finish: After floating draw a broom or hessian belt across the surface to produce a coarse even-textured slip-resistant transverse-scored surface.

Machine floated finish: After screeding and when the concrete has stiffened sufficiently, work the slab surface using a machine float. Hand float in locations inaccessible to the machine float. Cut and fill to tolerance class B and refloat immediately to a uniform, smooth texture.

Scored or scratch finish: After screeding, give the surface a coarse scored texture using a stiff brush or rake drawn across the surface before final set.

Steel trowelled finish: After machine floating, use power trowels to produce a smooth surface relatively free from defects. Then, when the surface has hardened sufficiently, use steel hand trowels to produce the final finish free of trowel marks and defects, and uniform in texture and appearance, to tolerance class A.

Wood float finish: After screeding, machine produce the final finish using a wood float, to tolerance class B.

Polished Finishes

Water blast: After steel trowelling, water blast the cured surface to provide texture or to form patterns without exposing the coarse aggregate using medium pressure water jets. Ensure that aggregate is not removed to a depth greater than 10mm.

Applied finish: To a steel trowel finished surface, apply a proprietary liquid or dry shake material in accordance with the manufacturer's written requirements.

Burnished finish: Continue steel trowelling until the concrete surface attains a polished or glossy appearance.

Surface Finishes

General: Provide surface finishes in conformance with the **Concrete Finishes** Schedule.

3.2.3.3 Formed surfaces

General

Provide formed concrete finishes in conformance with the **Concrete Surface Finishes** schedule.

Damage: Do not damage concrete works through premature removal of formwork.

Curing

General: If forms are stripped when concrete is at an age less than the minimum curing period, commence curing exposed faces as soon as the stripping is completed.

Finishing Methods

If exposed formed concrete elements are to have a finish other than off the form, provide details of proposed procedures. If not identified otherwise, all formed surfaces will be off form finish.

Exposed aggregate finish: Remove the vertical face forms while the concrete is green but set. Wet the surface and scrub using stiff fibre or wire brushes, using clean water freely, until the surface film of mortar is mechanically removed, and the aggregate uniformly exposed. Do not use acid etching. Rinse the surface with clean water.

Floated finishes:

- Sand floated finish: Remove the forms while the concrete is green. Wet the surface and rub using a wood float. Rub fine sand into the surface until a uniform colour and texture are produced.
- Grout floated finish: Remove the forms while the concrete is green. Dampen the surface and spread a slurry, using hessian pads or sponge rubber floats. Remove surplus slurry and work until a uniform colour and texture are produced.

Surface Repairs

Surface repair method: Before commencing repairs, submit proposals to the Engineer for approval.

3.5 BRICKWORK**3.5.1 GENERAL****3.5.1.1 Inspection**Notice

Give sufficient notice so that inspection may be made of the following:

- Set out of brickwork to lintels, arches and other architectural features.
- Damp-proof courses, in position.
- Lintels, in position.

3.5.2 PRODUCTS**3.5.2.1 Materials**First Class Bricks

First Class Bricks shall be made from good brick earth free from saline deposits, and shall be sand molded. They shall be thoroughly burnt by coal without being vitrified, of uniform and good color, shall be regular and uniform in size, shape and texture with sharp square edges and parallel faces. They must emit a clear metallic ringing sound when struck one against another. They shall be free from flaws, cracks, chips, stones, and nodules of lime or canker. A First Class Brick shall not absorb more than 1/6th of its weight of water after being soaked for one hour.

Second Class Bricks

Second Class Bricks shall be as well burnt as First Class or may be slightly over burnt but not vitrified, and must give a clear ringing sound when struck one against another. Slight irregularities in size, shape or color are acceptable provided irregular or uneven courses do not result. Second Class Bricks may have slight chips or flaws but must be free from lime or canker nodules. They shall not absorb more than 1/4th of their weight of water after being soaked for one hour.

General

Machine made pressed bricks shall be standard commercial products, locally manufactured unless specified. The Engineer prior to use in the Works shall approve the use of machine made pressed bricks.

Bricks not meeting the above requirements shall not be used in brickwork.

First and Second Class Bricks should have these dimensions after burning: 220mm x 105mm x 65mm. Dimensions may vary according to manufacturer, but must be approved by Engineer before laying. The unit weight of First and Second Class Bricks shall not be less than 1100 kg/m³.

The crushing strength of bricks shall be tested in a laboratory. The average crushing strength of First and Second Class Bricks shall not be less than 10.3 MPa (105 kg/cm²).

At the start of the works samples of the bricks shall be tested for crushing strength and water absorption, and brickwork shall only commence when the Engineer has approved the bricks. The Contractor may then only change the source of supply of bricks after samples from the new supplier have similarly been tested and approved.

Mortar Materials

Cement shall conform to the requirements of ASTM specification C-150 Type 1 or similar approved standard for normal Portland cement.

White cement: Iron salts content $\leq 1\%$.

Off-white cement: Iron salts content $\leq 2.5\%$.

Lime: Confirm source of Lime with Engineer to ensure highest quality Lime is used in the mortar. Protect from damage on site and store minimum 300mm above ground in waterproof storage facility.

Sand: Fine aggregate with a low clay content selected for grading, sharp and free from efflorescing salts. River or pit sand should be sharp, angular, hard, clean uncoated particles free from clay and organic impurities.

Water: Water to be used for the mixing of mortar should be clean and free from oil, acid, alkali, salts, organic materials or other substances that are harmful to the mortar mix.

Measurement of volume: Measure binders and sand by volume using buckets or boxes. Do not allow sand to bulk by absorption of water.

Mortar

Proportioning: Standard and ratio of mix for all mortar shall be M-400 (1:3), M-300 (1:4), M-250 (1:5) and M-200 (1:6). Provide minimum water.

3.5.2.2 Components

Nailing blocks

Solid timber, or hollow timber box filled with earthen mortar. Timber unseasoned or thoroughly pre-wetted.

Steel components, including reinforcement

All steel components to be galvanised for maximum durability after incorporation into the structure.

Window and Door lintels

Lintels: Use steel, concrete or timber lintels in accordance with the manufacturers' technical literature or conform to the **Steel angle and T-lintels table**.

Steel Angle and T-Lintels Table

Maximum span (mm)	Wall height above ≤ 600 mm			Wall height above > 600 mm, ≤ 1800 mm		
	Angle lintel size	T-Lintel dimensions: H x W x T (mm)	Bearing min. (mm)	Angle lintel size	T-Lintel dimensions: H x W x T (mm)	Bearing min. (mm)
1000	Two 75 x 50 x 5 Unequal angles	81 x 150 x 6	100	Two 125 x 75 x 8 Unequal angles	136 x 150 x 6	200
2000	Two 100 x 75 x 6 Unequal angles	136 x 150 x 6	150	Two 150 x 90 x 8 Unequal angles	156 x 150 x 6	200
2400	Two 125 x 75 x 8 Unequal angles	156 x 150 x 6	150	Two 150 x 90 x 10 Unequal angles	160 x 150 x 10	250
2800	Two 150 x 90 x 8 Unequal angles	158 x 150 x 8	200	Two 150 x 100 x 10 Unequal angles	210 x 200 x 10	300
3000	Two 150 x 90 x 10 Unequal angles	160 x 150 x 10	200	Two 150 x 100 x 12 Unequal angles	210 x 200 x 10	300

Timber Lintels

Size: Width of the wall and in conformance with the **Timber Lintels Height** table.

Grade: Best quality of imported Russian timber or suitable approved local timber.

Bearing: 300 mm (minimum).

Timber Lintels Height Table

Maximum span (mm)	Lintel height (mm)
1200	150
1800	150
2400	200
3000	250

Timber Fixing Plates

Size: 200 x 50 mm (minimum).

Holding-down Bolts

Type: 10 mm diameter threaded rod.

Termination: Horizontal 5 x 100 x 200 mm steel plate, weld-fixed, or with nuts.

Depth of embedment:

Length (minimum): 450 mm.

3.5.3 EXECUTION

Refer to **Brickwork Construction** schedule for details of brickwork and mortar types.

3.5.3.1 General

General

Construction of masonry brickwork shall not commence until the Engineer has accepted the footings on which it is to be placed.

Brickwork shall be built plumb, curved or battered as shown on the Drawings or as may be required, by skilled masons and properly supervised workmen. Bricks shall be clean and if necessary, they shall be scrubbed. Bricks shall be soaked in water for at least one hour before use.

Brick should be laid as indicated in drawings or schedules, or as specified by Engineer. All horizontal joints shall be parallel and level. Vertical joints in alternate courses shall come directly over one another. Joint thickness shall be 8mm and shall in no case exceed 12mm. The height of four courses including 4 bed joints shall rise 300mm. Set out brickwork with joints of uniform width and minimise cutting of masonry units.

Walls shall always be carried up regularly along their entire length unless otherwise directed by the Engineer. Bricks should be laid so that only full courses are used to avoid splitting bricks at beams, ledges, lintels.

Mortar Mix

Mortar mixing shall be done in a mechanical mixer unless the Engineer specifically permits hand mixing. If hand-mixing is done, the operation shall be carried out on a clean watertight platform and cement & sand shall be first mixed dry in the required proportion to obtain a uniform colour and then the mortar shall be mixed for at least two minutes after addition of water.

Cement Mortar shall be mixed in such quantities as can be used in the work within 30 minutes. Mortar, which has taken initial set, shall not be used, nor shall it be re-mixed with fresh mortar.

Preparing lime putty:

- Using hydrated lime: Add lime to water in a clean container and stir to a thick creamy consistency. Leave undisturbed for at least 16 hours. Remove excess water and protect from drying out.
- Using quicklime: Run to putty as soon as possible after receipt of quicklime. Partly fill clean container with water, add lime to half the height of the water, then stir and hoe ensuring that no lime remains exposed above the water. Continue stirring and hoeing for at least 5 minutes after all reaction has ceased, then sieve into a maturing bin. Leave undisturbed for at least 14 days. Protect from drying out.

Mortar proportions (cement:lime:sand): As defined on drawings.

Sand stockpile: Ensure sand is dry and stored undercover to avoid errors in volume batching during the mixing process.

Protection from Contamination

Protect masonry materials and components from ground moisture and contamination.

Building-In

Embedded items: Build in fixing blocks, brackets, lintels and accessories as the construction proceeds.

Steel door frames: Fill the backs of jambs and heads solid with mortar as the work proceeds.

Joining to Existing

If jointing to existing work is required, provide a straight joint. Do not tooth new masonry into existing work.

Chasing

Chasing of brickwork shall be to the **Brickwork Chasing** table and subject to the following limitations:

Parallel chases on opposite faces of a wall shall not be closer than 600 mm to each other.

Brickwork Chasing Table

Brick thickness (mm)	Depth of chase (maximum mm)
More than 250 thick	35
250 thick	25
100 thick non load bearing walls only	20

Joint Finish

Lay brickwork on a full bed of mortar. Fill perpendicular joints solid.

Finish:

- Externally: Tool to give a dense water-shedding finish for face brickwork or rake not more than 10mm to give a key for render finish.
- Internally: If wall is to be plastered, rake not more than 10 mm to give a key.

Temporary Support

If the final stability of the brickwork or blockwork is dependent on structural elements to be constructed after the brickwork, provide proposals for temporary support or bracing for the approval of the Engineer.

3.5.3.2 Facework

Cleaning

General: Clean progressively as the work proceeds to remove mortar smears, stains and discolouration.

Colour mixing

Evenly distribute the colour range of units and prevent colour concentrations and “banding” unless specifically identified as a feature of the brickwork.

Bricks or mortar shall not be stained or painted.

3.5.3.3 Damp-proof courses

Damp-proof Courses

Material: Embossed Polythene sheeting or bitumen membrane as approved by Engineer. Install sheeting at base of all walls to stop moisture rising up wall structures.

Location

Provide damp-proof courses as follows:

Walls built off slabs on ground: In the bottom course of the wall on top of the slab.

Walls adjoining infill floor slabs: In the course above the slab. Project 40 mm and dress down over the membrane turned up against the wall.

Installation

Lay in long lengths. Lap full width at angles and intersections and at least 150 mm at joints. Step as necessary, but not exceeding 2 courses per step. Sandwich damp-proof courses between mortar.

3.5.3.4 Control of movement

Joints

Provide joints as follows:

Expansion joints for brickwork:

- Maximum length of continuous wall face: 8 m.
- Closest joint location to external corner: 2.5m
- Maximum vertical spacing: 8 m.
- Width of control joint: $\geq 10 \text{ mm} \leq 20 \text{ mm}$.
- Width of horizontal joint: $\geq 15 \text{ mm} \leq 20 \text{ mm}$.

Filler material: Provide compatible sealant and bond breaking backing materials which are non-staining to masonry.

Bond breaking materials: To be non-adhesive to sealant, or faced with a non-adhering material.

Foamed materials: To be closed-cell or impregnated, not water-absorbing.

Joint filling:

- Installation: Clean the joints thoroughly and insert an easily compressible backing material before sealing.
- Sealant depth: Fill the joints with a gun-applied flexible sealant for a depth of at least two-thirds the joint width.

Refer to the **Brickwork Construction** and drawings for details of locations, types and extent of built in components.

3.7 LIGHT STEELWORK**3.7.1 GENERAL****3.7.1.1 Inspection**Notice

Give notice so that inspection may be made of steel framing erected before lining or cladding.

3.7.1.2 SubmissionsDesign

The Contractor is to confirm that all proposed member sizes are available for the project in accordance with the drawings and BOQ. If selected sizes are not available, seek alternatives and obtain approval from the Engineer.

3.7.2 EXECUTION**3.7.2.1 General**Fabrication

Length: Cut members accurately to length so that they fit firmly against abutting members.

Service holes: Form holes by drilling or punching if needed.

Bushes: Provide plastic bushes or grommets to site cut holes.

Swarf: Remove swarf and other debris from cold-formed steel framing immediately.

Site work: If possible, do not fabricate on site where welded connections are required.

Fastening

Select from the following:

- Bolting.
- Self-drilling, self-tapping screws.
- Blind rivets.

Welding

Burning: Avoid procedures that result in greater than localised “burning” of the sheets or framing members. Protect other adjoining materials from damage during welding activities.

Other workers: Protect other workers on site from welding flash, sparks and other potential injuries during welding activities.

Prefabricated frames

Protect frames from damage or distortion during storage, transport and erection.

Unseasoned Timber

Do not fix in contact with framing without fully painting the timber and/or the steel to avoid future rusting of the steel.

Earthing

Permanent earthing: Required.

Temporary earthing: Provide temporary earthing during erection until the permanent earthing is installed.

Protection

Coatings which have been damaged by welding or other causes shall be restored. Thoroughly clean affected areas to base metal and coat with zinc rich organic primer.

3.7.2.2 Trusses

Fabrication

Factory assemble trusses and transport to site where possible. Obtain approval from the Engineer if it is required to fabricate trusses on site.

Marking

Permanently mark each truss to show:

- Manufacturer.
- Tag or number.
- Location.
- Support points.

Installation

Fix to support structures, plumb to within $H/200$, where H is the height at the apex.

3.7.2.3 Completion

Cleaning

On completion of framing remove debris from any gaps between members.

3.8 STEELWORK PAINTING

3.8.1 GENERAL

3.8.1.1 InspectionNotice

Give sufficient notice so that inspection may be made of the following:

- Surfaces after preparation prior to application of first coating.
- Coating after application of final coat.

3.8.1.2 SamplesPainting and Coating Colour

Submit a sample of the finished product for each different coating system.

Size of each sample: 200 x 200 mm.

3.8.2 PRODUCTS

3.8.2.1 GeneralGeneral

All protective coatings must be handled, stored, mixed and applied strictly in accordance with the manufacturer's instructions and Product Data Sheets.

3.8.3 EXECUTION

3.8.3.1 ProtectionSurroundings

Provide protection of the surroundings to the coating works and ensure that no abrasive, overspray or paint waste debris is released either to air, ground or to any watercourse. Repair or clean damage as appropriate.

Contamination

Ensure protection of sensitive items during surface preparation and coating works. Do not permit surface preparation debris to contaminate coated surfaces which are not yet dry, nor cause damage to any other services or equipment.

Stacking and Handling

Do not stack, handle or transport coated items until the coating has sufficiently cured so as to resist handling actions.

Stack and handle all steelwork using fabric slings or padded chains, used in a manner that ensures that no damage is caused to the coating system. Adopt soft packaging, carpet strips or other deformable materials between all steel items. Do not permit steel to steel contact in any situation.

Water ponding: Stack coated items so that water ponding does not or cannot occur whilst the items are in storage, transport or "laydown".

Repair of Coating Damage

If damage occurs repair so as to ensure that the full corrosion protection ability of the system is reinstated.

3.8.3.2 Surface Preparation

General

Coatings shall be applied only to properly prepared and cleaned surfaces.

Surface Preparation

Ensure all surfaces are free from oil, grease, dirt, bird droppings or any other contaminants, particularly soluble contaminants.

Surface defects: Remove or correct other surface defects, including cracks, laminations, deep pitting, undercutting, weld spatter, slag, burrs, fins and sharp edges.

Remove all weld spatter by grinding or chipping.

Priming

Prime coat all surfaces with zinc rich primer on the same day as the completion of surface preparation works. In every case, the specified surface preparation standard, in both cleanliness and profile, shall be evident at the time that the primer coating is applied.

3.8.3.3 Coating application

General

Apply the coatings in accordance with the **Interior and Exterior Painting** schedules.

Final Surface Preparation or Coating Application

Limits: If the following climatic/substrate conditions are present do not apply coating:

- The ambient air temperature is below 5°C or above 40°C.
- The substrate temperature is below 10°C or above 35°C.
- The surface to be coated is wet or damp.

Defects: Apply materials so as to produce an even coating free from film defects.

Detail: Stripe coat all welds, bolt holes, sharp edges and difficult to spray areas by brushing in with the prime coat and intermediate coat material prior to the full coating application.

Subsequent Coats

Ensure that before any subsequent coating layer is applied, the surface condition of the preceding coat is complete and correct in all respects, including its cleanliness and freedom from defects. Correct any defects before the next coating layer is applied.

3.9 LIGHT TIMBERWORK**3.9.1 GENERAL****3.9.1.1 Inspection**Notice

Give sufficient notice so that inspection may be made of the following:

- Timber framing after erection before lining or cladding.
- Roof framing and connection to wall and ceiling structures.

3.9.1.2 SubmissionsDesign

The Contractor is to confirm that all proposed member sizes are available for the project in accordance with the drawings and BOQ. If selected sizes are not available, seek alternatives and obtain approval from the Engineer.

3.9.2 PRODUCTS**3.9.2.1 Timber**Timber Grades

Structural timbers:

- Appearance grade if exposed to view in the finished work:
Use best quality timber free from twists, knots, splits and other visual or physical defects.
- Structural grade if concealed in the building:
- Lower quality timber with some visual defects acceptable but with minimal physical defects.

3.9.2.2 Sheet ProductsStructural Plywood Panels

All structural plywood panels used for construction purposes are to be approved by the Engineer. Refer to drawings and BOQ for details of locations and sizes. All structural plywood is to be tested before use to the satisfaction of the Engineer to ensure that it will be suitable for the proposed use.

Use branded or certified plywood products where possible.

Hardboard or Fibreboard Panels

All hardboard or fibreboard panels used for construction purposes are to be approved by the Engineer. Refer to drawings and BOQ for details of locations and sizes. All material is to be tested before use to the satisfaction of the Engineer to ensure that it will be suitable for the proposed use.

Use branded or certified products where possible.

3.9.2.3 ComponentsSteel Post Bases

Minimum dimensions:

- Stirrup: 75 mm wide x 6 mm thick.
- Dowel: 20 mm diameter heavy tube.

Location: To timber posts supported off concrete slabs or footings.

Finish: Galvanize after fabrication.

Fasteners

Material:

Use best quality steel bolts, washers and nuts for bolted connections. Washers to be used both sides of timber to avoid crushing of the timber at the connection point.

Use best quality screws to avoid damage to screw heads during tightening process.

Use best quality bright steel nails for internal work protected from the weather and galvanised nails for external fixings exposed to the weather.

Lightweight alloy bolts and screws will not be permitted.

Installation: Pre drill holes in hardwood timber to avoid splitting the timber.

Do not split or otherwise damage the timber or fastener by hammering bolts or screws into the timber.

3.9.3 EXECUTION

3.9.3.1 General

Protection from Weather

General: Provide temporary protection for members until permanent covering is in place.

3.9.3.2 Floor framing

Bearers and Joists

Levelling: Level bearers and joists by packing for the full width of the member.

Joints: Locate joints only over supports:

- Minimum bearing of bearers: 50 mm.
- Minimum bearing of joists: 30 mm.

Fixing: Secure bearers and joists to supports to provide restraint against lateral movement.

Joist restraint: If joist timber is unseasoned, the span ≥ 3000 mm, provide solid blocking between each joist in rows at 1800 mm centres and at the ends of the joists over the supports.

Members: Provide bearers and joists where shown on the drawings and in the BOQ.

Flooring

Provide flooring of structural plywood where shown on the drawings and in the BOQ.

3.9.3.3 Roof and ceiling framing

Wall Plates

Fix timber wall plates to top of masonry walls with either straps or bolts, or provide fixings cast into the ring beam as required.

Ceiling Framing

Construct timber framed ceilings where shown on drawings with battens fixed to underside of trusses or ceiling joists as required.

Additional Support

Provide a frame member behind every joint in fibre cement sheeting or plywood lining to ensure that the lining is fully supported.

Roof Cladding Boards

Provide roof cladding boards minimum of 20mm thick to full extent of roof structure to support flat metal sheet roofing where shown on drawings. Securely fix to structure and ensure that the top surface is as smooth as possible to avoid damage to the roof sheeting.

3.9.3.4 Trusses

Installation

Support: Support trusses on bottom chord at two points only, unless designed for additional support.

Plumb: Within $H/200$, where H is the height.

Vertical movement: Over internal walls provide at least 10 mm vertical clearance and use bracing methods which allow for vertical movements.

Construction: Construct trusses strictly in accordance with the drawings. If variations are proposed due to construction fabrication or installation issues, obtain approval from the Engineer before changing the design.

3.9.3.5 Completion

Tightening

Tighten bolts, screws and other fixings so that joints and anchorages are secure at all times.

Clean up

Remove all shavings, discarded chips and pieces of timber from the structure during construction and clean up all working areas prior to Completion.

3.11 STRUCTURAL STEEL**3.11.1 GENERAL**

This section includes fabrication and erection of structural steel work, as shown on drawings including schedules, notes, and details showing size and location of members, typical connections, and types of steel required. Structural steel is that work defined in American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges" and as otherwise shown on drawings.

Related Sections: Refer to the following sections for related work:

3.1 Concrete Concrete General

3.8 Steelwork painting

3.10 Concrete Blockwork

REFERENCES

American Society of Testing and Materials (ASTM)

ASTM - A6: Specification for General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use

ASTM - A36: Specification for Structural Steel

ASTM - A53: Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

ASTM - A307: Specification for Carbon Steel Bolts and Studs, 60000 psi Tensile Strength

ASTM - A325: Specification for High-Strength Bolts for Structural Steel Joints

ASTM - A500: Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

ASTM - A501: Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing

ASTM - E94: Guide for Radiographic Testing

ASTM - E142: Method for Controlling Quality of Radiographic Testing

ASTM - F959: Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners

American Welding Society (AWS)

AWS - D1.1: Structural Welding Code - Steel

3.11.1.1 InspectionNotice

Give notice so that inspection may be made of steel framing before erection, lining or cladding.

3.11.1.2 SubmissionsProduct Data:

Submit product data or manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

- Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.

- Anchor bolts.
- Unfinished threaded fasteners.
- High-strength bolts (each type), including nuts and washers; include direct tension indicators if used.

Material Safety Data Sheets (MSDS):

Submit MSDS for structural steel (each type), anchor bolts, unfinished threaded fasteners, high-strength bolts (each type) including nuts and washers, structural steel primer paint and nonmetallic shrinkage-resistant grout.

Shop drawings:

Submit shop drawings, including complete details and schedules for fabrication and assembly of structural steel members, procedures, and diagrams.

- Include details of cuts, connections, cambers, holes and other pertinent data. Indicate welds by standard AWS symbols and show size, length, and type of each weld.
- Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other sections.

Welder Certifications:

Provide certification that welders to be employed in work have satisfactorily passed qualification tests in accordance with AWS D1.1. If recertification of welders is required, retesting will be Contractor's responsibility.

Test reports:

Submit test reports conducted on shop- and field-bolted and welded connections. Include data on type(s) of tests conducted and test results.

Welding Procedures:

Provide written welding procedure specification (WPS) document per AWS Code requirements.

QUALITY ASSURANCE

Codes and Standards: Comply with provisions of the following, except as otherwise indicated:

- AISC "Code of Standard Practice for Steel Buildings and Bridges" with paragraph 4.2.1 modified by deletion of the following sentence: "This approval constitutes the owner's acceptance of all responsibility for the design adequacy of any detail configuration of connections developed by the fabricator as a part of his preparation of these shop drawings."
- AISC "Specifications for Structural Steel Buildings" including the "Commentary", later referred to as "AISC Specifications".
- ASTM A325 or A490 Bolts "Specifications for Structural Joints using".
- AWS D1.1
- ASTM A6

Qualifications for Welding Work: Qualify welding procedures and welding operators in accordance with the requirements of AWS D1.1.

All materials used shall not contain asbestos fibers.

DELIVERY, STORAGE, AND HANDLING

- Deliver materials to site at such intervals to ensure uninterrupted progress of work.
- Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time so that work will not be delayed.
- Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration. If bolts and nuts become dry or rusty, clean and lubricate before use.

Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PROJECT CONDITIONS

Field Measurements: Check actual locations of walls and other construction to which steel framing must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings.

3.11.2 PRODUCTS

3.11.2.1 Materials

Metal Surfaces, General: For fabrication of work that will be exposed to view, use only materials that are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and applying surface finishes.

Structural Steel Shapes, Plates, and Bars: ASTM A36

Cold-Formed Steel Tubing: ASTM A500, Grade B.

Hot-Formed Steel Tubing: ASTM A501.

Steel Pipe: ASTM A53, Type E or S, Grade B; or ASTM A501.

Finish: Black, except where indicated to be galvanized.

Steel Castings: ASTM A27, Grade 65-35, medium-strength carbon steel.

Headed Stud-Type Shear Connectors: ASTM A108, Grade 1015 or 1020, cold-finished carbon steel with dimensions complying with AISC Specifications.

Anchor Bolts: ASTM A307, nonheaded type unless otherwise indicated.

Unfinished Threaded Fasteners: ASTM A307, Grade A, regular low-carbon steel bolts and nuts; provide hexagonal heads and nuts for all connections.

High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:

- Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A325.
- Where indicated as galvanized, provide units that are zinc-coated, either mechanically deposited complying with ASTM B695, Class 50, or hot-dip galvanized complying with ASTM A153.

Direct Tension Indicators: ASTM F959, type as required; use at Contractor's option.

Electrodes for Welding: Comply with AWS Code.

Structural Steel Primer Paint: Red oxide, lead- and cadmium-free, corrosion-inhibiting primer complying with performance requirements of FS TT-P-664.

Non-metallic Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107 (formerly referenced as CE CRD C621).

Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

100 Non-Shrink Grout (Non-Metallic) - Conspec, Inc.

Crystex - L & M Construction Chemicals, Inc.

Euco N-S Grout - Euclid Chemical Co.

Kemset - Chem-Masters Corp.

SonogROUT - Sonneborn Building Products Div., Rexnord Chemical Products, Inc.

Supreme Grout - Cormix, Inc.

Sure-Grip High Performance Grout - Dayton Superior

Vibropruf #11 - Lambert Corp.

3.11.2.2 Fabrication

Shop Fabrication and Assembly:

Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.

- Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.

- Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

Connections:

Weld or bolt shop connections, as indicated.

- Bolt field connections, except where welded connections or other connections are indicated.

- Provide high-strength threaded fasteners, unless otherwise indicated.

High-Strength Bolted Connections:

Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A325 or A490 Bolts".

Welded Construction:

Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.

Shear Connectors:

Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld shear connectors in field, spaced as shown, to beams and girders in composite construction. Use automatic end welding of headed stud shear connectors in accordance with manufacturer's printed instructions.

Steel Wall Framing:

Select members that are true and straight for fabrication of steel wall framing. Straighten as required to provide uniform, square, and true members in complete wall framing.

Build up welded door frames attached to structural steel framing. Weld exposed joints continuously and grind smooth. Plug-weld steel bar stops to frames, except where shown removable. Secure

removable stops to frames with countersunk, cross-recessed head machine screws, uniformly spaced not more than 10 inches (25 cm) o.c., unless otherwise indicated.

Holes for Other Work:

Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on final shop drawings.

- Provide threaded nuts welded to framing and other specialty items as indicated to receive other work.
- Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.

3.11.2.3 Shop Drawing

General:

Shop-paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel that is partially exposed on exposed portions and initial 2 inches (51 mm) of embedded areas only.

- Do not paint surfaces to be welded or high-strength bolted with friction-type connections.
- Do not paint surfaces scheduled to receive sprayed-on fireproofing.
- Apply 2 coats of paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

Surface Preparation:

After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Clean steel in accordance with SSPC as follows:

SP-1 "Solvent Cleaning"

SP-2 "Hand-Tool Cleaning"

SP-3 "Power-Tool Cleaning"

Painting:

Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 3.0 mils. Use painting methods that result in full coverage of joints, corners, edges, and exposed surfaces. Refer to 3.8 Steelwork Painting and 6.6 Painting Sections for more details.

3.11.2.4 Source Quality Control

Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements. Promptly remove and replace materials or fabricated components that do not comply.

3.11.3 EXECUTION

3.11.3.1 Erection

Temporary Shoring and Bracing:

Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place

and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.

Anchor Bolts:

Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work. Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate locations.

Setting Bases and Bearing Plates:

Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.

- Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
- Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
- Pack grout solidly between bearing surfaces and bases or plates to insure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
- For proprietary grout materials, comply with manufacturer's instructions.

Field Assembly:

Set structural frames accurately to lines and elevations indicated and in accordance with AISC Specifications. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

- Level and plumb individual members of structures within specified AISC tolerances.
- Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
- Splice members only where indicated and accepted on shop drawings.
- Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
- Do not enlarge unfair holes in members by burning or by using drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

Gas Cutting:

Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members that are not under stress, as acceptable to the SDR. Finish gas-cut sections equal to a sheared appearance when permitted. Comply with NFPA 51B for cutting processes.

Touch-Up Painting:

Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.

Apply by brush or spray to provide minimum dry film thickness of 3.0 mils.

3.11.3.2 Quality Control

Sandia National Laboratories (SNL) may engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.

- Testing agency shall conduct and interpret tests, state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.
- Provide access for testing agency to places where structural steel work is being fabricated or produced so required inspection and testing can be accomplished.
- Testing agency may inspect structural steel at plant before shipment. SNL reserves the right, at any time before construction complete, to reject materials not complying with specified requirements.

Correct Deficiencies in structural steel work that inspections and laboratory test reports have indicated are not in compliance with requirements. Perform additional tests, at Contractor's expense, as necessary to reconfirm any noncompliance of original work and to show compliance of corrected work.

Shop-Bolted and Field-Bolted Connections: Inspect or test in accordance with AISC Specifications.

Verify that gaps of installed direct tension indicators are less than gaps specified in ASTM F959, Table 2.

Shop Welding and Field Welding: Inspect and test during fabrication for shop welding and during erection for field welding, of structural steel assemblies, as follows:

- Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
- Perform visual inspection of all welds.
- Perform tests up to and including 100% of welds at SNL's option. Inspection procedures may include the following:
 - a. Liquid Penetrant Inspection: ASTM E165.
 - b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not acceptable.
 - c. Radiographic Inspection: ASTM E94 and ASTM E142; minimum quality level "2-2T".
 - d. Ultrasonic Inspection: ASTM E164.

Acceptance criteria shall be as specified in AWS D1.1.

3.11.3.3 CompletionCleaning

On completion of framing remove debris from any gaps between members.

4.1 WATERPROOFING**4.1.1 GENERAL****4.1.1.1 Interpretations**Definitions

Performance Requirements:

Provide waterproofing that prevents the passage of water through surfaces.

For the purposes of this worksection the definitions given below apply.

Substrates: The surfaces on which membrane systems are laid.

Bitumen: A viscous material comprising complex hydrocarbons which is soluble in carbon disulphide, softens when it is heated, is waterproof and has good powers of adhesion. It is produced as a refined by-product of oil.

Bond breakers: Layers which prevent membranes from bonding to the backgrounds.

Membranes: Impervious barriers to liquid water which may be:

Liquid applied: Membranes applied in liquid or gel form and air cured to form a seamless film.

Sheet applied: Membranes applied in sheet form with joints lapped and bonded.

Membrane systems: Combinations of membranes, flashings, drainage and accessories which form waterproof barriers and which may be:

- Loose-laid.
- Bonded to backgrounds fully or partially.

4.1.1.2 InspectionNotice

Give sufficient notice so that inspection may be made as follows:

- Background preparation completed.
- Before membranes are finished, covered up or concealed.

4.1.2 PRODUCTS**4.1.2.1 Membranes**Membrane Systems

To be proprietary membrane systems where possible having certification from an international testing organisation.

Internal Roof Outlets for Membrane Roof

Proprietary funnel shaped sump cast into the roof slab, set flush with membrane, with a flat removable grating and provision (e.g. clamp ring) for sealing the membrane into the base of the outlet.

4.1.3 EXECUTION

Refer to **Single layer, Multi layer and Liquid Waterproofing System** schedules for details of systems.

4.1.3.1 Preparation

General

Prepare backgrounds as follows:

- Check that pipes, conduits and other penetrations of waterproofing membrane have been installed before beginning this work.
- Fill all cracks in backgrounds wider than 1.5 mm with a filler compatible with the membrane system. Remove ridges and fins, leaving a smooth, clean surface.
- Fill voids and hollows in concrete backgrounds with a concrete mix not stronger than the background.
- Remove excessive projections.
- Remove deleterious and loose material.
- Check that areas to be waterproofed slope to drain, are clean and dry. Leave the surface free of contaminants, clean and dust free.

Moisture Content

Concrete backgrounds: Cure for > 21 days.

Falls

Verify that falls in backgrounds are > 1:100.

Joints and Fillets

Internal corners: Provide 45° fillets.

External corners: Round or arris edges.

Movement control joints: Prepare all background joints to suit the membrane system.

Priming

If required, prime the backgrounds with compatible primers to ensure adhesion of membrane systems.

4.1.3.2 Application

Job Conditions

- Apply waterproofing materials when the temperature in the space to be waterproofed and the substrate to be waterproofed are above 5-degree C.
- Do not apply waterproofing materials to damp, wet or frost covered surfaces.
- Illuminate work areas during installation to provide the same or greater level of illumination required to properly perform this work, and as will occur in the room or space after the building is in operation.
- Examine surfaces to be waterproofed.
- Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

Protection

Protect membrane from damage during installation.

Drains

Prevent moisture from tracking under the membranes at drainage locations.

Drains and cages: Provide grates or cages, to prevent blockage from debris.

Overflows: Turn the membranes into the overflow to prevent moisture from tracking behind the membrane.

Sheet joints

Bituminous sheet membranes:

- Side laps > 50 mm.

- End laps > 100 mm.

Synthetic rubber membranes:

- Factory–vulcanized laps > 40 mm.

- Field side laps > 50 mm for side laps.

- Field end-laps > 100 mm for end laps.

Curing of liquid applied systems

To the manufacturers' instructions.

Movement Control Joints

Locate over movement control joints in the substructure.

Fillets and bond breakers: Provide of sufficient dimension to allow the membrane to accommodate the movement.

Bonded membranes: Carry movement joints in the substrate through the surface finish.

Membrane Terminations

Edge protection: Provide upturns above the maximum water level expected from the exposure conditions of rainfall intensity and wind.

- Minimum height of 200mm for all upturns above membrane level unless noted otherwise on the drawings.

- Anchoring: Secure sheet membranes along the top edge.

- Edge protection: Protect edges of the membrane.

- Waterproofing above terminations: Waterproof the structure above the termination to prevent moisture entry behind the membrane using cappings, waterproof membranes or waterproof coatings.

Membrane Vertical Penetrations

Pipes, ducts, and vents: Provide separate sleeves for all pipes, ducts, and vents and have them fixed to the substrate. Minimum height of 200mm for all sleeves above membrane level unless noted otherwise on the drawings.

Overlaying Finishes on Membranes

Compatibility: If a membrane is to be overlayed with another system such as tiles, pavers, ballast, insulation, soil, and the like, provide an overlaying system that is compatible with and not cause damage to the membrane.

Ensure that no damage is caused to the membrane during the laying of the overlay material. If any damage occurs immediately stop work and repair the damage before proceeding with the overlay process.

Bonded or partially bonded systems: If the topping or bedding mortar requires to be bonded to the membrane, provide sufficient movement joints in the topping or bedding mortar to reduce the movement over the membrane.

Warranty

Submit sample copies of warranty for waterproofing membrane to be provided under this Section, clearly defining terms, conditions, and time periods for the warranty.

4.2 ROOFING

4.2.1 GENERAL

4.2.1.1 InspectionNotice

Give sufficient notice so that inspection may be made of:

Roof framing during construction.

Those parts of the roofing, vapour barrier, insulation and roof plumbing installation which will be covered up or concealed.

4.2.1.2 SubmissionsSamples

Submit samples of the following showing the range of variation available:

- Corrugated and flat metal roof sheeting
- Roof cappings, flashings, gutters, downpipes

4.2.2 PRODUCTS

4.2.2.1 Materials and componentsFasteners

Self-drilling screws: Corrosion resistant screws to approval of Engineer.

Nuts and bolts: Corrosion resistant fastenings to approval of Engineer.

Fastenings to timber battens or purlins: Provide fastenings just long enough to penetrate the thickness of the timber without piercing the underside.

4.2.2.2 Corrugated metal roofing and claddingGeneral

Provide a proprietary system of preformed corrugated sheets and all purpose-made accessories required to complete the installation to roof framing or wall framing. Refer to **Corrugated sheet roofing materials schedule** for details.

4.2.2.3 Flat Sheet metal Roofing and CladdingGeneral

Provide a system of flat metal sheets and all purpose-made accessories required to complete the installation to roof framing or wall framing. Refer to **Flat sheet roofing materials schedule** for details.

4.2.2.4 Glazed Roofing and SkylightsGeneral

Provide a proprietary overhead glazing system fixed to glazing bars or directly to the roof framing. Provide all purpose-made accessories required to complete the installation. Refer to **Glazed roofing materials and skylight schedule** for details.

4.2.2.5 Roof Ventilators

General

Provide proprietary roof mounted ventilators and all purpose-made accessories required to complete the installation where shown on the drawings to ventilate the roof space.

Provide fabricated ventilators in walls as shown on the drawings to ventilate the roof space.

Refer to **Roof ventilators schedule** for details.

4.2.3 EXECUTION

4.2.3.1 Installation

Protection

Keep the roofing and rainwater system free of debris and loose material during construction, and leave them clean and unobstructed on completion. Repair damage to the roofing and rainwater system.

If it is necessary to repair minor damage to metal roofing, do so immediately after the damage has occurred. The Contractor is take care to not damage other surfaces during the repair works.

Thermal Movement

Provide for thermal movement in the roof installation and the structure, including movement in joints and fastenings.

4.2.3.2 Sheet Metal Roofing and Cladding

Roofing Sheet Installation

Fixings: Provide all fixings required to fix the roof sheeting to the framing so that the entire roof covering is waterproof and secure. All loose edges are to be fixed down to ensure that they cannot get loose in high winds.

Expansion joints: refer to drawings for locations of expansion joints in roofs and details of construction.

Ridges and Eaves

Treat ends of sheets as follows:

- Project sheets 50 mm into gutters.

- Close off ribs of ribbed sheeting at bottom of sheets using mechanical means or with purpose-made end caps.

- Turn pans of ribbed sheeting up at tops and down into gutters by mechanical means.

- Provide pre-cut notched eaves flashings and birdproofing wire mesh where necessary.

Ridge and Eaves Capping

Finish off along ridge and side eaves edges with purpose-made ridge capping and eaves cappings.

End Laps

Where end laps are unavoidable in roof sheeting, and the sheet profile is not suitable for interlocking or contact end laps, construct a stepped type lap. Refer to details on drawings as required.

Length of lap (mm): Laps to ends of sheets should not be less than 150mm and sealed with a continuous line of silicone sealant between the sheets of roofing.

Curved Corrugated Sheet

Form by rolling from material recommended for curving. Minimise crimping or creasing across the face of the sheet. Trim off crimped or creased edges and ends.

K-Span roofing where identified on the drawings is to be strictly controlled during the installation process to ensure that the completed work is of a high standard.

Cladding Sheet Installation

Fixings: Provide all fixings required to fix the wall cladding sheeting to the framing so that the entire wall is waterproof and secure. All loose edges are to be fixed to ensure that they cannot get loose in high winds.

Expansion joints: refer to drawings for locations of expansion joints in walls and details of construction.

Flashings: Flashings are required at the top, sides and bottom of all metal wall cladding to ensure that the wall is waterproof in all weather conditions.

Metal Separation

Prevent direct contact between incompatible metals, and between green hardwood and aluminium or coated steel, by either:

- Applying an anti-corrosion, low moisture transmission coating to contact surfaces.
- Inserting a separation layer.

4.2.3.3 Glazed Roofing and Skylights

Installation

Fixing: Fix all glazed roof panels and skylights in accordance with the drawings.

Flashings: Flashings are required at the top, sides and bottom of all glazed roof panels and skylights to ensure that the roof is waterproof in all weather conditions.

4.2.3.4 Roof Ventilators

Installation

Fixing: Fix roof ventilators in accordance with the manufacturers construction details or in accordance with the drawings for fabricated ventilators.

4.2.3.5 Roof Plumbing

Refer to the **Gutter and downpipe schedule** for details.

General

Provide the flashings, cappings, gutters, rainwater heads, outlets and downpipes necessary to complete the roof system.

Joining Sheet Metal Rainwater Goods

Butt joints: Make joints over a backing strip of the same material.

Soldered joints: Do not solder aluminium or aluminium/zinc-coated steel.

Sealing: Seal fasteners and mechanically fastened joints. Fill the holes of blind rivets with silicone sealant.

Jointing system: Refer to the **Gutter and downpipe schedule** for specific jointing details for each type of element.

Flashings and Cappings

Installation: Flash roof junctions, upstands, abutments and projections through the roof. Preform to required shapes where possible. Cut, notch, bend or dress down as necessary to follow the profile of adjacent surfaces. Lap joints 150 mm in running lengths. Provide matching expansion joints at 6 m maximum intervals.

Upstands: Flash projections above or through the roof with two part flashings, consisting of a base flashing and a cover flashing, with at least 100 mm vertical overlap. Provide for independent movement between the roof and the projection.

Wall abutments: Provide overflashings where roofs abut walls, stepped to the roof slope in brickwork.

In masonry: Build cover flashing at least 100mm into the wall at least 250mm above the roof level.

Provide base flashing on roof and provide at least 100mm vertical overlap.

In concrete: Turn cover flashing at least 30 mm into sawcut grooves at least 250mm above the roof level, wedge at 200 mm centres with compatible material and render over top of flashing.

Provide base flashing on roof and provide at least 100mm vertical overlap.

Fixing to pipes: Solder, or seal with neutral cured silicone rubber and either of the following:

Secure with a clamping ring.

Provide a proprietary flexible clamping shoe with attached metal surround flashing.

Gutters

Prefabricate gutters to the required shape where possible. Form stop ends, bends and returns. Provide overflows to prevent back-flooding.

Gutter and sump support: Provide framing and lining to support valley gutters, box gutters and sumps. Line the whole area under the gutters and sumps.

Support: Steel straps as shown on drawings or as approved by the Engineer.

Lining: Timber boards or plywood as shown on drawings or as approved by the Engineer.

Valley gutters: Profile to suit the valley boarding. Nail or screw to the valley boarding at the top end to prevent the gutter creeping downwards.

Gratings and guards: Provide removable gratings over rainwater heads and sumps:

Type: Wire mesh cages reinforced with steel bars where required due to size and expected snow loads. Refer to drawings for details.

Expansion joints: Provide expansion joints in guttering longer than 30 m:

Type: Refer to drawings for details.

Downpipes

Prefabricate downpipes to the required section and shape where possible. Connect heads to gutter outlets and, if applicable, connect feet to rainwater drains.

Access cover: Provide a removable watertight access cover at the foot of each downpipe stack if the downpipe is connected to rainwater drains.

Downpipe support: Provide supports and fixings for downpipes.

4.2.3.6 Roof Mounted Equipment Access

Walkway

Product: Provide proprietary walkway system to locations as shown on drawings. Provide fabricated system constructed as shown on drawings. Fabricate in accordance with metalwork section of the specification.

Installation: Install proprietary systems in accordance with manufacturers details and as identified on drawings.

4.2.4 COMPLETION

4.2.4.1 Roof Inspection

The Contractor is to closely inspect the entire roof covering and metal cladding to walls at completion of the works.

Make good any defects or damage to the sheeting, cappings or flashings. Remove all loose metal and other rubbish, spare nails, screws, filings and other debris.

Clean down the roof, gutters, downpipe outlets to ensure that it is good condition ready for occupation.

4.3 WINDOWS AND WINDOW HARDWARE**4.3.1 GENERAL****4.3.1.1 Interpretation**Definitions

For the purposes of this worksection windows also includes louvres, either vertical or horizontal, set into frames.

4.3.1.2 InspectionNotice

Give sufficient notice so that inspection may be made of the following:

- Openings prepared to receive windows (where windows are to be installed in prepared openings).
- Fabricated window assemblies delivered to the site, before installation.
- Commencement of window installation.

4.3.2 PRODUCTS**4.3.2.1 Louvre assemblies**General

Provide louvre blades mounted in a surround frame and able to withstand the wind pressure for that location without failure or permanent distortion of blades, and without blade flutter.

Adjustable louvres

Provide louvre blades clipped into holders which pivot, linked together in banks, each bank operated by an operating handle incorporating a latching device, or by a locking bar.

Screens

Provide metallic coated steel wire mesh screens behind louvres to prevent the entry of birds, rodents and wind blown leaves and papers.

4.3.2.2 Insect screensAluminium Framed Screens

Provide insect screens with mesh frame channel. Provide an extended frame section where necessary to adapt to window opening gear.

Mesh: Fix the mesh into the frame channel with a continuous resilient gasket, so that the mesh is taut and without distortion.

Fixed Screens

Provide fixed screens to the window frames with a clipping device which permits removal for cleaning.

Hinged Screens

Hinge at the side to give access to opening sash.

Sliding Screens

Provide a matching aluminium head guide, sill runner, and frame stile sections for screens not part of the window frame.

Hardware: Nylon slide runners and finger pull handle.

4.3.2.3 Security Window Grilles

General

Provide security grilles in accordance with the drawings or proprietary metal security grille screens, fixed to the building structure with tamper resistant fastenings.

4.3.2.4 Window Hardware

Hardware

Provide hardware of sufficient strength and quality to perform its function, appropriate to the intended conditions of use and climate and fabricated with fixed parts firmly joined.

4.3.3 EXECUTION

4.3.3.1 INSTALLATION

General

Install windows so that the frames:

- Are plumb, level and straight within acceptable building tolerances.
- Are fixed or anchored to the building structure to resist the wind loading.
- Will not carry any building loads, including loads caused by structural deflection.
- Allow for thermal movement.

Flashing and Weatherings

Install moulds, sealant and cement pointing as required so that water is prevented from penetrating the building between the window frame and the building structure.

Fixing and Fasteners

Materials: Use materials compatible with the item being fixed and of sufficient strength, size and quality to perform their function.

Concealed fixings: Provide a corrosion resistant finish.

Exposed fixings: Match exposed fixings to the material being fixed.

Support: Provide appropriate back support (for example blocking and backing plates) for hardware fixings.

Window fastener spacing (nominal): 600 mm.

Window fasteners: Conceal fasteners where possible.

Packing: Pack behind fixing points with durable full width packing.

Prepared masonry openings: If fixing timber windows into existing prepared openings with fastenings through the frame face, make the fastener heads finish below the surface and fill the hole for a smooth surface finish.

Joints

Make accurately fitted tight joints so that neither fasteners nor fixing devices such as pins, screws, adhesives and pressure indentations are visible on exposed surfaces.

Operation

Ensure moving parts operate freely and smoothly, without binding or sticking and are lubricated.

Supply

Deliver window hardware items, ready for installation, in individual complete sets for each window.

In a separate dust and moisture proof package labelled for the specific window.

Including the necessary templates, fixings and fixing instructions.

Refer to the drawings and **Window, Louvre and Security grille/shutter schedules** for details of windows. Refer to the **Window hardware schedule** for details of window hardware.

4.3.4 COMPLETION

4.3.4.1 Cleaning

The Contractor is to clean all frames, glass, hardware at completion. Any damage to frames, or broken glass is to be repaired or replaced to the satisfaction of the Engineer.

4.3.4.2 Adjustment

Leave the hardware properly adjusted with working parts in working order and lubricated where appropriate.

4.4 DOORS AND DOOR HARDWARE**4.4.1 GENERAL****4.4.1.1 Interpretation**Definitions

For the purposes of this worksection the definitions given below apply.

Door frame: Includes door trims.

Doorset: An assembly comprising a door or doors and supporting frame, guides and tracks including the hardware and accessories necessary for operation.

Fire-doorset: A doorset which retains its strength and limits the spread of fire.

Smoke-doorset: A doorset which restricts the movement of smoke.

Flush door: A door leaf having two flat faces which entirely cover and conceal its structure. It includes doors with cellular and particleboard cores.

Joinery door: A door leaf having stiles and rails, framed together. A joinery door may also incorporate glazed panels.

Louvred door: A joinery door in which the panel spaces are filled in with louvre blades.

4.4.1.2 InspectionNotice

Give sufficient notice so that inspection may be made of the following:

- Door frames standing in place before building in to brickwork.
- Door frames installed before fixing trim.

4.4.1.3 SubmissionsSamples

Submit samples of all hardware items for approval by the Engineer before use in the works.

Subcontractors

Automatic sliding door assemblies: Submit names and contact details of proposed supplier and installer.

Product Warranties

Automatic sliding door assemblies: Submit a warranty from the supplier and installer for the system and its installation, for a period of at least twelve months from the date of completion.

Hardware: Submit the warranties offered by the manufacturer for the hardware items provided in the works.

Keys

Key codes: Submit the lock manufacturer's record of the key coding system showing each lock type, number and type of key supplied, key number for re-ordering, and name of supplier.

Keys: For locks keyed to differ and locks keyed alike, verify quantities against key records, and deliver all keys and records to the Engineer at completion.

4.4.2 PRODUCTS

4.4.2.1 Frames

Aluminium Frames

To be assembled from aluminium sections, including necessary accessories such as buffers, strike plates, fixing ties or brackets, and suitable for fixing specified hardware.

Timber Frames

To be constructed with best quality timber. Obtain approval from the Engineer for the timber selection before use. Construct as shown on the drawings and ensure that all joints are securely made to avoid distortion of the frame in use.

Steel Frames

To be folded from metallic-coated steel sheet sections, joints to be continuously welded, including necessary accessories such as buffers, strike plates, spreaders, fixing ties or brackets, and suitable for fixing specified hardware.

Finish: Grind the welds smooth, prepare and paint the welded joints with primer. Then prime the entire frame.

Hardware and accessories: Provide for fixing hardware including hinges and closers, using 4 mm backplates inside the frame. Screw fix the hinges into the back plates.

Base metal thickness:

- General: ≥ 1.1 mm.
- Fire rated doorsets: ≥ 1.4 mm.
- Security doorsets: ≥ 1.6 mm.

4.4.2.2 Doors

Flush Doors

Cellular core flush doors:

- Provide a subframe of 25 mm minimum width timber around openings for louvres and glazing.
- Provide additional material to take hardware and fastenings.
- Cut outs: If openings are required in flush doors (e.g. for louvres or glazing) make the cut outs not closer than 120 mm to the edges of the doors.

Solid core flush doors:

- Core of timber strips laid edge to edge, fully glued to each other and to facings each side of no less than two sheets of timber veneer.
- Single thickness of moisture resistant general purpose particleboard.

Refer to drawings and **Flush Doors** schedule for details.

Joinery Doors

Fabricate joinery doors as shown on the drawings and in the **Joinery Doors** schedule.

PVC Doors

Fabricate PVC doors as shown on the drawings and in the **PVC Doors** schedule.

Construction

Form rebates to suit standard rebated door hardware.

Louvre grilles: Construct by inserting the louvre blades into a louvre frame, and fix the frame into the door.

Double doors

Provide rebated meeting stiles unless the doors open in both directions. Chamfer square edged doors to prevent binding between the leaves.

4.4.2.3 Doorsets

Automatic Sliding Door Assemblies

Provide auto sliding door assemblies in accordance with the **Automatic door schedule**.

Toughened Glass Door Assemblies

Provide toughened glass door assemblies with matching concealed hinges and patch fittings as appropriate. Ensure that all glass edges are protected during installation and polish on completion.

Fire-Resistant Doorsets

Provide fire resistant doors and frames as matched sets for door openings required to have a fire rating. Refer to the **Fire and smoke resistant doorsets schedule** for details.

Provide copies of test certificates from recognised authorities proving the performance of the doorsets.

Smoke-Resistant Doorsets

Provide smoke resistant doors and frames as matched sets for door openings required to have a smoke stopping capability. Refer to the **Fire and Smoke Resistant Doorsets** schedule for details.

Provide copies of test certificates from recognised authorities proving the performance of the doorsets or seals to frames.

Security Screen Doorsets

Provide security screen doorsets in accordance with the **Security Screen Doors** schedule.

4.4.2.4 Ancillary materials

Nylon brush seals

To be dense nylon bristles locked into galvanized steel strips and fixed in a groove in the edge of the door or in purpose-made anodised aluminium holders fixed to the door

Pile weather strips

To be polypropylene or equivalent pile and backing, low friction silicone treated, ultra-violet stabilised.

Door Seals

To be proprietary items as identified in Schedules and to approval of Engineer.

4.4.2.5 Hinges

Butt hinge sizes

Refer to **Hinge Table A** and **Hinge Table B** in which length (l) is the dimension along the knuckles, and width (w) is the dimension across both hinge leaves when opened flat.

- Steel, stainless steel, brass, bronze butt hinges for timber doors in timber or steel frames: To **Hinge table A.**
- Aluminium hinges for aluminium doors, or for doors of other materials in aluminium frames: To **Hinge table B.**

Hinge materials

Aluminium hinges: High tensile aluminium with fixed stainless steel pins in nylon bushes, and with nylon washers to each knuckle joint.

Doors fitted with closers: Provide low friction bearing hinges.

Hinge Pins

Exterior or security doors opening out: Provide fixed pin hinges.

Hinge Table A

Nominal hinge size l x w x t (mm)	Door leaves not exceeding any of the following		
	Mass (kg)	Width (mm)	Thickness (mm)
70 x 50 x 1.6	16	620	30
85 x 60 x 1.6	20	820	35
100 x 75 x 1.6	30	920	40
100 x 75 x 2.5	50	920	50
100 x 75 x 3.2	70	1020	50
125 x 100 x 3.2	80	1220	50

Hinge Table B

Nominal hinge size l x w x t (mm)	Door leaf not exceeding mass (kg)	Minimum construction	
		Knuckles	Screws/hinge leaf
100 x 70 x 3	30	3	3
100 x 80 x 3.5	50	5	4

Number of Hinges

Provide 3 hinges for doors up to 2200 mm high, and 4 for door leaves between 2200 mm and 3000 mm high.

Wide Throw

If necessary, provide wide throw hinges to stop doors binding on obstacles such as nibs or deep reveals.

4.4.2.6 Door Hanging Systems

General

Provide sliding door tracks in conformance with the schedules.

4.4.2.7 Locks and Latches

General Door Hardware

Provide hardware of sufficient strength and quality to perform its function, appropriate to the intended conditions of use and climate and fabricated with fixed parts firmly joined.

Bolts

Provide bolts including barrel bolts and tower bolts with associated hardware, including lock plates, ferrules or floor sockets.

Furniture

Provide lock and latch furniture suitable for use with the lock or latch to which it is installed with the corresponding level of performance.

Strike Plates

Use strike plates provided with the locks or latches.

Fire Rated Door closers

Provide closers tested and certified for use as components of fire door assemblies.

Door Controllers Performance

Provide door controllers, including door closers, floor or head spring pivots which are suitable for the door type, size, weight and swings required and the operating conditions, including wind pressure.

4.4.3 EXECUTION

4.4.3.1 Frames

General

Install doors so that the frames:

- Are plumb, level and straight within acceptable building tolerances.
- Are fixed or anchored to the building structure to resist the wind loading.
- Will not carry any building loads, including loads caused by structural deflection.
- Allow for thermal movement.

Flashing and Weatherings

Install moulds, sealant and cement pointing as required so that water is prevented from penetrating the building between the door frame and the building structure.

Aluminium frames

Building in to masonry: Screw galvanized steel brackets twice to jambs and build in.

Fixing to masonry openings: Use proprietary expansion anchors and screw through jambs at each fixing.

Frame Fixing

Brackets: Metallic-coated steel:

- Width: ≥ 25 mm.
- Thickness: ≥ 1.5 mm.

Jamb fixing centres: ≤ 600 mm.

Fixing and Fasteners

Materials: Use materials compatible with the item being fixed and of sufficient strength, size and quality to perform their function.

Concealed fixings: Provide a corrosion resistant finish.

Exposed fixings: Match exposed fixings to the material being fixed.

Support: Provide appropriate back support (for example blocking and backing plates) for hardware fixings.

Packing: Pack behind fixing points with durable full width packing.

Prepared masonry openings: If fixing timber door frames into existing prepared openings with fastenings through the frame face, make the fastener heads finish below the surface and fill the hole for a smooth surface finish.

Joints

Make accurately fitted tight joints so that neither fasteners nor fixing devices such as pins, screws, adhesives and pressure indentations are visible on exposed surfaces.

Operation

Ensure moving parts operate freely and smoothly, without binding or sticking and are lubricated.

Supply

Deliver door hardware items, ready for installation, in individual complete sets for each door.

In a separate dust and moisture proof package labelled for the specific door.

Including the necessary templates, fixings and fixing instructions.

Refer to the drawings and **Flush doors, Joinery doors, PVC doors, Security screen doors, Fire and smoke resistant doorset** and **Automatic door schedules** for details of frames, doors and hardware.

4.4.4 COMPLETION

4.4.4.1 Cleaning

The Contractor is to clean all frames, doors, glass, hardware at completion. Any damage to frames and doors, or broken glass is to be repaired or replaced to the satisfaction of the Engineer.

4.4.4.2 Adjustment

Leave the hardware properly adjusted with working parts in working order and lubricated where appropriate.

4.5 GLAZING

4.5.1 GENERAL

4.5.1.1 InspectionNotice

Inspection: Give sufficient notice so that inspection may be made of the following:

- Glass products before they are installed.

4.5.2 PRODUCTS

4.5.2.1 GlassGlass and Glazing Materials

Glass and glazing materials generally: Free from defects which detract from appearance or interfere with performance under normal conditions of use.

Glazing plastics: Free from surface abrasions, and warranted by the manufacturer for 10 years against yellowing or other colour change, loss of strength and impact resistance, and general deterioration.

Refer to **Annealed Glasses**, **Processed Glasses** and **Fabricated Glass Units** schedules for specific details for the works.

4.5.2.2 Glazing materialsGeneral

Glazing materials (including putty, glazing compounds, sealants, gaskets, glazing tapes, spacers, setting blocks): Appropriate for the conditions of application and the required performance.

Jointing Materials

Provide recommended jointing and pointing materials which are compatible with each other and with the contact surfaces and non staining to finished surfaces. Do not provide bituminous materials on absorbent surfaces.

Pile Weather Strips

Materials: Polypropylene or equivalent pile and backing, low friction silicone treated, ultra violet stabilised.

Finned type: A pile weather seal with a central polypropylene fin bonded into the centre of the backing rod and raised above the pile level.

Extruded Gaskets and Seals

Type: Non cellular (solid) seals to exclude water from glass/frame junctions.

Material:

- Rubber products to be neoprene, ethylene propylene diene monomer (EPDM) or silicone rubber.
- Flexible polyvinyl chloride (PVC)

Priming

Apply the recommended primer to the surfaces in contact with sealant materials.

Movement Joints

Depth of elastomeric sealant: One half the joint width, or 6 mm, whichever is the greater.

Foamed materials (in compressible fillers and backing rods): Closed-cell or impregnated types which do not absorb water.

Bond breaking: Provide backing rods, and other back-up materials for sealants, which do not adhere to the sealant.

Glazing Films

Supply films identified in the schedules to approval of the Engineer. All films are to be proprietary products installed strictly in accordance with the manufacturers instructions.

4.5.2.3 Mirrors

Refer to **Mirrors** schedule for details.

Reflective surface

Type: Silver layer deposited on the glass or glazing plastic.

4.5.3 EXECUTION

4.5.3.1 Glass Processing

General

Perform required processes on glass, including cutting, obscuring, silvering and bending. Form necessary holes, including for fixings, equipment, access holes and speaking holes. Process exposed glass edges to a finish that will reduce the risk of injury.

4.5.3.2 Installation

General

Install the glass so that:

- Each piece is held firmly in place by permanent means which enable it to withstand the normal loadings and ambient conditions at its location without distortion or damage to glass and glazing materials.
- Building movements are not transferred to the glass.
- External glazing is watertight and airtight.

Toughened glass: Do not cut, work, or permanently mark after toughening. Use installation methods which prevent the glass making direct contact with metals or other non-resilient materials.

Frameless installations: Join the vertical edges of adjacent glass panels with silicone jointing compound.

External timber framed glazing: Glaze with putty. Do not dry bead into timber frames.

4.5.3.3 Fixing mirrors

Screw fixing

Direct to wall plugs with dome-headed chromium-plated screws in each corner and at 900 mm maximum centres around perimeter. Provide polyethylene sleeves and washers to prevent contact between screw and glass. Do not over-tension the screws.

Frame fixing

Proprietary aluminium frames to mirror perimeter, corners mitred. Attach the frame to the wall with concealed screw fixings. Frames and finish to approval of the Engineer.

Bead fixing

Rebated timber beads to mirror perimeter, corners mitred. Screw fix the beads to the substrate.

4.5.3.4 Glazed Shower Screens

Type

Proprietary system comprising frames of extruded aluminium, stainless steel, or PVC, assembled around safety glass to form fixed panels and sliding, hinged or pivoted doors.

Water Shedding

Provide an assembly which sheds water to the inside without retaining it on the frame surfaces. Seal the edge of the frame to adjoining surfaces with a resilient strip.

Sliding Assemblies

Hanging: Hang the sliding sash on stainless steel or nylon sheaves on overhead channel track formed in the frame head, and fit nylon or equivalent bottom guides.

Hardware: Pull handles on both sides of sash, or of leading sash in multiple sash arrangements.

4.5.4 COMPLETION

4.5.4.1 Cleaning

Replace damaged glass and leave the work clean, polished, free from defects, and in good condition.

4.6 GLASS BLOCKWORK**4.6.1 GENERAL****4.6.1.1 Inspection**Notice

Give sufficient notice so that inspection may be made of the following:

- Frame and expansion jointing installed, before reinforcing.
- Perimeter and vertical reinforcing installed, before placing mortar and blocks.

4.6.1.2 SubmissionsSamples

Glass blocks: Submit 2 blocks of each type showing size, colour, design and pattern of faces.

Accessories: Submit samples of reinforcing, fasteners, expansion materials and sealant.

4.6.2 PRODUCTS**4.6.2.1 Mortar-jointed panels**Perimeter

Frames:

Size: 100 x 50 x 6 mm.

Material: Aluminium channel.

Fixing: 10 mm masonry anchors with galvanized washers.

Drainage: Drill holes in web of sill channel.

Expansion jointing and sill channel lining: 10 mm (minimum) x width of the channel rebate.

Glass blocks

Refer to **Glass Block** schedule for block types.

Mortar

Cement: Slow setting Portland cement with low shrinkage.

Hydrated lime: calcium, or pressure-hydrated dolomitic lime if > 92% of active ingredients are hydrated.

Sand: Clean sharp river mineral sand, salt free, no admixtures, no iron compounds.

Water: Clean, potable.

Mortar and pointing mix by volume (cement:lime:sand): 1:0.25:3. As dry as practicable.

Pigments: Powder oxides.

Colour: Refer to **Glass Block** schedule

Reinforcement: 4.5 – 6 mm diameter, in lengths to suit full width or height of panel, as appropriate.

Fire-Rated PanelsPerimeter

Frames:

Size: 150 x 75 x 9 mm.

Material: Mild steel channel.

Fixing: 10 mm masonry anchors with heavy galvanized washers.

Drainage: Drill holes in web of sill channel.

Expansion jointing:

Type: Ceramic fibre blanket, 38 mm (minimum) x width of channel rebate.

Sill channel lining: Ceramic fibre board, 12 mm (minimum) x width of channel rebate.

Glass Blocks

Refer to **Glass Block** schedule for block types.

Mortar

Cement: Slow setting Portland cement with low shrinkage.

Sand: Clean sharp river mineral sand, salt free, no admixtures, no iron compounds.

Water: Clean, potable.

Mortar and pointing mix by volume (cement:sand): 1:3. As dry as practicable.

Compressive strength (minimum): 10 MPa at 2 days, 35 MPa at 28 days.

Pigments: Powder oxides.

Colour: Refer to **Glass block schedule**

Reinforcement: 6 mm diameter, in lengths to suit full width or height of panel, as appropriate.

Finish

Sealant: Fire resistant non-setting non-staining waterproof elastomeric sealant, hardening only at the surface.

4.6.2.2 Sealant-jointed panels

Perimeter

Frames: Proprietary extruded aluminium frame.

Fixing: 12 gauge 40 mm long stainless steel pan head screws, with nylon masonry plugs where appropriate.

Glass Blocks

Refer to **Glass Block** schedule for block types.

Panels

Reinforcement: 50 x 3 mm flat bars.

Block-locating clips: Proprietary plastic clips designed to clip on the reinforcement and fit the glass block edges.

Finish

Grouting sealant: Silicone.

Colour: Refer to **Glass block schedule**

4.6.3 EXECUTION

Ambient Conditions

General: Do not install below 5°C. Maintain panels above 5°C for the first 48 hours after construction.

Perimeter

Frames: Erect 4-sided frame mitred at corners, spaced 5 mm clear of the structure on packing.

Fixing: 400 mm centres. Centre hole on each side circular, other holes slotted longitudinally 50 mm.

Packing: 75 x 75 x 2 mm zinc-plated steel.

Sill channel: Lay sill channel lining in rebate.

Jamb and head channels: Adhesive-fix expansion jointing in rebates.

Panels

Laying blocks: By hand, may be knocked into position using a rubber or soft nylon hammer. Align block patterns consistently. Prevent mortar extrusion under load while setting.

Bond: Stack bond.

Reinforcement:

Frame: Two rods all round, hooked and connected with wire at the corners. Horizontal rods to be a tie rod assembly, with 6 mm diameter tie rods at 200 mm centres, spacing the main rods 40 – 45 mm apart.

Joint: Two rods in at least every second horizontal joint, and every tenth vertical joint. Overlap 230 mm (minimum) at corners. Do not tie vertical rods to horizontal rods. Do not impinge on expansion joints. Tie joint reinforcement to frame reinforcement.

Cover (minimum): 15 mm to outside face, 10 mm to inside face, 5 mm to blocks.

Joints:

Widths (clear): 10 – 15 mm. For curved walls, 5 – 20 mm for vertical joints.

Width tolerance: ± 3 mm.

Placing mortar: Do not retemper mortar. Do not furrow joints. Fill channel frame and panel joints.

Pointing: Point before mortar has hardened. Neatly tool to a smooth, dense concave joint. Remove excess mortar from glass surfaces using a damp cloth before mortar set occurs, without damaging the glass. Protect against premature drying, but do not moisten.

4.6.3.1 Sealant-Jointed Panels

Perimeter

Frames:

Assembly: Mitre frame at corners. Assemble with connection angles and cleats, drill, and fix frame to angles with blind rivets.

Fixing jamb frames: Position screws to clear the ends of the reinforcing bars. Fix screws with neoprene washers and through the packing, at 400 mm (maximum) centres, and pairs 100 mm from ends.

Fixing sill frame: Fix screws with neoprene washers and through the packing, at 800 mm (maximum) centres, and 100 mm from ends.

Packing: Locate to square the frame, maximum 10 mm, to sill and jamb frames only.

Panels

Laying blocks: Select and orient glass blocks to ensure consistent coursing dimensions. Lightly clean edges with steel wool.

Block-locating clips: Locate onto sill frame profile 20 mm from each corner and centred at every perpend, ribbed side up. Insert in perpend, including at jamb frames, centred at course centre line. Clip onto reinforcing bars 20 mm from the ends and centred at every perpend, ribbed side up. Insert above top course 20 mm from each corner and centred at every perpend.

Bond: Stack bond.

Joint reinforcement: Joint: Run reinforcement horizontally, and slot into the jamb frame channels on top of the glass block courses, except the top course, finishing 3 mm short of the jamb frame rebate faces.

Joints:

Widths: 3 – 4 mm.

Finish

Jointing: Clean and dry substrates. Execute work neatly, without gaps and holes. Inject structural sealant into blockwork joints to a depth of 5 – 8 mm.

Grouting: Clean and dry substrates. Execute work neatly, without gaps and holes. Apply grouting sealant to mitred frame corner joints, and apply to blockwork joints, including at the perimeter frame, to both panel faces. Remove excess sealant from glass at completion, without damaging the glass.

4.6.3.2 Maintenance

Mortar-Jointed and Fire-Rated Panels

Final clean: Wash using clean water. Remove dry powder using a clean soft dry cloth.

4.7 INSULATION AND VAPOUR BARRIERS**4.7.1 GENERAL****4.7.1.1 Interpretation**Definitions

General: For the purposes of this worksection the definitions given below apply.

Sarking-type material: Flexible reflective foil membrane material normally used for waterproofing, vapour proofing or thermal reflectance.

Mineral wool (including glasswool and rockwool): Entangled mat of fibrous non-crystalline material derived from inorganic oxides or minerals, rock, slag or glass, processed at high temperatures from a molten state.

Vapour barrier: A material or system that adequately impedes the transmission of water vapour.

4.7.1.2 InspectionNotice

Give sufficient notice so that inspection may be made of the insulation to roof space in areas which will be covered up or concealed.

4.7.2 PRODUCTS**4.7.2.1 Materials and components**Bulk Insulation

Mineral wool blankets and cut pieces: Provided in bulk rolls for laying over roof structures or on roof slabs and batts to suit ceiling member spacing.

Polystyrene (extruded rigid cellular sheets): Provided in modular panels for fixing to walls and roof slabs.

Reflective insulation: Provided in bulk foil rolls for laying over roof structures and foil batts to suit ceiling member spacing.

Sarking-Type Material

Sarking: Reflective foil fixed as a membrane to reduce liquid water transfer in walls or roof structures but allow water vapour to move through the building envelope.

Vapour barrier: Reflective foil sealed as a membrane to stop all liquid water and water vapour transfer.

Fasteners and Supports

Metallic-coated steel.

4.7.3 EXECUTION**4.7.3.1 General**Bulk insulation

Batts: Fit tightly between framing members. If support is not otherwise provided, fix over wire mesh stapled to the framing and stretch tight.

Reflective Foil Laminate

To timber: Metallic-coated flat head nails or staples at 300 mm maximum centres.

To steel or aluminium: Double sided pressure sensitive tape.

Overlap (minimum): 150 mm and adhesive fix.

Roof Sarking Locations

Location: Provide sarking under metal sheet roofs. Fix over timber supports and run rolls across roof plane. Overlap each layer of foil so that any water will run down the slope and discharge into the gutter without dripping into the roof space.

4.7.3.2 Roof insulationGeneral

Location: The whole of the ceiling area, except the following:

Eaves, overhangs, rooflights, vents and openings.

Roofs to outbuildings, garages, and semi-enclosed spaces such as verandahs, porches.

Installation

Refer to the drawings and **Insulation schedule** for details of insulation requirements for the works.

5.6 METALWORK**GENERAL****5.6.1.1 Inspection**Notice

Give sufficient notice so that inspection may be made of the following:

- Shop fabricated or assembled items ready for delivery to the site.
- Site erected assemblies on completion of erection.

5.6.1.2 SubmissionsSamples

Submit samples to the **Sample** table for approval by the Engineer.

Sample Table

Description	No. of samples
Each type of metal item to be purchased	2
Typical joints of welded or fabricated items	2
Finished sample of each type of painted or anodised metalwork indicating range within colour specified and finish	2
The finish to all stainless steel items	2

Manufacturer's data: Submit manufacturer's published product data and details for purchased items.

Stainless steel: For each batch of stainless steel supplied to the works, submit the certificate of compliance specified for the applicable standard.

PRODUCTS**5.6.1.3 Materials and components**Metals

Performance: Provide metals suited to their required function, finish and method of fabrication, in sections of strength and stiffness adequate for their purpose.

Rivets

Use blind rivets where available in the required metal.

Masonry Anchors

Proprietary types comprising screws or bolts in self-expanding sockets.

Masonry Plugs

Screws in purpose-made resilient plastic sockets or fixed to timber plugs built into the wall surface.

EXECUTION

5.6.1.4 Construction GenerallyMetals

Provide metals so that they transmit the loads imposed and ensure the rigidity of the assembly without causing deflection or distortion of finished surfaces.

Fasteners

Materials: Provide fasteners in materials of mechanical strength and corrosion resistance at least equal to that of the lowest resistant metal joined.

To copper and copper alloys: Provide copper or copper-alloy fixing devices only.

To aluminium and aluminium alloys: Provide aluminium alloy or stainless steel fixing devices only.

To stainless steel: Provide appropriate stainless steel materials only.

Fabrication

Workshop: Fabricate and pre-assemble items in the workshop wherever practicable.

Edges and surfaces: Keep clean, neat and free from burrs and indentations. Remove sharp edges without excessive radiusing.

Tube bends: Form bends in tube without visibly deforming the cross section.

Colour finished work: Match colours of sheets, extrusions and heads of fasteners.

Thermal movement: Accommodate thermal movement in joints and fastenings.

Fabrication Tolerances

Structural work generally: ± 2 mm from design dimensions.

Joints

Fit joints to an accuracy appropriate to the class of work. Finish visible joints made by welding, brazing or soldering using grinding, buffing or other methods appropriate to the class of work, before further treatment.

Self-finished metals: Free of surface colour variations, after jointing.

Joints: Fit accurately to a hairline where feasible.

Marking

Provide suitable and sufficient marks or other means for identifying each member of site-erected assemblies, and for their correct setting out, location, erection and connection.

Splicing

Provide structural members in single lengths where possible. Obtain approval of the Engineer for locations of joints where splices in metalwork cannot be avoided.

5.6.1.5 Welding and brazingGeneral

Quality: Provide finished welds which are free of surface and internal cracks, slag inclusion, and porosity.

Brazing

General: Ensure brazed joints have sufficient lap to provide a mechanically sound joint. Do not use butt joints relying on the filler metal fillet only.

5.6.1.6 Stainless Steel Fabrication

Welding Stainless Steel

All tube, angle or thick plate material is to be welded unless noted otherwise on the drawings. Ensure that welds do not discolour the final surface finish in the welding process.

Riveting

Riveting may be used only to join stainless steel sheet or strip less than 1 mm thick. Drill (not punch) the rivet hole, and drive the rivet cold. On completion, clean and passivate the riveted assembly.

Soldering

Do not solder stainless steel.

5.6.1.7 Metal fixtures

General

Provide metal fixtures where noted on drawings and in the **Metal fixtures schedule** as follows:

Components such as toilet roll holders, towel rails, soap dishes and their location, indicative construction details, trims, materials, dimensions and thicknesses, and finishes shall be as detailed or described in the schedule.

All dimensions noted on drawings shall be confirmed on site.

5.6.1.8 Pipe Handrails, Stairs, Ladders and Balustrades

Assembly

Material: Refer to drawings and BOQ for details of member sizes and assembly of components.

Fabrication

Method: Welding.

Joints: Produce smooth unbroken surfaces at joints. Make end-to-end joints over an internal sleeve.

Bends: Make changes of direction in rails by evenly curved pipe bends.

Free ends: Seal the free ends of pipes with fabricated or purpose-made end caps.

Fixing to Structure

Provide fabricated predrilled or purpose-made brackets or post bases, and attach the pipework to the building structure with fixings, including bolts into masonry anchors, and coach screws or bolts into timber, of metal compatible with the pipework.

Galvanizing

If possible, complete fabrication before galvanizing; otherwise apply a zinc-rich primer to affected joint surfaces.

Painting

If possible, complete fabrication before painting; otherwise apply paint to affected joint surfaces after fixing on site. Make good all damaged painted surfaces before completion of the building works. Paint finish in accordance with the **Exterior and Interior painting schedules**.

5.6.1.9 Corner Guards and Vehicle Guards

Corner Guards

Where corners of the structure are required to be protected from mechanical damage, provide metal corner guards as follows and as identified on the drawings or in the BOQ:

Consisting of angle sections or sections fabricated from metal sheet bent to the radius or angle of the corner.

Fitting close to adjoining surface finishes.

Solidly grouted up at the back to eliminate voids.

Securely fixed by a method which does not cause distortion in the guard surface, and consists of either concealed built in lugs, or flush countersunk head fixings into masonry anchors.

Paint finish in accordance with the **Exterior and Interior Painting** schedules.

Vehicle Guards

Where external features such as lamp posts, fire hose reels or pedestrian walkways are required to be protected from vehicle damage, provide metal guards as follows and as identified on the drawings and in the BOQ:

Consisting of steel pipe posts set in deep concrete pads with welded end caps or bent to form a rail and two posts.

Steel barrier rails securely bolted to the posts.

Heavy duty protection posts will be large diameter steel pipe posts filled with concrete.

Paint finish in accordance with the **Exterior and Interior painting** schedules.

5.6.1.10 Water Storage Tanks and Stands

Water Tanks

Fabricate metal water storage tanks to sizes shown on drawings and as identified in the BOQ. Allow for all reinforcement of tank walls, floors, and around fixtures projecting from the tank.

Bolt together prefabricated plastic or metal water storage tanks to sizes shown on drawings and as identified in the BOQ.

Fabricate metal tank stands for the water storage tanks as identified on the drawings and in the BOQ.

Refer to the **Metal fixtures** schedule for details.

Paint finish in accordance with the **Exterior and Interior Painting** schedules.

COMPLETION

5.6.1.11 Maintenance manual

General: Submit manufacturer's published recommendations for service use.

5.6.1.12 Cleaning

Temporary coatings: On or before completion of the works, or before joining up to other surfaces, remove all traces of temporary coatings used as a means of protection.

5.8 FIRE EXTINGUISHERS AND BLANKETS

GENERAL

5.8.1.1 SamplesGeneral

Provide samples of all fire extinguishers proposed for use in the project for approval of the Engineer.

5.8.1.2 Authorised productsGeneral

Provide equipment from Certified manufacturers only. Provide copies of the test certificates if requested by the Engineer.

PRODUCTS

5.8.1.3 ExtinguishersExtinguisher Type and Location

Provide portable fire extinguisher types and matching signs to the locations identified in the **Fire Extinguishers** schedule.

5.8.1.4 BlanketsFire blanket Type and Location

Provide fire blanket types and matching signs to the locations identified in the **Fire blanket** schedule.

6.1 PLASTERING**6.1.1 GENERAL****6.1.1.1 Interpretation**Abbreviations

For the purpose to this work section the abbreviations given below apply.

CRF: Cement render – finish.
CRM: Cement render – medium.
CRS: Cement render – stronger.
CRW: Cement render – weaker.
LF: Lime felting render- weaker.
GPM: Gypsum render - medium
GPF: Gypsum plaster – finish.

6.1.1.2 InspectionNotice

Give sufficient notice so inspection may be made of the following:

Backgrounds immediately before applying base coats.
Finish treatments before decoration.

6.1.2 PRODUCTS**6.1.2.1 Materials and components**Accessories

Beads: To be metal proprietary sections manufactured to be fixed to backgrounds and/or embedded in the plaster to form and protect plaster edges and junctions.

Aggregates

Sand: To be fine, sharp, well-graded sand with a low clay content and free from efflorescing salts.

Bonding products

To be proprietary products manufactured for bonding cement-based plaster to solid backgrounds.

Cement

Cement shall conform to the requirements of ASTM specification C-150 Type 1 or similar approved standard for normal Portland cement.

Colouring Products

To be proprietary products manufactured for colouring cement plaster.

Integral pigment proportion: 5% by mass of cement.

Curing Products

To be proprietary products manufactured for use with the plaster system.

Gypsum Plaster

To be a proprietary product containing calcium sulfate hemihydrate with additives to modify setting.

Lime

Confirm source of Lime with Engineer to ensure highest quality Lime is used in the mortar. Protect from damage on site and store minimum 300mm above ground in waterproof storage facility.

Preparing lime putty:

Using hydrated lime: Add lime to water in a clean container and stir to a thick creamy consistency. Leave undisturbed for at least 16 hours. Remove excess water and protect from drying out.

Using quicklime: Run to putty as soon as possible after receipt of quicklime. Partly fill clean container with water, add lime to half the height of the water, then stir and hoe ensuring that no lime remains exposed above the water. Continue stirring and hoeing for at least 5 minutes after all reaction has ceased, then sieve into a maturing bin. Leave undisturbed for at least 14 days. Protect from drying out.

Mixes

Select a mix ratio to suit the application in conformity to the **Mixes** table.

Measurement: Measure binders and sand by volume using buckets or boxes. Do not allow sand to bulk by absorption of water.

Plaster mixing: Machine mix for greater than 3 minutes and less than 6 minutes.

Strength of successive coats: Ensure successive coats are no richer in binder than the coat to which they are applied.

Mixes Table

Mix type		Application	Upper and lower limits of proportions by volume			
			Gypsum	Cement	Lime	Sand
Cement render coats in: -Single or multi-coat systems with integral finishing treatments -Base coats in multi-coat systems with cement or gypsum finishes	CRS	Dense and smooth concrete and masonry Thrown finishing treatments Tiled finishes Gypsum finishes Cement finishes	- -	1 1	0 0.5	3 4.5
	CRM	Clay or concrete masonry	- -	1 1	0.5	4.5 6
	CRW	Lightweight concrete masonry and other weak backgrounds	- -	1 1		6 9
Cement finish coats	CRF	Cement render base coats	- -	1 1	1	1.5 2
Lime felting finish coats	LF	Cement render base coats			1	3
Gypsum medium coats	GPM	Gypsum render base coats	Ready-Mix			
Gypsum finish coats	GPF	Gypsum render finish coat	Ready-Mix			

Movement Control Joint Products

To be proprietary products manufactured for use with the plastering system and to accommodate the anticipated movement of the backgrounds and/or the plaster.

Water

To be clean and free from any deleterious matter.

Refer to the **Plastering** schedule for details of plastering and locations.

6.1.3 EXECUTION

6.1.3.1 Preparation

Substrates

Ensure substrates have:

Any deposit or finish which may impair adhesion of plaster cleaned off.

If solid or continuous, excessive projections hacked off and voids and hollows filled with plaster stronger than the first coat and not weaker than the background.

Absorbent substrates: If suction is excessive, control it by dampening but avoid over-wetting and do not plaster backgrounds showing surface moisture.

Dense concrete: If not sufficiently rough to provide a mechanical key, roughen by scratching or hacking to remove 2 mm of the surface and expose the aggregate then apply a bonding treatment.

Painted surfaces: Remove paint and hack the surface at close intervals.

Untrue substrates: If the substrate is not sufficiently true to ensure conformity with the thickness limits for the plaster system or has excessively uneven suction resulting from variations in the composition of the background, apply additional coats.

Beads

Location: Fix beads as follows:

Angle beads: At all external corners.

Drip beads: At all lower terminations of external plaster.

Mechanical fixing to background: at 300 mm centres.

Movement control beads: At all movement control joints.

Stop beads: At all terminations of plaster and junctions with other materials or plaster systems.

Bonding Treatment

If bonding treatment is required, throw a wet mix onto the background as follows:

Cement plaster: 1 part cement to 2 parts sand.

Gypsum plaster: 1 part gypsum to 2 parts sand.

Curing: Keep continuously moist for 5 days and allow to dry before applying plaster coats.

Thickness: From greater than 3mm but less than 6 mm.

Embedded Items

If there are water pipes and other embedded items, sheath them to permit thermal movement. Ensure embedded items will have a suitable level of corrosion resistance prior to embedment.

6.1.3.2 Application

Plastering is to follow ASTM C842-05 standard for Application of Interior Gypsum Plaster.

Plastering

General: Provide plaster finishes as follows:

- Resistant to impacts expected in use.
- Free of irregularities.
- Consistent in texture and finish.
- Firmly bonded to substrates for the expected life of the application.
- As a suitable substrate for the nominated final finish.

Base coats: Scratch-comb each base coat in two directions when it has stiffened.

A bonding agent is required before the application of Gypsum Plaster – Medium (GPM) on concrete surfaces.

Finishing Treatments

- Bag: To be a finish mainly free from sand by rubbing the finish coat with a Hessian pad when it has set firm.
- Carborundum stone: To be a smooth finish free from sand by, rubbing the finish coat with a fine carborundum stone when it has set hard.
- Steel trowel: To be a smooth dense surface by steel trowelling which is not glass-like and is free from shrinkage cracks and crazing.
- Wood or plastic float: To be an even surface by wood or plastic floating the finish coat on application.

Incidental Work

Return plaster into reveals, beads, sills, recesses and niches. Plaster faces, ends, and soffits of projections in the background, such as string courses, sills, and other wall features. Trim around openings. Plaster exposed inside of built-in cupboards.

Joining-Up

If joining up is required, ensure joints will not be visible in the finished work after decoration.

Movement Control Joints

Provide movement control joints in the finish to coincide with movement joints in the background. Ensure that the joint in the background is not bridged during plastering.

- Depth: Extend the joint right through the plaster and reinforcement to the background.
- Width: 3 mm, or the same width as the background joint, whichever is greater.

Damp-proof courses: Do not continue plaster across damp-proof courses.

V-joints: Provide V-joints, cut right through the plaster to the background, at the following locations:

- Abutments with metal door frames.
- Abutments with other finishes.
- Junctions between different backgrounds.

Plaster Thickness

Conform to the **Plaster Thickness** table.

Plaster Thickness Table

Plaster	Application	Upper limit of thickness (mm)			
		Single coat systems	Multi-coat systems		
			Base coat(s)	Finish coat	System
Cement render base coats and cement finish	On clay and concrete brickwork and other backgrounds	15	13	4	16
Gypsum Plaster	On smooth dense concrete	-	10	4	13
	On clay and concrete brickwork and other backgrounds	-	13	4	16

Temperature

If the ambient temperature is less than 10°C or more than 30°C ensure that the temperature of mixes, backgrounds and reinforcement are, at the time of application, greater than 5°C or less than 35°C.

6.1.3.3 TolerancesGeneral

Conform to the **Tolerances** table.

Tolerances Table

Property	Tolerance criteria: Permitted deviation (mm)
Features ¹ : Verticality in 2000 mm	3
Features: Horizontality in 2000 mm	3
Soffits: Horizontality in 2000 mm	5
Walls: Verticality in 2000 mm	5
Walls: Flatness ² in 2000 mm	4
¹ Features: Conspicuous horizontal or vertical lines including external corners, parapets, reveals, heads, sills, movement control joints and mouldings.	
² Flatness: Measured under a straightedge laid in any direction on a plane surface.	

6.1.3.4 CompletionCuring

General: Prevent premature or uneven drying out and protect from the sun and wind.

Keeping moist: If a proprietary curing agent is not used, keep the plaster moist as follows:

Cementitious Base coats and single coat systems: Keep continuously moist for 2 days and allow to dry for 5 days before applying further plaster coats.

Cementitious finish coats: Keep continuously moist for 2 days.

6.2 CEMENTITIOUS TOPPINGS**6.2.1 GENERAL****6.2.1.1 Interpretations**Abbreviations

For the purposes of this worksection the abbreviations given below apply.

BCS: Bonded – cement and sand.

BFC: Bonded – fine concrete.

FFC: Floating – fine concrete.

MGR: Monolithic – granolithic.

SFC: Separated – fine concrete.

6.2.1.2 TolerancesGeneral

Thickness:

Thickness < 15 mm: ± 2 mm.

Thickness $\geq 15 < 30$ mm: ± 5 mm.

Thickness ≥ 30 mm: ± 10 mm.

Flatness: Measured under a 3000 mm straightedge laid in any direction on a plane surface:

Grade A: < 3 mm.

Grade B: $\geq 3 < 5$ mm.

Grade C: $\geq 5 < 10$ mm.

6.2.2 PRODUCTS**6.2.2.1 Products**Admixtures

Introduce in solution in a portion of the mixing water. Ensure a uniform distribution of the admixture in the batch within the mixing period.

Aggregates

Coarse aggregate: To be nominal single size.

Fine aggregate: To be fine, sharp, well-graded sand with a low clay content and free from efflorescing salts.

Bonding products

To be proprietary products manufactured for bonding cement-based toppings to concrete backgrounds.

Cement

Cement shall conform to the requirements of ASTM specification C-150 Type 1 or similar approved standard for normal Portland cement.

Colouring products

To be proprietary products manufactured for colouring cement toppings.

Integral pigment proportion: 5% by mass of cement.

Coloured chips

To be marble chips of selected colour or proprietary products manufactured for distribution in cement toppings.

Concrete

On site batch mixed concrete shall have characteristics and proportions of concrete ingredients which conform to those specified in M-150 (1:2:4).

Curing products

To be proprietary products manufactured for use with cement-based toppings and with the floor finish to be laid on the toppings.

Mixes

Provide concrete as follows or select mix proportions to the **Mixes** table.

Air entrainment: $\leq 3\%$.

Nominal coarse aggregate size: $\leq 0.3 \times$ topping thickness.

Slump: 80 mm.

Water quantity: Use the minimum necessary to achieve full compaction and prevent excessive water being brought to the surface during compaction.

Mixes Table

Mix type		Thickness (mm)	Upper and lower limits of proportion by mass (mm)		
			Cement	Fine aggregate	Coarse aggregate
Bonded – cement and sand	BCS	35	1	3	0
			1	4.5	0
Bonded – fine concrete	BFC	40	1	3	1
			1	3	2
Floating – fine concrete	FFC	100	1	3	1
			1	3	2
Monolithic – granolithic	MGR	Floors and treads: 25 Risers and skirtings: 13	1	2	1
Separated – fine concrete	SFC	70	1	3	1
			1	3	2

Movement Control Joint Products

Provide products manufactured for use with cement based toppings and accommodate the anticipated movement of the backgrounds and/or the toppings.

Sealing Products

Provide proprietary products manufactured for the sealing of movement joints in cement-based toppings.

Slip-resistance products

Provide proprietary products manufactured to improve the wet-slip resistance of toppings.

Silicon carbide granules:

Granule size: $\geq 300 < 600 \mu\text{m}$.

Colour: Black.

Surface treatment products

Provide proprietary products manufactured for use with cement- based toppings to change the characteristics of the surface of the finished topping.

Reinforcement

All reinforcing shall be supported and wired together to prevent displacement by construction loads, or the placing of concrete, beyond the tolerances specified in ACI 301. Any tack or spot welding of reinforcement shall not be performed without approval from the Engineer.

Reinforcement shall be free of loose rust and of any other coating which may adversely affect the bond.

Water

General: To be clean and free from any deleterious matter.

Refer to the **Cementitious Toppings** schedule for details of toppings and locations.

6.2.3 EXECUTION

6.2.3.1 PreparationBackgrounds

Ensure backgrounds have:

- Any deposit which may impair adhesion of monolithic or bonded toppings cleaned off.
- Excessive projections hacked off and voids and hollows filled with a mix not stronger than the background nor weaker than the topping.
- Hardened concrete roughened by scratching or hacking to remove 2 mm of the surface and expose the aggregate.

Bonded Toppings

Before laying topping wash the subfloor with water and use a bonding product or treat as follows:

Keep wet for ≥ 2 hours.

Remove surplus water and brush on neat cement or a clean slurry of cement and water.

Place the topping while the slurry is wet.

6.2.3.2 ApplicationLaying

Spread the mix and compact and level the surface to finished levels.

Monolithic toppings: Lay while concrete subfloor is plastic and surface water is no longer visible.

Toppings over 50 mm thick:

Lay in two layers of equal thickness.

Place a layer of reinforcement between the layers of toppings. Lap reinforcement 100 mm and tie. Do not create four way laps.

Floating and Trowelling

Machine float finish:

After levelling, consolidate the surface using a machine float.
Cut and fill and refloat immediately to a uniform, smooth, granular texture.
Hand float in locations inaccessible to the machine float.
Flatness: Grade B.

Steel trowel finish: After machine floating finish as follows:

When the surface has hardened sufficiently, use steel hand trowels to produce the final consolidated finish free of trowel marks and uniform in texture and appearance.
Flatness: Grade A.

Wood float finish: After machine floating finish as follows:

Use wood or plastic hand floats to produce the final consolidated finish free of float marks and uniform in texture and appearance.
Flatness: Grade A.

Floor Finish Dividers

Finish cementitious toppings at junctions with differing floor finishes with a corrosion resistant metal dividing strip suitable fixed to the background, with top edge flush to the finished floor. If changes of floor finish occur at doorways make the junction directly below the closed door.

Monolithic Toppings

Coved skirtings: Form coves in the topping material, and finish the top to a neatly struck line. Mitre internal and external angles. 10 mm radius to top of skirting. 25mm radius to junction between floor and skirting.

Movement Control Joints

Provide movement control joints to divide toppings into bays as follows

Form in situ using square edge steel forms and trowelling a 3 mm radius to edges.
Form a groove, extending at least one quarter the depth of the section, either by using a grooving tool, by sawing, or by inserting a premoulded strip.
Install a movement control joint product.

Bay sizes:

Area: $\leq 15 \text{ m}^2$.
Length to width ratio: $\leq 1:1.5$.

Joints in background: Provide movement control joints in toppings to coincide with joints in the background.

Slip-Resistance Treatment

Stair treads: Form two grooves and fill with a silicon carbide two-part resin.

Dimensions: 10 mm deep, 15 mm wide, length \geq width of tread less 100 mm.
Position:

First groove: Centre 35 mm from tread nose.

Second groove: Centre 60 mm from step nose.

Plane surfaces: Apply silicon carbide granules after floating and before the topping surface has set, and trowel into the surface so that the granules remain exposed.

Application rate: 1 kg/m² evenly distributed.

Surface Colouring

Apply the colouring product or coloured marble chips after floating and before the topping surface has set and trowel into the surface so that it is even in colour distribution.

Temperature

If the ambient temperature is less than 10°C or more than 30°C ensure that the temperature of mixes, backgrounds and reinforcement are, at the time of application, greater than 5°C or less than 35°C.

6.2.3.3 CompletionCuring

General: Prevent premature or uneven drying out and protect from the sun and wind.

Curing: Use a curing product or, as soon as it has set sufficiently, keep the toppings moist by covering with polyethylene film for seven days.

6.3 TILING**6.3.1 GENERAL**

Furnish all tools, equipment, materials, supplies, accessories and perform all labor to install ceramic tile work indicated on the Contract Drawings and as hereinafter specified.

6.3.1.1 InspectionNotice

Give sufficient notice so that inspection may be made of the following:

- Floor preparation and set out of floor tiles before fixing.
- Wall preparation and set out of wall tiles before fixing.
- Control joints before sealing and grouting.

6.3.1.2 SubmissionsSamples

Submit labelled samples of tiles, including fittings, accessories, grout and sealants, illustrating the range of variation in colour and finish.

6.3.1.3 InterpretationsDefinitions

For the purposes of this worksection the definitions given below apply.

Substrates: The surfaces on which tiles are bedded.

Bedding: Mixtures of materials which are applied to substrates in a plastic state and dry and cure to adhere tiles to substrates.

Adhesive bedding: Tiling adhered by adhesives.

Mortar bedding: Tiling adhered in a cementitious mortar bed.

Pavers: Slabs made from clays, stone, precast concrete and/or other inorganic raw materials generally over 20 mm thick used as coverings for floors and supported over continuous substrates.

Tiles: Thin slabs made from clays and/or other inorganic raw materials used generally as coverings for floors and walls and adhered to continuous supporting substrates.

Natural stone: Tiles cut from natural stone.

Industrial cast: Tile products of reconstituted stone. Also known as manufactured stone.

Cementitious: Manufactured cement based pre-finished tiles.

Terrazzo – cementitious: Manufactured cementitious terrazzo tiles formed in a suitable machine to give sufficient compaction and density to the finished surface, and moisture cured before grinding and honed at the place of manufacture. Thickness usually 35 mm.

Wet areas: Areas within buildings with water supply and drainage systems.

6.3.1.4 TolerancesCompleted tiling

Conform to the **Tolerances** table.

Tolerances Table

Property	Tolerance criteria
Alignment: Deviation of the finished tiles from a 3 m straight edge laid against any joints	< 4 mm
Flatness: Deviation of any plane surface under a 3 m straight edge laid in any direction on an area of uniform grade	< 4 mm

6.3.2 PRODUCTS

6.3.2.1 Tiles and accessories

Provide tiles and accessories to the **Wall Tiling** and **Floor Tiling** schedules.

Coves, nosings and skirtings: To be matching stop-end and internal and external angle tiles moulded for that purpose.

Exposed edges: To be purpose-made border tiles with the exposed edge glazed to match the tile face. If such tiles are not available, round edge with grout.

6.3.2.2 Adhesives

Type

General: Provide adhesives to the **Wall Tiling** schedule and to the **Floor Tiling** schedule and compatible with the materials and surfaces to be adhered.

Prohibited uses: Do not provide the following combinations:

Cement-based adhesives on wood, metal, painted or glazed surfaces, gypsum-based plaster.

Organic solvent-based adhesives on painted surfaces.

Organic PVC-based adhesives and organic natural rubber latex adhesives in damp or wet conditions.

PVA (polyvinyl acetate) based adhesives in wet areas or externally.

6.3.2.3 Mortar

Materials

Cement: Cement shall conform to the requirements of ASTM specification C-150 Type 1 or similar approved standard for normal Portland cement.

White cement: Iron salts content $\leq 1\%$.

Off-white cement: Iron salts content $\leq 2.5\%$.

Lime: Confirm source of Lime with Engineer to ensure highest quality Lime is used in the mortar. Protect from damage on site and store minimum 300mm above ground in waterproof storage facility.

Sand: Fine aggregate with a low clay content selected for grading, sharp and free from efflorescing salts.

Measurement of volume: Measure binders and sand by volume using buckets or boxes. Do not allow sand to bulk by absorption of water.

Bedding mortar

Proportioning: Select proportions from the range 1:3 – 1:4 cement:sand to obtain satisfactory adhesion. Provide minimum water.

Terra cotta tiles: Use proprietary polymer modified mortar.

Water

General: To be clean and free from any deleterious matter.

6.3.2.4 Grout

Type

Cement based proprietary grout: Mix with water. Fine sand may be added as a filler in wider joints.

Terra cotta tiles: Use proprietary polymer modified grout.

Portland cement based grout: Mix with fine sand. Provide minimum water consistent with workability.

For joints < 3 mm: 1 cement:2 sand.

For joints \geq 3 mm: 1 cement:3 sand.

Pigments

Pigments for coloured grout: Provide colourfast fillers compatible with the grout material. For cement-based grouts, provide lime-proof natural or synthetic metallic oxides compatible with cement.

6.3.3 EXECUTION

Provide tiling systems to walls, floors and other substrates as follows:

Consistent in colour and finish.

Firmly bonded to substrates for the expected life of the installation.

Resistant to expected impacts in use.

Set out with joints accurately aligned in both directions and wall tiling joints level and plumb.

To direct all water flowing from supply points to drainage outlets without leakage to the substrate or adjacent areas.

6.3.3.1 JOB CONDITIONS

Provide tiling systems to walls, floors and other substrates as follows:

Consistent in colour and finish.

Firmly bonded to substrates for the expected life of the installation.

Resistant to expected impacts in use.

Set out with joints accurately aligned in both directions and wall tiling joints level and plumb.

To direct all water flowing from supply points to drainage outlets without leakage to the substrate or adjacent areas.

Protection

Protect adjacent surfaces against damage during progress of the work of this Section.

Coordination and Cooperation

Coordinate work of this Section with work of other trades. Perform work without delay to the work in progress.

Workmanship

In accordance with best practice; work performed by skilled workers; jointings, intersections and returns well formed; drilling and cutting neatly done without marring the material; joints straight and solidly filled conforming to applicable "Standard Specifications" of the American National Standards Institute, Inc. ANSI A108.1 and ANSI A108.2.

6.3.3.2 Substrates

Drying and Shrinkage

Before tiling, allow at least the following times to elapse (for initial drying out and shrinkage) for these substrates:

Concrete slabs: 42 days.

Concrete blockwork: 28 days.

Toppings on slabs and rendering on blockwork: A further 21 days.

6.3.3.3 Preparation

Ambient temperature

Install mortar and set and grout the tile, only when the temperature is at least 10°C and rising. If the ambient temperature is less than 10°C or more than 35°C, do not lay tiles.

Substrates

Ensure substrates are as follows:

Clean and free of any deposit or finish which may impair adhesion or location of tiles.

If solid or continuous, excessive projections are hacked off and voids and hollows are filled with a cement:sand mix not stronger than the substrate nor weaker than the bedding.

Absorbent substrates: If suction is excessive, control it by dampening but avoid over-wetting and do not apply mortar bedding to substrates showing surface moisture.

Dense concrete: If not sufficiently rough to provide a mechanical key, roughen by scratching or hacking to remove 3 mm of the surface and expose the aggregate; then apply a bonding treatment.

6.3.3.4 Tiling Generally

Sequence

General: Fix wall tiles before floor tiles.

Cutting and Laying

Cutting: Cut tiles neatly to fit around fixtures and fittings, and at margins where necessary. Drill holes without damaging tile faces. Rub edges smooth without chipping.

Laying: Return tiles into sills and openings. Butt up to returns, frames, fittings, and other finishes.

Variations

Distribute variations in hue, colour, or pattern uniformly, by mixing tiles or tile batches before laying.

Protection

Floor tiles: Keep traffic off floor tiles until the bedding has set and attained its working strength.

Cleaning: Keep the work clean as it proceeds and protect finished work from damage.

6.3.3.5 Setting out

Tile joints

Set out tiles to give uniform joint widths within the following limits:

Ceramic floor tiles: 4 to 6 mm.

Quarry floor tiles: 6 to 12 mm.

Terrazzo and stone pavers to floor: 2 to 3 mm.

Large and/or irregular floor tiles: 6 to 12 mm.

Mounted mosaics: To match mounting pattern.

Ceramic wall tiles: 3 to 5 mm.

Terrazzo and stone wall panels: 2 to 3 mm.

Margins

Provide whole or purpose-made tiles at margins where practicable, otherwise set out to give equal margins of cut tiles. If margins less than half tile width are unavoidable, locate the cut tiles where they are least conspicuous.

Fixtures

If possible position tiles so that holes for fixtures and other penetrations occur at the intersection of horizontal and vertical joints or on the centre lines of tiles. Continue tiling fully behind fixtures which are not built in to the tiling surface. Before tiling ensure that fixtures interrupting the tile surfaces are accurately positioned in their designed or optimum locations relative to the tile layout.

6.3.3.6 Falls and levels

Grading

Grade floor tiling to even and correct falls to floor wastes and elsewhere as required. Make level junctions with walls. Where falls are not required lay level.

Fall, general: 1:100 minimum.

Fall, in shower areas: 1:60 minimum.

6.3.3.7 Bedding

Preparation of Tiles

Adhesive bedding: Fix tiles dry; do not soak.

Mortar bedding: Soak porous tiles in water for half an hour and then drain until the surface water has disappeared.

Terra cotta tiles: Use pre sealed tiles or apply a breathable sealer and lay dry. If a final sealed finish is selected, use a compatible laying sealer.

Bedding

Use bedding methods and materials which are appropriate to the tile, the substrate, the conditions of service, and which leave the tile firmly and solidly bedded in the bedding material and adhered to the substrate. Form falls integral with the substrate.

Thin Adhesive Beds

Provide only if the substrate deviation is less than 3 mm when tested with a 3 m straight edge. Cover the entire tile back with adhesive when the tile is bedded.

Thickness: 1.5 – 3 mm.

Thick Adhesive Beds

Provide on substrates with deviations up to 6 mm when tested with a 3 m straight edge, and with tiles having deep keys.

Nominal thickness: 6 mm.

Adhesive Bedding Application

Apply adhesive by notched trowel to walls and floors and direct to tiles if required, to provide evenly distributed coverage after laying.

Wall tile spacers: Do not use spacer types that inhibit the distribution of adhesive.

Curing: Allow the adhesive to cure for the period nominated by the manufacturer prior to grouting or allowing foot traffic.

Mortar Beds

For floor tiles: Either lightly dust the screeded bed surface with dry cement and trowel level until the cement is damp, or spread a thin slurry of neat cement, or cement-based thin bed adhesive, on to the tile back. Do not provide mortar after initial set has occurred.

Nominal thickness: 20 to 40 mm.

6.3.3.8 Movement joints

General

Provide movement joints to the **Tile Movement Joints** schedule and as follows:

Over structural (isolation, contraction, expansion) joints.

Close to external corners in large tiled areas.

Around the perimeter of the floor.

At junctions between different substrates.

To divide large tiled areas into bays, maximum 5 m wide, maximum 16 m².

At abutments with the building structural frame and over supporting walls or beams where flexing of the substrate is anticipated.

Depth of joint: Right through to the substrate.

Sealant width: 6 – 10 mm.

Depth of elastomeric sealant: One half the joint width, or 6 mm, whichever is the greater.

Movement Joint Materials

Divider strip: A proprietary expansion joint consisting of a neoprene filler sandwiched between plates with lugs or ribs for mechanical keying. Set flush with the finished surface.

Sealant: Two-pack self-levelling non-hardening mould resistant, one-part silicone or polyurethane sealant applied over a backing rod. Finish flush with the tile surface.

Backing rod: Compressible closed cell polyethylene foam with a bond-breaking surface.

6.3.3.9 Grouted and caulked joints

Grouted joints

Commence grouting as soon as practicable after bedding has set. Clean out joints as necessary before grouting.

Face grouting: Fill the joints solid and tool flush. Clean off surplus grout. Wash down when the grout has set. When grout is dry, polish the surface with a clean cloth.

Edges of tiles: Grout exposed edge joints.

Mosaic Tiles

Grouting mosaics: If paper faced mosaics are to be bedded in cement mortar, pre-grout the sheeted mosaics from the back before fixing. After fixing, rub grout into the surface of the joints to fill any voids left from pre-grouting. Clean off surplus grout. When grout has set, wash down. If necessary use a proprietary cement remover.

Sealant Joints

Provide joints filled with sealant and finished flush with the tile surface as follows:

Where tiling is cut around sanitary fixtures.

Around fixtures interrupting the tile surface, for example pipes, brackets, bolts and nibs.

At junctions with elements such as window and door frames and built-in cupboards.

Width: 5 mm.

Depth: Equal to the tile thickness.

6.3.3.10 Joint Accessories

Floor Finish Dividers

Finish tiled floors at junctions with differing floor finishes with a corrosion resistant metal dividing strip suitably fixed to the substrate, with top edge flush with the finished floor. Where changes of floor finish occur at doorways make the junction directly below the closed door.

6.3.3.11 Completion

Cementitious Terrazzo Tiled Surfaces

In situ grind and polish the completed installation with equipment nominated by the tile supplier.

Spare Tiles

Supply spare matching tiles and accessories of each type for future replacement purposes. Store the spare materials on site where directed by the Engineer.

Quantity: At least 1% of the quantity installed.

Cleaning

Clean tiled surfaces using an appropriate tile cleaning agent, and polish:

1. Remove mortar and grout prior to hardening during progress of work.
 2. Clean surfaces thoroughly after grouting and pointing have set sufficiently; remove all cement, dust and other foreign matter with plain water or mild alkaline cleaner. Sandblasting of exposed surfaces is prohibited.
 3. Cleaning with a solution not stronger than 10 percent muriatic acid to 90 percent water permitted only on unglazed tile; thoroughly wash afterwards with clean water. Completely protect hardware and fittings metal surfaces, cast iron and vitreous items from acid and fumes.
 4. Cleaning shall be done in accordance with the manufacturer's recommendations.
-

8

8.1 WATER SERVICES**8.1.1 GENERAL****8.1.1.1 Aims**Responsibilities

Provide water services systems subject to the site and other constraints below:

- Cold water services: Connect the cold water supply system to the water source with a stop valve at the connection point. Provide the water source if required to suit the particular conditions as defined on the drawings. Provide the cold water installation to the draw-off points or connections to other services.
- This is typical text. Edit to suit the project.
- Hot water services: Provide the hot water installation from the cold water connection points to the draw-off points or connections to other services.
- This is typical text. Edit to suit the project.
- Hose reel system: Provide the hose reel system where defined on the drawings and in the BOQ.
- Describe the required system. Delete if not applicable.
- Sanitary plumbing and drainage: Provide the plumbing and drainage system where defined on the drawings and in the BOQ.
- Describe the required system.
- Stormwater: Provide the stormwater system where defined on the drawings and in the BOQ.
- Describe the required system.
- Subsoil drainage: Provide the subsoil drainage system where defined on the drawings and in the BOQ.

8.1.1.2 InspectionNotice

Give sufficient notice so that inspection may be made of the following:

- Underground pipework prior to concealment.
- Above ground pipework prior to concealment.

8.1.1.3 SubmissionsExecution Details

Before starting the respective portions of the installation, submit the following for approval from the Engineer:

- Embedded services: Proposed method for embedding services in concrete walls or floors or chasing into concrete or masonry walls.
- Fixing of services: Typical details of locations, types and methods of fixing of services to structure.
- Inaccessible services: If services will be enclosed and not accessible after completion, submit proposals for location of service runs and fittings.
- Proposals for location of exposed piping.

Samples

Provide samples listed in the **Water Services Samples** schedule.

8.2 EXECUTION

Refer to the **Water system piping** schedule for details of all pipe types.

8.2.1.1 Installation generallyAccessories

Provide the accessories and fittings necessary for the proper functioning of the systems, including taps, valves, outlets, pressure and temperature control devices, strainers, gauges and pumps.

Isolating valves: provide valves so that isolation of parts of the system in the event of leaks or maintenance causes a minimum of inconvenience to building occupants.

Arrangement

Services and equipment: Locate and arrange so that:

Failure of plant and equipment (including leaks) does not create a hazard for the building occupants and causes a minimum or no damage to the building, its finishes and contents.

maintenance operations can be carried out in a safe and efficient manner, with a minimum of inconvenience and disruption to building occupants and without damaging adjacent structures, fixtures or finishes.

Embedded Pipes

Do not embed pipes that operate under pressure in concrete or surfacing material of a building without prior written approval. If embedding is approved:

Install in continuous lengths without fittings wherever possible.

Do not lay across joints between adjoining sections of concrete through which reinforcement does not extend.

Pressure test and rectify leaks before the concrete is poured.

Penetrations and Fixing

Limitations: Do not penetrate or fix to the following without prior approval:

- Structural building elements including external walls, fire walls, fire doors and access panels, other tested and rated assemblies or elements, floor slabs and beams.
- Membrane elements including damp-proof courses, waterproofing membranes and roof coverings.

Fire rated building elements: Seal penetrations with a system that maintains the fire rating of the element.

Membranes: If approval is given to penetrate membranes, provide a waterproof seal to the approval of the Engineer between the membrane and the penetrating component.

Piping

Install piping in straight lines, plumb and to uniform grades. Arrange and support the piping so that it remains free from vibration and water hammer, while permitting movement in both structure and services. Keep the number of joints to a minimum. Prevent direct contact between incompatible metals.

Concealment: If practicable, conceal piping and fittings requiring maintenance or servicing so that they are accessible within non-habitable enclosed spaces such as roof spaces, subfloor spaces and ducts. Provide at least 25 mm clearance between adjacent pipelines (measured from the piping insulation where applicable).

Cover plates: Where exposed piping emerges from wall, floor or ceiling finishes, provide cover plates of stainless steel or non-ferrous metal finished to match the piping.

Pipe support materials: To be the same as the piping or galvanized or non-ferrous metals, with bonded PVC or glass fibre woven tape sleeves where needed to separate dissimilar metals.

Pits

Location: Install below-ground water meters, control valves and gas regulators in concrete access pits with removable pit covers.

Internal dimensions: To give 300 mm clear space all around the fittings in the pit.

Concrete: Grade M-200, 100 mm thick, with reinforcement fabric.

Pit covers: To be minimum of 5mm thick steel covers with finger holes for easy removal.

Installation: Grade floor to a point on one side and drain to the stormwater drainage system. Carry the pit walls up to 50 mm above finished ground level. Cast in the pit cover frame flush with the top. Trowel the top smooth.

Valve boxes

Location: Install underground isolating valves in concrete access pits with removable pit covers.

Identification: Mark the box covers with the name of the service.

8.2.1.2 Installation of Fixtures

General

Accessories: Use manufacturer's brackets and accessories where these are available and suitable for the mounting substrate.

Protection: Deliver fixtures to site protected from damage under site conditions by coatings, coverings and packaging. Remove only sufficient protection to permit installation.

Installation

Connections: Connect to each fixture supply and waste services. Install plumb and level.

Cutting and fitting: If it is necessary to cut and/or fit substrate to install an item carry out this before the surface is finished or painted. Remove items when required for painting and protect until re-installed. Reinstall when painting and finishing is complete. Cap or plug the open ends of pipes.

Substrate and fixings: Before installation make sure that the substrate to which the fixtures are to be installed is adequate. In solid walls confirm adequacy of the material at fixing locations.

8.2.1.3 Painting, finishes and marking

Exceptions

Do not paint chromium or nickel plating, anodised aluminium, glass reinforced plastic, stainless steel, non-metallic flexible materials and normally lubricated machined surfaces.

Finishes

Finish exposed piping, including fittings and supports, as follows:

In internal locations such as toilet and kitchen areas: Chrome plate copper piping with bright finish.

Externally and steel piping and iron fittings internally: Paint.

In concealed but accessible spaces (including cupboards and non-habitable enclosed spaces):

Leave copper and plastic unpainted except for identification marking. Prime steel piping and iron fittings.

Valves: Finish valves to match connected piping.

Marking and Labelling

Mark services and equipment to provide a ready means of identification.

Locations exposed to weather: Provide durable materials.

Pipes, conduits and ducts: Identify and label.

Consistency: Label and mark equipment using a consistent scheme across all services elements of the project.

8.2.1.4 Hot and Cold Water Services

Fittings and Accessories

Provide the fittings necessary for the proper functioning of the water supply system, including taps, valves, backflow prevention devices, temperature control devices, strainers.

Line Strainers

Type: Low resistance, Y-form bronze bodied type, with screen of dezincification resistant brass, stainless steel or monel.

Screen perforations: 0.8 mm maximum.

Piping Insulation

Application: Fit insulation tightly to piping surfaces without gaps. Minimise number of joints. Insulate fittings for the same thermal resistance as the piping insulation. Install the insulation on unions and other items requiring service so that it is readily removable. Provide supports formed to fit around the insulation so the insulation thickness is reduced by < 10%.

Material: Select from the following:

Polyester in moulded tubular sections faced with factory bonded aluminium foil laminate or integral polyester scrim.

Polyolefin foam: Cross linked closed cell polyolefin foam faced with factory bonded aluminium foil laminate.

Tapware

Provide the tapware in accordance with the **Sanitary fixtures** schedule.

Metal heads and handles: Provide brass fittings or suitably bush to prevent electrolysis and growth.

Plastic heads and handles: Provide break-resistant fittings of a compact nature, to prevent fracture and exposure of jagged or rough edges.

Tap positions: Locate hot tap to the left of or above, the cold tap.

Thermostatic Mixing Valves

Water temperature regulated by a single hand control, capable of delivering water at the temperature of either of the supply systems and at any temperature in between and suitable for controlling single or multiple outlets, as appropriate. Refer to the **Sanitary fixtures schedule**.

Controls: Incorporate the following:

A temperature sensitive automatic control which maintains temperature at the pre-selected setting and rapidly shuts down the flow if either supply system fails or if the normal discharge water temperature is exceeded.

8.2.1.5 Water Heaters

Standard Electric Systems

Provide standard electrical water boilers as identified in the BOQ to locations identified on the drawings. Refer to the **Water heater** schedule.

Solar Water Systems

Provide a proprietary automatic water heater comprising solar collector and storage container, with or without supplementary heating unit and including connections, controls and necessary fittings.

8.2.1.6 Hose Reels

General

Provide hose reels with swivel hose guides in accordance with the **Fire hose reels** schedule.

8.2.1.7 Stormwater

Cleaning

During construction, use temporary covers to openings and keep the system free of debris.

Downpipe Connections

Turn up underground drainage pipelines to finish 50 mm above finished ground or pavement level.

Access Pits

Cover levels: Locate the top of covers or gratings, including frames as follows:

In paved areas: Flush with the paving surface.

In landscaped areas: 25 mm above finished surface.

Stormwater Drains

Provide stormwater drains to connect downpipes, surface drains, subsoil drains and drainage pits to the outlet point or discharge point.

Downpipe connections: Turn up underground drainage pipelines with bends to meet the downpipe, finishing 50 mm (nominal) above finished ground or pavement level. Seal joints between downpipes and drains. Alternatively, terminate downpipe minimum of 100mm above adjacent ground level and discharge water to surface run off area. Allow for scour protection to bottom of downpipe.

Lined Surface Drains-Grated Trenches

Provide precast or cast in situ concrete lined trenches with painted or galvanized steel gratings.

8.2.1.8 Subsoil Drains

General

Provide subsoil drains to intercept groundwater seepage and prevent water build-up behind walls and under floors and pavements. Connect subsoil drains to surface drains or to the stormwater drainage system as applicable.

Connection: Connect subsoil drains to the stormwater drainage system.

Filters: UV resistant geotextile material with a permeability ≥ 10 times that of the native soil and capable of retaining particles of 0.25 mm size. Securely fit or join the sock at each joint.

Subsoil drains: Provide proprietary perforated plastic pipe.

8.2.1.9 Sanitary Plumbing and Drainage

Vent pipes

Staying to roof: If fixings for stays penetrate the roof covering, seal the penetrations and make watertight.

Terminations: Provide bird-proof vent cowls of the same material and colour as the vent pipe.

Sanitary Fixtures

Provide sanitary fixtures in the **Sanitary fixtures schedule** complete with all accessories necessary for correct installation and use.

8.2.1.10 Completion

Testing

Hydrostatic tests: Do not install insulation until the piping has been tested. Pressure test cold and hot water services to ensure that all pipework is free from leaks. Include pipe joints, valve seats, tap washers and strainers. Repair as necessary, replace if damaged and retest.

Completion

Hot and cold water services: On completion, flush pipelines using water and leave them clean.

Stormwater and wastewater services: On completion, flush the system using water and leave clean.

Charging

On completion of installation, commissioning, and testing, fill the hot and cold water systems with water, turn on control and isolating valves and the energy supply and leave the water supply system in full operational condition.

Operation and Maintenance Manuals

Provide written operating and maintenance instructions containing:

- Contractor's contact details for service calls.
- Manufacturer's maintenance and operation literature.
- Description of day-to-day operation.

Record Drawings

Provide a drawing of the system as installed. Show dimensions, types and location of the services in relation to permanent site features and other underground services. Include all changes made during commissioning and the maintenance period.

Diagrams: Include diagrammatic drawings of each system.

Services below ground: Where pipes and fittings are below ground show the depth and dimensioned references that will allow the future location of the service for maintenance or expansion.

8.2 HOT WATER HEATING SERVICES

8.2.1 GENERAL

Responsibilities

Provide services systems subject to the site and following constraint:

- Hot water services: Provide the hot water installation from the existing hot water heating system main network draw-off points or connections to other services.

8.2.1.1 Inspection

Notice

Give sufficient notice so that inspection may be made of the following:

- Underground pipework prior to concealment.
- Above ground pipework and fixture installation prior to concealment.

8.2.1.2 Submissions

Execution Details

Before starting the respective portions of the installation, submit the following for approval from the Engineer:

- Embedded services: Proposed method for embedding services in concrete walls or floors or chasing into concrete or masonry walls.
- Fixing of services: Typical details of locations, types and methods of fixing of services to structure.
- Inaccessible services: If services will be enclosed and not accessible after completion, submit proposals for location of service runs and fittings.
- Proposals for location of exposed piping.

Samples

Provide samples listed in the **Hot water heating Services Samples** schedule.

8.2.2 PRODUCTS AND EXECUTION

Refer to the **Hot water heating system piping** schedule for details of all pipe types.

8.2.2.1 Installation generally

Accessories

Provide the accessories and fittings necessary for the proper functioning of the systems, including valves, outlets, pressure and temperature control devices, strainers, gauges and pumps.

Isolating valves: provide valves so that isolation of parts of the system in the event of leaks or maintenance causes a minimum of inconvenience to building occupants.

Embedded Pipes

Do not embed pipes that operate under pressure in concrete or surfacing material of a building without prior written approval. If embedding is approved:

Install in continuous lengths without fittings wherever possible.

Do not lay across joints between adjoining sections of concrete through which reinforcement does not extend.

Pressure test and rectify leaks before the concrete is poured.

Penetrations and Fixing

Limitations: Do not penetrate or fix to the following without prior approval:

- Structural building elements including external walls, fire walls, fire doors and access panels, other tested and rated assemblies or elements, floor slabs and beams.
- Membrane elements including damp-proof courses, waterproofing membranes and roof coverings.

Fire rated building elements: Seal penetrations with a system that maintains the fire rating of the element.

Membranes: If approval is given to penetrate membranes, provide a waterproof seal to the approval of the Engineer between the membrane and the penetrating component.

Piping

Install piping in straight lines, plumb and to uniform grades. Arrange and support the piping so that it remains free from vibration and water hammer, while permitting movement in both structure and services. Keep the number of joints to a minimum. Prevent direct contact between incompatible metals.

Concealment: If practicable, conceal piping and fittings requiring maintenance or servicing so that they are accessible within non-habitable enclosed spaces such as roof spaces, subfloor spaces and ducts. Provide at least 75 mm clearance between adjacent pipelines (measured from the piping insulation where applicable).

Pipe support materials: To be the same as the piping or galvanized or non-ferrous metals, with bonded PVC or glass fibre woven tape sleeves where needed to separate dissimilar metals.

Technical service room

See drawing for location, architectural dimensions and structural specs of the technical room.

8.2.2.2 Installation of Fixtures

General

Accessories: Use manufacturer's brackets and accessories where these are available and suitable for the mounting substrate.

Protection: Deliver fixtures to site protected from damage under site conditions by coatings, coverings and packaging. Remove only sufficient protection to permit installation.

Installation

Connections: Connect to each fixture supply and waste services. Install plumb and level.

Cutting and fitting: If it is necessary to cut and/or fit substrate to install an item carry out this before the surface is finished or painted. Remove items when required for painting and protect until re-installed. Reinstall when painting and finishing is complete. Cap or plug the open ends of pipes.

Substrate and fixings: Before installation make sure that the substrate to which the fixtures are to be installed is adequate. In solid walls confirm adequacy of the material at fixing locations.

8.2.2.3 Execution generally

In order to execute best hot water central heating system the contractor shall consider following general points:

1. All the pipes used in the system shall be steel pipes and shall be integral-cast pipes with no sign of joint-lines along the pipe surface.
2. Connection method for all pipes shall be either electrical or gas welding method.
3. Pipes with diameter of up to 20mm shall be bended directly in the turns and corners and shall not be fitted using elbows or other fittings.
4. Pipes having 25mm to 100mm diameter shall be redirected in turns and corners using steel elbows welded in connection points, no screwing method is allowed.
5. Valves used in hot water heating system shall be of purposely designed valves to be fitted using screwing methods with the system. Valves with diameter 32mm or more shall be of flanged type valves only.
6. Main supply pipes (with diameters of 32mm to 100mm) shall be properly heat insulated using mineral wool insulation sheets having an R-value of not less than 5.
7. The heating system shall have 2 separate water filters one installed at the incoming point where the liquid comes from the boiling center and another installed at the end of the system where the water circulates back toward the boiling system. This is required to filter any dusty granulations, stains etc arise either at the boiling center or at the radiators.
8. The system shall be equipped by a manometer to show the system pressure for all the time.
9. The heating system shall be equipped by 2 separate thermometers: one installed to show the incoming liquid temperature (could be up to 120 °C) and another to display the outgoing liquid temperature. These help monitoring staff to identify many of the system problems.
10. There are different types and standard sizes of plates and radiators that can be used in different building types as per given drawings:
 - Plate sizes of: 500X160mm, 600X150mm, 900X150mm, 1200X150mm and 1200X300mm.
 - Plate types: Cast iron, Steel, Aluminum.

Cast-iron type: This type has a very good quality and takes longer to get hot and takes longer to loose its potential temperature.

Steel type: This type is good but exposed to rust/corrosion. This type, however, gets hot and cool quickly.

Aluminum type: This type is safe against rust/corrosion and can get hot and cool quickly too.
11. The hot water heating system shall be equipped with air venting valves. These valves are vital to make sure no air exist within the system during installation and during first time circulation of the liquid into the system.
12. Proper supports and clips are to be used to mount the radiators on the walls firmly and safely. The supports shall prevent all radiator movement; horizontally, vertically; and prevent them from being tilted and turning and falling.
13. Leakage test shall be applied on overall heating system using special machinery establishing at least (4 to 5 bar pressure for pipes up to 25mm and 4 to 8 bar pressure for pipes with diameter of 32 to 100mm) at least 24 hours continuous testing period.
14. Painting: surfaces for all steel pipes and other members shall be neat and free of any dust or materials (use proper sand papers if required). After the substrate is ready for painting; one coat of anti-rust paint following with two other coats of oil-based painting to be applied. In case the Cast-Iron radiator used in the system, the radiators shall also be painted with one coat of anti-rust following two coats of oil-based painting.

9 ELECTRICAL

9.1 ELECTRICAL SERVICES

9.1.1 GENERAL

9.1.1.1 AIMS

Responsibilities

Provide electrical systems in conformance with the **Electrical Systems Schedule**.

Qualification

Use only persons appropriately experienced and qualified to undertake the electrical design and construction work on the systems documented.

Performance

Carry out verification tests and measurements to show compliance with the specification.

Rates for installation work

Rates for installation of cabling, light fittings, sockets, switches and all other electrical components are to include allowance for fixings, connection, chasing of wiring and any other works required for the installation of the electrical system to a fully operational and safe working condition.

9.1.1.2 Inspection

Notice

Give sufficient notice so that inspection may be made of the following:

- Underground electrical services conduits prior to concealment.
- Above ground electrical services conduits in walls prior to concealment.
- Switchboards prior to installation.

Inspection and testing on completion

To verify that the requirements of this specification have been met, all electrical installations and any alterations, additions or repairs to an existing electrical installation, after completion and before being energised shall be:

- Inspected as far as is practicable
- Tested

Precautions shall be taken to insure the safety of persons and to avoid damage to property and the electrical installation equipment during inspection and testing.

NOTE: if requires, the contractor is responsible to provide temporary power generator in order to undertake all needed testing.

A visual inspection shall be made when work on an electrical installation has been completed in order to verify that the work complies with the requirements of this specification. The visual inspection shall be carried out before, or in association with testing and shall where practicable be made before the relevant part of the electrical installation is placed in service. Visual inspections shall be carried out prior to the completion of the installation where that part of the electrical installation will be covered by following works.

The following items provide a guide to the matters to be checked during the visual inspection to assess that the relevant requirements of this specification have been met.

General:

- Protection against direct contact with live parts e.g. Insulation and enclosure.

- Protection against indirect contact with exposed conductive parts, e.g. Double insulation or isolating transformers.
- Protection against hazardous part, e.g. Enclosure, guarding or screening of flammable materials, hot surfaces and parts that may cause physical injury.
- Protection against spread of fire, e.g. Penetration of fire barriers.
- General condition of the electrical equipment, e.g. Signs of damage that could impair safe operation, disconnection of unused electrical equipment.

Consumers Mains:

- Current carrying capacity.
- Voltage drop.
- Underground installation conditions, e.g. Enclosure, depth of burial and mechanical protection.
- Aerial installation conditions.
- Connection of wiring.
- Protection against external influences.

Switchboards:

- Location, e.g. Access and egress.
- Protective devices, e.g. Overload and residual current rating, fault current rating.
- Isolating devices, e.g. Main switches.
- Connecting devices, e.g. Neutral bars, earth bars and live links.
- Connection and fixing of wiring and switchgear.
- Identification and labelling of electrical equipment.
- Protection against external influences.

Wiring systems:

- Conductor size, e.g. Current-carrying capacity and voltage drop.
- Identification of cable cores.
- Adequate support and fixing.
- Connections and enclosures.
- Particular installation conditions, e.g. Underground, aerial and emergency systems.
- Segregation from other services and electrical installations.
- Protection against external influences, e.g. Enclosure.

Electrical equipment:

- Isolation and switching devices for protection against injury from mechanical movement devices and motors.
- Isolation and switching devices for protection against thermal effects, e.g. Motors, room heaters and water heaters.
- Switching devices for particular electrical equipment, e.g. Socket outlets and cooking appliances.
- Particular installation conditions, e.g. Locations affected by water, explosive atmospheres, extra low voltage and high voltage.
- Compliance with required standard.
- Connection, support and fixing.
- Protection against external influences.

Earthing:

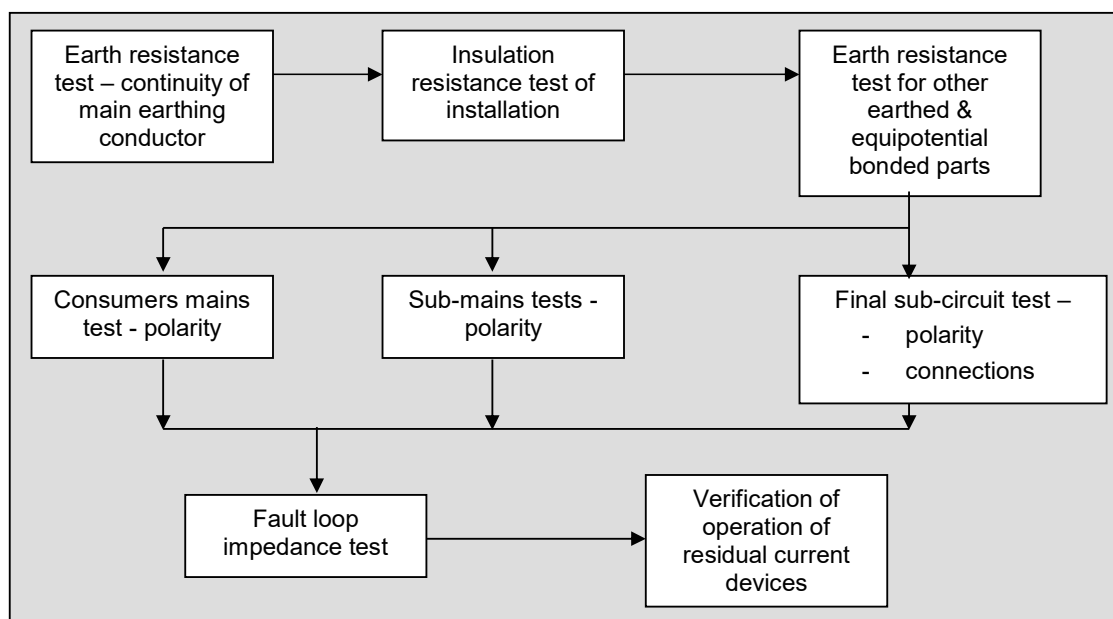
- Multiple earth neutral (MEN) connection.
- Earth electrode.
- Earthing conductors, e.g. Size and identification.
- Equipotential bonding conductors, e.g. Size and identification.
- Connections, joints and terminations.
- Protection against external influences.
- Connection to earthing arrangements for other systems.

- Creation of earthed situation that may require earthing of additional electrical equipment.

Testing:

After completion of, or in association with the visual inspection tests, testing shall be carried out on the electrical installation to verify that it complies with the requirements of this specification and that it is suitable for the use intended.

Sequence of tests as noted:



9.1.2 EXECUTION

9.1.2.1 GENERAL

General

Arrangement: Arrange services so that services running together are parallel with each other and with adjacent building elements.

Installation: Install equipment and services plumb, fix securely and organise reticulated services neatly. Allow for movement in both structure and services.

Lifting: Provide heavy items of equipment with permanent fixtures for lifting as recommended by the manufacturer.

Suspended ground floors: Keep all parts of services under suspended ground floors > 150 mm clear of the ground surface. Make sure services do not impede access.

Samples

Samples: Provide samples of all accessories and light fittings for the approval of the Engineer prior to use in the project.

Installation of accessories

General: Install accessories in conformance with the Installation of accessories table.

Flush mounting: Provide flush mounted accessories except in plant rooms.

Mounting heights: To on-site direction

Restricted location: Do not install wall boxes across junctions of wall finishes.

Surface mounting: Proprietary mounting blocks.

9.1.2.2 Installation Of Accessories Table

Wall construction	Installation and concealed cabling facilities
Rendered brickwork partition	Flush wall box with conduit chased into wall
Double sided face brick partition	Vertically mounted flush wall box with conduit concealed in cut bricks
Concrete wall or slab	Flush wall box or flush mounted outlet with thermoplastic insulated cables in conduit integral with slab. Do not chase into concrete walls without obtaining approval from the Engineer.

Installation of ceiling mounted appliances

Connections: Provide flush mounted outlets on the ceiling next to support brackets.

Fixing: Provide support brackets fixed through ceiling to the building structure. Brace appliances that have excessive bending moments, are heavy or vibrate, to prevent horizontal movement.

Electrical installations

- All cabling and wiring is to be installed in approved PVC conduit or within a metal cable tray for horizontal runs within the ceiling. there will be no exceptions. Any cabling installed otherwise will be removed and replaced correctly at the contractor's expense. All below ceiling level electrical circuits are to be installed in surface mounted conduits.
- International standard connectors (chocolate block) for the wiring and cabling are to be used for all connections, no other method is acceptable.
- All IP ratings given refer to Ingress Protection (IP) Codes to AS1939.

NOTE: Simple twisting of wires as a means of connecting wires and cables with protective electrical tape is not acceptable.

Earthing/Grounding

- All installed electrical fixtures and fittings are to be earthed to the main earth system for the facility, there are no exceptions to this requirement.
- All protective earthing conductors should be incorporated in the same wiring enclosure as the associated live conductors or in the adjacent vicinity.
- Where a 'clean' earth is specified for a particular item of electrical equipment, the manufacturer of the electrical equipment shall be consulted in order to confirm the necessary arrangements.
- Precautions shall be taken against the risk of damage to the earthing arrangement and other metallic part of the electrical installation through electrolysis or galvanic action.
- The size of an earthing conductor shall be such that it meets the requirements of the IEC regulations and is in accordance with the Earth conductor size table.

Earth Conductor Size Table

Nominal size of live conductor (mm ²)	Nominal size of copper earthing conductor (mm ²)	
	With copper live conductors	With aluminium live conductors
1	1*	-
1.5	1.5*	-
2.5	2.5	-
4	2.5	-
6	2.5	2.5

10	4	2.5
16	6	4
25	6	6
35	10	6
50	16	10
70	25	10
95	25	16
120	35	25
150	50	25
185	70	35
240	95	50
300	120	70
400	120	95
500	120	95
630	120	120

* These earthing conductors may be used only where incorporated in a multicore cable or flexible cord.

9.1.2.3 LOW VOLTAGE POWER SYSTEMS

General

Provide a complete operational low voltage power system, comprising the following and to the Electrical supply mains **and** Electrical switchboard design schedules:

- Supply from mains power
- Metering.
- Consumers mains and switchboard.
- Submains and sub boards.
- Final subcircuits.

Submissions

Technical data: Submit documentation to fully describe the proposed installation. As a minimum provide:

- Submain cable routes and support or enclosure method.
- Switchboard cupboard layouts including risers.

Accessories

Provide the following and to the Power accessories **and** Lighting control and fittings schedules:

- General power outlets.
- Isolating switches.
- Three phase outlets.
- Ceiling mounted sweep fans
- Duct heaters
- Wall, window or roof mounted exhaust fans
- Light switches
- Light fittings
- Emergency lighting and exit signs
- Other equipment as identified in the Schedule

Junction and terminal boxes

Shall be manufactured from PVC and rated to IP56. They shall come complete with a rigid PVC cover attached by means of screws.

Switches

All switches are to be manufactured in compliance with international standards IP24. rate is to include allowance for installation of switches recessed into the wall. Switches are to be installed in locations as shown on the drawings.

Wiring systems

Selection: Provide wiring systems appropriate to the installation conditions and the function of the load. All wiring quality to be approved by the Engineer before installation commences.

Power cables

Copper cable generally, multi-stranded except for MIMS. All cabling is to be manufactured to international standard (BS 5467 or BS 6500) and meet all appropriate safety and performance requirements.

Minimum size:

- Lighting subcircuits: 1.5 mm².
- Power subcircuits: 2.5 mm².
- Submains: 6 mm².

Voltage drop: Install final subcircuit cables within the voltage drop parameters dictated by the route length and load.

Dummy load tests

Where electrical tests are required and the actual load is not available, provide a dummy load equal to at least 75% of the design load.

9.1.2.4 SWITCHBOARDS**General**

Provide proprietary switchboards to the following and to the Electrical switchboard design schedule:

- Main switchboard.
- Distribution boards.

Distribution boards shall be constructed from steel with a lockable door. Boards shall be sealed to meet a rating of IP56. All cable entry and exit points shall be constructed using suitable sized, proprietary PVC cable glands.

Statutory authority's equipment

Refer to local supply authority service rules to determine their requirements. Install equipment supplied by the statutory authority, and provide wiring to complete the installation.

Cable entries

Single core cables rated > 300 A: Arrange to minimise eddy currents.

Construction

Fixing: Before making interpanel connections, fix assemblies and metering equipment enclosures into position, level and plumb.

Cable entries: Neatly adapt one or more cable entry plates, if fitted, to accept incoming cable enclosure. Provide the minimum number of entry plates to leave spare capacity for future cable entries. Do not run cables into the top of weatherproof assemblies.

Single core cables rated > 300 A: Pass separately through non-ferrous gland plates. Do not provide metal saddles.

Cable enclosures: Continue cable enclosures to or into assemblies and fit cable entry plates so that the IP rating of the assembly and the fire rating of the cable are maintained.

Cable supports: Support or tie mains and submains cables within 200 mm of terminations.

9.1.2.5 SWITCHBOARD COMPONENTS

Switch-isolator and combination fuse-switch units

Rated current: To suit unit installed in enclosure.

Rated fault capacity: Provide units selected for short-circuit making capacity that is at least the fault level at assembly incoming terminals.

Breaking capacity: At least the rated full load current.

Rated duty: Uninterrupted in non-ventilated enclosure.

Operation: Independent manual operation including positive 'ON/OFF' indicator.

Locking: Provide for padlocking in the 'OFF' position.

Handles: Removable only when switch is in open position.

Fuse links: Isolated when switch contacts are open.

Moulded case and miniature circuit breakers

Moulded case breakers to International Standards.

Miniature circuit breakers to International Standards

Fault capacity > 10 kA circuit breakers to approval of Engineer

Fault capacity < 10 kA, current rating < 100 A: Miniature overcurrent circuit breakers

Mounting: Mount circuit breakers so that the 'ON/OFF' and current rating indications are clearly visible with covers or escutcheons in position. Align operating toggles of each circuit breaker in the same plane.

Clip tray chassis: For miniature overcurrent circuit breakers provide clip tray assemblies capable of accepting single, double, or triple circuit breakers, and related busbars. Provide moulded clip-on pole fillers for unused portions.

Residual current devices

Integral type: Incorporate earth leakage in circuit breaker protection operation.

Maximum tripping current: 30 mA.

Fuses with enclosed fuse links

Standards: To International Standards

Fault level: Provide fuses suitable for the fault level at the assembly, and which discriminate with other protective equipment.

Let-through energy and peak cut-off current: To suit protected equipment.

Fuse-holders: Mount fuse-holders so that fuse carriers may be withdrawn directly towards the operator and away from live parts. Provide fixed insulation which shrouds live metal when the fuse carrier is withdrawn.

Barriers: Provide barriers on both sides of each fuse link, preventing inadvertent electrical contact between phases by the insertion of screwdriver.

Fuse links: Enclosed, high rupturing capacity type mounted in a fuse carrier. If necessary for safe removal and insertion of the fuse carrier, provide extraction handles. Mount on clips within the spares cabinet.

Identification: Clearly indicate manufacturer or distributor.

Contactors

Standard: To International Standards.

Rated operational current: Full load current of the load controlled.

Minimum rating: 16 A.

Mounting: Mount with sufficient clearance to allow full access for maintenance, removal and replacement of coils and contacts, without the need to disconnect wiring or remove other equipment.

Interconnection: Do not connect contactors in series or parallel to achieve ratings.

9.1.2.6 LIGHTING

General

Provide a complete operational lighting system, tested and commissioned.

Proprietary equipment: Provide only proprietary lights, fittings and accessories.

Modifications and refurbishing: Carry out to the original manufacturer's standards.

Lamps

Lamps: Provide all lights complete with lamps and accessories.

Verify operation: Install lamps in all lights and verify correct operation before completion

Low voltage lamps: Provide lamps strictly in accordance with the light manufacturer's recommendation.

Dichroic lamps: Provide dichroic lamps with integral reflector which match the design specification.

Lighting Control System

Provide the following and to the Schedules:

- Lighting switches.
- Dimmers.
- Automatic control systems.
- External light fittings.
- Internal light fittings.

Documentation: Provide complete technical and operational documentation for the lighting control system where installed.

Installation

Supports: Mount lights on proprietary supports by means of battens, trims or packing material to suit location.

Completion

Verify the operation of all lights.

9.1.2.7 EMERGENCY EVACUATION LIGHTING

General

Provide a complete operational emergency evacuation lighting system, tested and commissioned to International Standards.

Single-point system lights

Visual indicator lights: Provide a red indicator, readily visible when the light is in its operating location, which indicates that the battery is being charged.

Inverter system: Provide protection of the inverter system against damage in the event of failure, removal or replacement of the lamp, while in normal operation.

Local test switches: Provide a momentary action test switch, accessible from below the ceiling, on each fitting to temporarily disconnect the mains supply and connect the battery to the lamp.

Common test switches: Provide a common test switch on the distribution board which disconnects main supply to the lights and tests for discharge performance, after testing, this switch must automatically revert to normal operating mode.

Batteries

Type: Lead-acid or nickel-cadmium batteries capable of operating each lamp at its rated output continuously at least 2 hours during completion tests and 1.5 hours during subsequent tests.

Battery life: At least 3 years when operating under normal conditions at an ambient temperature of 25°C and subjected to charging and discharging at 6 monthly intervals.

Marking: Indelibly mark each battery with its date of manufacture.

Power supply to single-point systems

Provide an unswitched active supply to each fitting and exit sign, originating from the test switch control panel.

9.1.2.8 TELECOMMUNICATION CABLING

General

Provide a complete operational telecommunications cabling system, tested and commissioned to International Standards. Provide accommodation for telecommunications cabling infrastructure complying with relevant clearance requirements from power cable distribution systems.

Include the following and to the Telecommunication equipment schedule:

- Building distributor.
- Backbone cabling.
- Floor distributors.
- Consolidation points.
- Equipment racks and patch cords.
- Horizontal cabling.
- Telecommunications outlets.
- Fly leads.

Equipment racks

Type: 19 inch rack.

Free standing racks: Provide adjustable feet.

Modular connector patch panels

Terminations: Terminate directly to the modular connector.

Patch cords: Terminate cord ends with appropriate registered jacks.

Optical fibre termination panels

Break out trays: Provide fibre optic cable break out trays at each group of fibre optic cable terminations.

Loom cables: Neatly loom cables and lay stripped cables into the break out tray.

Secure cables: Ensure that cables are secured by the sheath and that there is no stress on the fibre optic cores.

Patch cords

Provide terminated patch cords for 60% of the total incoming and outgoing ports used.

Records

Record book: Provide a record book at each cross connect.

Records in pencil: Complete the records in pencil for each termination and jumper, providing origin and destination and type of service.

Location: Secure log books in each distribution frame records holder.

Cable separation

Low voltage cables: Separate telecommunications cables not enclosed in conduits or ducts from low voltage services by at least 150 mm.

Electromagnetic interference (EMI): Provide clearance to minimise the effect of EMI where communications cables are installed parallel and adjacent to power cables carrying loads in excess of 200 A.

Installation

Crossover: Install cables neatly and without crossovers between cables.

Loom size: Loom cables into groups not exceeding 50 cables, and hold looms in place using reusable cable ties at least 20 mm wide. Do not exert compressive force on the cables when installing cable straps.

Telecommunications outlets

Outlets: Provide RJ45 8 way modular jacks except where documented otherwise.

Pinouts: The pinouts vary with the application. Determine required pinouts before making cable terminations.

Fly leads

Provide minimum 2000mm long fly leads to 50% of the outlets installed.

Earthing system

Communication earth system (CES): Provide a communications earth terminal (CET) associated with the local protective earth (PE) system adjacent to each electrical distribution board.

9.1.2.9 AUTOMATIC FIRE DETECTION

General

Provide a fully operational system, tested and commissioned in accordance with International Standards.

Base station monitoring system connection

Connection: Connect the installation to the fire alarm monitoring base station via telecommunication carrier lines where identified in the **Fire detection equipment schedule**.

Installation wiring

Conductor size: > 1.5 mm² TPI 220 V rated, with red and white insulation.

Sheathing: Red.

Fire indicator panels

Provide metal cubicle-type enclosures to locations identified on drawings.

Detectors

Provide the following detector types as indicated on the drawings:

- Point type heat detectors.

- Duct sampling units.

- Integral heat detector/alarm units.

- Point type smoke detectors.
- Integral smoke detector/alarm units.

Self-indicating detectors

Provide a light emitting diode mounted in a clearly visible position, which illuminates whenever detector operation causes an alarm condition to register on the fire indicator panel. Provide self-indicating devices which, if faulty, will not render the detector inoperative under fire conditions.

Mounting positions of light emitting diodes:

- Visible detectors: On the outside of the detector or its base.
- Detectors concealed above ceilings: On the underside of the ceiling immediately below the detector.
- Detectors in other concealed spaces: On a visible panel close to the entry to the concealed space housing the detector.

Installation

Install detectors so they can be easily inspected and tested in situ, and readily withdrawn for service.

Control facilities

Provide ancillary control device circuits and connections for automatically controlling and releasing magnetic door holders to operate the relevant fire doors under fire alarm conditions.

Fire fan control and indication panels

Provide fire detection and alarm signals for the fire fan control panel to be incorporated by mechanical services.

9.1.2.10 ACCESS CONTROL**General**

Provide a complete operational access control system, tested and commissioned in accordance with International Standards as applicable. Refer to the **Access control equipment schedule**.

Processors or panels

Capacity: Provide separate entry/exit control modules for each designated door.

Users: Program the system to match the number of authorised users with unique access codes.

Time zones: At least 3 per day, with provision for weekends and public holidays.

Door control devices

Provide electric strikes, electric locks, drop bolts, or similar devices to suit door construction and hardware.

Fail-safe: Connect door control devices in a fail-safe mode to permit exit in the event of power failure.

Authorised products: Provide equipment approved for use by the Engineer.

Double leaf doors (solid frame): Provide an electric strike or lock on the fixed leaf, connected to the door frame by concealed flexible wiring.

Activation

Provide keypads, card readers or other activation devices, and locate next to entry points.

External: Provide weatherproof (IP56) hoods or housings for external units.

Mounting height: 1200 mm from floor level.

Vehicle control

Vehicle access control: Provide a vehicle access control system combining connection to vehicular doors and boom gates, and interconnection to the main access control system.

Exit Loop detection: Provide a buried loop detection system adjacent to the exit point to activate boom gates or vehicular doors on approach by a vehicle. Connect so that doors or gates close after a pre-set time.

Interlock: Provide a photo electric beam safety interlock.

Interlock function: To prevent door or gate from closing until the vehicle has cleared the exit point.

Push-buttons and readers: Where practicable, provide direct wall mounting for push-buttons or readers; otherwise provide a mounting bollard and extension arm.

Mounting height: 1000 mm from floor level.

Reed switches: Provide heavy duty reed switches on both sides of vehicle doors, which generate a door closed indication at the control panel.

Intercom

Base station: Provide an intercom base station at each external entry point, interconnected with the individual local stations. Include speakers and microphones.

Construction: Wall mounted flush stainless steel panel.

Weatherproofing: IP56.

Dial: Digital push-button type.

Schedule: Provide a weatherproof (IP56) schedule holder and card identifying individual local stations. Locate next to the intercom panel.

Local station: Provide wall mounted intercom local stations, interconnected with the base stations and external entry points.

Type: Surface mounted, removable handset type.

Operation: Provide an audible tone device to indicate that the individual station is being called, and a press-to-talk switch so that the local station can communicate with the base station only when the switch is held down.

Door control: Provide integral momentary action door release switches to operate the door release or opening mechanisms at each external entry point.

9.1.2.11 LABELLING

General

Provide labels including control and circuit equipment ratings, functional units, notices for operational and maintenance personnel, incoming and outgoing circuit rating, sizes and origin of supply and kW ratings of motor starters.

Identifying labels

Provide labels fixed to access panels, doors, covers and escutcheon panels and internal equipment, indicating the relevant information and componentry.

Single-line diagrams

Custom-built assemblies: Provide single-line diagrams.

Format: Non-fading print, at least A3 size, showing the situation as installed.

Mounting: Enclose in a folder and fix close to assembly.

Marking cables

Identify the origin of all wiring by means of legible indelible marking.

Identification labels: Provide durable labels fitted to each core and sheath, permanently marked with numbers, letters or both to suit the connection diagrams.

Telecommunications Cabling

Label telecommunications cables, cross connects and outlets.

Labels: Label cables to indicate the origin and destination of the cable. Label outlets to show the origin of the cross connect, the workstation or outlet number, and the port designation.

Location marking

Accurately mark the location of underground cables with route markers consisting of a marker plate set flush in a concrete base.

Location: Place markers at each joint, route junction, change of direction, termination and building entry point and in straight runs at intervals of not more than 100 m.

Concrete bases: 200 mm diameter x 200 mm deep, minimum.

Direction marking: Show the direction of the cable run by means of direction arrows on the marker plate. Indicate distance to the next marker.

Plates: Brass, minimum size 75 x 75 x 1 mm thick.

Plate fixing: Waterproof adhesive and 4 brass or stainless steel countersunk screws.

Marker height: Set the marker plate flush with paved surfaces, and 25 mm above other surfaces.

Labelling – Minimum Lettering Heights

Main assembly designation: 25 mm.

Distribution assembly designations: 15 mm.

Small proprietary distribution boards: 10 mm.

Main switches: 10 mm.

Outgoing functional units: 8 mm.

Identifying labels (on outside of cabinet rear covers): 4 mm.

Danger, warning and caution notices: 10 mm for main heading, 5 mm for remainder.

Other labels including equipment labels within cabinets: 3 mm.

Label colours

Generally black lettering on white background except as follows:

- Main switch and caution labels: Red lettering on white background.
- Danger, warning labels: White lettering on red background.

Fixing

General: Fix labels securely.

Fixing methods: Use screws and double-sided adhesive. Fixed in extruded aluminium sections attached to panels with rivets or countersunk screws.

Permanent fixing: Fix labels permanently in place.

Refer to drawings, BOQ and Electrical **Schedules** for details and locations of all fixtures, fittings and cabling.

Scope of Work

Project: Construction of Safe Room + Renovation Work

Introduction – UN WOMEN intends to construct a Safe Room and do minor renovations in the office and accommodation buildings within UNOCA compound. The implementation of the works referred to in the Bills of Quantities, technical specifications and set of architectural, structural & services drawings.

Scope of Work: The work in this contract shall include but not limited to the furnishing of all necessary tools, materials, equipment, skilled manpower, transportation, machineries, accessories, site engineers and supervisors to carry out all work as described below and as outlined on the drawings as well as Bill of Quantities.

Project Activities:

The contractor should provide labor, material and equipment to complete the project per the technical drawings, specification and bill of quantities. The following main activities should be considered for the construction of female dressing room and toilet projects.

- 1- Before mobilization to the site the contractor should consult with UN WOMEN and take access permission, and should follow up UNOCA compound administration and security requirement throughout the construction period.
- 2- Contractor is responsible to provide skill /unskilled labors, equipment's, and other required items and proceed with the safety roll and regulation in the project site.
- 3- Contractor should submit their revised project work plan, QC plan, safety plan and other required submittals.
- 4- Contractor should clean the site from trash, debris and other materials.
- 5- Demobilization and removing of all unusable materials out compounds, and clean the project site properly as per UN WOMEN engineer's instruction.

SCHEDULE OF REQUIREMENTS

Performance Period: The Contractor shall provide a detailed schedule for the project completion. This schedule shall provide dates for all material deliveries and a construction timeline for the major construction milestones. The timeline shall include the completion dates of the project.

The contractor will have maximum 3 months (Upon Signing of the Contract) to complete all sets of activities in the SoW. The Contractor shall begin work and complete each phase of the project, including final inspection and project acceptance within the mentioned performance period. No deviation from the approved schedule shall be permitted except as otherwise in this Statement of Work. Failure to complete work within the scheduled period shall be grounds for liquidated damages and/or termination for cause as provided in this Statement of Work.

General Conditions: The Contractor is required to cover general requirements to include but not limited to the following:

- ✓ Mobilization and demobilization
- ✓ Temporary facilities including power & water supplies, toilets etc. enclosures to the working premises, temporary storage etc.
- ✓ Qualified Site Supervision and Management.
- ✓ Watch & ward of his works, material & equipment until handing over the site

Other Preliminaries: Provisions for all other preliminary items such as standard construction safety and security, day markings, protection of existing utilities and adjacent properties that may be affected, submission of samples, reports, quality tests, shop drawings and as-built plans, disposal and clean-up.

Work Supervision: The Contractor shall assign a competent project manager who shall be a registered civil engineer to be present on each site always for the duration of the contract. The supervisor should be able to communicate effectively in the local and English languages.

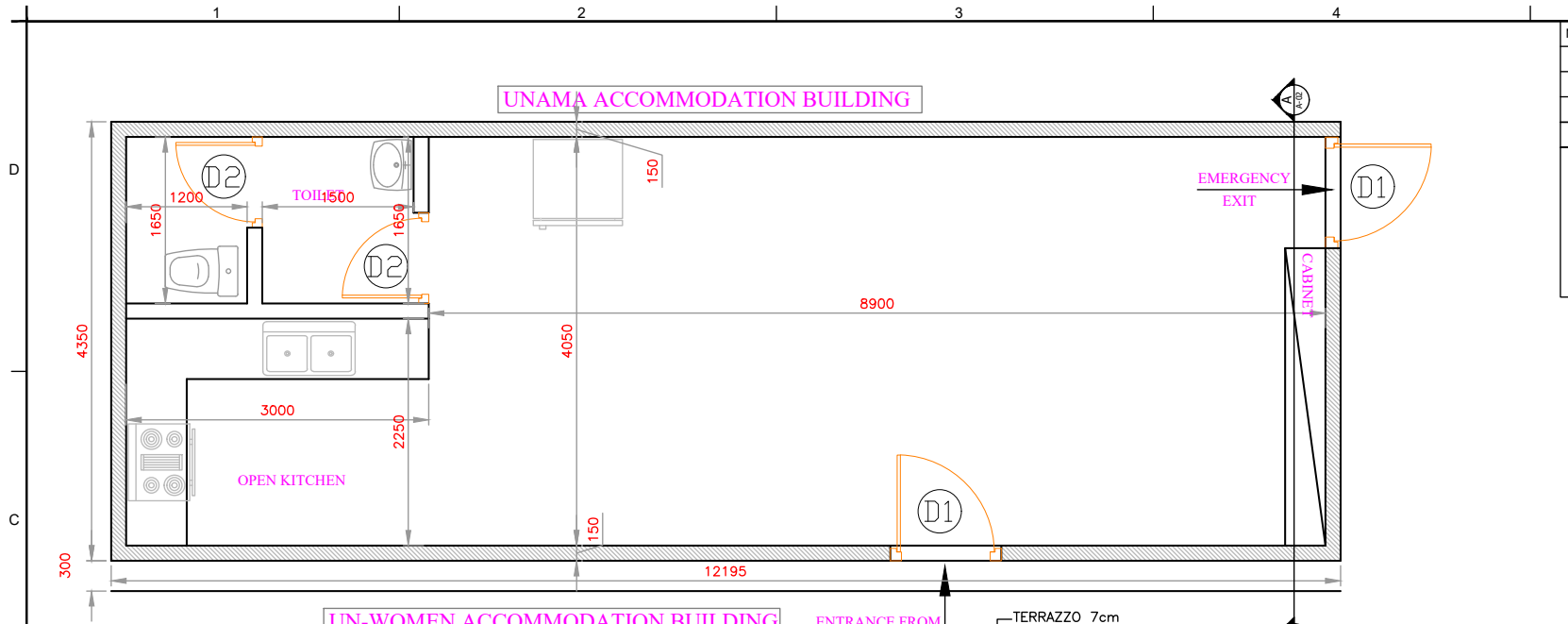
Materials and Workmanship: The Contractor shall seek approval of the UN WOMEN engineering department for all the materials, and whenever commencing other work items. All materials and workmanship used in the execution of the works shall be of the best quality and high quality workmanship and approved in advance.

Samples: The Contractor shall furnish at his own cost any samples of materials and/or related technical data required for the works that may be called for by the UN WOMEN engineer for approval and any further samples in the case of rejection. The engineers in charge may reject any materials not meeting the approved standards/specifications and contract requirement.

Existing Property: The Contractor shall take every precaution to avoid damage to the existing utilities or adjacent structures during the works. Care must be taken to avoid interference with or damage to existing services, except where such services are required to be removed or altered by virtue of the works. The Contractor will be held responsible for and shall make good all damages arising from the execution of this contract at its own expense.

Notes:

- ✓ The contractor should be aware that the proposed work will be carried out in the existing functioning building and that the daily activity shall not interrupt others ongoing daily activities.
- ✓ All construction materials to be approved by the Engineer before construction, fabrication or installation.
- ✓ All concrete and mortar QC testing to be applied as per specification

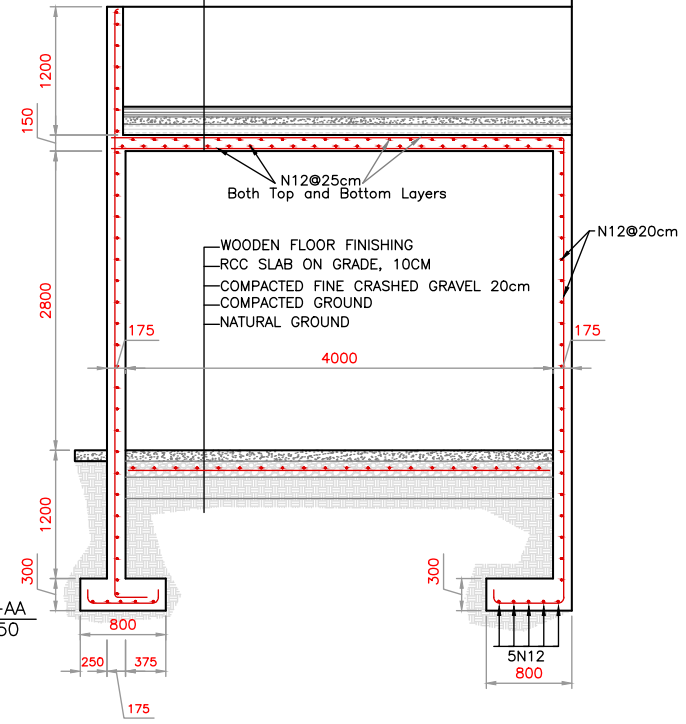


1 Floor Plan
A-01 SCALE: 1:50

ENTRANCE FROM
ACCOMMODATION

- TERRAZZO 7cm
- TWO LAYERS OF ISOGAM
- PCC FOR 2% SLOPE (5-10cm)
- RIGID POLYSTYRENE, 10cm
- RCC SLAB, 15cm
- CEMENT PLASTER, 1.5cm

UNAMA ACCOMMODATION
BUILDING WALL




2 SECTION-AA
A-01 SCALE: 1:50

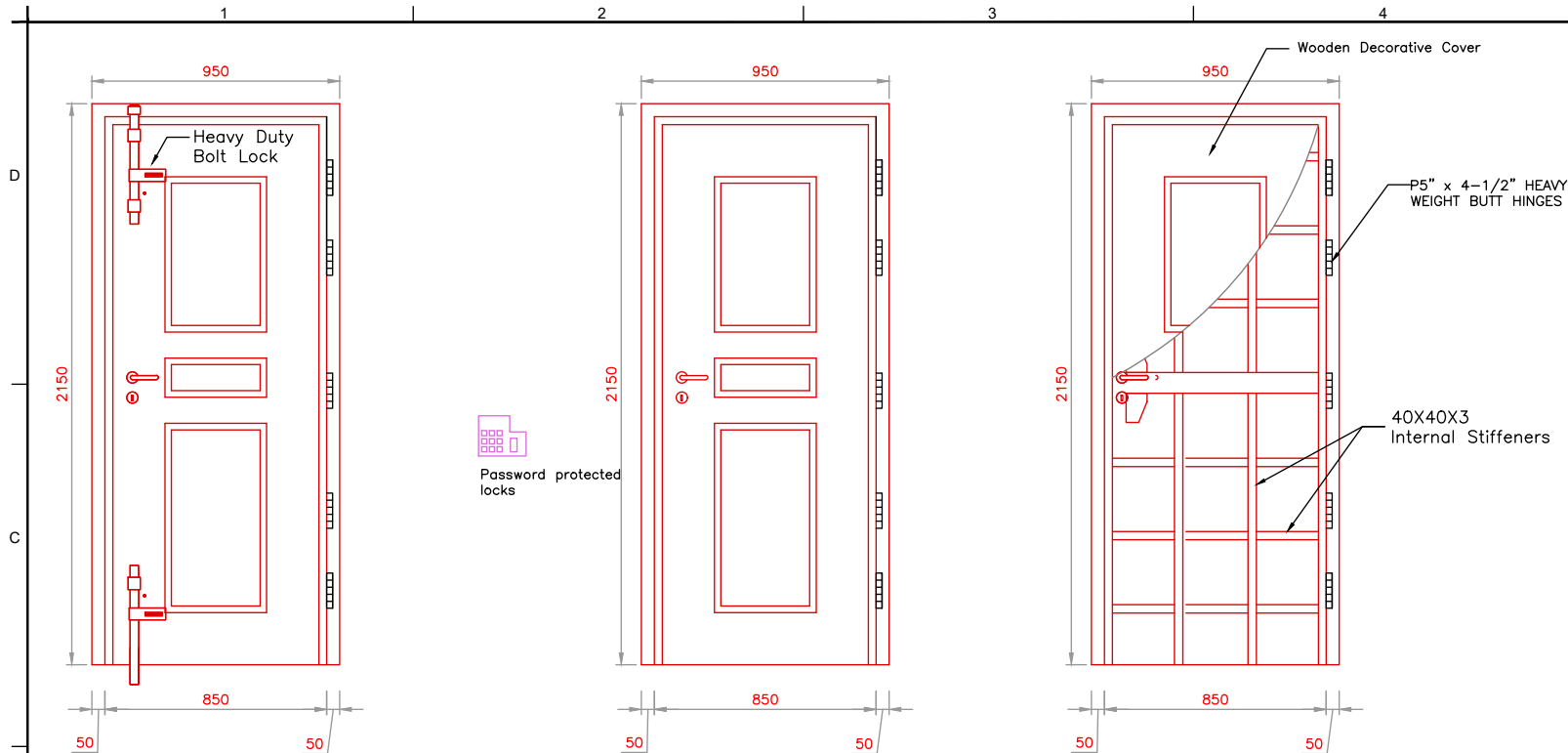
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NOTES

- * ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
- * DO NOT SCALE DRAWINGS.
- * VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCEMENT OF WORK.
- * ALL DRAWINGS SHALL BE READ IN CONJUNCTION WITH SPECIFICATIONS AND SCHEDULES.
- * ALL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH LOCAL LAWS AND UN WOMEN SPECIFICATIONS.
- * ANY DISCREPANCIES SHALL BE REPORTED TO UN WOMEN ENGINEER.

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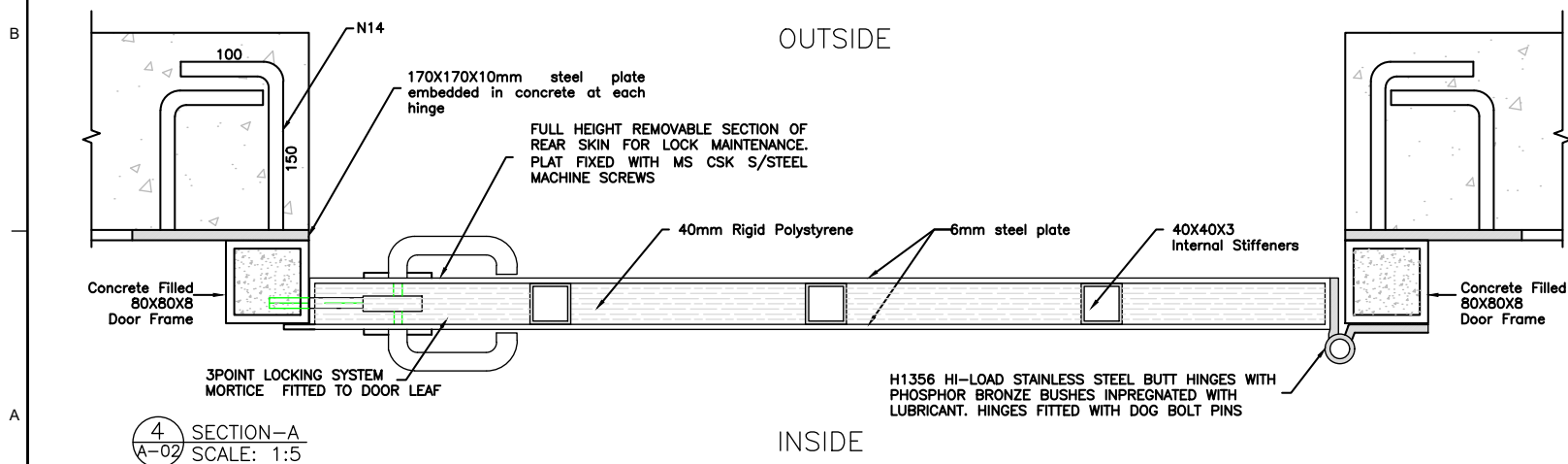
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PROJECT: CONSTRUCTION OF SAFE ROOM FOR UN-WOMEN			
DRAWING TITLE: FLOOR PLAN			
DESIGNED:	AH.KHALID	PROJECT NO:	2018-001
DRAWN:	AH.KHALID	SHEET SIZE:	A3
CHECKED:		SCALE:	1:50
APPROVED:		DATE:	29.07.2018
DRAWING NO.		REV.	
A-01		0	



1 Door-1 Outside Elevation
A-02 SCALE: 1:20

2 Door-1 Inside Elevation
A-02 SCALE: 1:20

3 Door-1 Framing Details
A-02 SCALE: 1:20



4 SECTION-A-A
A-02 SCALE: 1:5

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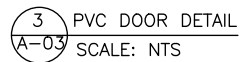
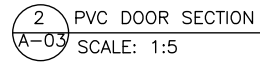
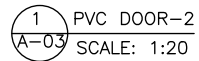
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ISSUED FOR TENDER

BENEFICIARY:			
PROJECT: CONSTRUCTION OF SAFE ROOM FOR UN-WOMEN			
DRAWING TITLE: BULLET PROOF DOOR DETAIL			
DESIGNED:	AH.KHALID	PROJECT NO:	2018-001
DRAWN:	AH.KHALID	SHEET SIZE:	A3
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APPROVED:		DATE:	29.07.2018
DRAWING NO.		REV.	
A-02		0	

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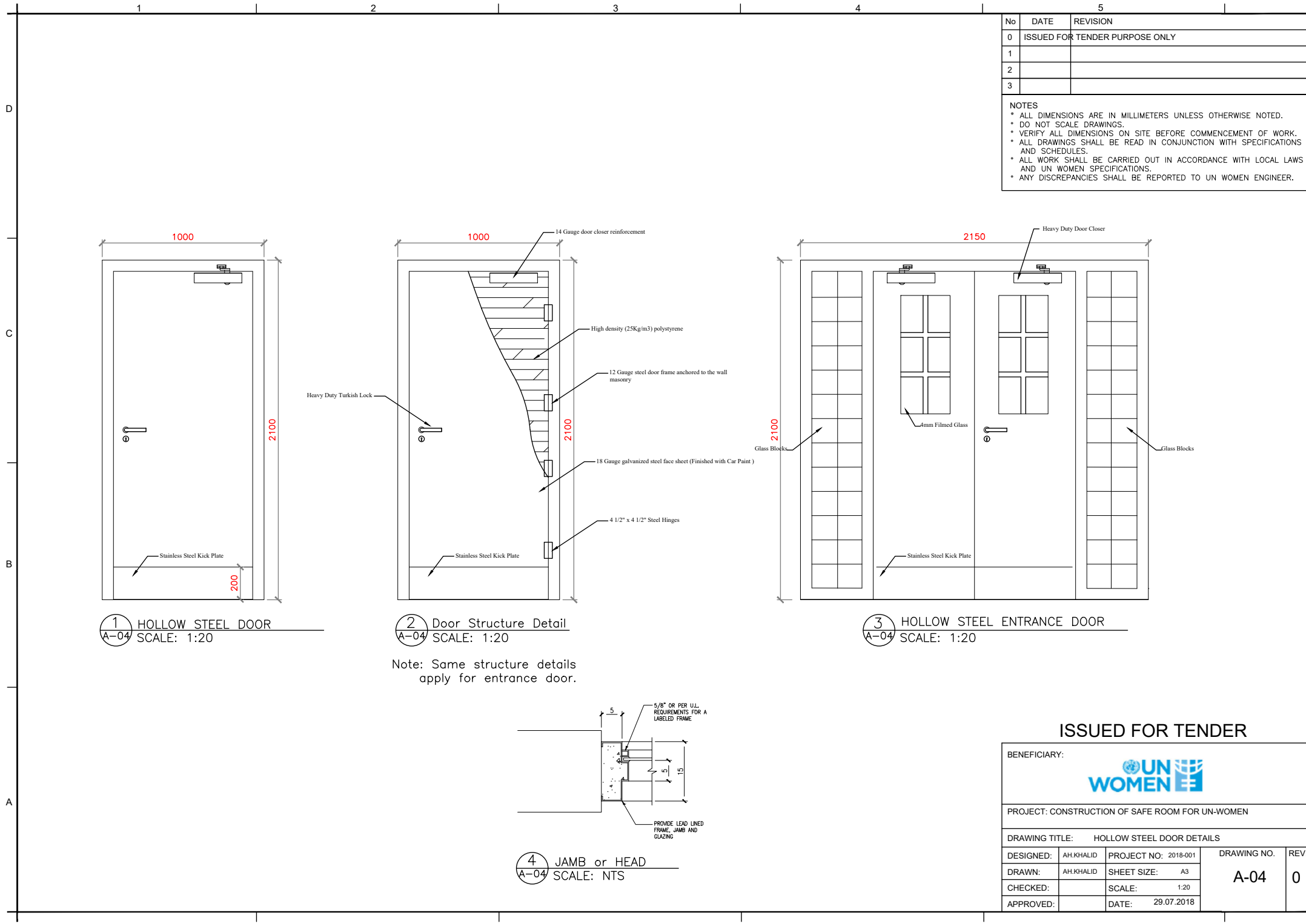
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PROJECT: CONSTRUCTION OF SAFE ROOM FOR UN-WOMEN

DRAWING TITLE:	TOILETS PVC DOOR-2
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DESIGNED:	AH.KHALID	PROJECT NO: 2018-001	DRAWING NO. A-03	REV. 0
DRAWN:	AH.KHALID	SHEET SIZE: A3		
CHECKED:		SCALE: 1:20		
APPROVED:		DATE: 29.07.2018		



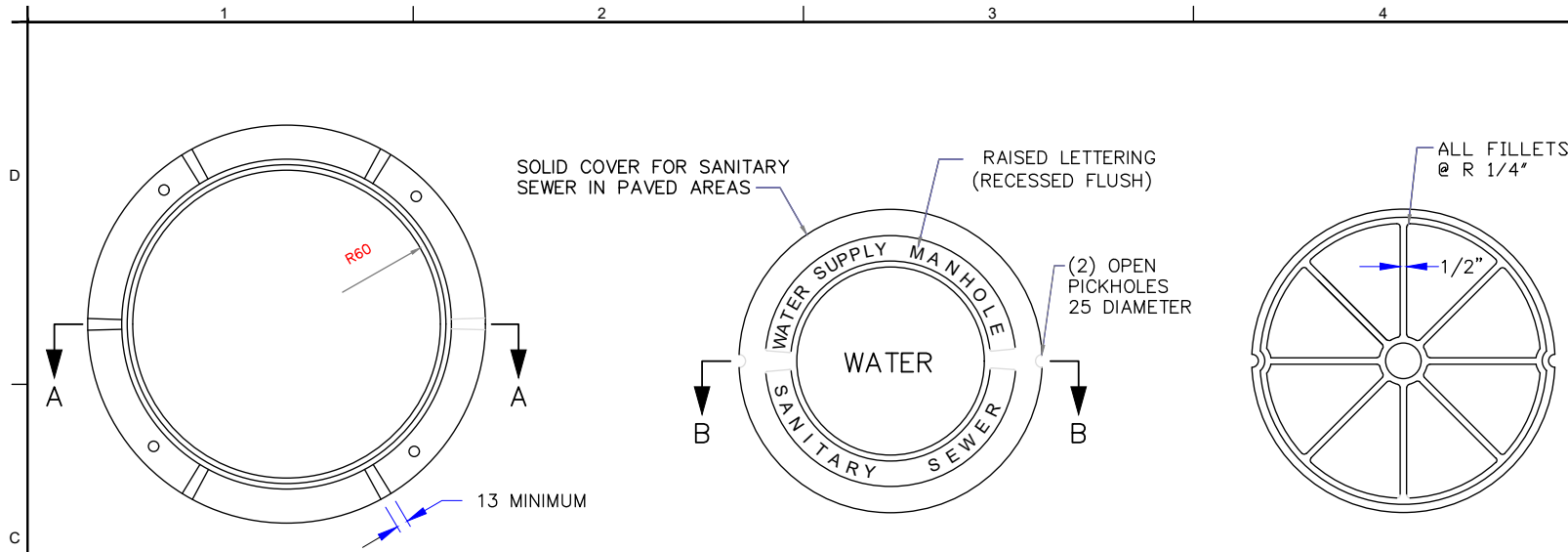
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NOTES

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- * VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCEMENT OF WORK.
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- * ANY DISCREPANCIES SHALL BE REPORTED TO UN WOMEN ENGINEER.

ISSUED FOR TENDER

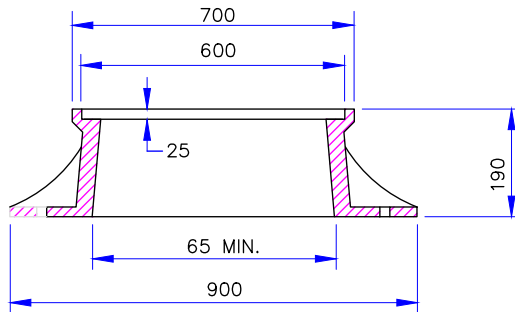
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PROJECT: CONSTRUCTION OF SAFE ROOM FOR UN-WOMEN				
DRAWING TITLE: HOLLOW STEEL DOOR DETAILS				
DESIGNED:	AH.KHALID	PROJECT NO:	2018-001	DRAWING NO.
DRAWN:	AH.KHALID	SHEET SIZE:	A3	REV.
CHECKED:		SCALE:	1:20	A-040
APPROVED:		DATE:	29.07.2018	



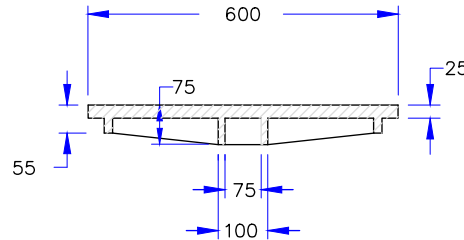
1 RING TOP VIEW
WS08 SCALE: 1:25

2 COVER TOP VIEW
WS08 SCALE: 1:25

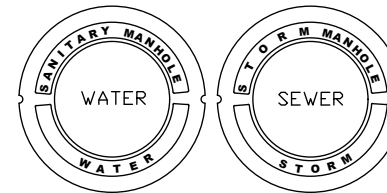
3 COVER BOTTOM VIEW
WS08 SCALE: 1:25



4 SECTION A-A
WS08 SCALE: 1:25



5 SECTION B-B
WS08 SCALE: 1:25



6 ALTERNATE LETTERING
WS08 SCALE: 1:25

No	DATE	REVISION
0		ISSUED FOR REVIEW PURPOSE ONLY
1		
2		
3		

NOTES

- * ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
- * DO NOT SCALE DRAWINGS.
- * VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCEMENT OF WORK.
- * ALL DRAWINGS SHALL BE READ IN CONJUNCTION WITH SPECIFICATIONS AND SCHEDULES.
- * ALL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH LOCAL LAWS AND UN WOMEN SPECIFICATIONS.
- * ANY DISCREPANCIES SHALL BE REPORTED TO UN WOMEN ENGINEER.

SPECIFICATIONS:

1. CLASS 35 GREY IRON.
2. COMPLIES WITH ASTM A48 CL35B.
3. CASTING TO BE COATED WITH A WATER BASED ASPHALT PAINT (BLACK).
4. ALL LETTERING SHALL BE CLEAN, CRISP, AND CLEARLY LEGIBLE.
5. ALL DIMENSION ARE IN MM.

ISSUED FOR TENDER

BENEFICIARY:			
PROJECT: CONSTRUCTION OF SAFE ROOM FOR UN-WOMEN			
DRAWING TITLE: WATER AND SANITATION MANHOLES IRON COVER DETAILS			
DESIGNED:	AH.KHALID	PROJECT NO:	2018-001
DRAWN:	AH.KHALID	SHEET SIZE:	A3
CHECKED:		SCALE:	1:25
APPROVED:		DATE:	29.07.2018
DRAWING NO.		REV.	
WS-08		0	

STANDARD MANHOLE RING AND COVER